Appendix 8: Abstracts

Adam, F., V. Aellen and M. Tranier (1993). Nouvelles données sur le genre *Myopterus*. Le statut de *Myopterus daubentonii* Desmarest, 1820 (Chiroptera: Molossidae).

New data on the genus *Myopterus*. The status of *Myopterus daubentonii* Desmarest 1820 (Chiroptera: Molossidae) - Five specimens of *Myopterus*, caught in Sénégal in 1973, allow to clarify the taxonomical status of *Myopterus daubentonii* Desmarest, 1820 (Chiroptera: Molossidae). A neotype is designated, housed in the Muséum national d'Histoire naturelle (MNHN), in Paris. Relationships between the so-called *M. daubentonii, M. albatus* and *M. whitleyi* are discussed; it is suggested that *M. albatus* might be a mere subspecies of *M. daubentonii*. New localities are given - or even resurrected - for this rare and poorly known genus: i.e. Gaboon and Uganda (*M. whitleyi*), Central African republic (*M. daubentonii albatus*).

Adam, F. and B. Hubert (1972). Chiroptères nouveaux pour le Sénégal.

Les auteurs donnent une liste de six espèces de chauves-souris nouvelles pour le Sénégal: *Epomophorus anurus, Lissonycteris angolensis smithi, Rhinopoma microphyllum, Eptesicus tenuipinnis, Glauconycteris poensis, Gauconycteris variegata*. Les mensurations externes et crâniennes des spécimens sont données.

Un spécimen de Richard-Toll est référable à *Pipistrellus rueppelli senegalis*, confirmant ainsi la validité de la sous-espèce créée par Dorst sur les caractères d'un seul spécimen de même origine.

Une étude biométrique de spécimens rapportés à *Hipposideros caffer tephrus* et à *Hipposideros caffer guineensis*, capturés ensemble dans un arbre creux,
démontre qu'*Hipposideros tephrus* est une espèce distincte.

Adam, F. and B. Hubert (1976). Les Nycteridae (Chiroptera) du Sénégal: Distribution, biométrie et dimorphisme sexuel.

Cinq espèces de Nycteridae sont présentes au Sénégal: *Nycteris hispida, N. grandis, N. macrotis, N. thebaica* et *N. gambiensis*. Les auteurs fournissent pour chacune leur distribution connue dans ce pays; pour les trois dernières, une étude biométrique montre l'existence d'un dimorphisme sexuel. La synonymie de *Nycteris aethiopica* avec *N. macrotis* est confirmée, tandis que celle de *N. thebaica* avec *N. gambiensis* est infirmée.

Adam, J. P. (1973). Hematozoaires des Chiroptères en Afrique Centrale.

D'assez nombreux hématozoaires ont été signalés ou décrits chez les chiroptères. En Afrique centrale le sang de plusieurs centaines de chauves-souris a été examiné par l'auteur. Ces animaux appartenaient à une vingtaine d'espèces réparties en dix huit genres. Ils provenaient, pour la plupart du Congo (Brazzaville) et quelques-uns de R.C.A., du Gabon et du Cameroun.

Au Congo, des infections par *Plasmodium voltaicum* ont été trouvées chez *Lissonycteris angolensis*. Trois espèces de Megachiroptères du Congo et de R.C.A. hébergent *Hépatocystis perronae* n. sp., *Polychromophilus* sp., parasite , au Congo, six espèces, de Microchiroptères appartenant à quatre genres. *Trypanosoma megadermae* existe chez *Roussettus aegyptiacus unicolor* et important des microchiroptères appartenant à cinq espèces différentes.

Adam, J. P. and I. Landau (1973b). *Polychromophilus* sp. Haemoproteidae parasite de Microchiroptères au Congo (Brazzaville).

Polychromophilus sp. a été trouvé par les auteurs au Congo-Brazzaville dans le sang de Microchiroptères troglophiles appartenant à cinq espèces (3 genres). L'hôte vertébré est porteur de gamétocytes toute l'année, mais la recherche des schitontes est restée infructueuse. La dissection de nombreux arthropodes sanguisuges (neuf espèces) a permis de trouver et décrire oocystes et sporozoïtes chez une Nycteribie dont le taux d'infection est élevé.

Polychromophilus s.p. was found by the authors in Congo-Brazzaville in the blood of troglophilous microchiroptera belonging to five species (three genera). The vertebrate host is bearing gamétocytes all year long but the search for schizonts remained unsuccessful. The dissection of many haematophagous arthropods (9 species) allowed us to find and describe oocysts and sporozoits in a nycteribiid fly whose rate of infection is high.

Adam, J. P. and F. LePont (1974). Les chiroptères cavernicoles de la république populaire du Congo. Notes bioécologiques et parasitologiques.

Dans un travail publié en 1968, AELLEN et BROSSET donnaient une étude systématique des chiroptères récoltés par nous au Congo entre 1961 et 1968. Aux quatorze espèces étudiées alors par ces auteurs, nos prospections permettent d'en ajouter deus autres ainsi que des localisations nouvelles pour plusieurs des espèces citées. Nous rapportons également les observations que nous avons eues l'occasion d'effectuer sur la bioécologie souvent peu connue des chiroptères et sur les hématozoaires qui les parasitent.

In 1968 AELLEN and BROSSET published a work on the systematics of the Chiropterans collected by us between 1961 and 1968 in the Congo. Two additional species and several new collecting sites for some of the fourteen species studied by these authors are given in the present paper. We also report observations on the bioecology of the chiropterans which is little known and on their hematozoa.

Aellen, V. (1956a). Speologica africana. Chiroptères des grottes de Guinée.

L'étude de la faune des Chiroptères de la Guinée française a été fort négligée jusqu'à ces dernières années. Aussi, lorsque M. A.VILLIERS m'a proposé d'examiner une série de Chauves-Souris qu'il avait capturées dans des grottes de ce pays. J'ai accepté d'emblée. en pensant qu'il y avait certainement des espèces intéressantes.

La collection comprend 52 spécimens appartenant à 5 espèces. Toutes sont nouvelles pour la Guinée française, sauf *Rhinolophus maclaudi* qui n était connu que par un seul individu. Une des formes est nouvelle pour la science et je me fais un plaisir et un devoir de la dédier au collecteur.

Ces Chiroptères sont tous conservés en alcool. Ils sont déposés dans les collections zoologiques de l'IFAN à Dakar.

Aellen, V. (1956b). Le Parc National du Niokolo-Koba. (Premier fascicule). II. Chiroptères.

Les Chiroptères faisant l'objet de cette étude sont au nombre de 58 et représentent 15 espèces. La plupart proviennent de Badi (Sénégal, Haute-Gambie, 13°15' N, 8°20 W), à la limite des savanes guinéennes et soudanaises. Ils ont été obtenus par des indigènes dans des cases ou des arbres creux.

L'intérêt de cette collection réside dans le fait que son étude apporte 9 espèces nouvelles pour le Sénégal et permet de mettre quelques formes en synonymie:

Hipposideros gigas viegasi MONARD = *Hipposideros commersoni gambiensis* ANDERSEN.
Hipposideros braima MONARD = *Hipposideros caffer tephrus* CABRERA.
Mops osborni occidentalis MONARD = *Tadarida condylura wonderi* (SANBORN).

La position systématique de "*Nycticeius leucogaster* CRETZSCHMAR" est revue. Cette forme, qui était considérée jusqu'à présent comme une sous-espèce de *Scotophilus nigrita* (SCHREBER), devient maintenant une espèce nominale dont *Scotophilus viridis* (PETERS) est une sous-espèce.

Aellen, V. (1957). Les Chiroptères africains du Musée zoologique de Strasbourg.

Les collections du Musée Zoologique de Strasbourg renferment 30 espèces (34 formes) de Chiroptères africains représentés par 55 spécimens.

Aellen, V. (1963). La réserve naturelle intégrale du Mont Nimba. XXIX. Chiroptères.

Les Chiroptères de la République de Guinée (ancienne Guinée française) sont relativement mal connus, malgré quelques travaux récents (AELLEN, 1956 a ; EISENTRAUT et KNORR, 1957). Aussi les récoltes du professeur M. LAMOTTE, au Mont Nimba, à l'extrême Sud-Est du pays, sont-elles particulièrement précieuses.

On ne connaissait, dans ce massif montagneux, que quelques espèces signalées par M. LAMOTTE (1942) (*Hipposideros fuliginosus, Eptesicus grandidieri, ? Xiphonyderis spurrelli*), A. VILLIERS (1948) (*Eidolon helvum*) et M. EISENTRAUT (1959) (*Rousettus aegyptiacus occidentalis*). Les identifications des trois premières espèces avaient été faites par P. Rode et devraient être vérifiées avant d'être acceptées; elles me paraissent douteuses. Ce matériel avait été récolté par le professeur LAMOTTE, en 1942, et aurait été déposé au Muséum de Paris, mais il n'y en a plus trace actuellement (in litt. prof. LAMOTTE, 30-IX-1960).

Les Chauves-Souris dont j'ai disposé pour cette étude proviennent d'une part, d'une récolte de MM. A. VILLIERS et P. L. DEKEYSER (IFAN) et, d'autre part, des captures de M. LAMOTTE et de ses collaborateurs qui ont été déposées en partie dans les collections de l'IFAN (récoltes de 1951) et en partie dans celles du muséum de Paris (récoltes de 1956, 1957 et 1958).

Parmi les 30 spécimens que j'ai examinés, j'ai identifié 10 espèces, dont 7 sont nouvelles pour la Guinée. Malgré cet apport important, il est encore prématuré de vouloir dresser une liste des Chiroptères du Mont Nimba et encore moins de la Guinée, dont on connaît actuellement 25 espèces.

Je remercie très vivement M. le professeur TH. MONOD, directeur de l'IFAN, de m'avoir confié l'étude des Chiroptères africains de cet institut et M. le professeur M. LAMOTTE de m'avoir adressé ses dernières récoltes de chauves-souris du Mont-Nimba.

Aellen, V. (1973). Un *Rhinolophus* nouveau d'Afrique centrale.

Espèce apparentée à *ruwenzorii* et à *maclaudi*, mais plus proche du premier, dont elle diffère par une taille plus faible, le connectif de la feuille nasale bien développé et la boîte crânienne et le rostre plus larges.

Les 3 espèces représentent probablement des types archaïques reliques maintenant isolés, mais ayant une origine commune avec les espèces orientales du groupe *philippinensis*.

Aellen, V. and P. Strinati (1970). Chauves-souris cavernicoles de Tunisie.

Etude de 6 espèces de chauves-souris observées lors d'un voyage spéléologique en Tunisie en octobre 1967. Une espèce est nouvelle pour le pays: *Rhinolophus blasii*. Localités nouvelles pour d'autres espèces. Précisions taxonomiques, en particulier sur la forme *Rhinolophus euryale tuneti*.

Aggundey, I. R. and D. A. Schlitter (1984). Annotated checklist of the mammals of Kenya. I. Chiroptera.

A list of 95 species in nine families of bats known by Kenyan specimens is annotated with records of museum specimens or with references to the literature. A gazetteer of collecting localities is included.

Aggundey, I. R. and D. A. Schlitter (1986). Annotated checklist of the mammals of Kenya. II. Insectivora and Macroscelidae.

Four families of Insectivora (Tenrecidae, Chrysochloridae, Erinaceidae, Soricidae) and one of Macroscelidea (Macroscelididae) are known from Kenya. Of these families, only the Soricidae, with 31 species, and the Macroscelididae, with five species, are known from more than a single species. Records of occurrence are annotated by museum specimens or with references to the literature. *Suncus murinus* seems to be the only introduced species in the insectivore fauna of Kenya. Distributional records of insectivores in Kenya are poor as 13 species of the 39 reported are known from only a single locality in Kenya. A gazetteer of collecting localities is included.

Aghomo, H. O., A. K. Ako-Nai, O. O. Oduye, O. Tomori and C. E. Rupprecht (1990). Detection of rabies virus antibodies in fruit bats (*Eidolon helvum*) from Nigeria.

Fruit bats (Eidolon helvum) were collected from three different localities in Western Nigeria: Oti, Ibadan and Idanre. Fifty Serum samples were analyzed using a modified rapid fluorescent focus inhibition technique against rabies, Mokola, Lagos bat and Duvenhage viruses. Twenty-five brain samples were screened for rabies and related lyssavirus antigens by direct fluorescent antibody microscopy and by an indirect fluorescent antibody technique with rabies anti- nucleocapsid monoclonal alltibodied. All brain samples were negative. Two serum samples had relatively high anti-rabies activity; no neutralizing activity was detected against Mokola, Lagos bat or Duvenhage viruses.

Albayrak, I. and N. Asan (1999). Distributional status of the bats from Turkey (Mammalia: Chiroptera).

Distributional area of 30 bat species living in Turkey was defined. The population of each species was described by assigning them into categories, common, uncommon, rare and very rare. Potential threats on Turkish bats were revealed and the developed conservation plans were discussed.

Alcalde, J. T. (1999). New ecological data on the noctule bat (*Nyctalus noctula* Schreber, 1774) (Chiroptera, Vespertilionidae) in two towns of Spain.

The Iberian Peninsula represents the South-western limit of distribution of the noctule bat (*Nyctalus noctule*) in Europe. We present here new ecological and behavioural data for the noctule bat in parks of two towns of Navarra (Northern Spain) which demonstrate its continuous presence throughout the year. Between 1995 to 1998, 148 individuals have been marked and located in 56 shelters. Groups mainly consisted of sedentary males; there were very few females in April-August but they were quite

common living in harems during the mating season (September-November). The unusual scarcity of females in relation to males found during autumn 1997 is also commented.

La Péninsule ibérique représente la limite méridionale de répartition de la noctule commune en Europe. Nous présentons des nouvelles données écologiques du comportement de cette espèce dans des parcs de deux villes de Navarre (Nord de l'Espagne) qui prouvent sa présence continue toute l'année. Entre 1995 et 1998, 148 individus ont été bagues et 56 refuges ont été localises. Les groupements observes sont composes de males sédentaires; d'avril à août, on a trouvé peu de femelles; en revanche, pendant l'accouplement (septembre à novembre) elles sont assez communes et se réunissent en harems. On montre aussi la rareté des femelles par rapport aux males en automne 1997.

Aldridge, H. D. J. N. and I. L. Rautenbach (1987). Morphology, echolocation and resource partitioning in insectivorous bats.

(1) Two hypotheses are tested in this paper: (i) wing morphology and echolocation-call 'design' can determine foraging site selection and foraging behaviour in bats, (ii) echolocation-call 'design' should be compatible with wing morphology (because some combinations of morphology and echolocation call would be maladaptive).

(2) In support of our first hypothesis, significant correlations were established between wing morphology, echolocation call design, manoeuvrability and habitat use.

(3) In support of our second hypothesis, significant correlations were established between those morphological parameters that improve manoeuvrability (low wingloading, low aspect ratio and high wingtip shape index) and echolocation calls that are resistant to acoustic clutter in support of our second hypothesis.

(4) There was an association between foraging habitat and diet: bats that fed in the same habitats tended to take the same types of prey, while species foraging in different habitats had significantly different diets.

(5) There was also a significant correlation between prey and predator size; large bats took insects over a range of sizes while small bats fed only on small prey.

Allen, G. M. (1908). Notes on Chiroptera.

The collection of bats in the Museum of Comparative Zoology contains upwards of 190 species, represented by skins, skeletal parts, and alcoholic specimens. Many of these specimens are of unusual interest. I have made the following notes while studying this material recently. In the case of certain imperfectly known species detailed series of measurements or other data of interest are given, and five species are described as new.

Of especial note are the collections received from the Thayer Expedition to Brazil, made in 1865, under the direction of Louis Agassiz ; also a considerable number of Indian bats sent at about the same time by Rev. M. M. Carleton from northern India and the Koolloo Valley. More recently a valuable series of alcoholic specimens from Java and Japan was presented by Mr. Thomas Barbour, in part collected by himself in 1906-07. I am indebted to the authorities of the Museum of Comparative Zoology for the privilege of making this report, and to the United States National Museum, through Dr. M. W. Lyon, Jr., for the loan of certain specimens.

All measurements are in millimeters, and colors are after Ridgway's Nomenclature of colors. I have followed the nomenclature and order adopted by Miller in his monograph on "The families and genera of bats" (Bull. 57, U. S. Nat. Mus., 1907).

Allen, G. M. (1923). New Chinese bats.

Over five hundred bats have been thus far sent back by the Asiatic Expeditions under the leadership of Mr. Roy C. Andrews. These are chiefly from Fukien, Szechwan, southeastern Yunnan, and North China. The series of skins is well supplemented by specimens in alcohol, and in many cases wide-ranging species are represented by a number of skins from the coastal regions as well as by others from the higher or more inland provinces, so that an unusual opportunity is afforded for a comparison of the lowland and the upland members of a species. This is undoubtedly the.largest single collection of bats yet obtained by any one expedition in China, and my thanks are due The American Museum of Natural History for the opportunity to study this important series.

Al-Safadi, M. M. (1991). Chiropteran fauna of Yemen Arab republic.

The chiropteran or bat fauna is the first group of the mammalian fauna of the Yemen Arab Republic to be considered. Four types of bats are recorded from Yemen Arab Republic; two of them identified to subspecies, *Tadarida pumila pumila* and *Scotophilus leucogaster leucogaster*; one identified to species, *Tadarida aegyptiaca*; and one to genus, *Pipistrellus*. The present additional records of bats from Yemen Arab Republic bring the total number of Yemen Arab Republic bats to seven species.

La faune de chauves-souris constitue le premier groupe de mammifères étudié en République Arabe du Yemen. Quatre taxons de chauves-souris ont été recenses: *Tadarida p. pumila, Scotophilus l. leucogaster, Tadarida aegyptiaca* et *Pipistrellus* sp.

Actuellement sept espèces de chauves-souris sont connues en République Arabe du Yemen.

Álvarez, Y., J. Juste B. , E. Tabares, A. Garrido-Pertierra, C. Ibáñez and J. M. Bautista (1999). Molecular phylogeny and morphological homoplasy in fruitbats.

The present study evaluates the evolutionary framework of the Old World fruitbats based on the cytochrome *b* and 16S rRNA mitochondrial gene sequences from a wide range of taxa. Phylogenetic analyses indicated that morphology-based subfamilies and most suprageneric groups are nonnatural assemblages. They also support the existence of an endemic African clade of fruitbats. The discrepancy between the evolutionary relationships yielded by molecular and morphological data sets may be, at least in part, explained by the recurrent retention of primitive morphology (*Rousettus*-like) across different lineages. The maintenance of primitive characters in different groups of flying foxes, as well as morphological convergence in nectar-feeding bats and possibly also in short-muzzle bats, may have led to high levels of homoplasy, resulting in misleading taxonomic arrangements. This may be particularly so with respect to high taxonomic levels based on morphological characters.

Amr, Z. S. and M. B. Qumsiyeh (1993). Records of bat flies from Jordan, Libya and Algeria.

Eight species of bat flies (Insecta: Diptera: Streblidae and Nycteribiidae) collected from bats from Jordan, Libya and Algeria are listed along with their respective hosts. *Brachytarsina flavipennis, Stylidia biarticulata, Stylidia integra* and *Basilia nana* are new records for Jordan.

Anciaux de Faveaux, M. (1965). Les Parasites de Chiroptères. Rôle épidémiologiques chez les animaux et l'homme au Katanga.

Le but de cette étude est de passer en revue les infections et le maladies provoquées directement ou indirectement, par les Chiroptères et leurs parasites.

Nous examinerons surtout les résultats obtenus dans une région bien déterminée: le Haut-Katanga (République du Congo).

Anciaux de Faveaux, M. (1973). Essai de synthèse sur la reproduction de chiroptères d'Afrique (région faunistique éthiopienne).

Les cycles annuels de Chiroptères de l'Afrique Ethiopienne sont basés sur trois principaux types: monooestrien, polyoestrien à reproduction saisonnière, polyoestrien à reproduction continue; les diverses espèces de chauves-souris sont classées en fonction de ces trois modes de reproduction.

La périodicité des mises bas est établie d'après quatre grandes aires climatologiques d'Afrique centrale; elle est variable suivant les familles et les genres.

Le concept d'équateur biologique est défini avec plus de précision; ses limites nord et sud sont liées aux lieux de reproduction.

Les variations de la latitude exercent une influence sur la périodicité et sur la durée du cycle reproductif; elles ne semblent pas avoir d'action positive sur le degré de fécondité.

La reproduction est déterminée en partie par des facteurs climatologiques (relation saison des pluies - régime alimentaire); elle dépend également de facteurs internes dont l'action est plus ou moins prépondérante dans certains cas qui sont précisés.

Anciaux de Faveaux, M. (1976a). La léthargie chez les chiroptères cavernicoles d'Afrique Centrale.

From his personal research undertaken in the subterranean field (natural and artificial cavities) in Shaba (ex-Katanga, in S.E. Zaïre) and Rwanda, the author briefly defines the macroclimate of the prospected regions as wel] as the microclimate of the subterranean habitat (humidity and temperature).

A reversible hypothermia has been noticed in the dry season only (from May till August) in eleven species of troglophile Chiroptera belonging to the following families: Rhinolophidae (7 species of Rhinolophus), Hipposideridae (only *Hipposideros ruber*) and Vespertilionidae (*Miniopterus inflatus rufus, Miniopterus schreibersi arenarius* & *M.s. natalensis, Myotis tricolo*r).

No sign of lethargy has been noticed in the Megachiroptera (*Lissonycteris angolensls, Rousettus aegyptiacus leachi*), Emballonuridae (*Taphozous perforants sudani*), Hipposideridae (*Cloeolis percivali australis*) or Nycteridae (3 species of *Nycteris*).

There could be correlations between lethargy and breeding if one takes into account the phenomena of late ovulation and delayed implantation.

The entry into lethargy is not caused by the scarcity of food. It does not concern ail the individuals of a colony or in various populations of a cave. The degree of humidity appears to be more important than the temperature as far as the conditions for hibernation are concerned.

Anciaux de Faveaux, M. (1978a). Définition de l'Equateur Biologique en fonction de la reproduction de Chiroptères d'Afrique Centrale.

Étude de la biologie reproductrice chez 18 espèces monooestriennes de Chiroptères, en Afrique Centrale, parmi lesquelles la périodicité est évidente, suivant des cycles de type boréal ou de type austral, en fonction des saisons.

A partir de ses observations personnelles au Rwanda et en se basant sur une étude critique de la littérature, l'auteur propose une définition plus précise de l'équateur biologique: ses limites septentrionales et méridionales où se manifestent les deux cycle (boréal et austral) sont comprises entre les latitudes 04°13' N et 01°32' S.

Anciaux de Faveaux, M. (1978b). Notes éco-éthologique et parasitologiques sur les Chiroptères cavernicoles du Shaba (Zaïre).

After a brief analysis of the elements of the cavernicolous rnicroclimate in Shaba, the aulhor emphasizes the possibility of relations between ecology and parasitism. He then reviews the 19 species of Chiroptera that live in the subterranean field in Shaba, pointing out their environmental habitat, behaviour and parasites.

Anciaux de Faveaux, M. (1978c). Les cycles annuels de reproduction chez les chiroptères cavernicoles du Shaba (S.E. Zaïre) et du Rwanda.

Les recherches menées au Shaba (ex Katanga) et au Rwanda concernent ici les observations faites dans le domaine souterrain (cavités naturelles et artificielles); elles portent sur un total de 24 espèces de Chiroptères parmi lesquelles 4 ont été trouvées par d'autres zoologistes: *Hipposideros commersoni* (E. Geoffroy, 1813) au Katanga, *Rhinolophus hilli* Aellen, 1973 et *Hipposideros caffer* (Sundevall, 1846) au Rwanda, et *Otomops martiensseni* (Matschie, 1897) au Katanga et au Rwanda.

Les cycles annuels de reproduction sont classés en 3 principaux types : monooestrien, polyoestrien saisonnier et polycestrien continu.

Les conclusions de l'auteur sont comparées avec celles d'autres chercheurs; un examen critique approfondi des données de la littérature a permis de préciser les modalités de la reproduction chez quelques espèces sur lesquelles l'auteur n'a pu obtenir aucun renseignement positif.

Pour chaque espèce, l'auteur présente les dates (celles concernant ses récoltes personnelles et celles publiées dans des travaux antérieurs sur les Chiroptères d'autres régions d'Afrique) et propose une interprétation de la biologie reproductrice.

Anciaux de Faveaux, M. (1981). Cycles de reproduction chez des Chiroptères phytophiles du Shaba (Zaïre) et du Rwanda. Abstract.

The research undertaken in Shaba (ex-Katanga) and Rwanda and set forth in this article concern the studies carried out in the trees and bushes of African savanna.

It covers 34 species of Chiroptera among which 20 have been found by other zoologists : *Epomophorus wahlbergi haldemani* (Halowell,1846), *Micropteropus pusillus* (Peters, 1867), *Plerotes anchietae* (Seabra, 1900), *Megaloglossus woermanni* Pagenstecher, 1885, *Nycteris arge* Thomas, 1903, *Chalinolobus (Glauconycteris) variegatus papilio* Thomas, 1905, *Eptesicus capensis* (A.Smith, 1829), *Eptesicus rendalli* (Thomas, 1889), *Mimetillus moloneyi thomasi* Hinton, 1920, *Myotis (M.) welwitschi* (Gray, 1866), *Nycticeius schlieffeni* (Peters, 1859), *Scotoecus hirundo hindei* Thomas, 1901, *Scotoecus albofuscus woodi* Thomas, 1917, *Scotophilus gigas* Dobson, 1875, *Kerivoula harrisoni lucia* Hinton, 1920 and *Tadarida (Xiphonycteris) nanula* (J.A.Allen, 1917) in SHABA; *Chalinolobus (Glauconycteris) argentatus* (Dobson, 1875) and *Tadarida (Mops) midas* (Sundevall, 1843) in RWANDA; *Nycteris hispida* (Schreber,1 775) and *Eptesicus tenuipinnis* (Peters, 1872) in SHABA and RWANDA.

The 14 species found by the author are: *Eidolon helvum* (Kerr, 1792), *Epomophorus labiatus* (Temminck, 1837), *Lavia frons* (E. Geoffroy, 1810) and *Tadarida (Xinhonycteris) thersites* (Thomas, 1903) in RWANDA; *Epomophorus gambianus* (Ogilby, 1835), *Epomophorus crypturus* Peters, 1852,

Taphozous mauritianus E. Geoffroy, 1818, *Laephotis angolensis* Monard, 1935, *Scotophilus dinganii* (A. Smith, 1833), *Kerivoula argentata* Tomes, 1861 and *Tadarida (Chaerephon) nigeriae spillmanni* (Monard, 1932) in SHABA; *Epomops dobsoni* (Bocage, 1889), *Myotis (M.) bocagei* (Peters, 1870) and *Pipistrellus nanus* (Peters, 1852) in RWANA and SHABA.

The annual breeding cycles are classified in 3 main types: monooestrian, seasonal polyoestrian and continual polyoestrian. The author's conclusions are compared with those of other research workers; a thorough critical investigation of the literature has given more precise details about the breeding modalities in some species on which the author has been unable to get any positive information.

For every species, dates are presented (those concerning the author's personal research and those published in previous works on the Chiroptera in other African areas) and an interpretation of breeding biology is advanced.

Anciaux de Faveaux, M. (1983). Les cycles annuels de reproduction chez les Chiroptères phytophiles au Shaba (S.E. Zaïre) et au Rwanda.

The research undertaken in Shaba (ex-Katanga) and Rwanda and set forth in this communication concern the studies carried out in the trees and bushes of savanna. It covers 34 species of Chiroptera among which 20 have been found by other zoologists.

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For every species, dates are presented (those concerning the author's personal research and those published in previous works on the Chiroptera in other African areas) and an interpretation of breeding biology is advanced.

Ando, K., F. Yasuzumi, A. Tagawa and T. A. Uchida (1983). Further study on the karyotypic evolution in the genus *Rhinolophus* (Mammalia: Chiroptera).

A detailed karyotype comparison among *R. cornutus cornutus, R. ferrumequinum nippon* and *R. luctus formosae* are made on the basis of relative length, G- and C-band patterns. The data presented here suggest strongly M.SM-1 and 2 in *R. f. nippon* were formed by centric fusion of four of five small A-autosome pairs such as those in A-23~25, 27 and 28 of *R. c. cornutus*, while occurrence of M-SM-3 in the former was caused by pericentric inversion of a small A-pair such as that in A-24 or 25 of the latter, confirming the assumption described in our previous report (ANDO et al. 1980a). On the other hand, appearance of the secondary short arms of A-autosomes in *R. f. nippon* is attributable to the C-band material added to the telomeres of A-autosomes. Addition of heterochromatin is considered to have taken place also in the short arm of the ST-X chromosome in *R. f. nippon*, and to have brought about the morphological difference of the Y chromosome within *Rinolophus*.

Andral, L., P. Brès, C. Sérié, J. Casals and R. Panthier (1968). Études sur la fièvre jaune en Ethiopie. 3. Étude sériologique et virologique de la faune sylvatique.

L'étude des réservoirs sylvatiques du virus de la fièvre jaune est une des préoccupations essentielles de l'épidémiologiste.

Une enquête sérologique portant sur une population simienne de la forêt de Manéra a mis en évidence des modifications qualitatives de la répartition des anticorps entre 1962 et 1964, avec diminution importante du nombre de sérums positifs pour le virus amaril et apparition d'une notable proportion de sérums positifs pour les antigènes Zika et chikungunya. Chez les chauves-souris, un faible

pourcentage de sérums renfermaient des anticorps. L'étude des rongeurs et des oiseaux n'a fourni que peu d'informations.

Sur le plan virologique, deux souches de virus amaril ont été isolées, l'une chez un jeune colobe, l'autre chez une chauve-souris du genre *Epomophorus*.

As part of the epidemiological investigation of the 1960-62 yellow-fever epidemic in Ethiopia, the authors carried out serological and virological studies of the silvatic reservoir of virus, largely among animals shot or captured in the forest near the Manera experimental station. In this area, all of 16 monkey sera from the Chouchouma valley in 1962 contained yellow-fever antibody; this was the only arbovirus antibody in 50 % of the sera and it was found together with Zika or group A antibody in the remainder. In 1964, 25 % of monkey sera were devoid of all arbovirus antibody, and a mere 18 % and 25 %, respectively, had only yellow-fever antibody or mixed antibody. The number of sera positive for group A had doubled in 1964.

Similar serological study of 140 bat sera showed only 3.5 % to harbour any arbovirus antibody, and only 4 sera to have yellow-fever antibody. Sera from rodents, other forest animals and birds gave almost uniformly negative results, antibody for arboviruses being found in only a civet and 2 birds (one of these, a guinea-fowl, had a 1/40 HI titre for yellow-fever virus).

Attempts to isolate yellow-fever virus were successful in 2 instances-once from the brain of a bat, and once from the brain of a month-old *Colobus* monkey that was captured alive and died 8 days later apparently of gastroenteric infection.

Ansell, W. F. H. (1967). Additional records of Zambian Chiroptera.

Additional records of Zambian Chiroptera are listed. Four species, *Lissonycteris angolensis, Myonycteris torquata, Nycteris grandis*, and *Rhinolophus capensis* are recorded from Zambia for the first time. *Tadarida niveiventer* (which includes *chitauensis*) is considered a valid species distinct from *T. condylura*.

Ansell, W. F. H. (1969). Addenda and corrigenda to "Mammals of Northern Rhodesia" Number 3.

Recent records of Zambian mammals are listed, including two bats, *Rhinolophus swinnyi* and *Eptesicus rendalli*, recorded for the first time in the country, and *Hipposideros ruber* is confirmed in Zambia for the first time as a species separate from *H. caffer*. Other data include discussion of the range of *Kobus ellipsiprymnus* in Zambia, description of the preputial gland of *Oreotragus oreotragus*, and of the pedal glands of *Alcelaphus lichtensteini* and *Connochaetes taurinus*.

Ansell, W. F. H. (1973). Addenda and Corrigenda to "Mammals of Northern Rhodesia", Number 4.

Further records and data on Zambian mammals are listed. *Suncus varilla* is recorded in the country for the first time. *Crocidura katharina* is regarded as conspecific with *C. cyanea*, which latter is therefore recorded authentically for the first time north of the Zambezi River. Data- are also given on various Chiroptera, *Galago* spp., *Manis*-spp., Carnivora, ungulates and rodents.

Ansell, W. F. H. (1974). Some mammals from Zambia and adjacent countries.

Information is given on mammals from Zambia, together with some from adjacent countries. *Erinaceus albiventris, Micropteropus pusillus, Miniopterus inflatus, Cephalophus natalensis, Anomalurops beecrofti*, and *Hybomys univittatus* are recorded for the first time in Zambia. The only authentic Zambian specimen of *Colobus angolensis* was obtained in Mwinilunga District. A pygmy shrew, genus *Crocidura*, similar in size to *C. bicolor*, and a forest species of *Graphiurus* have had for the present to be left indeterminate. A neotvpe is designated for *Cobus robertsi* (= *Kobus leche robertsi*), *Aethomys dolmanni* is removed from *A. chrysophilus* and placed as a subspecies of *A. nyikae*. *Thamnomys cometes* and *T. dolichurus* are accepted as separate species, though they are allopatric in Zambia. Collecting in 1973 confirmed all four Zambian species of *Dendromus* in the Northwestern Province. Other-data are recorded for various Insectivora, Chiroptera, Primates, Pholidota, Carnivora, Artiodactyla, and Rodentia. A list of specimens received by the National Museum of Zambia. Livingstone from other institutions is given in an appendix.

Ansell, W. F. H. (1985). Mammals from Malawi, Part I.

This paper reports on observations made in the course of preparing a new list and atlas of Malawi mammals, outlined by Ansell and Dowsett (1980).

The object is to cover a number of taxonomic and distributional matters which are more appropriately dealt with separately from the check list itself, and it is intended that other species will be similarly treated in a subsequent paper. This present paper is based on specimens in the Museum of Malawi (MM) examined during my visits to Blantyre in 1980 and 1983, and some subsequently borrowed for further study; also loans from the Transvaal Museum (TM), British Museum (Natural History) (BM), the National Museum, Bulawayo (NMB) and the American Museum of Natural History (AMNH). Flesh measurements and, where applicable, weight are from the species label, cranial measurements by me.

Ansell, W. F. H. (1986). Some Chiroptera from South-central Africa.

Data, including a number of breeding records, are given for several species of Chiroptera, supplementing previous information. *Tadarida ventralis* is recorded in Zambia for the first time, but *Rhinolophus capensis* has to be deleted due to previous misidentification. Successive pregnancies are confirmed in *Tadarida pumila*.

Des compléments d'information, y compris un certain nombre de données sur la reproduction, sont fournis pour plusieurs espèces de Chiroptères. *Tadarida ventralis* est mentionnée pour la première fois dans la faune de Zambie, mais *Rhinolophus capensis*, qui avait été mal identifiée, doit en être supprimée.

Anthony, H. E. (1926). Preliminary report on Ecuadorean mammals. No 7.

This is the seventh short paper in a series of preliminary reports upon the mammals of Ecuador. The purpose of these papers is the description of new forms which are discovered as material is gradually accumulated from the field.

In a collection of mammals made near the Rio Curaray, in eastern Ecuador, by Olalla e Hijos for the American Museum, are two specimens of the interesting marsupial genus *Glironia*, the first to be received at any institution in this country; and, as far as I can ascertain, the only specimens taken since the type and one other recorded by Thomas in 1912. These two specimens represent different species, one quite closely related to *venusta* Thomas, the other apparently quite distinct.

Arata, A. A. and B. Johnson (1978). Approaches towards studies on potential reservoirs of viral Haemorrhagic Fever in southern Sudan (1977).

This study was carried out in Nzara, W. Equatorial Province, Sudan, (in January-February, 1977) following the protocol agreed upon at the meeting at the London School of Hygiene and Tropical Medicine, 4-5 January 1977.

Mammals having the highest possible contact with humans in the Nzara cotton factory and agricultural environs where primary cases were noted were studied (Table 1). Although primates have been suggested as reservoirs, these were not collected because of the difficulties involved in collecting adequate samples in such a short period.

Organ and tissue samples were collected, frozen in liquid N2 and sent to Porton Down, U.K., for virological and serological studies on 13 February, 1977 (Table 2). Voucher specimens of the animals collected, preserved in formalin, were sent at the same time to the British Museum (Natural History), London, for confirmation of field identifications.

Data on sex, age and habitats (including human contacts) of all potential hosts were recorded to be correlated with virological and serological results. As the virology and serology are not yet available, the paper emphasizes the rationale used in establishing a survey for potential reservoirs of a disease of unknown aetiology.

Archbold, R. (193x). Mammals of the French English American Madagascar Expedition May 13, 1929-May 2, 1931 (Fieldnotes).

List of specimens collected between May 13, 1929 and May 2, 1931 by the Mission zoologique franco-anglo-américaine à Madagascar. Data includes type of animal, size and gender classification, location collected, collector and specimen numbers. The first two leaves of the book provide an explanatory diagram of the specimen tags and a list of abbreviations used throughout. The entries are written in many hands; presumably by the individual collectors. The Mission zoologique franco-anglo-américaine à Madagascar was an expedition to Madagascar coordinated with and represented by delegates from French, English and American institutions. Archbold's father had provided the sponsorship for the American Museum of Natural History to participate, and Archbold joined the expedition as photographer and collector. Richard Archbold was a sponsor of scientific study, mountaineer, aviator and research associate at the American Museum of Natural History from 1931. He established Archbold Expeditions (formerly Biological Explorations) which sponsored field work, a collection and curatorial staff at the American Museum of Natural History. He also founded the Archbold Biological Station in Florida in 1941 as a center for scientific research and ecological study. One of the first to recognize the value of air transport in expeditionary work, Archbold led three of the New Guinea Expeditions, the third of which culminated in the seaplane Guba II's historic transcontinental flight.

Archer, A. L. (1977). Results of the Winifred T. Carter Expedition 1975 to Botswana, Mammals - Chiroptera.

A collection of 133 bats representing 20 species was made between 15 November and 15 December 1975 within a 25 km radius of Xugana, Botswana. Three species obtained, *Epomorphons gambianus, Nycteris hispida* and *Tadarida chapini* are new records for Botswana. Some observations and breeding data are given together with a systematic list of the species collected, numbering 84, which were made up as study skins. The remaining 49 specimens consisting of duplicates, were preserved in formalin.

Arlettaz, R. and S. Aulagnier (1988). Statut de trois espèces de chiroptères rares au Maroc: *Nycteris thebaica*, *Hipposideros caffer* et *Pipistrellus rueppelli*.

Discussed is the occurrence of three rare species of bats in Morocco. *Nycteris thebaica* and *Hipposideros caffer* originate from Africa, south of the Sahara; in Morocco they live exclusively along the Atlantic coast. *Pipistrellus rueppelli* which was caught in the presaharian area (Tafilalt) is reported for the first time in Morocco. The populations of ail three species arc considered as remnants.

Arlettaz, R., G. Dändliker, E. Kaybekov, J. M. Pillet, S. Rybin and J. Zima (1995). Feeding habits of the Long-eared Desert bat, *Otonycteris hemprichtii* (Chiroptera: Vespertilionidae).

We studied food habits of the long-eared desert bat, *Otonycteris hemprichi*, in a subdesert area of Kirghizstan (central Asia) by fecal analysis and light-tagging. The bulk of the diet of 13 individuals in September consisted of arachnids (Solifugae, Scorpiones, and Araneae; 49.9% of total volume) and orthopterans (Acrididae, Gryllidae, and Tettigoniidae; 34.7%). Visual nocturnal observations confirmed that this species captures its prey from the surface of the ground.

Arlettaz, R., M. Ruedi, C. Ibañez, J. Palmeirin and J. Hausser (1997). A new perspective on the zoogeography of the sibling mouse-eared bat species *Myotis myotis* and *Myotis blythii*: morphological, genetical and ecological evidence.

The actual geographic distribution of the two sibling mouse-eared bat species Myotis myotis and Myotis blythii, which occur widely sympatrically in the western Palaearctic region, remains largely controversial. This concerns particularly the specific attribution of marginal populations from the Mediterranean islands and from adjacent areas of North Africa and Asia, which are morphologically intermediate between continental *M. myotis* and *M. blythii* from Europe. This study attempts to clarify this question by using four different approaches: cranial morphology, external morphology, genetics and trophic ecology. The three latter methods show unambiguously that North Africa, Malta, Sardinia and Corsica are presently inhabited by monospecific populations of *M. myotis*. In contrast, cranial morphometrics do not yield conclusive results. These results contradict all recent studies, which attribute North African and Maltese mouse-eared bats to *M. blythii* and consider that Sardinia and Corsica harbour sympatric populations of the two species. As concerns south-eastern populations, doubts are also expressed about the attribution of the subspecific taxon *omari* which may actually refer to *M. myotis* instead of *M. blythii*. Protein electrophoresis is presently the only absolute method available for determining *M. myotis* and *M. blythii* throughout their distribution ranges. However, species identification may be approached by relying on less sophisticated morphometrical methods as presented in this study. Species-specific habitat specializations are probably responsible for the differences observed between the geographic distributions of *M. myotis* and *M. blythii*, as they provide a logical groundwork for a coherent model of speciation for these two bat species.

Aulagnier, S. (1989). Les Chauves-souris (Chiroptera) dans le régime alimentaire des Rapaces nocturnes (Strigiformes) au Maroc.

An extensive material of owl pellets (8 owl species), collected in Morocco (96 localities) has been analyzed. However bats represent a minor part of the material (60 individuals of 11 species), the investigation revealed both the valuable faunal records (e.g. the first Moroccan record of *Otonycteris hemprichi*, a record of *Rhinopoma microphyllum*) and the data on factors influencing predation of bats by owls. In Morocco, Bubo ascalaphus was found to be the most important predator of bats (nearly 1 % of prey). In general, there is no relation between size of predator and prey but the habitat type is significant.

Aulagnier, S. (1990). Zoogeography of Moroccon bats. Abstract.

Among Moroccan mammals, Bats were still poorly known until recently for lack of investigations in the whole country. In 1932 Cabrera, who gathered informations mainly in the north, listed 8 species only. After some southern prospections, the list of Heim de Balsac (1948) reached 16 species. In the fifties, J.B. Panouse and A. Brosset initiated the first works on Moroccan bats, studying biometrics and reproduction of the 23 species they recorded. After Hill (1964) bat research were suspended during twenty years. Recently 3 species were added to the Moroccan fauna, so now 27 species are listed (Aulagnier and Thevenot 1990), that is the highest diversity in North Africa.

Although data are sparse, the distribution of Bats was mapped by Aulagnier and Thevenot (1986), and some zoogeographical features are prominent Some species as *Myotis emarginatus, M. nattereri, Pipistrellus pipistrellus, Nyctalus leisleri* and *Barbastella barbastellus* occur only in the north of the country or the Middle Atlas, while some other ones live only in presaharan and saharan areas south of the High Atlas: *Rhinopoma microphyllum, R. hardwickei, Asellia tridens, Pipistrellus rueppelli* and *Otonycteris hemprichi*. In addition, coastal areas provide suitable environments for some mediterranean (*Myotis capaccinii*) or african (*Nycteris thebaica, Hipposideros caffer*) Bats.

On the whole, Moroccan Bats are mainly palearctic taxa with 11 widely palearctic species and 8 "mediterranean" species (including the african extralimital *Rhinolophus blasii* and *Pipistrellus kuhli*, and the asiatic extensive *Tadarida teniotis* and *Myotis blythi*). Saharo-sindian Bats are not very numerous contrary to Rodents (4 species versus 17 species). Paleotropicai taxa are scarce too (only 3 Bats versus 11 Carnivores).

The present settlement of Moroccan Bats seems recent in spite of the lack of paleontological clues. African taxa such as Megadermatidae (and probably Emballonuridae) flew away south of the Sahara during the Pleistocene while European species crossed the Straight of Gibraltar or even other parts of the Mediterranean Sea (siculo-tunisian way for example).

Moreover the Moroccan bat fauna looks more like south-european fauna than north-east-african or subsaharian faunas. Maghreb, at least in its northern part, belong to the mediterranean biozone and Bats appear to be good current zoogeographical informers (unfortunately they are often excluded from this kind of study).

Aulagnier, S. (1991). Zoogeographical notes on Moroccan bat fauna.

Twenty seven species of bats are presently listed from Morocco. Five main pattern of distribution are observed, they can be sensibly linked with the main climatic zones of the country. The biogeographical origin of the moroccan bat fauna is diversified (8 faunic types), but there are mainly palaearctic-boreal (11) and - mediterrean (8) species according to the general climate. Concerning bats, Morocco, and the whole Maghreb, is closely similar to Western Europe. Bats are really good zoogeographical informers.

Aulagnier, S. and R. Destre (1985). Introduction à l'étude des Chiroptères du Tafilalt (sud-est marocain).

After some geographical and climatic data about Tafilalt (southeastern Morocco), the Chiroptera of this country are listed. An eco-ethological study was undertaken in a famous cave: Kef Azigza, where are living seven species removing all year long. Various observations all over the studied area are also discussed with reference to the biogeography of bats. There, between Atlas mountains and Sahara, palearctic species are the most numerous, nevertheless three afro-eremic ones were found, and especially *Rhinopoma microphyllum* (second data for Morocco).

Après une brève introduction géographique et climatologique sur le Tafilalt, les Chiroptères de cette région sont présentés à l'issue du suivi d'un site particulièrement favorable: le Kef Azigza. Quelques données d'ordre éco-éthologique ainsi que des observations recueillies sporadiquement complètent

l'étude de ce peuplement régional qui compte onze espèces essentiellement paléarctiques, avec cependant la présence remarquable de *Rhinopoma microphyllum*.

Avenant, N. L. (1997). Mammals recorded in the QwaQwa National Park (1994 - 1995).

Distribution, relative abundance, and habitat preference of mammals were studied in the newly proclaimed QwaQwa National Park (QQNP) and compared with those of the adjacent 33 year-old Golden Gate Highlands National Park, a nearby protected area in the KwaZulu-Natal Drakensberg, Lesotho, and the rest of the Free State Province. In total, 53 mammal species were recorded inside the park and the probability of another 14 likely inhabitants, discussed. The fact that the QQNP contains ca. 70% of mammalian fauna recorded in the Free State and between five and 10 Red Data species stresses the importance of this park and the necessity for correct management of this ca. 21 000 ha conservation area. The low, small mammal numbers, variety, and mean diversity found on 17 transects in the QQNP is attributed to previous human habitation and activities - some of which are still present in the park.

Avenant, N. L. (1999). Small mammals community characteristics as indicators of ecological disturbance in the Willem Pretorius Nature Reserve, Free State, South Africa. Abstract.

Biodiversity of small mammals have been used as an indicator to the measure of disturbance in a natural ecosystem. In the present study small mammal community structure was investigated on eight transects in the Willem Pretorius Nature Reserve. It was also the first study to quantify habitat-specific patterns in terms of Shannon-diversity in the Free State. Such indices are seen as essential to describe and compare mammalian faunas and are increasingly being used in inter alia impact assessments. The low species richness and diversity of small mammals and the high proportion of *Mastomys coucha* in all habitats indicate a high level of disturbance in the reserve. Possible reasons for this disturbance are discussed together with methods for monitoring and measuring small mammal diversity in Free State ecosystems.

Utilisation des caracteristiques de la communaute des petits mammiferes comme indice de la perturbation des milieux dans la reserve naturelle deWillem Pretorius (Free State, Afrique du Sud): Pour évaluer le degre de perturbation qui affecte les ecosystemes de la reserve naturelle de Willem Pretorius, la structure de la communaute des petits mammiferes a ete mesuree a partir des données collectées le long de 8 transects. C'est la première fois que des indices de Shannon sont calculés pour les differents types d'habitats rencontres dans cette reserve. De tels indices sont très utiles pour decrire et comparer les diverses communautes mammal iennes et sont de plus en plus utilises dans le cadre d'études d'impacts. Les faibles richesse et diversite specifiques du peuplement de petits mammiferes de la réserve et la grande abondance de *Mastomys coucha* indiquent un degre important de perturbations. Les causes de cette situation de meme que les methodes de suivi et d'etude de la diversite des petits mammiferes dans les écosystèmes de Free State sont discutées.

Avery, D. M. (1991). Late Quaternary incidence of some micromammalian species in Natal.

Information on the distribution in Natal of various micromammalian species during the late Quaternary is presented, based on the evidence of remains recovered from the archaeological sites of Border Cave in the Lebombo Mountains, Umhlatuzana near Durban and nine sites in or near the Tugela Basin, is presented. Many species have occurred at present locations for some considerable period. There are notable exceptions; *Mus triton*, which now occurs no closer than Tete District in Mocambique, was present at Border Cave up to about 60 000 years ago. *Pelomys fallax, Rhinolophus hildebrantii* and *Malacothrix typical* have also not recently been reported from Natal. *Georychus capensis* is shown to have been more widely distributed in the past.

Avery, D. M. (1998). An assessment of the lower Pleistocene Micromammalian fauna from Swartkrans Members 1-3, Gauteng, South Africa.

An assessment of the micromammalian fauna from Swartkrans Cave, Gauteng, South Africa reveals the presence of at least 29 species, comprising four insectivores, four bats, three elephant-shrews and 18 rodents. *Proodontomys cookei* seems to be the only definitely extinct taxon represented. All the other taxa may be modern and require re-analysis using current taxonomic methods. A review of the status of Lower Pleistocene micromammalian taxonomy in South Africa indicates the need for a complete revision. This, in turn, brings with it the opportunity to develop species definitions that apply equally to fossil and extant material. It is argued that such an approach is essential if the fossil data are to aid our understanding of the history of biodiversity and endemism. The present paper begins the exercise by providing a general background for future detailed studies of the individual taxa.

Une évaluation de la faune de la grotte de Swartkrans, Gauteng, Afrique du Sud, révèle la présence d'au moins 29 espèces dont quatre insectivores, quatre chauves-souris, trois macroscelidides et dix-huit rongeurs. Il semble que *Proodontomys cookei* soit la seule espèce définitivement disparue. Toutes les autres peuvent être actuelles et nécessitent une nouvelle analyse en utilisant des méthodes modernes. La taxinomie des micromammifères sud-africains du Pleistocene inférieur requiert une révision complète. Celle-ci, en retour, constitue une excellente occasion pour développer les définitions des espèces que l'on peut appliquer également aux spécimens fossiles et actuels. Il est soutenu qu'une telle approche est essentielle pour que les données fossiles contribuent a notre compréhension de l'histoire de la diversité biologique et de l'endémisme. La présente étude entame un tel exercice en fournissant une base pour des études détaillées futures des taxons.

Avery, D. M., I. L. Rautenbach and R. M. Randall (1990). An annotated check list of the land mammal fauna of the West Coast National Park.

Some 4000 Barn Owl pellets with small mammal remains have been collected over a period of nine year from two locations at the south end of the Langebaan lagoon. Two small samples of bones from archaeological sites on the Churchhaven peninsula provide evidence for past mammal occurrences. The remains of small mammals from the owl pellet collection provide an initial list of 18 species that occur within the West Coast National Park. Subsequent conventional censusing by means of trapping and observational techniques to assess the small and large mammal species divesity of the area were conducted during 1989. This study documents the definite occurrence of 63 mammal species in the park, seven of which are exotics. The presence of a further five species require confirmation. Interesting insight is gained into how direct censusing and owl pellet analyses augment each other in establishing the presence of small mammal taxa of an area.

Ayala, S. C., J. Bradbury and S. Bradbury (1981). *Hepatocystis* in *Hypsignathus monstrosus* (Pteropinea) in Gaboon. I. *Hepatocystis* malaria in a hammerhead bat population in Gaboon, West Africa.

Blood smears from 142 *Hypsignathus monstrosus* collected from one site in Gaboon were examined ; 139 bats showed *Hepatocystis* infection ; it seems that all animals have acquired *Hepatocystis* infection by the time they are 6 months of age. Intensity of parasitemias varies according to age, sex and for females to their reproductive status.

Les frottis sanguins de 142 *Hypsignathus monstrosus* capturés au Gabon dans un même gîte ont été examinés; 139 individus étaient parasités par *Hepatocystis*; tous les animaux semblent avoir acquis leur infection avant l'âge de 6 mois. L'intensité de la parasitémie varie en fonction de l'âge, du sexe et des phases de reproduction chez la femelle.

Ayensu, E. S. (1974). Plant and bat interactions in West Africa.

One of the most dramatic plant and animal relationships in the West African ecosystem is that which takes.place between such frugivorous bats as *Epomophorus gambianus* and *Eidolon helvum* and the introduced neem tree, *Azadirachta indica*. While earlier studies on bat behavior were carried out by personal observation and ordinary photographic means, recently developed night vision equipment has allowed the author to make nocturnal observations previously not possible. New observations, using this equipment, have now been made on bats and their interaction with trees of the following species: *Mangifera indica, Anacardium occidentale, Ficus umbrellata, Psidium guajava, Carica papaya, Kigelia africana, Spathodea campanulata, Parkia clappertoniana, Ceiba pentandra*, and *Adansoni digitata*. Observations are reported on the roosting characteristics of bats of the genus *Epomophorus*. The effect of feeding by bats on the fruits of various trees and the resulting dispersal of seeds on the coastal savannah-grasslandsl, (Accra Plains) of Ghana, are discussed. The effect of introduced plants on the bat population and disadvantages to the West African ecosystem which are attributable to the plant and bat interactions are summarized.

Azzaroli Puccetti, M. L. and B. Zava (1988). Nouvelles données sur les chiroptères des îles du Cap-Vert.

As a consequence of the recent capture of three bats in the Cape Verde Islands as well as of the study of the chiroptera specimens from this part of the world which are present in the collections of the Natural History Museums of Florence, Genoa, London and Paris, sixteen specimens of bats have been identified, belonging to five different species: *Taphozous nudiventris* (4 specimens from São Tiago and 2 from Maio), *Pipistrellus savii* (4 specimens from Fogo and 2 from São Vicente), *Plecotus austriacus* (1 specimen from Maio), *Pipistrellus kuhli* (1 specimen from São Vicente), *Miniopterus schreibersi* (2 specimens from Santo Antão). The last two species are new for the archipelago. The geographical, geological, climatic, ecological and historical aspects of the islands are also briefly considered.

Baeten, B., V. Van Cakenberghe and F. De Vree (1984). An annotated inventory of a collection of bats from Rwanda (Chiroptera).

Ce travail concerne l'etude de 1735 spécimens de Chiropteres, appartenants à 24 espèces différentes et collectés au Rwanda. Sept espèces nouvelles pour la faune du Rwanda ont été trouvées: *Rousettus lanosus, Hipposideros ruber, Myotis welwitschii, M. tricolor, Pipistrellus kuhlii, Eptesicus somalicus et Miniopterus inflatus*. Par cet apport, on connaît actuellement 41 espèces de chauves-souris du Rwanda.

Pour chaque espece, des notes sur la distribution geographique, les gites diurnes, les biotopes preferes ou la position taxonomique ont ete donnees. Des mensurations ont parfois ete ajoutees pour des raisons de comparaison.

Baker, R. J. and J. W. Bickham (1980). Karyotypic evolution in bats: evidence of extensive and conservative chromosomal evolution in closely related taxa.

G- and C-band data for seventy-eight species of bats from four families were subjected to a cladistic analysis to determine the number of chromosomal rearrangements required to convert the karyotype proposed as primitive for a family into the karyotype of extant species in that family. The number of rearrangements ranged from 0 to 36, and if the age of families is 60 million years, average rate of incorporation of rearrangements per million years ranged from 0 to 0.6. When chromosomal variation in congeneric species were subjected to a similar-cladistic analysis, most (34 of 54) species had undergone no chromosomal rearrangements; however, some species had undergone from 14 to 20 rearrangements and the types of rearrangements that were incorporated in species having the largest amount of change were generally rearrangements that should produce considerable reduction in gamete fertility in individuals heterozygous for such rearrangements. Radically reorganized karyotypes

appear not only in bats but in a wide variety of vertebrates. Factors related to demography, breeding structure, and speciation do not appear adequate to explain the occurrence of such radically reorganized genomes. Factors less related to demographic and vagility characteristics, such as mutation rate and mechanisms which reduce the meiotic constraints on the heterozygote, are phenomena which may be involved in evolving a radically reorganized karyotype.

Baker, R. J., B. L. Davis, R. G. Jordan and A. Binous (1974). Karyotypic and morphometric studies of Tunisian mammals: Bats.

Les caryotypes et les mensurations de 8 espèces de Chiroptera de Tunisie sont présentés dans ce travail. *Asellia tridens* et *Rhinolophus mehelyi* montrent une variation sexuelle secondaire significative. Les mesures des *Plecotus austriacus* de Tunisie sont comparées à celle des *P. austriacus* et *P. auritus* de Hollande. Les auteurs donnent des indications sur la reproduction des chauves-souris de Tunisie.

Les caryotypes de *Rhinolophus ferrumequinum, Pipistrellus kuhli, Eptescisu serotinus, Plecotus austriacus* et *Miniopterus schrelbersi* sont identiques en Tunisie et en Europe. *Rhinolophus mehelyi* a le même nombre diploïde qu'en Roumanie, mais le nombre fondamental est différent. Le caryotype de *Myotis blythi* de Tunisie est différent de celui de Tchécoslovaquie, mais il est semblable à ceux des *Myotis* de l'Ancien et du Nouveau Monde. Le caryotype d'*Asellia tridens* est 2N = 50, NF = 62.

Baker, R. J., R. L. Honeycutt and R. A. Van den Bussche (1991a). Examination of monophyly of bats: restriction map of the ribosomal DNA cistron.

Two opposing hypotheses concerning the origin of bats, as well as flight in mammals, have been proposed. In one, all bats shared a common ancestor after diverging from the remainder of extant Mammalia, whereas in the other, Megachiroptera, Primates, and Dermoptera shared a common ancestor after diverging from the Microchiroptera. In the latter hypothesis, flight in mammals would have evolved twice. To discriminate between the two competing hypotheses, we mapped 52 restriction sites for the ribosomal cistron (rDNA) for representative taxa using a mole, a shrew, and Mus as outgroups. We examined 14 genera representing 13 families of Microchiroptera, 5 genera of Megachiroptera, *Cynocephalus* (order Dermoptera), and *Homo* and *Lemur* (order Primates). Of the 52 mapped restriction sites, 24 were shared among all taxa. Resolution of the two alternative hypotheses was not found within these data. The only potentially resolving site was a *Pvu* II site in the nontranscribed spacer that united Dermoptera with the five genera of Megachiroptera. No synapomorphic site linked all bats, all Microchiroptera, or Megachiroptera, Dermoptera, and Primates. It is Hypothesized that the lack of resolution from these molecular data originates from these taxa sharing a common ancestor for a relatively short time after diverging from the remainder of extant Mammalia. Such a short time in a common ancestor would permit few molecular events in conservatively evolving DNA sequences to become established to document a common origin. Alternatively, events that became established in rapidly evolving molecules would be lost or obscured due to extensive evolution over the long term since the Primates, Megachiroptera, Microchiroptera, and Dermoptera separated from each other.

Baker, R. J., C. S. Hood and R. L. Honeycutt (1989). Phylogenetic relationships and classification of the higher categories of the new world bat family Phyllostomidae.

A new classification of the higher taxonomic levels within the New World bat family Phyllostomidae is presented which designates evolutionary relationships, provides a phylogenetic framework upon which modifications can be made as new comparative data are produced, and resolved certain obvious unnatural taxa that exist in the traditional classification. This new classification is a synthesis of classical morphological, chromosomal, and biochemical data. Within the family three subfamilies, the Desmodontinae, Phyllostominae, and Vampyrinae are recognized. The Desmodontinae includes the three genera of vampires, the Vampyrinae includes *Vampyrum, Trachops*, and *Chrotopterus*, and the Phyllostominae contains three tribes, the Phyllostomini (including *Phyllostomus, Tonatia, Mimon,*

Lonchirhina, and *Macrophyllum*), the Glossophagini (including genera of the previously recognized Glossophaginae and Brachyphyllinae), and Stenodermatini (including genera of the previously recognized Stenodermatinae and Carolliinae). Two genera (*Macrotus* and *Micronycteris*), do not share synapomorphies with any of these subfamilies, but have retained a large number of plesiomorphic features and are placed as incertae sedis.

Baker, R. J., M. Maltbie, J. G. Owen, M. J. Hamilton and R. D. Bradley (1992). Reduced number of ribosomal sites in bats: evidence for a mechanism to contain genome size

To better understand the organization of the genome of bats, we examined by in situ hybridization, the number of ribosomal DNA sites in 50 species of bats representing both suborders, 7 families, and 38 genera. Number of sites ranged from one to four pairs (average, 1.76) in bats, whereas the number of sites in 40 species of rodents ranged from two to ten pairs (average, 4.19). The possible relationship of a reduced number of sites to a smaller amount of DNA in the genome of bats is explored. We find little evidence to support the hypothesis that bats are retaining a fixed primitive condition of a low number of sites and we conclude that the most probable explanation is that bats, like other groups of mammals, have mechanisms that tend to increase the number of sites. However, the balance between mechanisms that increase and those that reduce the number of sites is more strongly in favor of reduction of sites than is characteristic of other mammals such as rodents.

Baker, R. J. and J. L. Patton (1967). Karyotypes and karyotypic variation of North American Vespertilionid Bats.

Karyotypes of 32 species of North American vespertilionid bats are described. Individual, population, subspecific, specific, and generic karyotypic variation are discussed. The use of karyotypes as a taxomomic tool and phylogenetic indicator in bats is discussed.

Barak, Y. and Y. Yom Tov (1989). The advantage of group hunting in Kuhl's bat *Pipistrellus kuhlii* (Microchiroptera).

Group hunting by *Pipistrellus kuhli* (Microchiroptera) was observed in Kibbutz Sde Eliyahu, Israel. The bats are attracted to aggregations of phototactic insects, mainly moths, which were found near street lights. While flying near aggregations the bats emitted mainly the searching component of their calls, which caused the insects to disperse, apparently in order to escape predation. A negative correlation was found between the number of bats present near a light and percentage of insects grouped together. Group hunting seems to be beneficial for bats; there was a high correlation between bats' group size and the incidence of 'feeding buzzes'.

Barak, Y. and Y. Yom-Tov (1991). The mating system of *Pipistrellus kuhli* (Microchiroptera) in Israel.

The mating system, of the microchiropteran bat *Pipistrellus kuhli*, was studied in kibbutz Sde Eliyahu, Israel. These bats roost during the day under roofs and in wooden huts and attics and hunt in uncluttered environments (e.g., fields) to which they fly along permanent routes. From the beginning of March the females aggregate, in hundreds, at maternity colonies. Pregnant females are found between March-May and lactating females from May-July. Maximal body weight is reached in autumn (October-November) before hibernation, and in spring, due to pregnancy.

Two types of males were observed: those which roost singly all year round in permanent places located along the females' flying routes, and those which roost in small groups (7-16 individuals), which are located elsewhere. Single males are characterized by attaining maximal body weight in March and minimal body weight in October, having larger testes and exhibiting song-flight and false landing

displays. In contrast, the body weight of grouped males fluctuates like that of the females. They have much smaller testes and do not exhibit mating displays. It is concluded that the system of *P. kuhli* might be categorized as female resource polygamy, where females are highly social and travel over a large area but along permanent routes, and the reproductive males roost and court along these routes.

La reproduction de *Pipistrellus kuhli* a été étudiée en Israel. Ces chauves-souris se reposent le jour sous des toits et chassent pendant la nuit sur des parcours constants dans un environnement ouvert. Au début de mars, les femelles se réunissent par centaines dans des colonies de maternité. Les femelles gestantes se voient de mars à mai et les femelles allaitantes de mai à juillet. Le poids maximal du corps est atteint en automne (octobre-novembre), avant l'hibernation, et au printemps à cause de la gestation.

Deux types de males ont été observés: ceux qui se reposent isolement toute l'année dans le même endroit, près des parcours de vol des femelles, et ceux qui se reposent en petits groupes (7 à 16) qui sont localises ailleurs. Les mâles solitaires atteignent leurs poids maximal en mars et leur poids minimal en octobre: ils ont des gros testicules et un vol bruyant et des parades de faux atterrissage. Par contre, le poids des males groupes fluctue comme celui des femelles. Ils ont des testicules plus petits et ne montrent pas de parades d'atterrissage. On en conclut à une polygamie des femelles; les femelles sont hautement sociales et voyagent sur une grande surface, mais selon des parcours constants, et les mâles reproducteurs se reposent et paradent le long de ces routes.

Baranga, J. and B. Kiregyera (1982). Estimation of the fruit bat population in the Kampala Bat Valley, Uganda.

A population estimate of fruit bats was carried out in the Kampala Bat Valley roost. The model used was a single-stage systematic sampling of unequal primary units (trees). The trees were first listed in a 'serpentine manner' with neighbouring trees having contiguous serial numbers. After a random start, every seventeenth tree was selected so that a sample of fourteen out of a total of 238 trees were counted. The exercise was carried out over 3 months, January, February and March, in 1979.

Information was gathered on the number of branches with bats, the number of bat clusters and cluster size. From the analysis of the data, the following monthly averages were obtained: total number of bats in the colony = 70,388; average number of bats on each tree = 310; average number of clusters per branch=4; average cluster size = 7.8. Measures of reliability of the estimates were made. The implications of these results and the conservation of the habitat are adjusted.

Une estimation de la population de chauve-souris frugivores a été menée dans les dortoirs devla 'Kampala Bat Valley'. Le modèle utilisé est un échantillonnage systématique en un temps d'unités primaires inégales (les arbres). La liste des arbres fut d'abord établie suivant un trajet en zig-zag. Apres un point de départ aléatoire, on a sélectionné chaque dix-septième arbre de telle façon qu'un échantillon de quatorze sur un total de 238 arbres fut compté. Ce travail fut entrepris pendant trois mois: de janvier à mars 1979. Des informations furent récoltées sur le nombre de branches portant des chauve-souris, le nombre de grappes et la taille des grappes. Les moyennes mensuelles suivantes ont pu être obtenues par l'analyse de ces données: nombre total de chauve-souris dans la colonie: 70.388, nombre moyen de chauve-souris sur chaque arbre: 310, nombre moyen de grappes par branche: 4, taille moyenne d'une grappe: 7.8. Les implications de ces résultats sur la conservation de l'habitat sont discutées.

Barlow, K. E. and G. Jones (1997a). Function of pipistrelle social calls: field data and a playback experiment.

The study aimed to determine whether the so-called social calls that are produced by foraging bats of two phonic types of *Pipistrellus pipistrellus* serve a social function. First, the relationship between insect availability and the rate of production of social calls was measured at a foraging site of both phonic types. Second, playback experiments of social calls of the two phonic types were conducted in the field to determine the response of foraging bats to these calls, and to determine whether the calls

are used in communication within or between phonic types. Two hypotheses are suggested for the function of social calls: that they may be used either to attract other bats to a food patch, or in agonistic interactions between bats in defense of a food patch. At relatively low insect densities, the rate of social call production of both phonic types increased significantly as insect density decreased. When social calls of each phonic type were broadcast, there was a significant reduction in bat activity of the same phonic type. In contrast, playbacks of social calls resulted in no change in activity of the other phonic type. The results supported the food patch defense hypothesis, that social calls are used to warn off other bats of the same phonic type when insects are scarce. The results also supported the hypothesis that the two phonic types are sibling species. Social calls were shown to serve a social function in intraspecific communication, but there was no communication between phonic types.

Barlow, K. E. and G. Jones (1997b). Differences in songflight calls and social calls between two phonic types of the vespertilionid bat *Pipistrellus pipistrellus*.

The pipistrelle (*Pipistrellus pipistrellus*) occurs as two phonic types in Britain, its echolocation calls falling into two distinct frequency bands, with mean frequencies of maximum energy at 55 kHz and 46 kHz. These are termed the 55 kHz and 45 kHz phonic types here for simplicity. Songflight calls produced by males in the mating season, probably to attract females, differed between the two phonic types in the number of components in the calls and the call parameters measured. Songflight calls of the 55 kHz phonic type, which generally consisted of three components, were of higher frequencies than those of the 45 kHz phonic type, usually of four components. There were also significant differences in call parameters among individuals. A discriminant analysis of songflight calls classified 100% of individuals to the correct phonic type. The relationships between echolocation call frequency and songflight call frequency differed significantly between phonic types. Social calls produced during flight also differed between phonic types, in the number of components and call parameters measured. Social calls were compared to songflight calls of each phonic type. Social calls of the 55 kHz phonic type did not differ significantly from songflight calls: there were small but significant differences between the two types of calls of the 45 kHz phonic type. The study provides support for the hypothesis that the phonic types should be treated as sibling species. If songflight calls are used for male choice, the differences may allow reproductive isolation between the two phonic types. The functions of songflight calls and social calls need to be investigated through experimental studies to explain the implications of the differences between phonic types.

Barlow, K. E., G. Jones and E. M. Barratt (1997). Can skull morphology be used to predict ecological relationships between bat species? A test using two cryptic species of pipistrelle.

Can ecological relationships between bat species be predicted largely on the basis of morphology? This question was addressed by investigating skull morphology of two cryptic species of the pipistrelle bat. Since 45 *Pipistrellus pipistrellus* apparently eats larger prey than 55 *P. pipistrellus*, we predicted that it would have a larger overall skull size, a larger dentary apparatus, and a larger gape. To test these predictions, variables were measured from skulls of the two cryptic species, and comparisons made between them. In accordance with our predictions, overall skull size was larger in 45 *P. pipistrellus* than in 55 *P. pipistrellus*, and 45 *P. pipistrellus* had a longer lower jaw and the distance between the jaws at maximum gape was larger. In addition, 45 *P. pipistrellus* had longer upper canines, which may allow it to pierce harder prey items than 55 *P. pipistrellus*. Only some aspects of dietary differences between the two cryptic species could be explained by differences in skull morphology, and we suggest that empirical data, at least on diet and habitat use, are also required to explain mechanisms of resource partitioning among species in bat communities.

Barnett, A. A. and M. L. Prangley (1997). Mammalogy in the Republic of Guinea: an overview of research from 1946 to 1996, a preliminary check-list and a summary of research recommendations for the future.

The mammal fauna of Guinea is one of the least well-known in West Africa. This review has been prepared to bring together the scattered literature, and in the hope of stimulating research and identifying topics, geographical localities and habitats where knowledge is most limited. It covers some 411 biological publications, attempting to review all relevant material concerning terrestrial and freshwater aquatic mammals of Guinea published between 1946 and July 1996. Veterinary papers and those on domestic or introduced species have been excluded, as have those on Cetacea. Taxonomic literature is considered only insofar as it is relevant to biogeographical matters.

The paper is divided into two parts: the first reviews information on the biology, ecology, natural history and biogeography of Guinea's mammals; the second part looks at threats, conservation measures and laws, and summarizes recommendations for future research. A preliminary check-list and a list of suggested priorities for future mammalogical research are provided.

Barraclough, D. A. (1998). *Katacamilla* Papp, 1978, a genus of Camillidae (Diptera: Schizophora) associated with the dung of bats, birds and hyraxes in Africa and the Arabian Peninsula.

Katacamilla Papp, 1978, hitherto a monotypic genus of Camillidae known only from Namibia, is revised to include five species from Africa and the southern part of the Arabian Peninsula. The revision is based on more than 400 specimens. The placement of *Katacamilla* in the Camillidae is confirmed. A revised diagnosis of the genus is given. *Katacamilla* is distinguished from all other camillid genera by at least 10 character states, six of which are autapomorphies. A key to the species is presented. Illustrations of head profiles, male forefemur and terminalia are provided for all species. *Katacamilla cavernicola* Papp is redescribed from three Namibian localities. Four new species are described: *K. braacki* from northeastern South Africa, *K. ctenidia* from northern Nigeria, *K. gallagheri* from eastern Oman and *K. procavia* from central Namibia. *Katacamilla cavernicola* is known only from caves, where it exhibits both parietal and troglophilic habitat preferences; it has been reared from dung of the rock pigeon, *Columba guinea* Linnaeus (parietal), and of the common slit-faced bat, *Nycteris thebaica* Geoffroy (troglophilic). *Katacamilla braacki* has been collected in close association with dung of the Egyptian fruit bat, *Rousettus aegyptiacus* (Geoffroy), in a troglophilic habitat. *Katacamilla procavia* has been reared from the dung of the rock hyrax, *Procavia capensis* (Pallas), taken from the shelter of a rocky overhang. *Katacamilla ctenidia* and *K. gallagheri* are probably associated with the dung of birds and/or small mammals in relatively exposed habitats. A preliminary cladistic analysis suggests that the clade comprising the bat-associated (cavernicolous) sister species, *K. cavernicola* and *K. braacki*, is the most highly derived in the genus and, consequently, that association with bats is a recent specialization.

Barratt, E. M., M. W. Bruford, T. M. Burland, G. Jones, P. A. Racey and R. K. Wayne (1995). Characterization of mitochondrial DNA variability within the microchiropteran genus *Pipistrellus*: approaches and applications.

Past systematic studies of the genus *Pipistrellus* have used either morphological or karyological characters to reconstruct phylogenetic relationships. We provide a new molecular perspective on the relationships of *Pipistrellus* species through a phylogenetic analysis of mitochondrial cytochrome *b* DNA sequence data. We have used the polymerase chain reaction to amplify DNA of individuals from both living populations and museum collections. Our results show that *Pipistrellus* is a diphyletic grouping, containing two distinct clades that differ by about 12% in mitochondrial DNA sequence. Surprisingly, we find that genotypes from the UK population of *P. pipistrellus* are found in both clades. Three possible explanations for this observation are (1) that hybridization has occurred between species from both clades, (2) that two distinct ancestral lineages have been retained in the species, or (3) that the lineages comprise separate species.

Barrière, P., P. Formenty, R. Hutterer, O. Perpète and M. Colyn (1999). Veille écologique-épidémiologique saisonnière du peuplement Soricidae en Forêt de Taï: à la recherche du réservoir du virus Ebola. Abstract.

Cette étude s'intègre dans le cadre du projet Ebola - Foret de Tai' de l'OMS (Organisation Mondiale de la Sante) visant à isoler le(s) réservoir(s) du virus Ebola. A la suite de deux épidémies Ebola apparues en Foret de Taï (sud-ouest de le Côte d'Ivoire) au cours des saisons pluvieuses 1992 et 1994, un suivi saisonnier des peuplements de rongeurs et musaraignes a été conduit dans le but d'effectuer une veille écologique et épidémiologique des communautés micro-mammifères. Ainsi, nous avons conduit une étude écologique plus fine de la structure et dynamique communautaire des Soricidae forestiers aux échelles spatiale (utilisation des habitats et micro-habitats) et temporelle (dynamique des peuplements - populations).

L'étude fut menée au niveau de l'Institut d'Ecologie Tropicale au cours de 2 mois consécutifs de saison humide (octobre - novembre) des années 1996 a 1998. Deux principales méthodes de collecte furent utilisées à des niveaux d'habitats différents : des lignes de pitfall-trap de 100 m au sol (foret et plantations incluses abandonnées) et des pièges à glue au niveau de la canopée. Pour chaque saison, les caractères de densité de végétation et humidité du sol furent définies et au niveau du matériel biologique, chaque individu a fait l'objet d'un prélèvement sérologique, virologique, musculaire et d'une analyse de classe d'âge et de condition de reproduction. Un effort global de 11600 nuits x pièges (24 lignes de pitfall-trap installées sur une période de 20 à 34 jours) a permis de capturer 530 musaraignes reparties en 2 genres et 3 espèces.

Outre des données nouvelles et originales pour le site, les résultats montrent une différence, entre foret et plantations, dans la composition (9 espèces et 2 genres forestiers et 8 espèces mono génériques en plantations) et la structure du peuplement. Alors que les sites forestiers se caractérisent par la dominance de deux espèces de plus faible taille, *Crocidura obscurior* (39,8 %) et *Crocidura muricauda* (31,9 %) totalisant 71,7 % d'abondance relative, les plantations sont dominées par *Crocidura obscurior* à 39,7 % et *Crocidura buettikoferi* (22 %). Du point de vue dynamique, la densité relative du peuplement forestier passe de 4,14 % en 1996 à 5,29 % et 3,51 % respectivement en 1997 et 1998. D'un point de vue comportementale, le piégeage réalise à l'aide des passerelles nous a permis de mettre en évidence la présence de *Crocidura muricauda* à plus de 35 m de hauteur, au niveau de la canopée. Ces résultats écologiques seront ultérieurement compares aux résultats sero-virologiques.

Ebola virus reservoir: Twenty-two years after Ebola hemorrhagic fever first occured in central Africa, the natural history and reservoir host of this Filovirus remain a mystery. During the small rainy season of 1992 and 1994, a high mortality rate, due to a new subtype of Ebola, was recorded among chimpanzees in Taï' National Park (Côte d'Ivoire). The fact that the virus circulates within a small area of the park and that the character of the two epidemics could indicate a demographic or a behavioural aspect in the vector or the reservoir species, justified to begin in 1996, long-term ecological studies on small mammals to discover the natural reservoir host of the virus. In this report, we present preliminary results on the population characteristics and community structure of shrews in relation to habitat type and structure and time.

Shrews were sampled during two consecutive rainy months (October-November) of three consecutive years, from 1996 to 1998. Two principal methods were used in different habitat types : pitfall traps on the ground level (25 lines totalizing 11600 buckets-nights) in the forest and wild included plantations; and glue traps set on platforms built at different levels in the canopy.

In the course of the study 530 Soricids, from 2 genera and any 10 species, have been trapped and their presence in the canopy, by direct observations and captures, recorded for the first time. More than providing new and original faunal data for the site, the results permit to discuss habitat preferences, temporal dynamics of shrew species and their potentiality to be vector/reservoir of Ebola. Combined with the results of serology and virus isolation, this current long-term study will help recording an ecological signal that could appear before an Ebola outbreak.

Barus, V. (1973). The finding of nematods and Acanthocephalans in Egyptian bats.

A description is given of four nematode species recovered from Egyptian bats, i.e., *Spinostrongylus spinosus, Rictularia rnacdonaldi, Physaloptera* sp. (larvae), *Cyrnea* sp. (larvae), and of two acanthocephalans - *Pachisentis* sp. and *Moniliformis* sp. (both acanthellae). Characteristics of the morphology and measurements are given for *S. spinosus* and *R. macdonaldi*, with an evaluation of their range of hosts and their geographical distribution (including a list of genera and species of the subfamily Spinostrongylinae). In addition, an evaluation is given of the phenomenon of reservoir parasitism of larval nematodes and acanthellae in the bat.

Bauer, K. (1992). *Laephotis botswanae* - a bat new for Tanzania.

A small collection of bats obtained in Tanzania in the 1930s includes a specimen of Laephotis botswanae, a rare from until now not known from Tanzania. This record enlarges the list of Tanzanian bats to 79 species.

Baum, D. A. (1995). The comparative pollination and floral biology of baobabs (*Adansonia* - Bombacaceae).

The baobabs comprise eight species with large, spectacular, nocturnal flowers. The African baobab, *Adansonia digitata*, has long been known to be bat-pollinated. In this paper I document the floral biology and pollination systems of the remaining seven species. The two species in section *Brevitubae*, both endemic to Madagascar, are pollinated by nocturnal mammals (fruit bats and lemurs). In contrast, the five species in section *Longitubae*, four endemic to Madagascar an one to Australia, are pollinated by long-tongued hawkmoths. In all cases, animals besides the legitimate pollinators also exploited nectar and pollen. The two pollinator systems occurring in the genus correlated closely with differences in the floral morphology, phenology, and nectar production.

Beaucournu, J.-C. and D. Kock (1996). Notes sur les Ischnopsyllinae du continent Africain, III. Compléments à la répartition des espèces (Insecta: Siphonaptera: Ischnopsyllidae).

First records of bat fleas are reported for Burkina Faso (*Lagaropsylla anciauxi* on *Tadarida major*), Eritrea (*Chiropteropsylla brockmani* on *Scotophilus dinganii flavigaster*; *L. anciauxi* on *T. bivittata*), Ethiopia (*L. idae* on *T. condylura* and *T. pumila*), Kenya (*L. idae* on *T. condylura* and *T. pumila*), Malawi (*Ischnopsyllus emminus* on *Pipistrellus rueppelli* and *P. kuhlii*; *Dampfia grahami equatoris* on *Eptesicus capensis*; *L. consularis* on *T. pumila*) and Senegal (*L. idae* on unidentified bat). New host species for bat fleas are *T. bivittata* for *L. anciauxi* (in Eritrea); *Rhinolophus aethiops* for *Rhinolophopsylla ectopa* (in Kenya); *P. rueppelli* (1st African record) and *P. kuhlii* for *I. emminus* (in Malawi); the genus *Scotophilus* (1st African record) is a new host for *C. brockmani* (in Eritrea). Collection records are also given for: *L. incerta* on *T. condylura* in Madagascar; *Araeopsylla scitula* on *Otomops martiensseni* and *Triaenops persicus* in Kenya; *I. octactenus* on *P. kuhlii* in Tunisia; *R. capensis* on *Rhinolophus clivosus* in South Africa; and *Rhinolophopsylla unipectinata arabs* on *Rhinolophus mehelyi* and *R. ferrumequinum* in Algeria.

Beaucournu, J.-C. and J.-F. Noblet (1985). Une Nyctéribie (Diptera, Pupipara) nouvelle pour la faune Française: présence de *Basilia mediterranea* Hurka, 1970 en Corse.

A l'occasion d'une capture faite sur 2 *P. pipistrellus* de Corse, la femelle encore non étudiée de *B. mediterranea* est brièvement décrite et comparée à celle des autres *Basilia* apparentées ou sympatriques.

A Nycteribid (Diptera, Pupipara) new to the french Fauna: *Basilia mediterranea* Hurka, 1970 in Corsica.

On the occasion of the capture from 2 Corsican *P. pipistrellus*, the female of *B. mediterranea* is briefly described and compared with related or sympatric *Basilia*.

Behrensmeyer, A. K., N. E. Todd, R. Potts and G. E. McBrinn (1977). Late Pliocene faunal turnover in the Turkana Basin of Kenya and Ethiopia.

Analysis of a large sample of well-dated fossil mammals from localities in the Turkana Basin of Kenya and Ethiopia revealed sampling biases that affect patterns of faunal turnover during the late Pliocene. When these biases were accounted for, results indicated that 58 to 77 percent of the mammal species were replaced between 3.0 and 1.8 million years ago (Ma). Overall diversity increased from 3.0 to 2.0 Ma but then declined. No distinct turnover pulse is seen between 2.8 and 2.5 Ma; instead, the most significant period of faunal change began after 2.5 Ma and continued through 1.8 Ma.

Bell, G. P. and M. B. Fenton (1984). The use of Doppler-shifted echoes as a flutter detection and clutter rejection system: the echolocation and feeding behavior of *Hipposideros ruber* (Chiroptera: Hipposideridae).

Hipposideros ruber use CF/FM echolocation calls to detect the wing flutter of their insect prey. Fluttering prey were detected whether the insects were flying or sitting on a surface, and prey in either situation were captured with equal success (approximately 40% of capture attempts). Stationary prey were ignored. The bats did not use visual cues or the sounds of wing flutter to locate their prey. Wing flutter detection suggests that *H. ruber* exploit the Doppler-shifted information in echoes of their echolocation calls. These bats fed primarily upon moths, usually those of between 10 and 25 mm wingchord, although moths of less than 5 mm and greater than 40 mm wingchord were also attacked and captured. They showed no evidence of selecting moths on the basis of species or other taxonomic distinction, and occasionaly captured other insects.

Benda, P. (1994). Biometrics of *Myotis myotis* and *Myotis blythi*: age variation and sexual dimorphism.

A large sample of *Myotis myotis* and *M. blythi* was investigated to evaluate the role of age dependent variation and the amount of sexual dimorphism in the total variation of morphometric characters. Growth of some cranial dimensions continued up to the age of 2-3 years. In comparison with *M. blythi*, this process is delayed in *M. myotis*. Sexual dimorphism was found in external measurements (females being larger) and some cranial ones (males being larger), the overall pattern being the same in both species.

Benda, P. and I. Horácek (1995a). Biometrics of *Myotis myotis* and *Myotis blythi*.

Myotis myotis and *M. blythi* differ in pattern of both ontogenetic and geographic variation. Cline increase in body size (from West to East) was found in *M. myotis*. In *M. blythi*, such a trend is restricted onto the zones of sympatry only. Such a parallelism and an inverse skewenes of morphometric variation in sympatric populations may indicate a character displacement in these species. *M. myotis* seems to be resident in the W-Mediterranean, including whole the N-Africa. *M. blythi* is expected to spread into the W-Mediterranean as late as during the late Holocene and supposedly it did not reach Africa at all.

Benda, P. and I. Horácek (1995b). Geographic variation in three species of *Myotis* (Mammalia: Chiroptera) in south of the western Palearctics.

A morphometrical study of a large sample (1348 specimens) of three *Myotis* spp. (*M. myotis, M. blythi, M. nattereri* s.l.) revealed in all three taxa a clinan variation in cranial measurements from the Western Mediterranean via Central Europe and Balkans to the Eastern Mediterranean. The trend of size increase from West to East terminated in the Ponto-Caspian region. Nevertheless, being the marginal populations excluded, the geographically dependent morphometric variation is insignificant. Hence, the populations of Central Europe, Balkans and Eastern Mediterranean are relativelly homogenous as to their variation pattern and, in contrast to those of Ponto-Caspian region and/or of the Western Mediterranean show no isolation-by-distance variation.

Benedict, F. A. (1957). Hair structure as a generic character in bats.

Since Cook's work (1868) on the hair of Indian bats, few studies have been made on the hair of the Chiroptera. Cole (1924) and Nason (1948) have stated that hair structure is of little taxonomic value in bats. Mayer (1952), however, has shown that hair structure can be used in distinguishing bats of the California fauna, and Volshina's (1951) preliminary study has also shown differences of hair structures in a few pteropids and in one emballonurid. The present study of bat hair is more extensive than any previous one and indicates clearly that hair structure can be a useful taxonomic tool, particularly for categories above the species level.

Benoit, P. L. G. (1958a). Les Polyctenidae du Congo Belge (Hemiptera - Cimicoidea).

Après avoir été négligée durant de longues années, la famille des Polycténides, composée exclusivement d'espèces parasites de Chauves-souris, a connu les faveurs de divers chercheurs au Congo Belge durant les dix dernières années. Jusque là, deux spécimens seulement avaient été récoltés dans nos Territoires d'Outre-Mer: -un spécimen par J. RODHAIN en 1920, un par A. COLLART en 1926.

A partir de 1948 par contre nos collections se sont enrichies de plus de vingt-cinq spécimens grâce aux recherches de N. LELEUP, M. LIPS, F. ANCIAUX DE FAVEAUX et finalement A. FAIN.

Dans leur excellente monographie de la famille G. F. FERRIS et R. L. USINGER (*Microentomology, vol. IV, 1939, contrib. number II* citent quatre espèces africaines: *Eoctenes intermedius* SPEISER, *E. nycteridis* HORVATH, *Adwoctenes horvathi* JORDAN et *Hypoctenes clams* JORDAN; aucune de ces espèces n'y est signalée du Congo Belge. COOREMAN en 1951 *Rev. Zool. Bot. Afr., 44, pp. 339-341* consacre une première publication à l'existence de la famille au Congo Belge pour les deux espèces africaines du genre *Eoctenes*. Quelques années plus tard le même auteur *Rev. Zool. Bot. Afr., 51, 1955, pp. 107-108* signale la capture d'*Adroctenes horvathi* JORDAN au Congo Belge.

Depuis ces deux publications de nombreux spécimens sont parvenus au Musée du Congo Belge; ils nous fournissent d'utiles précisions sur la distribution géographique et le choix de l'hôte.

Tous les spécimens originaires du Congo Belge cités dans cette publication font partie des collections du Musée Royal du Congo Belge.

Benoit, P. L. G. (1958b). Contribution a l'étude de Spinturnicidae du Congo Belge.

Dans l'état actuel de nos connaissances, les Spinturnicides, parasites du cheiropatagium des Chauves-souris, 'n'ont pas souvent été signalés du Congo Belge.

On ne sait pas encore si ces Acariens jouent un rôle dans la transmission de germes pathogènes. Ils sont incontestablement hématophages et la présence de sang dans le tractus digestif de la plupart des

spécimens constitue d'ailleurs un obstacle au montage direct des spécimens en préparations microscopiques. Il est presque toujours indispensable de les faire bouillir dans une solution de KOH à 5-7 % puis d'expulser le contenu liquifié du corps par de légères pressions. Ces pressions se font de préférence à l'aide d'un objet obtus à l'extrémité. Après un passage d'environ dix minutes dans l'acide acétique cristallisable, le montage en milieu de Hoyer m'a donné toute satisfaction. Il est préférable de colorer les nymphes à l'éosine en solution chlorhydrique. L'emploi de KOH en solution supérieure à 7 % est à proscrire; à cette concentration la microsculpture cutanée est entamée, elle devient indistincte et disparaît parfois entièrement.

Bergmans, W. (1973). New data on the rare African fruit bat *Scotonycteris ophiodon* Pohle, 1943.

Two additional examples of the rare African fruit bat *Scotonycteris ophiodon* Pohle, 1943, are described and discussed. By this new record the known size range and the known geographical range of the species are largely extended.

Neue Daten über den seltenen afrikanischen Flughund *Scotonycteris ophiodon* Pohle, 1943.
Zwei neue Funde des seltenen Afrikanischen Flughundes *Scotonycteris ophiodon* Pohle, 1943, werden beschrieben und diskutiert. Die bekannte Variation in der Große dieser Art, wie auch das bekannte Verbreitungsgebiet, werden damit beide erheblich erweiterr,

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Bergmans, W. (1975). On the differences between sympatric *Epomops franqueti* (Tomes, 1860) and *Epomops buettikoferi* (Matschie, 1899), with additional notes on the latter species (Mammalia, Megachiroptera).

The approximate limits of the region of sympatric occurrence of the West African fruit bats *Epomops franqueti* (Tomes, 1860) and *Epomops buettikoferi* (Matschie, 1899) are discussed. Series of the two species from that region are compared and a key is given to identify adult specimens. Notes are added on the distribution, ecology and biology of *E. buettikoferi*.

Bergmans, W. (1976). A revision of the African genus *Myonycteris* Matschie, 1899 (Mammalia, Megachiroptera).

The fruit bat genus *Myonycteris* Matschie, 1899, is considered to contain only two valid taxa: the species *M. torquata* (Dobson, 1878) inhabiting the forest blocks in West Africa and Central Africa, and *M. brachycephala* (Bocage, 1889) from the island of São Tomé. *M. wroughtoni* Andersen, 1908, and *M. leptodon* Andersen, 1908, are considered synonyms of *M. torquata*. The subgenus *Phygetis* Andersen, 1912, proposed for the species *brachycephala* only, is sunk into the synonymy of *Myonycteris*. A number of new (collecting) localities for *torquata* is recorded, among which the first one in Nigeria. Data are included on morphological variability, sexual dimorphism,ecology and biology. The possible type locality of *torquata*, and some evolutionary trends within the genus are discussed.

Bergmans, W. (1977a). Notes on new material of *Rousettus madagascariensis* Grandidier, 1929 (Mammalia, Megachiroptera).

Seize spécimens de *Rousettus madagascariensis* Grandidier, 1929, ont été étudiés et mesurés. La position et les affinités du taxon sont discutés.

Biometrics of 16 specimens of *Rousettus madagascariensis* Grandidier, 1929, are given. Characters and affinities, distribution, and habitat of the species are discussed.

Bergmans, W. (1977b). An annotated inventory of three small collections of Nigerian Microchiroptera (Mammalia, Chiroptera).

The Nigerian Microchiroptera in the natural history collections of the universities of Ibadan, Ife and Amsterdam are listed. Important data and some measurements of each specimen are given. Some species are discussed in detail. *Myotis bocagei cupreolus* Thomas, 1904, and *Tadarida (Mops) congica congica* (Allen, 1917) are first records for Nigeria. The occurrence of *Rhinolophus landeri* Martin, 1838, in Nigeria is suggested. Some *Eptesicus* specimens are assigned to the species *capensis* (Smith, 1829) and *somalicus* (Thomas, 1901). Four hitherto unknown specimens of *Scotophilus gigas gigas* Dobson, 1875, are recorded, and the type locality of this species is discussed.

Une liste a été dressée des Microchiroptères de la Nigérie, qui font partie des collections d'histoire naturelle des universités d'Ibadan, d'Ife et d'Amsterdam. Des données générales sont mentionnées pour tous les spécimens dont quelques-uns sont traites plus amplement. *Myotis bocagei cupreolus* Thomas, 1904, et *Tadarida (Mops) congica congica* (Allen, 1917), représentent des espèces nouvelles pour la Nigérie. On a conjecture la présence possible en Nigérie de *Rhinolophus landeri* Martin, 1838. Il a été fait mention de quatre spécimens de *Scotophilus gigas gigas* Dobson, 1875, qui étaient inconnus jusqu'a présent; tous les quatre sont originaires de localités situées soit tout près de Lagos, soit au Lagos même, la localité-type alléguée.

Die nigerianischen Microchiropteren in den Museumssammlungen der Universitäten von Ibadan, Ife und Amsterdam werden aufgelistet. Daten und einige Maße werden für verschiedene Arten angegeben. Für Nigeria sind *Myotis bocagei cupreolus* Thomas, 1904 und *Tadarida (Mops) congica congica* Allen, 1917 erstmals nachgewiesen. Ferner kann das Vorkommen von *Rhinolophus landeri* Martin, 1838, für Nigeria angenommen werden. Einige *Eptesicus*-Exemplare werden den Arten *capensis* (Smith, 1829) und *somalicus* (Thomas, 1901) zugeordnet. Weiterhin sind vier bislang unbekannte Exemplare von *Scotopbilus gigas gigas* Dobson, 1875 belegt und diskutiert.

Bergmans, W. (1978a). Rediscovery of *Epomophorus pousarguesi* Trouessart, 1904 in the Central African Empire (Mammalia, Megachiroptera).

Three recently collected specimens of the fruit bat *Epomophorus pousarguesi* Trouessart, 1904, hitherto only known from the type specimen, are described. In the author's view they confirm the specific status of the taxon; the type locality and distinguishing characters of the species are discussed.

Bergmans, W. (1978b). Review of drinking behavior of African Fruit Bats (Mammalia: Megachiroptera).

Certain captive African Megachiroptera drink regularly from a hanging posture. There are very few reports of these animals drinking in the wild, nearly all claiming that they would drink by skimming over open water surfaces and scooping water or wetting their fur and licking water from this afterward. This paper summarizes and critically deals with the literature on the subject, and presents some new evidence suggesting that the skimming maneuvers of some fruit bats might serve a purpose other than drinking. The discussion includes some related observations on Australasian Megachiroptera.

Bergmans, W. (1979a). Taxonomy and zoogeography of the fruit bats of the Peoples Republic of Congo, with notes on their reproductive biology (Mammalia, Megachiroptera).

This study deals with 272 Megachiroptera from the People's Republic of Congo, belonging to 13 taxa: *Eidolon helvum helvum* (Kerr), *Rousettus aegyptiacus unicolor* (Gray), *Lissonycteris angolensis angolensis* (Bocage), *Myonycteris torquata* (Dobson), *Hypsignathus monstrosus* Allen, *Epomops franqueti franqueti* (Tomes), *Epomophorus* cf. *labiatus* (Temminck), *Epomophorus wahlbergi haldemani* (Halowell), *Micropteropus grandis* Sanborn, *Micropteropus pusillus* (Peters), *Scotonycteris*

zenkeri zenkeri Matschie, *Scotonycteris ophiodon* Pohle, and *Megaloglossus woermanni* Pagenstecher.

Of these, *Epomophorus* cf. *labiatus* and *Micropteropus grandis* are recorded from this country for the first time. The known ranges of *Epomophorus* cf. *labiatus* and *Micropteropus grandis* are greatly extended towards the west. In morphology and zoogeography ten species correspond with populations to the north and, with the possible exception of both *Scotonycteris* species, to the south; towards the east the distribution of *Rousettus aegyptiacus* and both *Scotonycteris* species is possibly discontinuous. The two *Epomophorus* species and *Micropteropus grandis* are linked with populations towards the south and east only.

Seasonal biannual reproduction is assumed for *Epomophorus wahlbergi, Epomops franqueti*, and *Micropteropus pusillus*. Data on reproduction in other species are scarce or lacking.

Bergmans, W. (1980). A new fruit bat of the genus *Myonycteris* Matschie, 1899, from eastern Kenya and Tanzania (Mammalia, Megachiroptera).

Myonycteris relicta n. sp. is described from the Shimba Hills in southeast Kenya and from the Usambara Mountains in northeast Tanzania. The species is larger than the only other known African mainland species of the genus, *Myonycteris torquata* (Dobson, 1878), from the Central and West African rain forests and, if compared to *M. torquata* and the only other species in the genus, *M. brachycephala* (Bocage, 1889) from São Tomé, has a relatively longer rostrum, a more deflected cranial axis, and further differs in number, shape and position of its teeth. The new species provides new arguments for the relationship between the genera *Myonycteris* Matschie, 1899, and *Lissonycteris* Andersen, 1912. It is believed that *Myonycteris relicta* may be a forest species and as such restricted to isolated East African forests.

Bergmans, W. (1982). Noteworthy extensions of known ranges of three African fruit bat species (Mammalia, Megachiroptera).

True *Nanonycteris veldkampii* (Jentink, 1888) is recorded from the Central African Republic for the first time. The disputed occurrence of *Epomops buettikoferi* (Matschie, 1899) in Nigeria is confirmed. *Rousettus lanosus* Thomas, 1906, is added to the faunal list of Sudan.

Bergmans, W. (1988). Taxonomy and biogeography of African fruit bats (Mammalia, Megachiroptera). 1. General introduction; Material and methods; Results: The genus *Epomophorus* Bennett, 1836.

This first part of a revision of African fruit bats contains a short general Introduction and a section Materials and Methods, both pertaining to all parts -as are the first remarks under Results -, and a study of the genus *Epomophorus* ~ Bennett, 1836. Prior important descriptions of *Epomophorus* are reviewed and current concepts of the generic characters .~ relative rostrum length; relative palatal length; depression ofpostdental palate; palatal ridge pattern; and sexual dimorphism are modified.

Bergmans, W. (1989). Taxonomy and biogeography of African fruit bats (Mammalia, Megachiroptera). 2. The genera *Micropteropus* Matschie, 1899, *Epomops* Gray, 1870, *Hypsignatus* H. Allen, 1861, *Nanonycteris*, Matschie, 1899 and *Plerotes* Andersen, 1910.

The genera *Micropteropus* Matschie, 1899, *Epomops* Gray, 1870, *Hypsignathus* H. Allen, 1861, *Nanonycteris* Matschie, 1899 and *Plerotes* Andersen, 1910 and the species assigned to them are reviewed. All the currently recognized taxa are main- tained except subspecific partitions in *Epomops .franqueti* (Tomes, 1860). The known characters are reviewed and dis- cussed, and new characters

presented, and their possible taxonomical implications mentioned. Of the skull characters traditionally used to

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Bergmans, W. (1994). Taxonomy and biogeography of African fruit bats (Mammalia, Megachiroptera). 4. The genus *Rousettus* Gray, 1821.

The concept of the genus *Rousettus* Gray, 1821 as established by Andersen (1912) is revised to accommodate *R. madagascariensis* Grandidier, 1929, *R. obliviosus* Kock, 1978 and *R. spinalatus* Bergrnans & Hill, 1980, and to reflect the following mutations. Following Bergmans et al. (1988), the genus *Boneia* Jentink, 1879 is treated as a synonym of *Rousettus*, which adds to that genus the species *B. bidens* Jentink, 1879. The subgenus *Stenonycteris* Andersen, 1912 is considered a synonym of *Rousettus* and the subgenus *Lissonycteris* Andersen, 1912 a full genus, to be reviewed in the next part of this series. All African *Rousettus* species are characterized and their distributions, including many new records, and geographical variation are analyzed. Following Eisentraut (1960), *R. egyptiacus* (E . Geoffroy-St. Hilaire, 1810) is divided into four, geographically disjunct, subspecies: *egyptiacus* from southern Egypt northward to and along the Mediterranean coast, including Cyprus, into southern Turkey; *leachii* (Smith, 1829) from southern Sudan and Ethiopia through East Africa to the Cape; *unicolor* (Gray, 1870) from northwest Angola to the Mount Cameroun region and from there to Senegal; and the extralimital *arabicus* Anderson & de Winton, 1902 from the southern half of the Arabian Peninsula to southern Iran and Pakistan (*arabicus* records from East Ethiopia are thought to be based on small-skulled *leachii*). All four subspecies are shown to vary geographically. The differences between *arabicus* and *R. leschenaultii* (Desmarest, 1820), which both inhabit Pakistan, are discussed at length. Notwithstanding several recent publications, *Rousettus lanosus* O. Thomas, 1906 is considered very distinct from *Rousettus madagascariensis*. Its scattered highland distribution has given rise to appreciable geographic variation. Three rough divisions are described but for the present no subspecies are recognized: East Zaïre, adjoining Uganda and (probably) Rwanda; (probably) West Ethiopia, South Sudan, East Uganda and Kenyan highlands; and Northeast Tanzania to Malawi. The Malawi records are the first for that country. Of *R. madagascariensis*, many new specimens have come to light, and its diagnosis is adapted accordingly. Its association, as a subspecies, with *R. lanosus* by some recent authors is based on a misinterpretation of its original description and other literature, and rejected as untenable. Its differences from *R. obliviosus* are described in detail for the first time. Some previously unrecorded specimens of *R. obliviosus* are reported. It is suggested that sexual dimorphism may be at least partly responsible for the "geographic" variation noted by Kock (1978).

Bergmans, W. (1997). Taxonomy and biogeography of African fruit bats (Mammalia, Megachiroptera). 5. The genera *Lissonycteris* Andersen, 1913, *Myonycteris* Matschie, 1899 and *Megaloglossus* Pagenstecher, 1885; General remarks and conclusions; annex: Key to all species.

This is the last part in a series comprising all Megachiroptera known from mainland Africa and its islands. The concept of the genus *Lissonycteris* Andersen, 1912 is reviewed and adapted. For the first time, its differential characters vis-à-vis the genera *Rousettus* Gray, 1821, and *Myonycteris* Matschie, 1899 as described in the literature have been checked against material of all the species involved. As a consequence, a number of these characters are considered of no taxonomic value and have not been retained, while some new differential characters are described. *Lissonycteris* and *Myonycteris* are considered different from *Rousettus* on generic level, while *Lissonycteris* and *Myonycteris* are more closely related to one another than each of these to *Rousettus*. New observations on all African and extralimital species of *Rousettus* are reported and the retention of *Boneia* Jentink, 1879 as a subgenus by Corbet et al. (1991, 1992) is rejected. *Lissonycteris* is considered a monotypic genus, with as single species the polytypic *L. angolensis* (Bocage, 1898). The subspecies *angolensis, smithii* (O. Thomas, 1908) and *ruwenzorii* (Eisentraut, 1965) are recognized, and two new subspecies, *petraea* and *goliath*, are described. *Myonycteris* consists of three species, *torquata* (Dobson, 1878), *brachycephala* (Bocage, 1889) and *relicta* Bergmans, 1980. Their present taxonomy is conform earlier reports (Bergmans, 1976, 1980a). *M. torquata* is considered a monotypical species. *M. relicta* is reported from Zimbabwe for the first time, extending its known distribution 1400 km southwards. Following Kirsch et al. (1995) and Springer et al. (1995), the subfamily Macroglossinae

is considered a synonym of the subfamily Pteropodinae. The taxonomy and distribution of *Megaloglossus woermanni* Pagenstecher, 1885 are reviewed. In a final section, general remarks and conclusions are presented on the supraspecific taxonomy of the Megachiroptera and a classification is proposed which includes the raise to subfamily rank of the Rousettinae and Epomophorinae and the recognition of the new tribes Scotonycterini and Plerotini; some recent publications bearing on African species taxonomy are reviewed; and an appraisal is made of the distribution patterns found throughout this series. A vicariance model is proposed to explain the occurrence in Asia and Africa of both *Pteropus* Brisson, 1762 and *Rousettus* Gray, 1821. For woodland species, the regions SE Tchad/E Central African Republic/W Sudan; N half of Tanzania; and E Angola/adjoining Zaïre have been identified as having (had) a barrier effect on dispersal. For forest species, important divides appear to be in the regions Volta River/Dahomey Gap; SE Nigeria; C and S Gabon; C Zaïre, from N to S; the Western Rift system; several barriers in E Africa. Finally, an illustrated key to all African Megachiroptera is given, primarily based on externally visible characters and designed for use in the field.

Bergmans, W., L. Bellier and J. Vissault (1974). A taxonomical report on a collection of Megachiroptera (Mammalia) from the Ivory Coast.

Ce travail concerne l'étude de 209 spécimens de Megachiroptères de la République de Côte-d'Ivoire. Ils appartiennent à 11 espèces différentes (les chiffres entre parenthèses indiquent le nombre d'individus de chaque espèce): *Eidolon helvum* (8), *Rousettus aegyptiacus* (2), *Hypsignathus monstrosus* (12), *Epomops franqueti* (27), *Epomops buettikoferi* (66), *Micropteropus pusillus* (30), *Nanonycteris veldkampi* (20), *Scotonycteris zenkeri* (1), *Lissonycteris angolensis* (5), *Myonycteris torquata* (35) et *Megaloglossus woermanni* (3).

Les positions taxonomiques de certaines espèces et sous-espèces ont été discutées, en se fondant sur les mensurations et la coloration des spécimens.

Bergmans, W. and H. Jachmann (1983). Bat records from Malawi (Mammalia, Chiroptera).

Five species of bats are recorded from Kasungu National Park, Malawi: *Eidolon helvum* (Kerr, 1792); *Epomophorus anurus* Heuglin, 1864; *Epomophorus minor* Dobson, 1880; *Epomops dobsonii* (Bocage, 1889); and *Scotoecus hindei* Thomas, 1901. Some other Malawian records of these species, based on literature and specimens in collections, have been included. *Epomophorus anurus, Epomops dobsonii* and *Scotoeous hindei* are recorded from Malawi for the first time.

Bernard, R. T. F. (1980a). Reproductive cycles of *Miniopterus schreibersi natalensis* (Kuhl, 1819) and *Miniopterus fraterculus* Thomas and Schwann, 1906.

The reproductive cycles of *Miniopterus schreibersi* and *Miniopterus fraterculus* were investigated histologically using specimens collected in the Natal Midlands (c. 29° S 30° 15' S).

In both species the gestation period was extended by a period of delayed implantation. In *M. fraterculus* the period of delayed implantation was two-and-a-half months, one-and-a-half months shorter than this period in *M. schreibersi*. In both species the period of active fetal growth was approximately four months.

Copulation in *M. schreibersi* from the Natal Midlands began one month after copulation in the same species from southern and northern Transvaal (c. 25° S and c. 24° S), and it is suggested that this is the result of summer in the Transvaal ending approximately one month earlier than in the Natal Midlands.

On the basis of the reproductive cycle and winter behaviour, the difference between the reproductive cycles of *M. schreibersi* and *M. fraterculus* is explained by suggesting that *M. fraterculus* migrated

southwards from the tropics after *M. schreibersi*, that *M. fraterculus* has a shorter history at southern latitudes, and as such its reproductive cycle is intermediate between that of *M. schreibersi* from the same latitude, and the typical tropical reproductive pattern.

Bernard, R. T. F. (1980b). Female reproductive anatomy and development of ovarian follicles in *Miniopterus fraterculus*.

The uterus of *Miniopterus fraterculus* (Thomas & Swan 1906) is bicornuate and asymmetrical, the right uterine horn being larger than the lett in parous and nulliparous females. Ovarian and uterine function is asymmetrical; 94 % of observed ovulations originated in the left ovary and all implantations occurred in the right uterine horn. Growth and development of ovarian follicles follow the typical eutherian mammalian pattern. The preovulatory Graafian follicle differs from that of most hibernating verspertilionids in that the cumulus oophorus is relatively small. Two types of follicular atresia occur. The first type, in which the stratum granulosum degenerates before degeneration of the oocyte, occurs in multilaminar follicles. The second type occurs in primary and early secondary follicles and is characterized by the oocyte showing the first signs of regression.

Miniopterus fraterculus (Thomas & Swann 1906) het 'n bikornaatuterus wat asimmetries is met die regterhoring groter as die linker een. Die funksie van beide ovarium en uterus is asimmetries, deurdat 94 % van die waargenome ovulerings in die linker ovarium ontstaan het, en alle implanterings in die regterhoring van die uterus plaasgevind het. Groei en ontwikkeling van die follikels in die ovarium kom ooreen met die kenmerkende patroon in die eutheria. Die preovulatoriese follikel van Graaf verskil van die van meeste hibernerende vespertilionidae daarin dat dié cumulus oophorus relatief klein is. Twee tipes follikulêre atresia kom voor in *M. fraterculus*. Die eerste tipe is waar die stratum granulosum degenereer voordat degenerasie van die oösiet plaasvind, en word aangetref in multilaminêre follikels. Die tweede tipe kom voor in primêre en vroeë sekondêre follikels en hier word die eerste tekens van regressie in die oösiet gevind.

Bernard, R. T. F. (1982a). Female reproductive cycle of *Nycteris thebaica* (Microchiroptera) from Natal, South Africa.

Investigated monthly changes in the female reproductive organs and the reproductive cycle of *Nycteris thebaica*. Monthly changes in ovarian and vaginal activity were characterized by two peaks. The first, between April and early June, culminated in estrus, while the second, occurred between July and August during pregnancy and is thought to be a relict from polyestrous ancestors. The reproductive cycle was characterized by copulation and fertilization in early June, a five month gestation with parturition in early November, approximately two months of lactation, and a period of anestrus between termination of lactation and onset of proestrus in April.

Bernard, R. T. F. (1982b). Monthly changes in the female reproductive organs and the reproductive cycle of *Myotis tricolor* (Vespertilionidae: Chiroptera).

Myotis tricolor was monoestrous and monotocous. The oestrous cycle was characterized by a prolonged period of oestrus between mid-April and mid-September and a short period of anoestrus between the termination of lactation and the onset of pro-oestrus. The female reproductive cycle was characterized by copulation in mid-April and ovulation and fertilization in mid-September. The gestation period was estimated to have been 63 days and parturition occurred between mid-November and mid-December. Parturition was followed by a six-week period of lactation. It is assumed that between mid-April and mid-September the female stored spermatozoa in the uterine horns, a reproductive strategy previously reported for north-temperate members of this genus.

Maandelikse veranderinge in die vroulike voortplantingsorgane van *Myotis tricolor* is gekenmerk deur 'n kort ontwikkelingsperiode van die follikels van Graaf sowel as die vaginale epiteel gedurende pro-estrus. Die estrussiklus is gekenmerk deur 'n uitgerekte estrus en 'n kort anestrus tussen die einde

van laktasie en die begin van pro-estrus. Die vroulike voortplantingsiklus is gekenmerk deur kopulasie in middel April, ovulasie en bevrugting in middel September en geboorte tussen middel November en middel Desember. Dit word vermoed dat spermatozoa tussen middel April en middel September in die uterushorings gestoor word, 'n voortplantingstrategie reeds voorgestel vir noord-gematigde lede van hierdie genus.

Bernard, R. T. F. (1984). The occurrence of spermiophagy under natural conditions in the cauda epididymidis of the Cape horseshoe bat (*Rhinolophus capensis*).

In Cape horseshoe bats large numbers of spermatozoa remain in the cauda epididymidis after copulations have ceased in September. Light microscopy has shown that for 5 months after September phagocytes are present in the lumen of the cauda epididymidis and electron microscopy has shown these cells to be active spermiophages. The large numbers of spermiophages present suggests that these cells could be responsible for removal of most of the excess spermatozoa. Spermiophagy by the epididymal epithelial cells occurs rarely and is not significant in the treatment of excess spermatozoa.

Bernard, R. T. F. (1985). Reproduction in the Cape horseshoe bat (*Rhinolophus capensis*) from South Africa.

Structure of the reproductive organs and the processes of spermatogenesis and follicular development are described and are·similar to those described for other members of the genus *Rhinolophus*. The reproductive cycle of the Cape horseshoe bat is characterized by spermatogenesis between October and May (spring to autumn) with sperm released to the cauda epididymis in April and May. At this time the females are in oestrus or submaximal oestrus but copulation and ovulation are delayed until August and September (the end of winter hibernation). Between May and September spermatozoa are stored in the cauda epididymis where they show no positive association with the epididymal epithelium. Parturition occurs in November and December after a three to four month gestation.

Die struktuur van die voortplantingsorgane en die prosesse van spermatogenese en follikulere ontwikkeling word beskryf en is soortgelyk aan die van ander lede van die genus *Rhinolophus*. Die voortplantingsiklus van die Kaapse saalneusvlermuis word gekenmerk deur spermatogenese wat tussen Oktober en Mei (lente en somer) plaasvind met saad wat teenwoordig is in die cauda epididimis gedurende April en Mei. Die wyfies is in estrus of submaksimale estrus gedurende hierdie tydperk maar paring en ovulasie word tot Augustus en September (die einde van die winterslaap) vertraag. Tussen Mei en September word spermatozoa in die cauda epididimis gestoor waar hulle geen positiewe verbintenis met die epididimale epiteel vertoon nie. Geboorte vind plaas gedurende November en Desember na 'n dragtydperk van drie tot vier maande.

Bernard, R. T. F., C. Bojarski and R. P. Millar (1991). Plasma progesterone and luteinizing hormone concentrations and the role of the corpus luteum and LH gonadotrophs in the control of delayed implantation in Schreibers' long-fingered bat (*Miniopterus schreibersii*).

In Schreibers' long-fingered bat from South Africa (~ 33 °S) copulation, ovulation and fertilization occurred in April and May, implantation was delayed until August, and parturition occurred in December. Delayed implantation coincided with winter, during which the bats remained active, only entering prolonged periods of torpor during particularly cold spells. Plasma progesterone concentration was low during non-pregnancy (1.54 ng/ml) and during delayed implantation (1.67 ng/ml), and thereafter increased to reach a peak mean of 64.82 ng/ml in late pregnancy. Changes in size and ultrastructure of the luteal cells indicated periods of steroidogenesis just after formation of the corpus luteum, and for about 2 months after implantation; reduced steroidogenic activity during delayed implantation; and luteolysis in the last 2 months of pregnancy. Plasma luteinizing hormone (LH) concentration and pituitary LH-ß immunoreactivity were highest during follicular development and

peaked just before ovulation. During early delayed implantation, plasma LH concentration was low, and both plasma LH and pituitary LH- ß immunoreactivity increased from July, reaching peaks in late pregnancy. LH may be required to activate the corpus luteum and terminate delayed implantation, or, as in some small carnivores, it may be required for luteal maintenance.

Bernard, R. T. F. and G. S. Cumming (1997). African bats: evolution of reproductive patterns and delays.

Patterns of reproduction in African bats can be compared in three taxon-based groups: fruit bats (Megachiroptera), freetailed bats (Microchiroptera: Molossidae) and the nonmolossid Microchiroptera. In the fruit bats and nonmolossid Microchiroptera there is a trend from either seasonal or aseasonal polyestry, with prolonged or continuous spermatogenesis in the tropics, towards seasonal monestry and seasonal spermatogenesis at more temperate latitudes. Reproductive delays (sperm storage, delayed implantation and delayed development) are rare at tropical latitudes, but are the norm in the nonmolossid Microchiroptera away from the tropics. The molossids are mostly polyestrous at tropical and temperate latitudes, although the duration of the reproductive season decreases with increasing latitude. The molossids appear to have escaped the constraints that affect reproduction of the other Microchiroptera. We propose that this may be due to their flight capabilities and foraging behavior, which give them access to year-round food, and to the thermal characteristics of their roosts. We suggest that the ancestral reproductive pattern of the Chiroptera was probably aseasonal or seasonal polyestry, as seen in extant tropical species, and therefore that reproductive cycles have evolved from the polyestrous to the monestrous condition. Short periods of reproductive delay occur in some species of tropical bats; we suggest that these reproductive delays originally were not adaptations to temperate latitudes but rather to the long dry season, which is characteristic of African tropical latitudes. With the move away from the tropics, selective pressures, acting on the timing of lactation and spermatogenesis, would have ensured that these processes continued to occur in the warm wet season, and that the length of the reproductive delay increased. This model accommodates the probable evolutionary origin of bats and links the evolution and development of reproductive delays to the differences in climate that occur with changes in latitude. There is evidence that mate choice and sperm competition may be important to modem bats, but we believe that they need not be invoked as causal factors in the evolution of reproductive delays, which can be adequately explained using purely energetic arguments.

Bernard, R. T. F. and A. Davison (1996). Does calcium constrain reproductive activity in insectivorous bats? Some empirical evidence for Schreibers' longfingered bat (*Miniopterus schreibersii*).

Insects are a poor source of dietary calcium and since they are seasonally abundant, it has been suggested that calcium availability may play a significant role in controlling the timing of reproduction in insectivorous bats. To assess the possible role of dietary calcium, we have measured bone calcium concentrations in female and male long-fingered bats (*Miniopterus schreibersii*) through a full reproductive cycle. The results indicate that winter was not a period of calcium stress and, therefore, that seasonal changes in insect abundance and dietary calcium availability are not a satisfactory explanation for the occurrence of delayed implantation in the long-fingered bat. Bone calcium concentrations of females did not differ significantly throughout pregnancy, indicating that the insects available in winter and early summer were sufficient to meet the calcium demands of pregnancy. Lactating females had the lowest bone calcium concentrations of all specimens, supporting the suggestion that lactation is indeed a period of severe calcium stress in aerial insectivores. We conclude that parturition is probably timed so that lactation coincides with the period of maximal insect abundance and corresponding dietary calcium availability.

Bernard, R. T. F., D. C. D. Happold and M. Happold (1997). Sperm storage in a seasonally reproducing African vespertilionid, the banana bat (*Pipistrellus nanus*) from Malawi.

Spermatogenesis in the banana bat (*Pipistrellus nanus*) from southern Malawi began in the hot, wet season (February to April) and spermatozoa were released to the cauda epididymides at the beginning of the cool, dry season (May). Mating occurred between mid-June and early July, in the middle of the cool, dry season. After mating, spermatozoa were stored by the female until ovulation in August and by the male until at least September. The period of female sperm storage effectively lengthened the reproductive cycle so that early spermatogenesis occurred during the second half of one hot, wet season and births at the beginning of the following hot, wet season. During the period of sperm storage, males and females roosted together and group membership was labile, suggesting that the mating system may be promiscuous (both males and females mating with more than one partner) and that sperm competition may occur. The similarity between the chronology of reproduction in Malawi, Kenya, and South Africa leads us to propose that sperm storage occurs at all three localities.

Bernard, R. T. F. and J. A. J. Meester (1982). Female reproduction and the female reproductive cycle of *Hipposideros caffer caffer* (Sundevall, 1846) in Natal, South Africa.

Female reproduction and the female reproductive cycle of *Hipposideros caffer* from three disused mines in Natal (c. 29 °S) are described.

The uterus of *H. caffer* was bicornuate with sinistral structural and functional asymmetry. The corpus uteri and caudal ends of the uterine horns differed from the general mammalian pattern, being lined by stratified epithelium. Growth, development and atresia of ovarian follicles were typically mammalian. The corpus luteum of *H. caffer*, which was extruded from the ovary, disappeared within one month of ovulation.

H. caffer was monoestrous and monotocous. Follicular development began in February, with copulation and ovulation occurring in late April (early winter). The gestation period was estimated to have been approximately 220 days of which the period of the zygote accounted for 21 days or 9,5 per cent, the period of the embryo 123 days or 55,9 per cent and the period of the foetus 76 days or 34,5 per cent. Development from fertilization to implantation was normal but embryonic development was retarded during winter. Parturition occurred in early December and was followed by a period of lactation/anoestrus during December and January.

The oestrous cycle, including pregnancy, was characterised by a relatively long pregnancy stage and the absence of a separate period of anoestrus.

H. caffer did not hibernate throughout the winter period but entered short periods of torpor during particularly cold spells.

Results from the present study support the trend seen in the genus *Hipposideros* and other microchiropteran genera of increasing gestation length with increasing latitude.

Bernard, R. T. F., J. Paton and K. Sheppey (1988). Relative brain size and morphology of some South African bats.

Measures of relative brain size and brain macromorphology are described for four species of Microchiroptera, two from the Vespertilionidae and two from the Rhinolophidae, and two species from the pteropodidae (Megachiroptera). Four brain parameters (brain length, hemisphere length, brain width and brain height) were measured, and converted to indices of proportion to allow interspecific comparison. The megachiropteran species have relatively larger brains than the microchiropteran species, this being primarily a result of the greater development of the cerebral hemispheres in the former group. Of the microchiropteran species, *Miniopterus schreibersii* has the highest value for comparative brain size and its brain shows several characteristics of the more encephalized Megachiroptera such as reduced exposure of the mesencephalic tectum, and the presence of

prominent cerebral sulci. The possibility that the differences in brain size and development between the Megachiroptera and the Microchiroptera, may be related to diet, or that they may be of phylogenetic origin, is discussed.

Relatiewe breingrootte en brein-makromorfologie word beskryf vir vier spesies van die Vespertilionidae en Rhinolophidae (Microchiroptera) en twee spesies van die pteropodidae (Megachiroptera). Vier breinparameters (breinlengte, hemisfeerlengte, breinbreedte, en breinhoogte) is gemeet en omgesit na indekse van eweredigheid om interspesifieke vergelyking toe te laat. Die Megachiroptera-spesies het relatief groter breine as die Microchiroptera-spesies, wat primer te wyte is aan die groter ontwikkeling van die serebrale hemisfere van die eerste groep. Van die Microchiroptera-spesies het *Miniopterus schreibersii* die hoogste waarde vir relatiewe breingrootte en sy brein wys verskeie kenmerke van die meer ontwikkelde brein van die Megachiroptera soos verminderde ontbloting van die mesenteriese tektum en die teenwoordigheid van prominente serebrale sulci. Die moontlikheid dat die verskille in breingrootte en -ontwikkeling tussen die Megachiroptera en Microchiroptera verwant mag wees aan dieet, of dat hulle van genetise oorsprong mag wees, word bespreek.

Bernard, R. T. F. and J. N. Tsita (1995). Seasonally monoestrous reproduction in the molossid bat, *Tadarida aegyptiaca* from low temperate latitudes (33°S) in South Africa.

A histological study of reproduction in Egyptian free-tailed bats (*Tadarida aegyptiaca*) from the Eastern Cape Province of South Africa (c. 33° S) showed that females were seasonally monoestrous. Copulation, ovulation and fertilization occurred in August, at the end of winter. and births in December, after a four-month pregnancy. These results are compared with those of other molossid bats from lower latitudes in Africa. We conclude that the monoestrous habit of the Egyptian free-tailed bat at 33° S may be due to its relatively long pregnancy, and to the short summer period during which minimum temperatures are high enough to ensure an abundance of nocturnal flying insects.

'n Histologiese ondersoek van Egiptiese losstertvlermuise (*Tadarida aegyptiaca*) van die Oostelike Kaap Provinsie van Suid-Afrika (c. 33° S) toon dat dear slegs 'n enkele estrus per jaar is en dat dit seisoensgebonde is. Paring, ovulasie en bevrugting vind plaas gedurende Augustus, aan die einde van die winter, met geboortes gedurende Desember na 'n dragtigheidsperiode van vier maande. Die resultate word vergelyk met die van ander molossiede vlermuise van laer breedtegrade in Afrika. Ons maak die gevolgtrekking dat die enkele estrus van Egiptiese losstertvlermuise teen 33° S verklaar kan word deur 'n lang dragtigheidsperiode en die kort tydperk gedurende die somer wanneer die minimum temperature hoog genoeg is om te verseker dat daar 'n oorvloed vlieende naginsekte is.

Best, T. L., B. A. Milam, T. D. Haas, W. S. Cvilikas and L. R. Saidak (1997). Variation in diet of the Gray bat (*Myotis grisescens*).

During spring and summer 1991, a total of 1,476 fresh fecal pellets of gray bats, *Myotis grisescens*, was collected at Blowing Wind Cave, Jackson Co., Alabama. Fourteen orders of Insecta, unidentified Insecta, an unknown organism (possibly Insecta), two orders of Arachnida, and hair from gray bats were recovered; in decreasing order, the most common taxa were Lepidoptera, Diptera, and Coleoptera. Food categories exhibited significant variation among sampling sessions, nights within sampling sessions, and hours within sampling sessions. When quantity of each food category in fecal pellets was compared with quantity of potential prey available for consumption, there was no statistically significant correlation. There was significant variation in diet over time, but bats did not select prey in proportion to availability.

Bhatnagar, V. S. and G. Parveen (1985). Karyomorphology of an Indian rat-tailed bat, *Rhinopoma microphylum kineari* Wroughton.

The diploid chromosome number and the details of the karyotype of an Indian bat, *Rhinopoma microphylum kineari* Wroughton is being reported for the first time (2n = 36).

Bhide, S. A. (1979). Observations on the anatomy, histology and histochemistry of the stomach of the vespertillonid bat *Miniopterus schreibersii* (Kuhl).

Both the openings of the stomach of *Miniopterus schreibersii* are directed cranially and the fundus is large and rounded. The longitudinal layer of muscles is thin but the circular layer is thick particularly at the apex of the fundic caecum. In addition to the usual types of cells, namely pepsinogen cells, parietal cells, surface mucous cells and neck mucous cells, a new type of cell, the interstitial cell of the gastric mucosa, which stains intensely pink with PAS, has been identified for the first time in the gastric glands. In general there is a predominance of neutral mucins particularly in the pyloric region where blebs of mucus are seen to ooze out into the lumen. Acidic mucins are present in moderate amounts in the surface mucous cells at the apex of the fundic caecum.

Bickham, J. W. (1979). Chromosomal variation and evolutionary relationships of Vespertilionid bats.

Intergeneric evolutionary relationships were studied in vespertilionid bats using G- and C-band data. In most cases, chromosomal variation can be explained by Robertsonian changes, centric fusions being by far the most numerous. There appear to be three karyotypic, evolutionary trends among vespertilionids. The first is to remain karyotypically primitive by retaining a high diploid number with many acrocentric chromosomes. The second is to become karyotypically specialized by a process of centric fusion leading to lower diploid numbers with many biarmed chromosomes. The third is to reduce greatly the diploid number by centric fusions and translocations. The latter is seen only in *Lasionycteris* (2n = 20), which evolved from an ancestor with a karyotype like that of *Myotis* (2n = 44). A phylogenetic sequence is proposed based on banding patterns. A Myotis-like group including *Myotis, Pipistrellus, Lasiurus, Plecotus, Idionycteris*, and *Lasionycteris* evolved from an ancestor with the *Myotis* karyotype. An *Eptesicus*-like group including *Eptesicus, Rhogeessa, Antrozous*, and *Nycticeius* evolved from an ancestor with a karyotype like that of *Eptesicus*. *Miniopterus* represents a karyological intermediate between the two groups. The ancestral karyotype for the family is hypothesized to have been similar to that of *Myotis*.

Bigalke, R. C. (1968). Evolution of mammals on southern continents. II. The contemporary mammal fauna of Africa.

Africa and the Oriental Region are probably the areas from which mammals radiated into the rest of the world. Both regions have rich and diverse mammalian faunas. That of Africa, composed purely of placentals, is most closely related to the Oriental fauna and has very little in common with the faunas of the other southern continents. About one quarter of the families are endemic. Approximate numbers of species and superspecies are given for each family. Africa has about one-quarter of the mammal species of the world; rodents, bats, insectivores, artiodactyls, carnivores and primates, in that order, are the largest groups. Endemism at the generic level is high except in the bats. The main features of speciation, radiation, ecology and geographical distribution are discussed for each order. Outstanding features are the radiation of insectivores with the evolution of three endemic families, (the aquatic otter shrews, subterranean golden moles and bipedal elephant shrews); the great diversity of rodents, with endemic families resembling "flying" squirrels (anomalurids), moles (bathyergids), hyraxes (ctenodaclylids), cavies (thrynomyids) and kangaroos (*Pedetes*); extensive speciation in the Viverridae, and unparalleled radiation in the Bovidae to fill all available herbivorous niches. Regional faunas of the main biotic zones (Lowland Forest; Southern and Northern Savanna; South West, Somali and Sudanese Arid; and the Abyssinian Highlands) are described. The basic dichotomy is between forest and non-forest forms. A consideration of centers of endemism, mainly in the lowland forest and arid zones, leads to the conclusion that they were isolated as a result of fluctuations in climate and the resulting displacement of vegetation zones during the Quarternary. The faunas of Madagascar and of the Comoro, Seychelle and Mascarene Islands are described. Madagascar has a peculiar, ancient,

typically unbalanced, island fauna with African affinities. The other islands have small faunas, composed only of bats in the case of the farthest ones.

Birch, J. M. (1997). Comparing wing shape of bats: the merits of principal-components analysis and relative-warp analysis.

Size and shape are fundamental features of organisms. Ideally, the methods used to describe size and shape must be sensitive enough to detect small differences, and at the same time provide interpretation that is visually satisfying. I compared shape of wings among *Eptesicus fuscus, Myotis lucifugus, Pipistrellus hesperus*, and *Tadarida brasiliensis* using three methods of morphometric analysis; principal-components analysis on traditional measures of lengths and areas, principal-components analysis of interlandmark distances, and relative-warp analysis. These species were chosen to test the efficacy of each morphometric analysis at discovering and describing differences in both size and shape. Although principal-components analyses provided similar aggregations of species based on variable loadings, only relative-warps analysis provided clear pictures as to how species differ. The molossid bat, *T. brasiliensis*, had narrower wings than the vespertilionid bats; this shape was not due to compression of the entire wing, but to a complicated rotation around the fifth digit. The vespertilionid bats were difficult to discern based on wing shape alone, but the warp analysis showed that *P. hesperus* and *M. lucifugus* are more similar in shape of wing than either is to *E. fuscus*. Each method of analysis of shape has strengths, but relative-warp analysis provided both the power to discriminate among minor differences in shape of species within families, and the graphical capability to display those differences in a visually pleasing way.

Black, H. L. (1979). Precision in prey selection by the trident -nosed bat (*Cloeotis percivali*).

Stomach samples from 55 African trident-nosed Bats (*Cloeotis percivali*), collected in Zambia over a 12 month period, were analyzed for prey remains. Lepidoptera were identified in all stomachs. Only seven bats had eaten prey other than lepidopterans. The width of the food niche for *Cloeotis* is compared with that of a temperate insectivorous species, *Pipistrellus Hesperus*, and is shown to be narrower. Data are presented on the size distribution of selected insect taxa collected by light trapping. Seasonal aspects of prey abundance in relation to rainfall patterns is also presented. It is hypothesized that *Cloeotis percivali* is a specialist on lepidoterans irrespective of seasonal or short term changes in their abundance.

Le contenu des estomacs de 55 *Cloeotis percivali*, collectés en Zambie pendant une période de 12 mois, a été examiné pour déterminer la nature des proies ingérées. Des Lépidoptères ont été identifiés dans tous les estomacs et seulement 7 chauves-souris ont ajouté d'autres insectes à leur menu. La niche alimentaire de *Cloeotis* comparee à celle d'une espèce insectivore de région tempérée, *Pipistrellus hesperus*, est plus étroite. L'auteur donne des indications sur la répartition de la taille des insectes collectés à la lampe. Il donne aussi des indications sur la variation saisonnière de l'abondance des proies en relation avec les pluies. *Cloeotis percivali* pourrait être specialisée dans la prédation des Lépidoptères, quelle que soit la saison et quelles que soient les variations temporaires d'abondance des papillons.

Black, H. L., G. Howard and R. Stjernstedt (1979). Observations on the feeding behavior of the bat hawk (*Macheiramphus alcinus*).

A foraging bat hawk (*Macheiramphus alcinus*) was observed for six consecutive nights near a cave in Zambia. Feeding bouts lasting an average of 18.3 minutes per night caught an average of seven insectivorous bats (average percent success was 49.3 per attempt). Average weight of meals was 56.3 g. Kill-ingestion rates averaged 6.0 sec. Bats were the only observed prey. The morphological and behavioral adaptations of bat hawks are discussed and interpreted as strategies that are a sensitive reflection of the biology, behavior, and ecology of small, insectivorous bats.

Blackwell, M. (1980). Incidence, host specificity, distribution, and morphological variation in *Arthrorhynchus nycteribiae* and *A. eucampsipodae* (Laboulbeniomycetes).

Nycteribiidae (Diptera) are ectoparasites of bats in the Old and New World. Some Old World nycteribiids are hosts for *Arthrorhynchus* (Laboulbeniomycetes). Thirty-five additional collections of *A. nycteribiae* and *A. eucampsipodae* greatly extend the known host and distributional range of these two species. In addition, it has been found that although morphological similarity exists within fungal thalli of the same collection, both species are marked by a great degree of intraspecific variation which usually cannot be correlated with climate, geographical location, host species, host sex, or other factors. It is suggested that low population densities and partial isolation of populations may contribute to intraspecific variation.

Bobrinskoj, N. (1929). Bats of Central Asia.

Though the study of the systematic and geographical distribution of Bats of Siberia and Turkestan develops rapidly as a result of the recent research of Russian explorers and those of Near Asia, India and China thanks to the work of English and American scientists, the vast area of Central Asia remains quite unexplored.

There is however in the Zoological Museum of the Academy of Sciences a not very numerous but most valuable material of Chiroptera from Central Asia formed by different renowned Russian explorers, beginning with the famous N. PRZEVALSKIJ. It is therefore quite clear that I first paid attention to this collection when delegated by the Trustees of the Zoological Museum to revise their Collection of Bats.

In my article "Preliminary information on Bats of Central Asia" I gave: 1) a list of the Central Asiatic forms, according to the very poor literary information that is available, 2) a catalogue of the Collection mentioned after arranging it as I considered advisable, and 3) diagnoses of new species and subspecies. Being very restricted in print I could mention only very briefly the most important indications, and the diagnoses of the new forms were published only in Russian.

In the present article under the term „ Central Asia" I include the territory that borders on the USSR to the West and the North, . . .

Bocage, J. V. B. (1889b). Mammifères d'Angola et du Congo.

Sous ce titre j'ai l'intention de publier, dans une série d'articles, les résultats d'une première révision de nombreux matériaux déposés dans le Muséum de Lisbonne, qui me semblent destines à donner une idée plus exacte et plus complète des espèces de mammifères qui habitent les territoires d'Angola et du Congo.

La plupart de ces matériaux ont été récueillis par notre zélé naturaliste M. José de Anchieta, qui depuis 1867 s'occupe incessamment, sans un moment de défaillance, de l'exploration zoologique de ces possessions portugaises. Grace à lui, nos connaissances sur la faune de cette intéressante partie du continent africain ont fait de rapides progrès dans ces dernières années. Les territoires d'Angola et du Congo ne sont plus une *terra incognita* sous le point de vue de la zoologie.

D'autres personnes ont également droit à la reconnaissance de tous ceux qui s'intéressent aux progrès de la zoologie comme ayant contribué, quoique en proportions plus modestes, à la prospérité actuelle de nos collections africaines. J'aurai souvent l'occasion de citer leurs noms dans le cours de cette publication, mais je tiens à leur exprimer d'avance mes sincères remerciments pour leur généreux concurs.

Bogdanowicz, W. (1990). Phenetic relationships among bats of the family Rhinolophidae. Abstract.

Sixty-two species of rhinolophid bats were analyzed phenetically under the common-part-removed transformation of Wood C1983). Two ordination methods, one clustering technique, and a minimum spanning tree were employed to assess patterns of overall similarity among species. Two major phonetic groupings were revealed. One grouping was generally formed by Oriental and Australian species, while the second by Ethiopian and Palaearctic ones. Phenetic relationships between and within these groupings were discussed.

Bogdanowicz, W. (1992). Phenetic relationships among bats of the family Rhinolophidae.

Phenetic analyses, using the common-part-removed transformation of Wood (1983), were performed on 2.5 - 6.4% of the variance that describes morphometric differences among bats of the family Rhinolophidae. Two ordination methods, one clustering technique, and a minimum-spanning tree were employed to assess patterns of similarity among 62 species. Two major phenetic groups were revealed. One comprised Oriental and Australian species, whereas the other contained Ethiopian and Palaearctic taxa. On the basis of morphological similarity, all but one species were provisionally arranged in 11 phenetic groups: *megaphyllus, rouxii, euryotis, pearsonii, philippinensis, trifoliatus, fumigatus, ferrumequinum, capensis, euryale*, and *hipposideros*. Mensural data were not sufficient to clarify the status of *R. maclaudi*. Based on the morphological dispersion analysis, the Oriental region should be regarded as the center of origin of the family. On the basis of phylogenetic and functional factors, a close ancestor of rhinolophids probably lived in tropical rain forests, flew slowly emitting low-frequency sounds, and caught relatively soft but large prey.

Bogdanowicz, W., M. B. Fenton and K. Daleszczyk (1999). The relationships between echolocation calls, morphology and diet in insectivorous bats.

In this study we explored quantitatively the relationships between the size of bats, the frequencies in their echolocation calls, and the incidence of moths and beetles in their diets. We focused on the predictions of the allotonic frequency hypothesis which states that some insectivorous bats increase their access to moths that can hear echolocation calls by shifting to frequencies to which the ears of these insects are less sensitive. The hypothesis predicts that the frequencies dominating the echolocation calls of bats may be correlated with the incidence of moths in their diets. We collected data for 62 species of bats that take airborne prey, usually flying insects, 25 species of high duty cycle echolocating bats (Rhinolophidae and Hipposideridae) and 37 species that are low duty cycle echolocators (Vespertilionidae and Molossidae). For bats whose echolocation calls are dominated by frequencies < 100 kHz our regression analyses showed a parabolic dependency between moth consumption (% volume or % frequency) and echolocation call frequency (kHz), supporting the allotonic frequency hypothesis. The use of echolocation calls dominated by frequencies outside the range of best hearing by moths may indeed increase the availability of these insects to the bats. However, when the same analysis was performed with only the bat species using echolocation calls dominated by sounds > 100 kHz, the relationship was not statistically significant, suggesting that morphological characteristics rather than echolocation call frequency may limit the range of potential prey items. Our analyses also demonstrate the importance of jaw morphology as a predictor of the incidence of beetles or moths in the diets of bats, and reveal that generally bigger species (as defined by forearm length) use echolocation calls dominated by lower frequencies than smaller species. In both high duty and low duty cycle echolocating bats the relationship between body size and dominant call frequency was best described by a linear model. We also propose that perch hunting was central in the development of the high duty cycle approach to echolocation.

Bogdanowicz, W., S. Kasper and R. D. Owen (1998). Phylogeny of Plecotine bats: reevaluation of morphological and chromosomal data.

Recent systematic studies of the tribe Plecotini have generated two alternative phylogenetic hierarchies: *(Barbastella (Corynorhinus (Plecotus (Idionycteris Euderma))))*; and *(Euderma* [including *Idionycteris (Barbastella (Plecotus Corynorhinus)))*. To test these hypotheses we examined 44 - 45 morphological and 11 karyological characters of 10 plecotine species, including *Otonycteris hemprichii*. Character states for the hypothetical ancestor were inferred by evaluation of selected outgroup taxa: *Rhogeessa tumida, Nycticeius humeralis, Eptesicus fuscus, Myotis lucifugus, M. ciliolabrum*, and *Miniopterus schreibersi*. The most parsimonious trees, identical in topology but different in character-state optimization, were congruent with the systematic hierarchy of Plecotini suggested by the first hypothesis. *Otonycteris* branched off before *Corynorhinus*. These results strongly support separation of *Corynorhinus* as an independent genus and limitation of *Plecotus* to Palaearctic species. The two highly derived taxa, *Idionycteris phyllotis* and *Euderma maculatum*, seem to be sufficiently different from each other to be regarded as generically distinct. It is proposed that the tribe Plecotini originated in the eastern hemisphere.

Bogdanowicz, W. and R. D. Owen (1990). Phylogenetic analyses of the bat family Rhinolophidae. 1. Metrical characters. Abstract.

The continuous morphological data set representing 64 Operational Taxonomic Units of *Rhinolophus* sp. was analyzed by the maximum likelihood method (size-free and common-partremoved transformations). Of several groups of species recognized by Andersen (1905 a, b, 1918), Tate and Archbold (1939), only a few were well defined and supported phylogenetically. The majority, like the *philippinensis* group of Tate and Archbold (1939), for example, did not represent natural assemblages. The results suggested eastern part of the Oriental Region or "Australo-Indo-Malayan Tract" as a center of origin for Rhinolophidae.

Bogdanowicz, W. and R. D. Owen (1992). Phylogenetic analyses of the bat family Rhinolophidae.

The 35 mensural traits of 62 species from the family Rhinolophidae were analyzed by the maximum likelihood method using data matrices after size-free and common-part-removed transformations. Of several groups of species recognized by most earlier researchers, only a few are well defined and supported phylogenetically. The majority, like the philippinensis group of TATE (1943), for example, do not represent natural assemblages. The results suggest south-east Asia as a centre of origin for the family. The extreme morphological similarity among horseshoe bats appears to reflect the monophyly of the genus *Rhinolophus*.

Bogdanowicz, W. and R. D. Owen (1996). Landmark-based size and shape analysis in the Plecotine bats.

Morphometric divergence among the skulls of 10 species of plecotine bats (n = 105) was studied using x, y-coordinates of 11 homologous landmarks recorded from the left half dorsal view of each skull. Univariate and multivariate analyses of shape coordinates provided estimates of differences among taxa and between sexes. The differences in size among species were correlated with uniform shape differences. The centroid size to uniform factor allometry was more pronounced longitudinally (i.e., along the midline of the skull) than it was laterally. Significant shape differences among species were also detected in both uniform and non-uniform components. Non-uniform shape variation involved lateral rather than longitudinal displacement of landmarks on the skull. Sexual dimorphism was reflected by centroid size and was seen only in *Otonycteris hemprichi*, in which females were about 4.4 % larger than males. The UPGMA phenograms of Mahalanobis D^2 of shape coordinates and of relative warp scores (in which the uniform shape component had been removed) revealed two consistent phenetic clusters. One was formed by *O. hemprichi*, with the remaining genera grouping in

a second cluster. The relationships among genera in this second cluster varied depending on the phenogram generated. Nevertheless, the UPGMA phenogram derived from Mahalanobis D^2 computed on Bookstein shape coordinates (sexes combined) was entirely congruent with the current systematic hierarchy and phylogenetic hypothesis of the Plecotini sensu stricto recently put forward based on a parsimony analysis of 32 skin and skull characters. In our analysis, the most divergent species group was the monotypic *O. hemprichi*. A second group was formed by the genus *Barbastella*. The remaining clusters were composed of species of *Corynorhinus; Plecotus*; and a cluster containing *Idionycteris* and *Euderma*.

Böhme, W. and R. Hutterer (1979). Kommentierte Liste einer Säugetier Aufsammlung aus dem Senegal.

Pendant une excursion de trois mois au Sénégal une collection de 290 petits mammifères en 39 espèces a été recolté. Des resultats écologiques et faunistiques seulement les derniers sont résumés ici.

La présence de *Gerbillus pyramidum* au Sénégal est démontrée pour la première fois, c'est aussi la première trouvaille de ce genre dans ce pays. Deux autres espèces sont trouvées pour la deuxième fois au Sénégal: *Rhinolophus guineensis* (élevé ici au rang d'espèce) et *Hipposideros cyclops*.

Vu sous l'aspect historique de la faune, les espèces traités ici, peuvent être séparés en trois groupes:

1. Espèces répandues dans toute la savane soudanienne et sahélienne de la Mer Rouge jusqu'ä l'Ocean Atlantique. Leur Invasion très récente dans cette région peut être documentée par l'existence de plusieurs complexes d'espèces, très difficile dans leur taxonomie et démonstrants qu'ils sont encore en voie de spéciation.

2. Espèces distribués dans toute la région saharienne jusqu'ä l'Afrique du Nord, mais aujourdhui séparés dans des aires de répartition disjonctes: par example *Asella tridens, Gerbillus pyramidum, Lemniscomys barbarus, Mastomys erythroleucus* et *Lepus whytei*. Ce dernier est traité plus au fond quant à sa répartition actuelle en Algérie du Nord. Que la disjonction est assez récente, est démontré par le fait que les populations concernées sont encore conspécifiques.

3. Le dernier groupe est constitué de formes relictes qui sont en même temps d'espèces forestières. Leur plupart est bien defini taxonomiquement, ce que signifie que ces formes ont eu leur proces de spéciation avant les espèces savanicoles du groupe 1: *Rhinolophus guineensis, Hipposideros cyclops, Heliosciurus rufobrachium* et *Funisciurus anerythrus*.

During a three-months-excursion to Senegal 290 smaller mammals representing 39 species have been collected. From the reported ecological and faunistical data only the last named are summarized here.

Gerbillus pyramidum is recorded for the first time from Senegal representing also the first record of the genus for this country. Two further species were recorded for the second time: *Rhinolophus guineensis* (raised to specific rank in this paper) and *Hipposideros cyclops*.

Considering the aspect of faunal history the species discussed here can be grouped into three categories:

1. Species distributed throughout the savanna belt from the Red Sea to the Atlantic Ocean. The relatively recent date of invasion into the study area is documented by the existence of taxonomically difficult species complexes conclusive for the fact that their speciation process is not yet finished.

2 .Species formerly continiuously distributed throughout the Saharan region to North Africa, the area of which has been interrupted by the desertification. Examples given here are: *Asellia tridens, Gerbillus pyramidum, Lemniscomys barbarus, Mastomys erythroleucus* and *Lepus whytei*. The latter is discussed more extensively as regards to its recent distribution also in Northern Algeria. The relatively recent date of disjunction is documented by the conspecifity of the mentioned forms.

3. A last group can be characterised as relict group containing forest species. They are mostly well definable species thus supporting the view that they are older forms which have passed through their speciation phase earlier than the savanna forms of group 1: *Rhinolophus guineensis, Hipposideros cyclops, Heliosciurus rufobrachium* and *Funisciurus anerythrus*.

Bojarski, C. (1990). Immunolocalisation of, and ultrastructural changes in the LH gonadotropes of *Miniopterus schreibersii* and *Rhinolophus capensis* (Mammalia: Chiroptera) in relation to their reproductive cycles.

LH gonadotropes are successfully identified in the anterior pituitary of *Minioptems schreibersii* and *Rhinolophus capensis*, using immunogold labelling at the light and electron microscopy level. The gonadotropes are oval to polygonal in shape and possess numerous small secretory granules, which contain LH throughout the year. Their distribution is similar in both species, although the abundance varies slightly between species and sexes. Seasonal changes are detected in gonadotrope ultrastructure, pituitary LH levels, and plasma hormone levels, and activity pattern of LH gonadotropes generally coincide with reproductive activity in both bat species.

In female *M. schreibersii* gonadotrope activity, and high pituitary LH, and plasma LH levels coincide with follicular development, implantation and gestation. During the period of delayed implantation gonadotropes are inactive and plasma LH levels are low, coinciding with corpus luteum inactivity and low plasma progesterone levels. Implantation coincides with increased activity of the gonadotrope activity, increased plasma LH levels, reactivation of the corpus luteum and elevated plasma progesterone levels. Activation of LH gonadotropes towards the end of hibernation may be initiated by the winter solstice, which marks the change to increasing daylength.

In female *R. capensis* gonadotrope activity and high pituitary and plasma LH levels occur towards the end of follicular development. During hibernation gonadotrope activity and plasma LH levels decrease. Ovulation coincides with increasing gonadotrope activity (which follows the winter solstice), although a preovulatory peak in plasma LH is not detected.

In male *M. schreibersii* and *R. capensis*, gonadotrope activity and high plasma LH and testosterone levels coincide with spermatogenesis, except during a period of reproductive inactivity in spring in male *M. schreibersii*, where gonadotropes appear active and plasma LH and testosterone levels are high. The reason for this apparent activity is not known. Male sperm storage during hibernation in male *R. capensis* coincides with low gonadotrope activity and low plasma LH and testosterone levels. Factors initiating gonadotrope activity and hence spermatogenesis are probably decreasing daylength (summer solstice) in *M. schreibersii* and increasing ambient temperatures and food abundance (following the hibernation period) in *R. capensis*.

Bojarski, C. (1993). Seasonal changes in pituitary and plasma prolactin concentrations, and the role of prolactin in the control of delayed implantation in female *Miniopterus schreibersii*.

Mammotropes were successfully identified in the anterior pituitary gland of *Miniopterus schreibersii* using immunocytochemical (ICC) staining at the light and electron microscopy level. Mammotropes were distributed throughout the gland, were polygonal in shape and during secretory activity contained numerous large secretory granules (350 - 800 nm). Using double ICC labelling, prolactin and growth hormone were never co-localiszed and found in individual cells only. Plasma prolactin levels were successfully measured on a monthly basis using radioimmunoassay and monthly pituitary prolactin levels were quantified using morphometric analysis of immunogold ICC staining and densitometry with polyacrylamide gels.

Seasonal changes in the ultrastructure of mammotropes, and pituitary and plasma prolactin concentrations in female *Miniopterus schreibersii* indicated that there was an increase in prolactin secretion during the second half of the period of delayed implantation and that prolactin secretion remained elevated during normal embryonic development and lactation. This suggests that prolactin

may be part of the luteotropic and lactogenic complex, and that the hormone might be responsible for terminating the period of delayed implantation. The latter is supported by experiments, where exogenous prolactin initiated precocious implantation during early delayed implantation, and treatment with bromocryptine (which inhibits prolactin synthesis) retarded implantation.

Activation of mammotropes to synthesise prolactin and an increase of plasma prolactin levels occurred shortly after the winter solstice (21 June), suggesting that increasing daylength may be the environmental cue, which terminates the period of delayed implantation in *Miniopterus schreibersii*.

Bojarski, C. and R. T. F. Bernard (1988). Comparison of the morphology of the megachiropteran and microchiropteran eye.

The structure of the eyes of two South African bat species, *Rousettus aegyptiacus* (Megachiroptera: Pteropodidae) and *Rhinolophus capensis* (Microchiroptera: Rhinolophidae) was examined and compared by means of light microscopy. The eyes of both species exhibit characteristics of a typical 'noctumal eye' (presence of only rods in the retina; the cornea shows a marked curvature and occupies about one third of the globe; the anterior and posterior chambers are very large in relation to the vitreous) and neither possess a fovea. The main difference occurs in the choroid and the retina. The fruit bat *R. aegyptiacus* shows a marked folding of the retina, as a result of papillae that project inwards from the choroid. This does not occur in the insectivorous bat *R. capensis*, where the choroid and the retina form a smooth layer. It is suggested that this unique feature of the fruit bat, and the associated increase in surface area and hence the number of photoreceptors is probably responsible for its good nocturnal vision.

Die struktuur van die oë van twee Suid-Afrikaansa vlermuis-soorte, *Rousettus aegyptiacus* (Megachiroptera: Pteropodidae) en *Rhinolophus capensis* (Microchiroptera: Rhinolophidae) is ondersoek en vergelyk deur middel van die ligmikroskoop. Die oë van albei soorte toon kenmerke van 'n tipiese 'nagtelike oog' (teenwoordigheid van slags stawe in die retina; die horingvlies vertoon 'n duidelik waameembare geboë vorm en beslaan omtrent een derde van die oogbol; die voorste en agterste kamers is baie groot in vergelyking met die glasige deel) en nie een besit 'n fovea nie. Die belangrikste verskil kom voor in die choroïed en die retina. Die vrugtevlermuis *R. aegyptiacus* toon opmerklike voue in die retina as gevolg van papillae wat vanuit die choroïed na binne uitsteek. Dit kom nie voor in die insekvretende vlermuis *R. capensis* nie waar die choroïed en die retina 'n gladde laag vorm. Daar word aan die hand gedoen dat hierdie unieke kenmerk van die vrugtevlermuis, met sy gepaardgaande vergroting vav die oppervlakte en die gevolglike groter aantal foto-reseptore waarskynlik verantwoordelik is vir die vrugtevlermuis se goeie nagvisie.

Bonhote, J. L. (1910). On a small collection of mammals from Egypt.

The following is an account of a small collection of Mammals brought home from Egypt. It was made up partly of a few skins and skulls which Capt. S. S. Flower had brought together, chiefly those of animals that had died in the Gisai Zoological Gardens or had been killed as vermin, partly of animals brought in from the district by natives, whom Capt. Flower had commissioned on my behalf, and lastly of specimens collected by myself. Unless otherwise mentioned the specimens came from near Cairo.

The collection contains some 28 species, of which one (*Dipoclillus mariæ*) is new to science, in addition to which I have been enabled to resuscitate the name *Procavia burtoni* for the Egyptian Hyrax, which is quite distinct from both the Sudan and Palestine species. An example of *Acomys russatus*, a very rare species, which has hitherto only been found locally in Palestine and Syria, was procured within a short ride of Cairo. The material has also enabled the range of other and commoner species to be extended, e. g. *Gerbillus mackilligini, Lepus innesi*.

I must acknowledge my indebtedness to Messrs. Oldfield Thomas, R. C. Wroughton, and K. Andersen, who have given me much help in the working out of the collection, which is now in the British Museum, and lastly to Capt. Flower, who is doing so much for the Zoology of Egypt and without whose kind cooperation this collection would never have been brought together.

Booth, A. H. (1956). Some Gold Coast mammals not included in Cansdale's "Provisional Checklist".

CANSDALE's (1948) checklist of Gold Coast mammals is still, within its small compass, by far the most informative publication on the subject. A new checklist is being prepared by the writer, incorporating nomenclatorial and other data, but will not be available for some time. This interim publication is designed merely to add to Cansdale's list some forms which have since been discovered or which Cansdale omitted. The nomenclature is consistent with Candale's throughout.

Booth, A. H. (1958). The Niger, the Volta and the Dahomey Gap as geographic Barriers.

1. The distribution of species-groups of Primates, Sciuromorpha, Artiodactyla and Hyracoidea in West African High Forest is given in detail.

2. Four types of distribution are recognized:
a) *ambisilvan*, groups which occur both east of the Niger and west of the Volta.
b) *central*, groups which occur only east of the Niger.
c) *occidental*, groups which occur only west of the Volta.
d) *inter fluvial*, groups which occur between the Niger and the Volta, and which may have their origin from groups of type a), b) or c).

3. The central fauna is much richer than the occidental, which, though it contains a small number of endemic groups, is nevertheless thought to have been derived originally from the former.

4. The interfluvial fauna is remarkably poor. The zoogeographic data tend to corroborate geological evidence for the periodic deterioration of the climate between the Niger and the Volta during the 'Quaternary, which probably deprived the area of its High Forest several times, either partially or completely.

5. Climatic fluctuation has resulted in the Dahomey Gap acting as an important isolating mechanism in the past. Today, it is probably less important than the Volta and Niger rivers.

Booth, A. H. (1959). On the mammalian fauna of the Accra Plain.

The known mammalian fauna of the Accra Plain is listed. There are 75 species, 30 forest origin, 29 of savannah origin, and 16 which occur both in forest and in savannah. The forest fauna is limited by the 'thicket' type of closed cover which is virtually all that available. The savannah fauna is limited only partly by ecological considerations: geographic factors are also important. While some 15 of the savannah species could have penetrated forest from the north, 14 almost certainly could not. It is concluded that they do not represent a relic fauna, but have invaded the area from the Trans-Volla Togoland Region, following changes in the vegetation of the of the Plain.

Boulger, L. R. and J. S. Porterfield (1958). Isolation of a virus from Nigerian fruit bats.

A virus which is pathogenic for mice has been isolated from a pool containing the brains of six fruit bats (*Eidolon helvum*). The virus is not a strain of rabies virus. Serological tests indicate that it is probably a previously undescribed agent for which the name of Lagos Bat Virus is proposed.

Bowie, R. C. K., D. S. Jacobs and P. J. Taylor (1999). Resource use by two morphologically similar insectivorous bats (*Nycteris thebaica* and *Hipposideros caffer*).

Studies of morphologically dissimilar insectivorous bats have lead to the conclusion that morphology is the prime correlate of habitat use, and consequently of diet. This has lead to the prediction that morphologically similar bats should have similar diets. We examined the diet and morphology of two morphologically similar species, the slit-faced bat, *Nycteris thebaica*, and Sundevall's leaf-nosed bat, *Hipposideros caffer*, in the context of this predicution. Although both species foraged in the same habitat, they had distinctly different diets. The diet of *N. thebaica* consisted mainly of non-volant prey, primarily orthopterans and arachnids, and the diet of *H. caffer*, mainly of moths. Differences in wing design between the two taxa were small. The only significant difference was in aspect ratio. There were no differences in wing loading and wingtip shape ratio between the two species. The flying abilities reported for these two species are very similar, suggesting that these small differences in wing designe do not translate into differences in flying ability, and cannot explain the dietary differences between these two species. On the other hand, there are marked differences in their prey detection systems which correspond to differences in their diets. *H. caffer* uses echolocation to detect the flapping wings of insect prey, whereas *N. thebaica* depends on prey-generated sounds (fluttering of scuffing) to locate its targets.

Bown, T. M., M. Kraus, S. Wing, J. Fleagle, B. H. Tiffney, E. Simons and C. F. Vondra (1982). The Fayum Primate Forest revisited.

In Oligocene times, the Fayum area of northern Egypt was a subtropical to tropical lowland coastal plain with damp soils and seasonal rainfall that supported an abundance and variety of vegetation, including lianes (large vines), tall trees, and possibly mangroves, and a large and varied vertebrate fauna. The Oligocene marine strandline was close by and principal Jebel Qatrani Formation streams were probably brackish several kilometers inland due to tidal incursions. Sediments of the Jebel Qatrani Formation were deposited by several large meandering streams, associated with minor but sometimes extensive flood basin ponds. These rocks provide no evidence for the former existence, in early Tertiary time, of a "Proto-Nile" River. Large accumulations of silicified fossil logs in the Jebel Qatrani Formation are autochthonous and the logs were transported only a short distance before burial. The Oligocene higher primates *Aegyptopithecus, Propliopithecus, Parapithecus*, and *Apidium* lived in this paleoenvironment and postcranial remains of *Aegyptopithecus* and *Apidium* demonstrate that these animals were arboreal. This scenario for the paleoenvironment of the Fayum area in Oligocene times differs greatly from the nearly treeless, sparsely vegetated, semiarid sahélien Oligocene Fayum paleoenvironment populated by terrestrial primates that was recently proposed by Kortlandt (1980).

Braack, L. E. O. (1989). Arthropod inhabitants of a tropical cave 'island' environment provisioned by bats.

The arthropod community assoc&ted with an estimated population of 8000 *Rousettus aegyptiacus* fruit bats is described. The bats are permanent residents within a 64-m deep split in a sandstone cliff, the average width of the cave thus formed being 1.5 m and average height about 13 m. Transect sampling suggested a floor population in excess of 80000 *Gyna* spp. cockroaches. Other cave inhabitants included reduviid bugs preying on the cockroaches, parasitic evaniid and chalcidoid wasps, trogid beetles utilizing dead bats, tenebrionid and ptinid beetles, thysanurans, as well as numerous haematophagous argasid ticks and nycteribiid flies using the bats as food source. A simple food-chain depicts trophic relations in the cave.

Bradbury, J. W. (1977). Lek mating behavior in the hammer-headed bat.

Calling assemblies of *Hypsignathus monstrosus* were studied for 17 months in the field to determine if they were “leks” or mating arenas. Direct observations, netting of animals at the assembly sites, and radio-tracking of both ?? and ?? at the assembly sites, foraging grounds, and day roosts were all utilized

to make this determination. Captive animals were maintained to establish growth rates. It is concluded that *Hypsignathus* exhibit lek behavior even by the most conservative definition and share many features with other avian and mammalian lek species.

Bræstrup, F. W. (1935a). Remarks on climatic change and faunal evolution in Africa.

1) There is direct evidence of a steppe fauna in South West Africa as early as Lower Miocene.

2) The moister climate in Egypt during Tertiary is most satisfactorily explained as a result of equator movement, being in accordance with a southwards movement of all climatic zones in Europe as seen in the palaeoclimatic maps of KOPPEN-WEGENER. This means that Central Africa was in Early Tertiary within the southern dry belt, while South Africa was most probably covered by deciduous forest.

3) There is nothing in the recent fauna opposable to this view. The fact that some steppe types have been derived from forest types; does not demand such a theory as that advocated by LÖNNBERG.

Bræstrup, F. W. (1947). Remarks on faunal exchange through the Sahara.

The presence of Ethiopian faunal elements north of the western Sahara and of Palaearctic elements south of it is not exhaustively explained by former connections by river beds across the desert during periods of increased rainfall. There is also a question of temperature. This is seen by the following facts the significance of which seems to have been overlooked by previous authors:

1. Several tropical organisms in northern Egypt show a large break in their distribution further south. - This is probably owing to infavourable temperature conditions, and the inference is that they are survivors from a warmer period, probably the postglacial warm period, which would also allow ithe spreading of certain tropical snakes from western Sudan to Morocco, since it was accompanied by increased rainfall.

2. The few Palaearctic elements which are found in the western Sudan are restricted to the southern, more moist, parts near the forest border, where they are apparently rare. This occurrence is no doubt due to the less extreme heat In the south, and we may regard these species as survivors from a cooler period, probably the last Glacial Epoch, during which a combination of increased rainfall and low temperature favoured the southward spreading of Palaearctic elements.

3. The occurrence in North Africa of certain birds otherwise characteristic of The East African highlands is probably also to be explained by the cooler climate during the Glacial Epochs during which highland species could expand their ranges in the lowlands.

Braun, M. and U. Häussler (1999). Funde der Zwergfledermaus-Zwillingsart *Pipistrellus pygmaeus* (Leach, 1825) in Nordbaden.

Die Existenz einer kryptischen Zwillingsart der Zwergfledermaus *Pipistrellus pipistrellus* (SCHREBER, 1774), wurde erst kürzlich durch die DNA-Analyse bestätigt. Funde dieser "neuen" Art in Deutschland, für die der Name *Pipistrellus pygmaeus* (LEACH, 1825) von britischen Wissenschaftlern vorgeschlagen wurde, sind noch selten und werden hauptsächlich durch Detektorerhebungen geliefert. Bei Nistkasten-Kontrollen im September 1999 konnten 47 Individuen von *P. pygmaeus* in zwei Naturräumen in Nordbaden (Baden-Württemberg, SW Deutschland) nachgewiesen werden: 1. In den nordbadischen Rheinauen, 2. Im Gebiet "Kleiner Odenwald" südlich des Neckartales bei Heidelberg. Die Tiere waren einzeln oder in Paarungsgruppen von 1 Männchen und bis zu 5 Weibchen in den Nistkästen zu finden. Kurze Biotopbeschreibungen werden gegeben sowie Angäben zur Morphologie.

Records of *Pipistrellus pygmaeus* (LEACH, 1825), sibling species of the common pipistrelle in Nordbaden (Baden-Württemberg, SW-Germany). More recently the existence of a cryptic sibling species of the common pipistrelle *P. pipistrellus* (SCHREBER, 1774) has been affirmed by sequence divergence of DNA. In Germany records of the "new" species, for which the name *P. pygmaeus* (LEACH, 1825) was proposed by British scientists, still are rare and mainly refer to the Identification of its specific echolocation calls. During box inspections in September 1999 a total of 47 specimens of *P. pygmaeus* were found at sites located within two different landscapes of Nordbaden, 1) riparian woods of the river Rhine and 2) the edge of Ihe Odenwald mountains south of Ihe Neckar valley. The bats roosted individually or formed maling groups of one male and up to 5 females. *P. pipistrellus* was not found in boxes at the same sites. Descriptions of the biotopes inhabited by *P. pygmaeus* are given äs well as additional morphological data.

Bray, R. S. (1958). On the parasitic Protozoa of Liberia. I. Coccidia of some small mammals.

Four new species of *Eimeria* are described from small mammals in Liberia. These are: *E. levinei*, sp. nov. from a free-tailed bat, *E. firestonei*, sp. nov., and *E. milleri*, sp. nov., from a shrew, and *E. putevelata*, sp. nov., from a striped grass mouse.

Breitwisch, R. (1983). Fructivores at a fruiting *Ficus* vine in a southern Cameroon tropical wet forest.

A fruiting *Ficus* sp. vine in a southern Cameroon tropical wet forest was monitored for 57.75 hours over a 9-day period in early February 1979. Avian frugivores observed eating figs included one fruit pigeon, four hornbill, and three greenbul species. Two species each of monkeys and squirrels also ate figs. Greenbuls were present at 59 percent of the censuses, fruit pigeons at 12 percent, and hornbills at 11 percent. Mean foraging group sizes for greenbuls. fruit pigeons, and hornbills were 1.7, 2.3, and 2.0, respectively. Greenbuls ate an estimated 17,332 fruits over an 8 day period, fruit pigeons 4769, hornbills 253-*. and Greater White-nosed Monkeys 811.

Breman, J. G., K. M. Johnson, G. Van der Groen, C. B. Robbins, M. V. Szczeniowski, K. Ruti, P. A. Webb, F. Meier, D. L. Heymann and Ebola Virus Study Team (1999). A search for Ebola virus in animals in the Democratic Republic of the Congo and Cameroon: Ecologic, virologic, and seriologic surveys, 1979 - 1980.

More than 30 years after the first outbreak of Marburg virus disease in Germany and Yugoslavia and 20 years after Ebola hemorrhagic fever first occurred in central Africa, the natural history of filoviruses remains unknown. In 1979 and 1980, animals in the Democratic Republic of the Congo and Cameroon were collected during the dry season near the site of the 1976 Ebola hemorrhagic fever epidemic. The study objectives were to identify local animals and search for evidence of Ebola virus in their tissues. A total of 1664 animals representing 117 species was collected, including .400 bats and 500 rodents. Vero and CV-1 cells and IFA and RIA were used for virus and antibody detection, respectively. No evidence of Ebola virus infection was found. This study was limited in time and animal collections and excluded insects and plants. Long-term, prospective, multidisciplinary comparative studies will yield more information than will repeat short forays on the ecology of filoviruses.

Bronner, G. N. (1990). New distribution records for four mammal species, with notes on their taxonomy and ecology.

New distribution record for four mall mammal species (*Georychus capensis, Galerella pulverulenta, Rhinolophus swinnyi* and *Amblysomus julianae*) are presented, along with relevant notes on the taxonomy, karyology and ecology of these species.

Bronner, G. N., S. K. Maloney and R. Buffenstein (1999). Survival tactics within thermally-challenging roosts: heat tolerance and cold sensitivity in the Angolan free-tailed bat, *Mops condylurus*.

We studied roost microclimates, thermal preferences and temperature-related variation in body temperatures and flight abilities of *M. condylurus* from three roosts in man-made structures in South Africa. Roosts were characterized by marked spatio-temporal variability in ambient temperature and relative humidity on a daily and seasonal basis. Microclimates were thermally challenging, being very hot (>40°C) for several hours daily in summer and autumn, and cold <10°C) for much of the night in winter. Thermal preference tests revealed that the bats actively selected temperature zones (35°-42°C) in which basal metabolic rate could be maintained, and above the minimum necessary for sustained flight. This presumably allowed them to minimize energy costs of thermoregulation without compromising reproductive activity or their ability to avoid predators. Bats displayed pronounced heat tolerance and hyperthermia in response to prolonged experimental exposure to high temperatures (40°C). They also exhibited cold-sensitivity, characterized by hypothermia and entry into torpor, when exposed to ambient temperatures below the thermal neutral zone. This response to low ambient temperatures would conserve energy in cold periods when the high energetic costs of foraging may not be met owing to reduced insect availability. We hypothesize that this broad roosting tolerance has energetic, ecological and evolutionary benefits that outweigh attendant disadvantages, which are largely compensated for by an unusual physiology.

Brosset, A. (1961). L'hibernation chez les chiroptères tropicaux.

L'auteur étudie l'hibernation chez les Chiroptères de l'Inde occidentale, dont il a envisagé 29 espèces à ce propos. Cette étude porte sur des observations dans la nature et sur une expérimentation en laboratoire. Les résultats montrent que les *Taphozous, Megaderma* et *Hipposideros* ne sont pas capables d'hiberner, alors que les Vespertilionidés et les Rhinolophidés hibernent parfaitement. L'hibernation des Chiroptères tropicaux paraît avoir un déterminisme interne, car elle intervient souvent quand la nourriture est abondante et la température élevée. L'incapacité d'entrer en hibernation de certains groupes de Chiroptères explique leur répartition géographique.

Brosset, A. (1968). La permutation du cycle sexuel saisonnier chez le chiroptère *Hipposideros caffer*, au voisinage de l'équateur.

La reproduction du Chiroptère *Hipposideros caffer* a été étudiée au cours de cinq années (1963 - 1967) dans 8 grottes situées dans le nordest du Gabon (0° 32' - 1° 08' lat nord, 13° 3' - 13° 5' long. est). Bien que vivant sous l'Equateur les femelles sont strictement monoestriennes, et toutes celles d'une même colonie mettent bas simultanément, à date fixe chaque année. Le cycle des mâles, relativement contracté, et marqué par une longue période de quiescence, est synchrone de celui des femelles.

Le phénomène le plus remarquable mis en évidence par cette étude est le suivant: à l'intérieur d'une population sympatrique, il existe des colonies de cycle boréal (mise bas (in mars), tandis que l'immense colonie de la grotte du Faucon (500.000 individus au moins) est de cycle austral (mise bas en octobre). Le cycle de la mue s'accorde avec le cycle sexuel.

Une revue générale de ce qui est connu de la biologie d'*Hipposideros caffer* dans son aire immense de répartition, suggère que les populations situées au nord de l'Equateur se reproduisent suivant un rythme boréal, celles situées au sud suivant un rythme austral. Il apparaît que la permutation des cycles se situe légèrement au nord de l'Equateur géographique (probablement entre 1° et 4°), et que nos recherches ont porté précisément sur une population à cheval sur la ligne de permutation.

A notre connaissance, l'effet de l'isolement sexuel - non point dû à l'isolement géographique, mais à des rythmes incompatibles dans une même population - n'avait été étudié chez aucune espèce de Vertébré. Aussi nous sommes-nous appliqué à soumettre un échantillonnage de spécimens

appartenant pour partie au rythme sexuel austral et pour partie au rythme boréal à l'analyse statistique. Les résultats sont hautement significatifs. Les individus appartenant au cycle boréal sont plus grands. Nous avons ici un cas où la ségrégation sexuelle, due à des rythmes biologiques distincts, conduit à une ségrégation morphologique de deux types d'individus à l'intérieur d'une même population. Dans l'immense colonie de Belinga existe, chez les femelles seulement, deux groupes de taille différente, phénomène difficile à interpréter pour le moment.

L'aire de répartition de l'espèce *Hipposideros caffer* couvre la plus grande partie de l'Afrique, et ce Chiroptère est probablement le Mammifère le plus nombreux de ce continent. Il compte des populations dont la morphologie varie considérablement, ce qui suggère une espèce en pleine phase évolutive. La permutation du rythme de la reproduction sur l'Equateur, avec les conséquences qui en découlent: isolement de populations sympatriques, et différenciation morphologique en fonction du rythme, contribue-t-elle à une explication de l'instabilité typologique chez *Hipposideros caffer*? Ce n'est pas évident. En général, les populations de grands individus se situent au voisinage de l'Equateur. Les populations de petits individus seraient principalement périphériques, et situées aussi bien au sud qu'au nord de la ligne équatoriale. Il est possible aussi que les populations grandes soient plus particulièrement liées aux régions forestières, les petites aux régions découvertes.

The reproduction of the bat *Hipposideros caffer* had been studied over a 5 year period (1963 - 67) in 8 caves localized in the north-east of Gabun (0° 52' - 1° 08' lat. north - 13° 3' - 13° 5' long. east). The females are strickly monoestrous, and all members of each colony give birth to one youg at the same time each year. The cycle of the males, which is relatively compressed, and characterized by a long inactive period, is synchroneous with the cycle of the females. The most remarkable result obtained is the following: within one population, some colonies show a boreal cycle (birth of the youg in March), whereas the enormous colony of the "falken cave", containing probably more than 500.000 individuals, shows an austral cycle (birth of the young in October). The moulting cycle is synchroneous with the cycle of the reproduction.

A general review of what is known about thy biologie of *Hipposideros caffer* suggests that populations localized to the north of the Equator follow a boreal cycle, althroug population localized in the south follow an austral cycle. It seems that the inversion of the sexual cycle is situated between the latitude 0° - 4° North, and that my observation concerne precisely one population sitting astride the transition zone.

The resultant sexual isolation - not due to geographical gap, but due to incompatible rythms within sympatric populations - seems to be a novel phenomenon in our knowledge of vertebrates. Samples of populations exhibiting the austral or the boreal cycle were subjected to statistical analysis. The results are highly significant. Individuals of boreal cycle are larger than those of austral cycle, irrespectively of the situation of the colony from where they have been taken. We have here a case where sexual segregation due to distinct biological rythms induces morphological differenciation of two types inside the same population. In the huge colony of the falken cave, there exists - only among the females - two size groups. This is a very interesting fact, which cannot be explained at the moment.

The range of *Hipposideros caffer* covers almost the whole Africa. This bat is probably the most numerous Mammals of this continent. Populations are highly variables, a fact witch suggests a species at present in the course of evolution. Does the inversion of the sexual rhythm - in the equatorial zone, together with the consequent effect on the size of the individual thus isolated provide a valuable explanation for the typological instability in *Hipposideros caffer*? It seems not. Generally speaking, the populations with large specimens are observed around the Equator. The populations with small individuals are peripheral, and situated both to the north and to the south of the area. It is possible that the populations of large individuals are linked to' equatorial forest, and the populations of small individuals are linked to open countries.

Brosset, A. (1976). Social organization in the African bat, *Myotis boccagei*.

In northeastern Gabon (lat.: 0.4° north; long.: 12.5), the social organization of the vespertilionid bat *Myotis boccagei* was studied. In four groups, all individuals (55) were marked and monitored regularly

for 38 months. The basic social organization in *Myotis boccagei* is the "harem". In each group, a single adult ? is invariably found, accompanied by from 2 to 7 adult ?? and recent young.

Résumé
Le Vespertilion africain *Myotis boccagei*, gîte pendant le jour dans le bourgeon terminal des bananiers. En fermant brusquement l'extrémité du cornet formé par la jeune feuille, on capture facilement le groupe entier de Chauves-souris gîtant à l'intérieur. Comme ces groupes sont sédentaires, chacun d'eux occupant la même plantation de bananier pendant plusieurs années, le contrôle régulier d'une population marquée est relativement facile pour cette espèce.

Dans le Nord du Gabon (lat.: 0.4° Nord; long.: 12.5) 10 groupes de *M. boccagei* ont été étudiés. Dans 4 groupes, tous les individus (55) furent marqués et régulièrement contrôlés au cours de 38 mois. L'organisation sociale de base chez *M. boccagei* est le "harem". Dans chaque groupe, on trouve invariablement un unique ? adulte, avec de 2 à 7 ?? adultes et leur jeune. Des ? ? solitaires ont été trouvés 9 fois.

L'élément stable des harems est constitué par quelques ?? reproductrices. Certaines d'entre elles furent revues sur place à tous les contrôles pendant plus de 3 ans. La rotation des mâles "chefs de harem" est au contraire rapide: un harem eut successivement 5 ? ? différents en 3 ans, un autre 3 en 2 ans. Un troisième harem eut le même ? de Juin à Juillet 1974, et de Novembre 74 à Août 75, le harem dans sa totalité ayant été absent de la plantation de bananier pendant cet intervalle. Un mâle chef de harem en Juin 1973 fut déplacé de son harem par un autre ? en Août 75, et fut retrouvé solitaire à environ 40 m de distance de ce harem.

Tous les juvéniles nés dans ces harems en disparurent à l'âge de 4–5 mois. De 11 ?? marquées étant juvéniles, aucune ne fut recapturée à l'âge adulte. Par contre, de 9 ? ? marquées étant juvéniles, 2 revinrent à l'âge d'un an comme chefs de harem, l'un d'un harem voisin de celui de ses parents, l'autre du propre harem où il était né.

Peut-être y a-t-il corrélation entre ce type de structure sociale - le harem - et le déséquilibre du "sex ratio" chez les adultes. Durant cette étude, 61 ?? adultes furent capturées pour seulement 26 ? ?.

Zusammenfassung

Die afrikanische Glattnasenfledermaus *Myotis boccagei* verbringt den Tag in den noch gerollten jungen Bananenblättern. Mehrere Jahre lang wurden beringte Individuen im Freiland regelmäßig wiedergefangen.

Die Tiere leben in Gruppen (Harems) aus 2 bis 7 ?? mit ihren Jungen und einem adulten ?. Daneben gibt es Junggesellengruppen. Die geschlechtsreifen ?? einer Gruppe bleiben beisammen, das Harems-? wechselt in Abständen von weniger als 12 Monaten, alle Jungtiere verlassen die Elterngruppe, wenn sie etwa 4–5 Monate alt sind. Von 9 markierten Jung-? ? übernahmen 2 im Alter von 1 Jahr einen der bekannten Harems; ein ? übernahm die ?? seines Elternharems.

Brosset, A. (1982). Structure sociale du chiroptère *Hipposideros beatus*.

Une population de *H. beatus* a été marquée et contrôlée pendant 3 ans sur une île du fleuve Ivindo (Gabon). La structure sociale est la famille monogamique : une paire d'adultes, suivie du jeune de l'année. Ces familles sont sédentaires sur des territoires qui saturent le biotope spécifique.

Brosset, A. (1985). Chiroptères d'altitude du Mont Nimba (Guinée). Description d'une espèce nouvelle, *Hipposideros lamottei*.

La prospection des prairies d'altitude du Mont Nimba (zone guinéenne) a permis la capture de 4 Rhinolophidés nouveaux pour cette région, ce qui porte à 39 le nombre d'espèces de Chiroptères connus du Mont Nimba. Description d'une espèce nouvelle, *Hipposideros lamottei*.

Brosset, A., L. Barbe, J.-C. Beaucournu, C. Faugier, H. Salvayre and Y. Tupinier (1988). La raréfaction du rhinolophe euryale (*Rhinolophus euryale* Blasius) en France.

Before 1955, *Rhinolophus euryale* was common in France, south of a line Belfort-Brest. From 1955 to 1977, this bat becames almost extinct in most part of its range. This paper deals with the decline of the populations in 83 caves and quarries where observations on marked individuals were made from 1940 to 1987. No climatic or habitat modifications may explain the vanishing of *R. euryale*. Only one case of poisoning has been documented, but an indirect evidence of the role of pesticides comes from the fact that the periode of decline of the bat coencides exactly with the decline of the raptors populations, due to pesticides, in Europe and North America. Emphasis is given to the detrimental effects of increasing disturbances in the subterranean habitats and of uncontrolled ringing. Since the cessation of ringing, and the ban of the most dangerous pesticides (1980-1987), a slow recovery of the population of *R. euryale* is noticed.

Avant 1955, le rhinolophe euryale *Rhinolophus euryale* était commun en France au sud d'une ligne Belfort-Brest. Entre 1955 et 1977, cette chauve-souris disparut presque complètement dans la plus grande partie de son aire de répartition. Il est traité ici du déclin du rhinolophe euryale dans 83 cavités souterraines, où environ 10 000 individus furent marqués, et les populations suivies de 1940 à 1987. La disparition de l'espèce est totale ou quasi totale dans l'Est, le Jura et la zone Rhône-Alpes, la Provence, et tout l'Ouest de la France, des Charentes à la Sarthe. La diminution peut atteindre 50 % ou davantage dans la région pyrénéenne. Seule la région Aquitaine compte toujours des populations relativement prospères de rhinolophe euryale.

Les modifications climatiques ou environnementales ne paraissent pas expliquer la disparition de ce rhinolophe. Un seul cas probable d'empoisonnement d'une colonie par des pesticides agricoles a été observé, mais on remarque que la période de déclin de cette chauve-souris coïncide exactement (1960-1975) avec le déclin, dû à ces pesticides, des populations européennes et américaines de rapaces. Il est insisté sur le rôle néfaste des dérangements dus à la fréquentation croissante du milieu souterrain et aux opérations de baguage mal conduites. Depuis la cessation du baguage, et l'interdiction des pesticides les plus dangereux, une lente remontée des effectifs du rhinolophe euryale est notée localement depuis 1980.

Brosset, A. and B. Caubère (1960). La colonie d'*Asellia tridens* de l'oasis de Figuig (Chiroptères).

Les auteurs évoquent l'écologie d'*Asellia tridens* dans l'oasis de Figuig, Maroc; la colonie se tient dans une galerie souterraine (fogara) où règne une humidité extrême et une forte chaleur. Cette population appartient à la sous-espèce *Asellia tridens diluta* Andersen (coloration, mensurations).

Brosset, A. and H. Saint Girons (1980). Cycles de reproduction des microchiroptères troglophiles du nord-est du Gabon.

In north eastern Gaboon (Lat. 0.1° - Long. 12°), the Microchiroptera living in caves show a rhythm of reproduction strictly seasonal and monoestrous. In the three species concerned, all the females give birth, once a year, in October, to a single young. In *Hipposideros caffer*, the females of some populations give birth in March (boreal cycle) although other populations, living in neighbouring caves, give birth in October (austral cycle).

A histological study confirms the field data, and gives precise results on the sexual cycle of both sexes. In the male, spermatogenesis immediately precedes the mating season. In the female, contrary to what occurs in temperate countries, ovulation takes place a short time after. Implantation is not delayed, but follows fecundation. The annual sexual cycle (pregnancy and lactating period) is 6 months

in *Miniopterus inflatus* and *Hipposideros caffer*, and 12 months in *Hipposideros commersoni*. The cycle of sexual activity in the male is shorter than the cycle of similar species in temperate countries.

Sous équateur (O°4' N), une étude de terrain poursuivie pendant 14 ans montre que le cycle de reproduction des Microchiroptères troglophiles du nord-est du Gabon est monoestrien saisonnier. Toutes les femelles mettent bas une fois par an la même date. L'étude histologique précise que le cycle sexuel des males est synchronise avec celui des femelles qui ne présentent ni ovulation, ni implantation différées.

Brosset, A. and R. Vuattoux (1968). Redécouverte du "rat volant" de Daubenton *Myopterus senegalensis* Oken (Chiroptera), en Cote-d'Ivoire.

The bat *Myopterus senegalensis* was discovered by Adanson in Senegal about 1750 and called a "flying rat". Daubenton described it briefly in 1765. Later on the type was lost and the species was not found again. Its existence has just been confirmed by the capture of 5 specimens in a lontar palm at Lamto, in the Ivory Coast. Redescription of this very particular species, and which cannot be confused with any other.

Le Chiroptère *Myopterus senegalensis* avait été découvert par Adanson au Sénégal vers 1750. Sous le nom de "rat volant", Daubenton en avait donné une sommaire description en 1765. Par la suite, le type fut perdu, et l'espèce jamais retrouvée. Son existence vient d'être confirmée par la capture de 5 spécimens dans un palmier Ronier à Lamto, en Côte d'Ivoire. Redescription de cette espèce très particulière, et qui ne peut être confondue avec aucune autre.

Brown, C. R. (1999). Metabolism and thermoregulation of individual and clustered long-fingered bats, *Miniopterus schreibersii*, and the implications for roosting.

Oxygen consumption of individual long-fingered bats, *Miniopterus schreibersii*, was measured at air temperatures (T_a) between 2 and 42°C and that of clusters of four and six bats between 5 and 30°C. BMR of Individuals was estimated to be 2.29 ml O_2 g^{-1} h^{-1} between 34 and about 38°C. *M. schreibersii* showed two different responses to T_a, either maintaining body temperature (T_b) by increasing metabolic rate, or allowing T_b to fall close to ambient temperature and conserving energy (torpor). Euthermic clusters of four and six bats had lower rates of mass-specific oxygen consumption and lower thermal conductances than individuals at equivalent temperatures and torpid clusters maintained a greater temperature differential between T_b and T_a. Lowest rates of metabolism were measured for euthermic bats at air temperatures higher than those available to them in their natural roost in summer, so typical roost temperatures result in metabolic rates that are about 2.4 - 3.1 times estimated BMR. Roost temperatures of *M. schreibersii* in South Africa are substantially higher in winter than are generally accepted as being suitable for hibernation but these do not substantially affect torpid metabolic rates, which are low and independent of ambient temperature below 22°C. Clearly at least some species of insectivorous bats are capable of hibernating at temperatures generally considered to be too warm for this activity.

Bruton, M. N. (1978). Recent mammal records from eastern Tongaland in Kwazulu, with notes on Hippopotamus in Lake Sibaya.

Distribution records of 36 mammal species in eastern Tongaland are given based on specimens, photographs and sight records collected during the period 1970 to 1976. The distribution of hippopotami in the coastal lakes of eastern Tongaland is outlined and aspects of their ecology in Lake Sibaya are described. The hippopotamus population in Lake Sibaya has doubled since 1958 despite the removal of at least 25 individuals for management purposes. The number of hippopotami in the lake itself decreases at high lake level when a large part of the population inhabits adjacent lakelets and swamps.

Buffenstein, R., S. K. Maloney and G. N. Bronner (1999). Seasonal and daily variation in blood and urine concentrations of free-ranging Angolan free-tailed bats (*Mops condylurus*) in hot roosts in southern Africa.

Urine and plasma concentrations and haematocrits were measured in free-ranging Angolan free-tailed bats (*Mops condylurus*) inhabiting thermally-challenging roosts in the Komatipoort region of South Africa. Samples were collected in both autumn and summer, from bats caught emerging from roosts before feeding (pre-feeding), and those returning after foraging (post-prandial). Post-prandial bats exhibited higher body fluid concentrations, but lower haematocrits, than individuals caught prior to feeding, reflecting raised excretory mineral and nitrogenous loads and replenishment of body water pools during nocturnal foraging. Pre-feeding concentrations of both urine (2637 ± 506 mOsm/kg; n = 16) and plasma (331.5 ± 25.9 mOsm/kg; n = 24) were significantly higher in summer than autumn (urine: 2157 ± 454 mOsm/kg; n = 8; plasma: 294.5 ± 35.2 mOsm/kg; n = 18) reflecting the greater dehydration stresses within hotter roost microclimates, and a moderate kidney concentrating ability in this species. Haematocrits of pre-feeding animals were not, however, influenced by season and in both instances exceeded 53%, indicative of the higher oxygen carrying capacity needed for sustained flight in volant insectivores and also the defense of the rheological properties of blood. The ability of *Mops condylurus* to withstand a thermally-challenging roost milieu reflects, in part, its tolerance to dehydration, rather than the maintenance of water balance through exceptional renal concentrating ability.

Bulatova, N., L. Lavrenchenko, V. Orlov and A. Milishnikov (1999). Chromosome identification of mammalian species in western Ethiopia. Abstract.

Under supervision of the late Academician V.E. Sokolov, chromosome examination of Ethiopian mammals has been conducted since 1984. Karyological differences found in highland Abyssinian populations of several species with a spotted distribution over the continent inevitably raised a question of the species integrity and following questions of systematic position of karyologically distinct forms.

From the viewpoint of the genetic affinity of Ethiopian and neighbouring African taxa, mammals of western Ethiopia are of preferable interest. In 1987 - 1989, samples of murid rodents of gg. *Mastomys, Arvicanthis* and *Lemniscomys* were karyotyped in vicinities of Gambela. Instead of 3 morphologically distinguished species reported for these three genera in the region (Catalogue of the Mammals of Ethiopia, 1976), five chromosomal species were determined even on the level of routine morphology of chromosomes and the diploid number. Chromosome diagnoses were obtained for *M. natalensis* (2n=32), *M. erythroleucus* (2n=38), *A. dembeensis* (2n=62), *A.* cf *niloticus* (2n=56), *L.* cf *striatus* (2n=56).

From the view of karyological data, the conspecificity of *M. natalensis* from western Ethiopia, on the one hand, and West and South Africa, on the other hand is not excluded. The relatedness between 56-chromosome species of *Lemniscomys* from western Ethiopia and from the west of the continent, in Ivory Coast is noticeable. 2n values of *Arvicanthis*, though corresponding to the first descriptions of Robert Matthey for *A. abyssinicus* (2n=62) and *A. niloticus* (2n=56) studied in Central Africa, were nevertheless combined with different chromosome morphology. Unambiguously, the karyotype analysis confirms the species diversity of *A. dembeensis* from lowland Gambela and true Abyssinian *A. abyssinicus*. Further studies show that in Ethiopia rather lowland western zone (from Gambela up to the Omo Valley) is to be considered as a replacement area for many karyomorphs of specific or intraspecific range.

L'examen des chromosomes de mammifères éthiopiens est commence depuis 1984 sous la direction de l'Academicien V.E. Sokolov. Les différents caryotypes trouves sur les populations de plusieurs espèces du haut plateau d'Abyssinie avec une distribution ponctuelle sur le continent ont pose de nombreuses questions sur la validité des espèces et sur la position systématique des formes caryotypiquement distinctes.

Du point de vue des affinités génétiques des taxons éthiopiens et africains, les mammifères d'Ethiopie occidentale sont d'un grand intérêt. En 1987 - 1989, des échantillons de rongeurs muridés des genres *Mastomys, Arvicanthis* et *Lemniscomys* ont été caryotypes à proximité de Gambela. Au lieu de retrouver les trois espèces morphologiques distinctes signalées pour ces trois genres dans la région (Catalogue des Mammifères d'Ethiopie 1976), cinq espèces chromosomiques ont été déterminées seulement sur la base d'analyses de routine de la morphologique des chromosomes et du nombre diploïde. Les diagnoses chromosomiques ont été obtenues pour *M. natalensis* (2n=32), *M. erythroleucus* (2n=38), *A. dembeensis* (2n=62), *A.* cf *niloticus* (2n=56), *L.* cf *striatus* (2n=56).

Du point de vue des données cytogénétiques, la conspéificité de *M. natalensis* d'Ethiopie occidentale d'une part avec l'Afrique occidentale et australe d'autre part n'est pas à exclure. Il faut noter la relation entre l'espèce de *Lemniscomys* a 56 chromosomes d'Ethiopie occidentale et de l'ouest du continent en Côte d'Ivoire. Les valeurs du nombre diploïde d'*Arvicanthis*, bien que correspondant a la première description de R. Matthey pour *A. abyssinicus* (2n=62) et *A niloticus* (2n=56) d'Afrique Centrale, sont cependant associées à différentes morphologies de chromosomes. De façon non ambiguë, l'analyse des caryotypes confirme la diversité spécifique d'*A. dembeensis* de la plaine de Gambela et d'*A. abyssinicus sensu stricto* des hauts plateaux d'Abyssinie. D'autre études montrent que la région occidentale de basse altitude (de Gambela a la Vallée de l'Omo) doit être considérée comme une zone de remplacement pour beaucoup de caryomorphes de rang spécifique ou intraspécifique.

Burgess, N. D., L. B. Mwasumbi, W. J. Hawthorne, A. Dickinson and R. A. Doggett (1992). Preliminary assessment of the distribution, status and biological importance of coastal forests in Tanzania.

The lowland forests of coastal Tanzania comprise small and geographically isolated remnants of evergreen or semi-evergreen forest vegetation of the Zanzibar-Inhambane regional mosaic-undifferentiated forest type. Most of these 'coastal forests' are located at less than 600 m altitude and within 50 km of the coast. They have been isolated from other forest-blocks in Africa for perhaps the past 30 million years and have considerable biological importance, with high levels of endemism.

This paper presents a preliminary assessment of the distribution, status and biological importance of those Tanzanian coastal forests over 2 km^2 in extent. Twenty-four definite and 17 probable forests are identified. The largest are located on the Matumbi Massif to the southeast of Utete (c. 25 km^2), Zaraninge Plateau to the east of Sadaani (c. 20 km^2), Gendagenda to the west of Pangani (c. 26 km^2), Pugu Kazimzumbwi (c. 30 km^2) and inland from Kilwa (up to 100 km2). However, individual forests generally occupy less than 20 km^2, and the total area of forest remaining may be under 400 km^2.

Collectively these forests support many rare and poorly known plant species, including around 50 believed to be endemic to a single forest, seven bird species and subspecies of global conservation significance, several rare mammals, reptiles and amphibians, and an invertebrate fauna with many rare and undescribed species.

All Tanzanian coastal forests are being destroyed by unsustainable human actions generally following the sequence (a) logging for timber and fuel; (b) pole-cutting to build houses; (c) wholesale burning for charcoal; (d) wholesale conversion to agriculture. At the present rate of destruction the Tanzanian coastal forests and their globally important flora and fauna may be completely removed.

Butinsky, T. M. (1984). Ecological survey of the Impenetrable (Bwindi) Forest, Uganda, and recommendations for its conservation and management.

The primary goal of most national parks is to maximize the number of species contained therein. This goal is likely to be most successfully achieved where (1) a large array of habitat types are retained, (2) where habitat corridors are established, (3) where large numbers of individuals of each species are maintained, (4) where disturbances caused by human activities are minimized and (5), most importantly, where large tracts of land are incorporated into national parks.

Butler, P. M. (1984). Macroscelidea, Insectivora and Chiroptera from the Miocene of East Africa.

The East African Miocene Macroscelidea, Insectivora and Chiroptera are revised on the basis of new material. New taxa proposed are: *Miorhynchocyon*, n. gen, (Macroscelididae); *Miorhynchocyon meswae*, n. sp.; *Pronasilio ternanensis*, n. gen., n. sp. (Macroscelididae); *Hiwegicyon juvenalis*, n. gen. n. sp. (Macroscelididae); *Parageogale*, n. gen. (Tenrecidae); Prochrysochlorinae, n. subfam. (Chrysochloridae); Propottininae, n. subfam, (Pteropodidae); *Chamtwaria pickfordi*, n. gen., n. sp. (Vespertilionidae). *Gymnurechninus songhorensis* is synonymised with *G. camptolophus*.

The new material provides additional information on the dentition, especially of *Myohyrax oswaldi, Galerix africanus, Amphechinus rusingnsis, Protenrec tricuspis* and *Parageogale aletris*. Parlial skulls are described of *Amphechinus rusingensis, Protenrec tricuspis, Prochrysochloris miocaenicus* and *Taphozous incognita*.

The oldest member of the Macroscelidinae (*Pronasilio*) is described from Fort Ternan. *Galerix africanus* is closely related to *G. exilis* from Europe. *Amphechilnus rusingenesis* is compared with Asiatic Oligocene Erinaceinae. The Miocene age of *Crocidura* is rejected. On the evidence of humeri, the following families of Chiroptera are newly reported: Pteropodidae, Nycteridídae, Vespertilionidae, Molossidae. *Propotto* is regarded as an offshoot from the Pteropodidae, not ancestral to modern forms. *Chamtwaria* is a primitive vespertilionoid, provisionally placed in the Kerivoulinae.

Erinaceidae probably entered Africa at the beginning of the Miocene, before 20 Ma. Faunistic differences between deposits are largely to be ascribed to differences in local environment.

Cabrera, A. and A. E. Ruxton (1926). On mammals from Luluabourg, Southern Congo.

The present paper is based on three collections of small and middle-sized mammals obtained in Luluabourg, on the Lulua River, Kasai, Southern Belgian Congo, by Father R. Callewaert, of the Catholic mission of Saint Joseph de Luluabourg. The two larger collections, containing in all 678 specimens, were sent to the British Museum of Natural History, where, at the request of Mr. M. A. C. Hinton, we have examined them. A third arid smaller series, consisting of 76 specimens, was acquired by the National Museum of Natural Science at Madrid, Spain, and has been studied by only one of us (Cabrera); the authorities of that institution have kindly consented to incorporate the results of his work with the observations made in London. In this way we have been able to form a list of no less than 74 species collected in the same spot by the same collector, giving a very exact idea of the mammalian fauna of the Lulua region. The character of this fauna is in the main intermediate between that of Angola and that of Rhodesia, with several peculiar South Congolese forms, some of which appear to be undescribed. Among the material examined figures the type of the new genus and species of rodent *Hylenomys callewaerti* - recently described by Mr. Thomas.

Cagnolaro, L. (1976). Catalogo dei tipi del Museo civico di Storia naturale di Milano. III. I tipi dei mammiferi, con un profilo storico sulla collezione mammalogica.

L'autore traccia un profilo storico delle collezioni dei mammiferi del Museo Civico di Storia Naturale di Milano, raccolte per gran parte distrutte nel 1943 a seguito del bombardamento, tranne quelle dei micromammiferi in pelle, la sala dei Mammiferi italiani e pochi altri esemplari. Si considera brevemente l'entità ed il valore scientifico delle principali acquisizioni in base ai documenti d'archivio ed alla letteratura pubblicata sui materiali in oggetto; è pure ricordata l'attività degli Zoologi del Museo che si occuparono anche di Mammiferi, quali Jan, Cornalia, Bordelli e soprattutto Parisi. E' sommariamente descritta anche la fisionomia delle esposizioni dei Mammiferi al pubblico, mutata lungo il corso degli anni nelle tre diverse sedi in cui è statò sistemato il Museo.

L'entità attuale delle collezioni dei Mammiferi è di circa 5700 pezzi (2960 in pelle, 1400 in alcool, 900 montati e 450 tra crani e scheletri), ascrivibili ad oltre 400 specie. L'importanza della collezione

concerne essenzialmente la Fauna italiana; le raccolte in estensione espongono tutti gli ordini con una significativa rappresentanza della teriofauna mondiale, con particolare riguardo al Sudamerica.

Nella seconda parte del lavoro è steso l'elenco dei Tipi dei Mammiferi del Museo, concernenti 13 *taxa*: i tipi di 4 sono ancora esistenti, mentre 9 sono andati distrutti durante l'incendio del 1943. Di ogni *taxon* sono riportati i riferimenti bibliografici essenziali e lo stato sinonimico 9 entità sono ritenute ancora valide. I Tipi furono descritti: 5 da CORNALIA e 8 da DE BEAUX; 8 Tipi riguardano la fauna africana, 4 quella sudamericana e 1 l'Italia.

L'ampia Bibliografia di 109 titoli riporta i lavori sui Tipi, le pubblicazioni sulle collezioni dei Mammiferi del Museo, comprese le raccolte d'ostensione, pubblicazioni mammalogiche del personale del Museo, nonché le biografie dei principali zoologi che si sono occupati dei materiali considerati.

The Author draws the historical outline of the collection of the Mammals of the Civic Museum of Natural History of Milan, from its foundation (1838) till now. Since in 1943 thé Museum was almost destroyed by a bombardment, most of the collections were lost, except those of micromammals skins, the Hall of Italian Mammals and few other specimens. Today the theriological collections include almost 5700 specimens (2960 skins, 1400 specimens in alcohol, 900 mounted specimens, 450 skeletons and skulls), belonging to over 400 species.

The Author considers the main acquisitions, studying historical records and the specific literature on Museum's collections. Among others it is related about the collections of G. Osculati from South America (CORNALIA, 1849 and OSCULATI, 1860 and 1854), from Eritrea of Dr. P. Magretti (BORDELLI, 1902), from Somaliland of V. T. Zammarano (PARISI, 1923 a), from Abyssinia of U. Ignesti (DE BEAUX, 1925 b), from Congo of Dr. A. Rossi (DE BEAUX, 1925 a), from Africa too of Baron L. Franchiti and L. Tonker (DE BEAUX, 1923 a), from Haiti of the brothers R. and E. Ciferri (1927 - 1930), from the expeditions of Prof. G. Scortecci in Somaliland (1931: DE BEAUX, 1934), in Fezzan (1936: PARISI, 1938) and in Migiurtinia (1954; TOSCHI, 1956). From the Italy important are the collections of micromammals, especially of Trentino and the larger Festa Collection, both saved from fire.

The Author remembers the activity of the zoologists who worked in the Museum of Milan also in mammalian field, the founder G. Jan, Cornalia, Bordelli and above all Parisi. He briefly describes the disposition of the mammalian exhibition opened to the public during the years of history of Museum of Milan, in its three different buildings.

In the second part of this work the Types of Mammals of Museum of Natural History of Milan are listed, regarding 13 *taxa*; 4 Types still exist (*Scotoecus artinii* De Beaux, 1923; *Arvicanthis abyssinicus rossii* De Beaux, 1925; *Acomys bovonei* De Beaux, 1934; *Heterooephalus glaber scorteccii* De Beaux, 1934), 9 were destroyed by a fire in the 1943 (*Vespertilio Osculati* Cornalia, 1849; *Lepus De-Filippi* Cornalia, 1849; *Bradypus trivittatus* Cornalia, 1849; *Felis jacobita* Cornalia, 1865; *Sorex intermedius* Cornalia, 1870; *Petalia (Nycteris) thebaica aurantiaca* De Beaux, 1923; *Cercopithecus (Insignicebus) albogularis zmnmarmioi* De Beaux, 1923; *Petalia parisìi* De Beaux, 1923; *Genetta dongolana tedescoi* De Beaux, 1923. Among our Types, 5 taxa were described by Prof. Emilie CORNALIA, 8 by Prof. Oscar DE BEAUX. Their geographical distribution is: 8 from Africa, 4 from South America and 1 from Italy.

The Bibliography at the end-.of the work embraces 109 titles: the papers which contain the originai description of the listed Types, the papers on the mammalogical collections of the Museum of Milan, as well as the biographies of the zoologists, who worked on this field.

Capanna, E. and M. V. Civitelli (1964a). Contributo alla conoscenza della cariologia dei rinolofidi (Mammalia - Chiroptera).

In this paper the Authors show the results of a comparative analysis between the karyotype of two species of bats: *Rhinolophus ferrumequinum* and *Rhinolophus euryale*. Tissue colture tecnique has been employed.

The chromosomes number of *Rhinolophus ferrumequinum* in somatic mitoses is 2n=58. The karyogram of this species shows 24 pairs of acrocentric chromosomes, among which one medium-sized pair is provided with satellites, 2 pairs of metacentric chromosomes and 2 pairs of very small chromosomes. The X chromosome is a large submetacentric (centromeric index 30) and the Y chromosome is a very small one.

The chromosomes number of *Rhinolophus euryale* is also 2n=58; the karyogram shows 24 pairs of acrocentric chromosomes (no one with satellites), 2 pairs of metacentric chromosomes, but only one of these is morphologically similar to a pair of metacentric of the karyotype of *Rhinolophus ferrumequinum*, and 2 pairs of very small chromosome. The X chromosome of *Rhinolophus euryale* is a large submetacentric (centromeric index 25) and the Y chromosome a very small one.

A comparison between the karyotypes of the species has been made and the probable phylogenetic relationships have been discussed.

Sono stati esaminati, con la tecnica delle culture dei tessuti, i cromosomi somatici di *Rhinolophus ferrumequinum* (Schr.) e di *Rhinolophus euryale* Blasius.

Il numero dei cromosomi di *R. ferrumequinum* e risultato 2n=58; e stato inoltre definito il cariogramma di questa specie, comprendente 24 coppie di cromosomi acrocentrici, delle quali una di medie dimensioni con satelliti, due coppie di cromosomi metacentrici e due coppie di cromosomi puntiformi. L' eterocromosoma X e un grande metacentrico a braecia ineguali con in dice centromerico 30; l' eterocromosoma Y e un cromosoma puntiforme.

Il numero di cromosomi di *R. euryale* e risultato 2n=58; anche di questa specie e stato definito il cariogramma, comprendente 24 coppie di cromosomi acrocentrici (a differenza della specie precedentemente descritta, nessuno di questi e satellitato), due coppie di metacentrici e due coppie di cromosomi puntiformi. L'eterocromosoma X e un grande metacentrico a braccia ineguali, con indice cenb·omerico 25; l'eterocromosoma Y e un cromosoma puntiforme.

E stato effettuato un confronto tra i cariogrammi delle due specie e sono stati discussi i possibili rapporti filogenetici.

Capanna, E. and M. V. Civitelli (1965). Cariologia e cariometria del miniottero (Mammalia - Chiroptera).

The karyogram of a bat, *Miniopterus schreibersii* (Natt. in Kuhl) has been defined, on the basis of an accurate karyometric analysis. The karyogram shows 22 pairs of autosomes and one pair of heterochromosomes; among the 22 autosimic pairs, 3 are metacentric, clearly different from each other for average length and situation of the centromere; 17 pairs are acrocentric and 2 pairs are formed by very small chromosomes. The X chromosome is a medium sized metacentric and the Y a very small one.

In base ad una precisa analisi cariometrica, e stato definito il cariogramma di *Miniopterus schreibersii* (Natt. in Kuhl). Il cariogramma comprende ventidue coppie di autosomi ed una coppia di eterocromosomi; delle ventidue coppie autosomiche, tre sono di cromosomi metacentrici, tra loro chiaramente differenziabili per la lunghezza media e la posizione del centromero, diciassette coppie sono di cromosomi acrocentrici e due coppie di puntiformi. Il cromosoma X e un metacentrico di medie dimensioni, il cromosoma Y e un puntiforme.

Capanna, E. and M. V. Civitelli (1966). I cromosomi del pipistrello abolimbato.

The karyogram of a bat, *Pipistrellus kuhli* (Natt. in Kuhl) has been defined on the basis of a karyometric analysis. The karyogram shows 21 pairs of autosomes and one pair of heterochromosomes; among 21 autosomic pairs, 3 are large metacentric, 1 small metacentric, 15 acrocentric and 2 pairs are of very

small chromosomes. A pair of acrocentric chromosomes shows a large achromatic region. The X chromosome is a medium sized metacentric and the Y a very small one.

A comparison has been made between the karyogram of *Pipistrellus kuhli* and those of *P. pipistrellus, P. nathusi* (BOVEY 1949) and *Miniopterus schreibersii* (CAPANNA e CIVITELLI 1965).

In base alla analisi cariometrica, e stato definite il cariogramma di *Pipistrellus kuhli* (Natt. in Kuhl). Il cariogramma comprende 21 coppie di autosomi ed una coppia di eterocromosomi; delle 21 coppie autosomiche, tre sono di metacentrici grandi, una di piccoli metacentrici, 15 di acrocentrici, di cui una coppia mostra chiaramente una zona eterocromatica, 2 di cromosomi puntiformi. Il cromosoma X e un metacentrico di medie dimensioni, il cromosoma Y un puntiforme.

È stato fatto inoltre un confronto tra il cariogramma di *Pipistrellus kuhli* e quelli di *P. Pipistrellus* e *P. Nathusi* (BOVEY 1949). È stato anche fatto un confronto con i dati della cariometria di *Miniopterus schreibersii* (CAPANNA e CIVITELLI 1965).

Capanna, E., M. V. Civitelli and C. Spagnuolo (1968). Contributo alla cariologia del genere Myotis. Considerazioni sulla evoluzione del cariotipo dei Vespertilionidi (Mammalia-Chiroptera).

The karyogram of two Vespertilionid bats pertaining to the genus *Myotis* has been studied. In *Myotis myotis* (BORKHAUSEN) (vel *oxignatus* (MONTICELLI) the diploid number is 2n = 44 and the number of autosomic arms is 50. Indeed three pairs of autosomes are large metacentric chromosomes (average length = 1,7; centromere index = 44); all the remaining autosomes are acrocentric. No autosome with an heterochromatic zone has been observed. The X heterochromosome is a medium sized metacentric chromosome, the Y heterochromosome is a small acrocentric one.

The karyogram of Myotis capaccinii (BONAPARTE) is very similar and the karyometric differences were not regarded as meaningful. Also in this latter species the diploid number is 2n = 44, and three pairs of large metacentric and one pair of small metacentric autosomes have been found. The remaining autosomes are acrocentric. No autosomes have been observed in the karyogram of *Myotis capaccinii* presenting an heterochromatic zone. X heterochromosomes present, in this species, the same morphology as in *Myotis myotis*. The Y chromosome is again a small acrocentric one.

A comparison between the karyograms of the mentioned two species pertaining to the genus *Myotis* with those of the species studied by BOVEY (1949) and by BAKER and PATTON (1967) gives prominence to the close similarity of the karyotypes of all the *Myotis* so far investigated, whether paleartic or neartic.

The comparison among the karyometric values gathered by us in the Vespertilionid bats stresses a cytotaxonomic difference, noticeable from the difference in the average length of the aploid female set, between Miniopterinae and Vespertilioninae.

The small metacentric chromosomes, that has been found in many other Vespertilionid bats, has been found again in the two species studied here. This observation confirms its place as a "morphologically identical" chromosome for the Vespertilionid bats. Another "morphologically identical" chromosome has not been observed here, that is the acocentric chromosome, showing an heterochromatic zone, which on the contrary was observed by us in *Pipistrellus savii* and *Pipistrellus kuhli* and also by DULIC et al. (1967) in *Nyctalus*.

E. stato esaminato il cariotipo di due Chirotteri: *Myotis (Myotis) myotis* (BORKHAUSEN) (vel *oxignatus* (MONTICELLI) e *Myotis (Leuconoe) capaccinii* (BONAPARTE).

Il cariogramma delle due specie viene ritenuto uguale e cosl composto:

1) Gruppo di 6 grandi cromosomi metacentrici
2) Gruppo di 18 cromosomi acrocentrici

3) 1 coppia di piccoli cromosomi metacentrici
4) Gruppo di 12 cromosomi acrocentrici
5) Gruppo di 4 cromosomi puntiformi.

Il cromosoma X che e un metacentrico medio e l'Y che e un piccolo acrocentrico.

Dei cromosomi acrocentrici nessuno presenta zone eterocromatiche.

Sono stati anche discussi i rapporti citotassonomici nell'ambito della famiglia dei Vespertilionidi.

Capanna, E. and M. G. Manfredi Romanini (1971). Nuclear DNA content and morphology of karyotype in certain Paleartic Microchiroptera.

Histophotometric evaluation of the DNA content of the post-kinetic nuclei (lymphocytes) has been performed in 8 species of Palearctic Microchiroptera: *Rhinolophus ferrumequinum, R. euryale, R. hipposideros, Miniopterus schreibersi, Pipistrellus savii, P. kuhli, Myotys myotis* and *M. capaccinii*. The results obtained are compared with the known data (CAPANNA and CIVITELLI 1970) on the morphology of the karyotype of these species and are discussed whith a view to explaining the relationships between chromosome transformations and variations in DNA content.

Considering the entire field studied, the nuclear DNA content is found to be fairly homogeneous: a fact that has been interpreted as proof that this taxonomic group has attained evolutional stability.

E stato valutato con il metodo istofotometrico il contenuto in DNA dei nuclei postcinetici (linfociti) di 8 specie di Microchirotteri Paleartici: *Rhinolophus ferrumequinum, R. euryale, R. hipposideros, Miniopterus schreibers, Pipistrellus savii, P. kuhli, Myotis myotis* and *M. capaccinii*. I dati ottenuti sono stati confrontati con quanto e noto (CAPANNA e CIVITELLI 1970) sulla morfologia del cariotipo delle stesse specie e discussi in ordine a chiarire i rapporti tra trasformazioni cromosomiche e variazione di quantita di DNA.

Considerando l'intero ambito studiato il contenuto nucleare di DNA e risultato abbastanza omogeneo fatto che e stato interpretato come prova di una raggiunta stabilita evolutiva di questo gruppo tassonomico.

Carpenter, R. E (1986). Flight physiology of intermediate-sized fruit bats (Pteropodidae).

Up to eight physiological parameters were measured on members of four species of fruit bats with a size range of 0.188 - 0.650 kg as they flew in a wind tunnel. Regression lines were calculated for the relationships between body masses of bats and their power inputs (P_1), heart and respiratory rates. These were compared to similar relationships for flying birds.

Respiratory evaporation dissipated only 10% of the heat produced. At ambient temperatures (T_a) above 15°C, heat loss was facilitated by vasodilation of feet and wing membranes, but this mechanism became less effective at high T_a when thermal differential between wings and air was reduced. Bats are apparently unable to increase greatly their respiratory evaporation, and overheated at T_a of 25 - 30°C. At low T_a) the flight ability of two bats was reduced, suggesting that reduced coordination or even freezing of wings might be a general problem for bats flying at T_a close to 0°C.

The endurance of three bats was so much greater near the middle of their speed ranges that the maximum flight distances ought to be achieved at these velocities, even though the cost of transport would be lower at higher speeds. Endurance at an airspeed was proportional to the relative power input (P_i/P_{min}) raised to the power of -7.45; flying at a speed that raised P_i/P_{min} by 10 % reduced endurance by half.

Carroll, J. B. and A. T. C. Feistner (1996). Conservation of western Indian Ocean fruit bats.

The fruit bats of the western Indian Ocean islands are important components of these island ecosystems. Since fruit bats play key roles in the maintenance of tropical ecosystems as pollinators and seed dispersers, their continued survival may be of crucial significance for the maintenance of island forests. In turn the forests are important resources for the people of the region and protect vital watersheds. Continued survival of the western Indian Ocean fruit bats may thus be imperative for the conservation of the region's biodiversity. Many island endemics are susceptible to human-induced environmental degradation. In addition, most of the western Indian Ocean islands are affected by cyclones. These factors have led to the extinction of one species and five of the remaining 11 are threatened. Various strategies are being used to aid their conservation including captive breeding, education programmes and protection of wild populations.

Cassel-Beraud, A. M., D. Fontenille and L. Rabetafika (1989). Etude bactérienne, virale et parasitaire d'une population de chauves-souris *Chaerophon pumila* à Ahjiro, Madagascar.

Cette triple étude bactérienne, virale et parasitaire des chauves-souris *Chaerophon pumila* à Madagascar a permis aux auteurs de dénombrer, des feces de 88 de ces chauves-souris, 115 souches bactériennes appartenant à la famille des Enterobacteriaceae dont certaines sont très atypiques, rares ou potentiellement pathogènes pour l'homme.

La recherche de virus dans les glandes salivaires, le cerveau et le sang a permis l'isolement de 13 souches virales dont 8 au moins sont identiques au virus Dakar-bat.

Aucun parasite sanguin n'a été observé.

Bacterial, viral and parasitical study of the insect eater bats *Chaerophon pumila* in Anjiro, Madagascar.

This bacterial, viral and parasitical study of the insect eater bats *Chaerophon pumila* allowed to isolate, from stools of 88 of them, 115 bacterial strains to Enterobacteriaceae family : some of them were identified as very atypical, rare or potentially pathogenic for man.

From salivary glands, brain and blood, 13 viral strains were also isolated: 8 of them were less identified as Dakar-bat virus.

Any parasite was observed.

Chapman, R. F. (1958). Some observations on the food of a bat.

The food of a bat, probably *Nycteris thebaica* Geoffrey, in Tanganyika was determined by collecting the remains from beneath a roost. A wide variety of insects were eaten, depending on what was available. The number of insects eaten varied according to their abundance.

Chari, G. C. and A. Gopalakrishna (1984). Morphogenesis of the foetal membranes and placentation in the bat, *Miniopterus schreibersii fuliginosus* (Hodgson).

The development of foetal membranes and the changes in the structure of the placenta in the bat *Miniopterus schreibersii fuliqinosus* is described. The study reveals that *M. schreibersii fuliqinosus* exhibit developmental characters not matched by any other mammal let alone any other bat.

Chastel, C., H. Launay, G. Le Lay, H. Bailly-Choumara, H. Hellal, M. Valle, D. Bach-Hamba and J.-C. Beaucournu (1986). Petits mammifères sauvages et arbovirus dans la région du bassin méditerranéen occidental.

Les sérums de 1 083 petits mammiferes sauvages capturés entre 1976 et 1983 en Tunisie, Maroc, Espagne, Italie et Corse, ont été examinés pour rechercher la présence d'anticorps vis-à-vis de différents arbovirus. Ils ont été recueillis sur des bandelettes de papier buvard et traités au laboratoire en vue des réactions d'inhibition de l'hémagglutination et de fixation du complément.

Les résultats font apparaître un certain déclin de l'activité du virus West Nile dans l'ensemble de la région, alors que trois autres arbovirus se manifestent activement (virus Tahyna, de la fièvre à phlébotomes type Sicile et Arumowot).

De façon plus ponctuelle, on décèle aussi quelques réactions positives pour quatre virus transmis par des tiques (virus Bhanjà, Uukuniemi, Quaranfil et de l'encéphalite européenne à tiques).

Au point de vue mammalogique, les Muridae, Gerbillidae et Talpidae sont les plus fréquemment interessées par les réactions sérologiques positives. Ctenodactylus gundi et Pipistrellus kuhli, bien que capturés en nombre plus restreint, sont également souvent positifs.

Between 1976 ans 1983, we have studied sera from 1 083 small wild mammals trapped in Tunisia, Morocco, Spain, Italia and Corsica, in order to search for antibody against a number of arboviruses, belonging to several genera and serogroups.

The blood from trapped mammals was collected on blotting paper strips and was sent to the virus laboratory at ambient temperature. After that, the dessicated blood was eluted and treated for haemagglutination inhibition and complement fixation tests.

Results indicated that in the area as a whole, the activity of West Nile virus is somewhat declining, whereas three other arboviruses were emerging: Tahyna, Sicilian Sandfly fever and Arumowot.

Antibody for four tick-borne arboviruses: Bhanja, Uukuniemi, Quaranfil and Tick-borne encephalitis (european type) were alro detected but with a more restricted distribution.

From a zoological point of view, the species the most frequently found positive belong fo the Muridae, Gerbillidae and Talpidae families which were also the most frequently trapped. Ctenodactylus gundi and Pipistrellus kuhli, though trapped in a few specimens, were also frequently found positive. In epidemiological study of arbovirus infections, serosurveys in small wild mammals with blood collection using blotting paper strips, appeared as an interesting field method, easy to perform, not expensive and reliable. In countries where arboviruses were not previous!y studied, this method is able ta quickly supply basic informations, and in others where virological studies were more completely achieved, it may improve the inventory of the mammalian species involved in arbovirus circulation.

Chatelain, C. and D. Brugière (1999). Proposition de classement du parc national Mbaere-Bodingue et de l'aire d'utilisation durable des écosystèmes de la Mbaere dans la zone d'intervention du projet ECOFAC-RCA.

La forêt de Ngotto, gérée par le projet Ecofac-RCA fait l'objet d'un zonage délimitant trois types d'aires: une zone de développement rural, une zone d'aménagement forestier et une zone de conservation. La zone de conservation mise en place par le projet n'a pas de statut légal d'aire protégée. Le décret 96.305 bis du 15 novembre 1996 porte interdiction de la chasse dans la "Réserve Intégrale Mbaéré-Bodingué" du projet ECOFAC-RCA mais cette réserve n'a pas de base légale puisqu'aucun document juridique n'atteste de sa création. L'objectif de cette mission était de : i) faire une synthèse des données existantes sur ce site justifiant sont classement au titre d'aire protégées; ii) proposer un statut reconnu au niveau international (catégorie UICN) et iii) rédiger, après consultations des diverses parties et notamment du ministère de tutelle, les textes de classement du site.

Cheesman, R. E. and M. A. C. Hinton (1924). LXII. On the mammals collected in the desert of Central Arabia by Major R.E. Cheesman.

The collection of mammals described in this paper was made by Major R. E. Cheesman in the Hasa Province and in the Jafura and Jabrin Deserts which form part of the Great South Desert of Arabia. The expedition was arranged by Sir Percy Cox, and was undertaken in response to an invitation from H.H. the Sultan of Nejd, with the object of investigating the desert-fauna of Central Arabia, which, owing to the inaccessibility of the country and the fanaticism of its inhabitants, was unknown. As might be expected in a district so widely different from the surrounding areas, many forms have proved to be new.

Generally speaking, the exceptionally pale desert-coloration is the most striking feature of the collection as a whole, and to match it to some degree one has to proceed far to the west, where, in the Air district of the Central Sahara, Capt. Angus Buchanan found some little time ago an extraordinarily pale assemblage of mammals. It is of interest, perhaps, to note that certain inferences as to the special habits of some of the numerous and competitive species of *Meriones* and *Jaculus*, found living together in close local association, derived independently from a study of the skull-structure, find confirmation in and in turn confirm the observations made in the field to a remarkable degree.

There is reason to suppose that the list given below would apply to the whole of the Great South Desert, there being, so far as is known, no physical barrier until the confines of the mountains, such as Aden and Yemen to the south and Muscat to the east, are reached, where markedly darker forms are known to replace the desert fauna. The entire absence of the mungoose, so plentiful in Iraq, and the replacement of the big dark Iraq hare by the small pale desert-coloured hare, give definite evidence as to the limits of range of each of the species concerned.

The types of all the new forms have been presented to the British Museum by Major R. E. Cheesrnan.

Cheke, A. S. and J. F. Dahl (1981). The status of bats on western Indian Ocean islands with special reference to *Pteropus*.

L'histoire et la condition actuelle des chauves-souris des îles de l'Ocean Indien occidental à l'exception de Madagascar, sont passées en revue. L'attention est attirée sur l'extinction total de *Pteropus subniger*, qui habitait l'Ile Maurice et l'Ile de la Réunion, et sur la rareté critique de *P. rodricensis* (Rodrigues) et de *Coleura seychellensis* (Seychelles granitiques). On n'a pas constaté l'existence de *Scotophilus borbonicus* (La Réunion) depuis un siècle mais l'espèce pourrait y exister toujours. *Pteropus livingstonii*, également fort rare, est signalé pour la première fois de l'Ile de Mohéli, archipel des Comores. Nous n'avons pas pu confirmer l'existence actuelle aux Comores de l'espèce endémique *Rousettus obliviosus* qui a été collectée pour la dernière fois en 1903.

Child, G. S. (1965). Some notes on the mammals of Kilimanjaro.

In this article a list of mammals recorded from the locality Kilimanjaro is presented. The locality Kilimanjaro includes a wide range of altitudes and habitats. The Kilimanjaro Game Reserve falls within the locality Kilimanjaro and is considered to be a unit whose mammal fauna is worthy of closer examination. The Reserve includes all that part of the mountain lying above the lower edge of the forest. Two main habitats are recognised within the area. The mammals occuring in each of the habitats are dealt with in more detail and information on their present status given where available. The validity of two previous occurence records from the higher altitudes is questioned.

Some larger species of restricted habitat occuring in the Kilimanjaro forest are listed and the probability of finding certain mammals recorded on other East African mountains is examined. Reference to such aspects as climate, vegetation, geography and geology of the mountain are purposely omitted or kept to a minimum as it is assumed that they will be the subjects of other papers in this Journal.

Chitaukali, W. N., H. Burda and D. Kock (1999). Small mammals of the Nyika Plateau, Malawi. Abstract.

During two surveys (trapping, mist-netting, digging) of small mammals performed in several remote sites on the Nyika Plateau at altitudes ranging from 1.530 - 2.250 m in March-April 1997 (three weeks) and in August 1998 (two weeks), 181 specimens of small mammals were collected. These include four species of Chiroptera, of which a very rarely collected fruit bat, *Plerotes anchietae* represents a new record for Malawi and the first collected adult male. *Epomops dobsonii, Rhinolophus simulator*, and *Pipistrellus nanus* are new records for the Nyika Plateau. Among 19 rodent genera/species collected, *Mylomys* is a new record for Malawi, while *Steatomys* and *Saccostomus* are new records for the Nyika Plateau in particular and for montane regions in general. Karyological and some preliminary morphological and morphometrical data suggest that several specimens differ significantly from the taxa they have been conventionally identified with. They possibly represent taxa undefined until present and may need to be described as new forms: Thus *Mus, Heliophobius, Cryptomys, Lophuromys, Grammomys*, and *Graphiurus* specimens possess undescribed karyotypes. Two species of macroscelids (*Rhynchocyon cirnei* and *Elephantulus brachyurus*) and two to three *Crocidura* species were also recorded.

The material is currently being studied using standard taxonomical, cytological and molecular (in cooperation with R. L. Honeycutt, A & M University, Texas) as well as parasitological techniques. Ecological analysis of the data (diversity indices, trapping success, activity) for all the species recorded as well as new data on behavioural ecology of Bathyergidae will be presented. The survey demonstrates a high species richness and the uniqueness of the Nyika Plateau as an evolutionary theatre where speciation, divergence and adaptive radiation of small mammals have taken place.

Cent quatre vingt un petits mammifères ont été collectes au cours de deux missions de terrain (3 semaines en mars-avril 1997 et 2 semaines en août 1998) effectuées dans des sites recules du plateau Nyika a une altitude variant de 1530m a 2250m. Parmi les 4 espèces de chiroptères récoltées figure une espèce frugivore *Plerotes anchietae* non répertoriée au Malawi auparavant et dont aucun male adulte n'avait été jusqu'alors capture. *Epomops dobsonii, Rhinolophus simulator* et *Pipistrellus nanus* constituent de nouvelles espèces pour le plateau de Nyika. Parmi les 19 genres/espèces de rongeurs collectes, *Mylomys* est une nouvelle mention pour le Malawi de même que *Steatomys* et *Saccostomus* pour la région d'étude. Les caryotypes ainsi que les premiers résultats obtenus en morphologique et en morphométrie suggèrent que plusieurs spécimens collectés différent significativement des taxons auxquels on les rattache classiquement et pourraient appartenir a de nouvelles formes non encore décrites. Ainsi *Mus, Heliophobius, Cryptomys, Lophuromys, Grammomys* et *Graphiurus* possèdent des caryotypes différents de ce qui est connu pour ces taxons. Par ailleurs, deux espèces de Macroscelides (*Rhynchocyon cirnei* et *Elephantulus brachyurus*) et 2 à 3 espèces de *Crocidura* ont également été capturées.

Cette étude montre que le plateau de Nyika dote d'une forte richesse spécifique en petits mammifères a été, pour ces organismes, le théâtre de phénomènes de divergence, de spéciation et de radiation adaptative.

Chubb, E. C. (1908). 5. On some little-known South African mammals recently obtained in Rhodesia.

Among the 200 or so mammals that have been collected near Bulawayo or sent from further afield to the Rhodesia Museum during the last year are representatives of several rare species and one additional to the South African list.

Chubb, E. C. (1910). A revised list of the mammals of South Africa.

During the last ten years a considerable amount of attention has been paid by systematic mammalogists to South Africa and a number of valuable papers have been published. The most important of these is a series of ten based upon collections made by Mr. C. H. B. Grant in various parts of the sub-continent, and presented to the British Museum by Mr. C. D. Rudd, while our knowledge of the Chrysochloridæ has been greatly augmented by Dr. R. Broom's valuable monograph of the family.

This work has rendered Sclater's volumes on "The Mammals of South Africa," published in 1901, altogether out-of-date by the discovery of a number of new forms, and many names, which at that time were regarded as synonyms of others, have been shown to belong to distinct species; while not a few have been altered in order to conform to now recognised rules of nomenclature.

The object of the present paper is to give a list of the species at present known to occur in South Africa, south of the Zambesi and Cunene Rivers, with references to the original descriptions of all forms not recognised by Sclater. It comprises no less than 373 species and sub-species, (exclusive of the order Cetacea) which is 152 more than the number given in Sclater's work.

It is true that many of these recently described forms have been separated on somewhat slight differences, and many represent only local varieties; but it must be borne in mind that the work has been done on large series of excellently prepared material, carefully labelled with measurements taken in the flesh, when constant differences become apparent which would be taken for individual variation on single specimens from different localities.

Churchill, S. (K.), R. Draper and E. Marais (1997). Cave utilisation by Namibian bats: population, microclimate and roost selection.

Ten caves in central Namibia were searched for cave bats during May and June 1996. Up to seven species were found sharing a single cave. Different species of bats were found to select roost sites with significantly different microclimates, based on temperature and relative humidity. Bats were using these caves as over-wintering sites and were selecting either cool microclimates in which to enter daily torpor or warm microclimates to enable them to remain active with minimal energy expenditure. *Hipposideros commersoni* was observed to remain inactive at the roost for days without entering torpor or leaving the cave to forage. This large bat appears to over-winter by relying on its considerable fat store at this southern limit of its distribution. Roost behaviour, colony size and roost location within the cave was examined for each of the nine bat species encountered.

Claessen, C. J. and F. De Vree (1990). Systematic and distributional notes on the larger species of the genus *Epomophorus* Bennet, 1836 (Chiroptera: Pteropodidae).

Based on morphologic, biometric and zoogeographic characters, *E. gambianus, E. crypturus* and *E. angolensis* are considered to be well defined species. *E. gambianus parvus* is a junior synonym of *E. crypturus* and *E. pousarguesi* is a junior synonym of *E. gambianus*. *E. wahlbergi* is first recorded for Sudan.

Claessen, C. J. and F. De Vree (1991). Systematic and taxonomic notes on the *Epomophorus anurus-labiatus-minor* complex with the description of a new species (Mammalia: Chiroptera: Pteropodidae).

Two groups are present in the *E. anurus-labiatus*-minor complex: a first group with an obvious clinal size variation, consisting of specimens formerly identified as *E. anurus, E. labiatus* and partly as *E. minor*, and a second group with no geographic variation in size consisting of specimens formerly identified as *E. minor*. These two groups obviously belong to two different species, mainly differing in body measurements. We identified the first group as representatives of *E. labiatus*. Since the type

specimen of *E. minor* also belongs to this group, we concluded that E. minor DOBSON 1879 is a junior synonym of *E. labiatus* (TEMMINCK 1837). As a consequence no valid name is available for the second group. *E. minimus* n. sp. is described for this second group and a holotype is appointed with type locality Bahadu, Ethiopia.

Cockle, A., D. Kock, L. Stublefield, K. M. Howell and N. D. Burgess (1998). Bat assemblages in Tanzanian coastal forests.

Bat species lists were compiled in 17 small coastal forests of Tanzania, eastern Africa, between 1990 and 1992. Forty-six bat species were recorded, with up to 15 species in a single forest. Eight forests were sufficiently studied for comparisons to be made on species frequencies and species diversity. Regional diversity was 2.74, and local diversities ranged between 1.55 to 1.97. Many species were remarkably unevenly distributed. Records of biogeographical significance for Tanzania were: confirmations of *Myotis tricolor, Tadarida brachyptcra, Myonycteris relicta, Rhinolophus deckenii* and *Kerivoula Africana*, and first records of *Scotoplrilus nigrita alvenslebeni, Hipposideros Cyclops* and *Cloeotis percivali*.

Des Chiroptères ont été capturés dans 17 petites forêts côtières de Tanzanie, en Afrique de l'Est, entre 1990 et 1992. Quarante-six espèces ont été mises en évidence, avec jusqu'à 15 espèces dans une seule foret. Huit îlots forestiers ont été suffisamment étudies pour que des comparaisons des fréquences locales des espèces et des indices de diversité puissent être effectués. L'indice de diversité régional est de 2,74 et les indices locaux se situent entre 1,55 et 1,97. Beaucoup d'espèces sont reparties de façon remarquablement irrégulière. Les captures les plus intéressantes pour la Tanzanie sont: la confirmation de *Myotis tricolor, Tadarida brachyptera, Myonycteris relicta, Rhinolophus deckenii* et *Kerivoula africana*, et les premieres observations de *Scotophilus nigrita alvenslebeni, Hipposideros cyclops* et *Cloeotis percivali*.

Coe, M. (1972). The South Turkana Expedition. Scientific Papers IX. Ecological studies of small mammals of South Turkana.

During the three seasons of the RGS South Turkana Expedition the zoological party conducted an ecological survey of the small mammals. Other aspects of this programme will be described elsewhere. The main habitat types are described and the small mammal fauna is shown to be segregated between them. The role of microclimate in this habitat segregation is described. Breeding records indicate that the number of young produced by rodents may be dictated by rainfall and available food quality. An attempt is made to calculate the small mammal biomass for South Turkana, and the figure obtained (500 kg/km^2) represents 24 per cent of the large mammal biomass reported by Watson (1969). The zoogeography of the small mammal fauna indicates a strong connection with that of the Somalian arid zone.

Coe, M. (1976). Mammalian ecological studies on Mount Nimba, Liberia.

Le Mont Nimba est situé aux confins du Libéria, de la Guinée et de la Côte d'Ivoire. En 1964 et 1966, un relevé de la fauna de Mammifères a été réalisé sous les auspices de l'U.I.C.N. et de la L.A.M.C.O. qui est en train d'exploiter le mineral de fer à ciel ouvert et de faire disparaître ainsi une grande partie de la montagne. La géologie, le climat et les différents types de végétation sont décrits. Des mammifères vivants et morts on été pris au piège; certaines des plus grandes espèces ont été achetées à des chasseurs Mano. Les mégachiroptères ont été capturés à l'aide de filets fins. 8 327 pièges ont été posés et 55 espèces (sur 88 qui existent probablement) ont été observées ou capturées. L'auteur décrit l'habitat des différentes espèces de rongeurs; il pense que les habitats secondaires créés par l'homme sont responsables de l'accroissement marqu" de la densité de certaines espèces.

Sous forme d'une liste systématique, l'auteur donne des informations sur la répartitlion géographique, le régime alimentaire et la reproduction des espèces collectées. Il discute l'influence de la pression humaine et des exploitations minières et forestières sur la faune endémique.

La structure de la faune des mammifères est étudiée en fonction des principaux régimes alimentaires. L'auteur montre que les espèces prédatrices peuvent représenter 40 % de l'ensemble de la faune comme c'est le cas dans les habitats semblables des forêts hygrophiles de Malaisie, de Bornéo et d'Australie.

Des informations numériques sur les collections de mammifères libériens du Mont Nimba sont données en appendice.

Coetzee, C. G. (1981). Distribution patterns of terrestrial mammals in South West Africa / Namibia. Abstract.

In order to obtain a better understanding of the distribution patterns of the different mammal species and their zoogeographical affinities, necessitates a comparison between the faunal composition of the different ecogeographical areas. Twelve ecogeographical areas were identified which include one semi-isolated mountain area. The riverine growths of the four bordering river complexes were additionally considered as being corridors that lead from adjoining regions into vastly different geomorphological and climatic areas.

Delimitation of the ecogeographical zones are based on plant communities (Giess, 1971 and Keay, 1959) and on geographical and physiographical features (sand cover, gravel plains, saline desert, the Karstveld, mountain ranges and swamps). The different species of terrestrial mammals, with the exclusion of the bats, were used in a matrix showing the relationship between the faunas of the areas by listing the species common to the different areas. These values were used to calculate the different correlation coefficients in determining the Faunal Resemblence Factor of Duellman (1965).

SWA/N falls within three of the zoogeographical zones of southern Africa as defined by Rautenbach (1978). The validity of and relationship between the different ecogeographical areas as faunistic entities are being questioned, both on an interarea basis and in relation to the three zoogeographical zones.

Constantine, D. G. (1998). An overlooked external character to differentiate *Myotis californicus* and *Myotis ciliolabrum* (Vespertilionidae).

The observation of a perceived 4-mm tail extension beyond the border of the interfemoral membrane of the western small-footed myotis, *Myotis ciliolabrum*, and the absence of the free tail in the California myotis, *Myotis californicus*, stimulated a quantitative study to determine if the tail character could be verified as a consistent external criterion to differentiate these similar species. Existing study skins were unsuitable for this purpose, because the tail character had been destroyed or distorted by replacement of the tail vertebrae with wire. Twenty-three *ciliolabrum* and 22 *californicus* were collected in the Mojave Desert of California and prepared as study skins with tail vertebrae in situ. Examination of these specimens, identified by conventional methods, confirmed that the exserted tail was characteristic of *ciliolabrum*. Original descriptions, usually based on specimens preserved in alcohol, indicated that the tail character was recognized in ciliolabrum over a century ago.

Corbet, G. B. (1984). The mammals of the Palaearctic region: a taxonomic review. Supplement.

Published information supplementing that given in *The mammals of the Palaearctic Region: a taxonomic review* (London: British Museum (Natural History), 1978) is summarized, including details of all new names not included in that work, revisionary work affecting the delimitation of species,

comprehensive accounts of subspecific variation and major revisions of distribution. No new names are proposed in this work.

Corbet, G. B. and J. E. Hill (1992). The mammals of the Indomalayan Region: A systematic review.

The Indomalayan (Oriental) Region has been recognized for over a century as one of the major zoogeographical regions of the world, with about a thousand species of mammals, over 20 per cent of the world's mammalian fauna. However, there appears to have been no previous attempt to produce a comprehensive, integrated account of its mammal fauna. Hitherto, four separate nomenclatorial lists have together covered the region, all of them now very out of date but nevertheless providing a valuable foundation for the present work. These are:

Ellerman & Morrison-Scott (1951, 1965): *Checklist of Palaearctic and Indian mammals 1758-1946*, which covers the region north of 10°N, i.e. north of the Isthmus of Kra in peninsular Thailand.

Chasen (1940a): *A handlist oj Malaysian mammals*, covering the Malayan peninsula and the Greater Sunda Islands except Palawan.

Laurie & Hill (1953): *List of land mammals of New Guinea, Celebes and adjacent islands, 1758-1952*, covering all the Indonesian islands not dealt with by Chasen.

Taylor (1934): *Philippine land mammals*.

Except for Taylor's work on the Philippines these did not purport to provide descriptions nor, with some exceptions, keys to identification, but they did provide a valuable stimulus for further taxonomic work by postulating the limits of species, by pinpointing gaps and by erecting hypotheses of relationships that could be subjected to testing as new information became available. However, the research that has been conducted during the past 50 years has for the most part been highly fragmented and localized. Some of the results have been summarized in a few important regional works but there are many gaps.

Our objective in compiling this work has been to bring together in one place an account of every species of mammal in the region, documenting the names and synonyms in full, and placing them within a taxonomic framework that takes account of all relevant published research. The order Chiroptera (bats) has been dealt with by JE Hill, based largely upon research undertaken while on the staff of The Natural History Museum, London. The remaining orders and the Introduction have been dealt with by GB Corbel, based primarily upon a critical review of the existing literature, but the results have been tested and many gaps filled by use of the extensive collections of The Natural History Museum, supplemented by visits to many other museums with important collections of Indomalayan mammals. We have scrutinized and criticized each other's text but the taxonomic opinions expressed are those of the individual author.

About 7000 scientific names are documented (including c.340 based upon fossils described in Recent genera), with type localities in the case of species-group names. These are backed up by a bibliography of about 3000 items covering the original citation of all names as well as relevant, recent research.

Ideally, this kind of synthesis should be based upon more detailed syntheses of the component countries of the region and upon more detailed revisions of particular taxa, without artificial geographical limitations. Very few modern sources of this kind exist and for many groups we have had to depend upon a mixture of primary, and more or less obsolete and incomplete, secondary sources.

There is nothing definitive about this volume - it is a presentation of the current state of our knowledge, using our personal judgement and experience to choose the 'most probable' solution where alternative views have been expressed or where, as is so often the case, there are many alternative ways of combining the scattered data into an integrated whole. We hope that it will serve a useful purpose for reference and also act as a stimulus to further research that will show where we have gone wrong.

Cornette, R., G. Dobigny, S. Moulin and A. M. Drieux-Dumont (1999). Inventaire des micromammifères de l'Adrar des Iforas, Mali: Implications systématiques et biogéographiques. Abstract.

En mars 1999 une mission scientifique s'est rendue dans le massif de l'Adrar des Iforas, situe au nord-est du Mali, avec pour objectif de dresser un inventaire des mammifères de cette région peu étudiée. Par ailleurs, la situation géographique et l'altitude moyenne de ce massif précambrien en font une "île sahélienne" au milieu du Sahara, constituant par la-même un véritable refuge écologique isole depuis au moins 4000 ans.

En ce qui concerne les micromammifères, plusieurs mémorise de recensement ont été employées: capture a l'aide de pièges (grillages et Sherman), capture directe pour les espèces ne rentrant pas dans les pièges, observation et photographie des animaux ou de leurs traces, et étude des pelotes de rejection de rapaces. La plupart des animaux ont été gardes en vie pour caryotypage afin de confirmer les déterminations.

Les premiers résultats de cytogénétique (coloration conventionnelle) distinguent 7 espèces appartenant aux genres *Gerbillus* (4 espèces), *Acomys* (1 espèce), *Arvicanthis* (1 espèce), et *Myomys* (1 espèce). Deux formes chromosomiques ou espèces nouvelles pour *Gerbillus* et *Acomys* ont été mises en évidence. L'étude des pelotes montre la présence d'au moins 14 taxons différents: *Desmodilliscus braueri, Nannomys* sp., *Arvicanthis* sp, *Jaculus jaculus*, 3 Gerbillinae, 2 Murinae et 2 Chiroptères (dont *Rhinopoma* sp.), ainsi que 3 *Crocidura*, dont une pourrait n'avoir jamais été observée auparavant. Les observations de terrain permettent d'ajouter 4 espèces, *Hystrix cristata, Euxerus erythropus, Lepus* sp. et 1 Erinaceidae.

La présence de Murinae, notamment *Myomys* et *Arvicanthis*, et de certains Gerbillinae typiquement sahéliens comme *D. braueri*, conforte l'hypothèse selon laquelle le massif de l'Adrar des Iforas est une zone relique ou ces espèces auraient pu être piégées lors de la dernière progression du désert vers le sud, comme en témoigne aussi la présence d'autres espèces de moyens (*Mellivora capensis, Erythrocebus patas*) et grands mammifères (*Ammotragus lervia*). L'analyse en cours du reste du matériel collecté permettra de compléter ce recensement. Des études de banding chromosomique et de séquençage d'ADN permettront de quantifier les divergences chromosomique et génétique entre les rongeurs de l'Adrar malien et les populations conspécifiques vivant dans la bande sahélienne, afin d'estimer la date d'isolement effectif de cette faune relique des Iforas.

In march 1999, a scientific mission went to Adrar des Iforas, located in north-eastern Mali in order to draw up an inventory of the Mammals of this poorly known area. The geographical situation and the medium height of this precambrian massif make it a sahelian island in the middle of the Sahara, isolated for at least 4000 years.

Several inventory methods were used: wire mesh and Sherman traps for some species, hand capture for others, observation and photographs of the animals or their marks, and studies of raptors rejection pellets. Most of the animals were kept alive to be karyotyped to confirm the determination. The first cytogenetics results (conventional staining) distinguish 7 species belonging to the genus *Gerbillus* (4 species), *Acomys* (1 species), *Arvicanthis* (1 species), and *Myomys* (1 species). Two new chromosomal forms or new species have been found for *Gerbillus* and *Acomys*. The pellets study shows at least 14 different taxa: *Desmodilliscus braueri, Nannomys* sp., *Arvicanthis* sp., *Jaculus jaculus*, 3 Gerbillinae, 2 Murinae and 2 bat species (one of which is *Rhinopoma* sp.) and also 3 *Crocidura*, one of which may never have been seen before. Field observations let us add 4 species: *Hystrix cristata, Euxerus erythropus, Lepus* sp. and an Erinaceidae.

Species of Murinae, notably of the genera *Myomys* and *Arvicanthis* and of some of the typically sahelian Gerbillinae like *D. braueri* support the hypothesis that the Adrar des Iforas is a residual zone where these species can have been "trapped" during the latest southward progression of the desert also shown by the presence of medium-sized mammals (like *Mellivora capensis, Erythrocebus patas*) and big-sized ones (*Ammotragus lervia*). The rest of the material is still being analysed and the results

will help us to complete this inventory. Chromosomal banding studies and DNA sequences will let us estimate the quantification of chromosomal and genetic divergence between the rodents of Adrar des Iforas and conspecific populations living in the sahelian area in order to find the date of isolation of the Malian Adrar and its fauna.

Cosson, J. F., M. Tranier and F. Colas (1996). On the occurrence and possible migratory behaviour of the fruit bat *Eidolon helvum* in Mauritania, Africa.

The pteropodid bat *Eidolon helvum* (Kerr 1792) is recorded for the first time in Mauritania, this is one of the northernmost record for a member of this family in West Africa, and add some information on its probable migratory behaviour.

Distribution et comportement migratoire possible de la chauve-souris *Eidolon helvum* en Mauritanie Afrique.• Cette espèce de Pteropodidae est signalée pour la première fois en Mauritanie, c'est un des point les plus au nord pour un membre de cette famille en Afrique de l'Ouest. Des informations sur son comportement migratoire probable sont ajoutées.

Cotterill, F. P. D. (1996a). New distribution records of insectivorous bats of the families Nycteridae, Rhinolophidae and Vespertilionidae (Microchiroptera: Mammalia) in Zimbabwe.

The distributions of twelve species of insectivorous bats in Zimbabwe are reviewed in light of numerous new specimens which constitute significant range extensions. The first known specimens of *Pipistrellus anchietai* and *P. melckorum* are reported from Zimbabwe.

Cotterill, F. P. D. (1996b). New distribution records of free-tailed bats (Microchiroptera: Molossidae) in Zimbabwe.

New distribution records are presented for five species of free-tailed bats from Zimbabwe; and many of the specimens examined constitute significant range extensions. These include the first known specimens of *Tadarida ventralis* from Zimbabwe and two additional specimens of *T. lobata*.

Cotterill, F. P. D. (1998). Female reproduction in two species of tropical horseshoe bats (Rhinolophidae) in Zimbabwe.

Female reproduction was studied in sympatric populations of two species of African horseshoe bats in a seasonal tropical environment of central Zimbabwe. Both *Rhinolophus simulator* and its largest African congener, *R. hildebrantii*, were monotocous and monestrous, and reproduction was highly seasonal. In 3 consecutive years, *R. simulator* gave birth consistently later (15 - 20 days) than *R. hildebrantii*, and early embryonic development was retarded in the smaller *R. simulator*. Copulations occurred during June and July of the cool-dry season, and both species gave birth to single offspring during separate synchronized periods of parturition at the start of the wet season. Lactation in both species coincided with the period of maximal rainfall, but the weaning period of *R. hildebrantii* was distinctly long.

Cotterill, F. P. D. and R. A. Fergusson (1993a). Capturing free-tailed bats (Chiroptera: Molossidae): the description of a new trapping device.

This paper reviews methods suitable for the capture of African free-tailed bats. The most successful approach is to trap molossids as they leave their daylight roosts. Traps constructed from polythene sheeting on an aluminium frame are most suitable. This design permits flexibility: traps can be easily

constructed and rapidly adapted to different situations. The construction and operation of a new mobile trap is described in detail. The effectiveness of this technique for capturing some *Tadarida* species from their inaccessible roosts is discussed and compared with conventional methods.

Cotterill, F. P. D. and R. A. Fergusson (1999). Reproductive ecology of Commerson's leaf-nosed bats *Hipposideros commersoni* (Chiroptera: Hipposideridae) in South-Central Africa: interactions between seasonality and large body size; and implications for conservation.

The annual cycle and reproductive ecology of a large population of Commerson's leaf-nosed bats, *Hipposideros commersoni*, was studied in central Zimbabwe. The influence of the extremely large body size of this microchiropteran. interrelating with a seasonal, tropical environment, was the central theme of this study. Adaptive responses to seasonal environmental changes differed between reproducing adults of the sexes. Reproductive females dispersed twice during the annual cycle, while in contrast adult males reduced activity during the cool, dry season. A polygynous mating system was characterised by breeding males defending demarcated territories within lhe daylight roost Synchronized parturitions within maternity roosts (In late October) created a hot, humid microclimate which facilitated rapid post-latal development of neonates. The large body size of *H. commersoni* is suggested to have evolved in response to different selective agents, including: availability of large, hard shelled arthropods as prey; energetic constraints; and availability offat reserves to 'ride out' inclement periods when food is limiting. Sexual selection may be the ultimate cause of a large body size. The conservation of *H. commersoni* is discussed given the history and pressures for guano exploitation of their breeding caves and the keystone role of these large bats in transferring nutrients and energy into the cavernicolous ecosystems where they roost and breed.

Cotterill, F. P. D. and S. R. Giddings (1987). Observations on the activity patterns of the lesser yellow house bat, *Scotophilus viridis*.

The activity patterns of the lesser yellow house bat, *Scotophilus viridis*, were observed during December 1984. Whilst the activity patterns of the species as a whole were in agreement with published data, significant differences between the activity patterns of males and females were found. The majority of females were active between 19h00 and 21h00, whilst the activity of males peaked between 21h00 and 22h00.

Die aktiwiteitspatrone van *Scotophilus viridis* is gedurende Desember 1984 waargeneem. Hoewel die aktiwiteitspatrone van die spesies in geheel in ooreenstemming was met gepubliseerde data, is betekenisvolle verskille gevind tussen die aktiwiteitspatrone van mannetjies en wyfies. Die meerderheid wyfies was aktief tussen 19h00 en 21h00, terwyl die mannetjies tussen 21h00 en 22h00 aktief was.

Coulanges, P., Y. Robin, G. Le Gonidec, A. Mayoux and R. Bordahandy (1974). Chiroptères et arbovirus à Madagascar (Isolement de souche de virus Dakr-bat, etude sérologique de Chauves-souris frugivores).

Les auteurs rapportent l'isolement de (leux souches de virus-Dakar-bat, à Madagascar, à partir de chauves-souris insectivores. Ce virus a pu être adapté sur cellules (BHK.21.C.13 et HeLa). L'étude en inhibition de l'hémagglutination de 101 sérums de chauves-souris frugivores *Pteropus rufus* a également permis de montrer la circulation des arbovirus Sindbis et Chikungunya dans le' groupe A et West-Nile, Wesselsbron dans le groupe B.

Courts, S. E. (1996). Insectivory in two species of fruit bat: *Pteropus livingstonii* and *P. rodricensis*. Abstract.

Two fruit bat species of the genus *Pteropus*. Livingstone's fruit bat *P. livingstonii* and the Rodrigues fruit bat *P. rodricensis* have been observed in captivity actively catching and eating insects. Both species adopt the same technique to trap flying insects using their wings to envelop them. The capture position was assumed within 0.84 seconds (± 0.09) of the bat becoming aware of the insect, and its spontaneity indicates that the response is not an artefact of captivity. The behaviour was observed in captive-bred *P. rodricensis* which had no prior access to insects, suggesting that it is innate. A higher rate of successful captures was recorded for an older. wild-caught *P. livingstonii* female, indicating that the effectiveness of the technique used improves with age. Significant differences in the amount of time spent catching insects by males and females were evident in this species. This study supports suggestions that insects are eaten by some megachiropterans in order to supplement their protein intake, and has implications for the behavioural enrichment and nutrition of captive bats.

Cowles, R. B. (1936). Notes on the mammalian fauna of Umzumbe Valley, Natal, South Africa.

The following data were collected during a stay of 18 months in the Umzumbe Valley, where the writer was engaged in procuring detailed information regarding the life histories of certain birds and one reptile, the Nile monitor. While continuing this work, especial efforts were made to obtain as complete an understanding of the vertebrate fauna as possible, and it was in the pursuit of this objective that the present data were accumulated.

South Africa is an exceedingly large territory and while the topography and possibly the smaller mammals will remain unchanged for many decades, some of the sections, notably those in the less desirable locations that have been allotted to the natives, are undergoing a process of rapid alteration, because of the activities of the inhabitants in building houses, cultivating the hillsides, and herding grazing animals over the steep slopes. In many areas erosion is becoming a serious menace.

The studies here set forth were made in the confines of the Umzumbe River Valley in a section approximately 12 miles by road from the railway station named after the river. The Umzumbe River flows in a northwesterly direction. Twelve to 16 miles from the river mouth the valley lies behind high barriers of hills which cut off the tempering winds of the sea. Although rainfall is somewhat less abundant in these protected valleys, the xerophytic character of the vegetation is predominantly the result of insolation, the closed nature of these deep valleys, the consequent heating of the air, and the presence of strong reflections from neighboring surfaces.

The sections of the Umzumbe Valley allocated to natives (and they are badly over-crowded) are rapidly being denuded of all cover, either by direct human action or indirectly by the herds of cattle and the far more pernicious flocks of goats. As cattle suffer from depletion of their food supply, the natives keep an increasing proportion of goats, thus starting a vicious cycle which only can terminate in complete denudation of these areas. Other valleys and other native locations are faced with the same problems.

The native faunas of these districts suffer from the changes even before they become obvious to those interested only in the economic phases, and when these notes were being compiled, it was observed by native helpers that many animals which they had considered common a few years before, had practically disappeared.

During the 7 years that have elapsed between the collection of my specimens and notes, and the date of this writing (1935), floods and drought have played their part in affecting the terrain, and where dense bush once formed ample cover to shelter bush-buck and duiker, there remain now only small remnants through which a man can walk erect and see clearly for many yards in every direction. Only on the private estates farther inland, on crown lands, and along the valley nearer the sea, are conditions at all comparable to those once found in the area under consideration.

Crawford-Cabral, J. (1966). Quatro formas de mamíferos novas para Angola.

O autor cita *Eptesicus hottentotus pallidior* pela primeira vez para Angola. Cita também o género *Pronolagus*, classífica os animais dos distritos da Huila e de Moçâmedes na subespécie *Pronolagus caucinus waterbergensis* e resume a situação taxonómica das formas deste género no Sudoeste Africano. Descreve para as planícies do Morro do Camelo, distrito do Moçâmedes, uma nova subespécie, *Petromus typicus coetzeei*. Cita, por último, a Suricata para a regíão que se situa entre os rios Curoca e Cunene, classificando a na forma. *Suricata suricatta hahni*.

L'auteur cite l'*Eptesicus hottentotus pallidior* pour la première fois en .Angola. Il cite aussi le genre *Pronolagus*, classifie les animaux des districtes d'Huila et de Moçâmedes dans la sous-espèce *Pronolagus caucinus waterbergensis*, et fait un abrégé sur la situation taxanomique de ce genre dans le Sudouest Afrícain. L'auteur décrit une nouvelle sous-espèce, *Petromus typicus coetzeei*, pour les plaines de "Morro do Camelo", dans le district de Moçâmedes. Enfin, il cite la Suricate pour la. région que se trouve entre les fleuves Curoca et Cunene et la classifie de *Suricata suricatta hahni*.

Eptesicus hottentotus pallidior is recorded for the first time, from Angola. *Pronolagus* occurs in Angola, the specimens from the Huila, and the Moçâmedes districts beeing regarded as to belong to the subspecies *Pronolagus caucinus waterbergensis*, and a summing up on the taxonomíc situation of *Pronolagus* in the South-West Africa is done. A new subspecies *Petromus typicus coetzeei*, is described from the "Morro do Camelo" plains, in the Moçâmedes district. Finaly. the Suricate is recorded from the country between the Curoca and Cunene rivers, under the name of *Suricata suricatta hahni*.

Crawford-Cabral, J. (1989). A list of Angolan Chiroptera with notes on their distribution.

Sixty one taxa of bats (most of them species) are listed for Angola. The collecting localities cited in the literature are mentioned for each of them, as well as the material examined, housed in the ex-Centro de Estudos do Lubango, Angola (a department of the ex-Instituto de Investigação Científica de Angola), and in the Centre de Zoologia of the Institute de Investigação Científica Tropical, in Lisbon. Notes on distribution are also given for many of the taxa. The list is accompanied by distributional maps and is preceded by some introductory zoogeographical considerations.

Constam desta lista sessenta e um táxones de morcegos de Angola (a maior parte dos quais são espécies), sendo mencionadas, para cada um deles, as localidades de colheita citadas na literatura, assim como o material observado, pertencente ao ex-Centro de Estudos do Lubango, Angola (departamento do ex-Instituto de Investigação Científica de Angola), e ao Centro de Zoologia do Institute de Investigação Científica Tropical, Lisboa. Para muitos desses táxones foram acrescentadas notes sobre a sua distribuição. A lista é acompanhada de mapas de distribuição e precedida de algumas considerações introdutórias de ordem zogeográfica.

Crick, J., G. H. Tignor and K. Moreno (1982). A new isolate of Lagos Bat virus from the Republic of South Africa.

In 1980, a virus isolated from a bat in Natal, Republic of South Africa, was initially identified in the fluorescent antibody test as rabies virus. We have now shown this isolate to be Lagos bat virus. The possible epizootiological significance of this finding is discussed.

Csorba, G., P. Ujhelyi and N. Thomas (1999). Horseshoe bats of the world: systematics, distribution, ecology and conservation. Abstract.

To date, 71 species of horseshoe bat (Chiroptera: Rhinolophidae) are recognised worldwide. The current project seeks to summarise the external, cranial and dental characters of each species, evaluate their intraspecific variation and spot-map their distributions. There will be a review of their

ecology, feeding and breeding biology and a conservation status report will be given. Endemic species will be highlighted.

The family Rhinolophidae range throughout the Old World from Ireland to Japan, Africa and Australasia. While some species have extensive geographical ranges, others have relatively restricted distributions with a number of species being known only from the type locality, or from a few local records. For the majority of species, their population status is poorly known, and it is possible that once widespread and abundant taxa may have experienced a significant reduction in population size.

At least 11 species may be considered vulnerable, endangered or critically endangered; data for 7 species are so limited as to make any estimate of conservation status impossible. This work, illustrated with drawings, maps and photographs, will be published as a comprehensive monograph and will be available from Harrison Zoological Museum Publications in the year 2000. This publication will be essential reading for all those working on horseshoe bats worldwide.

Soixante et onze espèces de Rhinolophidae sont reconnues dans le monde aujourd'hui. Notre projet vise a réunir les caractéristiques externes, crâniennes et dentaires de chaque espèce, évaluer leur variation intraspécifique et cartographier leur distribution. Une synthèse de leur écologie, alimentation et biologie de la reproduction sera faite, et leur statut vis-à-vis de la conservation précise. Les espèces endémiques seront mises en avant.

Les Rhinolophidae sont repartis a travers l'Ancien Monde de l'Irlande au Japon, à l'Afrique et l'Australasie. Alors que certaines espèces ont des distributions géographiques très grandes, d'autres sont très localisées, voire connues seulement de la localité-type. Pour la majorité des espèces, le statut des populations est mal connu, et il est possible que des réductions significatives de taille de population aient eu lieu chez des espèces autrefois répandues et abondantes.

Au moins onze espèces doivent être considérées comme vulnérables, en danger ou en situation critique. Les données concernant sept espèces sont si limitées qu'il est impossible d'estimer leur statut. Ce travail sera publie en 2000 et constituera une synthèse essentielle pour ceux travaillant sur les Rhinolophidae du monde.

Cumming, G. S. and R. T. F. Bernard (1997). Rainfall, food abundance and timing of parturition in African bats.

We used published results from studies in Africa to test the hypothesis that the timing of parturition in the Chiroptera is constrained by rainfall. Comparison of year-round rainfall and insect data at various latitudes showed that insect abundance peaks approximately a month after peak rainfall. A similar comparison of parturition time to rainfall showed that with the possible exception of the molossids, the Microchiroptera commonly give birth a month before peak rainfall. With an average 6-week lactation period in the Microchiroptera, the timing of parturition is such that young bats are weaned just before the period of maximum insect abundance. We suggest that the needs of the young in this post-weaning period may be more important than the energetic demands of lactation on the mother in determining the timing of parturition on an evolutionary scale. A similar conclusion is implied for the African Megachiroptera, but there is insuffient information on their reproduction to adequately test the main hypothesis for these bats.

Cunneyworth, P. [Ed] (1996a). Kwamarimba Forest Reserve. A biodiversity survey.

Kwamarimba forest reserve is situated in the East Usambara mountains in north-east Tanzania. The East Usambaras form part of the mountain chain called the Eastern Arc which ranges from southern Kenya to southern Tanzania. These mountains are known for their rich floral and faunal diversity and high levels of species endemism (Hamilton, 1989). To investigate further this biodiversity, a biological survey of Kwamarimba forest reserve was conducted with a socio-economic component between October and December 1995 for a total of 51 research-days.

This report summarises the findings of the survey in terms of floral and faunal inventories. Notes on ecological requirements and degree of endemism for each species is presented to provide an indication of the number of (a) forest dependent species as opposed to forest non-dependent and non-forest species; (b) threatened and rare species (based on IUCN 1994 criteria) and (c) endemics and near-endemics to the Usambara mountains. These are presented so as to highlight the importance of Kwamarimba forest reserve in a national and international context. These three categories are then combined to assess which species are considered at high risk of becoming locally extinct if the forest continues to be further degraded and fragmented.

The survey identified 165 species of tree and shrub, 16 species of mammal, 11 species of bird, 17 species of reptile and 11 species of amphibian.

Flora

Four tree species are endemic to the Usambara mountains and 39 which have restricted ranges limited to the Eastern Arc and/or East African lowland forests. Thirty-seven species are dependent on primary forest, and of these species, 14 were also endemic or near endemic to the Usambara mountains. Twenty non-forest tree and shrub species are established within the reserve boundaries.

Species of particular interest encountered during this survey included:

Cola usambarensis, Cynometra brachyrrhachis, and *Cynometra longipedicellata* are wet evergreen forest trees, endemic to the East Usambara mountains recorded in the reserve. The first two were recorded twice and the latter 15 times;

Rinorea angustifolia, a wet evergreen forest tree, endemic to the East and the West Usambara mountains was recorded once in the reserve;

Sapium armatum, a small dry forest tree, previously recorded as a coastal endemic, is a new record for the region (FTEA);

Nesogordonia holtzii is considered a coastal endemic tree. The occurrence of this species in the Usambaras may represent a range extension however the full description of this species has yet to be published.

Fauna

Three faunal species were recorded which are endemic to the Usambara mountains and fourteen species were recorded as near-endemics, having restricted ranges limited to the Eastern Arc and/or East African lowland forests. Twenty species are dependent on primary forest, and of these species, 15 are also endemic or near endemic to the Usambara mountains. One non-forest species is established in the reserve.

Species of particular interest encountered during this survey include:

Typhlops pallidus, the pallid blind snake, known from Sudan, Kenya and Zanzibar. This is the first record from the Tanzanian mainland;

The Usambara eagle owl, *Bubo vosseleri*, and the Southern hyliota, *Hyliota australis* spp. *usambarae*, were recorded in the reserve. Both are endemic to the Usambara mountains. The former, is a CITES II species, also considered 'Vulnerable' by IUCN;

Mertensophryne micranotis is listed as 'Endangered' by IUCN;

Sheppardia gunningi, Bubo vosseleri, Philothamnus macrops, Elapsoidea nigra, Rhampholeon brevicaudatus, Bufo brauni, Leptopelis barbouri, and *Scolecomorphus vittatus* are listed as 'Vulnerable' by IUCN;

Chamaeleo melleri, Swynnertonia swynnertoni and *Rhynchocyon cirnei* spp. *petersi* are listed as 'Near-threatened' by IUCN.

Soils

The soils of Kwamarimba are typical of other soils studied in the East Usambaras. Human disturbance was found to be a major contributing factor to the differences in soil type. These differences are mainly in respect to nutrient status. Due to the tight nutrient cycle of the forests, this likely affects the vegetation the soil is able to sustain.

Disturbance

The highest level of pole and timber extraction recorded in the reserve was located on the transect which runs near to the central area of the reserve. This transect is characterised as mature mixed forest away from the reserve boundaries with areas of grassland and open/disturbed forest toward the boundaries. Trapping was not conducted on this transect therefore it is not possible to determine the extent the disturbance has on presence or absence of zoological species.

Socio-economics

The people living in the area of Kwamarimba forest reserve do not appear to understand the advantages of the forest reserves. They are given little information and education about the reserves and are thus unlikely to change their attitudes and consequently behaviour which have a direct impact on the forest, its' quality and long-term sustainability.

Cunneyworth, P. [Ed] (1996b). Kambai Forest Reserve: A biodiversity survey.

Kambai forest reserve is situated in the East Usambara mountains in north-east Tanzania. The East Usambaras form part of the mountain chain called the Eastern Arc which ranges from southern Kenya to southern Tanzania. These mountains are known for their rich floral and faunal diversity and high levels of species endemism (Hamilton, 1989). To investigate further this biodiversity, a biological survey of Kambai forest reserve was conducted with a socio-economic component between January and March 1996 for a total of 52 research-days.

This report summarises the findings of the survey in terms of floral and faunal inventories. Notes on ecological requirements and degree of endemism for each species is presented to provide an indication of the number of (a) forest dependent species as opposed to forest non-dependent and non-forest species; (b) threatened and rare species (using IUCN 1994 criteria) and (c) endemics and near-endemics to the Usambara mountains. These are presented to highlight the importance of Kambai forest reserve in a national and international context. These three categories are then combined to assess which species are considered at high risk of becoming locally extinct if the forest continues to be further degraded and fragmented. The survey identified 162 species of tree and shrub, 36 species of mammal, 11 species of bird, 18 species of reptile and 15 species of amphibian.

Czekala, N. M. and K. Benirschke (1974). Observations on a twin pregnancy in the African Long-tongued fruit bat (*Megaloglossus woermanni*).

This paper presents the findings of twin embryos of differing size in *Megaloglossus woermanni*. The possibilities for the cause of this unusual size difference are explored. Due to the excellent preservation of tissues in both embryos, the lack of any serious abnormalities in the small twin, and the age difference as determined by kidney sections, we have concluded the small twin to be superfetated.

Dalquest, W. W. (1965). Mammals from the Save River, Mozambique, with descriptions of two new bats.

During October 1963, 325 specimens of mammals were obtained from the Save River area, Mozambique, mostly near the hunting camp of Zinave, midway between the Indian Ocean and the Southern Rhodesian boundary. *Nycteris vinsoni* and *Scotophilus alvenslebeni* are described as new, *Triaenops persicus* is recorded from southern Africa for the first time, and data are provided concerning 51 other kinds of mammals, most of which are represented by specimens.

Dalquest, W. W. (1968). Additional notes on the mammals from Mozambique.

In October 1963, an expedition sponsored by Mr. Jerry Vinson obtained a collection of mammals from the Save River region of Mozambique. The bulk of this collection was taken at Zinave, a hunting camp on the south side of the river located approximately midway between the Indian Ocean and the Rhodesian boundary. The results of the first collection have been reported (Dalquest, J. Mamm., 46: 254-264, 1965).

In October 1965, a second expedition to the Save River was sponsored by Mr. Vinson. Personnel included Mr. and Mrs. Vinson, the writer, several white hunters, and numerous native helpers in the employ of Mozambique Safarilandia. Baron Werner von Alvensleben, Director of Mozambique Safarilandia, offered every assistance in making our work successful.

The base camp was again at Zinave, and additional mammals were taken there. Major efforts were directed to collecting at Panzila, a hunting camp midway between Zinave and the Rhodesian boundary. The specimens taken there are labeled "Panzila, 166 km S, 200 km W Beira, Mozambique." Although Panzila is at a considerable higher elevation than Zinave, it is still well east of the highlands along the Rhodesian boundary. Surroundings are essentially similar to those at Zinave. Major differences are the higher gradient of the Save River, low riverside cliffs of conglomerate, and some extensive but low cliffs of conglomerate capping the hills.

Large and small mammals were abundant both at Zinave and at Panzila. However, little time was spent in preparation of the specimens that duplicated the 1963 collection, so that more time might be spent in the field. The following specimens were obtained.

Davis, D. H. S. (1957). Studies on Arthropod-borne viruses of Tongaland. III. The small wild mammals in relation to the virus studies.

Fifteen species of small mammals were studied in the Lake Simbu area of Tongaland during April and May, 1955. Blood specimens were obtained from 10 of these species for immunological studies. Neutralisation tests with 4 viruses isolated in Tongaland gave negative results. Owing to the small number of samples tested no conclusion can be drawn from these results.

Dean, W. R. J. (1975). *Tyto alba* prey in South West Africa and the Northern Cape.

Ten collections of barn owl (*Tyto alba*) pellets from four localities in South West Africa and four collections from three localities in the northern Cape have been analyzed. Localities of the barn owl roosts and pellet collection sites are listed below.

De Beaux, O. (1922a). Mammiferi abissini e somali.

Ho riunito I mamm. Riportati dal Cap. Carlo Citerni, comandante la missione par la delimitazione tra la Somalia e l'Etiopia, V. 1908 - I. 1912, con quelli donati dal sig. Virginio Romano Scotti, del Setit, Eritrea,

1908. Questi ultimi, contrassagnati con R., constituiscono una lodevolissima raccolta di caccia grossa; i primi comprendono 41 specie o sottospecie, 4 della quali appaiono nuove. È nuova anche la decriz. del cranio di *Galao gallarum*, Thos.. La località "Dolo" va intesa in senso molto ampio e prevalentemente come "in marcia verso o da D."

De Beaux, O. (1922b). Collezioni zoologiche fatte nell'Uganda dal Dott. E. Bayon. XVII. Mammiferi. Parte II. Chiroptera.

I Chirotteri trattati nel presente lavoro constituiscono un contributo alla conoscenza della Mammalofauna del Lago Vittoria e particolarmente delle sue isole. Il materiale risulta di 23 specie o sottospecie in 1172 esempl., interni in alcool. Numero di catalogo tra parentesi.

De Beaux, O. (1923). Di alcuni Chirotteri africani del Museo civico di Milano.

Il presente lavoro è basato su alcuni Chirotteri africani che il Dott. B. Parisi, Direttore della Sezione di Zoologia, gentilmente mi affidò in istudio. Sentitamente ringraziando, sono lieto di potere constatare che la piccola, ma fortunata raccolta, dovuta in massima parte al BARONE L. FRANCHETTI et al COMM. L. TONKER, serve ad amplificare le cognizioni in materia. Le due località spesso citate di *Archers Post* et *Bulessa* si trovano sul fiume Guaso Nyiro settentr. Vicino allo sbocco del fiume Lakiundu, a Nord del monte Kenia nell'Africa orient. Inglese.

De Beaux, O. (1924). Mammiferi della Somalia Italiana raccolta del maggiore Vittorio Tedesco Zammarano nel museo civico di Milano.

Le spedizioni del Maggiore Vittorio Tedesco Zammarano Vittorio nella Somalia meridionale 1915-16 e 1921-22 (vedi ZAMMARANO, Impressioni di caccia in Somalis Italiana, Milano, 1921, e PARISI, Natura, Milano, XIV, Fasc. 1, 1923, p. 17-19) hanno dato un validissimo contributo alle nostre cognizioni sui mammiferi della Somalia italiana.

Mentre infatti, in base a materiale riportato da precedenti esploaratori non si registravano per il territorio italiano che 21 specie, oggi se ne elencano 87, delle quali 78 sono accuramente studiate su materiale assicurato in Musei italiani.

Mi è grato porgere al Dott. Bruno Parisi, l'attivo Direttore delle Sezione Zoologica del Museo Civico di Storia Naturale in Milano, i miei sentiti ringraziamenti per l'incarico affidatomi di studiare il cospicuo materiale mammalogico, dall'intelligente ed instancabile raccoglitore donato a codesto Museo.

Delle 43 forme riportate dallo Zammarano, 1 specie e 2 sottospecie risultatno nuove per la scienza. Molte altre porsero occasione a numerose ed utili considerazioni.

De Beaux, O. (1934). Mammiferi raccolti dal Prof. G. Scortecci nella Somalia Italiana Centrale e Settentrionale nel 1931.

La spedizione Scortecci nella Somalia Italiana (Bibl. 45 e 36) può dirsi molto fruttuosa per la conoscenza della Mammalofauna di questa nostra colonia, risultato particolarmente meritorio, se si riflette che la Somalia centrale e settentrionale costituiscono una zona faunisticamente piuttosto povera.

Lo Scortecci ha riportato 39 specie o sottospecie di Mammiferi cosi suddivise : 2 Primati, 13 Chirotteri, 5 Carnivori, 15 Roditori, 4 Ungulati.

Di questi 39 Mammiferi, 12 provengono dalla Somalia Italiana meridionale e precisamente 2 Primati, 6 Chirotteri, 1 Carnivoro, 3 Roditori.

Tra i 12 Mammiferi somali meridionali si trovano: 1 nuova specie di Topo spinoso, dono di E. Bovone (*Acomys bovonei*, spec. nova); "1 "bell'esemplare del notevole Chirottero *Glauconycteris*, dono del Governatore di allora Dott. G. Corni (*Gl variegata phalaena*, Thomas), 1 *Epomohiorus anurus*, Heuglin, ed 1 *Jaculus jaculus vulturnus* Thomas, che rappresentano 4 nuove acquisizioni per la Mammalofauna di quella zona.

Dei 27 Mammiferi riportati dalla Somalia Italiana centrale e settentrionale, 1 risulta appartenere ad una sottospecie nuova : *Heterocephalus glaber scorteccii*, fatto assai notevole, in quanto che questa forma sembra essere in realtà l'unica che non rientra nella tipica *glaber glaber*, Rüppell.

Dei rimanenti 26 Mammiferi non meno di 14 rappresentano acquisizioni nuove per la Mammalofauna della nostra Colonia, 12 delle quali sono da ritenersi proprie della Somalia Italiana centrale e settentrionale, in comune colla Somalia Britannica.

Le 18 forme che col presente lavoro vengono introdotte nella Mammalofauna della Somalia Italiana sono:

DeBlase, A. F. (1972). *Rhinolophus euryale* and *R. mehelyi* (Chiroptera, Rhinolophidae) in Egypt and southwest Asia.

Various criteria which have been used to distinguish between *Rhinolophus euryale* and *R. mehelyi* are presented. Of these lancet shape and certain cranial measurements (particularly zygomatic width) are shown to be the most reliable for specimens from southwest Asia. Both species are shown to be present in the USSR, Turkey, Iran, and Israel and both are shown to occur in the same caves in Iran. Only *R. mehelyi* is reported from Egypt and Cyprus. Several new locality records are given for Iran and *R. mehelyi* is reported for the first time from Iran, Israel and Jordan.

Decher, J. (1997). Bat community patterns on the Accra Plains of Ghana, West Africa.

Bat communities were sampled with mist nets at eight localities on the Accra Plains and two localities in the Northern Region of Ghana. I encountered five species of fruit bats (Pteropodidae) and 26 species from seven families of Microchiroptera in a total of 252 bats netted.

Glauconycteris poensis, Hipposideros cyclops, and *H. abae* were caught only in sacred groves protected by traditional law, whereas *Taphozous perforatus* was netted only near rocky cliffs in the legally protected Shai Hills Resource Reserve. *Myonycteris torquata* and *Myotis bocagei* were caught only at the edge of experimental forest plots in the northeastern part of the Accra Plains near the lower Volta River. There was a statistically significant negative correlation between canopy cover and bat species abundance and diversity.

Relatively open savanna at Shai Hills located close to bodies of water apparently had the greatest diversity and abundance of bats. The diversity of bats on the Accra Plains slightly exceeded published data from other savanna regions in West Africa.

Decher, J., D. A. Schlitter and R. Hutterer (1997). Noteworthy records of small mammals from Ghana with special emphasis on the Accra Plains.

In this paper we describe new or additional records of four species of shrews (Soricidae), nine species of bats (Hipposideridae, Vespertilionidae, Molossidae), and one species of rodent (Muridae) from Ghana. These records add to our knowledge of the distribution of small mammals in Ghana especially

those occurring on the Accra Plains. A zoogeographic explanation for these distributional data is sought in the context of the Dahomey Gap phenomenon

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De Graaff, G. and R. B. Martin (1972). A survey of existing sound recordings of mammals and birds of southern Africa (during the period December 1971 - February 1972).

The present status of sound recording of mammals and birds in Southern Africa is assessed. It is clear that the most significant collections of recording are the result of private initiative by a very small number of individuals. Only some 9 % of mammals and 61 % of birds have been recorded. Possible ways and means to overcome hazards for recording unrecorded species are indicated. The idea of a national wildlife sound collection is supported and recordists are encouraged to place their recordings (or copies) with the South African Broadcasting Corporation Sound Archives.

De Graaff, G. and J. A. J. Nel (1970). Notes on the smaller mammals of the eastern Cape National Parks.

During November/December 1965, at the invitation of the National Parks Board a survey was made of small mammals (insectivores, bats, smaller carnivores, rodents and lagomorphs) occurring in the National Parks of the eastern Cape. The aim was threefold: to determine which smaller, and therefor less conspicuous mammal species were present and to assess their relative abundance and distribution in the various habitats available in each park. Parasites were also collected. The following is a preliminary note on the small mammals of the Mountain Zebra National Park, the Addo Elephant National Park, and the Tsitsikama Forest and Coastal National Park. The survey was undertaken by using various types of traps, sight records, owl pellet analyses (when available) and published sources. Further visits are envisaged. Trapping was undertaken at localities which seemed typical of the various habitat, and no line transects were used.

De Graaff, G. and I. L. Rautenbach (1983). A survey of mammals in the newly proclaimed Karoo National Park, South Africa.

The African continent covers an area of 28,672,000 km^2 and carries the most diverse mammal fauna in the world (Cae, 1980). At the southern tip of this continent, the Republic of South Africa (RSA) with its diversity of abiotic and biotic factors, is rich in natural assets, thus challenging the conservation conciousness of man (de Graaff, Robinson,van der Walt, Bryden & van der Hoven, 1979). A well-known area of the Republic of South Africa encompasses the Karoo, covering a large portion of the South African land surface. It is a region with a harsh climatic and environmental regime, necessitating a high degree of adaptability of its faunistic and floristic components. In the RSA a ± 3,000,000 ha National Park movement exists. An important gap was present in the National Parks system in the absence of any conserved area representative of the Karoo. Such an area can be thought of as an area of land which has effectively been removed from the development stream for the purpose of perpetuating natural conditions (Pyle, 1980). The underlying concept of the National Parks Act of 1926 (as amended in 1962) is the establishment of a worthy National Park in each of South Africa's diverse ecosystems. The direction of the National Parks Board and the management policy thereof is steadily progressing towards the conservation of ecosystems, rather than the manipulation of populations of individual species.

In 1972 the International Union for the Conservation of Nature (IUCN) urged member countries to set aside additional areas as National Parks. The relevant South African authorities consequently proposed the proclamation of the Karoo National Park (KNP). Subsequent surveys by the National Parks Board, in close cooperation with the South African Nature Foundation (SANF) endeavoured to determine the most appropriate region to establish the envisaged conservation resource. It was decided to accept an offer of 7,209 ha of commonage by the Municipality of Beaufort West (a town proclaimed in 1818) while the SANF proceeded with a nationwide fund raising campaign. To date the

Park comprises some 23,000 ha (eventual aim at least 100,000 ha) and was officially proclaimed and opened on 12 September 1979 (de Graaff *et al.*, 1979).

This paper is the first detailed survey on mammals occurring in the KNP and as such it seems to be the first detailed account of an assemblage on mammals typical to the Karoo. Notes are presented on some 50 odd species, either occurring naturally in the area, or on those reintroduced into the new park (mainly larger mammals) whose reintroductions are based on earlier and reliable references in the literature. The information presented in this paper forms part of data required for management procedures.

Deleuil, R. and A. Labbe (1955a). Contributions à l'étude des chauves-souris de Tunisie.

Ces quelques recherches, qui seront suivies d'autres, jettent une lueur nouvelle sur l'étude des chauves-souris de Tunisie. Nous constatons que le *Myotis myotis oxygnathus* est extrêmement répandu et abondant dans les galeries de mines et dans les grottes de la Tunisie du Nord; le *Miniopterus schreibersii* et le *Rhinolophus euryale* se trouvent dans les mêmes gîtes mais en quantités beaucoup moindres; le *Rhinolophus ferrumequinum* semble relativement abondant dans certaines galeries de mine. Quant à *Pipistrelles kuhlii*, cette espèce paraît extrêmement abondante dans les villes, au moins celles du Nord. L'*Eptesicus isabellinus* et le *Plecotus auritus* n'ont été capturés que dans le Sud et en quantité relativement minime.

Delfinado, M. D. , Baker, E. W. (1963). Mites of the family Spinturnicidae from the Philippines (Acarina).

Four genera in Spinturnicidae are recognized from bats collected in the Philippines. Among the 7 species treated in this paper, 1 belongs to *Spintumix* von Heyden, 3 to *Meristaspis* Kolenati, 2 to *Ancystropus* Kolenati, and 1 to *Oncoscelus*, n. gen. The species described and illustrated are *Spinturnix verutus*, n. sp., *Meristapis calcaratus* (Hirst), *Meristaspis mindanaoensis*, n. sp., *Meristaspis lateralis* (Kolenati), *Ancystropus eonycteris* n. sp., *Ancystropus palawanensis*, n. sp., and *Oncoscelus kanheri* (Hiregaudar and Bal) n. comb.

Demeler, A. (1981). Small mammals and the food of owls (*Tyto* and *Bubo*) in northern Nigeria.

120 specimens representing 13 species of small mammals were collected in Yankari Game Reserve, northern Nigeria and in cultivated land outside the reserve. Of these, *Crocidura odorata, C. pasha, Epomophorus gambianus, Tadarida (Mops) condylura* and *Graphiurus murinus* are new records for the reserve. Pellets from *Bubo africanus* and *Tyto alba* were examined: shrews and rodents were the most important prey. New records for the reserve as indicated in owl pellets are *Taphozous mauritianus, Nycteris major, Crocidura flavescens, C. poensis* and *Dasymys incomtus*. *Suncus infinitesimus* was found in pellets from Futuk.

Demeter, A. (1982). Prey of the Spotted Eagle-Owl *Bubo africanus* in the Awash National Park, Ethiopia.

The prey composition of *Bubo africanus* is reported as determined by analyses of prey remains from a roosting site in the Awash National Park of Ethiopia. Mammals accounted for 88 % of the total number of prey items, in particular *Tatera robusta, Arvicanthis somalicus, Cerbillus pusillus* and *Crocidura fuscomurina* were the most frequent prey. By mass *Tatera robusta* and *Arvicanthis somalicus* made up over 60 % of the total mass of mammalian prey. *Crocidura* cf. *lusitania, C.* cf. *viaria, C. pasha* and *Steatomys* sp. are first recorded for the whole of Ethiopia. In addition to these, *Myotis tricolor* and *Praomys* cf. *fumatus* are first recorded for the Awash National Park.

Es wird fiber das Beutespektrum der Eule *Bubo africanus* im Awash Nationalpark in Athiopien berichtet. Dazu wurden Beutereste aus einem Nestplatz analysiert. Sauger bildeten 88 % der Gesamtzahlvon Beuteresten, am haufigsten waren *Tatera robusta, Arvicanthis somalicus, Gerbillus pusillus* und *Crocidura fuscomurina*. Die zwei Ratten *Tatera robusta* und *Arvicanthis somalicus* machten 60 % des Gesamtgewichtes an Saugern aus. *Crocidura* cf. *lusitania, C.* cf. *viaria, C. pasha* und *Steatomys* sp. werden erstmals fur Athiopien nachgewiesen, *Myotis tricolor* und *Praomys* cf. *fumatus* erstmals fur den Awash Nationalpark.

Demeter, A. and G. Topál (1982b). Ethiopian mammals in the Hungarian Natural History Museum.

A collection of 418 specimens belonging to 78 species of Ethiopian mammals is deposited in the Hungarian Natural History Museum. These are identified and notes on taxonomical aspects, distribution and field observations are included. A number of collecting localities are additional to the already known distributions of the species. *Myotis bocagei* is recorded for the first time for the country, and the second full specimen available for a rare genus, *Megadendromus*, is reported.

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de Paz, O. (1994). Systematic position of *Plecotus* (Geoffroy, 1818) from the Iberian Peninsula (Mammalia: Chiroptera).

The taxonomy of the genus *Plecotus* in the Iberian Peninsula and the Canary Islands was studied based on 129 specimens organized in several samples, including *P.auritus, P. austriacus austriacus, P. austriacus christiei* and *P. teneriffae*. Univariate and multivariate morphometric analyses indicated the existence of three different groups: *P. austriacus, P. auritus auritus* and a population of *P. auratus* from the south of the Iberian Peninsula, including *P. teneriffae* from the Canary Islands. With a discriminant analysis for a priori groups, the maximum of matrix classification (94.4%) was obtained from 9 characters of the 20 which were simultaneously considered. The *Plecotus* population from the south of the Iberian Peninsula seems to be closer to *P. auritus auritus* and it should be regarded as a new subspecies. Its geographical distribution coincides with areas of high altitude in the Supramediterranean Level.

Nous avons étudié la taxonomie du genre *Plecotus* dans la Péninsule ibérique, sur la base de 129 individus repartis en plusieurs échantillons appartenant à *P. auritus, P. austriacus austriacus, P. a. christiei* et *P. teneriffae*. Les analyses morphométriques, uni- et multivariées, ont indiqué l'existence de trois groupes différents: *P. austriacus, P. auritus auritus* et une population de *P. auritus* du sud de la Péninsule ibérique. Avec une analyse discriminante pour les groupes faits a priori, la classification maximale de la matrice (94.4%) fut obtenue avec 9 des 20 caractères considérés simultanément. La population de *Plecotus* du sud de la Péninsule ibérique semble être plus proche de *P. a. auritus* et elle pourrait être considérée comme une nouvelle sous-espèce. Sa distribution géographique coïncide avec les régions de haute altitude du niveau supraméditerranéen.

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de Roguin, L. (1988). Notes sur quelques mammifères du Baluchistan iranien.

A small collection of mammals from Iranian Baluchistan is studied. New localities are given for several species, and a new species of microtine rodent and a new subspecies of vespertilionid bat are described.

Une collection de mammifères du Baluchistan iranien est étudiée. De nouvelles localités sont données, une nouvelle espèce de *Microtus* et une nouvelle sous-espèce d'*Eptesicus* sont décrites.

De Sousa Dias, A. (1970). Mamiferos de Moçambique.

A lista que segué, representa apenas o agrupamento de espécies de mamíferos identificados em Moçambique, na sua maior parte por naturalistas estrangeiros que aquí se deslocaram ou que aquí enviaram colectores.

Calcula-se que falte um número considerável de espécies, dado que nunca foi feita uma verdadeira prospecção zoológica da Provincia, assim como é possível também que alguns animáis mencionados já não existam nos días de hoje.

Os trabalhos realizados vêm da segunda metade do século XVIII e incidiram principalmente sobre os territórios da África do Sul, Rodésias e Niassalandia.

Tudo leva a crer que as penetrações em terras de Moçambique se devem a ocasional curiosidade dos investigadores e não a acções prèviamente programadas. Assim, além de reconhecimentos da fronteira, apenas foram atingidas regiões de fácil acesso, tais como: Maputo, Lourenço Marques, rio Limpopo, Inhambane, Coguno, rio Save, Beira, Sena, Marromeu, Gorongosa, Boror, rio Zambeze e Tete. Existcm, portanto, áreas imensas sern qualquer prospecção realizada até hoje.

Na lista que apresentamos mencionam-se também: algumas espécies estucladas pelo médico-veterinário Dr. Travassos Dias, outras que se encontam no Museu Álvaro de Castro de Lourenço Marques e outras ainda que, por existirem junto às nossas fronteiras, tudo leva a crer que tenham também representação em Moçambique.

Este trabalho poderá interessar futuras campanhas zoológicas, pois marca segundo eremos, ponto de partida a investigações que devem ser efectuadas quanto antes, dada a missão cultural que nos cumpre levar a cabo nesta Provincia Ultramarina de Moçambique.

De Vree, F. (1969). Notes on *Xiphonycteris spurrelli* Dollman from the Togo Republic (Microchiroptera - Molossidae).

Recently the Koninkllijk Museum voor Middem-Afrika (Tervuren) (KMMA) received a large collection of bats collected by Mr. C. VERONESE in the Republic of Togo (West Africa). Among the Microchiraptera I found four interesting mollosids, belonging to a species of extreme rarity in collections: *Xiphonycteris spurrelli* DOLLMAN. Two are adult females, the first known.

Up to now only two specimens were known with certainty, namely the type and the topotype, both - males collected in the closed forest zone in Ghana (Bibiamiaha). The female thus far remained unknown. In the British Museum (Natural History) however there is a female specimen (BMNH N° 53.556), also from Ghana (Achimota), which HAYMAN (1967: 121) tentatively assigned to *X. spurrelli*. ROSEVEAR (1965 : 351) on the contrary came to the conclusion that the Achimota specimen can not be regarded as the female of this species, the skull and especially the teeth being too different.

Other possible records of this rare molossid have been reported by BASILIO (1962: 53) from Rio Muni and Fernando Poo (Banapa). This latter specimen, also mentioned by EISENTRAUT (1964: 545) and HAYMAN (1967: 122) has been sent to the American Museum of Natural History by BASILIO, but the determination has not yet been confirmed. Also KOOPMAN (1965: 31) tentatively allocated a specimen (a skin without a skull) from Congo Kinshasa (Luluabourg) to *X. spurrelli*.

De Vree, F. (1972). Description of a new form of *Pipistrellus* from Ivory Coast (Chiroptera).

A small bat was obtained by the author on the 19th November 1969 at Adiopodoumé, about 20 km west of Abidjan, Ivory Coast. It is a pipistrelle of moderate size, which is related to *Pipistrelllus eisentrauti* HILL from Cameroun, but differs sufficiently to warrant subspecific recognition. I propose to name the new form in honour of Louis BELLIER, who made such ar great contributoin to the knowledge of Ivory Coast Mammals.

De Vree, F. (1973b). New data on *Scotophilus gigas* Dobson, 1875 (Microchiroptera - Vespertilionidae).

The cranial and external measurements of twenty-one specimens of *Scotophilus gigas*, including the holotype and most of the hitherto reported specimens, were analysed to establish the range of size variation as well as the sexual variation. The taxonomy of the species is discussed and it is proposed that the specimens from Zaire, Malawi, Rhodesia and Mozambique may be provisionally differentiated as a subspecies, *S. gigas alvenslebeni* Dalquest.

Schadel- und äußere Maße von 21 Exemplaren von *Scotophilus gigas* wurden analysiert, um das Ausmaß der Großenvariaten und der Geschlechtsunterschiede festzustellen; zu dem untersuchten Material gehoren der Holotypus und die meisten bisher beschriebenen Exemplare. Die Taxonomie der Exemplare wird diskutiert, und es wird vorgeschlagen, die Exemplare von Zaire, Malawi, Rhodesien und Mozambique provisorisch als Unterart zu differenzieren: *S. gigas alvenslebeni* Dalquest.

Les mensurations crâniennes et corporelles de vingt et un spécimens de *Scotophilus gigas*, y compris le type et la plupart des spécimens antérieurement signalés, ont été analysées à fin de pouvoir déterminer la variation et le dimorphisme sexuel. La taxonomie de cette espèce est discutée et en conclusion il est proposé de considérer provisoirement les spécimens provenant de Zaire, Malawi, Rhodésie et Mozambique comme une race orientale *S. g. alvenslebeni* Dalquest.

De Vree, F., J. Hulselmans and W. N. Verheyen (1970). Contribution à l'étude des Chiroptères de la République du Togo. 2. Liste préliminaire des Chiroptères récoltés par la deuxième mission zoologique belge au Togo.

La presente note donne l'inventaire des Chauves-souris récoltées par la Deuxième Mission zoologique belge au Togo. Elle fait suite a une première contribution, qui inventorait les Chiroptères rapportés par la Première Mission belge au Togo (fin juin a debut septembre 1968) et ceux réunis par M. CARLO VERONESE en région d'Atakpame (septembre 1968 à mars 1969) (voir DE VREE, DE ROO et VERHEYEN *in Rev. Zool. Bot. Afr.*, LXXX, 1 - 2, 1969).

La présente collection a été réunie pendant les mois de juillet, août et septembre 1969. Les spécimens ont été fixes au formol et sont conservés en alcool au Musée Royal de l'Afrique Centrale à Tervuren.

Cette collection comprend 675 spécimens appartenant à 29 espèces. Parmi celles-ci figurent 4 espèces non encore signalées dans la première liste (1969): *Taphozous mauritianus, Nycteris grandis, Hipposideros caffer tephrus* et *Eptesicus capensis*.

Il nous est agréable de remercier toutes les personnes qui ont contribué a la réussite de l'expédition. La bienveillante collaboration de toutes les autorités toigolaises a rendu notre séjour au Togo des plus agréables. Qu'elles veuillent trouver ici l'expression de toute notre gratitude.

de Winton, W. E. (1899b). XXXVIII. On mammals collected by Lieut.-Colonel W. Giffard in the Northern Territory of the Gold Coast.

The mammals contained in the following list were obtained by Lt.-Col. (then Capt.) W. Giffard, while serving in an expedition with Lt.-Col. H. P. Northcott lately operating in the northern territory of the Gold Coast. Several of the smaller species are new to science, while all add to our knowledge of the genera to which they belong. The specimens are in excellent condition and carefully labelled, showing the care and trouble that was taken in making the collection. Considering the nature of the operations,

which kept the column constantly on the move, the number of specimens brought home is very creditable.

Colonel Giffard has presented the whole of his collection of small mammals to the British Museum, and Col. Northcott has also added some of his larger trophies and a number of birds to the National Collection.

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de Winton, W. E. (1900). 3. On the mammals obtained in Southern Abyssinia by Lord Lovat during an expedition from Berbera to the Blue Nile.

Lord Lovat's party consisted of five Europeans, including Mr. H. Weld Blundell, and Mr. Harwood as Naturalist. Starting from Berbera about the middle of December 1898, and travelling via Machanis Hill and Fijambiro, they reached Harrar towards the end of the month, and continuing almost west via Shola, Laga Hardim, and Jifia. Densa, they arrived at Addis Abeba towards the end of January 1899.

During February an expedition was made to the northward via Wogodi and Kooaa to Borameda, only some. 20 miles south of Magdala; then turning a little to the eastward, they returned by way of the Djimma Valley via Kombolsha, Ticka Chika, and Angolala.

Finally leaving Addis Abeba at the end of February, the expedition travelled due west via Managasha, Sellen, Goodur, Chellika, Bilo, and Lekemti to about 35° E., then turning to the north via Mendi, they crossed the Dabus River at about 10° N., and so on through the Beni Schongul, crossing the Blue Nile at Fainaka, and following the eastern or right bank of the river past Roseires, they reached Karkjof towards the end of May 1899, whence a passage was obtained in a boat to Khartoum.

The valuable collection of Birds brought home by the expedition will be found fully described by Mr. W. R. Ogilvie Grant in the 'Ibis' for January 1900, where- a map of ,the route is also given. The collection of Birds has been presented to the British Museum, together with all the small mammals and some of the most interesting of the Antelopes.

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de Winton, W. E. (1901a). V. Notes on Bats of the genus *Nyctinomus* found in Africa.

The working out of the species of *Nyctinomus* in connexion with Dr. Anderson's ' Fauna of Egypt' has necessitated looking through the whole of the specimens of this genus contained in the collection of the British Museum. In several instances the determination arrived at by Dobson in his 'Catalogue of the Chiroptera' has been found to require amendment, and the examination of the skulls has brought out additional facts of importance. This communication is confined only to those species, found principally on the continent of Africa and the island of Madagascar, which have the ears joined or rising close together from the centre line of the face, and does not deal with that section of the genus with smaller and more widely-separated ears which form the subgenus *Mormopterus*.

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de Winton, W. E., H. O. Forbes and W. R. Ogilvie-Grant (1903). Mammalia.

The Mammalian Fauna of Sokotra had been very cursorily examined by former expeditions, and, with the exception of a Bat, all the Mammals hitherto recorded were such as had undoubtedly been introduced by man. It was therefore thought that some species truly indigenous might be discovered; for it seemed to many highly improbable that an island in such a position could have been so long separated from the mainland of both Africa and Asia as would be suggested by the absence of all Mammals.

The present Expedition has failed in adding to the list, so it may now be said, with a fair amount of certainty, that Sokotra has no indigenous Mammals, and that with the exception of one or two Bats, which may occasionally find their way from the mainland, all the Mammals living on the island have been introduced by man.

The first list of the Mammals of Sokotra of modern times was given by Heuglin in Petermann's *Mittheilungen*, 1861, p. 149, in a general description of the island and its products. Camels, goats, wild or feral asses, and civets are mentioned as those most worthy of record, while jackals and gazelles are said to be found in the middle of the island. The two latter may now be disregarded, as no explorer has been able to find either on the island.

The small Mammals were first noticed in a report on Dr. E. Riebeck's collection by Dr. O. Taschenberg in the *Zeitschrift für Naturwissenschaften*, Halle, 1883, Vol. Ivi. p. 160. In this list the Free-tailed Bat (*Rhinopoma microphyllum*) is recorded with a rat (*Mus albipes*), and a mouse (*Mus gentilis*).

The following notes on the Mammals obtained by the present Expedition suggest themselves to me; the full list, with field notes, I leave in the hands of the collectors.

The Rasse (*Viverricula malaccensis*) is of the form common to Java and Madagascar, distinguished under the subspecific name of *V. malaccensis rasse*, Horsf. (see J. L. Bonhote, *Ann. Mag. Nat. Hist.*, Ser. VII., Vol. i., 1898, p. 119). This animal is now found almost everywhere in the islands of the Indian Ocean and Malayan seas, being carried in ships and dhows for the sake of the civet which it yields:

The Rat (*Mus rattus*), of which a large series was obtained, varies in the shade of colour between the two forms found in India, *Mus flavescens* of Elliott and *M. rufescens* of Gray. This is no doubt the *Mus albipes* of Dr. O. Taschenberg's list.

The House Mouse may have found its way on to the island, but it is just possible that young specimens of the last mentioned species were taken by Dr. Taschenberg for *Mus gentilis*, the pale form of *Mus musculus* found on the borders of the Red Sea.

The African Ass (*Equus asinus*) was found in a perfectly wild state, and probably has lived thus for some thousands of years. Failing wild killed specimens of the true wild Ass from Africa, it is impossible to say whether the Sokotran animal has undergone any modification from the ancestral form.

The Mammalian Fauna of Sokotra, so far as known, comprises eleven species.

Didier, R. (1965). Etude systematique de l'os penien des mammiferes (suite). Chiropteres, megachiroteres: Fam. des Pteropodidae.

Description anatomique et figurations de l'os pénien de chiroptères de la famille des Pteropodidae.

Dieckmann, R. C. (1979). Note on the smaller mammals of the Hester Malan Nature Reserve, Springbok, Namaqualand.

A survey of the smaller mammals of the Hester Malan Nature Reserve resulted in a checklist as well as information on the habitat in which the mammals occurred. Of the 38 species listed, 31 were collected or seen in the Reserve and seven on the neighbouring farms and surrounding district.

'n Opname is gemaak van die kleiner soogdiere wat in die Hester Malan Natuurreservaat aangetref word en het gelei tot die saamstel van 'n spesielys. Inligting oor die habitat van die soogdiere is ook verkry. Van die 38 spesies in die lys genoteer, word 'n totaal van 31 in die Reservaat aangetref. Hierbenewens is 'n verdere sewe spesies op naburige plase en omliggende distrik waargeneem.

Dippenaar, N. J., J. Meester, I. L. Rautenbach and D. A. Wolhuter (1983). The status of southern African mammal taxonomy.

The most recent review of the state of mammal taxonomy in southern Africa, is that of Meester & Eloff (1973). They, in agreement with authors of earlier similar reviews, stressed the need for continued and more detailed taxonomic work. Since then some powerful taxonomic procedures (viz. multivariate morphometric analyses, and cytotaxonomy) have been incorporated into local taxonomic research efforts. In the light of such demandlng but more exact procedures, the current status of southern African mammal taxonomy is reexamined.

This discussion concludes that the tempo and standards of local taxonomic research not only fail to keep up with contemporary work on European and North American mammals, but are in fact falling progressively further behind. Possible reasons for this situation are discussed.

Dobson, G. E. (1875e). XLVII. Conspectus of the suborders, families and genera of Chiroptera arranged according to their natural affinities.

The system of classification described in this paper having been adopted by me in the MS. of my descriptive Catalogue of the Asiatic Chiroptera, I here anticipate its publication, with the view of expressing more fully my reasons for classifying the genera according to a plan differing in some important points from those previously used, and also for the purpose of pointing out some important structural characters, of great value in the systematic arrangement of the families and genera, hitherto either unnoticed or insufficiently recognized.

The Chiroptera fall naturally into two subdivisions which may be called suborders, hitherto known as *Chiroptera frugivora* and *Chiroptera insectivora*; but as those names have not been framed in accordance with the accepted rules of zoological nomenclature, and as, moreover, the second part of the name of the second suborder has been previously applied to an order of Mammals, I use here instead the terms *Megachiroptera* and *Microchiroptera* to express these divisions respectively.

These terms are relatively correct; for, although some species of the Carnivorous Bats very much exceed in size many species of the Frugivorous, nevertheless the Frugivorous Bats taken collectively are very much larger than the Carnivorous, contrasting with them in size almost to the same extent as, among other Mammals, the Ungulata contrast with the Carnivora.

Dobson, G. E. (1876a). 8. A monograph of the genus *Taphozous* Geoff.

In 1872 I published some notes on the Asiatic species of *Taphozous*, giving a short synopsis of the species, in which they were divided into two groups. Since that time I have examined the types and large collections of specimens of the species of this genus in the British Museum, in the Museum of the East-India Company; in the Leyden, Berlin, and Paris Museums, also the collection in the Liverpool Museum and that of Sir Walter Elliot (most kindly forwarded from Scotland for my examination), as well as some private collections. Adding to these the large collection in the Indian Museum, Calcutta, I have thus examined a great number of specimens of the species of this genus, including the types, and am enabled to remove some nominal species from the list, to describe in detail, and to exhibit, in tabular form, according to their natural affinities, all. the species of *Taphozous*.

Dobson, G. E. (1880b). Sur quelques espèces de chiroptères provenant d'une collection faite en Algérie par M. Fernand Lataste.

M. Lataste a bien voulu m'envoyer quelques exemplaires de Chiroptères en bon état, conservés en esprit de vin, qu'il a recueillis en Algérie.

Les espèces représentées sont au nombre de huit: *Otonycteris Hemprichi* Ptrs., *Vesperugo (Vesperus) serotinus*, sous-esp. *Isabellinus* Temm., *Vesperugo pipistrellus* Schreb., *Vesperugo Kühli* Natt., *Vespertilio murinus* Schreb., *Vespertilio Capaccinii* Bonap., *Miniopterus Schreibersi* Natt., *Rhinolophus euryale* Blas. Je vais les passer successivement en revue.

Dobson, G. E. (1880c). Report on accessions to our knowledge of the chiroptera during the past two years (1878 - 1880).

One of the chief results hoped for from the publication of my natural history of the order Chiroptera, as stated in the preface to that work, was that it would be 'a stimulus to collectors and students to pay more attention to this difficult and obscure group of animals than, has been the case hitherto.' How fully this hope has been realised has been abundantly shown, not only by the publication of numerous papers on the subject in various scientific journals, both home and foreign, contrasting remarkably in number and quality, and especially in the number of different writers, with those recorded in any previous period of like duration, but also by the activity which has been displayed by collectors, as evidenced by the contributions received at the different museums, and by the numerous letters received by the writer from almost all parts of the world from those whose interest in the Chiroptera has been at length awakened.

To enumerate, classify, and correct these contributions; to add some remarks, supply a few omissions, and correct one or two errors since discovered in the work referred to above, is the object of this paper.

I commence by re-defining the suborders into which I have divided the Chiroptera, adding some important characters previously omitted.

Dobson, M. (1998). Mammal distributions in the western Mediterranean: the role of human intervention.

The natural distribution of the 17 non-flying mammal species occurring wild in both the Maghreb (north-west Africa) and Iberia (south-west Europe) is considered. It is concluded that only four species - Red Fox *Vulpes vulpes*, Wild Boar *Sus scrofa*, Wild Cat *Felis silvestris* and Otter *Lutra lutra* - are native to both regions, while another three - Red Deer *Cervus elaphus*, Brown Bear *Ursus arctos* and Aurochs *Bos primigenius* - were native to North Africa until the mid-Holocene but have probably died out naturally. Algerian Hedgehog *Atelerix algirus*, Barbary Ape *Macaca sylvanus*, Genet *Genetta genetta* and Egyptian Mongoose *Herpestes ichneumon* are widely accepted as introductions to Europe from North Africa. The remaining six species, and Red Deer now found in Africa, were also probably introduced - Rabbit *Oryctolagus cuniculus*, Weasel *Mustela nivalis*, Wood Mouse *Apodemus sylvaticus* and Lesser White-toothed Shrew *Crocidura russula* from Europe to Africa; Algerian Mouse Mus spretus from Africa to Europe; Savi's Pygmy Shrew *Suncus etruscus* perhaps from the eastern Mediterranean to both Iberia and the Maghreb.

There are two Maghrebi species which, although not found in Europe, are more closely related to Palaearctic than to Afrotropical species: Garden Dormouse *Eliomys melanurus*, probably native to north-west Africa, although possible augmentation of the natural population cannot be ruled out, and Whitaker's Shrew *Crocidura whitakeri*, a North African endemic.

Removal of so many species of European provenance from the list of mammals native to northwest Africa should not be considered to weaken its position as part of the Palaearctic zoogeographical region. Bats and other, non-mammalian, taxa illustrate the clear faunal relationship between the Maghreb and south-west Europe, whilst emphasizing its distinction from subsaharan Africa.

Doggart, N., M. S. Dilger, P. Cunneyworth and E. Fanning (1999a). Kwamgumi Forest Reserve: A biodiversity survey.

Kwamgumi Forest Reserve, in the East Usambara Mountains of north-east Tanzania was gazetted in 1905. It is situated in Muheza District, Tanga Region and covers 1708 ha between 150 - 915 m asl, encompassing lowland and submontane forest.

As part of the East Usambara Conservation Area Management Programme (from 1999 East Usambara Conservation Area Management Programme, EUCAMP) Frontier-Tanzania conducted a biological survey of Kwamgumi Forest Reserve between January - March 1995 and a follow-up survey was conducted between October - December 1996 for a total of 106 research-days. The survey covered systematically all parts of the reserve with a sampling intensity of 0.25% for the vegetation survey and five zoological trapping sites. This report provides an inventory of the trees, shrubs, herbs, mammals, reptiles, amphibians, birds, butterflies, millipedes and molluscs recorded during the survey. The report also describes disturbance within the reserve and presents the results of a socio-economic study. The species richness, endemism and ecological affinities of the taxa recorded are summarised as Table 1.

Kwamgumi Forest Reserve is part of a larger forest block that includes Segoma and Bamba Ridge Forest Reserves. In terms of conservation it is a significant area of lowland forest providing habitat for endemic and threatened species including the East Usambara endemic plants *Cynometra longipedicellata* and *Cola usambarensis*.

In terms of fauna, the reserve is home to one critically endangered, three endangered and 17 vulnerable species. This includes the recently described snake *Prosymna semifasciata* which was first discovered in Kwamgumi. The reserve has a high diversity of mammals and molluscs relative to other Usambara forests.

Timber cutting was found to occur at low levels throughout the reserve, pole cutting was concentrated near the reserve border although at lower levels than in neighbouring private forest. Fire has affected the forest around Muhinduro Peak and near Kwamtili.

The information collected will be used for management planning by the EUCAMP. The survey results are also available as a baseline for monitoring. The data is stored on a Microsoft Access database and is available on the Internet at the address: www.usambara.com

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Dollman, G. (1908). On a collection of bats from Yola, Northern Nigeria, collected by Mr. G.W. Webster.

The British Museum owes to the generosity of Mr. Gr. W. Webster a collection of bats from Northern Nigeria, and, being the first collection received from this region, it proves of very great interest. In addition to some extremely rare bats, it contains one new species, and there can be little doubt that when the Nigerian fauna is thoroughly worked out many other new forms will be discovered.

Dollman, G. (1909). XLV. On mammals collected by Mr. S.A. Neave, M.A. B. Sc (Oxon.) in Katanga, Congo Free State.

The collection is of interest both on account of the new geographical ranges established for many of the species and, in addition, for the discovery of a new form of Anomalurus allied to A. cinereus, Thos.

Dollman, G. (1910). XXV. On a collection of mammals made by Mr. S.A. Neave during his expedition in Northern Rhodesia.

The area in which Mr. Neave collected is situated between Lake Bangweolo and Lake Mweru, bounded on the west by the Luapula River, and on the east by the Mchinga Escarpment, extending as far north

as the southern end of Lake Tanganyika and as far south as Mpika. No collection of mammals of any importance has ever been received from this district before, and therefore it is not surprising to find that some of the specimens represent new and hitherto undescribed forms. The mammalian fauna of this area would appear to be very similar to that of North Nyasaland, and .though a few of the species show a distinct relationship with the West African fauna, the majority of forms are East African. The mammals of the Kalungwisi and Chambezi Rivers appear very much the same as those that occur on the Nyika Plateau, mixed with a sprinkling of South Nyasa forms, such as the small Zomba dormouse, *Graphiurus johnstoni*, Thos., a specimen of which Mr. Neave obtained from the Chambezi River District. Some of the species would appear to indicate a relationship with the Tanganyika and Uganda faunæ. Thus we find in the collection both the Marungu dormouse *Graphiunis microtis*, Noack, and the v' East African *Mus jacksoni*, de Wint.

Of the novelties, the Shrews are perhaps the most interesting. One of the forms, *Crocidura luna*, was obtained by Mr. Neave during his earlier expedition in Katanga. Since my paper on the Katanga mammals, the series of Central and East African *Crocidura* in the British Museum collection has been considerably increased, and it is now evident that these Katanga specimens ought to be considered as representing a distinct species. The series of *Lophuromys* from Mporokoso would appear to be new, being unlike any of the East or West African forms at present known. This species was also represented in the Katanga collection, and it is one of these Congo specimens that has been chosen as the type.

In addition to the descriptions of the new forms, a complete list of all the mammals obtained by Mr. Neave in Northern Rhodesia is here given, as so many of the species are of interest from a distributional point of view.

Dollman, G. (1911). Description of a new genus of molossine bats from West Africa.

Among a collection of West-African mammals recently presented to the British Museum by Dr. H. G. F. Spurrell is a bat representing a new genus of the family Molossidæ.

Dollman, G. (1914a). Notes on a collection of East African mammals presented to the British Museum by Mr. G.P. Cozens.

I have the pleasure of furnishing a report on the Mammals obtained by Mr. Willoughby P. Lowe during the recent East Africam Expedition organized by Mr. G. P. Cosens. The entire collection, some two hundred specimens in all, has been presented by Mr. Cosens to the British Museum.

In working out this collection I have found it necessary to describe six new forms, the most interesting of which, the new Gerbil (*Gerbillus cosensi*), I have named in honour of the generous donor. Another interesting novelty, *Taterillus lowei*, I have called after Mr. Willoughby Lowe, the collector.

The East African mammals were obtained in the Naivasha and Nyanza Provinces. The route taken was from Kijabe to Mt. Suswa, where the first collecting was done, then westwards across the Loita Plains and Lemek Valley to the Amala or Mara River. After ten days collecting along the Amala River the expedition turned south towards the Anglo-German Boundary and then eastwards, via Leganisho, to Lengototo, the Narossura and Southern Guaso Nyiro Rivers. Further collecting was done along the southern Guaso Nyiro, and the party then proceeded northwards as far as the Mau Escarpment, returning to the railway at Naivasha.

The Uganda Expedition started from Baringo in December, 1912, and travelled in a north-easterly direction across the Kerio and Wei Wei Rivers, and then along the Turkwel as far north as Ngamatak. Turning westwards the party reached the Kozibir Hills on January 22nd, 1913, and Mt. Maroto on January 28th. Proceeding in an easterly direction, via the Nakwai Hills and Lobor Mountains, Kamchuru was reached on February 9th, and here the greater part of the collecting was done. Other mammals were obtained on the journey from Kamchuru, via Pader and Falabek, to Nimule.

In the following list the East African and Uganda Collections are not treated of separately, as it seems more convenient, the two areas not being faunistically distinct, to consider the collections together.

Dorst, J. (1947). Les chauves-souris de la faune malgache.

Il n'existe à notre connaissance aucun travail d'ensemble sur les Chauves-Souris de Madagascar; le bel ouvrage de GRANDIDIER et PETIT (Zoologie de Madagascar, 1932), laisse volontairement ce groupe un peu en oubli. La révision et le classement de la collection de Chauves-Souris du Muséum, qui possède d'assez belles séries rapportées en particulier par MM. GRANDIDIER, HUMBLOT, DECARY et la Mission DELACOUR, m'ont permis de faire ce travail qui ne vise qu'à présenter ce que l'on connaît actuellement sur ce groupe de Mammifères malgaches.

Les affinités des Chauves-Souris de Madagascar sont plutôt à chercher en Afrique. On trouve des animaux absolument identiques à ceux que l'on trouve dans ce continent, tels que *Taphozous mauritanius, Hipposideros Commersoni, Eptesicus pusillus, Pipistrellus nanus, Chaerephon limbatus*. D'autres sont à peine différenciés: tels *Mormopterus albiventer* et *Nyctinomus fulminans* dont de proches parents habitent le continent voisin. Par contre nous signalerons la présence de *Pteropus*, les Rousettes de ce genre étant abondamment représentées en Indo-Océanie et par contre absentes d'Afrique. Une affinité du même ordre est indiquée par *Emballonura atrata* dont les proches parents habitent les régions malaises et papoues, .aucun n'ayant atteint l'Afrique. Madagascar montre aussi un caractère négatif très net vis-à-vis du continent: c'est l'absence de Chauves-Souris frugivores du groupe de *Epomophorus*, celles-ci étant caractéristiques de la région éthiopienne.

Nous trouvons dans la Grande Ile une espèce endémique, *Myzopoda aurita*; on en a fait le type d'une famille dont elle est l'unique représentant; ses affinités sont lointaines et incertaines, nous aurons l'occasion d'en reparler.

Signalons également l'absence de *Rhinolophus*, ce genre si bien représenté tant en Asie qu'en Afrique.

Nous donnerons une liste des espèces rencontrées jusqu'à ce jour dans l'île, indiquant les renseignements résumant ce que l'on connaît .sur chacune d'elles.

Dorst, J. (1960). A propos de quelques chiroptères du Sénégal, et description d'une forme nouvelle du genre *Pipistrellus*.

Au cours de sa dernière mission au Sénégal pendant l'automne de 1958, M. Francis Roux a bien voulu collecter à notre intention quelques chiroptères venus se faire prendre dans les filets tendus en vue de la capture des oiseaux. En dépit du petit nombre d'individus collectés, ces chauves-souris présentent cependant un grand intérêt en raison du peu de renseignements concernant les Chiroptères du Sénégal.

La petite série rapportée par M. Roux comprend 5 espèces. Si deux d'entre elles sont banales, les autres sont par contre nouvelles pour le Sénégal, et l'une d'entre elles pour l'Afrique occidentale toute entière. L'intérêt biogéographique de leur présence dans cette partie de l'Afrique est d'ailleurs variable suivant les espèces.

Tous les spécimens ont été capturés à Richard-Toll, Sénégal, au moyen de filets tendus aux alentours de mares.

Dorst, J. and R. de Naurois (1966). Présence de l'oreillard (*Plecotus*) dans l'archipel du Cap-Vert et considérations biogéographiques sur le peuplement de ces iles.

A Long-eared Bat is recorded from the Cape Verde Archipelago. On the basis of one specimen collected on I. do Maio; others are recorded from Santiago where bats were discovered in rocky cliffs

but not collected. Description of the specimen which probably is to be considered as *Plecotus austriacus* subsp. Although accidental transport by man cannot be excluded, the occurence of this Bat on these islands seems in accordance with their affinities, a high proportion of the species being obviously from palearctic origin, as shown by the Birds and Reptiles.

Dorst, J. and J. Prévost (1972). Notes sur quelques chiroptères collectés en Ethiopie.

Liste commentée de 12 espèces de Chiroptères collectées dans diverses régions d'Ethiopie. *Rhinolophus hildebrandti* est signalé pour la première fois de ce pays. Les captures permettent de préciser et d'étendre la répartition de plusieurs autres espèces, parmi lesquelles *Myotis scotti*.

Annotated list of 12 specles of Chiroptera collected in varions habitats in Ethiopia. *Rhinolophus hildebrandti* is recorded for the flrst time from this country; wide extensions of range are reported for several other bats, including *Myotis scotti*.

Doutre, M. P. and H. Sarrat (1973). Sérotypes de salmonelles isolées chez les chiroptères frugivores et insectivores du Sénégal. Importance épidémiologique.

Une enquête portant sur 646 chiroptères porteurs sains, prélevés principalement dans les environs de Dakar (Sénégal), est effectuée.

Elle intéresse 264 individus appartenant à des espèces frugivores (*Eidolon, Roussettus, Epomophora*), 382 exemplaires d'espèces insectivores (*Tadarida, Nycteris, Hipposideros*) et 106 prélèvements de guano (*Tadarida*).

A partir des coprocultures, 83 souches de *Salmonella* sont isolées chez les chiroptères, ce qui correspond à un taux d'infestation moyen de 12,8 p. 100. Les ensemencements de guano fournissent 48 souches.

64 sérotypes différents sont mis en évidence au cours de cette étude (4 souches sont encore en cours d'examen).

3 sérotypes nouveaux sont découverts: *S. taset, S. bambylor, S. sangalkam*, et 11 sérotypes rapportés pour la première fois au Sénégal: *S. vom, S. goma, S. umhlali, S. angers, S. miami, S. bolombo, S. uzaramo, S. blukwa, S. doorn, S. windermere, S. gokul*.

Les chiroptères constituent donc un réservoir animal de *Salmonella* dont l'incidence su les risques de contamination humaine et animale est discutée.

A survey dealing with 646 healthy carrier bats, collected mostly in the surroundings of Dakar (Senegal), was carried out.

The specimens consisted of 264 frugivorous species (*Eidolon, Roussettus, Epomophora*), 384 insectivorous bats (*Tadarida, Nycteris, Hipposideros*) and 106 samples of guano (*Tadarida*).

From the intestinal contents, 83 strains of *Salmonella* were isolated in chiroptera (infestation rate: 12,8 per cent). The seedings of guano gave 48 strains.

64 different serotypes were demonstrated during the whole of the study (the examinaiion of 4 strains is still in process).

3 new serotypes were discovered: *S. taset, S. bambylor, S. sangalkam*.

11 serotypes were recorded for the first time in Senegal: *S. vom, S. goma, S. umhlali, S. angers, S. miami, S. bolombo, S. uzaramo, S. blukwa, S. doorn, S. windermere, S. gokul*.

From the study, it seems that chiroptera constitute an important animal "reservoir" of *Salmonella*. The incidence on human and animal contamination is discussed.

Dowsett, R. J., D. L. Harrison and L. Granjon (1991). Bats (Chiroptera) from the Mayombe and lower Kouilou (with a checklist for Congo).

Cet article décrit une collection de 80 spécimens de chiroptères (appartenant à 14 espèces) obtenus dans le Bas-Kouilou et le Mayombe (Congo). Deux espèces sont nouvelles pour la faune congolaise (*Rhinolophus alcyone, Hipposideros cyclops*) et une troisième (*Scotonycteris ophiodon*) est l'une des plus rares espèces africaines. En outre quatre espèces sont signalées pour la première fois aus Mayombe. Les particularlités du crâne sont décrites pour certaines Mégachiroptères (*Scotonycteris, Megaloglossus*). Les activités reproductrices observées sont mentionnées. Nous donnons également la distribution des espèces ailleurs au Congo et la liste complète des espèces pour le pays (soid 34 au total).

A collection of 80 specimens of bats (of 14 species) is described from the lower Kouilou and Mayombe (Congo). Two species are new to the Congo fauna (*Rhinolophus alcyone, Hipposideros Cyclops*) and a third (*Scotonycteris ophiodon*) is one of the rarest African bats. Four other species have apparently not previously been reported from the Mayombe. Interesting skull characters are descrbed in some Megachiroptera (*Scotonycteris, Megaloglossus*). Breeding data are presented and species' distributions discussed. Reference is made to the other species of bats reported elsewhere in Congo, and achecklist presented of the 34 species known to date.

Dubois, G. (1955). Les Trematodes de chiroptères de la collection Villy Aellen. Etude suivie d'une revision du sous-genre *Prostodendrium* Dollfus 1937 (*Lecithodendriinae* Lühe).

Les Lecitkodendriinae Lühe font l'objet d'une étude spéciale. *Lecithodendrium linstowi* Dollfus 1931, *Prosthodendrium ascidia* (Van Beneden 1873) et *P. chilostomum* (Mehlis 1831) sont redécrits d'après des matériaux de la collection AELLEN.

Le sous-genre *Prosthodendrium* Dollfus 1937, revisé, groupe dix-neuf espèces (voir clé de détermination, p. 498). Le type est *P. dinanatum* (Bhalerao 1926) par désignation originale.

Sur la base d'un examen du matériel original le statut d'espèce est conféré à "*Lecithodendrium cordiforme parvouterus*" Bhalerao 1926, avec la dénomination de *Prosthodendrium parcouterus* (Bhalerao) comb. nov. "*Lecithodendrium cordiforme* Môdlinger 1930, nec Braun, *Prosthodendrium pushpai* Bhalerao 1936, *Prosthodendrium cordiforme* Bhalerao 1936, nec Braun, *Prosthodendrium pyramidum* subsp. *orientale* Yamaguti et Asada 1942, nec Lopss, et *Prosthodendrium pyramidum* forma *maroccana* Dollfus 1954, nec -Loess, sont considérés comme synonymes. L'espèce *parvouterus* a une distribution géographique étendue: Birmanie, Mandchourie, Europe, Maroc.

P. bhaleraoi (Pande 1935) tombe en synonymie avec *P. longiforme* (Bhalerao 1926) dont là var. *allahabadi* Pande 1935 est supprimée.

P. loossi (Pande 1935) devient une variété de *P. urna* (Looss 1907), dénommée *P. urna loossi* (Pande), et *P. luzonicum* (Tubangui 1928) une variété de *P. orospinosum* (Bhalerao 1926), désignée sous le nom de *P. orospinosum luzonicum* (Tubangui).

P. piriforme Yamaguti 1939 est considéré comme synonyme de *P. chilostomum* (Mehlis 1831), avec lequel "*Lecithodendrium cordiforme laxmii*" Bhalerao 1926 est également identifié.

P. Scabrum [= *Limatulum scabrum* Caballero 1940] Caballero 1943 et *P. paeminosum* Caballero 1943 sont indifférenciables de *P. naviculum* Macy 1936, lui-même n'étant qu'une variété géographique de *P. ascidia* (Van Beneden 1873), dénommée *P. ascidia navicula* Macy.

P. mizellei Seamster et Stevens 1948 est rejeté comme synonyme de *P. macnabi* Macy 1936.

Les *species inquirendae* sont: *P. posticum* (Stafford 1905) et *P. lilliputianum* (Travassos 1928).

Le sectionnement du sous-genre ou la création de genres pour certaines de ses espèces ne sont pas approuvés.

Đulic, B. and F. A. Mutere (1973a). Comparative study of the chromosomes of some Mollosid bats from eastern Africa.

By the analysis of bone marrow cells, the chromosomes of three East African Molossid bats e. g. *Otomops martiensseni, Tadarida condylura* and *T. pumila* were studied. It was found that the diploid chromosome number for all three species was 48. The autosomal fundamental number for the first two species was 56 and for *T. pumila* 58. The presence of an autosomal pair with secondary constriction in *O. martiensseni* suggests its closer relationship with *Eumops perotis* from Mexico. The pair XY differs mostly in *T. pumila*, whereas its morphology is similar in the other two species. It is evident that the African representatives of the family Molossidae are chromosomally quite similar to their American counterparts in diploid number and fundamental number. The presence of "marker-pair" in the family Molossidae was discussed too.

Đulic, B. and F. A. Mutere (1973b). Les chromosomes de trois espèces des Megachiroptères (Mammalia, Chiroptera) d'Afrique orientale.

Dans le présent travail on décrit les caryotypes de *Rousetlus aegyptiacus leachi, Epomophorus wahlhergi wablbergi* et *Epomophorus anurus* et on trouve que leur nombre diploïde est de 2n = 36, et que leur nombre fondamental varie très peu. L'hétérochromosome X de *R. aegyptiacus* et de *E. wablbergi* est un élément submétacentrique de la taille moyenne, tandis que l'Y est un petit chromosome punctiforme chez la première, et un petit acrocentrique chez la seconde espèce. Dans le caryogramme femelle de *E. anurus* on a pas pu identifier les chromosomes sexuels. Le trait commun du caryotype de toutes les trois espèces de Megachiroptères est la présence d'une paire d'autosomes avec la constriction centrale. On compare la morphologie des chromosomes des espèces africaines avec les mêmes données sur les réprésentants de l'Inde.

The chromosomes complement of *Rousettus aegyptiacus leachi, Epomophorus wahlbergi wahlbergi* and *Epomophorus anurus* was determined and a diploid number of 36 has been found. There is a very little variability in fundamental number (66 in *R. aegyptiacus* and 68 in *E. wahlbergi wahlbergi*, the arms of sex chromosomes have not been counted, and in female karyotype of *E. anurus* including sex chromosomes FN is 72). The X sex chromosome is a medium sized submetacentric element in *R. aegyptiacus* and in *E. wablbergi wahlbergi*, and the Y sex chromosome is a small punctiform chromosome in the first mentioned and a small acrocentric in the second one. In all three species one pair of medium autosomes is provided with a rather long centric constriction of different appearance in each species. A comparison of chromosome morphology among the African and the Indian species of fruit bats is given.

Đulic, B. and F. A. Mutere (1977). Chromosomes of some East African bats.

The description of karyotypes in 21 species of African bats predominantly from Kenya, Uganda and Rhodesia, was given by DULIC & MUTERE (1973a, 1973 b, 1974), WARNER, PATTON, GARDNER & BAKER (1974) and PETERSON & NAGORSEN (1975). During the excursions in the caves south of Mombasa in

September 1975 some species were collected, the chromosomes of which were either not known or were described from populations caught in far off localities.

Đulic, B. and B. Soldatovic (1969). Les chromosomes de *Rhinolophus mehelyi* Mastchie, 1900 (Mammalia, Chiroptera).

The chromosome complement of somatic cells of *Rhinolophus mehelyi* has been determined. The karyotype is characterized by a diploid number of 58. Of 28 pairs of autooomes 4 are metacentric, two of them are small-sized, and 24 are acrocentric. One pair of middle-sized acrocentric autosomes is provided with satellites, and among small elements only one pair is punctiform. The X chromosome is a large submetacentric one: its average centromere index is 2,89. The Y chromosome is small and oblong. A comparison has been made between the karyogram of *Rhinolophus mehelyi* and those of *Rh. ferrumequinum, Rh. euryale, Rh. blasii* and *Rh. hipposideros*. The results speak in favour of the opinion of CAPANNA and CIVITELLI (1964), and CAPANNA, CIVITELLI and CONTI (1967) on the significance of the morphologically identical chromosomes: their role in the phylogeny of Rhinolophid bats was discussed.

Dans le présent travail on décrit le caryotype de *Rhinolophus mehelyi*, et on trouve que le nombre diploide est de 2n=58. Le caryogramme comprend 28 autosomes dont 4 paires de métacentriques et 24 paires d'acrocentriques. Une paire d'acrocentriques est avec le satellite. L'heterochromosome X est un élément submétacentrique avec l'index centromérique 2,89, l'Y est un petit chromosome de forme ovale. En comparant le caryotype de *Rhinolophus mehelyi* avec ceux de *Rh. ferrumequinum, Rh. euryale, Rh. blasii* et *Rh. hipposideros* on supporte l'opinion de CAPANNA et CIVITELLI (1964), et CAPANNA, CIVITELLI et CONTI (1967) sur l'importance des chromosomes morphologiquement identiques et on discute le rôle de tels chromosomes dans la phylogénie des Rhinolophes.

Dumont, E. R., K. Etzel and D. Hempel (1999). Bat salivary proteins segregate according to diet.

Whole saliva samples were gathered from four insectivorous (*Myotis tricolor, Pipistrellus africanus, Mops condylurus*, and *Chaerephon pumilla*) and two frugivorous *Epomophorus labiatus, E. minor*) bat species following a 6 - 10 hour fasting period and immediately stored in liquid nitrogen. Proteins within the samples were visualized by SDS-PAGE techniques modified for saliva. With the exception of *E. minor*, each species is represented by four to five individuals. Only minor fluctuations in protein banding patterns were encountered among conspecifics. However, frugivores exhibit a major band at 60 Kd that is absent in insectivores and insectivores exbihit a major 40 Kd band that is lacking in frugivores. Peptides from three sets of bands were extracted directly from the gels after *in-situ* proteolysis and isolation using HPLC. Comparison of amino acid sequences to the PIR, EC, and SwisProt databanks did not yield any compelling similarities, though some interesting potential matches were generated. Based on their molecular weights, potential identities of the proteins are discussed with respect to their roles in digestion and the maintenance of the oral cavity. These data constitute the first comparative analysis of bat salivary proteins and suggest that this novel source of data will prove useful in answering both functional and evolutionary questions.

Des échantillons de salive one été recueillis de quatre espèces de chauves-souris insectivores (*Myotis tricolor, Pipistrellus africanus, Mops condylurus* et *Chaerephon pumilla*) et de deux espèces frugivores (*Epomophorus labiatus, E. minor*) après une période de jeûne de 6 à 10 heures, et placés immédiatement dans l'azote liquide. Les protéines contenus dans les échantillons ont été rendues visibles pare les techniques SDS-PAGE modifiées pour la salive. A l'exception de *E. minor*, chaque espèces est représentée par quatre à cinq individus. Parmi les individus conspécifiques, seules des fluctuations mineures ont été rencontrées dans les "banding patterns" des protéines. Cependant, les frugivores manifestent une bande majeure à 60 Kd, bande absente chez les insectivores. D'autre part, les insectivores montrent une bande majeure à 40 Kd, bande qui n'existe pas chez les frugivores. Des peptides ont été relevés directement des gels, après protéolyse *in situ* et isolation utilisant HPLC. La comparaison de séquences des acides aminés avec les banques d'information (Databanks) du PIR, EC et SuisProt, n'a abouti à aucune vraie similarité, quoique certaines similaritées potentielles ont été

réalisées. Se basant sur leur poids moléculaire, les identités potentielles des protéines sont discutées, notamment à propos de leur rôle dans la digestion et dans l'entretien de la cavité buccale. Ces résultats constituent la première analyse comparative des protéines salivaires des chauves-souris et suggèrent que cette nouvelle source d'informations pourrait aider à résoudre les questions fonctionnelles aussi bien qu'évolutives.

Duncan, F. M. (1937). On the dates of publication of the Society's 'Proceedings,' 1859-1926. With an appendix containing the dates of publication of 'Proceedings,' 1830-1858, ..., and of the 'Transactions,' 1833-1869, ..., originally published in P.Z.S. 193, 1913.

As requests for information concerning the dates of publication of early parts of the Society's ' Proceedings ' are occasionally received, it appeared desirable to place on record what information still exists relating to the volumes printed in the years following those given in the list of dates - 1830 to 1858 - already published in the Society's ' Proceedings ' for 1893, p. 436.

Why Dr. P. L. Sclater, who communicated that list, and Mr. F. H. Waterhouse, who had compiled it with the help of the Society's printers, did not apparently consider it worth while to carry the record down to 1893, I have never been able to understand. That they did not do so has proved most unfortunate, as Day-books and Receipt-books which were available at that time, belonging to the Society and to Messrs. Taylor and Francis, no longer exist.

For some years past I have, as opportunity presented itself, gathered together from various sources notes which appeared likely to throw some light on doubtful dates, and as but little further definite information is likely in the future to come to hand, it would seem best to place on record now what has been accomplished.

My chief sources of information have been our own ledgers and Day-books, and those of the Society's printers, Messrs. Taylor and Francis, to whom I would express my most grateful thanks for their unfailing courtesy and invaluable help in making repeated searches through their archives, and in checking, so far as was possible, uncertain dates. To my Assistant, Mr. G. B. Stratton, I must also extend my thanks for much help in the collation of volumes and parts.

From an examination of the available account-books it appears that up to, and including the year 1860, payments were made always for sheets, and presumably the 'Proceedings' were available in that form as well as in the three paper-bound annual parts. Beginning with the year 1861, payments were made only for each completed part, and the issue of separate sheets seems to have ceased.

Duncan, R. S. and C. A. Chapman (1999). Seed dispersal and potential forest succession in abandoned agriculture in Tropical Africa.

Natural forest succession on human-disturbed lands is often slow because the resources necessary for succession are depleted. In such landscapes, forest succession may be dependent on arrival of seeds from off-site, many of which are dispersed by fruit- eating animals. We studied bat and bird seed dispersal in a deforested agricultural area adjacent to Kibale National Park, Uganda. Seed rain was monitored for 6 mo in short (<0.5 m) and tall (2-5 m) grassland, and below short (1-3.5 m), medium (3.5-10.0 m), and tall (-10.0 m) isolated trees within grassland. Seed rain (numbers of seeds and seed species) under trees of all heights was greater than in short or tall grasslands. Bats dispersed seeds mostly below tall trees, while birds dispersed seeds mostly below both tall and midsized trees. More seeds and seed species were dispersed under tall trees than below short trees. Within 150 m of the forest there was no relationship between the seed rain under trees and the distance to the forest edge. Nearly half of the > 11 200 seeds collected were from hemi- epiphytic Ficus that are unable to grow from the ground. One-third of collected seeds were from shrubs, and most of the remainder were from trees. Nearly all tree and shrub seeds collected (>99%) were species typically found in disturbed grassland, not in forest. These results suggest that in this African region, forest succession may proceed very slowly on degraded lands.

Dunning, D. C. and M. Krüger (1995). Aposematic sounds in African moths.

In response to tactile stimulation and to ultrasonic pulses such as those of attacking bats, many moths of the family Arctiidae produce ultrasonic clicks. To test the hypothesis that these clicks are aposematic sounds, warning bats of unpalatable prey, African moths of these two families were captured at lights, assayed for clicking responses to tactile and ultrasonic stimulation and placed, together with moths of similar body sizes and other families captured at the same time, in a small cage with sympatric *Tadarida pumila* bats. Arctiid fragments were sought among the insect remains (mostly moth wings) dropped by free-foraging *Hipposideros caffer* bats. There were no arctiid wings among them, and the captive bats ate a significantly larger proportion of control moths than arctiids. There were no significant differences by species or sex in the arctiids' clicking responses to either stimulus or in their palatability to bats. Since the arctiids did dick in response to bat-like stimuli and were clearly less palatable to the bats than the control moths, we conclude that the sounds of these moths can act as aposematic sounds.

Dunning, D. C. and M. Krüger (1996). Predation upon moths by free-foraging *Hipposideros caffer*.

Predation upon insects by the bat *Hipposideros caffer* was studied at Skukuza in the Kruger National Park of South Africa. These bats, whose echolocation calls are inaudible to moths, fed overwhelmingly upon tympanate Lepidoptera, although insects of other orders frequently dominated the local light-responsive, flying, nocturnal insect community. The relative numbers of noctuid, pyralid, and arctiid moths taken by the bats were proportional to the representation of these families in the general population of moths, but they took disproportionately fewer moths of the family Geometridae. The bats also ate significantly fewer arctiid moths of those species capable of clicking than of those species that could not. Because the arctiids could not hear approaching *H. caffer*, these moths did not click before contact with an attacking bat, and their clicks could not protect them by interfering with echolocation by the predators. These results are consistent with the startle and acoustic-aposematism hypotheses for the bat-protective function of arctiid clicks.

Dupuy, A. P. (1973). Premier inventaire des mammifères du Parc Nationale de Basse-Cassamance (Sénégal).

Avec, la création récente du Parc national de basse Casamance (décret n° 70 319 du 10 avril 1970), l'étude des groupes zoologiques connait un renouveau dans cette région. Cela ira sans .aucun doute en s'amplifiant dans les années à venir, mais auparavant, les spécialistes de l'ÏFAN s'étaient intéressés dès 1946 à la faune de basse Casamance. P.-L. DEKEYSER et A. VILLIERS firent à cette époque une mission vers Bignona (voir bibliographie). Leurs recherches permirent de mettre en évidence le caractère guinéen accentué de cette partie du Sénégal. Puis, en 1961, A. VILLIERS, R. ROY et M. CONDAMIN firent, plutôt des prospections entomologiques. La forêt de Santiaba Mandjak (comprise actuellement dans le Parc) apparut particulièrement intéressante lors de cette mission, ce qui amena M. CONDAMIN à y faire l'année suivante des prospections plus poussées, G. MOREL de l'ORSTOM effectua une mission ornithologique au printemps 1969 ; enfin J. M. THIOLLAY, ornithologue du C.N.R.S., 0. FOURNIER, B. HUBERT et F. ADAM, de l'ORSTOM, entreprirent plus récemment des recherches sur les Vertébrés sous la direction de; F. PETTER, du Muséum national d'Histoire naturelle de Paris.

Nous-même, depuis quatre ans. dans le cadre d'inspections dans la région en vue de connaître les limites du nouveau l'arc, travaillons aux inventaires ornitho-mammalogiques du Parc national de basse Casamance et de sa région. Depuis février 1970, une brigade de surveillance a été installée en permanence sur place dans le Parc, ce qui a permis de faire de nombreuses et intéressantes observations sur la faune. C'est l'ensemble des résultats ainsi obtenus pour les Mammifères qui fait l'objet de la présente note.

Durette-Desset, M.-C. and A.-G. Chabaud (1975). Nématodes Trichostrongyloidea: Parasites de Microchiroptères.

1. a) Liste des Nématodes, parasites de Chiroptères européens récoltés par le Pr Aellen: compléments à l'étude morphologique de *Molinostrongylus alatus, M. panousei, M. skrjabini*; description de *M. aelleni* n. sp.

b) Description de *M. richardae* n. sp., *M. benexae* n. sp. et *M. bauchoti* n. sp. parasites de Molossidae malgaches.

c) Description de *M. colleyi* n. sp. et *M. owyangi* n. sp., parasites de Vespertilioninae malais, et d'*Allintoschius dunni* n. sp., trouvé chez *Myotis mystacinus* en Malaisie et *Pipistrellus nanus* en Afrique.

2. D'après le synlophe, les 17 espèces du genre *Molinostrongylus* semblent se répartir en cinq groupes d'espèces, chacun d'eux étant assez caractéristique d'un genre déterminé de Chiroptères.

3. La composition de la nématofaune (Trichostrongyloidea) des Chiroptères est analysée, ainsi que ses rapports avec les Trichostrongyloidea d'autres Mammifères (Tupaiidae, Pholidotes, Primates, Sciuridés). Six groupes sont individualisés, constituant deux ensembles bien distincts: genre *Strongylacantha*, d'une part; 12 genres plus ou moins directement issus des Molineinae, d'autre part.

4. Les trois pointes de l'extrémité caudale des femelles, qui définissent actuellement les Anoplostrongylinae par rapport aux Molineinae, se révèlent un caractère insuffisant. Les deux sous-familles forment un ensemble complexe, qui ne pourra être interprété qu'en tenant compte également de l'évolution du synlophe et de celle des bourses caudales des mâles.

Trichostrongyloidea Nematodes parasites from Microchiroptera.

1. a) List of Nematodes collected by Professor Aellen in european Microchiroptera. Additionnai morphological data to the study of *Molinostrongylus alatus, M. panousei, M. skrjabini*. Description of *M. aelleni* n. sp.

b) Description of *M. richardae* n. sp., *M. henexae* n. sp. et *M. bauchoti* n. sp., parasites of malagasian Molossidae.

c) Description of *M. colleyi* n. sp. and *M. owyangi* n. sp., parasites of Malaysian Vespertilioninae, and of *Allintoschius dunni* n. sp. discovered in *Myotis mystacinus* from Malaysia and *Pipistrellus nanus* from Africa.

2. Taking into account the characteristics of the synlophe, the 17 species of the genus *Molinostrongylus* may be divided into five groups, each one being reasonably well characteristic of the genus of their Chiropteran host.

3. The composition of the Trichostrongyloidea fauna of Chiroptera and its relationship with Trichostrongyloidea from other Mammals (Tupaiidae, Pholidotes, Primates, Sciuridés) are analysed. Six groups are separated and divided into two well defined lines: 1) genus *Strongylacantha*, and 2) 12 genera stemming more or less directly from the Molineinae.

4. The three conical outgrowths at the tip of the female tail which differenciate presently the Anoplostrogylinae from the Molineinae appear to be an unreliable characteristic. The two subfamilies form a complex group which will be better understood if the evolution of the synlophe and that of the caudal bursa of the males are taken into account.

Dusbábek, F. and W. Bergmans (1980). Spinturnicid mites from some Nigerian bats (Acarina, Spinturnicidae).

Five species of mites "belonging to three genera of the family Spinturnicidae are reported from six species of bats in Nigeria. The species are *Menstaspis kenyaensis* (Radford), *Ancystvopus aethiopicus* Hirst, *Spintumix walkerae* Zumpt & Till, *S. scotophili repens* ssp.n., and *S. intectus* sp.n. Male and female specimens of the two new taxa are fully described and figured. Zoogeographical and taxonomical implications of the results of this study are discussed.

Eger, J. L. and R. L. Peterson (1979). Distribution and systematic relationship of *Tadarida bivittata* and *Tadarida ansorgei* (Chiroptera: Molossidae).

Morphologically similar *Tadarida bivittata* and *T. ansorgei* inhabit dry, woodland savannah areas of central Africa, where they are partially sympatric. Specimens of these species were divided into population samples based on geographic proximity. Multivariate analysis of variance indicated that both species are sexually dimorphic. Results of principle components analysis illustrated interspecific differences. In areas of sympatry, specimens were subjected to discriminant analysis to confirm their identity. Based on this analysis, classification functions are provided as a useful aid for identifying the two species.

Les espèces morphologiquement semblables *Tadarida bivittata* et *T. ansorgei* habitent les régions sèches des savanes boisées du centre de l'Afrique ou elles sont partiellement sympatriques. Des spécimens de ces espèces ont été divisés en échantillons de population, selon leur proximité géographique. L'analyse multidimensionnelle de la variance indique que les deux espèces font preuve de dimorphisme sexuel. Les résultats de l'analyse des composantes principales illustrent les différences interspécifiques. Dans les régions ou les deux espèces sont sympatriques, les spécimens ont été soumis à une analyse discriminatoire permettant d'en confirmer l'identite. Cette analyse a permis d'établir des fonctions de classification qui facilitent la séparation des deux espèces.

Eisenberg, J. F. and D. E. Wilson (1978). Relative brain size and feeding strategies in the Chiroptera.

Brain weights were estimated from the cranial volumes of 225 species of Chiroptera. The log of the average cranial volume was regressed against the log of the average body weight and the results analyzed for correlations with phylogenetic affinity and foraging strategy. It is concluded that the family Phyllostomatidae shows a strong convergence of brain to body weight ratios toward the patterns shown by the Pteropidae. Foraging strategies involving the location of rich food resources which are isolated in small pockets seem to require a large brain weight relative to body mass. If we assume the ancestral chiropteran had a brain structured more like a terrestrial insectivore, then the highly specialized aerial insectivores with the lowest relative brain to body weight ratios of the extant chiroptera reflect an evolutionary tendency to maintain the brain mass at a minimum weight.

Eisentraut, M. (1941). Beitrag zur Oekologie Kameruner Chiropteren.

Während eines 6 wöchigen Aufenthaltes in Kamerun wurden 10 Chiropterenarten beobachtet, davon zwei Vertreter der Flughunde und 8 Vertreter der Kleinfledermäuse. Es werden u. a. das Vorkommen, die Tagesquartiere, ernährungs- und fortpflanzungsbiologische Eigentümlichkeiten behandelt, insbesondere Unterschiede zwischen Frucht- und Insektenfressern und die Fortpflanzungszeiten. Ferner wird auf die Variation der Fellfärbung bei einigen Arten eingegangen.

Eisentraut, M. (1945). Biologie der Flederhunde (Megachiroptera). Nach einem hinterlassenen Manuskript von Dr. Heinrich Jansen.

Im Anschluß an meine biologisch-ökologischen Arbeiten über heimische Fledermäuse entstand der Plan, diese Studien auch auf fremdländische Vertreter auszudehnen. Unter anderem war beabsichtigt, die Ernährungsbiologie der gesamten Chiropteren zu bearbeiten. Eine im Jahre 1938 unternommene Reise nach Kamerun sollte mit dazu dienen, tropische Vertreter, insbesondere auch Megachiropteren, an Ort und Stelle kennenzulernen und sowohl Beobachtungs- wie auch anatomisches Material zusammenzubringen. Mit den nahezu abgeschlossenen Literaturstudien wurde die geplante Arbeit dann bei Ausbruch des zweiten Weltkrieges zwangsläufig unterbrochen.

Unterdessen übersandte mir nun Herr Prof. Dr. H. WEBER aus dem Nachlaß des am 23.9.1933 verstorbenen Zoologen Dr. HEINRICH JANSEN ein umfangreiches, noch nicht veröffentlichtes Manuskript über die "Biologie der Flederhunde" zur Durchsicht. Bei einer eingehenden Prüfung erschien die Arbeit in der vorliegenden Form recht wenig zum Druck geeignet. Die bisweilen allzu ausführliche Wiedergabe von nebensächlichen oder gar falsch gedeuteten, in der Literatur niedergelegten Beobachtungen beeinträchtigte erheblich die geschlossene Darstellung und ließ die tatsächlichen Gegebenheiten nicht klar hervortreten. Auch die Einteilung des Stoffes erschien nicht immer glücklich. Im Hinblick auf meine eigenen Pläne entschloß ich mich daher gern, die mir von Herrn Prof. Dr. WEBER in liebenswürdiger Weise angebotene Umarbeitung des JANSENschen Manuskriptes zu übernehmen. Es mußte dabei außer zahlreichen textlichen Veränderungen an vielen Stellen eine erhebliche Kürzung vorgenommen werden. Einige Kapitel erforderten eine weitgehende Neubearbeitung. Bisweilen waren auch ergänzende morphologisch-anatomische Untersuchungen notwendig, für die mir von Herrn Prof. Dr. POHLE in dankenswerter Weise das entsprechende Material aus der Säugetierabteilung des Zoologischen Museums Berlin zur Verfügung gestellt wurde. Wohl annähernd vollständig waren in dem Manuskript die bis zum Jahre 1932 vorliegenden Arbeiten berücksichtigt. Dies war um so erfreulicher, als durch die kriegsbedingten Umstände die Beschaffung der Literatur sehr erschwert war, so daß meist auch keine Nachkontrolle der, von JANSEN angeführten Stellen vorgenommen werden konnte. Nach Möglichkeit aber wurde versucht, die nach 1932 erschienenen Arbeiten, soweit diese mir nicht schon durch die früheren Literaturstudien bekannt waren, einzusehen. Die Absicht, dem Text geeignete Abbildungen beizugeben, konnte infolge der erwähnten Schwierigkeiten nur in begrenztem Umfange zur Ausführung kommen.

Zu besonderem Dank verpflichtet bin ich den Herren Professor Dr. EIDMANN und Prof. Dr. KENSCH für Überlassung von Photos aus eigenem Besitz, ferner Herrn Prof. Dr. POHLE für Photos aus der Bildersammlung der Säugetierabteilung des Zoologischen Museums Berlin. Herrn Prof. Dr. O. v. WETTSTEIN danke ich herzlich für seine Bemühungen um Beschaffung einiger Abbildungen aus der Literatur und Nachkontrolle einer mir nicht zugänglichen Literaturstelle.

In vielen Punkten ist unsere Kenntnis von der Biologie der Flederhunde noch sehr lückenhaft, besonders hinsichtlich der feineren Unterschiede bei den einzelnen Arten. Dies ist mir bei Abschluß der Durcharbeitung immer mehr zum Bewußtsein gekommen. Die vorliegende Zusammenstellung kann daher keine abschließende Biologie sein. Weitere intensive Forschung und mühevolle Kleinarfbeit sind notwendig, um immer tiefer in die Lebensäußerungen dieser durch ihre vornehmlich nächtliche Lebensweise der Beobachtung oft nur schwer zugänglichen Tiere einzudringen

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Eisentraut, M. (1956a). Der Langzungen-Flughund, *Megaloglossus woermanni*, ein Blütenbesucher.

Auf Grund von Pollenfunden im Magen muß der einzige in Afrika heimische Vertreter der Langzungen-Flughunde, *Megaloglossus woermanni*, als Blütenbesucher angesehen werden. Es werden kurz die morphologisch-anatomischen Merkmale, die eine Anpassung an den Blütenbesuch erkennen lassen, beschrieben.

Eisentraut, M. (1956b). Beitrag zur Chiropteren-Fauna von Kamerun (Westafrika).

Während zweier Reisen in das britische Mandatsgebiet von Kamerun, 1938 und 1954, wurden 273 Chiropteren gesammelt, die sich auf 4 Megachiropterenarten (dazu eine nur beobachtete Art) und 14 Microchiropterenarten verteilen. Die systematische Bearbeitung ergab die Aufstellung einer neuen Spezies, *Hipposideros camerunensis*, die mit *Hipposideros cyclops* nahe verwandt ist und sich in erster Linie durch bedeutende Körpergröße auszeichnet. Die bisher als Unterart zu *Rhinolophus alcyone* gestellte Form *alticolus* muß als selbständige Spezies angesehen werden. *Pipistrellus culex, Eptesicus tenuipinnis* und *Rhinolophus landeri* wurden erstmalig für Kamerun nachgewiesen. Für die einzelnen Arten werden morphologische Besonderheiten hervorgehoben und ökologische Daten angegeben.

Ferner wird ein Überblick über das Vorkommen der Fiedertiere in dem engeren Gebiet und ihre Verbreitung in den Höhenstufen des Kamerungebirges gegeben. In diesem Zusammenhang werden auch die Tagesquartiere und das nächtliche Treiben der Fledermäuse behandelt. Die gesammelten Beobachtungen über die Fortpflanzungstätigkeit sprechen für begrenzte Fortpflanzungszeit. Die bei Megachiropteren festgestellten Zahnanomalien (Auftreten überzähliger Zähne) dürften im Zusammenhang mit den bei ihnen auftretenden Funktionsverminderungen infolge Anpassung an Frucht- und Blütennahrung stehen.

Eisentraut, M. (1958). Beitrag zur Chiropterenfauna Ostafrikas. (Ergebnisse der Deutschen Zoologischen Ostafrika-Expedition 1951/52. Gruppe Lindner, Stuttgart, Nr 28, und Gruppe Knipper, Bremen).

Die von den beiden getrennt operierenden Gruppen der Deutschen Zoologischen Ostafrika-Expedition 1951/52 im Tanganyika-Gebiet gesammelten Chiropteren verteilen sich auf 13 Arten, und zwar 10 Fledermäuse und 3 Flughunde; dazu kommen 2 jugendliche Exemplare von Epomorphoriden, deren genaue Artzugehörigkeit aus Mangel an geeignetem Vergleichsmaterial zunächst offenbleiben muß. Die meisten Arten sind zwar für das Gebiet bekannt (vgl. G. H. SWYNNERTON & R. W. HAYMAN: A Check List of the Land Mammals of the Tanganyika Territory and the Zanzibar Protectorate. J. East Africa nat. Hist. Soc., 1950, Vol. XX), doch wird unsere Kenntnis von ihrer Verbreitung durch die neuen Fundorte ergänzt. Eine Art, *Nycteris aurita*, ist für Tanganyika neu. Im Hinblick auf die noch immer recht mangelhaften Angaben über die Ökologie vieler Arten sind die während des Aufenthaltes in Afrika von H. KNIPPER und G. ZINK (als Teilnehmer der Gruppe LINDNER und von Ende Juni 1952 ab als alleiniger Bearbeiter) gesammelten biologischen Beobachtungen beigefügt.

Für einen Vergleich und eine Nachbestimmung einer Reihe von Arten bin ich Herrn Dr. V. AELLEN (Genf) zu herzlichem Dank verbunden. Ebenso danke ich Herrn R. W. HAYMAN (London) für die Begutachtung einiger Arten.

Eisentraut, M. (1960a). Der Rassenkreis *Rousettus aegyptiacus* E. Geoff.

Im Gebiet des Kamerangebirges leben zwei *Rousettus*-Arten: der kleine *R. angolensis* Bocage und eine größere Art, die bisher nur in wenigen Stücken gesammelt und von den einzelnen Autoren systematisch, verschieden eingruppiert wurde. Von ihr erwähnt wohl als erster Matschie (1891) ein Exemplar von Buea (1000m hoch am SO-Hang des Kamerungebirges gelegen), das er anfänglich als *Cynonycteris (= Rousettus) unicolor* bestimmte. Diese Form wurde von Gray (1870) unter dem Namen *Eleutherura unicolor* für Gabun beschrieben, später aber als Synonym zu dem in Ägypten und den angrenzenden Gebieten heimischen *R. aegyptiacus* gestellt. Sjöstedt (1897) sammelte einige Exemplare von den Orten Bibundi, N'dian, und Bonge am Fuße und nordwestlich vom Kamerungebirge. Er stellte sie zu *Cynonycteris collaris (= Rousettus leachi)*, einer Form, die in Ost- und Südafrika verbreitet ist. Gleichzeitig teilte er mit, daß sich Matschie bei einem Vergleich dieser Stücke mit seinem Buea-Exemplar überzeugt habe, daß letzteres ebenfalls zu *collaris (= leachi)* gehöre. 1936 erwähnt Sanborn drei Stücke, wiederum von Buea, und stellt sie zu *R. aegyptiacus*. Das gleiche tat Sanderson (1940) mit seinem aus dem nördlich vom Kamerungebirge gelegenen Mamfe-Gebiet mitgebrachten *Rousettus*. Jeannin (1936) nimmt an, daß *Rousettus aegyptiacus*

wahrscheinlich in ganz Kamerun vorkomme, aber sehr selten sei, und Aellen (1952) führt neben *angolensis* auch *aegyptiacus* für Kamerun an.

Nachdem ich von meinen beiden ersten Kamerunreisen (1938 und 1954) nur *R. angolensis* gesammelt hatte, gelang es mir, während meiner dritten Reise (1957/58), die ausschließlich der Erforschung der Wirbeltierfauna des Kamerungebirges gewidmet war, auch von der zweiten größeren Art eine stattliche Serie von 83 Exemplaren zusammenzubringen. Sie gehören zweifellos in den *aegyptiacus*-Rassenkreis, sind aber keineswegs identisch mit der Rasse *aegyptiacus* und auch nicht mit dem ost- und südafrikanischen *leachi*, so daß eine Abtrennung als Subspezies gerechtfertigt erscheint. Ihre genauere Bearbeitung veranlaßte mich, die verwandtschaftliche Beziehung und geographische Verbreitung der für Afrika und einige angrenzende Gebiete bekannten Formen des Rassenkreises *R. aegyptiacus* näher zu untersuchen.

Eisentraut, M. (1960b). Zur Kenntnis der westafrikanischen Flughundgattung *Scotonycteris*.

Die Gattung *Scotonycteris* mit der Art *zenkeii* wurde von Matschie (1894) nach einem von Zenker bei Yaunde (Süd-Kamerun) erbeuteten Stück (? ad) aufgestellt. Ein Weiterer Fundort für diesen bemerkenswerten Vertreter der Flughunde ist der Elefanten-See (Barombi Lake) bei Kumba, den Sjöstedt (1897) erwähnt. Ein von der Insel Fernando Poo stammendes Stück (? ad) wurde von Thomas (1904) als besondere Art, *Sc. bedfordi*, beschrieben, dann aber von Andersen (1912) mit Recht zu *zenkeri* gestellt, so daß *bedfordi* als Synonym zu gelten hat. Als besondere Unterart, *occidentalis*, beschrieb schließlich Hayman (1946) ein von Cansdale bei Oda im Gebiet der Goldküste gesammeltes Exemplar, wiederum ein ? ad.

Die zweite, bedeutend größere Art, *ophiodon*, wurde erst 1943 von Pohle nach einem im Berliner Museum befindlichen, von Zenker 1898 bei Sipindi (Kribi-Bezirk, Süd-Kamerun) gesammelten und bis dahin in Alkohol aufbewahrten Exemplar (? subad.) beschrieben. Bald danach gelang es wiederum Cansdale und ebenfalls bei Oda (Goldküste), ein erwachsenes ? von *ophiodon* mit dazugehörendem Pullus zu erbeuten. Das Stück kam in das Britische Museum nach London und wurde von Hayman (1945) als neue Subspecies, *cansdalei*, beschrieben. Dies ist im wesentlichen alles, was wir bisher über das Vorkommen der beiden *Scotonycteris*-Arten wissen.

Während meiner 3. Kamerunreise (1957/58) gelang es, von beiden Arten einiges Material zu sammeln. Die Erbeutung von 3 Exemplaren von *Sc. Ophiodon* und 4 Exemplaren von *Sc. Zenkeri* verdanke ich der Methode des Netzfanges. Offenbar leben die Tiere am Tage sehr versteckt im Niederungswald. Die erwähnten Stücke fingen sich über Nacht in den zwischen Bäumen oder Stangen am Waldrand ausgespannten Nylonnetzen (sogenannten Japannetzen) und kamen auf diese Weise lebend und unverletzt in meine Hand. Damit sind nun sowohl von *ophiodon* als auch von *zenkeri* beide Geschlechter in adultem Zustand vertreten; ferner liegt mir je ein subadultes Stück vor. Zur Abrundung unserer Kenntnis von dieser in Museen so überaus selten vertretenen Gattung möchte ich im folgenden, unter Beifügung der Maßangaben, die Beschreibung einiger Details bekanntgeben. Die charakteristischen Merkmale der Gattung sind in der Literatur hinreichend gekennzeichnet.

Eisentraut, M. (1960c). Zwei neue Rhinolophiden aus Guinea.

Bei der Bearbeitung der von Herrn HANS KNORR 1956 in Guinea (ehemals Französisch-Guinea) gesammelten Fledermäuse (EISENTRAUT und KNORR 1957) war bereits auf zwei Rhinolophiden hingewiesen, deren genaue Determination auf Grund einiger abweichenden Merkmale auf Schwierigkeiten stieß. Die eine Form, zweifellos in die nächste Verwandtschaft von *alcyone-landeri* gehörig, wurde zunächst als *Rhinolophus landeri* Martin subsp. ? geführt, eine Art, deren Nominatrasse für Westafrika bekannt ist. Die zweite Form, die sich durch besondere Kleinheit auszeichnet, steht der in Süd- und Südwestafrika verbreiteten Art *Rhinolophus denti* Thomas sehr nahe. Nachdem ich inzwischen im British Museum (Natural History) in London Gelegenheit hatte, dort befindliches Vergleichsmaterial, insbesondere auch das Typenmaterial von *Rh. Denti* zu vergleichen, ist es mir nunmehr möglich, eine abschließende Bearbeitung des KNORR'sehen Materials vorzunehmen und die beiden Formen zu beschreiben. Den Herren Dr. CROWCROFT und R. W. HAYMAN (London) bin ich für

die Erlaubnis, im Britischen Museum arbeiten und das dortige Material untersuchen zu können, zu besonderem Dank verpflichtet. Ebenso danke ich herzlich den Herren Dr. V. AELLEN (Genf) und Dr. J. DORST (Paris) für die Begutachtung der ihnen übersandten Sammlungsstücke.

Eisentraut, M. (1964). La faune de chiroptères de Fernando-Po.

Etude comparative de collectes de Chiroptères de l'île de Fernando-Pô et de la région continentale la plus voisine, les monts Cameroun, à la suite de missions de terrain dans les deux régions. La faune de l'île est un peu plus pauvre et ne comprend pas de représentants des genres *Epomophorus* et *Micropterus*, ni la Roussette *Epomops franqueti*. Il n'y a pas, contrairement à ce qui a été dit, de formes - espèces, sous-espèces ou races - endémiques de l'île. La détermination de races n'est d'ailleurs pas valable pour les Chiroptères. Certaines espèces n'étaient pas jusqu'alors connues de l'île: *Rhinolophus alcyone, Hipposideros curtus*. L'auteur a obtenu du Père Basilio des données sur d'autres espèces non encore signalées: *Xiphongcteris spurrelli, Hipposideros cyclops*. Chaque espèce fait l'objet de remarques sur sa position taxinomique et d'observations sur son abondance, son habitat, son comportement, sa nourriture, sa reproduction.

Eisentraut, M. (1965). Der Rassenkreis *Rousettus angolensis* (Bocage).

Die im British Museum (Nat. Hist.) in London befindlichen Stücke von *Rousettus angolensis* zeichnen sich durch besondere Größe aus. Sie müssen als östliche Rasse, die unter dem Namen *ruwenzorii* näher beschrieben wird, von den westlichen Vertretern des Rassenkreises, nämlich *angolensis* und *smithi*, abgetrennt werden. Letztgenannte Form ist die kleinste. Der Rassenkreis gibt ein schönes Beispiel für Größenzunahme von West nach Ost, die vor allem beim Vergleich der Schädelmaße zum Ausdruck kommt.

Eisentraut, M. (1968). Die tiergeographische Bedeutung des Oku-Gebirges im Bamenda-Banso-Hochland (Westkamerun).

Nach einer erstmaligen Zusammenstellung aller für das Oku-Gebirge im Bamenda-Banso-Hochland nachgewiesenen Säugetiere werden die Säuger- und Vogelarten dieses Gebietes herausgestellt, die teils eine enge Beziehung zu ostafrikanischen Vertretern erkennen lassen, teils als endemische Formen auftreten. Für diese tiergeographischen Gegebenheiten dürften in erster Linie die pleistozänen Klimaschwankungen von besonderer Bedeutung gewesen sein.

Eisentraut, M. (1969). Gibt es in West-Afrika eine auf Montangebiete beschränkte Säugetierfauna?

Die Bearbeitung einer umfangreichen Säugetieraufsammlung von W-Kamerun und Fernando Poo hat ergeben, daß wir in diesen gebirgigsten Teilen W-Afrikas einen hohen Prozentsatz von Formen finden, die in ihrer vertikalen Verbreitung auf Montangebiete beschränkt sind. Es handelt sich teils um Montanarten, teils um Montanrassen weiter verbreiteter und in anderen Rassen auch im Tiefland vorkommender Arten. Wir können daher - gegenüber der von manchen Autoren vertretenen gegenteiligen Ansicht - auch bei Säugetieren ebenso wie z. B. bei Vögeln und Schmetterlingen von einer Montanfauna und einer Tieflandfauna sprechen. In dem im Kameruner Hinterland gelegenen Oku-Gebirge ist sogar die Mehrzahl der bisher von dort bekanntgewordenen Säuger als montan anzusehen.

Eisentraut, M. (1974). Mammalogische Notizen aus Kamerun.

Es wird über eine kleine Aufsammlung von Säugetieren aus der Sudanzone in Nord-Kamerun und aus dem Waldgebiet von Süd-Kamerun berichtet. Einige bemerkenswerte fortpflanzungsbiologische Beobachtungen an den beiden Flughundarten *Epomops franqueti* und *Megaloglossus woermanni* betreffen die bisher noch ungenügend geklärte Frage des Mitnehmens der Neugeborenen durch die Mutter während des nächtlichen Nahrungsfluges und das Auftreten von verschieden weit entwickelten dizygoten Zwillingen.

Eisentraut, M. (1975). Weiterer Beitrag zur Saugetierfauna von Kamerun.

A report on a collection of mammals from the savanna region of northern Cameroon is given. There are represented almost exclusively savanna dwellers typical of the Sudan and Guinea zones; only a few forms are to be found in the region of tropical rain-forest, too. In a supplement a list is given of mammals collected in the mountain forest region of Mt. Lefo near Bamenda, the mammal fauna of which had not yet been studied. Among the species listed there, *Colomys gosling* is of particular interest, its area of distribution being extended to western Cameroon.

Eisentraut, M. and H. Knorr (1957). Les Chauves-souris cavernicoles de la Guinée française.

Notre connaissance des chauves-souris habitant la partie côtière occidentale de la Haute-Guinée est encore très incomplète. Les prospections ont cependant déjà conduit à de nombreux résultats surprenants. Ce district est en effet remarquable au point de vue biogéographique et faunistique, en ce qu'il forme une zone de passage entre la zone côtière couverte de forêt primaire à l'est et les savanes du nord et du nord-ouest et que les éléments faunistiques correspondants s'y mélangent. De nombreux éléments propres à la forêt, d'origine orientale, atteignent ici leur limite occidentale de dispersion. En outre, on rencontre une série de formes endémiques, propres à ce district d'après nos connaissances actuelles.

Nous faisons une allusion particulière au Rhinolophe géant, *Rh. maclaudi*, que Pousargues a déjà décrit en 1897 de Guinée française, d'après un exemplaire unique, et qui fut retrouvé en 1954 - un exemplaire unique lui aussi - par A. Villiers (voir V. Aellen 1956). En 1939, Monard a décrit l'Emballonuridé qu'il avait trouvé en Guinée portugaise, *Coleura kummeri*, et en 1954 Villiers retrouva celui-ci en Guinée française. Cette espèce est jusqu'à présent le seul représentant en Afrique occidentale de ce genre dont on ne connaissait jusqu'alors que plusieurs espèces des Séchelles et d'Afrique orientale. De plus Monard a trouvé en Guinée portugaise un nouvel Hipposidériné, *Hipposideros braima*. Une espèce remarquable, très différente des autres espèces du genre, est par ailleurs *Hipposideros jonesi*. Cette chauve-souris a été décrite en 1947 du Sierra Leone par Hayman et n'était connue que par trois exemplaires jusqu'à présent. Des cinq espèces collectées en 1954 par Villiers en Guinée française et étudiées par Aellen, pas moins de quatre étaient nouvelles pour ce district.

De nouvelles connaissances sur la faune des Chiroptères furent acquises par les récoltes que l'un de nous (Hans Knorr) a faites au cours d'un récent voyage en Guinée française. Celui-ci a visité, en compagnie de Mr. Klaus Noack, de septembre à décembre 1956, la partie méridionale du district de Kindia en partant de Conakry, et a collecté dans la région de Yembéré-Tahiré, sur le plateau de Kelesi et dans le district situé entre Nerebily et Kolenté, sur les plateaux de Salung et de Kankuya. Le territoire de collecte est compris dans le triangle Kindia-Mambia-Kolenté. Une attention spéciale a été consacrée aux nombreuses grottes, pour une grande part encore inconnues, de cette région. Le matériel fut acquis par le *Staatliches Museum für Naturkunde* de Stuttgart. Dans ce travail, nous donnons les résultats acquis sur le plan systématique en même temps que les observations biologiques que nous avons pu recueillir. La détermination subspécifique de deux Rhindlophes (*landeri* et *denti*) et d'un *Hipposideros (caffer)* ne peut être donnée avec certitude et est réservée pour un travail ultérieur.

Nous sommes reconnaissants au Dr. Jean DORST et au Dr. V. AELLEN (Genève) pour les déterminations et l'examen de quelques espèces. Nous remercions en outre le premier pour la traduction du texte en français.

Elbl, A., U. H. Rahm and G. Mathys (1966). Les mammifères et leurs tiques dans la forêt du Ruggege (République Rwandaise).

This study presents the result of a three week period of intensive collection and examination of mammals in the Forest of Ruggege, a primary mountain forest on the western border of the Republic of Rwanda, from the viewpoint of ecology, of the mammals and of the Ixodid ticks found on these mammals. The study covers 16 ecologically different trapping areas, five hunting areas and four areas of large mammal examination which can be divided into three categories - virgin (primary) forest, secondary forest, zone of cultivation and human activity - and in which a total of 203 small mammals were trapped, nine large wild mammals were killed and 66 domestic animals were examined.

These mammals belong to 44 different species and subspecies, of which one species and one subspecies are new to science: *Lophuromys rahmi* n. sp. Verheyen, 1964, *Lophuromys luteogaster* Hatt n. ssp. Verheyen (in press) and 18 species are reported for the first time from this region of Rwanda. A total of 107 of these mammals were found to be parasitized by Ixodid ticks (Ixodoidea, Ixodidae) while 166 had various other acarines (gamasids and trombiculids), 70 had fleas and 48 had lice.

The ixodid ticks collected, belong to five genera (*Amblyomma, Boophilus, Haemaphysalis, Ixodes, Rhipicephalus*) and represent 14 species. Five of these species are reported for the first time from Rwanda while the male of one species, *Ixodes muniens*, is reported for the first time ever. The tick species can be divided into species apparently indigenous to the forest as well as species apparently introduced into the forest by the passage of domestic animals.

Während einer driewöchigen, intensiven Fang- und Sammeltätitgkeit wurden im Gebirgswald von Ruggege, einem Urwald, der sich an der Westgrenze der Rwanda-Republik hinzieht, alle, meist kleinen Säugetiere und die darauf parasitierende Zecken zwecks ökologischer Studien untersuche. Die Erhebungen beziehen sich auf 16 ökologisch verschienden Fangzonen, fünf Jagdgebiete und vier Zonen, in dene Große Säugetiere untersucht wurden. Man kann diese verschiedenen Zonen in drei Hauptgruppen aufteilen: Urwals, sekundärer Wald und kultivierte Zonen, die direkt unter dem Einfluß des Menschen stehen. Insgesamt konnten 203 kleine Säugetiere, neun große Säugetiere und 66 Haustiere erfaßt werden.

Diese Säugetiere gehören 44 verschienden Arten und Unterarten an, wovon eine Art und eine Unterart neu sind: : *Lophuromys rahmi* n. sp. Verheyen, 1964, und *Lophuromys luteogaster* Hatt n. ssp. Verheyen (im Druck). Daneben sind 18 Arten erstmals aus diesem Gebiete des Rwanda erwähnt. Insgesamt waren 107 dieser Säugetiere durch Ixodes-Zecken (Ixodoidea, Ixodidae) befallen und 166 Tiere waren Träger von andern Milben (Gamasiden und Trombiculiden). Im übrigen zeigten sich auf 70 Tieren Flöhe und auf 48 Individuen Läuse.

Ellerman, J. R., T. C. S. Morrison-Scott and R. W. Hayman (1953). Southern African Mammals 1758 to 1951: a reclassification.

Notes in REFN 43

Elliot, D. G. (1897). List of mammals obtained by the Field Columbian Museum East African Expedition to Somali-land in 1896.

The chief reason that induced the Field Columbian Museum to send an expedition to Africa was the knowledge that the large wild animals were rapidly becoming extinct, and that no time was to be lost if examples of these still living species were to be procured for the Institution, to show to those who come after us the creatures that once in countless numbers roamed over the plains and in the forests of the Dark Continent. The Expedition was uncommonly successful in obtaining ample series of nearly all the species inhabiting the country it traversed, and beside the specimens themselves there were brought back photographs, casts of the head and muscles, and ample measurements of the Specimens obtained. Unfortunately, on account of the illness of members of the Expedition, it was unable to penetrate as far into the interior as was intended, so a few species that would undoubtedly have been obtained are omitted from the list. Many more examples of the different species could easily have been procured, but after what was considered to be a sufficient number had been secured no more weru killed, no matter how often the animals were encountered.

Elliot, D. G. (1907). A catalogue of the collection of mammals in the Field Museum of Natural History.

The present Catalogue purports to give the names and the number of specimens of Mammals in the Field Columbian Museum up to the date of issue. When the Author took charge of the Department of Zoology, as constituted in this Institution, the collection of Mammals was composed of a limited number of mounted examples furnished by the Ward Natural Science Establishment of Rochester, New York, many of them not freshly prepared, and nearly all with unreliable data of locality, causing them to be practically of little scientific value specifically, but useful to a certain degree as representatives of genera. There were no mammal skins, and consequently a study collection did not exist. At the present time a fair start has been made, and about fifteen thousand specimens are now in the Museum collection, the major portion, as is proper, being unmounted and reserved for scientific study and comparison. Knowing that the value of a museum's material depends greatly upon how much is available for scientific research, it has been the Author's policy to restrict the number of mounted specimens to as few as would give a proper conception as possible to the visitor, of the Order, Family, and usually the species, represented. To go beyond this would be but the production of useless repetitions, wearying to the observer and profitable [to no one. Naturally, when beginning the formation of a collection, the material nearest at hand was sought, and consequently the mammalian fauna of the United States occupies the largest portion of the Catalogue. The Author has not, however, been unmindful of exotic forms, and as many foreign species have been procured as possible, rather special attention having been given to Wild Horses and African Antelopes, - important and beautiful creatures advancing rapidly toward extinction. Although purchases have been liberally made, yet by such means the making of a collection would be necessarily slow and unsatisfactory, for the main dependence for achieving success and a collection at the same time is, of course, work in the field. The expedition to Africa under the Author's leadership produced large results, and numbers of valuable specimens were secured, the majority being various species of Antelopes. By keeping collectors constantly at work, mostly thus far in North America, it has been possible to bring together a sufficiently large number of specimens to constitute a nucleus for the grand collection it is hoped the Museum may eventually possess, and cause it to take its position in the front rank of the great world-embracing Institutions devoted to the scientific study of Natural History, and whose influence is felt and recognized throughout the earth. In the exhibition of mammals much attention, and, it may be added space also, has been given to groups, and specimens of single species of different ages and sexes have been brought together and placed in a miniature landscape of the country in which they once dwelt. Their environment was thus the natural one. When practicable this is the most satisfactory method of exhibiting specimens ; but it is limited, for no matter how large the museum building may be, only a very small portion of a collection could be so arranged, and if continued to any excess, other and equally important exhibits could not be shown. Mounting specimens in groups, therefore, must from sheer necessity be always limited.

Every example in the Museum that has passed through the Author's hands is contained in this Catalogue, together with all the information possessed regarding it; commencing with the sex, whether collected, purchased, presented, or exchanged, followed by the locality in which it was taken, the

person or institution from which it was procured, ending with the name of the collector. The signs and abbreviations used are: ?, male; ?, female; Coll., collected; P., purchased; Pres., presented; and Exch., exchanged. The arrangement is that of the Check-List of Mammals of the North American Continent and West Indies, as far as that work goes, viz.: for the mammals of the North American fauna, the exotic species being relegated to their various positions in accordance with the system of classification adopted by the Author. One species is described, a bat, Uroderma validum, on page 538, the discovery that the specimens represented a new form having been made too late for the Author to avail himself of any of the usual channels of publication and include it at the same time in the present work. In conclusion, it gives me much pleasure to acknowledge my indebtedness to Mr. W. J. Gerhard, Assistant Curator of Entomology, for his valuable aid in reading the proofs as the work passed through the press, and also for constructing the index, in which task considerable help was rendered by my assistant, Mr. E. B. Chope.

El-Rayah, M. A. (1980). Systematics of African molossid bats of the subgenus *Xiphonycteris* of the genus *Tadarida* (Molossidae: Chiroptera)

The morphological variations of the taxa of African molossid bats (genus *Tadarida* Rafinesque, 1814) included by Koopman (1975) in his proposed subgenus *Xiphonycteris* were analysed and compared with five representative taxa of the subgenus *Mops*.

Sexual dimorphism, geographic variation and phonetic similarities were assessed using 31 morphometric characters of 586 specimens utilizing univariate and multivariate analyses. Eight of the taxa tested for sexual dimorphism showed a clear statistical separation of the sexes, with *Tadarida spurrelli* being the most dimorphic (in more than 80 per cent of the characters measured) and *T. midas* the least dimorphic (in 45 per·cent of the characters). Accordingly, males and females were analysed separately.

Phenetic similarities were assessed by cluster analysis using correlation coefficients, average taxonomic distance, subsets and minimum spanning trees together with principal component analysis and nonmetric multidimensional scaling.

Geographic variation in female *T. (X.) nanula*, male and female *T. (X.) leonis* male and female *T. (X.) thersites* and female *T. (X.) spurrelli* was examined by generalized discriminant function analysis. Morphologic similarities among geographic samples, as indicated by the minimum spanning trees computed from the matrices of the square root of the Mahalanobis' generalized distances and superimposed on the discriminant configurations, were compared with geographic distances.

Character variations in geographic samples were tested by univariate analysis using Gabriels' sum of the square simultaneous test procedure (SS-STP) and Power's ranked means. Although character variations are clinal in *T. (X.) leonis*, they are mostly erratic and do not show a clear clinal trend in other taxa. Taxa known as *T. (X.) calabarensis, T. (X.) ochraceus* and *T. (X.) occipitalis* are shown to be synonyms of *T. (X.) nanula, T. (X.) leonis* and *T. (X.) thersites* respectively. Specimens of a previously undescribed taxon were compared with other taxa, diagnosed and named as a new species.

The five taxa found to be valid in the subgenus *Xiphonycteris* (*T. spurrelli, T. nanula, T. leonis, T. thersites* and the new species) were compared phenetically with representative taxa in the subgenus *Mops* (*T. demonstrator, T. condylura, T. trevori, T. congica* and *T. midas*). Results of cluster analysis, principal component analysis and non-metric multidimensional scaling showed that members in both subgenera are phenetically similar.

From a comparison of morphological characters and original descriptions of *T. thersites* (Thomas, 1903), *T. leonis* (Thomas, 1908) and *T. brachyptera* (Peters, 1852), it is shown that *T. brachyptera* is the earliest available name that includes *T. leonis* as a synonym. As the holotype of *T. brachyptera* has been lost and no lectotype or syntype exists, a neotype is designated and described according to article 75 of the International Commission of Zoological Nomenclature, 1964.

Based on number of lower incisors, the reduction of the last upper molar and the palatal emargination, characters on which the genus *Xiphonycteris* and later the subgenus were established, *Xiphonycteris*

is shown to be invalid as a genus or as a subgenus. Accordingly, species previously included in the subgenus *Xiphonycteris* are reassigned to the subgenus *Mops*.

Les variations morphologiques des taxa des chauve-souris molossides de l'Afrique (genre *Tadarida* Rafinesque, 1814) comprises par Koopman (1975) dans le sous-genre *Xiphonycteris*, propose par lui, sont analysées et comparées avec cinq taxa typiques du sous-genre *Mops*.

Le dimorphisme sexuel, la variation géographique et les similitudes phénétiques sont évaluées suivant 31 caractères morphométriques de 586 spécimens, en utilisant des analyses autant univariées que multivariées. Parmis les taxa mis à l'épreuve concernant leur dimorphisme sexuel, huit font clairement preuve d'une distinction entre les sexes, dont *Tadarida spurrelli* parait être le plus dimorphique (dans 80 % caractères mesurées) et *T. midas* le moins dimorphique (dans 45 % des caractèrs). C'est pourquoi les mâles et femelles sont séparément analysés.

Les similitudes phénétiques sont évaluées au moyen d'analyse par groupes en utilisant les coefficient corrélatifs, les distances taxonomiques moyennes, les sous-groupes et les arbres d'embranchement minimal, ainsi que l'analyse des composantes principales et la graduation multidimensionnelle non-mesurée.

La variation géographique de la femelle de la *T. (X.) nanula*, du mâle et de la femelle de la *T. (X.) leonis*, du mâle et de la femelle *T. (X.) thersites* et de la femelle *T. (X.) spurrelli* est examinée par analyse des fonctions discriminantes généralisées. Les similitudes morphologiques entre les échantillons géographiques impliquées par les arbres d'embranchement minimal calculées à partir des matrices de la recine carée des distances généralisées selon Mahalanobis, surimposées sur les configurations discriminantes, sont comparées avec les distances géographiques.

ca Les variations des caractères des échantillons géographiques sont mises à l'épreuve au moyen d'analyse univariée, en utilisant le procédé de tests simultanés de la somme des carrés, selon Gabriel (SS-STP) et des moyennes classées de Power. Quoique les variations des caractèrs soient déclives chez la *T. (X.) leonis*, elles sont pour la plupart erratiques et ne montrent pas une tendance déclive nette pour les autres taxa. Les taxa connus sous les noms de *T. (X.) calabarensis, T. (X.) ochraceus* et *T.(X.) occipitalis* s'avèrent être des synonymes de *T. (X.) nanula, T. (X.) leonis* et *T. (X.) thersites* à leur tour. Un taxon, non décrit jusqu'ici est comparé avec d'autres taxa, diagnostiqué et désigné comme nouvelle espèce.

Les cinq taxa démontrés être valables dans le sous-genre *Xiphonycteris* (*spurrelli, nanula, leonis, thersites* et la nouvelle espèce) sont soumis à une comparison phénétique avec les taxa·représentatif s du sous-genre *Mops* (*domonstrater, condylura, trevori, congica* et *midas*). Les résultats de l'analyse en groupe, de l'analyse des composantes principales et la graduation multidimensionnelle non-mesurée démontrent que les membre des deux sous phénétiquement semblables.

La comparaison des caractèrs morphologiques et descriptions originales de la *T. thersites* (Thomas, 1903), la *T. leonis* (Thomas, 1908) et la *T. brachyptera* (Peters, 1852), démontre que le nom *T. brachyptera* est le nom le plus ancien disponible, et que ce nom comprend la *T. leonis* comme son synonyme. Alors que l'holotype *T. brachyptera* est perdue et qu'apparemment aucun lectotype, ni syntype n'est pas en existence, un néotype est désigné et décrit, d'après l'art. 75 du Comite International de la Nomenclature Zoologique de 1964.

D'après le nombre des incisives inferieures, la réduction de la dernièr molaire supérieure et l'émargination palatine, caractères à la base desquels le genre *Xiphonycteris* et, plus tard, le sous-genre ont été établis-il est maintenant prouvé que la désignation *Xiphonycteris* n'est pas valide, ni comme genre, ni comme sous-genre. Par conséquent, l'espèces auparavant comprises dans le sous-genre *Xiphonycteris* sont maintenant assignées de nouveau au sous-genre *Mops*.

El-Rayah, M. A. (1981). A new species of bat of the genus *Tadarida* (family Molossidae) from West Africa.

As a result of a systematic analysis and review of the nominal species included in the proposed subgenus *Xiphonycteris* (Family Molossidae, Order Chiroptera), a distinct new taxon from West Africa has been confirmed and described.

Entwistle, A. (C.) and N. Corp (1997a). Status and distribution of the Pemba flying fox *Pteropus voeltzkowi*.

The Pemba flying fox *Pteropus voeltzkowi* is a fruit bat endemic to the island of Pemba, off Tanzania. A total of 41 reported roosting areas were visited in June and July 1995, and 19 occupied roosts were located, most of them in the west of the island, and on small islets off the west and south of Pemba. Roost were situated in primary forest, secondary forest (overgrown clove plantations), traditional graveyards and mangrove areas. A range of sizes and species of trees were used as roosts. The minimum population of *P.voeltzkowi* was estimated to be between 4600 and 5500 individuals. In total 94 per cent of the population was located at 10 roost sites. Larger colonies were associated with roosts located in forests, which together supported 75 per cent of the total bat population. Colonies were of mixed sex, but no young or obviously pregnant females were observed. Major threats to this species appeared to be hunting and deforestation (both logging and clearing for agriculture) and *P. voeltzkowi* is considered to be endangered.

Entwistle, A. C. and N. Corp (1997b). The diet of *Pteropus voeltzkowi*, an endangered fruit bat endemic to Pemba Island, Tanzania.

The diet of the Pemba flying fox *Pteropus voeltzkowi*, a species endemic to the island of Pemba off Tanzania, was investigated. Faecal pellets, ejecta and dropped fruits were collected from under roosts to facilitate dietary analysis. This was supplemented by data from local villagers and school students. The main component of the diet was mango (*Mangifera indica*), but bats also ate breadfruit (*Artocarpus altilis*), figs (*Ficus* spp.), flowers, leaves, and other fruit. Pollen from at least five plant species was also found in faecal pellets. *Pteropus voeltzkowi* may be one of the only species on the island that disperses larger seeds. The germination rate of bat-ingested seeds was higher than that for seeds from ripe fruit, and this appeared to be linked to selective ingestion of viable seeds by bats.

Erasmus, B. H. and I. L. Rautenbach (1984). New records of occurrences of six species of small mammals in the northern Cape Province.

The occurrence of two rodent species (*Steatomys krebsii* and *Dendromus melanotis*) and four species of bats (*Scotophilus dinganii, Hipposideros caffer, Taphozous mauritianus* and *Rhinolophus darlingi*) is recorded in the northern Cape Province for the first time. The difficulties in positively identifying *R. darling* specimens necessitated a karyological overview and morphometric multivariate analyses of selected representatives of the ten southern African species of *Rhinolophus*.

Die voorkoms van twee knaagdierspesies (*Steatomys krebsii* en *Dendromus melanotis*) asook vier spesies van vlermuise (*Scotophilus dinganii, Hipposideros caffer, Taphozous mauritianus* en *Rhinolophus darlingi*) word vir die eerste keer bevestig vir die noordelike Kaapprovinsie. Die heersende probleme met die positiewe identifikasie van R. darlingi-eksemplare het 'n kariologiese oorsig en morfometriese meervariantanalises van geselekteerde verteenwoordigers van die tien suider-Afrikaanse Rhinolophus-spesies genoodsaak.

Estrada-Peña, A. and C. Sanchez (1988). Two new species of *Steatonyssus* (Acarina: Macronyssidae) from bats in the Canary Islands. with the description of male and protonymph of *Parasteatonyssus hoogstraal* (Keegan).

Two new species of Pataearctic *Steatonyssus* (Acarina; Macronyssidae) parasitinq vespertilionine bats from the Canarv Islands are described: *S. (S.) balcellsi* and *S.(S.) teidae*. The female of *S. (S.) balcellsi* has 11 pairs of podonotal setae none of which are reduced, peritrernal plate divided, sternal plate with posterior margin strongly sclerotized, first pair or sternal setae clearly reduced, and terminal setae on opisthonotal plate longer than other marginal setae. The female of *S. (S.) teidae* is very similar to *tibialis* Till and Evans, but it can be readily separated by a combination of critical characters in the length of tarsus I and peritreme. The male and protonymph of *Parasteatonyssus hoogstraali* (Keegan) from a molossid bat from the Canary Islands are also described.

Se describen dos nuevas especies de *Steatonyssus* Paleárticos (Acarina: Macronyssidae) recogidos sobre rnurciélaqos Vespertiliónidos de las Islas Canarías: *S (S.) balcellsi* y *S. (S.) teidae*. La hembra de *S. balcellsi* tiene 11 pares de sedas podonotales. de las cuales ninguna está reducida, placa peritremal dividida, placa esternal con margen posterior fuertemente esclerotizado. Primer par de sedas esternales claramente reducido y sedas terminales en la placa opistonotal más largals que las otras sedas marginales. La hembra de *S. teidae* es muy similar a *tibialis* Till y Evans, pero puede ser rápidarnente separada por una combinación de caracteres críticos en la longitud del tarso y del peritrerna. Se describen asimismo, el macho y la protoninfa de *Parasteatonyssus hoogstraali* (Kaeqan), recoqidos sabre un murciélago Molosido de las Islas Canarias,

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Estrada-Peña, A. and J. Serra-Cobo (1991). The Acarinia and Nycteribidia zones of *Miniopterus schreibersi* Kuhl (Mammalia: Chiroptera) in the northeast of Spain.

Acarinia and nycteribidia zones of the bat species *Miniopterus schreibersi* Kuhl are studied in an area of northeast of Spain, where captures over a period of five years have been carried out. The species that characterize the mite-tick spectrum are *Ixodes (Pomerantzevella) simplex, Macronyssus longimanus, Macronyssus granulosus* and *Spinturnix psi*; nycteribidium is determined mainly by the presence of *Nycteribia schmidlii*. The life cycle, prevalence, curves of parasitation, and other notes on these most abundant ectoparasites are provided, as well as observations on other ticks, mites, and nycteribiid species found on this bat.

Fa, J. E. (1991). Conservación de los ecosistemas forestales de Guinea Ecuatorial.

1. Guinea Ecuatorial comprende tres entidades geográficas:

a) Una zona continental, la región de Mbini (anteriormente Río Muni), delimitada al norte por la frontera con Camerún (210'N), al este (11) y al sur (1S) por Gabón y al oeste por el océano Atlántico.

b) La isla de Bioco (Fernando Poo), más al norte (330'N) en el Golfo de Guinea.

c) La isla de Pagalu (Annobón), al sur de Santo Tomé y Príncipe, en el océano Atlántico.

2. La región de Mbini es la más importante en cuanto a los recursos forestales pero se encuentran bosques de sumo interés biológico en la isla de Bioco.

3. Guinea Ecuatorial se encuentra en su totalidad dentro del área de la vegetación ecuatorial. La formación vegetal que predomina en la región de Mbini es la pluvisilva tropical densa. Generalmente es una formación arbórea de gran porte, donde es posible encontrar de 70 a 80 especies de árboles, siempre dependiendo del suelo, la pendiente o la acción antropogénica. Esto último es un factor que lleva al bosque a ser un mosaico de formaciones vegetales que refleja el estado de recuperación de la tala y la quema hecha por el hombre. Una proporción importante del territorio de Mbini es utilizado

para la agricultura itinerante y está ocupado por diversas etapas de vegetación secundaria, aunque todavía es posible encontrar importantes extensiones de bosque primario.

4. Los mapas (1:100.000) del Servicio Cartográfico del Ejército Español de 1959/1960 y estimaciones hechas en 1980 y 1985 por la FAD, sugieren una reducción notable de la superficie del bosque primario, el que ocupaba más del 50% del país en 1959 y sólo el 28% en 1985. La extensión de bosque secundario ha disminuido de 10% a 8%. La parte occidental de Mbini ha sido la más explotada a causa de su proximidad a la costa. La Cadena de Niefang, por su inaccesibilidad, y la zona oriental, por su lejanía de la costa, particularmente la parte sureste, nunca han sido afectadas.

5. La diversidad biológica del país es alta por su localización en el trópico y debido a que fue un área de refugio Pleistocénico. Hay una gran falta de información en cuanto al número de especies de la fauna y flora del país. Los taxa mejor documentados son los mamíferos. Aún existen en Mbini importantes poblaciones de mamíferos grandes como el búfalo forestal, el gorila, el chimpancé y el elefante de selva. No existen datos exactos sobre la condición de la vida silvestre en Bioco y Pagalu. Por lo menos 18 subespecies de mamíferos y 45 de aves son endémicas de Bioco.

6. El problema más inmediato del país es el de la obtención de divisas que le permitan hacer frente a las importaciones necesarias para la subsistencia de la población, servicios básicos y bienes de capital, así como el pago de la deuda externa. El sector forestal es el que más contribuye a la economía del país. Más del 50% del ingreso nacional proviene de la exportación de la madera. El sector opera por medio de la concesión de bosques a compañías madereras. En la actualidad, hay 15 compañías con concesiones. Anualmente, se exportan aproximadamente 100.000m^3.

7. A pesar de la importancia económica del sector forestal, éste se caracteriza por:

• Una administración forestal con carencia de personal con preparación en la conservación de bosques y uso racional de los recursos naturales. Hay una carencia absoluta también de recursos materiales.

• Una gran escasez tanto de información cartográfica como de inventarios forestales que permitan la evaluación correcta de las tendencias actuales de la explotación o de la planificación de la misma hacia el futuro.

• La presencia de una industria forestal predominantemente empírica.

• La ausencia total de planes de ordenación y reforestación.

8. La creciente demanda de tierras para cultivo en el país se debe al incremento en la población rural. La práctica usual de la agricultura itinerante trae consigo cambios significativos en los bosques del país. Esto representa una fuerte presión sobre los ecosistemas forestales y se calcula que ha significado la desaparición de 65.000 ha de bosque en los últimos 25 años, según datos de la FAO. El bosque es transformado en plantaciones de corta duración de maíz, yuca y cacahuete que de hecho no satisfacen los requerimientos nutritivos dz la población local. En todo el país la caza es una actividad importante. La carne de monte se consume localmente pero también se vende en los centros urbanos y carreteras. Los aldeanos ponen trampas en la proximidad de sus cultivos para atrapar pequeños animales, pero los que poseen armas entran al bosque a cazar antílopes, monos, chimpancés y gorilas.

9. En la actualidad operan tres proyectos directamente relacionados con la conservación de los recursos naturales en Guinea Ecuatorial. El primero, de la FAO y con financiamiento del PNUD, atañe al manejo y la explotación racional de los recursos forestales de Mbini. El proyecto incluye un inventario del bosque, un banco de datos de concesiones forestales, un plan de manejo para los bosques de la región, la capacitación de personal forestal y la implementación de un proyecto piloto cerca de Bata. El segundo programa tiene como enfoque la investigación biológica y la conservación de la naturaleza, goza del apoyo financiero de la Cooperación Española y es llevado a cabo por científicos de la Estación Biológica de Doñana. El tercer proyecto forma parte del programa indicativo de la CEE y su objetivo es encontrar maneras de incrementar la aportación del sector forestal a la economía del país. El programa forestal abarca tres elementos principales: construcción de carreteras forestales, la comercialización de la madera y la conservación de los recursos forestales.

10. El sistema legal del país está en revisión y no existe todavía un marco jurídico que reglamente adecuadamente el uso racional de los recursos naturales de la nación.

Fadda, C., E. Verheyen and M. Corti (1999). Phylogeny and systematics of three endemic Ethiopian species: 1. Morphology and molecular phylogeny. Abstract.

Due to its unique geomorphology, Ethiopia is known for its high number of endemic mammals where 21% of the 70 species of rodents recorded are endemic. Among them, the genus *Stenocephalemys* includes two species, *S. albocaudata*, restricted to the afro-alpine moorland in the Bale Mts., and *S. griseicauda*, characterised by a broader distribution including Bale and Simien. They occur at different altitudes and environments, with *S. albocaudata* confined to the highest altitudes of the plateau between 3,000 and 4,100 m a.s.l., and *S. griseicauda* spread in the scrubby, open habitats between 2,400 and 3,300 m a.s.l. The two species are considered closely related to *Myomys albipes*, another Ethiopian endemic species, occurring between 1,500 and 3,300 m a.s.l. In the Bale, it is progressively altitudually replaced by *S. griseicauda*.

The purpose of this study is to investigate the phylogenetic relationships between the three species using maximum parsimony and maximum likelihood analyses of part of the sequence of the mitochondrial 16S rRNA gene. The result are compared with morphometric diversity estimated through the Procrustes distances in a geometric three-dimensional analysis of the skull.

The results showed that, according to molecular phylogeny, the genus *Stenocephalemys* is paraphyletic as *S. griseicauda* is more related to *M. albipes* than to *S. albocaudata*. However, morphometric differences reflect the accepted taxonomy of the three species. These results are compared with the karyotypes of the three species and their allozyme patterns, which are is in agreement with the morphometric relationships.

Due to the peculiar evolutionary scenario characterising Ethiopia (important climatic and geological changes occurred due to rifting), morphological changes could be affected significantly by adaptations to the different environment, therefore being faster and convergent for *Stenocephalemys* as a result of adaptation to high mountains environments.

De par sa géomorphologie unique, l'Ethiopie est connue pour abriter un grand nombre de mammifères endémiques, 21% des 70 espèces de rongeurs répertoriées étant endémiques. Parmi ces espèces, le genre *Stenocephalemys* comprend deux espèces, *S. albocaudata*, limite" aux landes afro-alpines des monts Bale et *S. griseicauda*, caractérisé par une plus large répartition incluant les monts Bale et Simien. Elles occupent des altitudes et des milieux différents, *S. albocaudata* se limitant aux altitudes les plus élevées du plateau entre 3000 et 4100 m d'altitude, et *S. griseicauda* occupant les habitats ouverts entre 2400 et 3300 m d'altitude. Les deux espèces sont considérées comme très proches de *Myomys albipes*, une autre espèce endémique éthiopienne, présente entre 1500 et 3300 m d'altitude. Dans les monts Bale, cette dernière est progressivement remplacée avec l'altitude par *S. griseicauda*.

L'objectif de cette étude est d'étudier les relations phylogénétiques entre ces trois espèces a l'aide de l'analyse (parcimonie et maximum de vraisemblance) d'une partie de la séquence du gène de l'ARNr 16S. Les résultats sont confrontés avec la variabilité morphométrique estimée par le calcul des distances de Procuste dans une analyse géométrique en trois dimensions du crane. Les résultats de la phylogénie moléculaire indiquent que le genre *Stenocephalemys* est paraphylétique, puisque *S. griseicauda* est plus proche de *M. albipes* que de *S. albocaudata*. A l'oppose, la variation morphométrique reflète la taxonomie traditionnelle des trois espèces. Ces résultats sont compares avec les données caryotypiques et allozymiques des trois espèces, congruentes avec les relations morphométriques.

De par les scenarios évolutifs particuliers caractérisant l'Ethiopie (changements climatiques et géologiques importants dus a la mise en place du Rift), des changements morphologiques pourraient être affectes de manière significative par des adaptations a des environnements différents, devenant ainsi plus rapide et convergent chez *Stenocephalemys* du fait de l'adaptation a des milieux de haute montagne.

Fahmy, M. A. M., A. M. Abdel-Rahman and R. Khalifa (1978). *Trypanosoma (Schizotrypanum) assiutis* sp. nov. from the house mouse *Mus musculus*, with a comparative study on *Trypanosoma (Schizotrypanum) vespertilionis* of the Egyptian bat *Vesperugo kuhli*.

On examination of a house mouse (*Mus musculus*) trapped in Rifa village (Assiut Governorate), a *Trypanosoma cruzi*-like trypanosome was encountered which differed from the *cruzi*-like trypanosomes of local bats. It appeared to be a hitherto unknown species for which the name *Trypanosoma (Schizotrypanum) assiutis* sp.nov. is suggested.

Fain, A. (1959e). Les Acariens psoriques parasites des chauves-souris. XII. Deux nouvelles espèces des genres *Teinocoptes* et *Chirobia* chez des Rousettes africaines (Sarcoptiformes - Teinocoptidae).

Dans la muqueuse buccale de 4 Chauve-souris *Myotis myotis* capturées dans les grottes de Han le 25-9-58, nous avons découvert 5 Acariens mâles, une nymphe et une larve appartenant à un nouveau genre et une nouvelle espèce de la famille *Sarcoptidae*. Tous les mâles et la nymphe étaient localisés dans la profondeur de la muqueuse de la lèvre inférieure, tout près de son bord libre. L'unique larve fut trouvée dans la muqueuse du palais. Aucune femelle ne put être mise en évidence ni dans la muqueuse, ni sur le reste du corps. Ces Chauve-souris étaient également parasitées par de nombreux spécimens, à tous les stades, de *Nycteridocoptes poppei* Oudemans

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Fain, A. (1967). Les Acariens psoriques parasites des chauves-souris XXVIII. *Teinocoptes ituriensis* sp. n., avec une clé et une liste des espèces du genre *Teinocoptes* (Teinocoptidae: Sarcoptiformes).

Dans cette note nous décrivons une nouvelle espèce du genre *Teinocoptes* et nous indiquons un nouvel hôte pour *Teinocoptes auricularis* FAIN.

Fain, A. (1978). Les Myobiidae d'Afrique au sud du Sahara et de Madagascar (Acarina - Prostigmata).

During 1972, 1973 and 1974, I had the opportunity to collect an interesting series of parasitic mites from various mammals in the collection of the British Museum (Natural History). Among this collection I found a number of new species belonging to several new genera of Myobiidae. The present paper provides detailed descriptions and figures of these species, preliminary diagnoses of all but one of which have been given in previous papers (Fain, 1972, 1973). In addition, three species found on bats preserved in the Institut royal des Sciences naturelles de Belgique, Bruxelles, and one species from a bat in the collection of the U.S. National Museum, Washington, are described.

Types have been deposited in the respective institutions where the mites were collected. In the following descriptions the length of the body includes that of the gnathosoma but not of the palps.

Fain, A. (1994). Adaptation, specificity and host-parasite coevolution in mites (Acari).

Parasitism by mites is widespread and involves all the classes of vertebrates, from fishes to mammals. Owing to their small size and their great plasticity, mites are able to adapt to a wide range of habitats. Most of the species are ectoparasites but endoparasitism, especially in the respiratory tract, is common in birds and mammals. The morphological modifications appearing during the process adaptation to

parasitic life, especially in Myobiidae, are analysed. Two kinds of characters are particularly important: the constructive specialized characters, consisting of the production of new structures, especially attachment organs allowing the mite to attach to the skin and the hair of the host, and regressive characters. Regression of the external structures is the most important phenomenon appearing in the process of evolution of parasitic mites. The importance of the regression in the parasite is correlated with the degree of evolution of the host. Host and parasite have a parallel evolution, but they go in opposite directions. The author surmises that the regressive evolution is related to the immunological reactions of the host that tend to reject the parasite. To escape from this rejection the parasite tends to select the less antigenic and therefore the most regressed phenotype. Specificity is generally strict in permanent parasites. Coevolution of host and parasite is studied in the family Myobiidae which parasitizes marsupials, insectivores, bats and rodents. The concordance between the radiations of the mites and that of their hosts is very high.

Fain, A. and V. Aellen (1994). Notes sur une petite collection d'acariens (Acari) parasites récoltés sur des chiroptères de la collection du Muséum d'histoire naturelle de Genève.

Notes on a small collection of parasitic mites (Acari) collected from bats deposited in the Museum of natural History of Geneva.

A small collection of pilicolous (Acari: Chirodiscidae and Myobiidae) or skin mites (Sarcoptidae), collected from bats deposited in the Museum of natural History of Geneva, is studied. Thirteen species were identified and among them a new genus and species, *Eurolabidocarpus helveticus*, collected from *Myotis daubentoni* from Switzerland. *Pseudoalabidocarpus secus* MacDaniel, 1972 is synonymized with *Pseudoalabidocarpus phyllostomi* Fain, 1972.

Fain, A. and P. Elsen (1972). Un nouveau Cimicide du Cameroun: *Stricticimex puylaerti* sp.n.

Cette nouvelle punaise fut récoltée au cours d'une Mission Parasitologique effectuée au Cameroun (juillet à octobre 1971), sur deux chauves-souris de la famille Emballonuridae. Elle est représentée par un mâle, une femelle et des nymphes.

Cette nouvelle espèce présente des caractères intermédiaires entre les genres *Stricticimex* d'une part et *Crassicimex* d'autre part, elle est cependant plus proche du premier genre.

Le rostre est nettement plus court que la longueur de la tête sans le labre. Dans les deux sexes le segment apical du rostre n'est que légèrement plus long que large, la *ratio* longueur : largeur est de 1,6 pour la femelle et de 1,4 pour le mâle.

Les yeux sont plus proéminents que chez *Crassicimex* et ressemblent à ceux des espèces du genre *Stricticimex*.

Les tibias II et III portent dans les 2 sexes de nombreux poils courts et sur leur bord dorsal un certain nombre de poils beaucoup plus longs et forts. Ce caractère n'a été signalé jusqu'à présent que chez *Crassicimex*. Notons cependant que KLEIN (1969) a rangé dans le genre *Crassicimex* une nouvelle espèce dont tous les tibias ne portent que des poils courts.

Notons encore que les tibias I et II portent une petite touffe à base étroite, formée d'une vingtaine de poils à sommet recourbé. Cette touffe n'a pas été signalée dans les genres *Crassicimex* et *Stricticimex*.

Nous voudrions remercier ici M. P. BASILEWSKY, Directeur du département d'Entomologe et M. G. SCHMITZ, Chef de la section des Hémiptères, du Musée royal d'Afrique Centrale, qui ont aimablement mis leurs collections à notre disposition pour notre étude.

Cette nouvelle espèce est dédiée à son récolteur M. F. PUYLAERT du Musée royal de l'Afrique Centrale.

Falcoz, L. (1931). Matériaux pour la connaissance des Diptères Pupipares. I.

Parmi le nombre des Diptères Pupipares de provenances diverses que j'ai eu l'occasion d'étudier récemment, certains, jugés nouveaux, seront décrits ici, d'autres, déjà connus, mais offrant quelques intérêt aux divers poins de vue systématique, éthologique ou géographique, feront l'objet d'une mention spéciale.

Farhang-Azad, A. and D. A. Schlitter (1978). *Capillaria hepatica* in small mammals collected from Shoa province, Ethiopia.

A total of 1,110 small mammals has been examined for *Capillaria hepatica* in Shoa Province, Ethiopia. Nineteen of 308 (6.2%) *Rattus rattus* and 1 of 212 (0.5%) *Praomys albipes* were infected. The data indicate that *C. hepatica* was essentially limited to commensal rats (*R. rattus*).

Farney, J. and E. D. Fleharty (1969). Aspect ratio, loading, wing span, and membrane areas of bats.

NOTE: Total loading is defined as the weight divided by the area of the wings and tail membranes. Aspect ratio is the wing span squared, divided by the area of the wings.

Fedyk, A. and S. Fedyk (1970). Karyotypes of some species of Vespertilionid bats from Poland.

Chromosomes ot 5 species of Vespertilionidae are described: *Plecotus auritus* - 2N = 32, NF = 54, *Plecotus austriacus*,- 2N = 32, NF = 54, *Myotis daubentoni* - 2N = 44, NF = 54, *Nyctalus notula* - 2N = 46, NF = 54, and *Eptesicus serotinus* - W = 50, NF = 52. The obtained results were compared with earlier data to show geographic variability of the chromosome formula in *M. daubentoni*, and differences in the morphology of Y chromosome in *Eptesicus serotinus*. Possible mechanisms of differentiation of karyotypes in Vespertilionidae were also discussed and some phylogenetic conclusions presented.

Feiler, A. (1984). Ueber Säugetiere der Insel Sao Tomé (Mammalia).

During a stay for three weeks in June 1983 on Säo Tomé *Rousettus aegyptiacus* subsp. could be detected for the first time, and *Myonycteris brachycephala* has been found in a second specimen since its description by BOCAGE (1889). Besides, other mammals could be watched.

Feiler, A. (1986). Zur Faunistik und Biometrie angolanischer Fledermäuse (Mammalia, Mega- et Microchiroptera).

Data on faunistics and biometry of the following Megachiroptera: *Hypsignathus monstrosus, Epomophorus wahlbergi, Epomophorus angolensis, Epomops iranqueti, Micropteropus pusillus, Plerotes anchietae, Eidolon helvum, Rousettus aegyptiacus, Lissonycteris angolensis*, are given, gained by self-collected materials from Uige, Luanda and its surroundings as well as from materials of other Angolian places which exist in the collections of the University of Angola and in the Museum für Naturkunde Berlin. Besides, several collected Microchiroptera are discussed. *Triaenops persicus* were found in Angola for the first time.

Feiler, A. (1988). Die Säugetiere der Inseln im Golf von Guinea und ihre Beziehungen zur Säugetierfauna des westafrikanischen Festlandes (Mammalia).

A short survey is given on the mammal fauna of the islands in the Gulf of Guinea evaluating the literature and a short trip of the author to São Tomé in 1983:

(1) Endemic species (*Crocidura thomensis, Myonycteris brachycephala*) are existing only on the Island of São Tomé.

(2) Non-endemic species are originally wild-living species, or species spread by man.

(2a) Among the originally wild-living species one species (*Eidolon helvum*) occurs on all Islands without intraspecific differentiation.

(2b) The other species do not live on all islands, only on some of them. There are as well species forming special subspecies on the islands (*Hipposideros commersoni*), as species having the same subspecies like the animals in the nearby situated continental forest areas (*Hipposideros ruber guineensis*). *Rousettus aegyptiacus* was detected for the first time 1983 on São Tomé by the author.

(2c) Among the species spread by man there are: cosmopolits (*Rattus rattus, Rattus norvegicus, Mus musculus*), intentionally introduced species (*Viverra civetta, Mustela nivalis numidica*), and species which are secundarily wild-living (pig).

(2d) Concerning the occurrence of the species *Cercopithecus mona* and *Miniopterus minor newtoni* the human influence is uncertain.

The reasons for the occurrence of the different species on the islands are discussed.

Feiler, A. (1990). Distribution of mammals in Angola and notes on biogeography.

A brief review is given on faunal investigations in Angola including the author's results in the years 1982/83. All Angolan terrestrial mammal species are listed and their distributions are compared with neighbouring countries. Previously proposed zoogeographical borders are discussed.

Feiler, A., J. Haft and P. Widmann (1993). Beobachtungen und Untersuchungen an Säugetieren der Insel Sao Tomé (Golf von Guinea) (Mammalia).

All wild living mammal species evident on Säo Tome, are demonstrated. Remarks on distribution, biology, ecology and morphology are given. There are the following species respectively subspecies: *Crocidura thomensis, Eidolon helvum, Rousettus aegyptiacus thomensis* subsp. n., *Myonycteris brachycephala, Hipposideros commersoni thomensis, Hipposideros ruber, Miniopterus minor, Cercopithecus mona, Sus scrofa* (forma domestica), *Canis lupus* (forma domestica), *Mustela nivalis, Civettictis civetta, Rattus rattus, Rattus norvegicus* and *Mus musculus* (?).

Feiler, A. and A. L. Pires (1984). Ueber *Chaerophon pumila* (Cretzschmar) in Angola (Mammalia, Chiroptera, Molossidae).

Some observations concerning distribution, biology, and reproduction äs well several body measures of the bat species *Chaerephon pumila* from Angola are dealt with.

Felten, H. (1962). Bemerkungen zu Fledermäusen der Gattungen *Rhinopoma* und *Taphozous* (Mammalia, Chiroptera).

Das Senckenberg-Museum erhielt kürzlich einige Fledermäuse aus der Rajasthan-Wüste in NW-Indien, die taxionomische und tiergeographische Bemerkungen zu Arten der Gattungen *Rhinopoma* (Rhinopomatidae) und *Taphozous* (Emballonuridae) erlauben.

Felten, H. (1971). Eine neue Art der Fledermaus-Gattung *Eptesicus* aus Kleinasien (Chiroptera: Vespertilionidae).

Specimens of the genus *Eptesicus* from Europe, USSR, Asia Minor, Iraq, Iran and Afghanistan are compared (measurements, skull, colour) to describe a new species of this genus. Members of other species are treated under distributional and taxonomic points of view.

Felten, H., F. Spitzenberger and G. Storch (1977). Zur Kleinsaugerfauna West-Anatoliens. Teil IIIa.

On small mammals from Western Asia Minor. Part IIIa.- Samples of the Horseshoe Bats (Chiroptera: Rhinolophidae) *Rhinolopbus ferrumequinum, R. hipposideros, R. euryale, R. mehelyi*, and *R. blasii* (with description of a new subspecies from Afghanistan) from Western Asia Minor have been investigated in relation to populations from the Mediterranean region and other parts of their total ränge. Data are given on systematics, variability and distribution. Two closely related species (*R. bocharicus* and *R. lepidus*) have been treated similarly. - Of Vespertilionidae (Chiroptera), the two closely related Mouse-eared Bats *Myotis myotis* and *M. blythi* are treated in a similar way. The possibilities of their distinction are discussed, and a new subspecies of *M. blythi* is described from N-Africa.

Fenton, M. B. (1972). The structure of aerial-feeding bat faunas as indicated by ears and wing elements.

Structure in the aerial-feeding bat faunas of southeastern Ontario, southern British Columbia, Cameroun, Guyana, and the Philippines is demonstrated on the basis of wing shape and relative ear size. The former is derived from the ratio of the length of the third digit metacarpal to the length of the fifth digit metacarpal (III/V) and the latter from the ratio of the length of the ear to the length of the forearm (E/FA). It is assumed that these characters affect flight pattern and echolocatory characteristics and thus prey selection in the aerial-feeding, echolocating bat. On the basis of these characteristics some Emballonurinae and the Mormoopidae are thought to replace the Vespertilionidae in the neotropics, and some Phyllostomatinae may be neotropical counterparts of the Rhinolophidae, Nycteridae, and Megadermatidae. The Diclidurinae seem to parallel the old world *Taphozous* in wing shape and ear size.

La forme de l'aile et la taille relative de l'oreille ont servi a établir la structure des faunes de chauves-souris se nourrissant au vol dans le sud-est de l'Ontario, le sud de la Colombie-Britannique, le Cameroun, la Guyane et les Philippines. Pour connaitre la forme de l'aile, on a calculé le rapport entre les longueurs des metacarpes des troisième et cinquième doigts (III/V) et, dans le cas de l'oreille, on a calculé le rapport entre la longueur de celle-ci et la longueur de l'avant-bras (E/FA). On émet l'hypothese que ces caractères affectent le vol et la faculté d'écholocation, et, par consequent, la sélection des proies, chez la chauve-souris se nourrissant au vol, par echolocauon. D'apres ces caractéristiques, il semble que les Emballonurinae et les Mormoopidae remplacent les Vespertilionidae dans la zone neotropicale et que certains Phyllostomatinae soient les equivalents neotropicaux des Rhinolophidae, des Nycteridae et des Megadermatidae. De la meme façon, les Diclidurinae paraissent remplacer le *Taphozous* du vieux monde.

Fenton, M. B. (1975). Observations on the Biology of some Rhodesian bats, including a key to the Chiroptera of Rhodesia.

Weights of 359 bats of 25 species are presented with vocalization frequencies for 14 species of Microchiroptera. Circumstantial evidence of visual orientation while bats were producing echolocation cries was obtained for eight species of microchiropterans. Insect wings obtained under roosts used by *Rhinolophus landeri* (Rhinolophidae) and *Nycteris thebaica* (Nycteridae) indicate differential use of Noctuidae and Sphingidae (Lepidoptera) as food, and selective feeding on particular prey species. Higher levels of flight activity of bats were found near buildings than over adjacent habitats. Frequencies of capture of 264 bats of 20 species in nine habitats at the Hostes Nicolle Institute of Wild Life Research are analysed; brachystegia woodland and areas over large rivers (the Sengwa and the Manyoni) had, respectively, the most and least diverse bat faunas. Availability of roosts affects the bat fauna of an area by selectively excluding species with specific roost requirements, where those requirements are not met. Partitioning of food resources by food type, size of bats, and, for insectivorous forms, wing shape and relative car size, is discussed. *Laephotis angolensis* (Vespertilionidae) is reported for the first time from Rhodesia. Included here is a key to 61 species of bats known (57) or expected (4) to occur in Rhodesia.

Fenton, M. B. (1983). Roosts used by the African bat, *Scotophilus leucogaster* (Chiroptera: Vespertilionidae).

The roosts of *Scotophilus leucogaster* were located by radio-tracking in Mopani woodland in the Sengwa Wildlife Research Area in Zimbabwe between 14 January and 12 February 1982. Bats changed roost trees from one day to the next, usually staying within relatively small areas of woodland. Bats frequently moved between night and day roosts. This behavior made it impossible to predict the location of bats from one day to the next.

Fenton, M. B. (1985). The feeding behaviour of insectivorous bats: Echolocation, foraging strategies, and resource partitioning.

This paper uses the results of work on temperate and tropical Microchiroptera to explore the relevance of ideas about interspecific competition to faunas of insectivorous bats. The bat fauna of the Sengwa Wildlife Research Area in Zimbabwe is the focus of much of the work reviewed here. The value of echolocation as a window on the behaviour and foraging ecology of Microchiroptera is considered, and some apparatus and approaches for exploiting this avenue of investigation are reviewed. A tentative association between different foraging strategies and the basic design of echolocation calls is proposed. Some insectivorous bats pursue flying prey, hunting in continuous flight or from perches; others are gleaners, taking prey from surfaces. Bats that hunt flying prey may operate at long or short range. Another group of bats, including rhinolophids, hipposiderids. and the mormoopid *Pteronotus parnellii* use echolocation to detect fluttering targets. In spite of many assertions to the contrary, evidence for insectivorous bats partitioning resources (food or roosts) remains ambiguous, overwhelmed by variation in prey selected and lack of data. African bats are ideal subjects for further studies of the dynamics of interactions between sympatric species, including the possible effect of limiting (?) resources.

Fenton, M. B. (1986a). Design of bat echolocation calls: implications for foraging ecology and communication.

A number of studies has proposed that echolocation calls of different design can be associated with specific hunting strategies of insectivorous bats. Unfortunately, a lack of data about intraspecific variation means that the hypothesis is not challenged by the data base. Changes in echolocation call design may reflect functions other than resolution of detail about targets. There is observational and experimental evidence indicating that echolocation calls may serve a communication function while

permitting an echolocator to collect information about its surroundings. Only further research will help us to appreciate the influences of different factors on the design of echolocation calls.

Certains auteurs ont envisagé que les différents types de cris d'écholocation des chauve-souris insectivores pourraient être en relation avec différentes stratégies de chasse. Cependant, la quantité de données se rapportant aux variations intraspécifiques du type des cris s'avère insuffisante pour vérifier cette hypothèse. Les différences dans le type de cri d'écholocation pourraient remplir d'autres fonctions que celle de la résolution des détails d'une cible. Il existe certains faits d'observation ou expérimentaux qui indiquent que ces cris pourraient également jouer un rôle dans la communication tout en permettant la collecte d'informations concernant l'environnement de l'émetteur du cri. Des recherches futures permettront d'apprécier l'influence des différents paramètres impliques dans le type des cris d'écholocation.

Fenton, M. B. (1986b). *Hipposideros caffer* (Chiroptera: Hipposideridae) in Zimbabwe: morphology and echolocation calls.

The results of this study of morphological variation and variation in echolocation calls indicate that only specimens with narrow lateral nasal inflations (=*Hipposideros caffer*) have been reported from Zimbabwe to date. In both Zambia and Mocambique, single localities yielded both specimens with narrow or wide lateral nasal inflations (nominally, *H. caffer* and *H. ruber*, respectively). There are significant differences in echolocation calls between one site in Zimbabwe and another near the Zimbabwe South Africa border that are not paralleled by significant morphological differences.

Fenton, M. B. (1992). Pelage pattern and crypsis in roosting bats: *Taphozous mauritianus* and *Epomophorus* species.

The grizzled dorsal pelage of *Taphozous mauritianus* (Emballonuridae) contributes to the camouflage of these bats when they are roosting on natural surfaces. The white ear spots of *Epomophorus* spp. (Pteropodidae) represent disruptive patterns contributing to the cryptic appearance of these bats when they are roosting in foliage.

Fenton, M. B. (1994). Echolocation: its impact on the behaviour and ecology of bats.

Echolocation is an active system of orientation involving the production of pulses of sound which are compared to echoes returning from the surroundings. Bats comprise the order Chiroptera, and while echolocation is a feature apparently common to all species in the suborder Microchiroptera, only one species in the suborder Megachiroptera is known to echolocate. Furthermore, not all echolocating bats use the same specific approach to echolocation. The short range nature of echolocation may be the reason why most Microchiroptera are small. Small size has metabolic consequences such as high metabolic rates and high energy demands. This, in turn, means that bats eat a great deal and many species exploit concentrations of food. Species in two families, the Rhinolophidae and Vespertilionidae, use heterothermy to minimize thermoregulatory costs and this affects the reproductive patterns of these bats. While echolocation does not appear to be energetically expensive in terms of sound production, the signals make bats conspicuous to other bats and to their prey. Information leakage affects many aspects of bats' behaviour. Bat morphology often reflects echolocation, from pinnae that may be tuned to the frequencies in echolocation calls, to species with large ears for collecting low frequency sounds associated with the movements of prey. Noseleafs affect the patterns of sound emission. Bats that depend upon the sounds of prey often do not rely on echolocation for locating and assessing targets, and the role of echolocation in the lives of fruit, nectar and pollen, and blood feeding bats remains unclear. Echolocation and its attendant specializations are components in the ongoing debate about whether or not bats are monophyletic.

L'écholocalisation est un système d'orientation mettant en jeu la production de vibrations sonores qui sont comparées aux échos réfléchis par le milieu. Les chauves-souris font partie de l'ordre des Chiroptères et, bien que l'écholocalisation soit une caractéristique apparemment commune à toutes les espèces du sous-ordre des Microchiroptères, on ne connaît qu'une seule espèce du sous-ordre des Mégachiroptères qui écholocalise. De plus, les chauves-souris qui écholocalisent n'utilisent pas toutes la même technique. Le fait que l'écholocalisation serve à la communication à faible portée pourrait expliquer la petite taille de la plupart des Microchiroptères. Une petite taille a des conséquences sur le métabolisme, comme des taux métaboliques et des besoins énergétiques élevés. Cela signifie donc que les chauves-souris mangent beaucoup et que de nombreuses espèces profitent de concentrations de nourriture. Les espèces appartenant aux familles des Rhinolophidea et des Vespertilionidea peuvent minimiser les dépenses entraînées par la thermorégulation grâce à l'hétérothermie, laquelle influence leur comportements de reproduction. Bien que l'écholocalisation ne semble pas entraîner une dépense énergétique élevée, les signaux rendent les chauves-souris repérables par d'autres chauves-souris ainsi que par leurs proies. La fuite d'information influence plusieurs aspects du comportement des chauves-souris. Le type d'écholocalisation est reflété dans la morphologie des chauves-souris, des espèces dotées de pavillons d'oreilles s'ajustant aux fréquences des émissions d'écholocalisation, aux espèces dotées de grandes oreilles captant les basses fréquences associées aux mouvements des proies. Les appendices nasaux influencent les patrons d'émission des sons. Les chauves-souris qui dépendent des sons émis par leurs proies ne se servent pas toujours de l'écholocalisation pour situer et localiser les cibles. Le rôle de l'écholocalisation chez les chauves-souris frugivores, nectarivores, pollinivores, ainsi que hématophages reste à élucider. L'écholocalisation et les spécialisations connexes font partie du débat inachevé visant à savoir si les chauves-souris sont monophylétiques ou non.

Fenton, M. B. (1997). Science and the conservation of bats.

The conservation implications of some recent advances in our knowledge about the ecology and behavior of bats are presented. A central question facing bat biologists is the relative importances of roosts and food as limiting factors in the population biology of bats. There is no reason to presume that the answer is the same for all species and the available data suggest intraspecific variation. This question is important for either conservation or behavior and ecology. Eavesdropping on the species-specific echolocation calls of bats has allowed documentation of distribution and habitat use by some bats although variability of calls complicates this picture. Radiotracking and surveys have produced data on use of space by bats. Although foraging areas and roosts are vital resources for bats, the associations between species of bats and habitats are not always clear. The mobility of bats and the low cost of flight together blur the link between bats and particular habitats. Radiotracking demonstrates how mobility gives bats access to mosaics of habitats, partly reflecting their size and flight characteristics, and the scale of habitat availability. For some species, access to mosaics of habitats for foraging is critical. Activities of humans influence the habitats available to bats and can generate feeding and roosting opportunities. The use that roosting bats make of buildings is an obvious example of bats benefitting from activities of humans. Another is bats feeding in the concentrations of insects at lights. In promoting the conservation of bats, it is important to consider people's perceptions of these animals, which are colored by the impact of bats on public health. Public interest in bats has vastly outstripped scientific research about them, presenting interesting challenges and opportunities for bat biologists.

Fenton, M. B., N. G. H. Boyle, T. M. Harrison and D. J. Oxley (1977a). Activity patterns, habitat use, and prey selection by some African insectivorous bats.

Between 10 January and 14 February 1976, activity patterns, habitat use, and selection of prey by some insectivorous bats were studied in mopane and brachystegia deciduous woodlands in the Sengwa Wild Life Research Area of the Hostes Nicolle Institute of Wild Life Research in Rhodesia (18°10' S, 23°13' E), using ultrasonic (=bat) detectors, light tags, and analysis of insect remains from bat feces. Some bats were active throughout the night, in part feeding, but in general bat activity was reduced from around midnight until just before dawn. Rain tended to suppress bat activity, although the timing of the rain was important. Since insects remained active in the rain, we suspect that the

responses of the bats to rain reflected problems of thermoregulation associated with wet fur, and the effect of multiple echoes and atrenuation of high-frequency sound on echolocation. Bright moonlight suppressed bat activity and altered the foraging patterns of light-tagged *Scolophilus viridis, Eptesicus capensis*, and *Nycticeius schlieffeni* which on dark nights fed above the canopy and along the grassland sides of meadow/woodland interfaces, but which were mainly restricted within the woodland on bright moonlight nights. Since a pair of bat hawks (*Macheiramphus alcinus*) nested near the study area and fed mainly on bats, we suggest that the bats' responses to moonlight are predator-avoidance behaviors. *S. viridis* (15 - 20 g), *E. capensis* (5 - 6 g), and *N. schlieffeni* (5 - 6 g) appeared to feed on concentrations of insects, and responded quickly to aggregations of insects around lights. These bats fed mainly on beetles (*S. viridis* - 85%; *E. capensis* - 68%; *N. schlieffeni* - 72%), although *E. capensis* also took moths (18.5%) and *N. schlieffeni* took flies (19%). Other insectivorous bats in the study area fed mainly on moths (*Hipposideros caffer, Laephotis angolensis, Glauconycteris variegate* or beetles (*Scotopbilus nigrita*), or both (*Rhinolophus hildebrandti, Pipistrellus nanus*). Data for some insectivorous bats from the vicinity of Salisbury, Rhodesia, indicated a similar separation for some bats (moths - *Nycteris thebaica, Rhinolophus landeri*; beetles - *Rhinolopus clivosus*) in addition to two species of *Miniopterus* which took mainly aquatic Diptera. The data from this study, with those from other works, are used to illustrate partitioning of insect prey by the species of bats known to occur in the Sengwa Wild Life Research Area.

Fenton, M. B., R. M. Brigham, A. M. Mills and I. L. Rautenbach (1985). The roosting and foraging areas of *Epomophorus wahlbergi* (Pteropodidae) and *Scotophilus viridis* (Vespertilionidae) in Kruger National Park, South Africa.

In April 1984, in Kruger National Park, we used radio tracking to study the roosting and foraging behavior of *Epomophorus wahlbergi* and *Scotophilus viridis*, two bats known to roost in trees. Most *E. wahlbergi* roosted in foliage in riverine forest, although some roosted in a shelter cave; the *S. viridis* invariably roosted in hollow mopane trees along the steep sides or tops of ridges. Neither species showed any strong evidence of changing the day roosts they used to minimize commuting distance to foraging areas, although both species regularly switched locations of day roosts within localized areas. Switching day roosts may reduce predation

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Fenton, M. B., D. H. M. Cumming, J. M. Hutton and C. M. Swanepoel (1987a). Foraging and habitat use by *Nycteris grandis* (Chiroptera: Nycteridae) in Zimbabwe.

This study describes the foraging strategies, foraging areas, and roosts used by four female radio-tagged *Nycteris grandis* along the Zambezi River in Mana Pools National Park in Zimbabwe. The bats exhibited two foraging strategies, sometimes hunting from perches, other times flying continuously close to the ground. Some individuals used one strategy more than the other. During the study, the bats fed mainly on frogs, selecting only *Ptychadena anchietae*; they also took crickets, moths and cicadas. Each bat usually consumed two frogs each night and patterns of occupation of feeding perches suggest that their foraging efficiency was between 21 and 36%. The marked bats roosted in an old water tower or in a hollow *Acacia albida*. Four of five marked females were nursing young during this study.

Fenton, M. B., D. H. M. Cumming, I. L. Rautenbach, G. S. Cumming, M. S. Cumming, G. Ford, R. D. Taylor, J. Dunlop, M. D. Hovorka, D. S. Johnston, C. V. Portfors, M. C. Kalcounis and Z. Mahlanga (1998a). Bats and the loss of tree canopy in African woodlands.

We studied the activity patterns, abundance, diversity, and diets of bats, along with the abundance of nocturnal volant insects, at 30 sites in Miombo woodland in northern Zimbabwe. The woodland at 50 M of the sites had been disturbed by high elephant densities to the extent that the tree canopy was greatly reduced. The tree canopy was intact at the other sites. Intact and impacted sites differed significantly in tree (> 3 m t all; > 15 cm basal diameter) and shrub (1 - 3 m tall; < 1 m tall) diversity and cover. At each site we used ultraviolet lights to sample insects and mist nets and bat detectors to

sample bats. To assess their diets we collected and analyzed feces from captured bats. We caught 343 bats representing the families Pteropodidae (1 species), Vespertilionidae (11 species) and Molossidae (3 species). The molossids and vespertilionids are all aerial feeders taking airborne insects. Bat species richness, abundance, and activity were greater at intact than at impacted sites, but these differences were statistically significant only at adjacent sites (< 5 km apart) not at more distant intact and impacted sites (> 20 km apart). At the adjacent sites we caught a significantly greater proportion of small (< 10 g) bats at intact than at impacted sites. These dat and a signifantly greater proportion of *Scotophilus* species (> 10 g) caught during the early evening at intact than at impacted sites suggested that the removal of canopy trees affected roost availability for the bats. Although larger species may have commuted between intact and impacted sites, smaller species did not. In contrast, the availability of prey did not appear to have been significantly affected by the removal of the canopy trees, as indicated by the light-trap catches of insects and the bat's diets. Most bats ate mainly beetles and moths, the most abundant insects samples at the ultraviolet lights. Our findings suggest that aerial-feeding bats such as vespertilionids and molossids do not appear to be useful indicators of disturbance in this habitat, even in the face of significant loss of tree canopy.

Estudiamos los patrones de actividad, abundancia, diversidat y dietas de murciélagos, al igual que la abundancia de insectos voladores nocturnes en 30 sitios en el bosque de Miombo al norte de Zimbabwe. El bosque ha sido impactado en un 50 M de los sitios por densidades altas de elefantes, a tal grado que el dosel de árboles ha sido reducido grandemente. El dosel estuvo intacto en los otros sitios. Sitios intactos e impactados difieren significativamente en diversidad y cobertura de árboles (> 3 m de altura; > 15 cm de diámetro basal) y arbustos (1 - 3 m de altura; < 1 m de altura). En cada sitio usamos luz ultravioleta para musestrear insectos y redes y dectores de murciélagos para muestrear murciélagos. Para determinar sus disetas, colectamos y analizamos heces de los murciélagos capturados. Capturamos 343 murciélagos representando a las familias Pteropodidae (1 especie), Vespertilionidae (11 especies) y Molossidae (3 especies). Los molósidos y vespertiliónidos son todos consumidores aéreos, altimentándose de insectos voladores. La riqueza de especies, abundancia y actividad de murciélagos fue mayor en sitios intactos, pero estas diferencias fueron estadísticamente significantivas solo en sitios intactos e impactados adyacentes (> 5 km aparte) pero no cuando eran mas distantes (> 20 km aparte). En sitios adyacentes capturamos une proporción significativamente mayor de murciélagos pequeños (< 10 g) en sitios intactos que en sitios impactados. Estos datos y une proporción significativamente mayor de especies de *Scotophilus* (> 10 g) durante el atardecer en sitios intactos comparados con sitios impactados sugiere que la remoción del dosel afecta la viabilidad de perchas para los murciélagos. A pesar de que especies mas grandes podrían viajar diariamente entre sitios intactos e impactados, la especies pequeñas no lo hicieron. En contraste, la viabilidad de presas aparentemente no fue significativamente afectada por la remoción del dosel, a como lo indicaron la captura de insectos en trampas de luz y las dietas de los murciélagos. La mayoría de los murciélagos se alimentaron principalmente de escarabajos y mariposas nocturnas, siendo los insectos mas abundantes capturado en las trampas de luz ultravioleta. Nuestros resultados sugieren que los murciélagos de alimentación aérea como son los vespertiliónidos y molósidos, no aparentan ser indicadores útiles de disturbación en este tipo de hábitat, a pesar de une evidente pérdida significativa del dosel.

Fenton, M. B. and J. H. Fullard (1979). The influence of moth hearing on bat echolocation strategies.

The ears of moths we tested in Canada and Côte d'Ivoire are most sensitive to sounds between 20 and 40 kHz, and much less sensitive to sound over 65 kHz. The insectivorous bats most commonly encountered in these (and other) locations use high intensity, frequency modulated echolocation calls with frequency components in the 20 - 40 kHz range, making them detectable by the most sensitive tympanate moths up to 40 m away. In Africa bats such as species in the Nycteridae, Megadermatidae, and some in the Hipposideridae, use low intensity calls with high frequency components, and these species are not detectable by moths at over 2 m. The hearing ability of moths may significantly influence the feeding efficiency of bats, and changes in the intensity and frequency components of bat echolocation calls can drastically reduce the range at which bats are detected, and thus the time available to the moths for evasive behaviour (Fig. 4). The use of low intensity, high frequency echolocation calls may constitute a bat counter-maneuver against insects tuned to bat calls.

Fenton, M. B., C. L. Gaudet and M. L. Leonard (1983). Feeding behaviour of the bats *Nycteris grandis* and *Nycteris thebaica* (Nycteridae) in captivity.

The feeding and hunting behaviour of *Nycteris grandis* and *N. thebaica* was observed in captivity at the Sengwa Wildlife Research Area in Zimbabwe in January and February 1982. Both species preferentially selected katydids and beetles over moths, and relied heavily on acoustic stimuli emanating from prey to detect targets. *Nycteris grandis* readily consumed frogs and bats and appeared not to use the calls of male frogs or the echolocation calls of other bats to locate prey. Both species produced echolocation calls during attacks on prey, increasing the rates of pulse repetition as they closed with targets and suggesting the use of echolocation in hunting. The echolocation calls of *N. grandis* are described along with general observations of the behaviour of both species.

Fenton, M. B. and D. R. Griffin (1997). High-altitude pursuit of insects by echolocating bats.

Bat detectors on helium-filled kite balloons revealed echolocating bats active at altitudes <= 600 m above the ground over *Brachystegia* woodland in the Sengwa Wildlife Research Area, Zimbabwe. Feeding buzzes indicated that bats were actively foraging to 600 m. At least seven species of bats were detected, including six molossids and one emballonurid.

Fenton, M. B. and R. L. Peterson (1972). Further notes on *Tadarida aloysiisabaudiae* and *Tadarida russata* (Chiroptera - Molossidae - Africa).

Eleven additional specimens of *Tadarida aloysiisabaudiae* and one of *T. russata* extend the known range of both species westward to Ghana. Their allopatric ranges appear to be restricted to a narrow zone extending at least 3300 km (2100 mi) just north of the equator. *Tadarida russata* has been taken only in or adjacent to the "invasive Guinea woodland," whereas all *T. aloysiisabaudiae* have been collected peripheral to it. Recent specimens taken in association with *T. russata* were *T. (Xiphonycteris) spurrelli* and *T. thersites*. Measurements of the *T. russata* from Ghana are compared with those from previously recorded specimens, and a statistical summary for the measurements of *T. aloysiisabaudiae* is given. In addition, other morphological comparisons including the first illustrations of the palatal ridges of both species are provided.

Onze spécimens additionnels de *Tadarida aloysiisabaudiae* et un de *T. russata* étendent l'aire de répartition de ces espèces vers l'ouest du Ghana. Leurs répartitions allopatriques semblent être restreintes à une bande éroite d'au moins 3300 km (2100 mi) située juste au nord de l'equateur. *Tadarida russata* a été prise seulement dans, ou adjacente à, la "région boisée envahissante de la Guinée" alors que tous les *T. aloysiisabaudiae* ont été pris dans une zone périphérique à cette région. Des spécimens de *T. (Xiphonycteris) spurrelli* et de *T. thersites* ont été trouvés récemment, associés avec *T. russata*. Les mesures prises sur les *T. russata* du Ghana sont comparées avec celles des spécimens pris précédemment et un sommaire statistique des mesures faites sur *T. aloysiisabaudiae* est donné. D'autres comparaisons morphologiques sont données, parmi lesquelles on trouvera les premières illustrations des crêtes palatales des deux espèces.

Fenton, M. B., C. V. Portfors, I. L. Rautenbach and J. M. Waterman (1998b). Compromises: sound frequencies used in echolocation by aerial-feeding bats.

Hunting aerial-feeding bats, species that take airborne prey (usually flying insects), use echolocation to detect, track, and assess targets. The echolocation calls of aerial-feeding bats at sites in Canada (British Columbia and Ontario), Mexico, Brazil, and Zimbabwe were significantly dominated by frequencies between 20 and 60 kHz, although at the more tropical locations some aerial-feeding bats used echolocation calls with most energy < 20 or > 60 kHz. The impact of frequency-specific

attenuation, perhaps combined with frequency-specific, hearing-based defenses of some insects, suggests that by using echolocation calls < 20 kHz, bats could both extend the effective range of echolocation and make their calls less conspicuous to insect ears. Bats using calls > 60 kHz would be less conspicuous to the insects. We found two patterns of echolocation-call behaviour. Most adjacent echolocation calls, and all that were dominated by sounds > 20 kHz, showed large (80%) overlap in bandwidth. The other pattern involved much less overlap in bandwidth (0 - 30%) between adjacent calls and was evident in the calls of the molossid *Tadarida midas*, which used echolocation calls dominated by sounds < 20 kHz. This behaviour would allow the echolocating bat to extend its effective range of perception by separating in frequency the echoes returning from adjacent calls.

Les chauves-souris qui se nourrissent au vol, donc de proies qui volent (généralement des insectes), utilisent l'echolocation pour détecter, suivre et évaluer leurs cibles. Les cris d'écholocation de chauves-souris au vol à divers sites au Canada (Colombie-Britannique et Ontario), au Mexique, au Brésil et au Zimbabwe sont dominés de façon significative par les frequences situées entre 20 et 60 kHz, quoique, dans les plus tropicales de ces régions, certaines chauves-souris utilisent plus souvent des cris < 20 kHz ou > 60 kHz. Les effets de l'attenuation du son en fonction de la fréquence, peut-être en combinaison avec la nature du système de défense acoustique de certains insectes base sur la fréquence des sons, permet de croire qu'en utilisant des cris d'écholocation < 20 kHz, les chauves-souris peuvent augmenter l'étendue efficace de leurs cris et les rendre moins audibles aux insectes. Les chauves-souris qui émettent des cris > 60 kHz sont moins susceptibles d'être perçues par les insectes. Nous avons constate l'existence de deux types de comportemems d'écholocation. La plupart des cris adjacents dominés par des sons > 20 kHz se chevauchent largement (80%) sur la bande de frequence. Dans l'autre type de comportement, il y a beaucoup moins de chevauchement des cris adjacents sur la bande de fréquence (0 - 30%) et ce comportement a été observé chez le molosse *Tadarida midas* qui utilise surtout des cris < 20 kHz. Ce comportement peut permettre à la chauve-souris émettrice d'augmenter l'étendue efficace de sa perception en émettant ses cris de façon à ce que les échos des cris adjacents qui lui reviennent n'aient pas des fréquences voisines.

Fenton, M. B. and I. L. Rautenbach (1986). A comparison of the roosting and foraging behaviour of three species of African insectivorous bats (Rhinolophidae, Vespertilionidae, and Molossidae).

We used radio tracking to study the roosting and foraging behaviour of *Rhinolophus hildebrandti, Scotophilus borbonicus* (=*S. viridis* and *S. leucogaster*), and *Tadarida midas* in the Pafuri Region of Kruger National Park, South Africa in November 1985. Although the species roosted in different locations (*S. borbonicus* in hollow mopane trees, *R. hildebrandti* in a hollow baobab tree, and *T. midas* in buildings), roost temperatures and the bats' body temperatures were generally similar. The *S. borbonicus* and *T. midas* flew continuously while foraging in pursuit of flying prey; the *R. hildebrandti* switched between continuous flight, and hunting from a perch also in pursuit of flying prey. All three species foraged for about 60 min nightly, but the *T. midas* ventured at least 10 km from their roosts, while for *S. borbonicus* and *R. hildebrandti*, comparable figures were 4 and 2 km, respectively. The three species showed a spectrum of wing morphology and echolocation call design features from clutter resistant (*R. hildebrandti*) to relatively clutter resistant (*S. borbonicus*) and clutter intolerant (*T. midas*) and the foraging areas used by the bats corresponded to these features. *Rhinolophus hildebrandti* foraged below the canopy in riverine forest and deciduous woodland, while *S. borbonicus* foraged around the canopy but not closer than 0.5 m to it, while *T. midas* foraged in the open well above the canopy. These differences are discussed along with variations in foraging behaviour in insectivorous bats.

La radiotélémetrie a permis d'étudier les comportements de rassemblement au dortoir et de recherche de nourriture chez *Rhinolophus hildebrandti, Scotophilus borbonicus* (=*S. viridis* et *S. leucogaster*) et *Tadarida midas* dans la région Pafuri du Pare National de Kruger, Afrique du Sud, en novembre 1985. Les trois espèces utilisaient des dortoirs differents (*S. borbonicus*, les troncs creux de bois de fer, *R. hildebrandti* le tronc creux d'un baobab et *T. midas* les édifices), mais la température etait à peu près la même dans les trois types de dortoirs et celle des chauves-souris etait generalement semblable chez les trois especes. Les *S. borbonicus* et les *T. midas* chassaient leurs proies volantes en vol

continu; les *R. hildebrandti* utilisaient en alternance le vol continu et la chasse à partir d'un perchoir, également à la poursuite de proies volantes. Les trois espèces chassaient durant environ 60 min par nuit, mais les *T. midas* s'aventuraient parfois jusqu'a 10 km de leur dortoir, alors que les*S. borbonicus* ne s'en éloignaient pas de plus de 4 km et les *R. hildebrandti*, pas de plus de 2 km. Chez les trois espèces, il y a tout un spectre de morphologie des ailes et les cris d'écholocation varient selon l'espece: resistants a la confusion chez *R. hildebrandti*, relativement résistants à la confusion chez *S. borbonicus* et intolerants à la confusion chez *T. midas* et les territoires de chasse utilisés par les trois espèces variaient en fonction de ces caractéristiques. *Rhinolophus hildebrandti* chassait sous la couverture d'arbres dans les forêts ripariennes et les bois décidus, *S. borbonicus* chassait autour de la couverture d'arbre, mais en restait toujours éloigné d'au moins 0,5 m, alors que *T. midas* chassait en terrain ouvert, bien au-dessus de la couverture d'arbres. Ces differences et les variations des comportements de recherche de nourriture chez les chauves-souris insectivores font l'objet d'une discussion.

Fenton, M. B., I. L. Rautenbach, D. Chipese, M. B. Cumming, M. K. Musgrave, J. S. Taylor and T. Volpers (1993). Variation in foraging behaviour, habitat use, and diet of Large slit-faced bats (*Nycteris grandis*).

Examined the diet of *Nycteris grandis*, a 30 - 35 g African nycterid which varied significantly from year to year, season to season and roost to roost, suggesting flexible foraging behaviour and opportunism. Frogs, insects, and bats formed the bulk of the bats' diet. Although five species of frogs were consumed, two dominated the diet. Insect prey were mainly larger Lepidoptera and Orthoptera with occasional consumption of smaller species (< 10 g) of bats. Diurnal insects (butterflies - Lepidoptera; dragon flies - Odonata) and small (< 10 g) birds also were eaten. Over 14 nights in June 1990, prey taken by *N. grandis* did not reflect the availability of frogs, bats or insects. Radio-tagged *N. grandis* showed significant variation in approach to foraging, including the use of woodland or river habitat, and two foraging techniques, namely hunting from continuous flight or from a perch.

Fenton, M. B., I. L. Rautenbach, S. E. Smith, C. M. Swanepoel, J. Grosell and J. van Jaarsveld (1994). Raptors and bats: threats and opportunities.

To quantify the opportunity that emering bats present to raptors and the risks that hunting birds pose to these bats, predator-prey responses were documented by (1) counting emerging bats and recording their emergence patterns and (2) monitoring the presence of raptors and quantifying the incidence of raptor attacks on bats. Hobby falcons, *Falco subbuteo*, African goshawks, *Accipiter tachiro*, and Wahlberg's eagles, *Aquila wahlbergi*, succeeded in 51 % of 59 attacks on bats. The attacks occurred in woodlands (two attacks in 10 samples), and as bats emerged from colonies in buildings (three in 39 samples) and bridges (54 in 32 samples). Wahlberg's eagles hand hobby falcons attacked by stooping at flying bats whil African goshawks pursued them in flight. The birds usually took each captured bat to a perch to consume it, achieving handling times (from capture to eating to resumption of hunting) of 30 - 300 s. The raptors could maximize their use of bats by rapid handling of captures and by hunting at sites where bats were most numerous. This combination of factores meant that bats could form a siginificant portion of the diet of opportunistic raptors. Flying and emerging bats responded to attacks of potential attacks. For colonies of less than 100 bats, there was no relationship between emergence time and colony size, while bats tended to emerge significantly earlier from colonies of greater than 100 individuals. In all colonies, increasing numbers of bats decreased the risk of raptor attack by any individual. In colonies of less than 100, individuals could decrease their risk of attach by switching roosts, and by adjusting the times and duration of their emergences. Bats emerged earlier from larger colonies despite the increased risk of attack by raptors.

Fenton, M. B., C. M. Swanepoel, R. M. Brigham, J. Cebek and M. B. C. Hickey (1990). Foraging behavior and prey selection by large Slit-faced bats (*Nycteris grandis*; Chiroptera: Nycteridae).

Analysis of prey remains from beneath feeding perches in Mana Pools National Park in Zimbabwe between 1 Match 1987 and 30 April 1988, showed that *Nycteris grandis* fed mainly on frogs, bats, and

arthropods, and occasionally took birds and fish. There was marked seasonal variation in the prey taken, with bars and frogs dominating the biomass at different times. In November 1987, all-night radio-tracking over 15 bat nights revealed significant differences in habitat use between individuals, with one bat foraging along and over the Zambezi River, and another foraging in *Acacia albida* woodland and over the river. The bats alternated between foraging from continuous flight and making short flights from perches, although foraging over the river usually entailed continuous flight. Significant differences in the use of these foraging strategies between 1987 and an earlier study coincided with differences in November rainfall, and a drastic reduction in the amount of food the bats consumed daily.

Fenton, M. B. and D. W. Thomas (1980). Dry-season overlap in activity patterns, habitat use, prey selection by sympatric African insectivorous bats.

We used mist nets, ultrasonic sensors, light tags, and analysis of feces to examine habitat use, activity patterns, and prey selection of some insectivorous bats during the dry season at the Sengwa Wild Life Research Area (18°10'S; 28°13'E) between 7 and 28 June 1977. The results show broad overlap in all parameters investigated for the 13 species present in the area during the dry season. During the wet season, some species of insectivorous bats relied more on beetles than on moths as food, or vice versa. The lack of food partitioning, particularly in the dry season, appears to conflict with theories of niches and competitive exclusion, but it is in accord with predictions based on optimum foraging strategy. We conclude that most insectivorous bats are opportunistic feeders, a strategy which results in a mosaic of specialized and generalized diets and which is compatible with their energetic demands. We report the first record of *Tadarida chapini* from Zimbabwe (Rhodesia).

Fenton, M. B., D. W. Thomas and R. Sasseen (1981). *Nycteris grandis* (Nycteridae): an African carnivorous bat.

Nycteris grandis in Mana Pools National Park in Zimbabwe regularly include a variety of vertebrates and arthropods in their diet, ranging from fish through frogs, bats and birds, to different Orthoptera, Lepidoptera and Coleoptera. Analysis of the faeces of these bats suggests a considerable range in size of prey taken, from the 10 g birds and bats to caddis flies 15 mm long.

Fenton, M. B., J. M. Waterman, J. D. Roth, E. Lopez and S. E. Fienberg (1998c). Tooth breakage and diet: a comparison of bats and carnivores.

Species of carnivorans that eat bone are believed to break teeth more often than those eating mainly meat. Two predictions that arise from this hypothesis are that bats, which do not eat bone, will have a lower incidence of broken teeth than carnivorans and that smaller carnivorans, which often feed heavily on arthropods and other insects, will exhibit less tooth damage than larger carnivorans. We found no difference between bats and carnivorans in the proportion of skulls with broken or missing teeth in a sample including 10 species of carnivorans from ermines to bears, and 13 species of bats including some that eat insects, fruit, nectar and pollen, and blood. When the sample is expanded to include larger carnivorans studied by Van Valkenburgh (1988), there is a significant difference in the incidence of tooth breakage, indicating that the selection of species in the sample affects the results. Tooth breakage was strongly influenced by body size in carnivorans but not in bats. This evidence suggests that factors other than diet influence tooth breakage in mammals. We propose that lifespan, which increases with body size in carnivorans but not in bats, is a better predictor of tooth breakage than diet.

Ferris, G. F. (1930). Some African Diptera Pupipara.

For the material herein dealt with, I am indebted principally to Mr G. A. H. Bedford of the Division of Veterinary Services of South Africa. Other material collected by the writer from bats in the United

States National Museum some years ago and a specimen received from Dr C. R. Kellogg of Foochow, China, are also recorded.

In this paper, as in others by the writer, the policy is followed of describing as new everything that cannot definitely be connected with named forms.

Findley, J. S. (1972). Phenetic relationships among bats of the genus *Myotis*.

A numerical taxonomic analysis of the species of the chiropteran genus *Myotis* revealed the existence of three major phenetic groupings. These may correspond to three feeding-foraging modalities. Phenetic evidence suggests the Oriental Region as a center of origin for *Myotis*, and a *Myotis goudoti*-]ike bat as a likely myotine prototype.

Findley, J. S. and H. Black (1983). Morphological and dietary structuring of a Zambian insectivorous bat community.

Diet and external morphology of nine species of insectivorous bats from Zambia, East Africa, were compared using multivariate methods. Morphological and dietary resemblance between species were positively correlated; that is, taxa which resembled each other most strongly morphologically were also most similar in dietary intake. The degree of morphological and dietary distinctiveness of a species was positively correlated with its morphological and dietary variability. For example, species which are quite distinct from others in morphology or diet tend also to be quite variable in those two attributes. Morphology of the bats was strongly,predictive of their diets; most dietary variance was accounted for by morphological variance, and the first morphological principal component predicted the presence in the diet of Lepidoptera, beetles, and Orthoptera with a high level of significance. These results led to a model of community organization for closely related species in which a relatively large number of specialists with invariant attributes are clustered near the community centroid and a smaller number of distinctive, variable species occupy niches more distant from the centroid.

Findley, J. S., E. H. Studier and D. E. Wilson (1972). Morphologic properties of bat wings.

A method was devised for estimating aspect ratio, wing ratio, wing area, wing loading, and wing length from study skins of bats. These measures were taken of 136 species representing 15 families. Wing area and loading are positively, and wing length negatively, correlated with size. Aspect and tip ratios are independent of size and of each other. Distinctive combinations of some of these variables characterize groups of bats that presumably have similar flight modes. Speed is positively correlated with aspect ratio and tip index, but regresses significantly only on the former. Long tips coupled with low aspect ratio may characterize hoverers. Long wings and short tips may characterize bats that are capable of remaining airborne at slow speeds. Most bats with low aspect ratios are forest dwellers, whereas species with high aspect ratios are migrants and foragers in open areas.

Findley, J. S. and G. L. Traut (1970). Geographic variation in *Pipistrellus hesperus*.

Geographic variation in *Pipistrellus Hesperus* consists of an eastern series of populations of large individuals and a western series of populations of small individuals, this situation perhaps resulting from historical changes in the distribution of deserts. Other facets of geographic variation involving color, sexual dimorphism, and variability are discussed in relation to climate, rainfall, and sexual differences in behavior.

Flower, S. S. (1901). 1. Notes on the fauna of the White Nile and its tributaries.

No Europeans having been able to visit the "White Nile for many years owing to the Mahdist insurrection, these notes on the animals seen during an expedition up this river may be of interest. The following itinerary will help to localize the places mentioned in this paper, which are not marked in the ordinary atlases available:

11th March, 1900. Leave Omdurmau and proceed up the White Nile.
12th. Pass El Duem, and later Kowa.
13th. Cross 14° North lat. in morning, pass Goz Abu Grorna, and arrive at Abu Zeit.
16th. Leave Abu Zeit.
17th. Pass Jebel Ain in morning.
18th. Reach Eenk in evening.
19th. Reach Long Tom in evening.
20th. Pass Jebel Ahmed Agar.
21st. Pass Kaka.
22nd. About 5 A.M. reach Fashoda, and about 9 P.M. the Sobat.
23rd. Reach the base-camp of the sudd-cutting expedition near Gabt-el-Meghahid; about 5 P.M., mouth of the Bahr-el-Zeraf.
24th-26th. Proceed about 50 miles up the Zeraf and back again.
27th. Proceed west along the White Nile, pass the mouth of the Bahr-el-Jebel, reach Lake No.
28th. Leave Lake No, proceed up the Bahr-el-Ghazal.
29th. Visit tributaries of the Bahr-el-Ghazal (the Bahr-el-Arab, proceeding about 12 miles up and back again ; the Bahr-el Homar found unnavigable).
30th. On Lake Ambadi, near Meshra er Rek.
31st March-2nd April. Return down the Bahr-el-Ghazal to Lake No.
3rd April. Proceed up the Bahr-el-Jebel.
5th. Pass Heliat Nuer (=Meshra Nuer, or Eljab Dok).
8th. Reach neighbourhood of Shumbe (=Schambeh), about 7° 20' North latitude, and about 830 miles from Omdurman, and turn back on account of shallow water and want of fuel for the steamer.
14th. Get back to mouth of the Bahr-el-Jebel, and 11 P.M. reach Gabt-el-Meghahid.
16th. Proceed about 12 miles up the Sobat and down again.
17th. Reach Fashoda.
26th. Arrive back at Omdurman.

I have to acknowledge my deep sense of obligation to Sir William Garstin, K.C.M.G., and to Mr. C. Crawley for their assistance in noting facts of interest and in securing specimens during the two months I had the privilege of travelling with them on the Nile; and to the officials of the British Museum of Natural History for their invariable kindness in helping me to work out the collections brought home. I am particularly indebted to Mr. Oldfield Thomas and to Mr. W. E. Ogilvie Grant.

The nomenclature of the birds in this paper is according to the British Museum Catalogue, but the Orders are arranged as far as possible as in the Exhibition Bird Gallery, and not according to the volumes of the Catalogue.

Flower, S. S. (1932). 22. Notes on the recent mammals of Egypt, with a list of the species recorded from that kingdom.

Many Egyptian mammals had been described, especially by Cretzschmar, F. Cuvier, E. Geofiroy, Hemprich & Ehrenberg, Lichtenstein, and Linnaeus, but a general account of the Mammals of Egypt was much needed.. Dr. John Anderson, F.R.S. (1833-1900) had set his heart on bringing out a complete and useful book; his whole energy was concentrated on his self-imposed task, when the work was cut short suddenly by his death on 15 August, 1900.

After Andersen's death his widow decided to publish a book as complete as could be made from her husband's notes, and, at the joint request of herself and W. T. Blanford (1832-1905), W. E. de Winton (1856-1922) undertook the revision and completion, as far as possible, of the work, the result being the publication in 1902 (Hugh Rees, Ltd., London) of the 'Zoology of Egypt: Mammalia,' a magnificent

quarto volume of 391 pages, with, besides other illustrations, fifty-five hand-coloured plates which have seldom been equaled either for zoological accuracy or artistic merit, the artist being P. J. Smit.

Everyone interested in zoology or Egypt must be grateful to the liberality of the late Mrs.- Anderson and to the perseverance of de Winton in producing this interesting volume, and it seems almost invidious to make any criticisms.

However, it is easily understood that the editing of a posthumous work, based on incomplete and often undated memoranda (written in this case during a period of eight years), is a difficult task, and everyone will agree that de Winton did all he could under the circumstances.

The result was a valuable contribution to Mammalogy, but hardly a natural history of the Mammals of Egypt. 138 out of 363 pages of text (38 per cent.) and 30 out of 66 plates (45 per cent.) refer to animals of tropical Africa which do not occur in Egypt - that is to say, in the country that is usually called Egypt as apart from the Anglo-Egyptian Sudan. On the other hand, such species of Egyptian mammals as the -Leopard, Seal, and Bottle-nosed Dolphin are not mentioned.

Before even a complete nominal list of the Mammals of Egypt can be written very much more field-work remains to be done, especially in the great tract of hilly country that lies between the Nile and the Bed Sea, and also to a lesser extent on the eastern side of the Sinaitic Peninsula and in the oases of the western desert. This paper, will show how little is yet known, and how the very existence of several species rests on the evidence of even less than half-a-dozen individual specimens of each.

The conditions under which wild animals live in Egypt are altering so rapidly through modern changes, especially in irrigation and communication, that it may be useful to put on record the notes now presented by one who was fortunate enough to be able to walk and ride about the country before the internal-combustion engine brought havoc in its train.

Foley, H. (1922). Contribution a l'étude de la faune saharienne (Première Note).

Nous avons examiné, de 1907 à 1920, pour la recherche de leurs parasites songuicoles, un assez grand nombre d'animaux appartenant à la faune saharienne. Ils ont été rencontrés, soit à Beni-Ounif de Figuig pendant un séjour de 8 années, soit au cours d'explorations scientifiques que nous avons faites, seul ou avec le Dr Edmond SERGENT, dans le Sud Algérien. D'autres nous ont été envoyés de divers postes des Territoires du Sud par des médecins militaires, qui nous ont aimablement prùeté leur concours.

La première liste que nous donnons ci-dessous - simple contribution à l'inventaire de la saune saharienne - ne comprend que les Vertébrés. Elle n'a pas été établie par une recherche systématique, mais au hasard des déplacements et des circonstances: elle est donc fort incomplète. Elle pourra, cependant, fournir aux spécialistes quelques indications utiles de géographie zoologique, grâce à l'exactitude des déterminations que nous devons à savants autorisés: MM. Le Dr. TROUESSART, professeur au Muséum, et SEURAT, professeur à la Faculté des Sciences d'Alger, pour les Mammifères; MENEGAUX et KOLLMANN, du Muséum, pour les Oiseaux; Dr. PELLEGRIN, du Muséum, pour les Poissons; DOUMERGUE (d'Oran), pour les Reptiles. Nous leur exprimons nos vifs remerciements.

Le lieu et la date de la capture sont indiqués pour chaque espèce. Les remarques biologiques qui suivent ces indications sons dues le plus souvent aux spécialistes qui ont fait les déterminations.

Fontenille, D., F. Rodhain, J. P. Digoutte, C. Mathiot, J. Morvan and P. Coulanges (1989). Les cycles de transmission du Virus West-Nile a Madagascar, Ocean Indien.

Des recherches virologiques, sérologiques et entomologiques entreprises à Madagascar, depuis 1975 ont permis de mettre en évidence la large répartition du virus West-Nile sur l'île. Cet arbovirus a été isolé chez l'homme, les perroquets et les aigrettes. Les vecteurs appartiennent au genre *Culex*, mais le virus a été également isolé chez des *Aedes* et des *Anopheles*. Les sérologies pratiquées sur plus

de 1600 sérums humains et près de 1000 sérums animaux, ont montré que l'homme peut être contaminé dans toute l'île. Les autres hôtes vertébrés possibles mis en évidence, en plus des oiseaux, sont les bovins et les chauves-souris. Les insectivores, les rongeurs et les lémuriens jouent probablement un rôle très faible.

Forman, G. L. (1973). Studies of gastric morphology in North American Chiroptera (Emballonuridae, Noctilionidae and Phyllostomatidae).

Stomachs of 12 species of Neotropical bats were examined grossly and histologically. Those of stenodermines (family Phyllostomatidae) were highly variable in configuration between species, and even congeneric kinds were distinguishable. The stomachs of stenodermines varied in elongation of the caecum or elongation of the pyloric region, both of which provided for accommodation of large quantities of food. Structural peculiarities, especially in the stenodermines, were considered with respect to their possible relationship to diet.

Francis, C. M. and J. E. Hill (1998). New records and a new species of *Myotis* (Chiroptera, Vespertilionidae) from Malaysia.

The status of *Myotis ater* and *Myotis muricola* in south-east Asia is reviewed. Both species appear to occur sympatrically in several localities including Sulawesi, Borneo and peninsular Malaysia. Peninsular Malaysian specimens referred to *M. ater* are larger than those from elsewhere and are allied with *ater* with some doubt. *M. ater nugax* from Borneo appears be the Bornean representative of *M. ater*, but specimens formerly referred to that form by Hill and Francis (1984) and Payne *et al.* (1985) prove to be a previously undescribed species which described here. *M. oreias* from Singapore is quite distinct from any of these species, but the type and only known specimen is in poor condition, and its true affinities are difficult to determine.

Le statut de *Myotis ater* et de *Myotis muricola* en Asie du Sud-Est est évalué. Les deux espèces sont trouvées en sympatrie dans plusieurs localités incluant Sulawesi, Borneo et la Malaisie peninsulaire. Les spécimens de la peninsule malaise considérés comme *M. ater* sont plus grands que partout ailleurs, et sont associés à *ater* avec quelques doutes. *M. ater nugax* de Borneo est bien le répresentant local de *M. ater*, mais des spécimens attribués précédemment à cette forme par Hill et Francis (1984) et Payne *et al.* (1985) representent en fait une espèce nouvelle, décrite ici. *M. oreias* de Singapour est nettement distincte de ces autres espèces, mais le spécimen-type, qui est le seul spécimen connu de l'espèce, est en mauvais état, et ses réelles affinités sont difficiles à determiner.

Francis, C. M., D. Kock and J. Habersetzer (1999). Sibling species of *Hipposideros ridleyi* (Mammalia, Chiroptera, Hipposideridae).

The morphology and sonar characteristics of roundleaf bats of the genus *Hipposideros* in southeast Asia that possess an enlarged internarial disc are studied. *H. ridleyi* is confirmed from Peninsular Malaysia and N. Borneo. *H. orbiculus* n. sp. is described from Sumatra, Indonesia, and identified as also occurring in Peninsular Malaysia. *H. rotalis* n. sp. is described from the Annamite Mountains, Laos, increasing the number of endemic or near-endemic mammals known to occur in this region.

Freeman, P. W. (1979). Specialized insectivory: beetle-eating and moth-eating molossid bats.

The jaw structure and mechanics of insectivores have been little studied. An efford is made here to compare and contrast jaw characteristics of insectivorous bats with thos of herbivores and carnivores. Further, in one particular family of bats (Molossidae) jaw modifications are such that animals that take hard-shelled insect prey can be distinguished from thos that take soft-shelled insect prey. Beetle-

easters generally have thick jaws, well-developed cranial crests, and fewer but bigger teeth, whereas moth-eaters have thin jaws, little crest build-up, and more but smaller teeth.

Freeman, P. W. (1981b). A multivariate study of the family Molossidae (Mammalia, Chiroptera) morphology, ecology, evolution.

The primary goal of my study, determining natural morphological groups of molossid bats, isccomplished by defining exactly the variation which occurs among the extant molossid species. I attempted to include as many of the species in the family as was possible.

To do this, I used principal components, distance (size-in and size-out), and correlation analysis on 80 species. Morphological trends that emerge from the data are size, as indicated by the first component; a suite of jaw characters, by the second; several facial features, by the third; and a few less important features, but particularly a wing characteristic, by the fourth. Each of the groups of phonetically similar molossids which appear in the PCA and in the distance and correlation analyses are described in terms of characters which are most highly correlated with the components. In particular, the second component, concerned with jaw structure, divides the species in the following way: *Cheiromeles, Molossus, Promops, Mops, Myopterus, Molossops* (including *Neoplatymops* and *Cynomops*), and several species of *Mormopterus* (including *Platymops*) and *Eumops* are located on the positive side of this axis, meaning these molossids have relatively thick jaws and robust skulls; molossids on the negative side *Tadarida, Nyctinomops, Chaerephon, Otomops*, and several species of *Mormopterus* (including *Sauromys*) and *Eumops*, have thin jaws and less robust skulls. I use the suite of jaw characters to predict what molossids are eating and give data to support the predictions: bats with thick jaws eat hard-shelled insects like beetles, and bats with thin jaws eat soft-shelled insects like moths. Likewise, I predict where molossids may be roosting or flying based on the shape of their wing tips. Bats with broad (relative to other molossids) wing tips may be slower and mor emaeuverable than molossids with narrow tips, and the few data available support this notion. Molossids tend to have two kindes of appearances: one with large, anteriorly directed ears which are joined over the nose, lips that are wrinkled, and basisphenoid pits that are medium or deep; and the other with short, laterally directed ears which are widely separated, lips that are unwrinkled, and basisphenoid pits that are shallow or nonexistent. I suspect that the two different appearances indicate two different ways in which molossids detect and consume prey, but I have no data to support or refute this thought.

Ecologically, both New and Old Worlds contain molossids with thick and thin jaws, *Molossus* in the New World and *Mops* in the Old World are probably ecological counterparts in that both probably concentrate on hard-shelled foods. The same is true of several molossids with thin jaws in both the New and Old Worlds; these bats are probably concentrating on soft-shelled prey. However, in another morphological characteristic, the width of the wing tip, the fauna in the New World contains most of the species with narrow wing tips. As for general size in molossids, the percentage of medium-sized bats is approximately the same in both New and Old World; but th Old World tends to have a greater percentage of large molossids, whereas the New World has a greater percentage of small ones.

The evolutionarey or phylogenetic relationships among the species and the genera are examined phonetically and with the use of several primitive-derived characters. Twelve genera are delineated:

Chaerephon (formerly *Tadarida [Chaerephon]*)
Cheiromeles
Eumops
Molossops (including *Neoplatymops* and *Cynomops* as subgenera)
Molossus
Mops (formerly *Tadarida [Mops]*; includes *Xiphonycteris*)
Mormopterus (formerly *Tadarida [Mormopterus]*; including *Sauromys* and *Platymops* as subgenera)
Myopterus
Nyctinomops (including four New World species formerly assigned to *Tadarida*)
Otomops
Promops
Tadarida

Three of these genera, *Tadarida, Mormopterus*, and *Eumops*, are more dispersed morphologically than the other nine. I think all 12 form natural groups based on morphological similarity.

In terms of primitive-derived traits, two groups emerge: the *Mormopterus*-like bats and the *Tadarida*-like bats. *Tadarida* and *Mormopterus* are the two most primitive genera to which all other genera can be related. The two groups differ primarily in ear design, separated or joined, and associated characters mentioned above and represent two basically different ways of detecting and consuming prey. Parallel trends of tooth loss and increased robustness of the skull occur in both groups. Genera in the *Mormopterus* group are *Mormopterus, Molossops, Myopterus*, and *Cheiromeles*; and genera in the *Tadarida* group are *Tadarida, Nyctinomops, Chaerephon, Mops, Otomops, Eumops, Promops*, and *Molossus*. These last three genera are the most derived in the family.

Geographically, the Indo-Australian molossid fauna is the most dispersed morphologically followed by the Neotropical and Ethiopian faunas. Good cases can be made for all three being the oldest molossid fauna: morphologically, the most distinctive genus, *Cheiromeles*, is found in the Indo-Australian fauna; ecologically, the Ethiopian molossids seem to fill more completely the available niches; and phylogenetically, the most derived genera are in the New World.

Freeman, P. W. (1984). Functional cranial analysis of large animalivorous bats (Microchiroptera).

Large animalvorous bats include carnivorous, piscivorous and insectivorous microchiropterans. Skull proportions and tooth morphology are examined and interpreted functionally. Four wide-faces bats from four families are convergent in having wide skulls, large masseter muscle volumes and stout jaws, indicating a powerful bite. Three of the four also have long canine teeth relative to their maxillary toothrows. Carnivorous bats have more elongate skulls, larger brain volumes and larger pinnae. The wide-faces bats are all oral emitters and have heads positively tilted relative to the basicranial axis. The carnivorous species are nasal-emtting bats and have negatively tilted heads. The orientation of the head relative to the basicranial axis affects several characters of the skull and jaws and is not correlated with size. The speculation that the type of echolocation may be more of a determinant of evolutionary change than the feeding mechanism is addressed. Wide-faced bats are thought to be capable of eating hard prey items (durophagus) and are probably non-discriminating, aurally less sophisticated insect generalists while the carnivorous and non-durophagus insectivorous bats may be more discriminating and aurally more sophisticated in what they eat.

Freeman, P. W. (1988). Frugivorous and animalivorous bats (Microchiroptera): dental and cranial adaptations.

The most derived fruit-eating bats have small canines, wide palates and molars with a distinctive labial rim. Paracone and metacone have moved from a dilambdodont position in the middle of the tooth the labial side of the tooth where they form the labial cutting edge. Along with the well-developed and close fitting labial cutting edges of the premolars and canines, this cutting edge skurts nearly the entire perimeter of the palate. The labial rim of the lower teeth fit inside the labial rim of the upper teeth like two cookie cutters nesting one inside the other. Frugivores have a greater allocation of tooth area at the anterior end of the toothrow. The area occupied by canines of predators of struggling prey is greater than that for bats that eat non-struggling prey leke fruit. In addition, frugivores have wider palates than long while many carnivores have longer palates than wide. Omnivores appear to have a more equal allocation of space to more kninds of teeth, particularly the incisors and non-molariform premolars, on the toothrow than do frugivores or animalivores. The mechanical nature of different food items is discussed and the suggestion made that describing foods in terms of their texture may be more important in tooth design than whether they are fruit or insect or vertebrate.

Freeman, P. W. (1992). Canine teeth of bats (Microchiroptera): size, shape and role in crak propagation.

Upper canines in microchiropteran bats show a variety of cross-sectional shapes. A consistent feature of all species studied here is that the tooth is edged and not simply round or oval. Prominent sharp edges are positioned in several directions but particularly antero-medially toward the incisors and posteriorly toward the premolars. These edges appear to direct the cracks made in food items to the incisors or to the premolars. A continuous cutting edge is apparent in the occlusal view of the palate running from tip of canine to the ectoloph of the molars. Size and shape analysis indicates that larger bats have slender, rather than stouter, canines for their height, a condition that may be attributable to the nature of the prey. Most bats take prey that have little hard substance imbedded within. The compromises in tooth shape may vary between that of a terrestrial predator with short, conical canines for processing endoskeletal prey to that of a small flying predator with long, slender, edged canines for capturing and processing exeskeletal prey. Unicuspid teet and how they might function in food break-up have been overlooked to the literature; such a study could lead to an understanding of how more complex teeth function.

Freeman, P. W. (1995). Nectarivorous feeding mechanisms in bats.

Cranio-dental characteristics are quantified between micro- and megachiropteran nectarivores and compared with microchiropteran animalivores, frugivores, and megachiropteran frugivores. Microchriopteran nectarivores share many characteristics with megachiropteran nectarivors and frugivores, but differ in having a long, narrow head. Megachiropterans have wide zygomata, which would allow for more jaw musculature. Diminutivfe cheekteeth are characteristic of nectarivory in both suborders, but both have relatively large canines. Teeth in nectarivores can occupy as little as a tenth of the palatal area compared to nearly two-thires in microchiropteran animalivores. The proportion that the dilambdodont stylar shelf occupies of molars in microchiropteran nectarivores can be as much as that in microchiropteran animalivores (insectivorous and carnivorous bats) or a little as that in microchiropteran frugivores but not as extreme as either. In addition to diminutive teeth, nectarivores have fused mandibles and upper canines that are worn from contact with the lower canines (thegosis). These characteristics may be necessary for the lower jaw to support an elongated, mobile tongue. While microchiropteran nectarivory, frugivory, and carnivory probably evolved independently from an insectivorous microchiropteran ancestor, megachiropteran nectarivory probably evolved from megachiropteran frugivory or the reverse.

Freeman, P. W. and C. A. Lemen (1992). Morphometrics of the family Emballonuridae.

Morphometric analysis reveales three distinctive groups among the genera of emballonurids. *Taphozous* - *Saccolaimus* is a group distinctive in size and shape, particularly cranially. Diclidurids are distinctive in appendicular characters only, especially those in the wing. The third group includes all other emballonurids. Phylogenetic studies also separated *Taphozous* - *Saccolaimus* as distinctive but included diclidurids among other New World species. Compared with molossids, emballonurids are morphologically quite homogeneous.

Freeman, P. W. and W. N. Weins (1997). Pucturing ability of bat canine teeth: The tip.

Casts of upper canine teeth of 15 species of microchiropteran bats were fixed securely into a testing machine and made to puncture the bloom side of an appel. The force necessary to break through the surface of an appal was regressed against both shape of the tip of the canine and the size of the animal. Sharper tips require less force to puncture than blunt ones. Results were also verified using giant two-dimensional models of Plexiglas™ with sharp and blunt tips that were loaded onto a Plexiglas™ beam. Fringes, or stress lines, are more highly concentrated at the point of contact for a smaller radius than for a larger radius under the same loading conditions, indicating that stress in the

beam is higher and more concentrated at the sharper tip. Ours is some of the first experimentatl work to quantify apical sharpness of a tooth and performance as it punctures a substance.

Freitas, T. R. O., M. R. Bogo and A. U. Christoff (1992). G-, C-bands and NOR studies in two species of bats from Southern Brazil (Chiroptera: Vespertilionidae, Molossidae).

Described the karyotypes of two species of bats from Southern Brazil, *Eptesicus brasiliensis* (2n = 50; AN = 48) and *Molossus molossus* (2n = 48; AN = 54). The study of *E. brasiliensis* was based in seven males and seven females, while that of *M. molossus* included three males and 13 females. All autosomal chromosomes of *E. brasiliensis* are acrocentric, while *M. molossus* presents four pairs of submetacentric and 19 pairs of acrocentric chromosomes. Both species present an acrocentric Y chromosome; the X is submetacentric in *E. brasiliensis* and metacentric in *M. molossus*. The G-bands of *E. brasiliensis* do not differ markedly from those reported for other species of *Eptesicus*. *M. molossus*, however, presents a rather different G-pattern from those of other species of the same family. As for the C-bands, the results for both species are not remarkably different from those of other species of the same families. *E. brasiliensis* and *M. molossus* show a nucleolus organizing region (NOR) in only one pair, the one that presents a secondary constriction near the centromere.

Es werden Standardkaryogramme sowie G-, C- und NOR-gefarbte Metaphasen von zwei Fledermausarten aus Südbrasilien beschrieben. Je 7 Männchen und Weibchen von *Eptescus brasiliensis* (Vespertilionidae) und 3 Männchen und 13 Weibchen von *Molossus molossus* (Molossidae) wurden untersucht. Die cytogenetische Analyse ergab 2n = 50 und AN = 48 für *E. brasiliensis* und 2n = 48 und AN = 54 für *M. molossus*. Bei *E. brasiliensis* sind alle Autosomen akrozentrisch; *M. molossus* weist 4 Paare submetazentrischer und 19 Paare akrozentrischer Chromosomen auf. Beide Arten haben ein akrozentrisches Y-Chromosom, das X-Chromosom ist submetazentrisch bei *E. brasiliensis* und metazentrisch bei *M. molossus*. Die Muster der G-Bander bei *E. brasiliensis* unterscheiden sich nicht von denen anderer *Eptesicus*-Arten. Dagegen unterscheidet sich *M. molossus* deutlich von anderen Arten der Familie. Bei den C-Bandern ergaben sich keine wesentlichen Unterschiede. Bei beiden Arten ließen sich NORs nur in einem Chromosom anfarben, welches eine sekundare Einschnurung in der Nahe des Centromers aufweist.

Friant, M. (1951). La dentition temporaire, dite lacteale, de la Rousette (*Rousettus leachi* A. Sm.), Chiroptère frugivore.

La dentition temporaire du genre *Rousettus*, qui était, jusqu'ici, inconnue, est plus régressée encore que celle des Chiroptères insectivores: elle comporte une seule molaire, Mt2; à la mâchoire supérieure, les dents, en forme, de crochets simples et aigus, montrent, par leur position, le rôle qu'elles jouent, durant les premiers mois de la vie, alors que le jeune demeure accroché à la fourrure de sa mère.

Frost, D. R. and R. M. Timm (1992). Phylogeny of Plecotine Bats (Chiroptera:"Vespertilionidae"): Summary of the evidence and proposal of a logically consistent taxonomy.

Using standard phylogenetic techniques, 25 transformation series of morphological characters and 11 of karyological characters are evaluated in an attempt to recover the phylogenetic history of plecotine vespertilionid bats. Plecotini contains four genera in the topology (*Euderma (Barbastella (Plecotus Corynorhinus*))). The Plecotini of Hill and Harrison (1987), including *Rhogeessa, Baeodon, Nycticeius*, and *Otonycteris*, is rejected because this view is based solely on subjective evaluations of bacular overall similarity, and is clearly in disagreement with other lines of evidence from anatomy and karyology. *Idionycteris* is synonymized with *Euderma* because *I. phyllotis* and *E. maculatum* are sister species. *Corynorhinus* is removed from the synonymy of *Plecotus*. The relationships within *Corynorhinus* and *Plecotus* are not resolved.

Funaioli, U. (1959). I mammiferi della Somalia. Cenni al loro intreesse nell'economia del Paese. Primo elenco.

In una mia precedente nota dedicata all'esame del problema faunistico e venatorio della Somalia (1) auspicavo una sollecita e più realistica revisione dell'Ordinanza A.F.I.S. N. 26 rep. del 6 dicembre 1951 che regola attualmente l'esercizio della attività venataria, in quanto rivelatasi in molti punti inadeguata ad un sano sfruttamento del patrimonio faunistico, mentre per altri lascia adito a dubbi per i cacciatori e per i tutori della Legge.

Un elemento fondamentale di questa revisione è rappresentato dalla conoscenza degli animali che compongono il patrimonio faunistico, della loro distribuzione geografica e del loro ruolo attuale nell'economia agraria e generale del Paese.

Ho creduto pertanto opportuno compilare, sulla base degli studi italiani e stranieri che ho potuto rintracciare e con l'aggiunta di qualche elemento acquisito direttamente in Somalia, un primo elenco dei mammiferì di questo Paese, nei suoi confini politici, accennando a problemi attuali vari ad essi inerenti, all'interesse che essi rivestono per cacciatori (costituendo essi il maggiore oggetto dell'attività venataria), commercianti ed agricoltori della Somalia, e coll'intento di fornire una prima base aggiornata a studiosi ed a legislatori nel campo faunistico e venatorio somalo.

L'ordine sistematico seguito è quello di-ALLEN M.G. (1939), mentre le notizie relative alla distribuzione degli animali, alla loro biologia ed alla loro importanza economica sono ricavate da numerose pubblicazioni nonchè dalla esperienza personale di alcuni, anni di soggiorno in Somalia

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Funaioli, U. and B. Lanza (1968). On some bats from Somalia.

We have some time ago begun a detailed study of the Chiroptera from Somalia. This study considers chiefly specimens in the collections of the Museo Zoologico of the University of Florence, the Museo di Storia Naturale "Giacomo Doria" of Genoa and the Museo di Storia Naturale of Milan, which house particularly rich collections from this region. However, as a considerable time will lapse before this extensive research will be completed, we deem it useful to publish now some particularly significant finds. We are grateful, for the valuable assistance given us by Dr. V. AELLEN (Muséum d'Histoire Naturelle, Genève), Dr. D. L. HARRISON (British Museum of Natural History, London) and Dr. K. F. KOOPMAN (American Museum of Natural History, New York).

Funaioli, U. and A. M. Simonetta (1966). The mammalian fauna of the Somali Republic: Status and conservation problems.

The present report is, in some ways, a follow-up of our paper "Statut actuel des Ongules en Somalie" (FUNAIOLI & SIMONETTA, 1960); the Mammalian Fauna of Somalia is, indeed, among the less known of Africa both in its composition and in distribution, so that both mammalogists and the Somali and International Authorities concerned with the conservation and scientific exploitation of wildlife are greatly interested in obtaining information on the present status of the Mammals of Somalia and on possible future developments of the situation.

We have been asked by colleagues working at the Smithsonian African Project, as well as by F.A.O. Offices and by Officers of the Somali Government to make available the information we had gathered in these years of study of the Fauna of the Somali Republic and to give advice as to the more effective measures to take for its conservation.

Indeed, such a report, if it could combine the more relevant data on the whole Mammalian Fauna of the Republic (within its present political borders), with and objective evaluation of the present and possible future economic significance of wildlife for the People of Somalia, might prove of some use to the pure zoologists as well as to those involved in planning the economic development of Somalia. It

might also disoblige us a little of the assistance and hospitality which the People and the Government of the Somali Republic have offerec to our expeditions.

Moreover, though our research plans have always been primarily aimed at pure research, in the present stage of social and economic development, it is mandatlory that whenever in the course of research the scolar collects data which may be of practical use, he makes tham promptly available to whoever may be concerned with their use.

Funakoshi, K., A. Zubaid and S. Matsumura (1995). Regular pulse emission in some megachiropteran bats.

We recorded vocalizations of megachiropteran bats, *Cynopterus brachyotis, C. horsfieldi, Megaerops ecaudatus* and *Macroglossus sobrinus* as they were held in our hands, in a hanging position or moved up and down, simulating flight. All four species produced regular audible tone pulses with a frequency spectrum of less than 9 kHz (peak at 4 - 6 kHz). The duration of a single pulse varied from 14.9 to 23.6 msec on average among these species. The interpulse interval was between 108.3 and 127.7 msec. In *M. ecaudatus* and *M. sobrinus*, double pulses were occasionally emitted, with interpulse intervals averaging 39 msec and 31 msec, respectively. The regular pulse emission may indicate that the bats studied use sounds to probe space.

Gaisler, J. (1970). The bats (Chiroptera) collected in Afghanistan by the Czechoslovak expeditions of 1965-1967.

The present paper is based on a total of 748 specimens of 17 species of bats, collected in Afghanistan during several shorter periods in 1965 to 1967. In taxonomical evaluation of the material - being the core of the study - a thorough comparison has been made with the material of the British Museun (Natural History). Evidence has been obtained of the presence of following species and subspecies in Afghanistan: *Rhinopoma microphyllum microphyllum, Rhinopoma hardwickei hardwickei, Rhinopoma hardwickei seianum, Taphozous nudiventris kachhensis, Megaderma lyra lyra, Rhinolophus ferrumequinum irani, Rhinolophus hipposideros midas, Hipposideros fulvus pallidus, Myotis longipes, Eptesicus nasutus nasutus, Eptesicus serotinus turcomanus, Eptesicus serotinus pashtonus, Nyctalus montanus, Pipistrellus pipistrellus bactrianus, Pipistrellus pipistrellus mediterraneus, Pipistrellus coromandra coromandra, Pipistrellus kuhli lepidus, Scotophilus heathi heathi, Plecotus austriacus wardi, Miniopterus schreibersi fuliginosus* and *Miniopterus schreibersi pallidus*. A revision has been made of the subspecies of *Eptesicus serotinus* and a new ssp. *pashtonus* described. *Myotis longipes, Eptesicus walli* and *Nyctalus montanus* are valid species. The systematics of *Pipistrellus coromandra* is unclear; it is possible that the specimens, tentatively arranged under the nominates subspecies . . . new species. *Pipistrellus aladdin* appears to be synonymous with *Pipistrellus pipistrellus bactrianus*. Apart from the distribution and systematics of individual species, also their sex dimorphism, ecology and reproduction has been investigated.

Gaisler, J. (1983). Nouvelles données sur les Chiroptères du nord algérien.

Myotis nattereri est signalé pour la première fois en Algérie. *Myotis capaccinii* et *Pipistrellus pipistrellus* ont été retrouvés dans ce pays après une centaine d'années. *Pipistrellus savii*, provenant de trois régions d'altitude (entre 1050 et 2004 m), fait l'objet de précisions sur son écologie et sur son comportement. La distribution de 10 autres espèces, *Rhinolophus ferrumequinum, R. hipposideros, R. euryale, R. mehelyi, R. blasii, Myotis blythi, M. emarginatus, Pipistrellus kuhli, Plecotus austriacus* et *Miniopterus schreibersi*, est complétée par quelques données faunistiques. Le peuplement d'une grotte au cours de l'année et l'activité saisonnière des Chiroptères dans une ville sont étudiés.

Myotis nattereri is recorded for the first time in Algeria and for the second time in Africa. *Myotis capaccinii* and *Pipistrellus pipistrellus* are rediscovered in the country after a hundred years. *Pipistrellus savii* is recorded in two Algerian National Parks and in one town, at the elevations ranging

from 1050 to 2004 m; data are given on its ecology and behaviour. The other ten species, *Rhinolophus ferrumequinum, R. hipposideros, R. euryale, R. meheleyi, R. blasii, Myotis blythi, M. emarginatus, Pipistrellus kuhli, Plecotus austriacus* and *Miniopterus schreibersi*, are recorded for new locations. Chiropteran community in a cave on the Mediterranean coast was explored during 11 successive visits. Bats hunting in a town were netted and their activity registered and correlated with some climatic parameters.

Gaisler, J. (1984). Bats of northern Algeria and their winter activity.

Twenty-six species of 6 families of bats are recorded in Algeria, 17 of which occur in the northern (mediterranean) zone of that country. *Myotis nattereri* and *Nyctalus leisleri* are added to the fauna list of Algerian mammals. *Pipistrellus savii* appears to be a common bat in the Algerian mountains. Winter activity of Pipistrelle and Longeared bats was studied in the town of Setif. These bats seem to hibernate but their lethargy is often interrupted by periods of hunting activity.

Gaisler, J. and K. Kowalski (1986). Results of the netting of bats in Algeria (Mammalia: Chiroptera).

Three hundred seventeen bats of 20 species were taken by nets at 26 localities, most of them in northern Algeria, in the years 1980 - 1983. This sample has been evaluted with regard to faunal size, relative abundance, species diversity in areas, and the foraging diversity of the species. The species diversity corresponds in a certain degree to the diversity of environment, and on the whole it is higher in samples from western Algeria than from the east of the country. The highest foraging diversity has been found in *P. kuhli*, the only species caught both in the Mediterranean zone and in the desert; a high foraging diversity is also shown by *M. blythi, P. pipistrellus, E. serotinus, R. ferrumequinum* and *P. austriacus*. The bats are less active in the Meditenramean zone as well as in oases in the Sahara in winter. Two peaks of nocturnal activity, with the maximum after sunset, have been ascertained in three most abundant species.

Gaisler, J., G. Madkour and J. Pelikán (1972). On the bats (Chiroptera) of Egypt.

The present paper is based on a total of 236 specimens of 11 species of bats, collected in Egypt (A. R. E.) during April and May, 1969. In taxonomical evaluation of the material - being the core of the study - evidence has been obtained of the presence of the following species and subspecies in Egypt: *Rousettus aegyptiacus aegyptiacus, Rhinopoma hardwickei sennaariense, Rhinopoma hardwickei cystops, Taphozous perforatus perforatus, Taphozous nudiventris nudiventris, Nycteris thebaica thebaica, Rhinolophus clivosus clivosus, Rhinolophus clivosus brachygnathus, Asellia tridens tridens, Pipistrellus kuhli marginatus, Pipistrellus deserti, Plecotus austriacus christiei* and *Otonycteris hemprichi hemprichi*. Particular attention is paid to *P. deserti*, a species new for the fauna of Egypt, evidence being forwarded of this species being different from the sympatric forms of the genus *Pipistrellus*. Remarks on the ecology of each of the species collected are attached. A systematic review is given of 8 families, 13 genera and 21 species of bats hitherto recorded in Egypt, with notes on their occurrence. In zoogeographical respect, most of the species (76.2 %) are Palaearctic, those of Afro-eremic origin predominating. The rest (23.8 %) are Ethiopian species. The chiropteran fauna, of Egypt is related especially to that of the Arabian Peninsula and also to that of the Maghreb region.

Gallagher, M. D. and D. L. Harrison (1988). The small mammals of the Wahiba Sands, Oman.

The results are presented of a survey to establish what species of small mammals occur in the Wahiba Sands, and to provide preliminary evidence of their distribution and behaviour. Ten bats (Chiroptera) of three species were collected (Trident bat *Asellia tridens*, Persian Leaf-nosed Bat *Triaenops persicus*, and Kuhl's Pipistrelle *Pipistrellus kuhli*); and eight rats and mice (Rodentia: Muridae) of two species

(Black Rat *Rattus rattus*, House Mouse *Mus musculus*; and 18 specimens of Cricetidae: Sundevall's Jird *Meriones crassus* and Cheesman's Gerbil *Gerbillus cheesmani*). The pipistrelle, jird and gerbil were found in the Sands, the remainder on the border. Evidence is given of other species which may occur. Further behavioural studies are suggested.

Garnham, P. C. C. and R. B. Heisch (1953). On a new blood parasite of insectivorous bats.

(1) A new blood parasite - *Nycteria medusiformis* n.gen.n.sp. - of insectivorous bats (*Nycteris capensis*) is described.

(2) Gametocytes only are present in the blood, and infected erythrocytes show filaments protruding from the surface.

(3) Tissue schizonts are found in parenchyma cells of the liver, superficially resembling, the pre-crythrocytic schizonts of *Plasmodium falciparum*, but differing essentially in the structure of the nuclei.

Gautier-Hion, A. and G. Michaloud (1989). Are figs always keystone resources for tropical frugivorous vertebrates? A test in Gabon.

This paper evaluates the suggestion of Terborgh (1986) that figs constitute "keystone plant resources" for frugivorous mammals and birds in African rain forests as they appear to do in South America and Asia. From studies of the diets of monkeys and other mammals and birds in Gabon, we show that figs are infrequently eaten by most species, and are always eaten in small amounts. Figs in Gabon occur at very low densities and have unpredictable fruiting patterns and relatively low crown production. Thus, fig fruits are not staple foods and cannot sustain most populations of frugivorous species during periods of low fruit availability. In Gabon, monkeys and large birds depend on the fruit of two species of Myristicaceae and of one species of Annonaceae. These regularly bear ripe fruit during the lean period and are abundantly consumed. Figs occur in such distant patches that they are mainly fed on by wide-ranging animals such as large frugivorous bats.

Gelderblom, C. M., G. N. Bronner, A. T. Lombard and P. J. Taylor (1995). Patterns of distribution and current protection status of the Carnivora, Chiroptera and Insectivora in South Africa.

Geographic patterns of species richness and endemism in three mammalian orders (Chiroptera, Insectivora and Carnivora) were studied in relation to the biomes and existing protected areas of greater South Africa (including Lesotho and Swaziland). Locality data for 21500 specimens representing 124 species were analysed with a geographical information system. Species richness of Chiroptera is high in the savanna biome, particularly in the north-east of the country, owing to the marginal intrusion of 14 tropical species. Endemism in Chiroptera is low, however, with only two endemic species in the fynbos and Karoo biomes. The Carnivora display less biome specificity and endemism than the Chiroptera. Whereas the north-eastern savannas have the highest species richness, the transition between the Nama-Karoo and grassland biomes is an important southern African centre of endemism for the Carnivora, particularly the smaller species. In addition to being an important centre for species richness in the Carnivora and Chiroptera, the Kruger National Park is also particularly important for Red Data Book species in both orders. The Insectivora display both high species richness and endemism. Species richness of the Insectivora is greatest in the mesic south-east of the country, whereas endemism is most pronounced in the forest and grassland biomes. Differences in biome specificity and endemism between these orders reflect not only phylogenetic divergence, but also variation in body size, vagility and life-history strategies. Most of South Africa's endemics are small mammals and many of them are listed in the Red Data Book. Distributions, life-history strategies and trends in man-induced habitat degradation were used to re-evaluate the protection status of the 124 species. We conclude that at least 11 endemic species are not adequately protected by existing publicly owned protected areas and consequently identify several areas which need to be added to the existing protected area system.

Die geografiese patrone van spesiesverskeidenheid en endemisme in drie soogdier ordes (Chiroptera, Insectivora en Carnivora) is bestudeer in verhouding tot die biome en bestaande beskermde areas van groter Suid-Afrika (insluitend Lesotho en Swaziland). Lokaliteitdata vir 21500 eksemplare verteenwoordigend van 124 spesies is geanaliseer met behulp van 'n geografiese informasiesisteem. Spesiesverskeidenheid van Chiroptera is die hoogste in die savanna-bioom, veral in die noord-oostelike dele van die land as gevolg van die marginale indringing van 14 tropiese spesies. Endemisme in Chiroptera is laag, met slegs twee endemiese spesies, een elk in die fynbos- en Karoo-biome. Die Carnivora vertoon minder bioomspesifisiteit en laer endemisme as die Chiroptera. Terwyl die noord-oostelike savannas die hoogste Carnivora spesiesverskeidenheid het, is die oorgang tussen die Nama-Karoo- en grasland-biome belangrik vir die endemiese Carnivora van suidelike Afrika, veral wat betref die kleiner spesies. Die Nasionale Kruger Wildtuin is nie net 'n belangrike sentrum vir spesiesverskeidenheid wat betref die Carnivora en Chiroptera, maar ook vir Rooi Data Boek-spesies van die twee ordes. Die Insectivora vertoon beide hoe spesiesverskeidenheid en endemisme, met die hoogste spesiesverskeidenheid in die mesiese suid-oostelike dele van die land, terwyl endemisme meer algemeen voorkom in die woud- en grasland-biome. Hierdie verskil in bioomspesifisiteit en endemisme reflekteer nie slegs filogenetiese divergensie tussen die ordes nie, maar ook variasie in liggaamsgrootte, verspreidingsvermoe en historiese lewensstragtegiee. Meeste van die Suid-Afrikaanse inheemse fauna is kiein soogdiere en bale van hulle is gelys in die Rooi Data Boek. Die bewaringstatus van 124 spesies is geherevalueer met inagneming van verspreidings, lewensgeskiedenis- strategies en verskynsels soos habitats wat deur die mens gedegradeer is. Ons gevolgtrekking is dus dat ten minste 11 van die endemiese spesies nie genoegsaam deur die bestaande reservaate beskerm word nie. Gevolglik het ons verskeie gebiede geïdentifiseer wat by die bestaande reservaatsisteem gevoeg moet word.

Genov, T., R. Stoykova-Hajinikolova and R. Mészáros (1992). *Molinostrongylus* spp. (Nematoda: Molineidae) from bats in Bulgaria, with a review of European species.

Four species of *Molinostrongylus* are recorded in bats in Bulgaria: *M. alatus* in *Myotis myotis* and *M. blythi*, *M. panousei* (= *M. ornatus* sensu Yanchev and Stoykova 1973) in *Miniopterus schreibersi* (new geographical record), *M. skrjabini* in *Nyctalus noctula*, and *M. vespertilionis* in *Pipistrellus pipistrellus* (new geographical record). The species are redescribed and figured. A survey of European *Molinostrongylus* spp. is presented. A total of 8 nominal species has been recorded in European bats; lists of records, hosts and localities are given for every species. *M. tipula* is regarded as species inquirenda; *M. morosovi* is considered nomen nudum. A key to *Molinostrongylus* spp. in Europe is included.

Genoways, H. H. and D. A. Schlitter (1985). Survey of the recent mammal collections of the world.

Survey of collections of recent mammals reveal that there are 706 of these collections located in 78 countries. These collections hold 4 874 954 specimens. There are 19 collections that hold 50 000 or more specimens of recent mammals.

Gerell, R. and K. Lundberg (1985). Social organization in the bat *Pipistrellus pipistrellus*.

The social organization of the pipistrelle bat *Pipistrellus pipistrellus* was studied by means of bat boxes in southern Sweden. The males set up territories around a roosting site in the beginning of the summer at the same time as the females formed nursing colonies. After breeding, the females joined the single males in their day roosts establishing transient mating harems. Subsequently, immatures arrived at the mating grounds. The immature females, which probably attained sexual maturity during their first autumn, were admitted to the day roosts of the harem males, in contrast to the immature males. The size of the harem was dependent on the total number of females present on the mating grounds. The

size, however, was also restricted hy some factor, presumably the quantity of food resources in the surroundings of the specific roost site, or the capability of the . . . A resource defense polygyny, . . . Other related temperate species indicate a similar social organization in *Pipistrellus nathusii* and *Nyctalus noctula*.

Gerlach, J. (1993). The conservation of Silhouette Island, Seychelles. II. Animals.

Silhouette is the third largest of the granitic islands of Seychelles and, as such, supports a wide variety of localized plants and animals. The extensive ecological damage by forest clearance that occurred historically on other Seychelles islands has been prevented by the steepness of the terrain on Silhouette. Recent studies of the island's habitats have confirmed its great conservation value. The status of the species of animals recorded on the island are discussed below and specific conservation problems are described.

Gharaibeh, B. M. (1997). Systematics, distribution, and zoogeography of mammals of Tunisia.

The taxonomic identity of each species of mammals that occurs in the Republic of Tunisia, North Africa has been determined to the subspecific level. History of names was followed and descriptions of types were studied to better provide opinions on the nomenclature and minimize the confusion existing in the literature concerning the taxonomic identity of many Tunisian species. Keys to distinguish related taxa were constructed and maps depicting the distribution of species within the borders of Tunisia and in the whole North African region were drawn. These maps show original records obtained during this study as well records reported in the literature. Furthermore, the available natural history information on the Tunisian mammal fauna and background information on the vegetation, rainfall, topography, and land forms of the country were presented.

Chromosomal G-band data for *Meriones shawi* from Tunisia, hitherto unavailable, was used to reexamine proposed chromosomal homologies and update the phylogenetic tree of Family Gerbillidae. G-banded chromosomal complement for *Jaculus orientalis* was reported. Notable differences in pelage color were seen between populations of the North African elephant shrew, *Elephantulus rozeti* in northern and southern Tunisia. However, no disjunction was seen in morphometric measurements analyzed using principal components analysis (PCA).

Differences in pelage color between 5 populations of *Gerbillus campestris* are discussed. Two populations of this gerbil, one on the Island of Djerba and the other around Medenine deserve systematic studies using molecular data or multivariate analyses of morphometric measurements. Differences in pelage color, mandibular foramina number, color of foot pad hair and other characters between 2 populations of *Jaculus jaculus* were also noted and further investigation of the taxonomic status recommended.

Zoogeographical analyses of the mammalian faunal elements in Tunisia and the whole area were made. Two groups of bats were recognized. Bat fauna that invaded Tunisia from the north, and one that invaded from the south. Land mammals were in three groups: strictly Mediterranean zone, widely-distributed Mediterranean, and Saharan mammals. Species richness in quadrates 1° latitude X 1° longitude spanning Tunisia was discussed. The species richness provided evidence to areas of high biodiversity. Areas that deserve conservation are Djebel Zaghouan, Ghardimaou, Tamerza-Kasserine, and Dahar-Djeffara plain. Finally, conclusions and recommendations for future mammalian studies in the area were suggested.

Giglioli, E. H. (1888). Note intorno agli animali vertebrati raccolti dal Conte Augusto Boutourline e dal Dr. Leopoldo Traversi ad Assab e nello Scioa negli anni 1884-87.

Nell'estate del 1884 il Conte Augusto Boutourline ed il Dr. Leopoldo Traversi frequentarono assiduamente il laboratorio tassidermico annesso al mio Gabinetto, per porsi in grado di saper

raccogliere e conservare animali; e ciò in occasione di una esplorazione nell'Africa N. E. che avevano divisato di fare insieme.

Nel settembre 1884 il Conte Boutourline lasciò Firenze per Assab, ove fu raggiunto dal Dott. Traversi nel seguente novembre. Dopo breve soggiorno in quel nostro possedimento essi andarono a Massaua, accampando nelle vicinanze di Monkullo. Qui il Conte Boutourline venne colto da febbri ostinate e molto a malincuore si vide costretto a rimpatriare. Con rara generosità egli volle lasciare al Dott. Traversi una porzione non piccola del suo bagaglio speciale e delle sue armi e provviste; ed il Traversi potè così avviarsi subito verso l'interno. Egli tentò di penetrare nell'Abissinia per la via dell'Asmara, e difatti vi era entrato, quando il *Negus* colto da uno dei suoi capricci e forse insospettito per avere saputo che egli era medico militare, lo mandò indietro. Per nulla scoraggiato il Dott. Traversi ritornò ad Assab e per la via allora poco praticata dell'Aussa penetrò nello Scioa ove ebbe buona accoglienza dal Re Menilek. Ora da quasi tre anni vi soggiorna, amato e stimato da tutti ; fa il medico, raccoglie animali e studia gli indigeni. Da solo o accompagnando il Re Menilek in qualcuna delle sue scorrerie guerresche, il Dott. Traversi ha già potuto compiere importanti esplorazioni, delle quali la nostra Società Geografica ha già pubblicato varii resoconti, ed egli ha tale fibra e tale energia che ben altre cose potrà fare prima di tornare in patria.

Mi sia concesso nel chiudere questa breve introduzione di tributare un voto di ben meritato elogio al modesto quanto bravo ed intrepido nostro esploratore e di augurargli un glorioso successo nell' ardua impresa da lui assunta.

Godawa-Stormark, J. (1998). Phenetic analysis of Old World *Myotis* (Chiroptera: Vespertilionidae) based on dental characters.

Similarities between 42 taxa of genus *Myotis* were studied based on 11 dental characters. The most primitive conditions were found in subgenus *Leuconoe* and in most taxa of subgenus *Selysius*. No clear differences between subgenera *Leuconoe* and *Selysius* were found. Only *Myotis altarium, M. ikonnikovi, M. mystacinus*, and *M. hosonoi* were found to be distinct from the 13 species studied within subgenus *Selysius*. The subgenus *Myotis* was distinct from the other subgenera in having the most derived conditions.

Goff, M. L. (1982). Two new species of chiggers (Acari: Trombiculidae) from East African bats (Chiroptera).

Microtrombicula (Eltonella) tanzaniae is described from specimens collected from Noack's African Leaf-nosed Bat, *Hipposideros ruber ruber*, Persian Leaf-nosed Bat, *Triaenops persicus afer*, and Egyptian Slit-faced Bat, *Nycteris thebaica*, and *Whartonia novemsetosa* from Egyptian Fruit Bat, *Rousettus aegyptiacus*, taken in Tanzania, Africa. New host and locality records are given for *Whartonia oweni*.

Goodman, S. M. (1993). A reconnaissance of Ile Sainte Marie, Madagascar: the status of the forest, avifauna, lemurs and fruit bats.

Between 26 March and 3 April 1991 a reconnaissance of Ile Sainte Marie, Madagascar, was conducted to determine the condition of the remaining forests and the species of birds occurring on the island. Specific information was sought on the snail-eating coua *Coua delalandei*, a species known only from lie Sainte Marie, but which had not been reported for over 150 years. Sight observations and interviews with local people were used in this investigation. The only remaining forest on laterite soil, Foret de Kalalao, has been severely degraded and is now a series of small disjunct blocks. One area of littoral forest, Foret d'Ambohidena, is relatively intact. A single obligate forest bird is known still to occur on the island. There is a high correlation between the species of birds observed during the reconnaissance and those recognized from pictures by local inhabitants of the island. On the basis of the extent of habitat destruction, the condition of the remaining forest, and information from local

people, the snail-eating coua is presumed to be extinct. Incidental information was also obtained about lemurs and fruit bats occurring on the island.

Entre 26 mars et 3 avril 1991, un reconnaissance de l'île Sainte Marie, Madagascar, a été conduit, pour déterminer les conditions écologiques de la reste de forêt et les espèces d'oiseaux existantes dans l'île. Une information spécifique a été poursuivi sur le coua de Delalande (*Coua. Delalandei*), une espèce qui est connue seulement dans cet île, mais qui n 'a pas été reconnue depuis environ 150 années. Des observations et des enquêtes locales ont été faites, et qui nous ont permis d'avancer sur cette recherche. La seule foret restante a sol latéritique - foret de Kalalao - a été en partie dégradée, et qui se présente sous forme de série de petites bloques disjointes; et une partie de la foret littorale - foret d'Ambohidena - qui est relativement intacte. Il existe une haute corrélation entre les espèces d'oiseaux observées pendant la reconnaissance faite sur terrain et celles reconnues par les habitants locaux. Cornpte tenu de l'extension de la destruction forestière par les gens du village, la variation des conditions écologiques du milieux, et des informations prises, le coua de Delalande est considère comme disparu. Une information incidente a été aussi obtenue a propos des lémurs et des chauves souris,

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Goodman, S. M. (1996). Results of a bat survey of the eastern slopes of the Réserve Naturelle Intégrale d'Andringitra, Madagascar.

Four bat species were recorded in the Réserve Naturelle Intégrale d'Andringitra: *Rousettus madagascariensis, Hipposideros commersoni. Myotis goudoti*, and *Miniopterus minor*. The greatest species richness was at 720 and 810 m. Evidence was found that *Myotis* and *Miniopterus* occupy the same day-roosts. There was also the indication that *Miniopterus minor* has synchronized breeding and delayed embryonic development.

Quatre espèces de chauve-souris ont été recensées dans la Réserve Naturelle Intégrale d'Andringitra: *Rousettus madagascariensis, Hipposideros commersoni, Myotis goudoti* et *Miniopterus minor*. La plus grande richesse spécifique a été constatée entre 720 m et 810 m d'altitude. La preuve que les especes *Myotis* et *Miniopterus* occupent des mêmes reposoirs diurnes a été établie. On a aussi relevé l'indication que *Miniopterus minor* a une reproduction synchronisée et un développement embryonnaire retardé.

Goodman, S. M. (1998). Notes on the bats of the Réserve Spéciale d'Anjanaharibe-Sud, Madagascar.

Three bat species were collected in the Reserve Speciale d'Anjanaharibe-Sud at 650 m: *Rousettus madagascariensis, Myotis goudoti*, and *Miniopterus fraterculus*. These species are broadly distributed across the island in both forested and disturbed areas.

Trois espèces de chauve-souris ont été collectées dans la Réserve Speciale d'Anjanaharibe-Sud a 650 m d'altitude: *Rousettus madagascariensis, Myotis goudoti*, et *Miniopterus fraterculus*. Ces espèces présentent une large distribution a travers toute l'île au sein de zones boisées et dégradées.

Goodman, S. M. (1999). Notes on the bats of the Réserve Naturelle Intégrale d'Andohahela and surrounding areas of southeastern Madagascar.

Four bat species were collected in the Réserve Naturelle Intégrale d'Andohahela: *Rousettus madagascariensis, Miniopterus manavi, Mormopterus jugularis*, and *Myotis goudoti*. With the exception of *Mormopterus*, all were obtained in the humid forest portions of the reserve (parcel 1); *Mormopterus* was netted in an area of spiny bush vegetation (parcel 2). The humid forest species are

broadly distributed across the island and occur in both forested and disturbed areas. An analysis of the forest-dwelling bat faunas known from several eastern humid forest sites indicates that species richness is low and that there is little change in the community across this region, which covers about 12° of latitude.

Quatre espèces de chauves-souris ont été collectées dans la Réserve Naturelle Intégrale d'Andohahela: *Rousettus madagascariensis, Miniopterus manavi, Mormopterus jugularis*, et *Myotis goudoti*. A l'exception du *Mormopterus*, on les a toutes prises dans les zones de forêts humides de la réserve (Parcelle 1), et le *Mormopterus* a été attrapé par filet dans une zone de végétation broussailleuse et épineuse (Parcelle 2). Les espèces de forêt humide sont largement eparpillées à travers l'île aussi bien dans la région boisée et dans la région perturbé. Une analyse effectuée sur les chauves-souris demeurant dans la forêt, connue dans plusieurs sites de forêt humide à l'Est a indiqué que la richesse des espèces sont faible et qu'il y a presque aucun changement au niveau de cette communauté a travers la région qui couvre presque 12° de latitude.

Goodman, S. M., A. Andrianarimisa, L. E. Olson and V. Soarimalala (1996). Patterns of elevational distribution of birds and small mammals in the humid forests of Montagne d'Ambre, Madagascar.

Les résultats obtenus le long d'un transect altitudinal réalisé sur les versants de la Montagne d'Ambre, dont le sommet culmine à 1475 m, localisée dans l'excrême nord de Madagascar sont ici presentés. La forêt est de type humide sempervirent au-dessus de 600 m d'altitude et est de type transitionnel ou de type sec caducifolié au dessous de 600 m. Les insectivores, les rongeurs et les oiseaux ont fait l'objet d'une étude au niveau de trois paliers altitudinaux localisés à 340 m, 1000 m et 1340 m sur le versant nord est du massif. Les mammifères et les oiseaux présentent une diversité spécifique relativement faible comparée à celle constatée 2e au niveau d'autres sites forestiers humides de Madagascar. Plusieurs éventuelles raisons sont évoquées pour expliquer ces différences. La forêt humide sempervirente de la Montagne d'Ambre, qui se développe sur un substrat géologique récent, est actuellement isolée d'autres blocs forestiers du même type localisés au sud de ce dernier. Au cours du Pleistocene Ancien et de l'Holocene, le massif de la Montagne d'Ambre était connecté à d'autres blocs de forêt localisés au sud de ce dernier par l'intermédiaire de corridors forestiers. A la suite de changements climatiques, les zones forestières de basse altitude de cette région ont considerablement évoluées. Aujourd'hui, les forêts de basse altitude du versant sous le vent sont des forêts de transition entre la forêt pluviale sempervirente et la forêt sèche caducifoliée. De plus des éruptions volcaniques intervenues au Quaternaire ont probablement considérablement affectées l'habitat naturel de la zone sommitale du massif de la Montagne d'Ambre. Enfin, *Rattus rattus* a colonisé en masse la forêt humide sempervirente, et a travers la competition qu'elle a établie, ou de par un processus direct de prédation, cette espèce pourrait eêre responsable de la disparition de certains éléments de la faune locale.

Results are presented of an elevational transect of the slopes of Montagne d'Ambre (summit at 1475 m), extreme northern Madagascar. The forest is classified as humid on the higher slopes above about 600 m and as transitional or dry deciduous below 600 m. Insectivores, rodents, and birds were surveyed at three sites (340, 1000, and 1350 m) along the northeastern slope. Mammals and birds had relatively low species richness when compared to other humid forest sites on Madagascar. Several possible reasons are presented for these differences. The humid forests on Montagne d'Ambre, a geologically recent formation, are currently isolated from similar habitats to the south. During the Late Pleistocene and Holocene Montagne d'Ambre was connected to areas further south by corridors of humid forest. As a result of climatic shifts there has been a drastic change in the lowland habitats of this region. The remaining lowland forests on the moist side of the mountain are transitional between dry deciduous and humid forest. Further Quaternary volcanic eruptions may have greatly altered the habitat on the upper portion of the mountain. Finally, *Rattus rattus* has colonized the humid forest en masse and through competitive exclusion or direct predation may be displacing some of the native fauna.

Goodman, S. M., G. K. Creighton and C. Raxworthy (1991). The food habits of the Madagascar Long-eared Owl *Asio madagascariensis* in southeastern Madagascar.

A collection of regurgitated pellets and food remains was found below an occupied roost of the Madagascar Long-eared Owl *Asio madagascariensis* in southeastern Madagascar. The owls are taking a wide variety of prey including insects, frogs (*Boophis*), geckos (*Uroplatus*), birds (*Eurystomus, Hypsipetes*), bats (large *Hipposideros*), rodents (*Eliurus* spp., *Rattus*), and lemurs (*Microcebus*). This is the first quantitative information on the food habits of this owl species.

Goodwin, G. G. (1953). Catalogue of type specimens of recent mammals in the American Museum of Natural History.

This is the first attempt to bring together and publish a catalogue of the type mammal specimens in the American Museum of Natural History.

The types, with the exception of those in the Archbold Collections, are kept in special locked storage cases in the Department of Mammals and are marked with red labels.

The present list records all the type specimens of recent mammals up to December 31, 1952, a total of 944, in the Museum collections. The skins of many of the earlier types have been made over or are in the process of renovation.

In the list of type specimens the order of arrangement follows the principles of classification of mammals by George G. Simpson (1945).

The species and subspecies are arranged in taxonomic order based on published records and on an examination of the specimens.

The name of each genus, species, and subspecies is recorded as in the original description, followed by a reference to the place and date of publication. A later name is preceded by an equals sign, followed by a citation of the authority for its use. Where the original name appears to be outdated but not so recorded in the literature, a more recent name is substituted, followed by comments on its use.

Where generic and specific names have been changed but not recorded for the particular species and subspecies listed here, a later name is added in brackets.

An author's name is placed in parentheses when the generic name that was used in the original description has been changed. A dagger, placed before the name, indicates that the type is fossil.

Citations are followed by the American Museum of Natural History catalogue number; the nature of the specimen, whether it is skin, skull, skin and skull, or preserved in alcohol (omission of mention of skin or skull indicates that it did not reach the museum); sex and age (omission of sex indicates that it is not definitely known); locality where taken; date when caught; name of collector; the original or field number; and condition of the specimen. Measurements are given as a means of identification. Where possible the field measurements of the skin are given. The three principal dimensions of the skull given have been checked and obvious errors corrected.

The type specimens are reserved for the use of qualified scientists at the Museum and are not permitted out on loan.

Granvik, H. (1924). On mammals from the eastern slopes of Mount Elgon, Kenya Colony. Mammals collected by the Swedish Mount Elgon Expedition 1920.

During the stay of the Swedish Mount Elgon Expedition 1920 on and around the giant extinct volcano Elgon in Kenya Colony a collection of mammals was made, but as most of the time was devoted to

studying and collecting birds, we did not succeed in getting such a good picture of the mammal life as that of the bird life.

The greater part of the large mammals was shot by the leader of the expedition. Director S. A. Loven, Stockholm, who also contributed a lot of the smaller mammals. The natives around Elgon - as in other parts of the country - were very interested in our doings and arrived sometimes with Rodents and other small creatures, taken in their own traps.

I should here have given a short description of the nature and the different geographical zones of Mount Elgon but as I have already written about these matters in my work on the bird life, I refer to that paper.

I take this opportunity of expressing my grateful thanks to Professor P. Matschie, Berlin, who saved me much time and trouble when I worked at the Museum in Berlin by giving me good advice and who always helped me in so many ways. - I am also much indebted to Mr. J. Hinton - keeper of the Mammal room at the British Museum, London - for all his kindness and assistance. - For valuable hints and help during my stay at the British Museum I also wish to thank Mr. J. G. Dollman and Mr Kershaw.

From the Royal Physiographical Society at the University of Lund I have twice received pecuniary assistance for my studies at the Museums in foreign countries, and it is an exceedingly pleasant duty for me to acknowledge here my very deepest gratitude.

To my respected teacher, Professor H. Wallengren, who kindly allowed me to use a room for my work at the Zoological Institute and who always followed my work with interest, I wish to offer my most sincere thanks.

For valuable assistance in translating this work into English I beg to thank my friend Mr. Owen Morton, Malmo.

Gray, J. E. (1825a). XIII. A list of the species of Vespertilionidæ found in Great Britain.

Merret in his *Pinax* led the way to the study of the animals of a peculiar country; and Linnæus in his *Fauna Suecica* following up the subject, shewed the manner in which it ought to be treated. But this kind of study, which since the time of the latter great naturalist, has become so fashionable, is now fortunately on the decline, and is giving way to the study of natural groups, or the monography of particular genera; a mode of illustration which is much better adapted to the improvement of science. But yet as it is certainly both interesting and useful to the student, to be acquainted with what are the native inhabitants of his own country, especially when that country is such an insulated place as Great Britain; and as I consider that a list of the Species of a group from a systematic author, with a few of the principal Synonyma is as useful for that purpose as a more enlarged description; I have drawn up such a list of the Species of Bats found in this country, which are preserved in the British Museum, with an account of their habitation when they appeared local.

Gray, J. E. (1839). I. Descriptions of some mammalia discovered in Cuba by W.S. MacLeay, Esq. With some account of their habits, extracted from Mr. MacLeay's notes.

The small collection of Mammalia made by Mr. MacLeay during his stay in Cuba consisted of the following species of Cheiroptera, and a foetal specimen of a Dolphin (*Delphinus*), which I have not been able to determine on account of its youth.

The bats, besides adding to our knowledge, are very interesting forms, and several hitherto unrecorded species are particularly interesting, as enabling me to locate with certainty, according to my present views, the genus *Mormoops* of Dr. Leach, of which only a single dried specimen was before known, and which had always been placed among the anomalous genera of this interesting family. It is curious, as regards the geographical distribution of these animals, which have usually been considered very local, that out of this small collection of eight species five should prove to be new to science and one of them an entirely new form, and that the other three should be common to Cuba and Jamaica.

Gray, J. E. (1866b). A revision of the genera of Rhinolophidae, or Horseshoe Bats.

At the preceding Meeting I gave an account of the genera of *Pteropidæ*. I have lately been revising my former manuscript on the Horseshoe Bats, and adding descriptions of the specimens which have been received at the British Museum since it was composed.

The family *Rhinolophidæ* is characterized as containing Leaf-nosed Bats, which have only rudimentary intermaxillary bones, suspended in the nasal cartilages. They sometimes have upper cutting-teeth; but these are generally early deciduous. The hinder, erect portion of the nose-leaf is often complicated and divided by septa into cells.

Green, A. A. (1983). Rodents and bats of Arli and Pendjari national parks, Upper Volta and Benin.

The small mammals have often been ignored in the early stages of national park development in West African national parks. Nevertheless, they play important, roles in the savanna ecology. The first step to remedy this situation of ignorance is to determine what species are present and what are their distributions. This can be done by collecting.

I came to Upper Volta in November 1971 as an American Peace Corps Volunteer to perform a game census of larger mammals for the forestry service. I lived at Arli Village at the edge of Arli Park throughout the year, remaining there until June 1975. In addition to game censusing, I performed an ecological survey of Arli Park. The data were later used by an FAO (United Nations) project for park development.

In late 1974 an FAO project for park development and wildlife management was begun for Pendjari Park in Benin. I worked in this project from September 1976 through December 1979, living in a camp on the Pendjari River at Mare (lake) Diwouni, 30 kilometres from Arli village in Upper Volta. I was a Smithsonian Institution-Peace Corps Volunteer serving as ecologist with the FAO project team. Although I did reconnaissance surveys elsewhere in Benin, my principal concern was with Pendjari Park.

Because of limited time and resources, I seldom collected small mammals far from either Arli village or my camp at Mare Diwouni. The lists themselves are quite incomplete, and data on migration (in the cases of bats), distribution and habitat preference are limited. Nevertheless, I hope these short lists may be of help to later researchers in the region and be of general interest to those who may visit these parks.

Griffin, D. R., A. Novick and M. Kornfield (1958). The sensitivity of echolocation in the fruit bat, *Rousettus*.

1. The ability of a single specimen of the fruit bat, *Rousettus aegypticus*, to avoid test obstacles of various sizes by echolocation in total darkness was tested. This bat avoided vertically placed 3-mm. metallic wires 85 % of the time. Its success declined gradually as the wires were reduced in size but the bat displayed considerable success (68 % misses) against 1.07-mm. wire and did significantly better than chance (45 % misses) against wires 0.46 mm. in diameter.

2. These results have been compared with those of Curtis (1952) who studied the vespertilionid, *Myotis l. lucifugus*.

3. *Rousettus*' success at echolocation was considerably reduced when it was forced to fly in a field of intense thermal noise.

Griffin, M. (1999). Checklist and provisional national conservation status of Amphibians, Reptiles and Mammals known or expected to occur in Namibia (9th revision).

Included are species which have not yet been recorded (or confirmed) from Namibia but which can reasonably be expected to occur. In these cases, the area where the species is expected is given in brackets before the predicted Conservation Status (except marine forms). Two noteworthy regions are the areas adjacent to the Orange and Zambezi rivers; numerous species are known from the southern and eastern banks respectively, but not a short distance across on the Namibian side. These rivers will ultimately present no barrier to such mobile species as bats and antelope, but may effectively limit more sedentary species. In general though, rivers are ineffective barriers and many of these anomalies are due to a lack of collecting on the Namibian side rather than the species' absence. Questionable species (taxonomic or occurrence) have been included rather than left out. Other unlisted species, fossorial reptiles in particular, will undoubtedly be found to occur. This is especially likely in the north and northeast part of the country. Species which have been historically recorded from Namibia but not confirmed, are also listed.

Assigning common names to many species is problematic; most of the smaller mammals and practically all reptiles and amphibians are not commonly recognized by the layman and so do not have traditional names. Thus, when common names are available they tend to be derived. When common names are available and seem appropriate, they are included in the list, and several previously used names were altered to better suit the local situation.

The conservation-status rankings given in this list refer to Namibia only, and are entirely provisional. THESE RANKINGS SHOULD NOT BE QUOTED OR PUBLISHED BEFORE CHECKING WITH THE AUTHOR.

Griffin, M. and H. J. W. Grobler (1991). Wetland-associated mammals of Namibia - a national review.

Namibia is primarily an arid country (estimated 3 % wetlands) and the majority of its mammal fauna is also arid-adapted. Thirty-eight species (20 %) are dependent on free water and/or associated wetland habitats to the extent that their distributions in Namibia may be effected by this dependence. Half of these species are only dependent on drinking water, thus 19 species or 10 % of Namibian mammals are dependent on wetland habitats. The highest species diversity of wetland-dependent mammals is in the Kavango-Caprivi area, where 92 % of Namibian wetland-associated species occur to some extent, and 40 % occur nowhere else in Namibia.

There is a general paucity of information on the smaller mammals. However, there is presently no evidence that they suffer from any conservation problems, other than general reductions in critical habitat. The hippopotamus has suffered major range reductions; it is extinct in the Orange, and nearly so in the Cunene River. Of Namibian wetlands, the Kavango River and associated riparian growth has been effected most. Only about 35 km of the original 400 km has not been heavily altered by an ever-encroaching human population. Human pressure is the critical factor throughout the Kavango-Caprivi region and this can be expected to increase in the future, with a subsequent increase in conservation problems for the six local wetland habitat-dependent antelope species. Waterbuck and puku numbers are already down to critical levels. A high proportion of Namibian wetland habitat-dependent mammals are of national conservation concern. This is because these species suffer from both direct exploitation and habitat-altering human practices. However, as Namibia is an end user of these major river systems, the major effort in the future will have to be split between preserving the species and critical habitats that still remain in Namibia and, through neighbourly cooperation, assuring the quantity and quality of these waters at their sources.

Griffiths, T. A. (1994). Phylogenetic systematics of Slit-faced bats (Chiroptera, Nycteridae), based on hyoid and other morphology.

The hyoid musculature and hyoid apparatus of bats of the family Nycteridae are described and compared with the hyoid morphology of other bat families described elsewhere. Four hyoid and four nonhyoid apomorphic character states are described within the family. All nycterids share the apomorphic hollowing ofthe rostrum into a basin, covered by a dermal vertical slit ornamented with the distinctive nycterid "noseleaf." All nycterids also possess a distinctive T-shaped terminal caudal vertebra. All nycterids except *N. arge* share a reduced ceratohyoid insertion and a reduced hyoglossus origin. All nycterids except *N. tragata* and *N. arge* share an epihyal that is reduced in length, a smaller lower second premolar, and a loss of the posterior tragus constriction. A cladistic analysis of the data suggests that the African *hispida, macrotis*, and *thebaica* groups form a clade. The Asian bats of the *javanica* group are a sister group to the *hispida-macrotis-thebaica* clade. Bats of the African *arge* group are the most basal lineage within the Nycteridae. This analysis supports separating the more primitive nycterids into an *arge* group and a *javanica* group rather than combining them in a single group.

Griffiths, T. A. (1997). Phylogenetic position of the bat *Nycteris javanica* (Chiroptera: Nycteridae).

Eleven of the thirteen species of bats within the family Nycteridae are African and two are Southeast Asian in distribution. Dissection of the hyoid apparatus and musculature of the Southeast Asian bat *Nycteris javanica* and analysis of other non-hyoid morphology reveal that it shares five derived morphological characters with the previously described species *N. tragata*, also from southeastern Asia. In particular, the two Asian species share a morphologically distinctive post-laryngeal chamber that is different in shape from that of other nycterids. Cladistic analysis suggests that *N. javanica* and *N. tragata* are more closely related to each other than either is to any African species of nycterid.

Griffiths, T. A., K. F. Koopman and A. Starrett (1991). The systematic relationship of *Emballonura nigrescens* to other species of *Emballonura* and to *Coleura* (Chiroptera: Emballonuridae).

Dissection of the hyoid musculature and examination of ear, penial, and skull morphology of eight species of *Emballonura* and one species of *Coleura* reveal that, with the exception of *Emballonura nigrescens*, all species share a derived character of the hyoid region. The stemohyoid muscle in all species except *nigrescens* is deflected dorsally and laterally by a prominent postlaryngeal tracheal expansion. Additionally, *E. nigrescens* is clearly derived in having a distinctive penis, in contrast with other species of *Emballonura* as well as *Coleura*. These observations strongly suggest that non-*nigrescens* species of *Emballonura* are more closely related to species of *Coleura* than either is to *Emballonura nigrescens*. We conclude therefore that the available generic name *Mosia* Gray, 1843, should be used for the species currently called *Emballonura nigrescens*. We continue to recognize *Coleura* as a valid third genus.

Griffiths, T. A. and A. L. Smith (1991). Systematics of Emballonuroid bats (Chiroptera: Emballonuridae and Rhinopomatidae) based on hyoid morphology.

The hyoid musculature and hyoid apparatus of bats of the families Emballonuridae and Rhinopomatidae are described and compared with the hyoid morphology of selected specimens of bats of the families Nycteridae, Megadermatidae, and Rhinolophidae. The hyoid region of rhinopomatids is slightly modified, and the hyoid region of emballonurids is markedly modified from the primitive chiropteran hyoid morphology. In both families (and in nycterids and megadermatids), the omohyoid has shifted its origin medially from the scapula to the mid-clavicle. This permits the omohyoid to act as a primary tongue retractor, relieving the sternohyoid of this function. In rhinopomatids, the sternohyoid has been reduced to a weak, narrow muscle. In emballonurids, the sternohyoid has remained robust, but has developed a unique attachment to the posterior larynx. It appears to function

in emballonurids as an extrinsic laryngeal muscle. A cladistic analysis of the hyoid data reveals two major clades within the Emballonuridae: the first contains *Taphozous* and *Saccolaimus* and the second contains *Emballonura, Mosia, Coleura*, and all New World genera. Within the latter clade, the genera *Emballonura, Mosia*, and *Coleura* compose a clade distinct from the New World genera. Within the New World clade there are two major lines: a line leading to *Rhynchonycteris* and *Diclidurus*, and a line leading to *Balantiopteryx, Saccopteryx, Cormura, Peropteryx*, and *Peronymus*. The phylogeny presented here agrees well with a recently published emballonurid phylogeny produced from karyotypic and electrophoretic/immunological data.

Griffiths, T. A., A. Truckenbrod and P. J. Sponholtz (1992). Systematics of Megadermatid bats (Chiroptera, Megadermatidae), based on hyoid morphology.

The hyoid musculature and hyoid apparatus of bats of the family Megadermatidae are described and compared with the hyoid morphology of bat families described elsewhere. Megadermatids share an apomorphic character state with nycterids, rhinopomatids, and emballonurids in that the omohyoid muscle has shifted its origin from the scapula to the mid-clavicle. We suggest that because of the omohyoid shift, megadermatids have been able to develop a morphological condition described previously only in New World phyllostomid bats. The sternohyoid, hyoglossus, and geniohyoid muscles have partially detached from the basihyal, retaining a connection only through a tendon and a few deep fibers of the geniohyoid. The styloglossus muscle has a posteriorly shifted insertion, as in phyllostomids. Within the Megadermatidae, there is morphological variation in the origin of the sternothyroid, hyoglossus, and sphincter colli profundus muscles, in the morphology of the styloglossus, and in the insertion of the geniohyoid and ceratohyoid muscles. A cladistic analysis ofthe data suggests that *Lavia frons* is closely related to *Megaderma spasma* and *M. lyra*. *Cardioderma cor* is a sister species to the *Lavia-Megaderma* group. *Macroderma gigas* is the most distantly related of the four megadermatid genera.

Grimshaw, J. M., N. J. Cordeiro and C. A. H. Foley (1995). The mammals of Kilimanjaro.

This paper presents an up to date account of 154 mammal species recorded on Mount Kilimanjaro, Tanzania, and the surrounding area, from 1883 to the present, when 128 species are known to occur. Old records are reviewed and several new records added, while four recorded species have been excluded. One species, the black rhinoceros, is reported to have become extinct; another, the klipspringer, does not now occur in the area. Evidence for its alleged former presence and extinction is assessed. Red deer, introduced to Kilimanjaro during the German colonial period, is now extinct on the mountain. Other reported extinctions and colonisations of mammal species on Kilimanjaro are discussed and 19 marginal species or taxa for which further information is needed are mentioned for completeness.

Grubb, P. (1971). Further records of mammals from Ghana, based on the collections of Angus Booth.

There is still a great shortage of information on the Ghanaian mammal fauna. Several collections of specimens from Ghana remain inadequately reported, the last to receive full notice being that resulting from the LOWE-WALDRON expedition (HAYMAN, 1935). The faunal list for the country remains incomplete. Distributional data from Ghana have not been adequately collated though they could contribute to an understanding of fauna! changes across the stratified West African vegetation zones. The present paper provides further locality records and draws attention to the collection made by Angus BOOTH which might otherwise be neglected. BOOTH died before being able to report fully on the results of his efforts. It is especially unfortunate that his field notes are not available. Most of his primate specimens are now in the British Museum (Natural History), London. A few rodents and bats were also sent there for identification and are referred to incidentally by ROSEVEAR (1965, 1969). The rest of the collection is in the Department of Zoology, University of Ghana. Over 530 specimens can now be traced, and they are listed below, but some others have been mislaid.

As far as possible I have employed the scientific names accepted in the Smithsonian Institution's Preliminary Identification Manual for African mammals (MEESTER, 1966-1968). Reference should be made to ALLEN (1939) for nomenclatural history. No attempt has been made to discuss infraspecific categories, except in the case of tree squirrels. Geographical coordinates have been taken from the Official Standard Names Gazeteer for Ghana (U.S. Board on geographic names, 1967).

Grubb, P. (1978). Patterns of speciation in African mammals.

The distribution and speciation of African mammals can be interpreted in terms of both isolation and dispersal associated with Quaternary climatic and vegetational changes. Patterns of faunal diversity and endemism suggest the former existence of refugia in Forest Regions and dispersal between these Regions. Isolation has also been significant in savanna, but dispersal patterns are less easily assessed here. In certain superspecies, the directions involved in dispersals can be ascertained from the distribution of primitive and derivative character states, which in turn imply the cotemporal existence of ancestral and descendant taxa. Long term "ecological translation" in speciation appears to have occurred down the faunal diversity gradient, especially across the forest-savanna boundary, but also from savanna to arid zones. Different mammalian taxa have speciated in different ways and there are other impediments to the reconstruction of speciation patterns.

Grubb, P. (1983). The biogeographic significance of forest mammals in eastern Africa.

A distinctive mammalian forest fauna occurs in Africa east of the Great Lakes and the Kenya Rift Valley. The distribution of species which are confined to this area defines an Eastern Forest faunal Region. The fauna is characterised by a low species diversity, the absence of many otherwise widespread forest species, and a high proportion of endemic taxa yet it has a close phyletic relationship with the Central Forest fauna. Species confined to montane habitam often have very restricted distributions in the Region, where there are several centres of endemism. Evolution of the fauna has involved shifts in habitat tolerance; successional and centrifugal dispersal along mountain chains and bands of coastal forest; and isolation of populations in forest refuges,

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Grünmeier, R. (1993). Bestäubung der Fabaceae *Mucuna flagellipes* durch Flughunde in Kamerun.

The Pantropical genus *Mucuna* exhibits both bird- and bat-pollinated representatives in America, S.-E. Asia and Africa. Detailed studies of the African species *M. flagellipes* have been lacking up to now. The observations were carried out during the rainy season in the equatorial lowland rain forest of Cameroon. Two bat species (Megachiroptera) were found to pollinate this liana: *Myonycteris torquata* and the Long-tongued Fruit Bat *Megaloglossus woermanni* (Macroglossinae). In addition to the phenology and pollination ecology of the flowers information is given about the flying periodicity and diet of these bats. Pollen samples from the fur, alimentary canal and faeces were examined. These papilionaceous blossoms are highly adapted bat-flowers; sunbirds or insects are not able to pollinate them. The pollination mode of this African liana appears rather similar to that of other chiropterophilous *Mucuna* species in the Palaeotropics, but differs - at least to some extent - from that of Neotropical *Mucuna* visited by tiny glossophagine bats (Microchiroptera).

Die pantropische Gattung *Mucuna* hat sowohl vogel- als aus fledermausblütige Vertreter in Amerika, Südostasien und Africa hervorgebracht. Von der afrikanischen M. flagellipes haben bisher keine detaillierten Felduntersuchungen vorgelegen. die vorliegende Arbeit berichtet über die Bestäubungsverhältnisse dieser Plfanzenart aus dem äquatorialen Tieflandregenwald von Kamerun. Zwei Flughundarten (Megachiroptera) wurden als Bestäuber dieser Liane identifiziert: *Myonycteris torquata* und der Langzungenflughund *Megaloglossus woermanni* (Macroglossinae). Neben der Phänologie und Bestäubungökologie der Blüten werden Mitteilungen gemacht zur Flugperiodik und

Ernährungweise der Flughunde. Pollenproben aus dem Fell, Verdauungskanal und Kot der Flughunde wurden analysiert. Diese Schmetterlingsblüten sind hochangepasste Fledermausblumen, Nektarvögel oder Insekten vermögen sie nicht zu bestäuben. Die Bestäubungsverhältnisse an dieser afrikanischen Liane ähneln denen anderer chiropterophiler *Mucuna*-Arten der Palaeotropis, sie unterscheiden sich jedoch - zumindest teilweise - von denen neotropischer Mucunen, die von kleinen Glossophaginen (Microchiroptera- besucht werden.

Grünmeier, R. (1996). Flower-visiting bats and their role as pollinators in the African Rain Forest. Abstract.

The pollination of flowers by bats (chiropterophily) is widely spread in the tropics and subtropics of both hemispheres. In contrast to America and Asia, few field observations have been carried out in Africa.

Own studies of the biology and pollination ecology of rain forest trees and lianas are presented from Cameroon. Their flowers - variable in morphology and blooming strategy - are characterized by a typical feature syndrome attractive to bats. Several fruit bat species (Pteropodidae) are found to pollinate them. The bats differ profoundly in their ability to utilize these flowers (e.g. in terms of their activity and behaviour in the trees, at the flowers, and in their diet), including large and middle-sized species of the genus *Eidolon, Rousettus* and *Micropteropus*, which have more or less frugivorous feeding habits, as well as the tiny long-tongued *Megaloglossus woermanni*, the only highly specialized flower-bat in Africa, but still poorly known.

Gustafson, Y. and H.-U. Schnitzler (1979). Echolocation and obstacle avoidance in the Hipposiderid bat *Asellia tridens*.

The echolocation sounds of the hipposiderid bat *Asellia tridens* consist of a constant frequency (cf) component followed by a frequency modulated (fm) terminal downward sweep of 19-21 kHz. The cf-part constitutes about 7/10 of the entire signal. In individual roosting animals the frequencies of the cf-part of consecutive sounds (resting frequency) is kept very constant but varies from bat to bat. In 18 *Asellia tridens* resting frequencies between
111 - 124 kHz have been measured.

The sound duration in roosting and free flying bats is between 7 - 10 ms. In the approach and terminal phase of bats landing on a perch or flying through obstacles, the sound duration is reduced and the repetition rate increased the nearer the bat approaches the target. At the end of the terminal phase sound durations of a minimum of 3 ms have been measured.

Flying bats lower their emission frequency in order to compensate for Doppler shifts caused by the flight movement. The echofrequency is therefore kept constant about 150 - 200 Hz above the resting frequency.

In flights through obstacles consisting of vertically stretched wires with different diameters, the bats were able to avoid wires down to a diameter of 0.065 mm whereas at 0.05 mm the percentage of flights without collisions is far below the chance level. The results demonstrate that the echolocation behavior of the hipposiderid bat *Asellia tridens* does not differ fundamentally from that of rhinolophid bats. As a result, a new suggestion for categorization of bats producing cf-fm orientation sounds is put forward.

Gyldenstolpe, N. (1928). Zoological results of the Swedish Expedition to Central Africa 1921. Vertebrata. 5. Mammals from the Birunga Volcanoes, north of Lake Kivu.

The following paper contains an account of the Mammals collected by the Swedish Zoological Expedition among the different mountains of the Birunga Range. At least as far as I know, no comprehensive work has ever been published about the Mammalian Fauna of this most interesting region in the heart of Central Africa, and the following notes may therefore give some idea about the

Mammals of the Range. In all we spent a little more than two months among these beautiful mountains and during the whole time we collected assiduously.

Although we made our camps at several places and at different altitudes it is, however, most certain that a few more species than those, obtained, or observed by us still remain to be discovered. But on the whole I believe, that our collection of Mammals is fairly complete and representative of the Range. A noteworthy fact was, however, the almost total absence of *Chiroptera*. A single specimen of a small Bat was seen circling in the air near our highest camp on the saddle between Mikeno and Karissimbi, but- unfortunately we -did not succeed in obtaining it. Some small caves were also explored, but no signs of Bats were found in them.

The maiority of the species enumerated below were collected on the different mountain peaks, but a few specimens from the lava plains surrounding the actual Volcanoes are also included in the list. In my previous paper on the Birds obtained by the Expedition (Kungl. Sv. Vet. Akad. Handl., Bd. 1, No. 3, 3rd. series, 1924) I have already given some notes about the physical features and the vegetation of these Volcanoes accompanied by a sketch-map of the region in question.

In the Appendix a nominal list of the Mammals collected by the Expedition in the Western parts of Uganda and in Eastern Belgian Congo is published.

Habersetzer, J. (1981). Adaptive echolocation sounds in the bat *Rhinopoma hardwickei*.

1. *Rhinopoma hardwickei* were studied under natural conditions in the Madurai region of southern India.
2. Frequency modulated (FM) sounds of 3 ms duration were emitted shortly before landing and during times when 10 - 70 individuals were flying in clusters as they left their roosts.
3. Constant frequency (CF) sounds of 48 ms duration were produced in open space by single flying bats and by bats flying in a group. At these times the most intense component was the second harmonic.
4. When bats flew in a group the frequencies of the CF-sounds emitted by different individuals were in three different bands (30.0, 32.5, and 35.0 kHz) whereas single flying bats used only 32.5 kHz. Evidence is presented that shows that *Rhinopoma hardwickei* flying in groups regulate the frequency of their individual CF-components and in this way they avoid jamming one another.
5. After landing a pure tone multi-harmonic sound of long duration (maximally 100ms) is emitted. In this sound the fundamental frequency is dominant. Its significance, either communicative and/or echolocative, is not clear.
6. The possible role of different types of sounds recorded in different orientation situations is discussed.

Haffner, M. and V. Ziswiler (1989). Tasthaare als diagnostisches Merkmal bei mitteleuropäischen Vespertilionidae (Mammalia, Chiroptera).

Vibrissae as a taxonomie character in palaeartic Vespertilionidae (Mammalia, Chiroptera).

The arrangement and number of facial vibrissae were investigated for several species of vespertilionid bats. Although bats have a small number of vibrissae, a determination key could be obtained. While some genera and species can be separated macroscopically by the arrangement and number of long vibrissae, the identification of others is based on histological investigations to distinguish the short vibrissae from adjacent facial hairs.

In addition to the taxonomic relevance of the vibrissae, phylogenetic conclusions
could be drawn. The arrangement and number of vibrissae in *Pipistrellus savii* support the hypothesis of Horacek & Hanak (1986) of combining this species with other species of the genus *Pipistrellus* that have characters in common with *Eptesicus* in a new genus *Hypsugo*. The fact that the examined vespertilionid bats have less vibrissae in comparison with their phylogenetic related Insectivora can be explained as an adaptation to flight ability and echolocation.

Die Frage, ob Tasthaare in der Säugetiertaxonomie als diagnostisches Merkmal verwendet werden können, wurde in der Literatur nur selten aufgegriffen. Vor allem bei der Identifikation von Jungtieren, die noch nicht auf Grund von Zahnmerkmalen und Körpermassen determiniert werden können, wäre es wünschenswert, wenn man auf andere Merkmale zurückgreifen könnte. Tasthaare würden sich dazu eignen, da sie zu den prominenten und in der Ontogenese zu den sich früh entwickelnden Haaren gehören.

Anhand von grobmorphologischen und histologischen Untersuchungen der Kopfhaut von Glattnasenfledermäusen (Vespertilionidae) bestimmten wir die Anordnung und Anzahl der Tasthaare bei 134 Individuen aus 15 Arten und 6 Gattungen. Obwohl diese Fledermausarten eine geringe Anzahl Tasthaare und Tasthaargruppen aufweisen, konnte ein Bestimmungsschlüssel erstellt werden. Während sich einzelne Gattungen anhand von langen Tasthaaren bereits makroskopisch voneinander unterscheiden lassen, sind vor allem auf Artniveau histologische Untersuchungen nötig, um die kurzen Tasthaare von normalen Gesichtshaaren zu unterscheiden.

Zusätzlich zur taxonomischen Relevanz der untersuchten Tasthaare können auf Grund der erfassten Verhältnisse auch phylogenetische Schlüsse gezogen werden. So unterstützen Anordnung und Anzahl der Tasthaare bei *Pipistrellus savii* das Postulat von Horacek & Hanak (1986), die Art zusammen mit anderen Pipistrellusarten, die Affinitäten zur Gattung *Eptesicus* aufweisen, in einer neuen Gattung Hypsugo zu vereinigen.

Die bei den untersuchten Fledermausarten im Vergleich zu den phylogenetisch nahestehenden Insektivoren geringe Anzahl Tasthaare kann als Anpassung an die Flugfähigkeit und die Echoorientierung angesehen werden.

Haiduk, M. W., R. J. Baker, L. W. Robbins and D. A. Schlitter (1981). Chromosomal evolution in African Megachiroptera: G- and C-band assessment of the magnitude of change in similar standard karyotypes.

Differential staining (G- and C-banding) is used to assess magnitude of chromosomal variation in eight species of African megachiropterans. These data are compared with those suggested by standard karyotypic studies, and it is concluded that in this example standard methods underestimate chromosomal variation by a factor greater than 4.5. The implication of these data is that models constructed from patterns of chromosomal evolution in standard karyotypes need to be evaluated in light of in-depth studies based on G- and C-bands.

Haiduk, M. W., L. W. Robbins, R. L. Robbins and D. A. Schlitter (1980). Karyotypic studies of seven species of African Megachiropterans (Mammalia: Pteropodidae).

Karyotypes of seven species of megachiropterans from Africa are described. *Epomops franqueti, Hypsignathus monstrosus, Lissonycteris angolensis*, and *Myonycteris torquata* have a 2n = 36 and karyotypes that are similar to each other in morphology. *Micropteropus pusillus* (2n = 35) is similar to the above four, but possesses what appears to be an X/Y,Y2 sex-determining system. *Scotonycteris ophiodon* (2n = 34, FN = 62) and *Megaloglossus woermanni* (2n = 34, FN = 62) are respectively distinctive from the other taxa studied, but may share several chromosomal characteristics with the other species.

Haiduk, M. W., L. W. Robbins and D. A. Schlitter (1983). Chromosomal banding studies and their systematic implications in African fruit bats (Chiroptera: Pteropodidae).

The bat family Pteropodidae is a diverse assemblage of approximately 150 species (Koopman & Jones, 1970). While much is known about morphological characteristics of taxa within this family, other characters of these organisms with potential systematic and evolutionary use have not been extensively explored. One such aspect is the study of the chromosomes, particularly the use of

differential staining techniques, and the application of these data to resolve systematic and evolutionary questions. Studies utilizing non-differentially stained chromosomes have yielded data for 26 species of Pteropodids (see Haiduk et al., 1980), but only one study (Haiduk et al., 1981) has incorporated differentially stained material. On the basis of data from nondifferentially stained chromosomes, the megachiropterans are relatively conservative with most species possessing the same or similar diploid and fundamental numbers (Haiduk et al., 1980). G- and C-band data, however, have demonstrated that complex chromosomal differences do exist between several species with very similar standard karyotypes (Haiduk et al., 1981).

In this study, the examination of differentially stained chromosomal material is further pursued. Two species of *Epomophorus* (*wahlbergi* and *minor*) are examined and compared with those species reported previously (Haiduk et al., 1981). These data are then used to construct a cladogram depicting the evolutionary relationships of the taxa examined thus far.

Hammer, M. and R. Arlettaz (1998). A case of snake predation upon bats in northern Morocco: some implications for designing bat grilles.

During a study of North African mouse-eared bats in Morocco in August 1993 (Arlettaz et al., 1997) some accidental observations on chiropterophagy by the snake *Coluber hippocrepis* were made. This adds a new species to the list of bat-eating serpents documented so far (for a general review see Schätti, 1984). In addition, our observations lead to some recommendations for the construction of bat grilles at underground sites to minimize predation risk by snakes or other predators upon bats.

Hanák, V. (1964). Zur Kenntnis der Fledermausfauna Albaniens.

In der Arbeid sind die bisherigen faunistischen Untersuchungen der Fledermäuse Albaniens zusammengefasst. Es wurden 14 Fledermausarten gemeldet, von denen 8 Höhlenbewohner sind. Die Fundstellen der einzelnen Arten sind in einer Verbreitungskarte dargestellt.

Von den höhlenbewohnenden Arten ist in Albanien *Rhinolophus ferrumequinum* die häufigste. Ihre Wochenstuben (100 - 300 Ex.) wurden in 7 Höhlen festgestellt. In grösseren Höhlen würden auch *Miniopterus schreibersi, Rhinolophus euryale* und *Rhinolophus blasii* gefunden, die öfter Mischkolonien bildeten. Regelmässig wurden in den Höhlen auch *Myotis myotis* und *Myotis blythi oxygnathus* wie auch *Myotis capaccinii* und *Myotis emarginatus* gesammelt.

Zu den reichsten Fundorten gehören die Höhle Mezhgoranit bei Tepelene und die Höhle bei Koritë (Cerovoda), wo je 7 Arten gesammelt wurden.

Die übrigen aufgeführten Arten, *Nyctalus noctula, Pipistrellus nathusii, Pipistrellus kuhli, Pipistrellus savii, Plecotus austriacus* und *Eptesicus serotinus* wurden nur gelegentlich in anderen Biotopen erbeutet.

Bei den meisten angeführten Arten wurde auch die Analyse der Körper- und Schädelmasse des albanischen Materials und ein Vergleich mit den Werten einiger Populationen aus anderen Gebieten Süd- und Mitteleuropas durchgeführt mit dem Ziel, ihre subspezifische Stellung zu bestimmen. Die Werte der Körper- und Schädelabmessungen und die Vergleichswerte sind in Tabellen zusammengefasst worden.

Herr Dr. G. H. W. Stein hat diese Arbeit gefällig durchgesehen und namentlich in sprachlichen Hinsicht verbessert, wofür ich Ihm meinen herzlichen Dank ausdrücke.

Hanák, V. (1966). Zur Systematik und Verbreitung der Gattung *Plecotus* Geoffroy, 1818 (Mammalia, Chiroptera).

Die systematisch-zoogeographiche Analyse von 318 Exemplaren von *Plecotus* aus verschiedenen Gebieten von Europa, Asien und Nordafrika ergibt folgende vorläufige Schlüsse:

(1) Das Areal von *Plecotus auritus* und *Plecotus austriacus* in Europa wird genauer umschrieben. Im augedehnten Gebiet von Mittel- West- und Südeuropa leben beide Arten gemeinsam, aber dennoch bleiben sie hypsometrisch und ökologisch gewissermassen getrennt.

(2) Im paläarktischen Raum leben offenbar nur zwei Arten der Gattung *Plecotus*: *Plecotus auritus* LINNÆUS, 1758, mit wahrscheinlich nur 2 Subspezien:

Plecotus auritus auritus LINNÆUS, 1758 im augedehnten Gebiet von Europa, Sibirien und Ost- sowie vielleicht auch nördlichen Teil von Zentralasien.

Plecotus auritus sacrimontis ALLEN, 1908 durch grössere Masse und dunklere Färbung gekennzeichnet, in Japan und vielleicht auch im östlichsten Teil des Festlandes von Asien. Die Populationen aus dem östlichen Teil der UdSSR (nach Westen bis zum Altai) weisen ebenfalls Merkmale dieser Rasse auf.

Plecotus austriacus FISCHER, 1829, umfasst folgende Subspezien:

Plecotus austriacus austriacus FISCHER, 1829, im europäischen Areal und im Kaukasus (*Plecotus austriacus hispanicus* BAUER, 1956 und *Plecotus auatriacus? tenerifæ* BARRETT HAMILTON, 1907 sind offenbar Synonymen).

Plecotus austriacus wardi THOMAS, 1911, naheverwandt mit der Nominatrasse, unterscheidet steh vor allem durch eine lichte Färbung, in den Gebirgs- und Tieflandsgebieten von Mittelasien.

Plecotus austriacus kozlovi BOBRINSKOJ, 1926, als grösste Rasse dieser Art, mit lichter Färbung; in den Wüstengebieten von Zentralasien (Südmongolei, West- und Mittelchina?) Zur Verwandschaft dieser Rasse gehört auch *Plecotus austriacus ariel* THOMAS, 1911, welche bloss durch dunkle Färbung unterschieden ist.

Plecotus austriacus christiei GRAY, 1838 (=*Plecotus austriacus ægyptius* FISCHER, 1829), eine kleine, licht gefärbte Form aus Nordafrika.

Die systematische Stellung der Form *homochrous* HODGSON, 1847 (= *puck* BARRETT-HAMILTON, 1907) bleibt bisher unklar.

Hanák, V. and A. Elgadi (1984). On the bat fauna (Chiroptera) of Libya.

The present paper is based on total of 73 specimens of 9 bat species, collected in Libya during two short-term visits in 1979 and 1980. The sample is completed by a small collection of bats from various museums and by all literary data available from this area. The result of this study confirms the occurrence of 13 species of three families in the studied area. Five species (*R. mehelyi, M. blythi, P. pipistrellus, N. leisleri* and *M. schreibersi*) and one subspecies (*P. a. austriacus*) are reported for the first time from Libya, other findings are additional distributional records. The main external and cranial measurements, ecological comments and a preliminary taxonomical evaluation of the studied material are given. Provisionally zoogeographical analysis shows that the most of hitherto known Libyan bat fauna consist of species of Mediterranean and Palaearctic-arboreal origin.

Happold, D. C. D. (1967). The natural history of Khartoum Province: Mammals.

The mammals of Khartoum Province are less well known than the birds because most of them are nocturnal and rarely seen. But since there are only 30 species (Table 1), it is not difficult to know and recognise them all.

All mammals have hair or fur, are warm blooded, and produce milk to feed their young. The Class Mammalia, which includes all mammals, is divided into 18 Orders, 7 of which are represented in Khartoum Province. These are (1) Insectivora, insect eating mammals, e.g. hedgehogs and shrews; (2) Lagomorpha, the rabbits and hares; (3) Rodentia, one of the largest Orders, including mice, rats, squirrels, jerboas, and porcupines: (4) Chiroptera, the bats which are the only flying mammals; (5) Carnivora, the flesh eating mammals including cats, dogs and foxes, and mongooses; (6) Hyracoidea, the hyraxes or dassies; and (7) Artiodactyla, the even-toed ungulates which includes cows and antelopes.

In Khartoum Province there are two principal habitats: the vegetation and cultivated banks along the Nile where food and water are abundant; and the desert and jebels where trees and grass are rare, and where water is not readily available except after the rains. Mammals can be divided into 'riverain' or 'desert' species; some terrestrial mammals, and the bats, are found in both habitats (Table 2).

The desert is a difficult place to live in, and mammals living there show many interesting adaptations. The rodents spend the daytime in burrows several feet under the surface protected from the high temperatures arid low humidity. In these burrows the climate remains.- almost constant during the day and night. After sunset when the temperature drops, these small mammals emerge and stay above ground until just before sunrise. The desert rodents can exist and flourish without drinking water since they obtain sufficient from their food of seeds and grass, and because they produce only very small quantities of concentrated urine. Since they remain in their burrows during the heat of the day, they do not lose water trying to keep their body temperature constant; in fact these rodents do not possess sweat glands and so they would be unable to lose heat by sweating. Hedgehogs, hares, and the carnivores also have burrows, or remain hidden during the day in the shade of rocks and trees.

The desert appears to be lifeless during the day because it is essential that the mammals, and other animals, do not become overheated. All the special desert adaptations ensure that the heat and water balance of the mammals remains more or less constant. The largest mammal of Khartoum Province, the gazelle, rests in the shade but because of its larger size, special behaviour and physiology, it is able to live in the desert away from water for many days at a time. Species not adapted to desert conditions, e.g. the house mouse, the Nile rat, and the creambellied roof rat, can only live along the Nile banks and in houses.

The number of species, and individuals, of mammals in the desert is small compared with the rainforests and savannah to the south, and the temperate regions to the north. Only certain species are able to live under desert conditions and on the limited amount of food that is available. There is probably never a lack of food for the small rodents since some species store food after the rains, and grass and seeds are blown into holes and crevices where they remain as 'food stores' for many months. But the number of rodents is never large, and the number of predators (foxes, genets, etc.) which feed on them is even smaller.

There are other interesting features, other than physiological ones, shown by mammals in the Province. For example, many of the nocturnal mammals, especially the jerboas, have large eyes. Two groups of mammals, the hedgehogs and the spiny mice, have hairs which are stiffened and modified into spines. The jerboa is an extreme example of a jumping mammal with very long hindlegs and tail, and short forefeet used only for feeding and washing. The hyrax is adapted for life on rocks, and is capable of running up and down almost vertical rock cliffs.

The breeding season of desert mammals is short and well defined. Most species breed during, and just after, the rains from July to November. It is not known whether there are two seasons, one in July and another in October-November. It appears that, that there is a lot of variation from species to species. Rodents found in houses and along the Nile probably breed throughout most of the year.

Khartoum is in a transition zone between the extreme desert to the north and the woodland savannah to the south. There are many species in the northern Sudan, Egypt, and Libya which are not found near Khartoum, and similarly other species abundant in the savannah which are not found as far north as Khartoum. Probably there were more of these 'southern' species until the end of the last century when increased human population and disturbance altered the environment near Khartoum. More recently, the Gezira irrigation scheme acts as a barrier preventing southern species from moving northwards. The Nile acts as a link from Egypt through the northern Sudan, and some species, e.g. the Nile fox, are found along most of its length.

There are few publications on the mammals of the Khartoum region. The most comprehensive work on Sudanese mammals is that of Setzer (1956), but several species are omitted and it is of little use as a field guide. There are several old papers (e.g. Thomas 1901, 1903) recording species collected in various localities. Descriptions of game animals are given by Brocklehurst (1931), and the distribution of ungulates is reviewed by Mackenzie (1954). Other references which are useful are Anderson (1902), Flower (1932), and Owen (1953).

All the species described (Table 1) have been caught or seen during the period 1963-1966, so their presence is definitely confirmed. Other species not seen during 1963-1966 (Table 3) may have disappeared from the Province since the records were made. This is quite possible because of the vegetation changes described above; if these species are still present, they are probably rare. Some records may be incorrect.

The Arabic names for mammals are not. specific and it is impossible to use them to describe a species; e.g. 'abu gunfud' refers to 2 species, 'urn sisi' refers to 5 species, and 'watwat' or 'abul riggi" refers to all the bats. The English names, too, are not always specific, but there is no confusion if the Latin names are used. Latin, English, and Arabic names for all species are included in Table 1.

The knowledge about mammals of Khartoum Province (and the rest of the Sudan) is very limited. The natural history of most species is unknown, and consequently there are many problems to be studied. But first it is essential to know exactly what species are likely to be found. Although this guide does not claim to be comprehensive, the following pages describe the mammals which are likely to be encountered in the Province.

Happold, D. C. D. (1981). Geographical ecology of Nigerian mammals. Abstract.

The mammalian fauna of Nigeria consists of 42 families, 133 genera and 241 species. This diversity is due, in part, to the prominent cline of vegetation, rainfall, temperature and seasonality from south to north. The fauna is composed mostly of widespread West African species, although others reach their eastern, western and southern limits in Nigeria.

The rainforest fauna is the most diverse of all the major biomes despite the relatively small area of rainforest. Species numbers in the different biomes show two distinct patterns: in general, rodents, bats and primates decrease in number from south to north, whereas carnivores and artiodactyls increase in number. When biomes are compared, there is little similarity between the rainforest and the savannas, and greater degrees of similarity within the four savanna zones.

In addition to the north-south cline, distribution patterns are also determined by the influence of the Niger river, the presence of relic forests in the savannas, the de-afforestation of the rainforest, and the montane environment of the Jos plateau. Species diversity indices indicate a higher diversity in the rainforest than in the savannas, and analysis of trophic relationships in selected communities suggest that rainforest communities differ from and are more saturated than savanna communities.

This study shows that a more representative system of reserved areas is necessary for adequate conservation of Nigerian mammal communities.

Happold, D. C. D. (1984). Chapter 17. Small Mammals.

It comes as rather a surprise to learn that most hot deserts of the world have a rich and diverse fauna of small mammals. These small mammals (adult weight up to 3 kg) are rarely seen by the casual observer as they are mainly nocturnal and widely dispersed. Some unfavourable parts of the Sahara are completely devoid of mammals while other favourable habitats support flourishing populations of several species. The most successful orders of small mammals are the rodents, carnivores and bats and, to a lesser extent, the hares and hyraxes. All of them are adapted to the harshness and unpredictability of the desert environment. Many of these adaptations, such as nocturnal activity, efficient water conservation, behavioural control of body temperature, and rapid initiation of reproduction after drought, are shared by similar species of small mammals in other hot deserts of the world. Hence, there appear to be only a limited number of evolutionary options for small mammals in deserts.

Happold, D. C. D. (1985). Geographical ecology of Nigerian mammals.

1. The vegetation zones of Nigeria replace each other with increasing latitude. Rainforest and swamp forest in the south are succeeded by derived savanna, Guinea savanna, Sudan savanna and finally Sahel savanna in the extreme north. Climatic characteristics such as mean annual rainfall, mean number of rainy days each year and mean monthly minimum temperatures decrease from south to north, whereas number of months with less than 25 mm of rain, mean monthly maximum temperatures and range of mean annual temperature increase from south to north . Associated with this clinal pattern is increased seasonality, decreased productivity and lower mean vegetation height from south to north.

2. Nigeria has a diverse mammalian fauna of 42 families, 133 genera and 241 species. The general distribution of each species according to vegetation zones is tabulated. The proportional representation of each order is about the same as found in other African countries, although Chiroptera and Primates are especially well represented. The number of mammalian species is close to the predicted number in relation to the surface area of the country. The greatest numbers are found in the rainforest (116 spp) despite the small area of this vegetation zone; numbers decline in each successive zone to the north. The numbers of species of Chiroptera, Primates and Rodentia decline in each successive vegetatlon zone from south to north, but the Carnivora and Artiodactyla attain their highest species numbers in Guinea and Sudan savannas. The species composition of the rainforest zone is essentially different to that of any other zone; in contrast, there is considerable similarity between the faunas of the savanna zones. The rainforest fauna has the highest number of endemic species whereas Sudan and Sahel savannas contain very few endemic species. Correlation between climatic factors and species numbers is rodents show that annual range of temperature and annual rainfall are the best predictors of species numbers; in contrast no significant correlations are apparent for all species of mammals probably because of the different responses of the major orders to changes within the vegetation zones.

3. The mammals of Nigeria are typical of West Africa. The affinities of the fauna show that the majority of mammals are those of 'savanna', 'rainforest' and 'widespread' origin. Other species are of 'Saharan', 'montane', 'western rainforest', and 'eastern rainforest' origins; and one species is endemic. Thus all except one species occur in other West African countries.

4. The mammals of the rainforest zone may be considered as two groups, divided by the Niger river; of the endemic rainforest species 60 occur west of the river and 69 occur east of the river. The Niger river appears to act as a dispersal barrier to 27 species (ie. 35 % of endemic rainforest species). The Jos plateau, forest relics in the savanna, and savanna-like habitats in the rainforest zone have influenced the distribution of some species.

5. Analysis of the distribution and proportional abundance of small terrestrial rodents shows that species diversity indices are highest in the derived savanna and lowest in the rainforest. Many of these species occur in only one vegetation zone and have small habitat breadths; only three species have wide habitat breadths.

6. Trophic levels and diversity are examined in relation to bats. Nigerian bats show the same pattern of diversity as those of Botswana and Zimbabwe. The majority are insectivorous and a small but significant proportion are fruit/nectar feeders.

7. Eight 'faunal regions' are recongnised for the purposes of conservation of Nigerian mammal communities. Most faunal regions are, or will be, adequately conserved in proposed or gazetted reserved areas except for 'rainforest' and the 'Jos plateau and relic forest' communities; additional conservation areas are required in these two faunal regions.

8. Geographical ecology of the mammals of Nigeria (as well as for many other African countries) is hampered by inadequate information on distribution patterns and an absence of quantitative and synecological studies. A community approach is necessary in order to understand many of the fascinating aspects of the geographical ecology of African mammals.

Happold, D. C. D. (1999). Ecology of African Small Mammals. Abstract.

During the last decade, research on African small mammals has changed from being based primarily on fieldwork towards a greater emphasis on laboratory studies. This change has been due, in part, to advances in technology and to the political and economic uncertainties in many African countries. Likewise, the research effort is very uneven among different African countries. As a result, the relative number of ecological studies has declined in recent years.

Ecology is very diverse discipline. In this paper, I will consider five subdisciplines - community ecology, autecology, behavioural ecology, reproductive ecology and geographical ecology. For each, I will consider a few recent studies and show how these have assisted our understanding of small African mammals. I will also consider the importance of small mammals in African ecosystems, and the necessity (and methods) for the conservation of small mammals. Finally, recommendations will be suggested for research in the future and the new methodologies that may be employed.

Pendant la dernière décennie, la recherche sur les petits Mammifères africains a évolué vers une part plus importante des travaux de laboratoire par rapport aux études de terrain. Ce changement est lie d'une part aux avancées technologiques, mais également a l'instabilité politique et économique de nombreux pays africains. Par ailleurs, l'état de la recherche est très inégal selon les pays. Comme résultat, la part relative des études écologiques a décliné ces dernières années.

L'écologie est une discipline diversifiée. Dans cette communication, je considérerais cinq sous disciplines - l'écologie des communautés, l'autoécologie, l'écologie comportementale, l'écologie de la reproduction et l'écologie géographique. Dans chacune d'entre elles, et a partir d'un petit nombre d'études récentes, je montrerai comment notre compréhension des petits Mammifères africains a progresse. Je considérerai également l'importance des petits Mammifères dans les écosystèmes africains, ainsi que la nécessité (et les méthodes) de leur conservation. Finalement, des recommandations de recherches futures et méthodologies nouvelles a mettre en œuvre seront faites.

Happold, D. C. D. and M. Happold (1988). Renal form and function in relation to the ecology of bats (Chiroptera) from Malawi, Central Africa.

The ratio of the medulla to the cortex (M/C ratio) was determined for three species of Megachiroptera, and the ratio of the inner medulla to the cortex (IM/C ratio) was determined for 28 species of insect-eating Microchiroptera from diverse savanna and montane habitats within Malawi. Although all these species occur in the southern savanna biotic zone of Africa, each varies in its ability to exploit the African rainforest, arid and desert biotic zones. The kidneys of the Megachiroptera were very different to those of the insect-eating Microchiroptera, and these differences were related to the need of fruit-bats to excrete the surplus water associated with their diet. The urine concentrating capacity of each species of Microchiroptera was predicted from the IM/C ratio. Family characteristics were examined, and the urine concentrating capacities of the Malawian bats were compared with bats from elsewhere,

and with some rodents. The insect- eating Microchiroptera exemplified a very diverse range of IM/C ratios. The IM/C ratio of each species was compared with its drinking behaviour in captivity, diet, foraging strategy, flight, aspect ratio, domicile, roosting behaviour and habitat. It was hypothesized that the ability of insect-eating Microchiroptera to conserve urinary water would be an advantage to species: (a) living in xeric habitats; (b) adapted for sustained high-speed flight; (c) roosting in hot dry domiciles; (d) roosting in solitude; and € living at high altitudes where seasonal low temperatures induce torpidity. These hypotheses were tested, and it was concluded that, while the ability to conserve urinary water may have been an advantage in most of these situations, it was not essential.

Happold, D. C. D. and M. Happold (1989a). The bats (Chiroptera) of Malawi, Central Africa: Checklist and keys for identification.

At the present time, 55 species of bats have been recorded in Malawi. and these comprise 30 % of the mammalian fauna of the country. The species of bats vary greatly in their distribution and abundance: some are widespread end very common while others are rare and recorded from very few localities. In spite of the large number of species and the abundance of some of them, the bats are one of the least known orders of mammals in Malawi, and in Africa as a whole.

Until recently, most of the knowledge of the bats of Malawi was derived from a few small collections, and from publIcatIons by Ansell (1974, 1978), Ansell & Ansell (1973), Ansell, Benson &; Mitchell (1962), Bergmans & Jachman (1983), Dowsett & Hunter (1980), Hanney (1961), Harrison (1959,1982), Kershaw (1922), Koopman (1966), Lawrence & Loveridge (1953), Morris (1964), Sweeney (1959) and Thomas (1894, 1896, 1897). Recently, a checklist of 55 species of bats of Malawi, with measurements, locality records and notes, was compiled by Happold, Happold & Hill (1987), and distribution maps and taxonomic notes for these species have been complied by Ansell & Dowsett (1988).

This paper presents keys for the identification of the 55 species of bats currently recorded for Malawi, and for 10 addittonal species (marked with an asterisk) which occur in adjacent countries and which may occur in Malawi. All measurements are in millimetres, and the ranges given are those for the spectes irrespectIve of locality. If possible, the mean derived from measurements of specimens from Malawi is added in parentheses (data from Happold et al. 1987).

The taxonomy of some species is controversial. In this paper, we have principally followed Hayman & Hill (1971), but have made some changes in response to the subsequent revisions of *Laephotis* (Hill, 1974a), *Scotoecus* (Hill, 1974b), *Scotophilus* (Robbins *et al.*, 1985), and *Nycteris* (van Cakenberghe & de Vree, 1985). Some controversial taxonomic Iisues, with the relevant references are mentioned in the notes on some genera.

Other keys are also useful for identifying bets in Malawi; however, their usefulness is limited because they either include many species which do not occur in Malawi (e.g. Hayman & Hill, 1971), or do not include all the species now known to occur in Malawi (e.g. Fenton, 1975; Smithers, 1983; Smithers & Labao
Tello, 1976; Smithers & Wilson, 1979). The present key is designed specifically for Malawi, and the information in the keys is correct for the subspecies, colour varieties, and forms found in Malawi. The key is based, as far as possible, on external characteristics and/or dentition which may be examined without harming the bat, and without special expertise. We have frequently used, or modified, definitive characteristics which have been used in previous keys by Fenton (1975), Happold (1987), Hayman & Hill (1971), Koopman (1966), Rosevear (1965) and Smithers (1983).

A glossary of terms used in the keys is given at the end of the paper, and the majority of characteristics are illustrated in Figs. 1 to 10.

Happold, D. C. D. and M. Happold (1989b). Reproduction of Angola free-tailed bats (*Tadarida condylura*) and little free-tailed bats (*Tadarida pumila*) in Malawi (Central Africa) and elsewhere in Africa.

Angola free-tailed bats and little free-tailed bats occur in diverse habitats throughout most of Africa south of the Sahara. This study investigated the reproductive strategies and related biology of these species in Malawi where they were sympatric, and analysed data from elsewhere in Africa to show how the strategies varied along a gradient of habitats from approximately 12° N to 25° S.

Both the Angola free-tailed bat and the little free-tailed bat were normally monotocous. Angola free-tailed bats invariably had 2 births/year, and the interval between consecutive births decreased with increasing latitude. When the interval was shortest
(~90 days) a post-partum oestrus occurred. Little free-tailed bats differed by having a shorter gestation (~60 days), and the ability to have up to 5 births/year with a postpartum oestrus after each birth. The extent to which this potential is achieved varies with latitude and rainfall, mainly so that lactation can coincide with peaks in the abundance of food. The interaction between rainfall and reproductive characteristics results in the two species having patterns of reproduction which are sometimes similar, but more often different. Competition between the species is unlikely to be affected by differences in their reproduction.

Happold, D. C. D. and M. Happold (1989c). The bats of Malawi. Abstract. Eigth International Bat Research Conference, Sydney, Australia, 9 - 15 July 1989.

The location of Malawi, midway between warm temperate South Africa and the equator, makes Malawian bats (55 species, 8 families) particularly interesting. Comparison of the bats of Malawi and other African countries revealed patterns and trends in community composition, species-latitude relationships, trophic diversity and domiciles. Comparison also showed how reproductive strategies vary interspecifically, intraspecifically, and in different African environments, and indicated that reproductive flexibility is sometimes likely to influence distribution. Two sympatric species of *Tadarida* exemplify different reproductive chronologies in Malawi, and each modifies its chronology indifferent ways in other parts of Africa. Comparison of renal form in Malawian bats enabled relationships between renal function and ecology to be investigated. Comparison of the biology of the bananabat, *Pipistrellus nan us,* in Malawi,South Africa, Kenya and Zaire, revealed differences related to climate and the use of permanent or ephemeral domiciles.

Happold, D. C. D. and M. Happold (1990a). The domiciles, reproduction, social organisation and sex ratios of the Banana Bat *Pipistrellus nanus* (Chiroptera, Vespertilionidae) in Malawi, Central Africa.

Investigated were the domiciles, reproduction, social organisation and sex ratios of the Banana Bat, *Pipistrellus nanus* in Malawi. The bats were taken from furled banana leaves at fortnightly or monthly intervals from September 1984 to June 1985. The furled leaves were ephemeral domiciles lasting one to three days. A surplus of domiciles was always available. Females were monoestrus with the birth of twins in November and lactation lasted about eight weeks. The testes in males were scrotal from April to October, and attained maximal size in May. During lactation adult males roosted singly, while females with their young roosted singly or in maternity groups. Post-lactating females roosted singly or with groups of subadults and/or other post-lactating females, and the adult males continued to roost singly. In April, by which time the testes of all males have become scrotal, all bats were assumed to have reached sexual maturity and they began to live in harems (one adult male with one or more females). An equal number of males and females were born, but females outnumbered males for at least seven months of the year. The data from Malawi are compared with data from Kenya (O'SHEA 1980). South Africa (LAVAL and LAVAL 1977), and elsewhere. Geographical variation in domiciles and reproducrion, and the relationships between different aspects ot the biology of *P.nanus*, are discussed.

Happold, D. C. D. and M. Happold (1996). The social organization and population dynamics of leaf-roosting banana bats, *Pipistrellus nanus* (Chiroptera, Vespertilionidae), in Malawi, east-central Africa.

Banana bats were censused at their daytime roosts in furled leaves of bananas at fortnightly intervals from August 1993 to June 1994. The study area was a plantation of 138 numbered banana clumps arranged in a grid of 2 000 m^2 near Namadzi in the Shire Highlands of Malawi. Each bat (n = 125) was banded. At each census, every furled leaf in the plantation was examined and all of the bats within each occupied leaf were captured. The band number of each bat, its reproductive condition, the composition and membership of each group of bats, and the site of capture were recorded.

Bats were assigned to cohorts whose fates were followed; the population size ranged from 84 to about 45 during the study. Banana bats roosted in groups of 1 - 12 individuals. Mean group size ranged from 1.3 to 2.4, according to season. During parturition and lactation, females with young roosted separately from males, and the males roosted singly. At other times, adult males roosted singly or in larger groups composed of one (rarely two) male(s) and 1 - 10 females. Formation of groups of two or more bats was not attributable to a shortage of furled leaves. On most occasions, each male was found with a different group of females, and each female with a different male, showing that group membership is highly labile and suggesting that the mating system is promiscuous. Most males showed fidelity to a small number (< 5) of "reliable" banana clumps which were close together and which had one or more suitable furled leaves at all times. Females did not show such fidelity. The roosts, social behaviour, reproductive biology and sex ratios of leaf-roosting banana bats and thatch-roosting banana bats (considered to be conspecific), and two other species of bats, are compared so as to elucidate some of the environmental and phylogenetic factors which might have shaped the mating system of the leaf-roosting banana bats in Malawi.

Des chauves-souris des bananiers ont été recensées tous les quinze jours depuis août 1993 jusqu'a juin 1994 dans leurs refuges diurnes constitués par des feuilles de bananiers enroulées. La zone étudiée était une plantation de 138 bananiers numerates, sur une grille de 2 000 m^2, près de Namadzi dans les Highlands du Malawi. Chaque chauve-souris (n = 125) a été baguée. A chaque recensement, chaque feuille enroulée de la plantation a été examinée et toutes les chauves-souris qui occupaient une feuille ont été capturées. Le numéro de chaque chauve-souris, son état génital, la composition de chaque groupe de chauves-souris et le site de la capture ont été enregistrés.

Ces chauves-souris ont été attributés à des cohortes dont le devenir a été suivi; la taille de la population a varié de 84 à environ 45 pendant l'étude. Elles se réfugiaient en groupes de 1 à 12 individus, en moyenne 1,3 à 2,4 selon la saison. Au cours de la parturition et de la lactation, les femelles restaient avec leurs jeunes, a l'ecart des mâles et les mâles restaient isolés. A d'autres moments, les mâles adultes étaient seuls ou en petits groupes composés d'un ou rarement deux mâles et d'une à dix femelles. La formation de groupes de deux, ou plus de deux chauves-souris, n'était pas attribuable au manque de feuilles enroulées. Dans la plupart des cas chacun des mâles a été trouvé avec un groupe différent de femelles, et chaque femelle avec un mâle different, ce qui montre que l'adhesion a un groupe est très fragile, et ce qui permet de penser que le système de formation du couple est la promiscuite. La plupart des mâles montrent de la fidelite à un petit nombre (< 5) de bananiers "fiables", proches les uns des autres, et ayant une ou plusieurs feuilles enroulées disponibles tout le temps. Les femelles ne montrent pas une telle fidélité. Les refuges, le comportement social, la biologie de la reproduction et les sex-ratios de ces chauves-souris qui se reposent dans les feuilles de bananiers et de celles qui trouvent refuge dans les chaumes (qu'on considère comme conspécifiques), et de deux autres espèces de chauves-souris, sont comparés de façon a élucider quelques-uns des facteurs environnementaux et phylogénétiques qui doivent avoir façonné le système de reproduction des chauves-souris qui se réfugient dans les feuilles de bananiers au Malawi.

Happold, D. C. D. and M. Happold (1997a). Conservation of mammals on a tobacco farm on the Highlands of Malawi.

The natural vegetation of the Shire Highlands of Malawi has become fragmented because of human activities. As a consequence, some species of mammals have become locally extinct and the

population numbers and geographical ranges of other species have declined. This study investigated the species richness of mammals on a commercial tobacco farm, and the importance of remnants of natural vegetation on farms for the conservation of mammals. The farm covered 180 ha and supported 44 species of mammals (equivalent to 66 % of the species known to occur in the Shire Highlands at a similar altitude, and 24 % of the total mammalian fauna of Malawi). Most of the species were bats (22 species) and rodents (13 species). The largest remnants of natural miombo" woodland supported more species and more individuals than smaller remnants. The high species richness was due, in part, to the variety of different habitats on the farm ('miombo' woodland, riverine forest, grassland, swamp, streams and dams), as well as to good conservation practices. The farm is especially important for the conservation of 13 species which are rare and/or have limited geographical ranges in Malawi. It is suggested that well-managed farms which contain remnants of natural vegetation can play a significant role in the conservation of mammals, and other vertebrates, in Central Africa.

Happold, D. C. D. and M. Happold (1998a). Effects of bat-bands and banding on a population of *Pipistrellus nanus* (Chiroptera: Vespertilionidae) in Malawi.

This study provides information about the effects of flanged metal bat-bands, and the procedures associated with banding and frequent censusing, on a population of *Pipistrellus nanus*, a particularly small vespertilionid bat. The bats were censused at their roosts in a banana plantation, at intervals of approximately two weeks, for 10 months; 120 bats were banded and 75 were recaptured (447 recaptures). The best data came from a cohort of 64 adults (banded during the first six censuses), 25 of which were recaptured 9-15 times. Band-status (the effect of the band on the bat) was recorded each time a bat was captured. We recognised four classes of band-status ranging from class 1 (band-free with no injuries, observed on 66% of occasions) to class 4 (band-immobile with an unhealed wound, observed on 11% of occasions). Analyses of the results showed that (a) the majority of bats were in class 1 on most occasions, but some had injuries (classes 2-A) which often improved or deteriorated unpredictably; (b) the band-status changed in relation to time after banding, following an unexplained pattern; (c) band-status was not affected by seasonal changes in climate, or by the sex of the bat; (d) banding did not affect flight and foraging, or mass, or "survival" in the population; and (e) roosting behaviour was not adversely affected. Bats banded when we were inexperienced (census 1) were more prone to injuries than bats banded when we had improved our banding technique. Banding enabled us to study the social behaviour and reproduction of this species and we believe that the results justified banding one small population of this common, widespread species. We predict that other species of small vespertilionids may respond similarly to banding, but extrapolation to species in other families is probably not justified. We recommend that flanged bat-bands should be fitted as loosely as possible, that new bat-banders should be trained by experienced banders, and that banding of bats is permitted only when there are very good scientific reasons for the banding and when harm to individual bats and populations is likely to be minimal.

Happold, D. C. D., M. Happold and J. E. Hill (1988). The bats of Malawi.

This paper gives an account of the 55 species of bats currently known to occur in Malawi. Six species are recorded for the first time, together with 86 new species-locality records which increase the records for Malawi by approximately 44 percent. Data were obtained from 1489 specimens (36 species) collected from 13 localities by DCDH and MH (August 1984 to June 1985), and museum specimens in Malawi. The account of each species includes measurements, localities, and brief notes on distribution, status, habitat, domiciles and behaviour. The bat faunas of Malawi and 13 other African countries are compared to reveal patterns and trends in the zoogeography and geographical ecology of the bats of Malawi.

Liste commentée de 55 espèces de chauves-souris du Malawi. Six espèces sont citées pour la première fois au Malawi; 86 points de captures nouveaux pour les chauves-souris du Malawi permettent d'augmenter de 44 % les connaissances sur leur repartition dans ce pays. Toutes ces données proviennent de 1 489 specimens (36 especes) capturés dans 13 localites par DCDH et MH d'août 1984 à juin 1985 et de specimens de musée au Malawi. Les renseignements donnés sur chaque

espèce comprennent les mensurations, les localites de capture, et de breves notes sur la repartition, le statut, l'habitat, les domiciles et le comportement. La faune des chauves-souris du Malawi est comparée a celle de 13 autres pays africains pour mettre en evidence les caracteristiques zoogeographiques et ecologiques des chauves-souris du Malawi.

Happold, M. and D. C. D. Happold (1997b). New records of bats (Chiroptera: Mammalia) from Malawi, east-central Africa, with an assessment of their status and conservation.

This paper reports 97 new species-locality records of bats from Malawi. Of particular interest are four species of bats (*Rhinolophus swinnyi, Triaenops persicus, Eptesicus flavescens, Tadarida nigeriae*) which have not been recorded previously from Malawi. The relative status of bats in Malawi was estimated and the species were placed in five categories ranging from 'rarely-recorded' to 'very commonly-recorded'. Of the 59 species of bats known to occur in Malawi, 28 are rarely-recorded in Malawi. The relative status and species-locality records of bats were analysed to assess which species, and which localities, need special conservation effort. Seventeen species which are rare throughout their ranges in Africa as well as being rarely-recorded or seldom-recorded in Malawi, are considered to require special effort. Checklists of bats are given for 11 localities, including Liwonde NP in the Upper Shire Valley (29 spp.), two localities on the Shire Highlands (28, 22 spp.), Thyolo on the boundary between the Shire Highlands and Phalombe Plain (22 spp.), and Chiromo in the Lower Shire valley (30 spp.), which have particularly rich bat faunas. Localities in need of urgent conservation effort include Ntchisi FR in the Central Region, and Chiromo. Ninety-two percent of the species of bats known to occur in Malawi have been recorded from the Southern Region. Most of these species will probably continue to survive in southern Malawi provided that the National Parks (especially Liwonde NP) are maintained and well-managed, and there is no further destruction of the indigenous vegetation at Chiromo and Thyolo, and on the Shire Highlands.

Happold, M. and D. C. D. Happold (1998b). New distribution records for bats and other mammals of Malawi.

The most comprehensive review of the mammals of Malawi in recent years is that of Ansell & Dowsett (1988). In this book, each species is listed with notes on its taxonomy, distribution, habitat and habits. and a map showing the quarter-degree squares in which it has been recorded. Owners and users of this book may find it useful to update the distribution maps and, with this in mind, we have tabulated 100 new records of which 97 were obtained by us between August 1993 and 1994 during a year of field-work on bats and small terrestrial mammals in Malawi (Tables 1 & 2). For the purpose of this paper, a record is considered to be new if the species was not recorded within the relevant quarter-degree square by Ansell & Dowsett (1988).

Harmsen, R. and I. Jabbal (1968). Distribution and host-specificity of a number of fleas collected in South and Central Kenya (including the collection of the University College, Naitorib, Mount Kenya Expedition, March 1966).

During the years 1963 - 1966 a collection of fleas was made by various members of the Department of Zoology of University College, Nairobi (UCN). This collection was mainly based on Dr. J. B. Foster's trapping of small mammals, and on the fieldwork of Dr. J. B. Sa!e with hyrax. Some specimens, however, were collected occasionally from road kills and other incidental mammalian hosts. The collection culminated with the work of the University College Mount Kenya Expedition in March 1966. The collection was mounted and identified by members of the Division of Insect-Borne Diseases (DIBD), Medical Department, Kenya, and a number of specimens were sent to Mr. F. G. A. M. Smit, Zoological Museum, Tring, England, for confirmation of identification.

The present records of distribution and host-specificity are of interest for a variety of reasons. Fleas only spend their adult life in intimate contact with the mammalian host, the larva is a free living insect, feeding on proteinaceous detritus. It is, therefore, to be expected that fleas will be mainly found on

those mammals which have permanent dwelling sites, and particularly on nest or den building animals. This is the immediate effect of the need of a freshly emerged adult flea to contact a new host. Flea eggs deposited in a nest or den have a much higher chance of developing into adults within the immediate reach of a new host than flea eggs deposited at random in the field. One other consequence of this necessity of the flea to locate a host within its life time after larval development away from the host, is a dependence on the climate.

It is, thus, to be expected that within the fairly narrow geographical confines of Kenya a number of flea species will be restricted to particular altitudinal levels in response to a climatic adaptation, even when suitable hosts are available at other altitudes. Alternatively, one would expect to find fleas restricted to particular hosts at one altitude, and to other hosts at another altitude, this in response to the combined effect of climate and nesting habits of different hosts. This form of ecologically based isolation could well become the basis of speciation.

Harrison, D. L. (1953). Some systematic notes on the Long-fingered Bats of the genus *Miniopterus* Bonaparte occurring in South Africa and Madagascar.

1. Two species of the genus *Miniopterus* are considered to exist in southern Africa and two on the island of Madagascar, these being *M. natalensis, M. fraterculus*, and *M. majori, M. manavi* respectively.

2. The original description of *M. fraterculus* Thomas and Schwann is amended with regard to colouration and cranial characters, and some cranial indices are employed for comparision of this species with *M. natalensis* and *M. schrebersii*.

3. The subspecies *M. n. smitianus* Thomas is considered valid, but the race *M. n. dasythrix* is not believed to be separable and is sunk into the synonymy of *M. n. natalensis*.

Harrison, D. L. (1956a). On a collection of mammals from Oman, Arabia, with the description of two new bats.

1. A collection of mammals made by the author in Oman is described and field notes on the various species given.

2. The collection includes two new subspecies *Triaenops persicus macdonaldi* and *Taphozous nudiventris zayidi*, which are here described.

3. The following six species are newly recorded from Oman; *Triaenops persicus, Asellia tridens, Pipistrellus kuhlii, Meriones crassus, Gerbillus cheesmani* and *Mus musculus praetextus*.

Harrison, D. L. (1956c). Mammals from Kurdistan, Iraq, with description of a new bat.

During 1954 a small collection of mammals was made by the author in the extreme north of Iraq, which forms part of Kurdistan. This is an extremely mountainous district and the mountain ranges are continuous with those of Asia Minor and Persia. The mammalian fauna is composed of animals which are quite different to those found in the lowlands and desert of which most of Iraq consists and includes many species which are found in Persia, Asia Minor and Syria. It appears to be a faunal element which has been but little studied in Iraq for a number of the species recorded here have not been previously noted as existing in that country. The collection here described was made in the mountains around Amadia, Kurdistan. In this area the mountains are quite extensively covered with scrub oak forest, while the valleys are very fertile and contain poplars and other trees (See Plate 1).

The mammals obtained are listed below, with notes on their characteristics and field habits and with a description of a new bat.

Harrison, D. L. (1956d). A key to the identification of the bats (Chiroptera) of the Arabian Peninsula.

During several years of field and museum research on Arabian bats it became abundantly clear that a comprehensive key to their identification would be of great value to workers in this field. Included in this attempt to provide such a key are all the forty-two species recorded up to the time of writing from any part of the peninsula including the northern part as far as the northern and eastern frontiers of Syria and Iraq, as well as Sinai. In compiling this key I have been fortunate to have at hand a copy of the late J. L. Chaworth-Musters's notes on the Arabian bats which he prepared for the use of collectors some time before his death, but never published. His notes included a key which did not however comprise the whole area dealt with here, whilst a number of species have been added to the list since that time. The present key is partly based on his work, but differs in several respects, particularly in the vespertilionid group of bats, the largest single group and by far the most difficult to identify. The writer considers that the dentition provides the easiest primary division of these bats and accordingly places more emphasis on it in this key.

The purpose of a key is to provide an accurate identification of the species included in it, but unfortunately in the Chiroptera this cannot be done without recourse to details of cranial and dental anatomy, and this key being intended primarily for scientific workers it is where necessary based on such characters. Every endeavour has been made to make the characters employed as simple and " absolute " as possible.

It must be admitted that the taxonomy of several species groups of the bats in the peninsula area is still somewhat confused. The nomenclature here employed is based in the main upon Ellerman & Morrison-Scott (1951). In particular it is likely that further research will clarify the very confused position of the Arabian serotine bats (Genus *Eptesicus*) of which no less than five species are recorded. The characters of the last three forms here listed (*E. isabellinus, E. hingstoni* and *E. serotinus turcomanus*) appear doubtfully separable at a specific level and it may well prove that all three are in reality forms of *E. serotinus*.

No key can be absolutely reliable, since whatever characters are employed there will be occasional aberrant individuals which do not "fit". Thus for example, where the number of teeth is the criterion employed there will be occasional difficulties with supernumerary or absent teeth from the normal dentition of the species. Indeed it appears likely that in evolution the loss of teeth from the dentition is a very gradual process in which different members of the same generation may be at different stages in the process, with occasional " throw-backs " to the original formula. That final identification can often only be made by direct comparison with the relevant material in a museum collection must be admitted, but it is hoped that in many cases an individual bat could be confidently identified from the use of this key alone. Where special difficulty is likely to be encountered a second and occasionally a third character has been included to assist the worker. Where the subspecies in the area are known the key has been extended to include them but in many of these the subspecific status is still in doubt. The possibility of intermediation between these subspecific forms must also be borne in mind. The discovery of further species in the peninsula is more than likely and to include such additions modifications of the key may be necessary.

Harrison, D. L. (1956e). A new flat-headed bat of the genus *Platymops* Thomas from S.E. Sudan.

Amongst a number of bats received from Mr. John G. Williams of Nairobi, which he obtained in the extreme south-eastern part of Sudan during 1953, were two small Flat-headed Bats belonging to the genus *Platymops* Thomas. Bats of this genus seem to be extremely rare and hence material for comparison is very sparse. Direct comparison of these specimens with the type specimen of *Platymops macmillani* Thomas (1906), the type locality of which is between Addis Ababa and Lake Rudolph in Abyssinia, and study of Thomas' original description reveals that these specimens possess certain striking characters, from which I have concluded that they represent a new species, which I propose to name

Harrison, D. L. (1957a). Some systematic notes on the trident bats (*Asellia tridens* E. Geoffroy) of Arabia.

L'auteur décrit les différences existant entre *Aseltia t. tridens* et *A. t. muraiana*, race trouvée en Irak, en Iran et en Arabic, se manifestant surtout par une taille superieure et une oreille proportionnellement plus petite chez cette dernière sous-espèce. Après une étude morphologique, l'auteur discute la répartition géographique et émet l'hypothèse selon laquelle l'espèce serait migratrice dans le Nord de son habitat, ce qui expliquerait certains de ses caractères.

Harrison, D. L. (1957c). Notes on African Bats. 1. Some systematic and anatomical notes of the African bats of the genus *Otomops* Thomas. 2. Some observations on the relationship between the African slit-faced bats *Nycteris hispida* Schreber and *Nycteris aurita* K. Andersen.

1. Three topotypical specimens of *Otomops icarus* Chubb are here described. This form is now considered to represent a subspecies of *O. martiensseni* Matschie.

2. The histology of the gular sac of *O. m. icarus* is described and shown to differ from that of *Cheiromeles torquatus*.

Harrison, D. L. (1958b). A new race of tomb bat *Taphozous perforatus* E. Geoffroy, 1818 from northern Nigeria, with some observations on its breeding biology.

1. The species *Taphozous perforatus* E. Geoffroy, 1818, is recorded from north-western Nigeria for the first time, thus establishing it as a West African mammal.

2. The subspecies *Taphozous perforatus swira* is described, differing from the known subspecies in its greyish brown dorsal surface. The type-locality of the new race is Sokoto, north-western Nigeria.

3. Some observations are made on the breeding biology of the new subspecies, and it is shown that two seasons of parturition must occur in the Nigerian population during one year. In one female at least, the association of lactation with early pregnancy suggests that two pregnancies had occurred in rapid succession.

Harrison, D. L. (1959b). Report on the bats (Chiroptera) in the collection of the National Museum of Southern Rhodesia, Bulawayo.

A collection of bats from the National Museum of Southern Rhodesia, comprising seventy-nine identifiable specimens and including twenty-three species has been sent to the author for examination.

This collection includes several new geographical records and has provided the opportunity to make some systematic researches for which purpose material in the British Museum collection and in the author's collection has been examined also and the findings have been incorporated into the present report.

The identifiable material in the collection has been listed systematically, with the results of the systematic studies undertaken. The author is greatly indebted to Mr Reay H. N. Smithers, the Director of the National Museums of Southern Rhodesia, who has kindly made ;this collection available for study and to the staff of the Mammal Section of the British Museum (Natural History), for their kind co-operation, to Mr W. F. H. Ansell, Mr L. D. E. Vesey-Fitzgerald, Mr I. A. D. Robertson, Mrs P. Swire, Mr J. M. Start, Mr A. Start, Mr J. G. Williams, Mr C. J. P. Ionides and Mr P. A. Clancey from whom the author has received material which has contributed considerably to some of the studies included in this report.

Harrison, D. L. (1960e). A checklist of the bats (Chiroptera) of Kenya Colony.

The known Chiroptera of Kenya comprise seventy-five named forms at the time of writing. There is at present no comprehensive work of reference to which the interested zoologist may turn to find an account of the available material and the literature dealing with this large and still growing assemblage of bats. The purpose intended in preparing this check list has been to provide such a basis for further work on the Chiroptera of Kenya, rather than to provide a final answer, which certainly cannot yet be given, to the many systematic difficulties still involved in the taxonomy of African Bats. Where special difficulties are likely to be encountered, notes have been appended explaining these difficulties and giving sometimes an opinion regarding their possible solution and lines for future research. It is hoped that this list will provide as a first step a working guide to the status of the species known to exist in the area and to the literature about them. A key to their identification, suitably illustrated, will form a natural addition to the present groundwork.

The list has been based on material in the British Museum of Natural History, the Coryndon Museum in Nairobi and the author's personal collection as well as on the published literature. It cannot be hoped that all records will have been included, especially of the commoner species, but it is hoped that a fairly complete picture of their distribution so far as it is known will have emerged. The source of each locality record, either the collection in which the specimen is to be found, or a number referring to the publication in question as listed in the bibliography, will be found in brackets after the locality name. (Abbreviations employed are as follows - B.M.C. = British Museum Collection, C.M.C. = Coryndon Museum Collection, H.C = Harrison Collection). It is regretted that considerations of space have not allowed full details of the collector of each specimen to be given with each record. Locality names have been checked so far as possible against the Ordnance Survey Map of the Colony. A full synonymy of all the named forms has not been included.

The author is especially indebted to Mr. J. D. L. Fleetwood and Mr. J. G. Williams of the Coryndon Museum for all their efforts in stimulating interest in the collection of new material, which has added so much to our knowledge of the local bat fauna in recent years. Mr. Fleetwood has also given invaluable help with details" of the material in the Coryndon Museum. I would like to express my thanks also to the following, who have kindly provided specimens or information, which have been invaluable to this work - P. Bally, B. M. N. Brown, Mrs. P. Bowles, D. Brown, P. W. Barnley, Mrs. C. F. Christopher, A. Cole, J. L. Cruickshank, Mrs. M. Ellis, R. J. Evans, V. Fay, M. Fennessy, J. Fowler, J. Gosham, J. B. Hacker, C. Hagner, J. Hill, B. Hopkins, Col. R. A. F. Hurt, C. J. P. Ionides, Dr. J. Leakey, Mr. Lumsden, C. Moore, I. Parker, R. Peake, Miss J. E. Proctor, Mrs. D.-Powles, A. H. Randall, K. Rawlins, D. Sheldrake, A. Start, J. Start, Lt. Col. H. F. Stoneham, Mrs. Tweedie, M. E. H. Vickers and J. D. Vinson. I am much indebted also to the staff of the Mammal Section of the British Museum of Natural History for their kind co-operation, to Dr. J. Dorst of the Paris Museum for his assistance and to Dr. V. Aellen of Geneva Museum for his assistance. Dr. E. Kulzer of the Zoophysiologisches Institute at Tubingen has kindly allowed me to examine some material in his care.

The surprising number of species added to the Kenya list in recent years and indeed the altogether new forms still being discovered as well as the very scanty knowledge of many others all point to the pressing need for further research and collecting. It is hoped that this list will provide a stimulus to that end and at the same time form a compact synthesis of our present factual knowledge.

Harrison, D. L. (1961a). On Savi's Pipistrelle (*Pipistrellus savii* Bonaparte, 1837) in the Middle East, and a second record of *Nycticeius schlieffeni* Peters, 1859 from Egypt.

1. *Pipistrellus savii* BONAPARTE is recorded from Lebanon and Cyprus. The characters of *P. s. caucasicus* SATUNIN are discussed and the Lebanese specimens are referred to this race, which averages larger than the typical one, is paler and usually lacks the small upper premolar.

2. The specimen from Suez obtained by RUEPPELL in 1832 and believed by him to be *P. savii* is shown to be the second Egyptian specimen of *Nycticeius (Scoteinus) schlieffeni*.

Harrison, D. L. (1962). On bats collected on the Limpopo river, with the description of a new race of the Tomb rat, *Taphozous sudani* Thomas, 1915. I. Systematic notes.

1. *Pipistrellus rusticus* Tomes is recorded from Southern and Northern Rhodesia.

2. *Platymops (Sauromys) petrophilus* Roberts is recorded from Southern Rhodesia. The characters of this species are compared in detail with those of *Platymops barbatogularis parkeri* Harrison & Fleetwood and *Tadarida aegyptiaca bocagei* Seabra and subgenus *Sauromys* Roberts is upheld.

3. *Taphozous sudani* Thomas is recorded from Southern Rhodesia and a new subspecies of it, *T. s. australis* is described.

Harrison, D. L. (1963a). Some observations on *Myotis dogalensis* Monticelli, 1887 (Mammalia: Chiroptera).

A complete re-examination has been made of the type specimen of *Myotis dogalensis* Monticelli, 1887, including extraction of the skull. It is concluded that this bat is an Arabian representative of the African *Myotis bocagei* and should accordingly be known as *Myotis bocagei dogalensis*. Satisfactory assessment of its subspecific characters must await the collection of fresh material.

L'esemplare tipo di *Myotis dogalensis* Monticelli, 1887, è stato sottoposto a un complete riesame, compresa l'estrazione del cranio. Si conclude che questo pipistrello e un rappresentante arabo dell'africano *Myotis bocagei* e deve perciò essere conosciuto come *Myotis bocagei dogalensis*. La definitiva precisazione dei suoi caratteri sottospecifici deve attendere la raccolta di materiale fresco.

Harrison, D. L. (1963b). Observations on the north African serotine bat, *Eptesicus serotinus isabellinus* (Temminck, 1840) (Mammalia: Chiroptera).

1. The original type material of *Eptesicus isabellinus* (Temminck, agrees with *Eptesicus serotinus* Schreber, 1774, in size and in all essential characters, the specimens differing only in their pallid colour. The thus regarded as a pale N. African desert subspecies of *E. serotinus*, should be known as *Eptesicus serotinus isabellinus* (Temminck).

2. A specimen of the original type series, now No. 17648 in the Rijksmuseum van Natuurlijke Historie, Leiden, is here selected as the lectotype and is described in detail.

3. *Eptesicus innesi* Lataste, 1887, is clearly a distinct species from *E. serotinus isabellinus*, being much smaller (forearm 40.3-42.3 mm, condylobasal length of the skull 15.2-16 mm).

Harrison, D. L. (1964b). Notes of some Southern Rhodesian Microchiroptera.

A large number of bat specimens recently collected in Southern Rhodesia have been sent to the author for determination by Mr. Reay H. N. Smithers, Director of the National Museums of S. Rhodesia. Amongst these, several species are represented that have not been hitherto recorded from S. Rhodesia and which are therefore worthy of note.

Harrison, D. L. (1965a). A note on the occurrence of the large free-tailed bat, *Otomops martiensseni* Matschie, 1897 (Chiroptera: Molossidae) in Rhodesia.

A specimen of *Otomops martiensseni martiensseni* is recorded from the Kariba Dam, Rhodesia. The characters of *O. m. icarus* are further discussed in the light of additional material of both races and the suggestion made that *icarus* averages smaller in external dimension, as well as differing slightly in colour from the typical form.

Harrison, D. L. (1965b). Remarks on some trident leaf-nosed bats, (genus *Asellia* Gray, 1838), obtained by the Israel South Red Sea expedition, 1962.

The little known Patrizi's Trident Bat, *Asellia patrizii* DE BEAUX, 1931, is recorded from Entedebir Is., S. Red Sea. The species was formerly only known from the mainland of Eritrea. The specimens from Entedebir Is. are slightly smaller than those described by DE BEAUX from the mainland, but otherwise agree closely with his description and differ strikingly from *Asellia tridens* in size.

Harrison, D. L. (1968a). On three mammals new to the fauna of Oman, Arabia, with the description of a new subspecies of bat.

Description d'un Mouflon (*Ovis ammon*) adulte mâle tué dans les montagnes d'Oman en novembre 1967. C'est la première fois que l'espèce est signalée dans la peninsule arabique en dehors de l'Irak. Sont également à ajouter à la faune de l'Oman deux espèces de Microchiropteres: *Eptesicus nasutus* (Vespertilionide) décrite comme une race locale *E. n. batinensis*, et *Taphozous perforatus* (Emballonuridé).

An adult male Wild Sheep, *Ovis ammon* (Artiodactyla: Bovidae) obtained in the mountains of Oman in November 1967 is described and illustrated. It is the first known occurrence of the species in the Arabian peninsula apart from Iraq. Two species of Microchiroptera are newly recorded from Oman: *Eptesicus nasutus* (Vespertilionidae) is here described as a new local race *E. n. batinensis, Taphozous perforatus* (Emballonuridae) is also added to the local fauna.

Harrison, D. L. (1968b). Further notes on African Microchiroptera.

Material of African bats recently sent to the author for examination includes several notable records, which help to complete our knowledge of the geographical ranges of the forms concerned. These are listed below and discussed.

Harrison, D. L. (1973). Checklist: Saudi Arabian mammals.

With the publication of Volume III of Dr. David L. Harrison's Mammals of Arabia (London, Ernest Benn, 1972), this authoritative work is complete. Volume I, 1964, and Volume II, 1968, were reviewed by J. Mandaville in the first issue of the Journal (July 1971; then called Report), and all three volumes are available in the Society's library.

We plan to publish articles on the various families and species from time to time, leaning heavily on Harrison, but adding such information as has been collected by local observers, hope these articles will heighten interest in this branch of the natural history of Saudi Arabia and encourage and assist other members in enjoying and sharing their increasing knowledge.

Mr. Mandaville, of Aramco, Dhahran, is the Society's consultant on mammals and reports may be sent to him. Cal Ham, Aramco, Jiddah, would be pleased to receive information here.

As an introduction to the subject, we are presenting herewith a check list drawn from Harrison. Extinct animals, marine mammals and domesticated species are not covered by Harrison and thus will not appear on the list. Harrison's "Arabia" includes the entire peninsula and, therefore, lists a number of species that are not found within the territorial bounds of the Kingdom. These are not included in our list.

Harrison, D. L. (1975a). A new species of African Free-tailed bat (Chiroptera: Molossidae) obtained by the Zaire River Expedition.

A collection of more than two hundred bats was recently obtained by Major M. D. Gallagher on the Zaire River Expedition. This collection will be fully documented elsewhere, but it contains one small Molossid bat presenting such unique features that it clearly represents a species unknown to science. This most interesting firid clearly demands special treatment and itf is here named in honour of its discoverer.

Harrison, D. L. (1975b). Scientific results of the Oman flora and fauna survey, 1975. Description of a new subspecies of Botta's Serotine (*Eptesicus bottae* Peters, 1869, Chiroptera: Vespertilionidae) from Oman.

Description d'une forme, propre à la région d'Oman, de la Serotine de Botta. Il s'agit de la plus petite forme de l'espece.

During the month of April 1975 a survey of the flora and fauna of the Jebel Akhdar in the Sultanate of Oman was carried out by a party of five naturalists at the invitation of the Oman Government and sponsored by the Ministry of Diwan Affairs.

Amongst 59 mammal specimens obtained by the author on this expedition are three examples of Botta's Serotine (*Eptesicus bottae* Peters, 1869). These specimens represent the first occurrence of this species in Oman, being known previously in the Arabian Peninsula from widely scattered localities in Yemen, Israel and Iraq (Harrison, 1964). They differ so strikingly from all previously described forms of this species that they clearly represent a form new to science which is here named.

Harrison, D. L. (1979). A new species of pipistrelle bat (*Pipistrellus*: Vespertilionidae) from Oman, Arabia.

Three small pipistrelle bats received from Northern Oman recently present a striking combination of external, cranial and dental features which together distinguish them quite sharply from all other bats of this genus. They are considered to represent a new species here named

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Harrison, D. L. (1982a). Observations on some rare Arabian *Pipistrellus* (Chiroptera: Vespertilionidae) with special reference to the external male genitalia.

Further material of the recently described and little-known *Pipistrellus arabicus* from Oman is here recorded. The external male genitalia and baculum are described and compared with those of *P. pipistrellus* and *P. bodenheimeri*, the latter also described in detail for the first time. Marked morphological differences are revealed.

Weiteres Material der kürzlich beschriebenen und wenig bekannten *Pipistrellus arabicus* aus Oman wird mitgeteilt. Das äußere männliche Genitale und Baculum wird beschrieben und mit dem von *P. pipistrellus* und *P. bodenheimeri* verglichen, wobei letztere Art erstmals im Detail beschrieben wird. Zwischen allen drei Arten bestehen markante morphologische Unterschiede.

Harrison, D. L. (1982b). Two bats (Chiroptera) new to the fauna of Malawi.

A recent review of African Chiroptera In the collection of the Harrison Zoological Museum (HZM) , has revealed material of two species that do not appear to have been previously recorded from Malawi, although from their general range they might be expected to do so, and are recorded here as an addition to our knowledge of the local bat fauna.

Harrison, D. L. (1983). The mammal fauna of Oman, with special reference to conservation and the Oman flora and fauna surveys.

The terrestrial mammal fauna of the Sultanate of Oman, currently comprising fifty-six known species, is reviewed from a conservation viewpoint. A total of thirty-four species are of some conservation interest, but only eight species are considered to be threatened with local extinction at the present time. All are large artiodactyls or carnivores. One species is considered actually extinct locally but has been saved in captivity and is to be restored to the wild state soon.

A review of conservation progress and requirements shows that preservation of habitat is at least as important if not more vital than protection of the actual animals from hunting. Experience with the Oman Flora and Fauna Surveys and the WWF/IUCN Tahr Project have revealed the value of detailed scientific analysis of the whole 'ecosystem' in selection of sites for National Parks and in their management. A clear need emphasized by this review will be the establishment of a special Reserve in the mountains of Dhofar, where an altogether unique flora and fauna exist in a strictly limited area.

The ultimate success of any conservation policy in Oman will depend on education. A prime object of the recent Flora and Fauna Surveys has been to make more comprehensive information available to the Oman people as well as to the scientific world about the fascinating natural history of this ancient land. Already a splendid start has been made to this task with publications sponsored by the Government on the wild flowers of northern Oman (Mandaville, 1978) and wildlife in Oman as well as the interim reports of the Oman Flora and Fauna Surveys (Oman, 1976; 1979), all available in Arabic and English editions. Books on butterflies (Larsen & Larsen, 1980) and birds (Gallagher & Woodcock, 1980) of Oman have also been published. As stated by HM Sultan Qaboos bin Said in his Foreword to *The Scientific Results of The Oman Flora and Fauna Survey, 1975* 'the work of surveying the flora and fauna of the Sultanate must continue for some time. The *Journal of Oman Studies* will convey the results to the scientists and interested laymen of the world. As the teaching of science progresses in our schools this knowledge will be available also for the youth of Oman.' Only in this way will this priceless national heritage be preserved and cherished from one generation to the next

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Harrison, D. L. and P. J. J. Bates (1989). Observations on two mammal species new to the Sultanate of Oman, *Vulpes cana* Blanford, 1877 (Carnivora: Canidae) and *Nycteris thebaica* Geoffroy, 1818 (Chiroptera: Nycteridae).

Blanford's Fox (*Vulpes cana* Blanford, 1877) is recorded for the first time from Oman. Recently recognised as a relict montane species in Israel, this is the first record of the species from the southern part of the Arabian peninsula. The baculum of the species is described and shown to be distinctively different from that of *Vulpes rueppelli*. Also the Slit-faced Bat, *Nycteris thebaica* Geoffroy, 1818, is recorded for the first time from Oman.

Harrison, D. L. and P. J. J. Bates (1991). The mammals of Arabia. Second edition.

Nearly twenty years have passed since the publication of the first edition of this work was completed in 1972. During that time considerable advances have been made in our knowledge of the mammalian

fauna of the Arabian peninsula. Previously unknown species and subspecies have been described and new researches have necessitated changes in the status of some pre-existing taxa.

At the same time rapid development in the region has led to expanding interest in the Natural History of Arabia and to the foundation of many new Universities and Colleges with an interest in Zoology. Increased pressure on the environment has produced an urgent need for conservation of wildlife, especially of the large mammals, many of which are under serious threat of extinction. All these considerations indicate the need for an updated second edition of *The Mammals of Arabia* which we have jointly undertaken. Although some well illustrated books have appeared describing the mammals of various parts of the region and their general natural history, this is still the only comprehensive scientific reference work covering the whole peninsula. This edition is intended as an up-to-date revision of the taxonomic part of the first edition; its geographical scope is identical, including the entire peninsula, namely: Iraq; Syria; Lebanon; Jordan; Israel; Sinai; Kuwait; Saudi Arabia; Qatar; U.A.E.; Oman; North Yemen; South Yemen and the Arabian offshore islands. Its zoological scope is also similar, to include all wild terrestrial mammals occurring in the region; domesticated and marine mammals are excluded as well as those species that are definitely extinct.

Several changes in format and treatment of data have been introduced here in order to produce a compact and readily workable edition. Tables of measurements have been reduced to means, ranges and standard deviations, rather than tabulated data of individual specimens. Although in some ways regrettable this is an unavoidable necessity in a condensed edition. The treatment of subspecies is less formal here than in the first edition; they are now assessed in the general context of intraspecific variation. The descriptive text has been condensed, but it has been felt essential to retain the important details of external, cranial and dental morphology, especially having regard to the very real difficulties involved in distinguishing between many of the extant species found within the region; it is hoped that it will also prove useful for those undertaking palaeontological studies within Arabia. Knowledge of ecology and habits has greatly increased and therefore discussion of these aspects of the fauna has been much expanded. Distribution maps have been updated and while every effort has been made to include all significant new range extensions it is clearly no longer practicable to list every known record of the more abundant species.

Illustrations have been reviewed and many new photographic plates have been introduced as well as some new line drawings. Keys to identification have been simplified and made dichotomous wherever possible; character matrix keys have also been employed in some of the more complex and taxonomically difficult groups. Knowledge of karyology is rapidly expanding and becoming established as a useful adjunct to conventional morphological taxonomy. Where known, the karyotypes of Arabian specimens are briefly discussed with reference to the original sources in the literature, to which interested workers can refer. Synonymies have been simplified, with the exclusion of all taxa not directly relevant to this region. With these changes incorporated it is hoped that this new edition will provide a useful working tool for the taxonomists, ecologists, conservationists and palaeontologists alike.

The Arabian peninsula is a vast region with habitats of many types, including some of the most harsh and exacting on our planet. Much basic research still needs to be done on its mammalian life, which is of unique interest, including Eurasian and African elements as well as local endemic species. Successful conservation of this fascinating fauna can only be achieved by detailed scientific analysis of the component species and their habitat requirements. This book has been designed to assist in achieving this important and increasingly urgent objective

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Harrison, D. L. and I. P. Brownlow (1978). A comparative study of the baculum in bats of the genus *Scotophilus* (Chiroptera: Vespertilionidae).

Les os péniens des 5 espèces connues du genre *Scotophilus* sont étudiés et comparés dans cette note. Ils n'ont pas la valeur d'un caractère taxonomique pour reconnaltre les espèces de ce genre.

On constate une croissance post-natale de cet os; le baculum n'est pas ossifié chez les jeunes. Chez les adultes il est situé obliquement dans le gland. Un second specimen de *S. gigas* de Nigeria est signalé.

The baculum of all five recognised species of genus *Scotophilus* is studied and compared. It is of no value as a taxonomic character in distinguishing the species of this genus. Significant postnatal growth of the bone occurs; the baculum is unossifled in infants; in the adult it lies obliquely in the glans penis. The second specimen of *S. gigas* from Nigeria is recorded.

Harrison, D. L. and J. D. L. Fleetwood (1960). A new race of the flat-headed bat *Platymops barbatogularis* Harrison from Kenya Colony, with observations on the anatomy of the gular sac and genitalia.

Seven specimens of this remarkable bat, known hitherto by three individuals, were obtained on 12 February, 1958, at Lualeni Borehole, Maktau, southern Kenya Colony (03° 25' S., 38° 10' E.) by Mr. Ian Parker, of the Kenya Game Department, thus extending the known distribution of the species from the type-locality, i.e. Lokomarinyang Marsh, Ilemi Triangle, south-eastern Sudan (*vide* Harrison, 1956), to southern Kenya Colony.

The material consists of three adult females, one adult male, two immature females and an immature male. The specimens were preserved in alcohol from which they have been relaxed and prepared. They have been compared with the *Type* and paratypes of the species from Lokomarinyang, with which they agree in all essential characters, but they exhibit certain constant differences in size and colour, and we have concluded that they represent a new subspecies to science. This we propose to name in honour of its discoverer.

Harrison, D. L. and R. E. Lewis (1961). The large mouse-eared bats of the Middle East, with description of a new subspecies.

The greater mouse-eared bat, *Myotis myotis* Borkhausen, is recorded from Syria and Lebanon and a new subspecies is described, type locality 2 km east of Amchite, Lebanon. This bat exists together with the lesser mouse-eared bat, *Myotis blythi* Tomes, in certain localities in Syria and Lebanon. The forms *M. m. omari* Thomas (type locality Derbent, Iran) and *M. m. risorius* Cheesman (type locality Shiraz, Iran) are considered to be races of *M. blythi* Tomes, and it is considered likely that *risorius* is a synonym of *omari*.

Hatt, R. T. (1928). Note sur un chéiroptère nouveau du Soudan français (note presentée par M. Th. Monod). I. Introduction (par Th. Monod); II. *Chaerophon* (*Lophomops*) *nigri* sp. n.

(introduction written by Th. Monod.)

Deux faits intéressants ont été révélés par l'examen de la petite collection de Cheiroptères que j'ai recueillie au cours de la Mission Saharienne Augiéras-Draper. C'est d'abord la capture à Tamanrasset (Hoggar) de *Rhinolophus fumigatus* Rüppel (= *Rh.Antiornii* Dobson) (2) et la découverte, à; Bourem, en compagnie du banal *Pipistrellus Kuhli* Natterer, d'un *Chærophon (Lophomops)* nouveau pour la science.

J'ai communiqué les échantillons de cette dernière forme à M.le Dr Robert T. HATT qui à bien voulu rédiger la diàgnose que l'on trouvera plus loin.

Häussler, U., A. Nagel, M. Braun and A. Arnold (1999). External characters discriminating sibling species of European pipistrelles, *Pipistrellus pipistrellus* (Schreber, 1774) and *P. pygmaeus* (Leach, 1825).

Two forms of the common pipistrelle *Pipistrellus pipistrellus*, that emit echolocation calls at distinct frequencies have been found to exhibit considerable genetic divergence, thereby confirming their status as sibling species. The 45 kHz phonic type is usually regarded as *P. pipistrellus*, while the name for the 55 kHz phonic type remains to be clarified. Under discussion are *P. pygmaeus* (Leach. 1825). the type specimen of which is probably indeterminate. and *P. mediterraneus* (Cabrera. 1904). Diagnostic wing characters of the latter form were confirmed in animals corresponding with genetic markers. Because of its small body size and diet the German name "Muckenfledermaus" (midge bat) is proposed. Morphological differences in external characters were found between live *P. pygmaeus* from riparian habitats of the Rhine river valley in SW -Germany (n = 67) and alcohol material of *P. pipistrellus* from the same geographical region (n = 68). The following are useful as diagnostic field characters: 1. The 2nd (osseous) and 3rd (cartilaginous) phalanges of the 3rd digit are almost the same length in *P. pygmaeus*, while in *P. pipistrellus* the 3rd phalange is generally shorter than the 2nd. 2. In contrast to the typically greyish penis of *P. pipistrellus* carrying a light median band of mucosa across the dorsal aspect of the glans, the colour of the penis integument in *P. pygmaeus* is orange and there is no distinct median band. *P. pygmaeus* is also characterized by relatively shorter ears,. shorter snout, more densely furred tail membrane, and on average a shorter forearm and 5th finger.

Hayman, R. W. (1935b). On a collection of mammals from the Gold Coast.

The following report is based on a collection of 321 mammals from Ashanti and the Northern Territories of the Gold Coast, the result of an expedition to Ashanti in 1933-1934 by Mr. Willoughby P. Lowe and of a combined journey by Mr. Lowe and Miss F. Waldron through Ashanti and the Northern Territories in 1934-1935.

Four new forms are described, two of which represent genera not previously recorded from the Gold Coast (*Mylomys* and *Steatomys*), and the collection extends the known range of other West Coast species. Mr. Lowe was particularly successful in obtaining monkeys, and a striking red Colobus is now known to be peculiar to Ashanti.

I am greatly indebted to Mr. M. A. C. Hinton, F.R.S., Deputy Keeper of Zoology, for the opportunity to work out this important collection. Mr. R. I. Pocock, F.R.S., has been kind enough to contribute detailed notes on the leopards.

A note on the localities mentioned in this paper may be useful. Goaso and Mampong are entirely rain forest areas in Ashanti. Mr. Lowe informs me that Goaso, a particularly rich locality for the forest forms, was once the royal hunting ground of the kings of Ashanti. Ejura is just outside, the northern edge of the rain forest, but most of the obviously forest forms labeled Ejura come from a nearby strip of gallery forest. Farther north, Wenchi is hi the orchard bush country, and the remaining localities, Bole, Wa, Laura, Sicili River, Navarro, Tumu, and Tamale, are all in the Northern Territories, in the grass savannah areas.

Hayman, R. W. (1937). Postscript.

Some further specimens collected by the Lake Rudolf Rift Valley Expedition have come to hand since the author left England for a period of some months. At her request I have examined this material. It includes a new race of mouse-tailed bat (Rhinopoma), which Miss St. Leger asks me to describe, and a shrew and a spiny mouse not represented in the collection first received.

Hayman, R. W. (1938). A new Crested bat (*Chærephon*).

Among a small collection of mammals - chiefly bats - made recently in N.E. Rhodesia by Mr. D. Gordon Lancaster, and presented by him to the British Museum, there occurs a specimen of *Chærephon* with a long bicoloured crest and a pure white underside. Careful comparison with previously described forms shows that Mr. Gordon Lancaster's specimen belongs to an undescribed form, for which I now propose the name.

Hayman, R. W. (1941). British Expedition to South-west Arabia. 1. Mammalia: Chiroptera.

Examples of four species were brought back by Dr. Scott and Mr. Britton. One of them constitutes an addition to the list for Arabia, and the other three were found in places whence they had not previously been recorded. At the end of the paper is added a list of all the Chiroptera known from the area of the Expedition.

The specimens of the fruit-bat (*Eidolon sabaeum*) formed part of a colony which had previously rested in a cypress-tree within the walls of San'a. They alone, of the four species, were infested with insect-parasites, namely, a large species of *Cyclopedia* (Nycteribiidae). The examples of the three insectivorous bats were all found in a low cave, with roof sloping steeply upwards from the entrance, in sandstone rocks near the foot of Jebel Harir, in the Aden Protectorate.

Hayman, R. W. (1946). A new *Scotonycteris*, with notes on other Gold Coast bats.

Among the small mammals recently collected in the Gold Coast of West Africa by Mr. G. S. Cansdale for the British Museum are some interesting bats, one of them new, which add considerably to our knowledge of the Chiroptera of that region and demonstrate that we have much yet to learn about the.smaller mammals of the West African forest regions.

The new form is a small fruit bat, belonging to a genus of some rarity in collections, and may be known as

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Hayman, R. W. (1947b). A new race of *Scotonycteris zenkeri* from the Gold Coast.

A collection of mammals recently received from Mr. G. S. Cansdale, of the Gold Coast, contains a single specimen of the dwarf fruit bat *Scotonycteris zenkeri* which differs sufficiently from the Cameroon form to warrant distinction as a local race, for which I propose the name

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Hayman, R. W. (1947d). A new *Hipposideros* from Sierra Leone.

Among a collection of small mammals from Sierra Leone recently presented to the British Museum by Mr. T. S. Jones were three examples of a very distinct new bat of the genus *Hipposideros*, which may be described as

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Hayman, R. W. (1951). A new African molossid bat.

I am indebted to Dr. H. SCHOUTEDEN for the opportunity to examine and describe what appears to be a new species of Molossid bat from the highlands west of Lake Albert, in the Belgian Congo. I propose to name the new form

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Hayman, R. W. (1954). Notes on some African bats, mainly from the Belgian Congo.

I am indebed to Dr. M. POLL of the Musée Royal du Congo Beige for the opportunity to examine in London a large number (466) of unidentified bats from the collection in his care. Nearly all are in alcohol. Although many belong to comparatively well-known forms, others represent species either now recorded for the first time from the Belgian Congo, or presenting other points of special interest.

The following are new to the Belgian Congo, so far as I have been able to determine from available collections and literature.

Micropteropus grandis SANBORN.
Epomophorus gambianus OGILBY.
Rhinolophus hildebrandti PETERS.
Tadarida (Chaerephori) spillmanni MONARD.
Tadarida (Chaerephon) pumila CRETZSCHMAR.
Nycticeius (Scotoecus) hirundo hindei THOMAS. Genus and species.
Glauconycteris beatrix THOMAS.
Pipistrellus crassulus THOMAS.
Pipistrellus culex THOMAS.
Miniopterus minor PETERS.

The identifications of all the Congo Museum bats examined are given in the following list. The Congo Museum numbers are followed by localities, dates of collection where known, and the collector's name in parentheses. The localities are to be found on the accompanying map. Specimens are all in alcohol except where noted otherwise. Of the specimens listed, a set of duplicates has been generously presented to the British Museum by the authorities of the Congo Museum, but all unique specimens remain in the collection of the latter institution.

Hayman, R. W. (1957). Further notes on African bats.

The following brief notes on the distribution or status of some comparatively little-known African bats are based on specimens recently examined, the majority being among collections identified for the Congo Museum, Tervuren. I am indebted to Dr. M. POLL for the opportunity of studying these.

Hayman, R. W. (1960a). A note on the bat *Cloeotis percivali* Thomas.

(1) The characters distinguishing *Cloeotis percivali australis* have been examined and re-described in the light of additional material.

(2) The known range of *C. p. australis* has been extended by the recording of specimens from Bechuanaland, Northern Rhodesia, and Katanga, Belgian Congo.

(3) The noseleaf of *Cloeotis percivali australis* has been described in detail and is figured for the first time.

Hayman, R. W. (1960c). Notes on some small African mammals.

Among a number of small mammals from various localities in the highlands of Ethiopia, collected recently by Mr. F. R. ALLISON, there occurs a series of rats of an apparently undescribed race. They belong to the long-tailed, white-bellied group of *Rattus* formerly included in the *Myomys* subgenus by ELLERMAN (1941), but later, ELLERMAN, MORRISON-SCOTT and HAYMAN (1953), transferred to the subgenus *Praomys, Myomys* being considered unavailable because of uncertainty about the identification of its type species, *Mus colonus* BRANTS. This undescribed race is obviously closely

related to *Rattus (Praomys) fumatus* of Kenya and to the form *brockmani* of Somaliland which is best regarded as a subspecies of *fumatus*.

Hayman, R. W. (1963). Mammals from Angola, mainly from the Lunda District.

Among the material results of the extensive biological investigations into the fauna and flora of the Lunda District of Northeastern Angola, initiated and sustained by the Dundo Museum, is a valuable collection of the smaller mammals of that district which has been entrusted to me for examination in London. This collection, totalling 602 specimens, has proved to include a number of forms of special interest; the present report lists fourteen forms new to Angola and adds two new species of bat to the Angolan list. The collection includes a few specimens from other regions of Angola, but the major part is from the Lunda District, from the Congo border in the north to the Kasai-Zambesi watershed in the south.

It should be stressed that this collection in no way represents the total mammal material preserved in the Dundo Museum. It represents rather a selection of forms which Dr. MACHADO considered to be worthy of further examination by a specialist. Dr.MACHADO informs me that it is intended to prepare at a later date a more comprehensive work on the mammal fauna of the Lunda District.

The Lunda District has been thoroughly described in all its aspects by Dr. A. DE BARROS MACHADO (1952) of the Dundo Museum. He has stressed the fact that, zoogeographically, this is a highly interesting region presenting, in close proximity, essential elements of both the Guinea-Congo and the Zambesian-Rhodesian faunas. This situation is accounted for by the fact that the district as a whole consists of a gentle slope to the northward of the typical Rhodesian-type savannah, deeply intersected by the numerous northward flowing rivers draining the region towards the lower Kasai and hence to the Congo. The courses of these rivers are marked by long narrow strips of gallery forest extending like long fingers from the Congo rain forests of the north deep into the savannah region. The result of this interlocking of two entirely distinct environmental regions is that in this area of Angola the distinction between the two faunas (so far as mammals are concerned, at least) is very clearly shown in spite of the often close approximation in actual territory. The collection itself illustrates the comparative numerical paucity of forest species (perhaps influenced also by the comparative difficulty of finding and collecting them) in that it contains representatives of only eleven forms which can be truly considered fully representative of forest environments, but of no less than sixty-eight forms associated mainly with the savannah environment, and indicating to a large extent affinity with the mammalian fauna of the Zambesi-Rhodesian-Katangan region. Thus this collection of mammals reinforces the views already clearly and fully expressed by Dr. A. DE BARROS MACHADO regarding the faunal relationships of the Lunda District.

The following forms are here listed for the first time from Angola.

Crocidura nigrofusca MATSCHIE
Crocidura cyanea electa DOLLMAN
Crocidura aff. denti DOLLMAN
Crocidura aff. roosevelti HELLER
Crocidura russula silacea THOMAS
Epomophorus crypturus PETERS
Scotophilus nigrita dingani A. SMITH
Nycticeius (Scotoecus) hirundo albigula THOMAS
Taphozous (Saccolaimus) peli TEMMINCK
Helogale parvula varia THOMAS
Heliosciurus gambianus rhodesiae WROUGHTON
Graphiurus (Claviglis) murinus lorraineus DOLLMAN
Rattus (Mastomys) natalensis bradfieldi ROBERTS
Dendrohyrax (Dendrohyrax) arboreus braueri HAHN

In addition, the following form, although reported by Dr. MACHADO (1952) was overlooked by ELLERMAN, MORRISON-SCOTT and HAYMAN (1953) and by the Zoological Record (Mammalia): - *Cercopithecus neglectus* SCHLEGEL.

The two new species of bat described below are *Micropteropus intermedius* and *Glauconycteris machadoi*.

Measurements. These are given throughout in millimetres, except where otherwise indicated.

Hayman, R. W. (1964). Notes on a West African bat *Hipposideros jonesi*.

La présence d'*Hipposideros jonesi* Hayman est. rapportée pour la première fois du Ghana. Des mesures comparatives de cette population et d'autres specimens montrent une variation selon un cline à travers l'aire géographique connue. L'existence de deux phases de coloration est discutée; des variations de structure dans la feuille nasale sont notées.

Hayman, R. W. and D. L. Harrison (1966). A note on *Tadarida* (*Chaerophon*) *bivittata* Heuglin.

A reexamination has been made of the original specimens of the little-known bat *Tadarida (Chaerephon) bivittata* Heuglin. Detailed external measurements and skull measurements are published for the first time. Further specimens from Kenya, Uganda and Northern Rhodesia (Zambia) are also reported on. It is concluded that the species is a very distinct one but that the colour pattern, particularly as regards the spotting or striping from -which the species takes its name, is very variable individually.

Hayman, R. W. and J. E. Hill (1971). Order Chiroptera.

The preparation of this work, in which 10 families, 46 genera and 212 species are keyed and annotated, has shown that the scope for further work on practically every aspect of African bat systematics and biology is unlimited. Basically, it has shown that:

1. although the total number of specimens reported on, either directly or in the available literature, is very considerable, it is true to say that in relation to the total land mass of Africa, viewed as possible bat habitat, the numerical representation in the world's museums is negligible;

2. the geographic gaps in the representation of even the commonest species are enormous, and are probably due to the purely accidental incidence of the location of many collector's stations and to the accessibility, or lack of accessibility, of many others;

3. the number of species, which in some cases were first made known to science half a century or more ago and which are even now represented in collections in no more than single figures, is surprisingly high;

4. the taxonomic status and affinities of many of the more abundant species, represented in museum collections by a considerable quantity of material, are still very frequently the subject of widely divergent views held even by present-day workers;

5. the total volume of reliable field data available for even the most abundant species is pitifully small.

In view of these facts it is not to be expected that anything approaching finality on many aspects of taxonomy and geographic distribution would be possible at the present time. It has been attempted here to bring together in an unbiased fashion the divergent views expressed in many cases, and to present such keys as are (a) possible in the present state of knowledge, and (b) practicable for use in the field with the minimum use of detailed dental and cranial examination. The notes supplied wherever considered necessary should be used in conjunction with the keys. They are intended to draw attention to the problems still awaiting an agreed solution, and to indicate how various authors have up till now dealt with them.

The bibliography is designed with two main objectives. One is to provide references to all bat names which have not already appeared in any one of the three standard check lists covering Africa either in whole or in part, namely Alien (1939), Ellerman and Morrison-Scott (1951) and Ellerman, Morrison-Scott and Hayman (1953), thereby bringing up to date (to the end of 1966*) the lists of African bat names already provided in those works. Such additional names in the text are provided with the page reference in addition to the author and year; the full references appear in the bibliography. The second main objective is to provide the full reference for every authority cited in the text.

All measurements in the text are given in millimetres.

It may be added that without the very full facilities available at the British Museum (Natural History), in the form of both the wide scope and historical importance of the rich collections, and the very comprehensive library resources, even a purely provisional work such as this would have presented yet more problems than did in fact arise during its compilation.

Since the retirement of the senior author in November, 1967, soon after the completion of the preliminary draft of this work, the arduous task of assessing, and where appropriate, incorporating the comments and criticisms of other workers, as well as the major points of a number of relevant works published after the completion of the draft and up to December 1968, has been willingly and conscientiously undertaken by the junior author, without whose whole-hearted co-operation the completion of this work would not have been possible.

Hayman, R. W., X. Misonne and W. N. Verheyen (1966). The bats of the Congo and of Rwanda and Burundi.

Historically, the beginning of published records of *Chiroptera* found in any part of the present Republique du Congo, formerly the Congo Belge (referred to subsequently herein as the Congo) appears to date from JOHNSTON (1884), who presented a short list of bats identified from the Congo River from its mouth to Bolobo. So far as appears from the literature examined, the next list of bats from any part of the region is included in the report by THOMAS (1888) on the mammals obtained by that indefatigable investigator Emin Pasha in the north-east of the Congo basin. Thereafter a long hiatus in the listing of Congo bats extended almost to 1915, when THOMAS recorded some of the interesting results of the collections made in the Ituri region by Dr C. CHRISTY on behalf of the Congo Museum, Tervuren.

The first real landmark in the literature on the subject, and a major contribution to knowledge of the bats of the north-east Congo in particular, especially the Ituri Forest and the Uele savannahs, was the detailed taxonomic report by J. A. ALLEN (1917) on the vast collections made by H. LANG and J. P. CHAPIN on behalf of the American Museum of Natural History. These consisted of nearly 800 specimens. ALLEN listed them as 68 forms, no less than 29 of which he described as new. As ALLEN was the first to admit, the difficulties due to the first World War made it impossible for him to compare this rich material with forms already described from neighbouring regions of Africa, mainly housed in European museums. The lack of so many of these forms in American museums at that time made reliance on descriptions in the literature inevitable. As a consequence, it is now known that a good proportion of ALLEN'S new names fall into the synonymy of earlier described species from outside the Congo. Nevertheless, ALLEN'S work remains an essential point of departure for all later investigators of Congo bats, although the status of a number of his new names is still in doubt. Further, the copious field notes provided by the trained field workers LANG and CHAPIN contribute a very important part of the American Museum report.

From the date of ALLEN'S work stem more and more frequently local lists, taxonomic reports on collections, and extensions of range for many of the bats of the region. As a consequence of this stimulus to research, the list of forms recognised from the Congo has grown steadily; the list forming the basis of the present work catalogues 34 genera and approximately 120 species (allowing for the uncertain status of a few names).

This increase has been largely due to the intensive collecting carried out in the National Parks of the Congo, notably in the Parcs Nationaux Albert, Garamba, Upemba and Kagera, during the past three decades, by trained investigators working on behalf of the Institut des Parcs Nationaux du Congo. Among the names outstanding in this connection are those of G. F. DE WITTE, S. FRECHKOP and others. The results of most of these collections have been reported on mainly by Dr. H. SCHOUTEDEN and S. FRECHKOP. The outstanding work of Dr. SCHOUTEDEN in this field needs no stressing, and the appearance in 1947 of his invaluable work, De Zoogdieren van Belgisch Congo en van Ruanda-Urundi, marks the second landmark in the history of the cataloguing of the Congo bats (among other mammals). In particular, the synthesis of all recorded occurrences of Congo bats up to that date has provided an excellent view of the geographical distribution, so far as collecting has revealed. Apart from the special collections from the National Parks, very large collections of bats have been made in recent years in the Katanga region, where the abundance of mine shafts, old and new, has provided bat collectors with a fruitful source of supply. All these collections, totalling nearly 7000 specimens, have been preserved in Brussels; partly in the Musée Royal de l'Afrique Centrale (formerly the Musee Royal du Congo Beige) at Tervuren, partly in the Institut Royal des Sciences Naturelles de Belgique, partly in the Institut des Parcs Nationaux du Congo. The opportunity in 1962 to investigate personally a large part of these collections, at the invitation of the authorities concerned, proved of great assistance to the senior author of this list, and enabled a number of identification and taxonomic problems to be solved. In addition, over 500 Congo bats in the British Museum (Natural History) have been examined, and the report by J. A. ALLEN on the 794 specimens forming the American Museum of Natural History's north-east Congo collection has been made much use of.

The third landmark in the literature on the Congo bats was the publication in 1957 of the major work by J. VERSCHUREN on the ecology, biology and systematics of the bats of the Garamba National Park. The thoroughness of this work, and the light it threw on many aspects of bat life in this selected region of the Congo, set a pattern for the future which will be difficult to excel.

It is very much to be hoped that the political changes which have taken place recently, leading to the independence of the Congo, will not in the long run hamper unduly the further investigation of many parts of the territory, which, as the compilation of this list has shown, are still very poorly represented in museums. The comparatively intense collecting of bats in the north-east of the Congo and in the Katanga region has stressed by contrast the need for similar large scale collecting in most parts of the central Congo basin, in the Lower Congo region, and also in the highlands of the Albertine Rift borderlands.

Zoogeographically, the Congo basin occupies a unique position in Africa from many faunal aspects. Its central position in the continent, its immense size, and particularly the enormous extent of the tropical forest belt, all contribute to its importance. Particularly it is clear that the almost unbroken extent of rain forest extends the range of very many of the typically West African forest forms as far east as the eastern border of the forest zone, which partly coincides with the political boundary in the east along the Rift Valley. Further, both to the north and to the south, the open savannahs, intersected frequently by the gallery forests bordering the river systems draining towards the Congo, support a bat fauna consisting partly of the Sudanese-East African-Rhodesian savannah elements, partly of the West African element extending north and south of the central forest zone by way of the gallery forests. There is no doubt that further collecting in all regions will produce still more species not yet listed from the Congo, and there is also little doubt that undescribed forms still remain to be obtained. Modern methods of bat collecting, particularly .the use of mist nets which elsewhere have shown spectacular results in catching forms not normally collected by conventional methods, will undoubtedly play a large part in filling the gaps (still far too wide) in our knowledge of the bats of the region.

The present list, it has seemed to us, may fill a need in putting on record a summary of the present data on the taxonomy and particularly the distribution of the Congo bats. It is hoped that it may stimulate further interest among those in a position to carry the work further ; the distribution maps in particular will help to indicate where the greatest gaps lie. It should also be stressed that wherever keys are provided, it is not claimed that they are final or perfect; they are offered as some assistance to those wishing to develop their interest in the subject. It is, unfortunately, still not possible to be positive about the status of a number of Congo bat names, particularly in the difficult group Molossidae and in some of the Vespertilionidae. It must be left to future workers to complete the task.

Heim de Balsac, H. (1934a). Mission Saharienne Augiéras-Draper 1927-1928. Mammifères.

La collection de Mammifères recueillis, au cours de la Mission AUGIERAS-DRAPER, a déjà fait l'objet de plusieurs notes de la part de TH. MONOD. Néanmoins le sujet n'était pas épuisé et l'auteur nous a prié de bien vouloir examiner lé matériel dans son ensemble. L'intérêt que présentent les Mammifères de l'A'haggar et des régions situées au delà n'était pas douteux. Dans la littérature il n'existe que deux notes de première main concernant la faune mammalienne de ces régions, basées sur les récoltes de BUCHANAN, qui furent étudiées par O. THOMAS et M. HINTON: Comme il était à prévoir, nous avons trouvé des faits nouveaux dont certains présentent un intérêt biogéographique. Nous ne reviendrons pas ici sur le trajet effectué par la Misson, ni sur les localités traversées; ces détails se trouvent dans des publications antérieures et dans la note que nous avons consacrée ici même aux Oiseaux rapportés par la Mission.

Heller, E. (1912). New races of Insectivores, Bats, and Lemurs from British East Africa.

Further study of the collection of East African mammals in the U. S. National Museum has resulted in the discovery of several new races of insectivores, bats, and lemurs, which are described in the present paper.

Nearly all of these new forms have been detected in the collection recently made under the direction of Mr. Paul J. Rainey in British East Africa.

The new races described are chiefly from the summits of isolated mountains situated either in the northern desert of British East Africa near the Abyssinian border, or else in the Taru Desert near the coast.

The material has been compared directly with the types of the described species in the British Museum. For the privilege of examining the specimens, in the British Museum, and for facilities in the working out of the collection the writer is indebted to Mr. Oldfield Thomas, the curator of mammals.

Heller, K. G. (1992). The echolocation calls of *Hipposideros ruber* and *Hipposideros caffer*.

Bats of the *Hipposideros caffer/ruber* - group are the commonest representatives of this genus in many regions of Africa. In large parts of their range two morphologically very similar species, *H. caffer* and *H. ruber*, occur sympatrically. We studied the frequency in the constant frequency part of the echolocation calls of bats belonging to this group in Irangi (Prov. Kivu, Zaire). Here we found two forms with frequency bands of 132 - 138 kHz and 154 - 157 kHz, which also differed in forearm length (53 - 56 mm and 50 - 52 mm). Taking into account other acoustic and morphological data, our results indicates that *H. ruber* emits calls with frequencies between 130 and 140 kHz, whereas the calls of *H. caffer* are higher in frequency, especially in areas where both species occur sympatrically.

Heller, K. G. and M. Volleth (1984). Taxonomic position of "*Pipistrellus societatis*" Hill, 1972 and the karyological characteristics of the genus *Eptesicus* (Chiroptera: Vespertilionidae).

Recently collected material (five specimens from Ulu Gombak, Malaysia) shows that *Pipistrellus societatis* Hill 1972 has to be considered as a lowland form of *P. circumdatus* Temminck 1840. Chromosomal analysis (2n = 50, FN = 48) and examination of the baculum prove that *Pipistrellus circumdatus* be placed in the genus *Eptesicus*. Karyological and morphological differences of the genera *Vespertilio, Pipistrellus* and *Eptesicus* are discussed. Extension of the definitions of these genera is proposed, taking into consideration karyological characteristics and the form of the baculum. The number of premolars is considered less significant.

Anhand von neu gesammeltem Material (fünf Exemplare aus Ulu Gombak / Malaysia) wird gezeigt, daß *Pipistrellus societatis* Hill, 1972 als Tieflandform von *Pipistrellus circumdatus* Temminck, 1840 zu betrachten ist. Aus der Chromosomenanalyse (2n = 50, FN = 48) und der Untersuchung des Baculums geht hervor, daß *P. circumdatus* in die Gattung *Eptesicus* zu stellen ist. Die karyologischen und morphologischen Unterschiede der Gartungen *Vespertilio, Pipistrellus* und *Eptesicus* werden diskutiert. Es wird eine Erweiterung der Definitionen dieser Gattungen unter Einbeziehung der karyologischen Merkmale und der Baculumform vorgeschlagen. Der Anzahl der Prämolaren wird dabei weniger Wert beigemessen.

Heller, K. G. and M. Volleth (1995). Community structure and evolution of insectivorous bats in the Palaeotropics and Neotropics.

The most diverse known communities of insectivorous bats in the Palaeotropics and Neotropics are similar in alpha diversity (number of species). However, they show distinct differences with respect to wing morphology and the echolocation behaviour of their component species. In the Palaeotropics, most bat families are clearly separated in wing morphospace. The morphological niche of Rhinolophidae is vacant in the Neotropics, but primitive echolocators using sound primarily for scanning the environment rather than for prey capture are much more frequent there than in the Palaeotropics. In our opinion, a large portion of this difference can be traced to the different evolutionary histories of the respective communities. Bat families of different geographical origin are involved and their foraging styles obviously evolved differently in the Old and New World.

Heller, K. G., M. Volleth and D. Kock (1994). Notes on some vespertilionid bats from the Kivu region, Central Africa (Mammalia: Chiroptera).

Three species of rare vespertilionid bats were recorded in 1990 in the Kivu region (Rwanda and Zaire): *Hypsugo eisentrauti* (new for Rwanda), *Hypsugo crassulus* (additionally new for Ivory Coast) and *Glauconycteris beatrix*. The West African *H. eisentrauti bellieri*, according to the holotype skull and skin studied, is to be removed from *H. eisentrauti* and very probably represents a western subspecies of *H. crassulus*. Of all three species and some further *Glauconycteris* sp. Bacula are illustrated and for both *Hypsugo* species distribution maps are given. The taxonomic status of *G. beatrix, G. poensis* (1st record from Cameroon) and *G. humeralis* is discussed.

Herholdt, E. M. (1989). A new distribution record for the Botswana long-eared bat in South Africa.

A new distribution record for *Laephotis botswanae*, the Botswana long-eared bat, is reported from the Waterberg area of the north-western Transvaal, based on four specimens collected over seven months. Some observations on the natural history of this species are made.

'n Nuwe verspreidingsrekord vir *Laephotis botswanae*, die Botswana-langoorvlermuis, gebaseer op vier eksemplare versamel oor 'n termyn van sewe maande, word gerapporteer vanaf die Waterberg-distrik van die noordwes-Transvaal. Waarnemings rakende hierdie spesies se algemene biologie word ook genoteer.

Herlant, M. (1953). Etude comparative sur l'activité génitale des cheiroptères.

Etude comparée du tractus génital et de l'hypophyse chez un Megacheiroptère congolais, *Epomophorus anurus* et chez quelques Microcheiroptères indigènes, en particulier, *Myotis myotis* et *Rhinolophus ferrum equinum*.

Epomophorus anurus ne parait pas présenter de phase d'activité sexuelle bien nette et en toutes saisons, on trouve des femelles à divers stades de la gestation. Chez le mâle, la spermatogénèse paraît constante. Il n'a pas été possible, d'autre part, d'étudier le comportement de femelles adultes en dehors de la gestation ou de la lactation. La phase oestrale est apparemment de courte durée.

Cette activité génitale contraste très fortement avec celle de *Myotis myotis* qui est monœstral. De nombreuses femelles au terme de la gestation ont été capturées à la fin du mois de mai et des femelles lactantes en juin. La lactation est encore active à la fin du mois de juillet mais la glande mammaire a complètement régressé chez des femelles capturées à la fin de septembre. A cette époque, la maturation des follicules s'accélère mais le follicule destiné à se rompre au printemps suivant ne se différencie de ses congénères que durant la phase d'hibernation. Néanmoins, dès la fin du mois de septembre, nous avons trouvé des femelles de *Myotis myotis* et de *Rhinolophus ferrum equinum* fécondées.

L'hypophyse des Chéiroptères constitue un matériel de choix pour l'étude de la deuxième forme de cellules acidophiles. En comparant ces éléments chez *Epomophorus* où elles sont peu chromophiles, et chez *Myotis* où elles manifestent une-forte affinité pour l'érythrosine, on peut aisément conclure que ces éléments se différencient à partir des chromophobes et forment une souche distincte des cellules acidophiles classiques.

Les cellules érythrosinophiles ont des rapports étroits avec la gestation et la lactation. Chez *Epomophorus* comme chez *Myotis*, elles.sont rares et mal développées chez le mâle et la femelle impubère tandis qu'elles constituent les cellules les plus nombreuses chez la femelle gravide ou lactante, en outre chez *Myotis*, il a été possible de suivre leur involution progressive au cours du post-partum et de la phase œstrale automnale. L'étude de ces éléments chez les Cheiroptères confirme l'hypothèse suivant laquelle ces cellules sécrètent la prolactine.

L'hypophyse des Vespertilionides se prête très favorablement à la distinction entre les deux formes de cellules basophiles. Cette distinction est plus malaisée chez les Rhinolophides et chez *Epomophorus* par suite de la faible chrômophilie de ces éléments. Chez *Epomophorus* adulte, en toute saison dans les deux sexes, les cellules basophiles manifestent des signes d'activité secrétpire intense mais chez *Myotis*, ces éléments ont une évolution cyclique très nette, ils augmentent considérablement de nombre en automne et montrent des images d'activâîion en rapport avec la phase œstrale. On voit de plus chez cette espèce, que ces phénomènes affectent uniquement l'une des formes basophiles.

Herreid, C. F. and R. B. Davis (1966). Flight patterns of bats.

The time of the evining emergence and return of Tadarida brasiliensis mexicana is correlated with light conditions. ..... three annual emergence patterns in bats: (1)species without seasonal differences in emergence time in relation to sunset, (2)species which leave relatively later in the spring and fall and (3)species which emerge relatively earlier in the spring and fall. ...

Herselman, J. C. and P. M. Norton (1985). The distribution and status of bats (Mammalia: Chiroptera) in the Cape Province.

Distribution maps with notes on taxonomy, distribution and status, habits, food and breeding are presented for 29 species of bats occurring in the Cape Province of the Republic of South Africa. Comparisons are made between data from the survey, which lasted from 1976 to 1979, and specimens examined in South African museums. The main motivation for the survey was the conservation of bats. A high priority was placed on collecting from roosts. Some very scarce and endemic species were collected and many interesting new localities were recorded.

Verspreidingskaarte met aantekeninge oor die taksonomie, verspreiding en status, gewoontes, voedsel en aanteel van 29 species vlermuise wat in die Kaapprovinsie van die Republiek van Suid-Afrika voorkom, word aangebied. Vergelykings word gemaak tussen gegewens wat versamel is tydens

die intensiewe opname, wat vanaf 1976 tot 1979 geduur het, en monsters wat bestudeer is in die groter Suid-Afrikaanse museums. Die motivering vir die opname was die bewaring van vlermuise, en 'n hoê voorkeur is geplaas op die versameling van data in die skuilplekke van elke spesie. Sommige van die baie skaars en endemiese spesies is versamel, en interessante nuwe voorkoms lokaliteite is gevind.

Herzig-Straschil, B. and G. A. Robinson (1978). On the ecology of the fruit bat, *Rousettus aegyptiacus leachi* (A. Smith, 1829) in the Tsitsikama Coastal National Park.

Field observations were carried out on *R. aegyptiacus* in the Tsitsikama Coastal National Park in the winter of 1974 and the summers of 1975 and 1976. The roost of the fruit bat population was a cave in the narrow gorge of the Storms river. The population was estimated at 3 000 bats. Activity during the night was found to be significantly longer in summer than in winter. The possible reaction of these bats to the commencement of activity to moon light conditions at the cave is discussed.

Food items (*Ekebergia capensis, Cassine crocea, Acokanthera oppositifolia* and *Viscum obscurum*) were established by direct observations or by identification of food remains and seeds in the guano.

Time of birth of infants was calculated from the forearm length of captured bats. According to these calculations parturition takes place during October to June with a peak in December.

Heuglin, Th. von and L. J. Fitzinger (1866). Systematische Uebersicht der Säugethiere Nord-Ost Afrika's, mit Einschluss der arabischen Küste, des rothen Meeres, des Somáli- und der Nilquellen-Lander, südwärts bis zum vierten Grade nördlicher Breite.

Die vorliegende Arbeit enthält eine Zusammenstellung sämmtlicher Säugethiere, welche seither in Nordost-Afrika und dem an das rothe Meer angrenzenden Theile von Arabien von den verschiedenen Naturforschern, die jene weitausgedehnten Länderstrecken bereisten, aufgefunden, beschrieben oder beobachtet worden sind; somit eine vollständige Säugethier-Fauna jener Länder.

Es ist dieselbe das Werk des rühmlichst bekannten Naturforschers und Reisenden Herrn Dr. Theodor von Heuglin, und größtentheils auf seine eigenen Beobachtungen gegründet, die er während einer längeren Reihe von Jahren auf mehrfachen und in den verschiedensten Richtungen unternommenen Reisen in jenen Ländern zu machen Gelegenheit fand.

Schon im Jahre 1859 habe ich der kais. Akademie der Wissenschaften über dieses höchst verdiensthche und für den Zoologen so wichtige Elaborat Bericht erstattet und einen kurz gefaßten Auszug aus demselben mitgetheilt, Welcher auch im XXXVI. Bande der Sitzungsberichte der mathematisch-naturwissenschaftlichen Classe im Drucke erschien; indem ich die Absicht hatte, dasselbe nach der mir vom Herrn Verfasser übertragenen Richtigstellung der Bestimmungen nach den von ihm gesammelten Original-Exemplaren und Ergänzung mit seinen auf einer späteren Reise gemachten Entdeckungen und gewonnenen Erfahrungen, ehestens in den akademischen Schriften zu veröffentlichen.

Eine neuerliche Reise des Herrn Dr. v. Heuglin in den Südosten von Afrika, welche eben in jene Zeit fiel, war die Ursache, daß ich die Veröffentlichung jener Arbeit damals unterließ, um auch die Entdeckungen auf dieser neuesten Reise in dieselbe einzuschalten und ihr dadurch eine um so größere Vollständigkeit zu geben.

Nachdem dies geschehen und ich sonach den Wunsch des Herrn Verfassers erfüllt habe, glaube ich nicht mehr zögern zu dürfen, jene Arbeit zu veröffentlichen, welche ihrer Wichtigkeit wegen gewiß bei allen Zoologen freundliche Aufnahme finden wird und denjenigen Naturforschern , welche in der Folge das nordöstliche Afrika und den westlichen Theil von Arabien bereisen sollten, von wesentlichem Nutzen sein dürfte.

Ich wiederhole, was ich schon in meinem im Jahre 1859 an die kais. Akademie der Wissenschaften erstatteten Berichte ausgesprochen habe, daß ich an dieser Arbeit kein anderes Verdienst habe, als

die Richtigstellung der Bestimmungen nach den vom Herrn Verfasser gesammelten und nun größtentheils im kais. zoologischen Hofcabinete zu Wien aufbewahrten Original-Exemplaren, die Sichtung der Synonymie und die Einschaltung der mir von ihm zugekommenen brieflichen Mittheilungen, sowie auch die Einreihung der den genannten Ländern eigenthümlichen Raçen von Hausthieren. Schließlich muß ich noch bemerken, daß von den unter den Synonymen angeführten beiden Heuglin'schen Schriften jene, welche den Titel "Fauna des rothen Meeres und der Somali-Küste" führt, in "Petermann's geographischen Mittheilungen" 1861, Heft I, die andere aber, welche unter dem Titel "Beiträge zur Kenntniß der Säugethiere" citirt ist, der ungünstigen Zeitverhältnisse wegen bis jetzt noch nicht erschienen ist.

Hill, J. E. (1963a). A revision of the genus *Hipposideros*.

The genus *Hipposideros* presents a wide range of morphological variation, and the characters of its numerous species rarely combine to indicate clearly defined natural groups or evolutionary trends. This revision, based chiefly on the features of the ears, noseleaf and skull, discusses the morphological criteria within the genus and its supraspecific groupings, recognizing seven species groups containing a total of forty-three species. These groups and their included species are described in some detail, with keys, and their probable relationships have been defined and discussed. These studies have suggested a less diffuse classification of *Hipposideros* than those proposed by earlier revisers, and indicate that despite the wide morphological dissimilarity of many of its species, the genus includes but three major evolutionary trends.

Hill, J. E. (1963b). Some notes on the *Pipistrellus ceylonicus* group, with the description of a new subspecies.

Brief notes are given on the historical and current classification of the members of the *Pipistrellus ceylonicus* group. The named forms hitherto referred to the group are considered to constitute a single species. *Pipistrellus ceylonicus*, which is recorded for the first time from Borneo with the description of a new subspecies.

Hill, J. E. (1964). Notes on a collection of bats from Figuig, Morocco.

Cet article rapporte la présence de *Tadarida teniotis rueppelli* au Maroc et de *Pipistrellus savii* en Algérie, les deux apparemment pour la première fois. Il indique de nouvelles captures au Maroc d'*Eptesicus serotinus isabellinus, Pipistrellus kuhli kuhli, Pipistrellus savii* et *Plecotus austriacus* (?) *christei*. Notes historiques et taxinomiques.

Hill, J. E. (1965). Asiatic bats of the genera *Kerivoula* and *Phoniscus* (Vespertilionidae), with a note on *Kerivoula aerosa* Tomes.

Etude des statuts respectifs des genres *Kerivoula* et *Phoniscus*, lequel mérite le rang de genre. Les 9 espèces de *Kerivoula* en Asie sont recensées et le genre *Phoniscus* est revisé. Etude plus approfondie de *K. aerosa*, dite d'Afrique du Sud mais qui s'avère être un *Phoniscus* peut-être d'origine asiatique.

The relative status of the nominal genera *Kerivoula* and *Phoniscus* is examined and *Phoniscus* accorded generic rank. Nine species of *Kerivoula* are recognised in the Asiatic part of its range and these are briefly reviewed, while the named forms referable to *Phoniscus* are reviewed and an outline of the probable classification of this comparatively little known genus is presented. A further examination is made of *Kerivoula aerosa* Tomes, reputedly from South Africa. It is shown to be a *Phoniscus* and possibly may be of Asiatic origin.

Hill, J. E. (1966). The status of *Pipistrellus regulus* Thomas (Chiroptera, Vespertilionidae).

L'auteur fait une étude critique des spécimens originaux de *Pipistrellus regulus* Thomas du sud-ouest de l'Australie. Le type est une peau de *Chalinolobus morio* associée a un crâne d'*Eptesicus pumilus*, tandis que l'autre spécimen est une peau et un crâne de *Chalinolobus morio*. Pour remédier à cette confusion, le crâne du "specimen type" est designé comme "lectotype" de *Pipistrellus regulus* qui devient synonyme d'*Eptesicus p. pumilus*. De même, *Registrellus* Troughton, dont *Pipistrellus regulus* est l"espece type, tombe en synonymie avec *Eptesicus*.

A critical examination is made of the original specimens of *Pipistrellus regulus* Thomas from southwestern Australia. The type specimen is found to consist of a skin of *Chalinolobus morio* in association with a skull of *Eptesicus pumilus*, while the other specimen proves to be a skin and skull of *Chalinolobus morio*. To resolve this confusion, the skull of the "type specimen" is designated as the lectotype of *Pipistrellus regulus* so that this name becomes a synonym of *Eptesicus pumilus pumilus* and *Registrellus* Troughton, of which *Pipistrellus regulus* is the type species, falls to the synonymy of *Eptesicus*.

Hill, J. E. (1968). Bats from the Cameroons, with the description of a new species of *Pipistrellus*.

The small collection of bats from the Western Cameroons reported in this paper is complementary to the earlier detailed studies of the area and its fauna by Professor Martin Eisentraut (1957, 1963), who obtained the present collection. The majority of the species represented have already been recorded from the region but the new material now reported adds *Rhinolophus clivosus, Pipistrellus kuhlii* and *Tadarida ansorgei* to the known bat fauna of the Cameroons and additionally includes three specimens of a novel *Pipistrellus*, here described as *Pipistrellus eisentrauti* in honour of its collector.

Hill, J. E. (1974a). A review of *Laephotis* Thomas, 1901 (Chiroptera: Vespertilionidae).

The majority of specimens of *Laephotis* hitherto reported in the literature are allocated to the appropriate one of the four species recognized in the most recent study of this genus, and these are briefly reviewed. Female specimens of *L. wintoni* are recorded from Ethiopia, whence until now the genus has been unreported.

Hill, J. E. (1974b). A review of *Scotoecus* Thomas, 1901 (Chiroptera: Vespertilionidae).

The vespertilionid genus *Scotoecus* is reviewed in detail, and is considered to include four species, one, *pallidus*, from India, having been referred at one time to *Scoteinus* and more recently to *Nycticeius*. The three remaining, *albofuscus, hirundo* and *hindei* are African: evidence is brought forward to support the view that *hirundo* and *hindei* are specifically distinct, not conspecific as thought by the majority of modern authors. Both are reported for the first time from the Cameroon and from Ethiopia.

Hill, J. E. (1976). A note on *Pipistrellus rusticus* (Tomes, 1861) (Chiroptera, Vespertilionidae).

The African vespertilionid species *Pipistrellus rusticus* (Tomes, 1861) is reviewed in some detail and the subspecies *P. r. rnarrensis* Thomas & Hinton, 1923 recorded for the first time from Ghana, Cameroon and Kenya.

Hill, J. E. (1977a). A review of the Rhinopomatidae (Mammalia: Chiroptera).

The major diagnostic features of the microchiropteran family Rhinopomatidae are reviewed, with a detailed account of the sole included genus, *Rhinopoma*. Current taxonomic opinion in the genus is synthesized with the recognition and definition of three species.

Hill, J. E. (1977b). African bats allied to *Kerivoula lanosa* (A. Smith, 1847) (Chiroptera: Vespertilionidae).

The smaller of the African forms of *Kerivoula* with fringed interfemoral membrane are reviewed and discussed. They are referred to one species, *K. lanosa* (A. Smith, 1847), with *K. l. harrisoni* Thomas, 1901, *K.ll. muscilla* Thomas, 1906 and *K. l. lucia* Hinton, 1920 as valid subspecies. *Kerivoula harrisoni bellula* Aellen, 1959 is considered a synonym of *K. lanosa muscilla*.

Hill, J. E. (1980). The status of *Vespertilio borbonicus* E. Geoffroy, 1803 (Chiroptera: Vespertilionidae).

The taxonomic history of *Scotophilus borbonicus* (E. Geoffroy, 1803) from Reunion Island is reviewed and summarised, with the designation of a lectotype. The insular form that it represents is considered conspecific with the small *Scotophilus viridis* (Peters, 1852) of southern Africa. As a result, *Scotophihis borbonicus* becomes the valid name for this species, and will also replace *Scotophilus leucogaster* (Cretzschmar, 1830), if the small members of the genus from more northerly localities in Africa are united with their southern congeners.

Hill, J. E. (1982a). Records of bats from Mount Nimba, Liberia.

The Oxford Expedition to Mount Nimba, Liberia in 1978 retained a limited selection of the many bats caught and examined so that the identities of the species studied might be confirmed. These have been presented to the British Museum (Natural History) : the majority belong to species already established from Liberia by Kuhn (1965), Coe and Curry-Lindahl (1965) or Verschuren (1976) but a few represent species that have not been recorded from that country or are uncommon in collections.

Hill, J. E. (1982b). A review of the leaf-nosed bats *Rhinonycteris*, *Cloeotis* and *Triaenops* (Chiroptera: Hipposideridae).

The major taxonomic features of three hipposiderid genera, *Rhinonycteris, Cloeotis* and *Triaenops* are described and discussed. Where appropriate, species and subspecies are diagnosed and defined, with an indication of geographic variation.

Hill, J. E. (1983). Further records of bats from the Central African Republic (Mammalia: Chiroptera).

These notes supplement the detailed and comprehensive survey of the known bat fauna of the Central African Republic by Schlitter et al. (1982), with records of four further species hitherto unreported from that country.

Hill, J. E. (1993). Long-fingered bats of the genus *Miniopterus* (Chiroptera: Vespertilionidae) from Madagascar.

This paper reports and reviews bats of the genus *Miniopterus* from Madagascar. Further specimens of *M. minor manavi* and *M. schreibersii majori* are discussed and measured, and earlier informal records of *M. fraterculus* and *M. inflatus* are substantiated.

Cet article fait le point sur les chauves-souris du genre *Miniopterus* de Madagascar. De nouveaux spécimens de *M. minor manavi* et *M. schreibersii majori* sont considérés et mésures et d'anciennes données concernant *M. fraterculus* et *M. inflatus* sont presentées et discutées.

Hill, J. E. and D. L. Harrison (1987). The baculum in the Vespertilioninae (Chiroptera: Vespertilionidae) with a systematic review, a synopsis of *Pipistrellus* and *Eptesicus*, and the description of a new genus and subgenus.

Current classification of the Vespertilioninae rests chiefly on a suite of mainly adaptive characters, among which facial shortening throughout the subfamily with consequent changes in the structure, size, relative position and number of the incisive and premolar teeth features prominently. Such characters may not necessarily reflect relationships or phyletic diversity, and sometimes do not serve properly to distinguish the genera that they purport to define, as in the distinction of *Pipistrellus* and *Eptesicus*, where generic boundaries remain unclear. The search for possibly less strongly adaptive features suggested the possibility that the morphology of the os penis or baculum might prove valuable in the study of the systematics of these genera and perhaps in the subfamily as a whole.

This paper reviews earlier studies of the baculum in the Chiroptera and their relevance to systematics in the Order, with an examination ofits gross morphology throughout the Vespertilioninae, especial attention being given to species currently allocated either to *Pipistrellus* or to *Eptesicus*. A synoptic review of the species content of these genera is presented, with the recognition and definition of subgenera and included species groups: three such (*pumilus, capensis* and *tenuipinnis*) currently referred to *Eptesicus* on dental grounds seem instead more closely related to *Pipistrellus* to which they are here transferred. One subgenus of *Pipistrellus* is described as new (p. 250).

The Vespertilioninae as a whole display a wide range of bacular variation, which falls into two major and several minor groups. This has suggested a revision of the current classification of the subfamily, combining bacular features with those conventionally in use. Bacular morphology provides a clear indication that the 'Nycticeini' (or 'Nycticeiini') is an artificial grouping and that the genus *Nycticeius* as presently understood is composite. Currently it is held to include two species, the North American *humeralis* and the African *schlieffenii*: these are here thought to be sufficiently characterised to justify generic separation and a new generic name is proposed for *schlieffenii* (p. 254).

A suggested classification of the subfamily is presented, with a tabulated review of earlier classifications; possible relationships between the constituent genera are discussed and the zoogeography of the bacular types within the subfamily is examined.

Hill, J. E., D. L. Harrison and T. S. Jones (1988). New records of bats (Microchiroptera) from Nigeria.

Specimens of bats accessed recently to the collections of the British Museum (Natural History), London (BM(NH)) and the Harrison Zoological Museum, Sevenoaks (HZM) include examples of three species hitherto not recorded from Nigeria, whence at least 71 species of Chiroptera are already known to occur (Happold 1987).

Hill, J. E. and P. Morris (1971). Bats from Ethiopia collected by the Great Abbai expedition, 1968.

The Great Abbai Expedition obtained 115 specimens of bats (including cave remains), chiefly from the Blue Nile Gorge or from the Awash National Park. One specimen from the Blue Nile Gorge proves to represent a new species closely allied to *Myotis tricolor*, for which the name *Myotis morrisi* is proposed. Specimens in the collections of the British Museum (Natural History) and also others collected by the Expedition confirm the presence of *Micropteropus pusillus* in Ethiopia; *Triaenops persicus afer* and *Glauconycteris variegata variegate* were obtained for the first time in Ethiopia by the Great Abbai Expedition, which also obtained further specimens of *Asellia patrizii* and *Tadarida nigeriae nigeriae*; a few specimens in the British Museum (Natural History) obtained from other sources and reported in this paper furnish the first Ethiopian records of *Rhinolophus simulator, Tadarida Africana* and *Tadarida acetabulosus*, and of *Otomops martiensseni* in French Somaliland (Territory Afars and Issas). The classification of *Taphozous perforatus, Hipposideros caffer* and *Hipposideros rubber* is reviewed. *Rhinolophus simulator* Andersen, 1904 and *Rhinolophus alticolus* Sanborn, 1936 are considered to be conspecific

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Hill, J. Eric (1937). Two new bats, *Eptesicus* and *Mops*, from Angola.

In the collection of mammals from Angola, secured by the Vernay Angola and Phipps-Bradley Expeditions, are two bats apparently new to science.

Hill, J. Eric (1942). A new bat of the *Rhinolophus philippinensis* group from mount Ruwenzori, Africa.

In the collection secured by the Ruwenzori-Kivu Expedition (Chapin, Sage, Mathews) of the American Museum there is an undescribed horseshoe-nosed bat.

Hill, J. Eric and T. D. Carter (1941). The mammals of Angola, Africa.

The mammals collected by the Vernay Angola and the Phipps-Bradley Expeditions of the American Museum in Angola, add considerably to what was known of the fauna of that part of Africa. Several new forms have been described from these collections, and a number of hitherto unrecorded species have been discovered to occur in Angola, but one of the most important results of these collections was the securing of good series of many species and races that were previously poorly represented in the Museums of the world.

In addition to the material in the collections of the American Museum, a number of Angolan mammals were loaned for examination by the Carnegie Museum, Pittsburgh. During the autumn and winter of 1937-1938, Hill, assisted by Mrs. Hill, examined and photographed most of the types and other important material from Angola in five European Museums: The Rijksmuseum van Natuurlijke Historie, Leiden; the Zoologisches Museum der Universitat, Berlin; the Museum National d'Histoire Naturelle, Paris; the Musée du Congo Belge, Tervueren; and the British Museum (Natural History), London. This study, extremely helpful in the identification of questionable specimens, was undertaken under a grant from the Carnegie Corporation of New York.

Acknowledgments are due Dr. Harold E. Anthony, Curator of Mammals, The American Museum of Natural History, for the opportunity to work on these collections, and for helpful criticism and advice; Mr. Rudyerd Boulton of the Field Museum of Natural History, for assistance in identifying Angolan localities and photographs; Dr. A. Avinoff, Director, and Mr. J. Kenneth Doutt of the Carnegie Museum, for the loan of specimens from Angola. Dr. H. Boschma and Dr. G. C. A. Junge of the Leiden Museum; Dr. H. Pohle of the Berlin Museum; Professor E. Bourdelle and Dr. Paul Rode of the Paris Museum; Dr. H. Schouteden of the Congo Museum; Mr. Martin A. C. Hinton, Mr. T. C. S. Morrison-Scott, and Mr. G. W. C. Holt of the British Museum, extended every courtesy and assistance possible in the studying of type specimens in the collections of those institutions.

The Vernay Angola Expedition was given to the Museum by Mr. Arthur S. Vernay, who has done so much for this institution. Messrs. Herbert Lang and Rudyerd Boulton, collectors, went to Angola in April, 1925, and remained there for about three months. Landing at Lobito, near Catumbela, a few animals were secured here. The expedition went to Hanha Estate (not the Hanha usually given on maps), an oil palm plantation near the coast, some thirty-two kilometers north of Lobito. The party then went south by way of Huambo where they were joined by Messrs. A. S. Vernay, Alan and Charles Chapman. Mr. Vernay, with Lang and Charles Chapman, went to Mossamedes and collected at Pico Azevedo and 101 km. east of Mossamedes; they returned eastward over the high escarpment to Capelongo, and side excursions of 40 and 65 km. south of that locality were undertaken for large game by Mr. Vernay and C. Chapman. Mr. Boulton and Alan Chapman went to Quipungo, Chipopia, and Luvando. At the end of August the expedition united at Capelongo and returned by way of Caconda to Huambo, where several animals were secured. At Huambo the party again divided; Mr. Vernay, Lang, and Alan Chapman went to Chitau. Mr. Lang remained in Chitau and collected numerous specimens. Mr. Vernay and his guide, Alan Chapman, went across the Cuanzo and hunted sable antelope and other species in the region around Chissonque, 20 to 35 km. east of the river. A few small mammals were secured near this locality also. Meanwhile Boulton and Charles Chapman went to Namba in the Mombolo region.

The Phipps-Bradley Expedition was donated by Mr. John H. Phipps, who also organized and managed the expedition. Mr. Lee S. Bradley, collector, went first to Angola and began working at Caporolo, inland from- Bengela, July 2, 1932, and remained there for about two weeks. He went from Caporolo to Chitau, where he began collecting August 18. Leaving there near the end of September, he went to Mulondo and collected from October 17 to 24. From Mulondo, Mr. Bradley went to Humpata, where a large collection of small mammals was made in the period between October 26 and December 8. He returned to Chitau and stayed there from February 9 to March 17. Returning to the coast, Mr. Phipps joined the party and they went to Mossamedes region where a few gemsbok were secured. A trip was made to the higher part of Mount Moco the first part of June, and several specimens were collected at the Hanya River on July 2 and 3. In August the party hunted near Quissongo, Libolo region.

The Vernay Angolo Expedition secured approximately 1300 specimens, and the Phipps-Bradley Expedition brought back more than 1000. The two collections combined give a very representative picture of the mammalian fauna of Angola, at least of the southwestern quarter of that country. In addition several specimens were donated by Mr. H. F. Varian and fifty mammals were purchased from Mr. C. P. Chapman, collected at Chipepe, Namba, and Monte Victoria Verdun.

Throughout this paper the color nomenclature used is that of Ridgway, 1912, "Color Standards and Nomenclature," except for color names in lower case. Comparisons were made in diffused daylight with his standards. Measurements are of adults, unless otherwise noted, and were taken with dial calipers reading to tenths of a millimeter in the case of the smaller measurements (under 150 millimeters). Larger measurements were taken with outside calipers and steel tape. Measurements of head and body were usually obtained by subtracting tail length from total length as recorded by the collector. Where questions existed as to the accuracy of the original measurements of the hind foot, checks were made on the dried skins. And, if greater discrepency was found than that to be expected from shrinkage, the measurements from the dried specimen were substituted with a note to that effect.

Photographs of specimens and several of the types of country in which collections were made, were those taken by Mr. Herbert Lang, Mr. Rudyerd Boulton, and Mr. Arthur Vernay on the expedition. The line drawings were made by Miss Helen Hunt, and were made possible by generous financial assistance from Mr. Vernay.

Hodgson, B. H. (1835). Synopsis of the Vespertilionidae of Nipal.

I have the pleasure to forward to you herewith the names and characters, which I have provisionally affixed to the Vespertilionidæ of the central region of Nipal. Without access to large museums and libraries, it is scarcely necessary to observe that the naming and defining of species can be but very imperfectly performed.

Hoesch, W. and E. von Lehmann (1956). Zur Säugetier-Fauna Südwestafrikas.

Als erstes möchte ich allen denjenigen danken, die mir die Erfüllung eines langjährigen Wunsches ermöglichten, an der Bearbeitung einer von mir in Süd-Westafrika zusammengebrachten Kleinsäuger-Sammlung mitzuhelfen und die Ergebnisse für eine Untersuchung des Anpassungsproblems auszuwerten, Mein Dank gilt der Deutschen Forschungsgemeinschaft, die mir ein mehrmonatliches Arbeiten am Museum A. Koenig, Bonn, finanziell ermöglichte, dem Direktor dieses Museums, Herrn Prof. Dr. von Jordans, sowie dem Leiter der Säugetier-Abteilung, Herrn Dr. H. Wolf. - Eine Reihe wertvoller Literatur-Nachweise und sonstiger Informationen für den Teil meiner Arbeit, der sich mit dem Anpassungsproblem beschäftigt, verdanke ich dem Leiter der ornithologischen Abteilung des Museums A. Koenig, Herrn Dr. G. Niethammer, von dem auch ein Teil des bearbeiteten Balg-Materials gelegentlich eines früheren Aufenthalts in Südwest gesammelt wurde. Dank des Entgegenkommens des Leiters des Übersee-Museums in Bremen, Herrn Dr. H. O. Wagner, konnten die für dieses Museum von mir in Südwest gesammelten Bälge für die Arbeit ebenfalls mit herangezogen werden.

Der Stoff wurde so zwischen uns aufgeteilt, daß v. Lehmann die Systematik und Hoesch die Ökologie und Biologie der Säugetiere Südwestafrikas bearbeitete, ohne daß die betreffenden Abschnitte im speziellen Teil jeweils mit unseren Namen gekennzeichnet wurden.

Hoffmann, A. (1999). Spatial and temporal patterns in *M. cf. natalensis* revealed by radiotracking. Abstract.

Radiotracking on *Mastomys* cf. *natalensis* was carried out in the grasslands of Queen Elizabeth National Park in Uganda. Seven individuals were radio-tracked successfully. The radio-fixes were taken at 30 or 60 min. intervals. The results are based on 1.375 fixes recorded over two 14-day periods. The locations were determined in a 5x5 m grid system. Home range sizes calculated by RANGES V® using the Minimum Convex Polygon Method (95 %) ranged from 0.119 - 0.255 ha in the *Imperata-Cymbopogon-grassland* and from 0.656 - 0.840 ha in the bushland-grassland-mosaic. Telemetry-derived home range sizes were on average 3 times larger then those calculated by the CMR-method. There was no indication that the home range size is correlated with sex or sexual activity, however an inverse relation between home range size and population density existed.

With few exceptions, *M.* cf. *natalensis* returned to the same den each night, which were found in termite structures of *Odontotermes* sp., in *Euphorbia-Capparis* bushes, as well as in single holes. In the bushland-grassland-mosaic where *Euphorbis-Capparis* bushes (6-8/ha) represent 6% of the plant cover of the area, *M.* cf. *natalensis* were tracked during 47 % of the total activity phase in those bushes, during 38 % in the *Themeda-Bothriochloa* grassland and in 15% under small shrubs within the grassland. The high habitat utilization of 94.4 % in the bushes corresponds with the results obtained by CMR method (89,6 %). In both sites *M.* cf. *natalensis* was strictly nocturnal, but showed different activity patterns. The activity period varied between 6 - 11 h for the individuals in the bushland-grassland-mosaic and was on average 2:45 h shorter compared to those in the *Imperata-Cymbopogon* grassland. Several factors, e.g. seasonal variations of vegetation composition, habitat structure, availability of food and predation risk might have caused the differences in the activity patterns between both sites.

Le suivi télémétrique de *Mastomys* cf. *natalensis* a été conduit dans les prairies du Pare national Queen Elizabeth en Ouganda. Au cours de ce suivi 1375 relevés ont été effectués a 30 ou 60 min d'intervalle pendant 2 périodes de 14 jours et reportes sur un quadrillage de référence de 5x5m. La taille des domaines vitaux évaluée grâce au logiciel Ranges V en utilisant la méthode des polygones convexes (95%) variait de 0,119 à 0,255 ha dans les prairies a *Imperata-Cymbopogon* et de 0,656 à 0,840 ha dans les habitats constitues d'une mosaïque de prairies et de steppes.

La taille des domaines vitaux évaluée par télémétrie était en moyenne 3 fois plus grande que celle calculée par Capture-Marquage-Recapture. Il n'y avait pas de relation entre la taille du domaine vital et le sexe ou l'activité sexuelle. En revanche, une relation inverse a été trouvée avec la densité de la

population. Dans les habitats mosaïques (steppes/prairies), les rongeurs passaient 47% de leur activité dans les buissons a *Euphorbia-Capparis* (qui représentent 6% de la surface), 38% dans les zones herbeuses a *Themeda-Bothriochloa*, et 15% caches sous des petits buissons de la prairie. Dans les 2 types d'habitats, *M. natalensis* était strictement nocturne mais montrait des patrons d'activité différents. La durée d'activité variait entre 6 et 11 heures dans les habitats mosaïques (steppes/prairies) et était en moyenne 165 minutes plus courte que celle mesurée dans les prairies. Plusieurs facteurs tels que la variation saisonnière de la composition de la végétation, la structure de l'habitat, la disponibilité en nourriture et la prédation pourraient expliquer ces différences inter-habitats.

Höhne, K., B. Loose and H. P. R. Seeliger (1975). Isolation of *Listeria monocytogenes* in slaughter animals and bats of Togo (West Africa).

Grâce à des cultures sur milieu d'enrichissement pendant six semaines à 4° C, l'examen des 342 animaux sains sacrifiés à l'abattoir municipal de Lomé a permis d'isoler 8 fois *L. monocytogenes* à partir de ganglions mésentériques (chez deux porcs, cinq petits ruminants et un bœuf). Toutes les souches ont été identifiées comme sérovar 1/2a. Par ailleurs, sur 236 chauves-souris examinées, trois se sont révélées porteuses de *L. monocytogenes*; ces souches ont été étiquetées sérovar 4b (deux souches) et sérovar 1/2a (une souche).

Une étude de la littérature disponible a montré que ces isolements de *L. monocytogenes* sont les premiers en Afrique de l'Ouest. Ils sont discutés à la lumière des connaissances actuelles sur la présence de *L. monocytogenes* chez certaines espèces animales et sur les conséquences qui peuvent en découler pour l'homme.

Listeria monocytogenes was isolated from the intestinal lymph nodes of 8 out of 342 apparently healthy slaughter animals at the municipal abattoir in Lome (Togo) and from the faeces of 3 out of 236 bats. Except two strains of serovar 4b isolated from bats, all the nine others belonged to serovar 1/2a. The positive findings of slaughter animals were made from the carcasses of 2 pigs, 5 little ruminants and 1 cattle.

The findings are discussed in the light of present knowledge on the occurrence of *L. monocytogenes* in some species of animals and its implications for the human being.

Listeria monocytogenes; Togo; Cattle; Chiroptera; Mesenteric lymph node; Isolation; Epidemiology

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Hollar, L. J. and M. S. Springer (1997). Old world fruitbat phylogeny: Evidence for convergent evolution and an endemic African clade.

Knud Andersen (1912, *Catalogue of the Chiroptera in the Collections of the British Museum: I. Megachiroptera*, British Museum of Natural History, London) divided Old World fruitbats (family Pteropodidae) into the rousettine, cynopterine, epomophorine, eonycterine, and notopterine sections. The latter two sections comprise the subfamily Macroglossinae; members of this subfamily exhibit specializations for nectarivory (e.g., elongated, protrusible, brushy tongues) and cluster together in cladistic analyses based on anatomical characters. Other evidence, including single-copy DNA hybridization, suggests that macroglossines are either paraphyletic or polyphyletic; this implies that adaptations for pollen and nectar feeding evolved independently in different macroglossine lineages or were lost in nonmacroglossines after evolving in a more basal common ancestor. Hybridization data also contradict Andersen's phylogeny in providing support for an endemic African clade that includes representatives of three of Andersen's sections. Here, we present complete mitochondrial 12S rRNA and valine tRNA gene sequences for 20 pteropodids, including representatives of all of Andersen's sections, and examine the aforementioned controversies. Maximum likelihood, minimum evolution, and maximum parsimony analyses all contradict macroglossine monophyly and provide support for an African clade that associates *Megaloglossus* and *Lissonycteris* and those two with *Epomophorus*. In conjunction with the DNA hybridization results, there are now independent lines of molecular evidence suggesting: (i) convergent evolution of specializations for nectarivory, at least in *Megaloglossus* versus

other macroglossines, and (ii) a previously unrecognized clade of endemic Africa taxa. Estimates of divergence time based on 12S rRNA and DNA hybridization data are also in good agreement and suggest that extant fruitbats trace back to a common ancestor 25 million to 36 million years ago.

Hollister, N. (1918). East African mammals in the United States National Museum. I. Insectivora, Carnivora and Chiroptera.

Many special papers on the extensive collection of mammals from Eastern Equatorial Africa preserved in the United States National Museum have been published since the accumulation of this material began. These papers have been written by various specialists, and for the greater part consist of descriptions of new forms or reports on the collections of certain expeditions. No attempt has before been made to furnish a list of all the material in the museum, based on what amounts to monographic work in each group and careful identification of every specimen. Such a list is the basis of the proposed work of which the present section is the first part. It is hoped that the entire East African collection can be listed in a similar manner in a bulletin completed in three parts. Part I consists of the reports on the insectivorous mammals (Order Insectivora), the bats (Order Chiroptera), and the carnivores (Order Carnivora).

In addition to the lists of specimens carefully determined according to modern standards of systematic mammalogy, pertinent notes which seem worthy of preservation for future workers on the taxonomy and life histories of East African mammals are presented under the various generic, specific, and subspecific headings. What it is hoped will prove even more useful to systematic mammalogists are the extensive tables of measurements of individual specimens which have been made as a basis for preliminary work in each group, and which are published with the report.

The material in the collection, consisting almost wholly of well-prepared specimens with accurate data, has been assembled during many years from numerous sources. While many sections of the area treated are almost unrepresented in the collection by specimens of most groups, the mass of material accumulated from certain large areas far surpasses in numbers and importance that preserved in any other museum. This is the natural result of the efforts of the competent field naturalists who accompanied the larger and more extensive expeditions, and the foresight and energy of the museum authorities in the organization and maintenance of the work.

Hood, C. S. and R. J. Baker (1986). G- and C-banding chromosomal studies of bats of the family Emballonuridae.

Extent and nature of chromosomal change among nine species representing six genera (*Saccopteryx, Rhynchonycteris, Diclidurus, Balantiopteryx, Cormura*, and *Taphozous*) were examined using data from G- and C-banded chromosomes. Heterochromatin was restricted to centromeric regions in most taxa; extensive additions of C-positive material occurred in *Balantiopteryx* and *Cormura*. Comparisons of G-bands of euchromatic arms revealed considerable variation in G-band pattern and imply extensive chromosomal evolution among emballonurid species. Outgroup comparisons of G-band karyotypes proposed as primitive for several families of bats failed to reveal conserved G-band patterns, thus limiting the usefulness of differentially stained chromosomal data for resolving phylogenetic relationships of the Emballonuridae. The karyotype of *Cormura brevirostris* includes an extraordinarily large X chromosome that is mostly euchromatic. Evolution of the X chromosome and the nature of the sex-determining system in *Cormura* are unclear, but the species appears to possess a unique sex chromosome mechanism

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Hoogstraal, H. (1956). African Ixodoidea. I. Ticks of the Sudan. (With special reference to Equatoria Province and with preliminary reviews of the genera *Boophilus*, *Margaropus* and *Hyalomma*).

The primary objective of Volume I of this series of studies is to present our research on Sudanese ticks, including a critical survey of published worldwide information concerning each species. This has been attempted with reference to; (a) distribution in the Sudan and elsewhere, (b) hosts, (c) biology, and (d) identification. The secondary objective is to provide a suitable background for subsequent volumes presently in preparation. These studies will include all economically important tick species of Africa and all diseases and injuries associated with them.

The present report is intended to serve the tyro and specialist alike, and should provide a sound source of information for those who compile textbooks and review literature. Special attention is invited to the introductory paragraphs in section IV, pages 43 to 47, in which presentation methods and handling of data are elucidated, and to the fact that mention of disease relations herein are merely cross-referencing for subsequent volumes.

It should be stressed that most tick species of known or potential medical or veterinary importance of the Ethiopian Faunal Region (see Figure l) are found in the Sudan and are treated in the present report. Those few species that do not occur in the Sudan will be treated in a forthcoming volume, entitled "The Economically Important Ticks of Africa." Therefore, pertinent facts concerning all known species of medical and veterinary importance of continental Africa will be included in these two reports. Also included in the forthcoming volume will be maps of the distribution of each species in the Sudan, as well as in other African regions and elsewhere in the world. Subsequent volumes will be entitled: "Human Tick-Borne Diseases and Injuries in the Ethiopian Faunal Region" and "The Biological Relationships of African Ticks and Veterinary Diseases." Since a year or more will probably elapse between the publication of each volume, additional material concerning species previously treated will be presented in each new section in an effort to bring the pertinent information up-to-date.

The primary purpose of the report on veterinary diseases, mentioned above, is to present the biological relationships of ticks to these diseases in order to provide a better working knowledge for basic research in hviman diseases. It is also intended that this section will be of use to veterinarians in the area concerned.

Possibly one of the greatest general criticisms of contemporary literature on African ticks is that the reader obtains the impression that specialists' knowledge is usually more or less complete with respect to identification, biology, hosts, and distribution. When first considering the study of African ticks, I was told by several scientists that these parasites were so well known and so easily identified that there would be little to do that could not be accomplished in short order! Quite the contrary proved to be true; and it was soon realized how much specialized and practical information on African ticks is lacking. The best expectation for this undertaking is that the numerous indications for existing queries, problems, and lacunae in or information on African ticks will stimulate readers to seek out additional data. It is also hoped that this work will provide a useful body of information for authors of textbooks and teaching manuals. Towards these ends, every effort has been made to present and review data as correctly as possible. Should errors occur, it will be appreciated if readers call them to my attention for inclusion in errata in subsequent volumes.

Hoogstraal, H. and G. M. Kohls (1967). Bat ticks of the genus *Argas* (Ixodoidea, Argasidae). 7. *A*. (*Chiropterargas*) *cordiformis*, new species, a heart-shaped parasite from South-West Africa.

Nymphs of *Argas (Chiropterargas) cordiformis*, new species, and larvae presumed to represent this species are described. Larval hosts were *Nycteris thebaica damarensis* Peters in the Uis tin mine, Omaruru District, South-West Africa. The larva resembles those of *A. (C.) boueti* Roubaud and Colas-Belcour and of *A. (C.) confuses* Hoogstraal. The nymph differs from those of these species chiefly in the remarkable cordiform body shape and in the absence of posterior paired organs

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Hoogstraal, H. and R. Traub (1963). The fleas (Siphonaptera) of Egypt. Host-parasite relationships of Insectivora and Chiroptera.

Synosternus pallidus is the typical flea of all Egyptian hedgehogs (*Hemiechinus* and *Paraechinus*) practically wherever these animals occur. *Echidnophaga gallinacean* is also common on hedgehogs but more restricted in its geographis range. Infestation of these animals by other flea species is insignificant.

Host specific fleas of shrews (*Crocidura*) apparently are not present in Egypt and fleas are rare or absent on shrews here. *Crocidura olimeri* is infested by fleas usually parasitic on the Nile Grass Rat, *Arvicanthis n. niloticus*.

Only bats that rest in sizeable colonies have been found infested by fleas in Egypt and the rate and incidence of infestation is usually low. The four species of the Family Ischnopsyllidae parasitic on bats in and near the Nile Valley and Delta are *Chiropteropsylla aegyptia, C. brockmani, Araeopsylla gestroi*, and *A. wassifi*. Another, *Ischnopsyllus consimilis*, occurs chiefly in more humid coastal areas where it parasitizes *Pipstrellus k. kuhli*, Nile Valley colonies of which harbor no fleas.

Hoogstraal, H., K. Wassif and M. N. Kaiser (1957). Results of the Namru-3 Southeastern Egypt Expedition, 1954.

The following mammals were collected during the NAMRU-3 Southeastern Egypt Expedition, 1954: *Paraechinus a. aethiopicus, Asellia t. tridens, Ictonyx striatus erythreae, Vulpes r. rüppelli, Genetta g. senegalensis, Procavia capensis burtoni, Gazella dorcas* subsp., *Lepus capensis isabellinus, Jaculus j. elbaensis, Gerbillus (G.) pyramidum* subsp., *Gerbillus (G.) g. gerbillus, Gerbillus (Dipodillus) h. henleyi, Gerbillus (D.)* spp. (2), *Gerbillus (D.) calurus, Meriones crassus pallidus*, and *Acomys cahirinus dimidiatus*. In addition, records of the following mammals from this area are provided; *Felis caracal* and *Proteles cristatus*. Two others, *Dugong dugong* and *Capra ibex nubiana*, are known to exist here, while *Equus asinus taeniopus* is suspected to be present and legends of *Ammotragus lervia ornatus* and *Panthera pardus* exist among the tribes of this area. Also collected near Aswan but not in Southeastern Egypt were *Vulpes v. aegyptiaca* and *Gerbillus p. pyramidum*.

These mammals are mostly Palaearctic in ongin and the most valuable indicator species, rodents and insectivores, are entirely so. Only the more primitive hyrax and a few of the more mobile carnivores and the hare and bat are definitely Ethiopian.

Several of these mammals have not previously been recorded from Egypt and the known distributional range of others is considerably extended. Data for parasitism by ticks, fleas, streblids, and hippoboscides are presented and the potential of vector-borne diseases in Southeastern Egypt is briefly discussed.

Horácek, I. (1990). Enigma of *Otonycteris*: Relationship, phylogeny, ecology. Abstract.

The paper is intended to discuss what does genus *Otonycteris* represents in frame of the Palearctic bat fauna and which is its position among the vespertilionid bats. Some field experiences with *Otonycteris hemprichi* are reported together with results of morphometrical studies undertaken with extensive museum materials and fossils related to the genus.

The recent genus is apparently monotypic. No substantial geographic differences were found in support to subspecific status of the forms named within the species (i.e. *jin, ustus, cinereus* etc.). Close relationship between *Otonycteris* and MN 12 *Samonycteris majori* has been confirmed. A resemblance among both the taxa and the fossil forms referred to *Scotophilus* (Steinheim, Anwil, Djebel Zelten) and/or to *Eptesicus serotinus* group (Sansan, Suchamasty 3) indicates a possible relationship.

Appearance of *Samonycteris*, undoubtedly an ancestor of *Otonycteris*, in the W-Palearctic is synchronous with extensive spread of eremial biome associated with the Messinian (cf. also the author's unpublished record of Rhinopomatidae in MN11 locality Elaiochoria 2, N-Greece).

Otonycteris is an inhabitant of the temperate zone rocky deserts. Its ecology exhibits a number of respective adaptations including those responding food supply in such habitats. Feeding on vertebrate prey (suggested e.g. by Norberg & Fenton 19SS) has not been observed, but it cannot be excluded. Field observations as well as dental adaptations of *Otonycteris* indicate a carnivorous-like foraging pattern (cf. slow narrow flight, close to ground, low frequency echolocation with a low repetition rate, well pronounced sensitivity to external acoustic stimuli, etc.,). Not only in these respects but in number of morphological characters, *Otonycteris* closely resembles *Antrozous*. The similarity is considered to be a product of the parallel adaptation strategies in different but related clades. Affinities of *Antrozous* seems to be with *Nycticeius* (not with Nyctophilini as often suggested), while *Otonycteris* seems to be related to Scotophilus and/or *Hypsuqo*. Both the clades are considered to be sister groups of *Eptesicus*.

Horácek, I., J. Gaisler and V. Hanák (1999). Bats of the Palearctic region: a taxonomic, zoogeographical and ecological review. Abstract.

Checklists of Palearctic mammals (Corbet 1978, 1984) as well as distributional data on the bats of the world (Koopman 1994, Nowak 1994) reveal about 85 species of 8 families to inhabit the Palearctic region. For about 63 species of 6 families this zoogeographical region is an essential part of their distribution ranges. During the last decades the list has been supplemented with additional taxa: (1) newly described forms such as *Rhinolophus imaizumii, R. kirgisorum, Myotis abei, M yesoensis, M pruinosus, Murina silvatica*; (2) forms described earlier but the species status of which has been established as a result of recent taxonomic analyses, e.g, *Myotis schaubi, M bombinus, Eptesicus gobiensis, Hypsugo alashanicus, Pipistrellus maderensis, Plecotus teneriffae, Murina fusca*. In some other taxa (*Rhinolophus ferrumequinum, R. hipposideros, Myotis myotis, M blythii, M. nattereri, M daubentonii*, etc.) the patterns of their geographic variation were reinvestigated and new ideas resulted on their intraspecific taxonomy. A particularly complicated situation occurred with the clades for which recent data proved an unexpected cryptic variation, i.e. *Pipistrellus pipistrellus* and *Myotis mystacinus*. Taxonomic and nomenclatoric consequences of these discoveries have not been resolved entirely as yet, while similar problems possibly concern some other clades, e.g. the *Plecotus* spp. In this respect it is promising that the taxonomy of Palearctic bats has increasingly been operated with new tools combining traditional approaches with advanced techniques such as molecular taxonomy and molecular phylogeography.

Recent decades. provided considerable amount of new distributional records in certain regions the bat fauna of which was insufficiently known (Middle East, Central Asia, Siberia, Far East and China). This data has refined our knowledge of distribution in individual taxa as well as the notion of structure in local Chiropteran communities. Considering earlier approaches to the zoogeography of Palearctic bats (Wallin 1969, DeBlase 1977) and the new information, the following major chorologic units and/or community types can be distinguished: (1) W-Palearctic arboreal, (2) Mediterranean, (3) W-Palearctic eremial, including those of dry habitats in the Middle East, (4) E-Palearctic arboreal, and (5) E-Asiatic transitional. Worth mentioning is that many of the supraspecific taxa with Eupalearctic distribution (*Rhinolophus ferrumequinum* group, *Myotis nattereri* group, *Eptesicus* including *Amblyotus, Vespertilio, Nyctalus noctula* group, *Plecotus, Barbastella*) exhibit vicariance patterns concordant with the above mentioned chorologic units, e.g. the arboreal-eremial disjunctions in the W-Palearctic and the W-E disjunction of Eupalearctic arboreal in the South. Further implications of these and other patterns will be discussed from the point of view of historical biogeography. Another problem to be dealt with is the degree of endemism.

Most species of Palearctic bats hibernate and are insectivorous or feeding on insects and other arthropodes. Only three species of flying foxes, the distribution of which is mostly non-Palearctic, are frugivorous and there are no carnivorous or piscivorous species among the Palearctic bats. However, various foraging strategies such as fast hawking, slow hawking, foliage and ground gleaning, trawling and flycatching have been recorded in Palearctic insectivorous bats (Norberg & Rayner 1987). Other ecological differences among species concern habitat and roost preferences, movements,

reproduction strategies and survival. The ecological part of the paper will focus on major ecological characteristics with respect to the phenetic packing of species and communities and the patterns of taxonomy and zoogeography mentioned above. While a detailed knowledge of their autecology and behaviour is available on certain species, e.g. *Rhinolophus ferrumequinum* (Ransome 1990), *Myotis myotis* and *M. blythii* (Arlettaz 1995), *Eptesicus serotinus* (Robinson & Stebbings 1997), etc., little has been known concerning the life strategies of many other species. Similarly, the available information on bat assemblages of various habitats in certain regions is incomplete. Thus, one of the aims of our paper is to draw the attention of chiropterologists to the black holes in the knowledge of the Palearctic bat fauna.

Horácek, I. and V. Hanák (1986). Generic status of *Pipistrellus savii* and comments on classification of the genus *Pipistrellus* (Chiroptera, Vespertilionidae).

Pipistrellus savii and several other species are placed into a separate genus *Hypsugo*. New diagnoses are proposed for *Pipistrellus, Hypsugo* and *Eptesicus*.

Hosken, D. J. (1998). Testes mass in megachiropteran bats varies in accordance with sperm competition theory.

Sperm competition is a widespread phenomenon influencing a range of characters, including investment in gonadal tissue. Conspecific proximity is one factor which can influence the risk of sperm competition and hence testicular investment, and decreased confidence of paternity may be one cost of group living. Aspects of female biology may also influence spermatogenic investment and sperm morphology. This study examines the associations between relative testes mass and roost-group size across 17 species of Megachiroptera. Associations between breeding season duration and investment in spermatogenesis are also examined, as are associations between female reproductive tract dimensions and testes mass and dimensions of spermatozoa across all bats. Relative testes mass was significantly positively associated with roost-group size at a species level and after appropriate phylogenetic control (pairwise comparisons and comparison of independent contrasts). There were no significant relationships between breeding season duration and relative testes mass. Across all bats, neither testes mass nor sperm length were significantly related to dimensions of the female tract. The results are discussed in the context of sperm competition.

Howard, C. W. (1908). A list of the ticks of South Africa, with descriptions and keys to all the forms known.

There are probably none of the external parasites of domestic animals of more importance to the stock raiser in South Africa than the ticks, owing to the large number of diseases which they transmit from animal to animal. The ticks of South Africa have, however, only been studied with regard to their connection with the transmission of diseases, and very few people are aware of the distinction between the various species and the various forms of the same species.

With a view to throwing a little more light on these creatures, and mainly of assisting the work of those interested in the study of the diseases referred to, a study of the ticks of South Africa was taken up by me about three years ago while in the Transvaal. Since then a large number of the life histories of these ticks have been worked out, and their immature stages carefully studied and compared. There are still many species which I have not been able to see owing to the rareness with which they occur, but in such cases I have compiled1 the literature from other authors and placed it in such shape as I consider will prove useful to the South African workers. There is still an immense amount of work to be done on this subject, and my only plea for placing this paper before the public is in the hopes that it will arouse more interest in such studies, and consequently advance the work.

Hubert, B. and W. Böhme (1978). Karyotype of *Gerbillus pyramidum* I. Geoffroy (Rodentia, Gerbillidae).

Gerbillus pyramidum is reported from Senegal for the first time. The external and cranial measurements and karyotype of the female specimen are presented.

Hutcheon, J. M., J. A. W. Kirsch and J. D. Pettigrew (1998). Base-compositional biases and the bat problem. III. The queston of microchiropteran monophyly.

Using single-copy DNA hybridization, we carried out a whole genome study of 16 bats (from ten families) and five outgroups (two primates and one each dermopteran, scandentian, and marsupial). Three of the bat species represented as many families of Rhinolophoidea, and these always associated with the two representatives of Pteropodidae. All other microchiropterans, however, formed a monophyletic unit displaying interrelationships largely in accord with current opinion. Thus noctilionoids comprised one clade, while vespertilionids, emballonurids, and molossids comprised three others, successively more closely related in that sequence. The unexpected position of rhinolophoids may be due either to the high AT bias they share with pteropodids, or it may be phylogenetically authentic. Reanalysis of the data with varying combinations of the five outgroups does not indicate a rooting problem, and the inclusion of many bat lineages divided at varying levels similarly discounts long branch attraction as an explanation for the pteropodid-rhinolophoid association. If rhinolophoids are indeed specially related to pteropodids, many synapomorphies of Microchiroptera are called into question, not least the unitary evolution of echolocation (although this feature may simply have been lost in pteropodids). Further, a rhinolophoid-pteropodid relationship - if true - has serious implications for the classification of bats. Finally, among the outgroups, an apparent sister-group relation of Dermoptera and Primates suggests that flying lemurs do not represent the ancestors of some or all bats; yet, insofar as gliding of the type implemented in dermopterans is an appropriate model for the evolution of powered mammalian flying, the position of *Cynocephalus* in our tree indirectly strengthens the argument that true flight could have evolved more than once among bats.

Hutterer, R. (1984). I. Säugetiere.

A short review is given of the history and the development of the mammal section of the Museum Alexander Koenig and its collections. A. Koenig collected mammals since 1875 for his private collection which later became part of the museum collections. The department of mammalogy was founded in 1935. Since then activities in Europe, Asia and Africa have resulted in a considerable enlargement of the mammal collections which hold more than 30 000 specimens. In 1978 most of the historical collections of the Göttingen Museum were transferred to Bonn. The type specimens of this old collection are included in the present catalogue. The type catalogue lists syn-, holo-, lecto- and paratypes of eighty mammalian names. A lectotype is designated for *Mus sylvaticus maximus* Burg, 1925.

Hutterer, R., F. Dieterlen and G. Nikolaus (1992). Small mammals from forest islands of eastern Nigeria and adjacent Cameroon, with systematical and biogeographical notes.

26 species of insectivores, bats and rodents are recorded from the Gotel Mts and the Mambilla Plateau in eastern Nigeria and adjacent Cameroon. These mountain ranges carry relict forests representing distribution islands for many vertebrate species. 8 species of mammals are recorded for the first time from Nigeria, one bat from Cameroon, and a new subspecies of *Praomys hartwigi* is described. The taxonomic status of several forms is discussed and full species rank is proposed for *Sylvisorex camerunensis, Hylomyscus grandis* and *Lophuromys eisentrauti*. The insectivore and rodent faunas of nine mountain areas within the Cameroon Mountains system are analyzed and the result is presented in the form of an area cladogram.

Hutterer, R. and U. Joger (1982). Kleinsäuger aus dem Hochland von Adamaoua, Kamerun.

35 Kleinsäugearten werden aus dem Hochland von Adamaoua (Kamerun) gemeldet. Erstnachweise für Kamerun sind *Suncus infinitesimus, Crocidura boydi, C. roosevelti, Eptesicus guineensis, Aethomys hindei* und *Uranomys niddi*. Artstatus wird *Crocidura attila* und *Aethomys stannarius* gegeben, und die Merkmale von *Aethomys stannarius* und *Aethomys hindei* werden beschrieben. - Die Säugetierfauna des Westkameruner Montanblocks besteht zu einem großen Teil aus ostafrikanischen Arten und aus Endemiten.

35 species of small mammals are recorded from the Adamaoua hignlands of Cameroun. Six represent first records from Cameroun: *Suncus infinitesimus, Crocidura boydi, C. roosevelti, Eptesicus guineensis, Aethomys hindei* and *Uranomys ruddi*. *Crocidura Attila* and *Aethomys stannarius* are raised to specific rank, and the characters of *Aethomys stannarius* and *Aethomys hindei* are described. - A considerable amount of mammals of the Cameroun mountains are East African species and endemics.

35 espèces de petits mammifères sont signalés du plateau de l'Adamaoua (Cameroun). *Suncus infinitesimus, Crocidura boydi, C. roosevelti, Eptesicus guineensis, Aethomys hindei* et *Uranomys ruddi* sont cités du Cameroun pour la première fois. Le rang d'espèce est donné à *Crocidura attila* ainsi qu'à *Aethomys stannarius*. Les charactères spécifiques d'*Aethomys stannarius* et d'*Aethomys hindei* sont décrits. - Une grande partie des mammifères de la faune montagnarde camerounaise se constitue de formes est-africaines ou bien endémiques.

Hutterer, R. and J. C. Ray (1997). Bat predation by small carnivores in a central African rainforest.

Fragments of four species of bats (*Mops* cf. *spurrelli, Nycteris arge, Hipposideros cyclops, H. ruber* were identified in scats of small carnivores collected in a tropical rainforest of Central African Republic. For all four species the Dzanga forest constitutes the second locality record in this country. Genets (*Genetta servalina*) and long-nosed mongoose (*Herpestes nasa*) were identified as the predator species. Bats occurred in only 0.4 % of the scats analyzed. The few examples refer to bat species which roost solitarily or in small groups. Their presence in the scats can be attributed to chance encounters. Large bat colonies seem to be rare or inaccessible in the study area.

Hutton, J. M. (1986). The status and distribution of bats in Zimbabwe.

Faunal diversity in the southern African subregion increases both northwards and eastwards. Zimbabwe lies in the northeast of the subregion in the highly productive Southern Savanna Woodland biotic zone. Bat specimens have been collected from 44% of the quarter degree grid squares in Zimbabwe. Fifty-eight species are recorded, of which 14 reach the southern periphery of their range. A broad analysis of distribution relative to dominant geographical and climatic features is made. Several species are confined to the eastern half of the country but few show a similar restriction to the drier west. Seven species are widespread, but only *Nycteris thebaica* and *Eptesicus capensis* are truly ubiquitous. The distribution of many species is markedly correlated with altitude and the central watershed disrupts the distribution of several. Fourteen species are represented by too few specimens for their distribution to be assessed. Six species fail to show a distributional pattern. Distribution maps are given for species with a marked increase in collecting localities over Smithers & Wilson (1979).

Ibáñez, C. (1988). Notes on bats from Morocco.

In the last few years, a series of papers on the bats from Morocco have modified and increased the information available on the composition of this fauna (Palmeirin 1982; Aulagnier and Destre 1985; Aulagnier and Mein 1985; Kock 1987).

These notes offer the most relevant of the information obtained from fieldwork conducted in the north of Morocco during the spring and summer of 1986 and the spring of 1987. This information refers to the occurrence of a species reported for the first time in this country as well as to other species which are not well known. Linear measurements are given in millimeters and weight in grams. Except when otherwise indicated, the specimens are adults with fused phalangeal epiphyses. All of the specimens cited are deposited in the collection of the Estacion Biologica de Donana.

Ibáñez, C. and R. Fernández (1985a). Murciélagos (Mammalia, Chiroptera) de las Islas Canarias.

En esta contribution ampliamos y actualizamos la informatión existente sobre aspectos distribucion y taxonomía de las seis especies de murciélagos conocidas en el archipielago canario (*Pipistrellus kuhli, P. maderensis, P. savii, Plecotus teneriffae, Barbastella barbastellus* y *Tadarida teniotis*).

This paper adds to and brings up to date the existing information on some aspects of distribution and taxonomy of the six species of bats known in the Canary Islands (*Pipistrellus kuhli, P. maderensis, P. savii, Plecotus teneriffae, Barbastella barbastellus* and *Tadarida teniotis*).

Ibáñez, C. and R. Fernández (1989). Catalogo de murcielagos de las colecciones del museo nacional de ciencias naturales.

This paper shows the results of a revision of the bats collection held in the Museo Nacional de Ciencias Naturales de Madrid, which consists of over 1300 specimens shared by at least 144 species belonging to 11 families.

The more interesting specimens are emphasized, those being without doubt the types of the 17 species and subspecies described by Angel CABRERA using the material from this Museum. Of them, they are actually considered as valid names *Dobsonia remota, Rhinolophus anderseni, Hipposideros caffer tephrus* and *Cabreramops aequatorianus* although the first species offers some doubts. Their holotypes and paratypes are preserved, at least parcially. A careful study of the different grupus could make possible the validity of some other names like *Rhinolopnus carpetanus, R. f. obscurus, Pipistrellus p. mediterraneus* and *P. savii ochromixtus*. The rest of them are included under synonymy in a rather definitive way.

En este trabajo revisamos la colección de quirópteros del Museo Nacional de Ciencias Naturales de Madrid, que consta de más de 1.400 ejemplares repartidos al menos en 144 especies de 11 familias.

Hacemos mayor hincapié en los ejemplares de más interés que son, sin duda, los tipos de las 17 especies y sub especies descritas por Angel CABRERA con material de este Museo. De todas estas descripciones actualmente son considerados como nombres válidos *Dobsonia remota, Rhinolophus anderseni, Hipposideros caffer tephrus* y *Cabreramops aequatorianus*, la primera especie con ciertas dudas. De todos ellos se conservan los holotipos y paratipos al menos parcialmente. Es posible que con una revisión profunda de los distintos grupos algunos otros nombres puedan tener validez, tal es el caso de *Rhinolophus carpetanus, R. t. obscurus, Pipistrellus p. mediterraneus* y *P. savii ochromixtus*. El resto está incluido en sinonimia de forma bastante definitiva.

Ifuta, N. B. (1985). Observations sur quelques groupements interspécifiques de Microchiroptères des forêts ombrophiles de Kisangani (Zaïre).

Cet article relate les résultats de deux années de recherches intensives sur les rassemblements entre Microchiroptères d'espèces différentes, récoltés à Kisangani et ses environs.

A l'issue de cette étude, nous avons mis en évidence sept groupements incluant: d'une part les familles des Nycteridae et Hipposideridae, les Nycteridae et Rhinolophidae; et d'autre part les familles des Nycteridae et Vespertilionidae entre elles.

The present paper gives an account of the results of intensive investigation into assemblages of different species of Microchiroptera collected in Kisangani and its vicinity over a period of two years.

At the close of this study, seven groupings of bats, including Nycteridae and Hipposideridae as well as Nycteridae and Rhinolophidae families on the other hand, and Nycteridae and Vespertilionidae by themselves on the other, were placed in a prominent position.

Six out of seven of the assemblages are mentioned for the first time.

Ifuta, N. B. and H. Gevaerts (1986). Données préliminaires sur la reproduction d' *Epomops franqueti* (Chiroptera: Pteropodidae) recoltées à Kisangani et environs.

Epomops franqueti est une chauve-souris dont le régime alimentaire est essentiellement frugivore à Kisangani. C'est même de loin le plus abondant des Mégachiroptères de nos récoltes, représentatns à lui seul 63.7 % de nos captures.

Les données relatives à sa reproduction ne sont pas nombreuses et sont souvent les résultats de sondages pris au hasard parmi les individus capturés. Elles sont consignée dans la monographie de Verschuren (1957), les publications de Brosset (1988a et b) et celle de Jones (1972). Toutes ces investigations font état de l'absence de périodicité de la reproduction chez *Epomops franqueti*. Sous cette étude, qui d'ailleurs est en cours et qui prendra fin en novembre 1986, nous présentons les prémices de nos résultats sur le cycle annuel de reproduction de cette espèce animale au voisinage de l'équateur afin de les comparer aux recherches antérieures. Le présent travail s'étandra sur une durée totale de deux ans.

Ifuta, N. B., H. Gevaerts and E. R. Kuhn (1988). Thyroid hormones, testosterone, and estradiol-17ß in plasma of *Epomops frangueti* (Tomes, 1860) (Chiroptera) in the Rain Forest of the Equator.

Using Japanese catching nets a total of 77 males and 37 females of the fruit eating bat *Epomops franqueti* (Megachyroptera) were captured during a period of 1 year around Kisangani (Zaire). Adult males with white epaulets weighing 143 ± 3.6 g (18) had their testes present in the scrotum and higher plasma concentrations of thyroxine (T_4) and testosterone than adult males without epaulets and with abdominal testes (weight 107.5 ± 2.0 g (39)) or juveniles (72.7 ± 2.8 g (20)). Mean embryo weight of pregnant bats was 4.26 ± 1.09 g (12) ranging from 1.8 to 14.8 g whereas body weight of mothers (+ embryos) was 117.0 ± 3.6 g (12). Body weight of nonpregnant bats was 107.3 ± 2.1 (10) and of female juveniles 74.6 ± 4.3 (15). Plasma concentrations of triiodothyronine (T_3) were lowest in nonpregnant adults and comparable in juveniles and pregnant bats. No difference in plasma T_4 concentrations was found between all groups. Estradiol-17ß concentrations were three times higher in pregnant bats compared to nonpregnant ones or juveniles. A possible relationship between these high figures and elevated T_3 values has been discussed.

Ifuta, N. B., G. B. Katuala and M. L. Bola (1987). Etude du régime alimentaire de quelques espèces des Mégachiroptères de la région de Kisangani (Zaïre).

Des recherches menées sur le régime alimentaire de huit espèces de chauves-souris de Kisangani - Megachiroptera - nous ont conduit à recenser 34 espèces végétales dont les fruits sont consommées.

Les fruits les plus affectionnés appartiennent aux familles des Moraceae, Anacardiaceae, Mytaceae, Rubiaceae, Apocynaceae et Museceae.

Dans cette étude, une esquisse des préférences alimentaires de chaque espèce des Mégachiroptères est tentée.

The study made on the diet of eight bat species - Megachiroptera - at Kisangani revealed 34 plant species whose fruits are eaten.

The most consumed fruits belong to Moraceae, Anacardiaceae, Myrtaceae, Rubiaceae, Musaceae and Apocynaceae families. In this paper, the alimentary preferences of each species of Megachiroptera is outlined.

Ilchenko, G. G., E. I. Kozhurina, E. M. Astrakhova and A. Selivanova (1999). Daily activity of Egyptian fruit bats, *Rousettus aegyptiacus*, in captivity. Abstract.

Adult Egyptian fruit bats imported to Moscow Zoo from ??? of Dutch zoos in 1996, and their descendants ??? kept in ? flight cage with reversed light cycle. ? darkened ?????? of the enclosure serves them as ? roost place; ?? entrance to the feeding b?? is located in the lower part of the enclosure. Analysis of numerous short-term observations and the data ?? behaviour in ? group of 13 fruit bats during twenty-four hours and two dark phases allows us to outline the dynamics of their daily activity.

?n hour and ? half before coming of the "morning", the bats bunch and stay together for 8 - 9 hours. Most animals ??? sleeping, however regular alterations occur in the group: individuals from the periphery of the cluster gradually ??n?tr?t? its center, some bats begin grooming, agonistic interactions sometimes break out. Six ?? seven hours before switching off the light, the group is getting loose. ???? ??? engaged in grooming, some are fluttering or flying around, check the feeding b?? and drinking bowl; juveniles ??? picking u? the food remains from the floor. Just as the light is switched off, the wh?l? group bursts into activity, and the cluster disintegrates. Putting down the food into feeding b?? leads to further increase in activity. Flight bouts, fluttering, flying u? to the feeding b??, entering it and subsequent flying out with pieces of fruits alternate with perching ?? the ceiling and walls. ?h? animals are dispersed at most, t?m?????? groups consist of 2 - 3 individuals. At the beginning of the "night", ? few bats succeed in entering the feeding b?? which suggests the existence of competitive interactions between individuals. Before forming ? dense cluster, Egyptian fruit bats swarm in the enclosure for ?? hour ?? so, like m?n? cavernicolous bats in the wild. ??? ??? suppose that swarming behaviour is functionally equivalent in captive fruit bats and in free-ranging bats.

Iliopoulou-Georgudaki, J. (1986). The relationship between climatic factors and forearm length of bats: evidence from the chiropterofauna of Lesvos island (Greece- East Aegean).

The environmental correlates of morphological differences between Greek mainland bat populations and related of Lesvos island were conducted, based on the morphometric study of 451 specimens. Absolute and relative humidity, rainfall, and wind speed for the collecting vicinities are examined as well. Statistical analysis showed significant differences for several morphometric characters between insular and mainland populations but only forearm length exhibits a constant pattern among the species. From the meteorological factors, only wind speed differs most substantially among the localities. A negative correlation between forearm length and the mean wind speeds is indicated.

L'étude morphométrique de 451 spécimens de chauve-souris a permis de mettre en évidence des corrélations entre les différences des conditions du milieu et les différences morphologiques chez des populations de Grèce continentale et chez celles de l'ile de Lesbos. L'hygrométrie, la pluie et la vitesse du vent dans les localités de capture ont aussi été examinées. Une analyse statistique a montré des différences significatives pour plusieurs caractères morphométriques de ces populations, mais seule la longueur de l'avant-bras a montré une différence constante. Parmi les facteurs météorologiques, c'est la vitesse du vent qui diffère le plus selon les localités. Une corrélation négative est mise en évidence entre la longueur de l'avant-bras et la vitesse moyenne du vent.

Iliopoulou-Georgudaki, J. and E. B. Giagia (1986). The chromosomes of Kuhl's pipistrelle bat *Pipistrellus kuhli* (Kuhl, 1819) from Greece.

Standard karyotype and G-bands observed in the chromosomes of *Pipistrellus kuhli* from Greece are described. The karyorypes have confirmed the high conservatism of the Vespertilionidae bats, as the studied species possess 2n = 44 with three large biarmed pairs. The G-band patterns found in the karyotypes of the examined species are identical with those previously described of that species from Ajerbaijan (USSR) and Libya.

Ingoldby, C. M. (1929). On the mammals of the Gold Coast.

A collection of mammals - mainly small mammals - from the Gold Coast Colony, including Ashanti and the Northern Territories, recently got together by the author, proves to contain a considerable number of species not previously recorded from the Colony; and, as available literature on this area is scanty and scattered, it seems worth while to attempt a list of its mammalian fauna as now known.

Two considerable collections have been received by the British Museum from Ashanti - by Dr. Spurrell (1910-1912), and by Captain Giffard, from the Northern Territories. A few specimens have been sent by others from time to time. For the Ungulates I have drawn fully on the B.M. "Catalogue of Ungulate Mammals," 1914-1916, Lydekker. I have to acknowledge the assistance I have received from the authorities of the British Museum, who have allowed me ready access to the collection and to literature, and especially to Mr. M. A. C. Hinton and Mr. Oldfield Thomas, who have given me the friendliest encouragement and help throughout. To Mr. Pocock, who has also helped me with a valued gift of "separates," to Dr. E. Schwarz, for help in some points of nomenclature of the Primates and one or two of the Carnivores, and to Mr. Oldfield I owe thanks.

The most interesting facts brought to light by this new collection are, perhaps, the large number of species inhabiting this small area, the occurrence of *Hylochcerus meinertzhageni* so far to the west, and the discovery of an important new species of the rare genus *Uranomys*.

Iredale, T. and E. Le G. Troughton (1934a). A check-list of the mammals recorded from Australia.

More than three centuries have passed away since Pelsart in 1629 provided the first known description of an Australian pouched animal, and, although over 400 species and subspecies of mammals, marsupial and otherwise, have since been described, the present work is the first to assemble in a. comprehensive taxonomic list the mammalian orders indigenous to Australia and the adjacent seas.

Much care has been devoted to supplying the original references to species, thus avoiding the reiteration of extensive synonymic lists, while the essential generic references are quoted in a manner adequately stabilising the name to be accepted. A feature especially helpful to fellow-workers is the listing of authentic type localities, as those of many of the earlier species have hitherto been either overlooked or misquoted, and wrong conclusions have resulted therefrom.

A very natural result of the early recognition of the extraordinary interest of the Australian fauna was that collections made by explorer-naturalists, officials, and settlers went overseas to be described and stored away for all time. Until recently, therefore, much of the mammalian research has been carried out abroad, and Australian, workers have been troubled by the fact that many species are known only by meagre descriptions of material which is rarely illustrated and mostly unrepresented in their collections.

Further confusion arose from the fact that for many years no attempt was made accurately to localise individual discoveries, so that a vast amount of field-work must be carried out in order to check not only the identity but the actual survival and present range of many species.

No student of Australian mammalogy, however, can fail to be impressed by the magnitude of the work accomplished by John Gould, and the wide knowledge he gained in the early days of various parts of the continent and the habits of its quaint denizens, which led to the preparation of the three wonderful volumes of "The Mammals of Australia."

The authors also pay tribute to those past and present workers who have devoted much ability and energy to furthering a knowledge of the fascinating mammalian fauna. Amongst the earlier workers were Gerard Krefft and Dr. B. Pierson Ramsay, past Curators of the Australian Museum. In the nineties J. Douglas Ogilby was engaged by the Museum Trustees to prepare a "Catalogue of Australian Mammals," published in 1892, a compilation which, though providing a useful basis, suffered from the author's lack of experience of the subject, and his failure to consult the important collections already available in the Museum. While a member of the Museum staff, Edgar R. Waite contributed some important work upon the mammals, notably in association with Professor Baldwin Spencer, who also named some important discoveries, on the collections of the Horn Expedition to Central Australia.

The "Catalogue of Marsupialia and Monotremata" by Oldfield Thomas, of the British Museum, will, of course, provide a basis of study for all time. Since its publication in 1888, however, its author has described not only a great number of marsupials, but rodents and bats as well, so that his acitivities alone provided urgent need for the compilation of a check-list.

Of the more recent comprehensive works, the "List of Australasian and Austro-Pacific Muridæ," published by Heber A. Longman in 1916, is invaluable when studying the indigenous rodent fauna, but many forms have since been described, while the nomenclature has been subjected to considerable revision. Finally, there is the splendid handbook to "The Mammals of South Australia," 1923-1925, prepared and illustrated with so much care and originality by Professor F. Wood Jones while occupying the Chair of Anatomy at the University of Adelaide. Workers in mammalogy owe a debt of gratitude to the author of this handbook, which, though restricted as to the range of actual forms, really provides a complete introduction to the study of the mammalian fauna of Australia.

Concerning the major classification of Marsupialia, it has seemed advisable to follow the older and more familiar one used in the "Catalogue" by Thomas rather than that adopted by Wood Jones in his Handbook, though close analysis of the latter classification must prove very instructive to students of mammalogy.

All references to scientific names have been checked by consultation of Palmer's "Index Generum Mammalium" and Sherborn's "Index Animalium." The accuracy of both of these compilers is, of course, beyond comparison, and the satisfactory compilation of this List has been greatly facilitated by the assistance of these standard works.

Throughout this work, the provision of vernacular names for all forms, many of which were met with in the wild state only by the collector, has often proved a more difficult task than that of establishing the priority of scientific names. The aboriginal names, which may vary with local tribes, or those used by settlers in various districts or States, for instance, are hardly applicable to single species which may occur in several mainland States and on islands as well.

The law of priority has invariably been followed in the acceptance of scientific names and, although the inevitable and sometimes drastic changes may be regretted, adoption of the earliest valid name provides the sole means of reaching finality, and also avoids the lasting confusion which results from conserving here and rejecting there.

At the present time there is definite evidence of a revival of interest in mammalian research within the Commonwealth, and it is the authors' hope that this List will not only enable workers to designate genera and species with certainty, but also assist ia creating a universal understanding of our faunal problems and the urgent need for the conservation of existing species.

Izhaki, I., C. Korine and Z. Arad (1995). The effect of bat (*Rousettus aegyptiacus*) dispersal on seed germination in eastern Mediterranean habitats.

The fruit-bat *Rousettus aegyptiacus* (Pteropodidae) in Israel consumes a variety of cultivated and wild fruits. The aim of this study was to explore some of its qualities as a dispersal agent for six fruit-bearing plant species. The feeding roosts of the fruit-bat are located an average of 30 m from its feeding trees and thus the bats disperse the seeds away from the shade of the parent canopy. The bat spits out large seeds but may pass some (2 %) of the small seeds (< 4 mg) through its digestive tract. However, neither the deposited seeds nor the ejected seeds (except in one case) had a significantly higher percentage germinating than intact seeds. Although the fruit-bat did not increase the percentage germinating, seeds of three plant species subject to different feeding behaviors (deposited in feces or spat out as ejecta) had a different temporal pattern of germination from the intact seeds. The combined seed germination distribution generated by these different treatments is more even over time than for each treatment alone. It is suggested that this increases asynchronous germination and therefore enhances plant fitness by spreading the risks encountered during germination, especially in eastern Mediterranean habitats where the pattern of rainfall is unpredictable.

Jackson, H. D. (1973). Faunal notes from the Chimanimani mountains, based on a collection of birds and mammals from the Mucrera river, Mozambique.

The paper reports on a collection of 125 specimens taken in August - September, 1972, in the vicinity of the Mucrera River, Mozambique; this is in the Chimanimani Mountains close to the Rhodesian border. The collection includes the first specimen of Cape Eagle Owl *Bubo capensis* from Mozambique (see Jackson, 1973a) and useful series of Whitethroated Swallow *Hirundo albigularis* (ten specimens), Wailing Cisticola *Cisticola lais* (25 specimens), Bokmakiri *Telophorus zeylonus* (eight specimens; see Jackson, 1972) and Egyptian Freetailed Bat *Tadarida aegyptiaca* (27 specimens). The specimens represent 24 bird and four mammal species; also recorded are another 27 bird and five mammal species seen but not collected, including the first record of the Rednecked Francolin *Francolinus afer* from the Chimanimanis.

Habitat notes are provided for most of the species. The Dabchick *Tachybaptus ruficollis* was found breeding in the Chimanimanis for the first time and ovarian activity was noted in Rameron Pigeon *Columba arquatrix* (apparently no breeding records from Mozambique or Rhodesia), Freckled Nightjar *Caprimulgus tristigma* and Stonechat *Saxicola torquata*; for most species the breeding season was only just beginning. Notes on courtship and other behaviour are included for several species.

The Mucrera deme of the Wailing Cisticola is shorter-winged than *C.l. mashona*, the taxon to which the Chimanimani populations are usually referred.

The Whitethroated Swallow is not resident in the Chimanimanis as claimed by Hodgson (1971); it arrives in August, the males apparently preceding the females by a few weeks.

The weights of all specimens are given and for several bird species the colours of soft parts given in McLachlan & Liversidge (1970) are shown to be unreliable.

Jacobs, D. S. (1996). Morphological divergence in an insular bat, *Lasiurus cinereus semotus*.

1 Bats are the only terrestrial mammals to have reached isolated oceanic islands without human assistance. Despite the fact that the greatest evolutionary divergence would be expected on such islands, very few studies on the divergence of oceanic island fauna from their mainland counterparts have focused on bats. This study investigated divergence of the insular Hawaiian Hoary Bat, *Lasiurus cinereus semotus*, from its North American subspecies, *L. c. cinereus*.

2. Divergence in the Hawaiian Hoary Bat involved characters related to flight and feeding.

3. The Hawaiian bat has undergone a 45 % reduction in body size with allometric responses in the size of its wings. These changes resultedin a combination of low wing loading (ratio of weight to wing area) with relatively long, narrow wings. The low wing loading permits slower and more manoeuvrable flight near vegetation, whild the relatively long, narrow wings enable enduring flight in open areas. This increased flexibility in fligh behavior has allowed the Hawaiian bat to expand its foraging habitat to include open habitats similar to those of *L. c. cinereus*, and closed habitats that are not used by *L. c. cinereus*.

4. Divergence in characters related to feeding involved relative increases in size of the gape, size of the masseter muscle and the height of the coronoid process. These changes give the jaw more crushing power for more efficient processing of large and hard-bodied prey. This has enabled the Hawaiian bat to include large, and hard-bodied insects (not taken by *L. c. cinereus*) in its diet despite a marked reduction in body size.

Jacobs, D. S. (1999). Intraspecific variation in wingspan and echolocation call flexibility might explain the use of different habitats by the insectivorous bat: *Miniopterus schreibersii* (Vespertilionidae: Miniopterinae).

On the basis of its long narrow wings, Schreiber' long-fingered bat (*Miniopterus schreibersii*) has been characterized as a species, which uses rapid flight in open spaces. Until now, observations of the foraging behavior of this species have supported this view. However, its long narrow wings are combined with relatively low wing loading suggesting that it might be capable of the slow manoeuvrable flight characteristic of species that forage within dense vegetation (i.e. in clutter). At De Hoop Nature Reserve in South Africa, *M. schreibersii* were trapped in dense vegetation as well as in open areas, prompting my investigation into the morphological basis for the ability of this species to use both kinds of space. The wing parameters and echolocation calls of individuals that were captured in open areas were compared with those that were captured in clutter. Bats captured in clutter had shorter wingspans and therefore lower aspect ratios than individual captured in open space. A shorter wingspan enables greater manoeuvrability in the confined spaces associated with clutter. In accordance with theoretical predictions, individuals flying in open space used echolocation calls of longer duration and lower mean maximum frequency than individuals flying within clutter. The longer, lower frequency echolocation calls used by bats in open spaces increases the range at which they detect insect prey, which should allow more time to react at the rapid flight speeds used in open space. The use of both open and cluttered spaces in this species thus appears to be based on intraspecific variation in wing span and individual flexibility in echolocation calls.

Jacobsen, N. H. G., P. C. Viljoen and W. Ferguson (1986). Radio tracking of problem Fruit bats (*Rousettus aegyptiacus*) in the Transvaal with notes on flight and emergetics.

Radio tracking was used to locate a cave in which Egyptian fruit bats roosted after nightly feeding visits to litchi orchards in the Trichardtsdal/Ofcolaco area of the northeastern Transvaal. This paper reports on results of this technique and discusses its shortfalls.

Radio-Ortung von schadenanrichtenden Flughunden (*Rousettus aegyptiacus*) in Transvaal mit Anmerkungen über Flug und Energiehaushalt.

Radio-Ortung wurde zur Auffindung einer von Nilflughunden benutzten Höhle gebraucht, in die sie nach nächtlichem Fressen in Litschi Obstgärten in der Trichardtsdai/Ofcolaco-Region des nordöstlichen Transvaal zurückflogen. Die Arbeit berichtet über die Ergebnisse dieses Verfahrens und diskutiert seine Schwächen.

Jadin, J. B., P. H. Vercammen-Grandjean and A. Fain (1955). *Trombicula nycteris* n.sp. Un Trombiculidae (Acarina) parasite de chiroptères.

En juin 1953, l'un d'entre nous récolta sur une Chauve-souris: *Nycteris macrotis*, un certain nombre de larves de Trombiculidés d'espèce nouvelle et apparentée à *Trombicula* PHIL. & TRAUB 1950.

Cette espèce nouvelle fut appelée: *Trombicula nycteris*. Elle appartient à un groupe important des *Trombicula*, africains, parmi lesquels sont déjà connus les suivants: *T. panieri* JAD. & VERC. 1952, *T. jadini* VERC. 1952 et *T. rodhaini* JAD. & VERC. 1952.

Javrujan, E. G. (1989). On some bat species from northern Africa (Algeria). Abstract.

From October, 1980 to July, 1984 incl., the author investigated the bat fauna of Algeria and its borderland with Tunisia and Morocco. The study area is heterogeneous as to geography and climate. Most bat species are concentrated on the Mediterranean coast, fewer species occur in the oases of the Sahara Desert, and still fewer in the mountain regions separating the wide coastal zone from the Sahara.

The author has ascertained 20 out of the 23 species recorded in the territory of Algeria; they belong to the families Rhinolophidae and Vespertilionidae. He inspected around 220 shelters and banded 660 individuals. Eighteen species, which mostly occur also in Armenia, were studied systematically. Mr Ahmed Amiri, vice-principal of the University, and students of the Department of Zoology of the University, in Annaba participated in the investigations.

Particular attention was paid to the Annaba region and the Algerian coastal zone where most morphological and biological investigations were made. Each year, five to seven expeditions were made to the Sahara. Investigations into ruins, tombs, mosques and houses were connected with diffeculties. Nevertheless, the author succeeded in compiling maps of localities and in obtaining an idea of the species composition and ecology of the bats of Algeria. The material obtained has also enabled him to compare the morphometric characters of certain northern African and Armenia species.

Editorial Note. In the same years (1980 - 1984), other authors also studied the distribution and ecology of bats in Algeria. According to published data (Gaisler 1983, 1984; Vesmanis 1985; Gaisler et Kowalski 1986; Kowalski et al. 1986), 26 species of six families of Chiroptera have been recorded in Algeria.

Jeffrey, S. M. (1975). Notes on mammals from the high forest of Western Ghana (excluding Insectivora).

Des renseignements sont fournis sur 73 espèces de Mammifères, collectionnés pendant trois ans dans une région forestière du Ghana occidental (près de Sefwi Wiawso) comprenant environ 3 845 km^2. Des détails de localité, d'habitat, de poids et de taille, de mœurs et de reproduction sont indiqués quand ils sont connus. *Tadarida congica* est rapporté pour la première fois en Afrique de l'Ouest.

Jentink, F. A. (1881). Description of a new African bat, *Leiponyx büttikoferi*.

In the family of the Pteropodidae there are three genera in which the claw, to the index finger is wanting, viz. *Cephalotes, Notopteris* and *Eonycteris*. The first of these genera is represented by two, the others each by a single species. They are distributed in the following manner: *Cephalotes peronii* inhabits the islands of the Austro-Malayan subregion, while *Cephalotes minor* is to be found in New Guinea; *Notopteris macdonaldii* is limited to the Fiji-group and Aneiteum-island and *Eonycteris spelaea* is to be found in caves on the Indian continent (Burma). The Pteropodidae met with by the numerous travellers in the African continent belong without exception to the genera *Epomophorus* and *Cynonycteris*. Taking these facts into consideration I was greatly surprised to find in a small collection of bats, made in Liberia by our travellers Büttikofer and Sala a *Pteropus*-like bat, which did not possess a claw to the index finger and so could not belong to a species of *Epomophorus* or *Cynonycteris*. This species differing in many points from the other species without a claw to the index finger, I am obliged to regard our specimen as the type-species of a new genus, which I propose to call *Leiponyx*.

Jentink, F. A. (1888a). Zoological researches in Liberia. A list of mammals, collected by J. Büttikofer, C.F. Sala and F.X. Stampfli, with biological observations.

This paper is a continuation of Büttikofer's papers on the zoological researches in Liberia in the Notes from the Leyden Museum, 1885, Vol. VII, p. 129 and 1886, Vol. VIII, p. 243. As well as Büttikofer's list of the birds gives a good impression of the richness of the Avifauna in that part of Africa, so my paper will give an idea of the luxuriousuess of the Mammalian forms in that country. Our travelers have been happy enough to procure several new species besides specimens of species hitherto only known by mutilated skins or by a single skull, by a single specimen or of which the locality was unknown or uncertain. The collections are the results of four voyages, made by Büttikofer and Sala (January 1880 - April 1882), by Stampfli (July 1884 - April 1886), by Büttikofer and Stampfli (November 1886 - May 1887) and the continuation of the latter by Mr. Stampfli who is still hunting in Eastern Liberia, but intends to return within a few months. In the above mentioned paper ....

Jentink, F. A. (1890). On a collection of mammals from Billiton.

Up to this day I knew only a single Mammal, *Sciurus prevostii*, from Billiton, a small island, situated between Borneo and Banka. As the islands between Sumatra and Borneo bear a peculiar scientific interest with regard to the distribution of the animals and to the hypothesis concerning the relation in prehistorical times between these two large islands, I was in sanguine expectations in receiving a letter from Dr. A. Vorderman (Batavia), containing the kind information that he had made a journey to Billiton in June 1888 and now presented the then collected animals to our Museum. And how great was my astonishment in finding in that collection no less than 10 species of Mammals from Billiton. So that we know at present eleven well-defined species from that interesting point in the Malay Archipelago.

Two species, *Pteropus edulis* and *Sciurus prevostii*, in the collection are from Mendanao, a small island close to the west coast of Billiton.

The following 10 species are contained in Vorderman's collection from Billiton.

Jobling, B. (1939). On the African Streblidae (Diptera, Acalypterae) including the morphology of the genus *Ascodipteron* Adens and a description of a new species.

Dr. F.W. EDWARDS has kindly submitted to me the specimens of Streblidae collected by him in March 1935, during his entomological expedition to East Africa, in the caves near Kapretwa, at 6500 ft., on Mt. Elgon, Kenya. To this material he added the specimens collected by Dr. G.H.E. Hopkins, in the same locality, and asked me to write a short report.

After an examination of these two collections, I came to the conclusion that a short report on these specimens will have very little value. Therefore, I have decided to write this paper, which includes all the records of the African Streblidae known to me at present, and an illustrated key for their identification.

Amongst the material of Dr. Hopkins there were thirteen spirit specimens of bats infested with the endoparasitic females of the genus *Ascodipteron*. With this material I was able to study the external structure of this endoparasite, and the description of it is given in this paper. I think that this description will serve as a basis for the further study of the characters of the species of this highly specialized genus.

As I could not refer to the specimens of *Ascodipteron* to either *A. lophotes* Monticelli (1898), or to *A. tabulatum* Speiser (1908a), they are described here as a new species. However, I must mention that the descriptions of these authors are incomplete, and a comparison of my type specimen with theirs may demonstrate its identity with either *A. lophotes* or *A. tabulatum*.

The African species of this family of Diptera belong to the following three genera: *Raymondia, Nycteribosca* and *Ascodipteron*. The first two genera are included in the subfamily Nycteriboscinae and the last in the Ascodipterinae. The species of these genera are widely distributed in the Oriental region, where those of the genus *Nycteribosca* are more numerous than in Africa. But non of the Oriental species of these genera occur in Africa and vice versa. Three Ethiopian species, *Nycteribosca Africana* Walker, *N. alluaudi* Falcoz and *Raymondia huberi* Frauenfeld, are common on certain bats in the Palaearctic region of Africa. Of these species *Nycteribosca Africana* has the widest distribution, and is the only streblid which occurs in the Mediterranean parts of Europe and Asia (Portugal, south of France, Sardinia, Cyprus and Palestine).

Table 1 shows that the African Streblidae parasitize bats belonging to eight families of Chiroptera. The more common and widely distributed species, such as *N. africana* and *Raymondia huberi*, have been found on the species of the three families of bats, whereas the less common species, with the more localized distribution, have been recorded only from one, or from two species of bats of the same genus.

It seems that the evolution of the Streblidae has been going on side by side with that of their hosts. The most generalized species of this family occur on the species of the most generalized family of Chiroptera. Thus *Nycteribosca bequarti* and the Oriental species, *N. gigantean*, which are the most generalized species of the Streblidae, have been found only on bats of the most primitive form of Pteropidae of the suborder Megachiroptera.

The distribution of the African Streblidae is known very incompletely, for instance, there is only one record of these Diptera from the whole of West Africa (Old Calabar, South Nigeria), none from French Equatorial Africa and only two from the Belgian Congo.

Jobling, B. (1952). Description of two new species of *Ascodipteron* from Africa and one species of *Nycteribosca* from Madagascar (Diptera, Streblidae).

The description of one new species of *Ascodipteron* and another one of *Nycteribosca* is based on the material collected in Africa and Madagascar respectively by Mr H. Hoogstraal, of the United States Naval Medical Research Unit No. 3. These specimens represent a part of the collection which was sent to me for identification by Mr R. L. Wenzel of the Chicago Natural History Museum. In this paper I have also included the description of another new species of *Ascodipteron* of which two specimens were collected by Mr T. S. Jones in West Africa. As the specific characters of the species of the genus *Ascodipteron* have not been properly understood, they are described here in the comparative form, together with the morphology of the head, thorax and the abdomen.

Jobling, B. (1954). Streblidae from the Belgian Congo, with a description of a new genus and three new species (Diptera).

Mr. P. BASILEWSKY, Chief of the Entomological Department of the Musée Royal du Congo Belge at Tervuren, and Mr. P. L. G. BENOIT, Assistant, have very kindly submitted to me a very large collection of *Streblidae* made by N. LELEUP in the Belgian Congo, during his work at the *Institut pour la Recherche Scientifique en Afrique Centrale* (I.R.S.A.C.). In this collection were one new genus and three new species; the descriptions of these are given below, together with the record of the known species which have been found in this collection. The types are deposited in the Musée Royal du Congo Belge.

Except *Raymondia setiloba* sp. n . and *Raymondioides leleupi* gen. n. and sp, n. the rest of the *Streblidae* of the Belgian Congo occur in many other parts of Africa, and therefore, in order to give the complete records of their distribution, I have also included their previous records.

During the last ten years the *Streblidae* have been very extensively collected in the North-eastern parts of Africa, and for this we are indebted to Mr. H. HOOGSTRAAL, Head of the Department of Medical Zoology, U. S. Naval Medical Unit N° 3, in Cairo. His specimens have been identified by me, and they are now preserved jn the Chicago Natural History Museum. They helped me greatly to clarify several obscure points during the preparation of this paper, and the record of some of them are also mentioned here.

As my key to the African *Streblidae* was published in 1939, and during the intervening years several new species have been added to the African list, I have decided to include in the present paper a new key to the genera *Nycteribosca* and *Raymondia*. The species of the genus *Ascodipteron* are not treated here because they have not been sufficiently studied, and as yet, have not been recorded from the Belgian Congo.

Jobling, B. (1956). Streblidae from the French Ivory Coast, with a description of new species (Diptera).

Dr. V. AELLEN of the "Muséum d'Histoire Naturelle", Geneva, very kindly sent me a small but interesting collection of Streblidae, made by him during his scientific expedition to the French Ivory Coast. Among the specimens of this collection were two new species which are described below. A specimen from French Guinea is also recorded. The types of new species are deposited in the "Muséum d'Histoire Naturelle" of Geneva.

Johansson, S. G., P. Cunneyworth, N. Doggart and R. Botterweg (1998). Biodiversity surveys in the East Usambara Mountains: Preliminary findings and management implications.

Geographically referenced biodiversity information is important for conservation management and zoning. Biodiversity surveys were initiated in the East Usambara Mountains in 1995 to provide baseline information on the biological values of the forests for management planning and monitoring, and to train field staff in the use of biological inventory techniques. They were conducted in ten-week field phases. Vegetation plots were laid along a grid of 450 m x 450/900 m. Forest disturbance was assessed using the grid transects. Selected groups of fauna were surveyed using standard methods. Inventories have been completed in ten forests covering 11,076 ha. New species have been discovered, and several range extensions have been documented. Data on local distribution of endemics and threatened species has been incorporated in management plans for Forest Reserves. About 35 foresters have been trained. During 1997 a database was developed for data entry, retrieval and mapping.

Jones, C. (1971). The bats of Rio Muni, West Africa.

Based on reference specimens obtained from known localities, a modern list is presented of the bats of Rio Muni, West Africa. Information is presented and summarized on some aspects of the biology, especially reproduction and ecologic distribution, of these mammals. Data are recorded with regard to some of the morphological variations found in the species of bats listed.

Jones, C. (1972). Comparative ecology of three pteropid bats in Rio Muni, West Africa.

Data on morphologic features, habits ,stratification, flight, and thermal response are presented for *Eidolon helvum, Epomops franqueti*, and *Micropteropus pusillus* from Rio Muni, West Africa. Relative abundance and reproduction activities of these pteropodids are concordant with seasonal rainfall and availabitlity of foods in Rio Muni. There are major differences between these sympatric species with regard to roosting sites, foods and feeding behaviour, levels of flight, and aerodynamic properties. Thermal responses vary between the species and are correlated with differences in behavioural thermoregulation.

Jones, G. and E. M. Barratt (1999). Case 3073. *Vespertilio pipistrellus* Schreber, 1774 and *V. pygmaeus* Leach, 1825 (currently *Pipistrellus pipistrellus* and *P. pygmaeus*; Mammalia, Chiroptera): proposed designation of neotypes.

The purpose of this application is to provide neotypes for two broadly sympatric cryptic species of pipistrelle bats; until recently only a single taxon was recognised and known as *Pipistrellus pipistrellus* (Schreber, 1774). The species were first distinguished by their ultrasonic echolocation calls but also differ in other ways. It is proposed that the species with the lower-pitched call should be denoted by the name *P. pipistrellus*, and that the name *P. pygmaeus* (Leach, 1825), which has been regarded as a synonym of *P. pipistrellus*, should be used for the smaller species which calls at a higher frequency.

Jones, G., T. Gordon and J. Nightingale (1992). Sex and age differences in the echolocation calls of the lesser horseshoe bat, *Rhinolophus hipposideros*.

The CF portion of calls emitted by hand-held Lesser Horseshoe Bats *Rhinolophus hipposideros* depends on the age and sex of the bat. Bats older than one year have calls higher in frequency than those produced by first-years, and females emit higher frequency calls than males. Within sexes, frequency is not correlated with forearm length. The implications of intraspecific variation in pulse design for communication and resource partitioning are discussed.

La portion CF des cris émis par des Petits rhinolophes fer à cheval, (*Rhinolophus hipposideros*), tenus à la main, dépend de l'âge et du sexe de la chauve-souris. Celles qui sont agées de plus d'un an émettent des cris a plus haute fréquence que celles qui ont moins d'un an, et les femelles émettent à plus haute fréquence que les mâles. Entre membres du meme sexe, lé frequence à laqueile est émis le cri n'a aucun rapport avec la longueur de l'avant-bras. Une discussion est engagée sur les consequences possibles des variations intra-spécifiques dans la production des cris, pour la communication et le partage des resources.

Jones, G. and T. Kokurewicz (1994). Sex and age variation in echolocation calls and flight morphology of Daubenton's Bats *Myotis daubentonii*.

We investigated variation in echolocation calls and in wing shape of Daubenton's Bats *Myotis daubentonii* in west Poland. Bats in their first year emitted echolocation calls which were slightly (but significantly) lower in frequency than calls made by bats older than one year (1 + year bats). Although

sexual differences in echolocation were not apparent, there was sexual dimorphism in size. Females were on average larger than males in wing span, wing area, hand-wing length, arm-wing length, and had significantly higher body masses. Although females had a larger average arm-wing area than males, there was no significant difference in hand-wing area between the sexes. Consequently, females had a lower mean tip area ratio than males. Such sexual dimorphism in wing shape may have consequences for the flight behaviour of the two sexes. Bats older than one year were on average heavier than first-years, and had higher body condition indices. Females had higher mean wing-loadings than males. There were no obvious differences in the humidity requirements of the sex and age classes, but first-years tended to occur at lower temperatures than 1 + year bats. Within sex and age-classes call frequency was negatively correlated with several measures of body size in first-year males, though consistent trends were not evident in other groups. Interpulse interval was positively correlated with forearm length in first-year males and first-year females.

Nous avons étudié la variation des cris d'écholocation et de la morphologie de l'aile du Murin de Daubenton, *Myotis daubentonii*, dans l'ouest de la Pologne. Les individus d'un an ou moins émettaient des cris sonar légèrement, mais d'une manière significative, de plus basse fréquence que ceux émis par des murins plus âges. Bien qu'une différence sexuelle dans les cris sonar ne se soit pas manifestée, il existait un dimorphisme de la taille corporelle. Les femelles étaient en moyenne plus grandes que les males en ce qui concerne l'envergure et la superficie des ailes. La longueur de l'aile comprenant les doigts et celle comprenant les bras étaient toutes deux plus grandes chez les femelles, et celles-ci étaient aussi plus lourdes que les mâles, d'une manière significative. Les femelles avaient, en moyenne, une superficie d'aile plus grande que les mâles, lorsqu'on a mesuré seulement les portions comprenant les os des bras. La différence entre les deux sexes lorsqu'on a mesuré seulement les portions de l'aile représentées par les doigts n'était pas significative. Par conséquent, le rapport de la superficie moyenne du bec d'aile était plus bas chez les femelles. Une telle différence sexuelle dans la morphologie des ailes pourrait avoir des conséquences sur le comportement en vol des deux sexes. Les chauves-souris âgées de plus d'un an étaient en moyenne plus lourdes que celles d'un an ou moins et les indices de l'état de leur condition physique étaient aussi meilleurs. Le chargement de l'aile était en moyenne plus haut chez les femelles que chez les males. Il n'y avait pas de différence évidente dans le niveau d'humidité requis par les différentes classes d'âge et de sexe, mais les chauves-souris d'un an ou moins étaient présentes en général, à des températures plus basses que celles de plus d'un an. Pour les males d'un an ou moins, la fréquence des cris sonar avait une corrélation négative avec plusieurs dimensions du corps. Les mêmes tendances n'ont pas été mises en évidence dans les autres classes d'âge et de sexe. L'intervalle entre les pulsations des cris sonar avait une corrélation positive avec la longueur de l'avant-bras chez les mâles et femelles d'un an au moins.

Jones, G., M. Morton, P. M. Hughes and R. M. Budden (1993). Echolocation, flight morphology and foraging strategies of some West African hipposiderid bats.

We studied echolocation call structure, flight morphology and feeding behaviour of three hipposiderid bats (*Asellia tridens, Hipposideros caffer* and *H. ruber*: Chiroptera: Hipposideridae) in The Gambia during the wet season (July - August). All three species emitted brief CF/FM echolocation calls. In *A. tridens* CF (constant frequency) frequencies between 108 and 122 kHz were recorded. This variation was caused mainly by sex and age difference in call frequencies: juveniles used lower frequencies than did adults, and males were lower in frequency than females. Among adults, CF frequency was related to forearm length in a polygonal manner. *Asellia tridens* is unusual for a microchiropteran in that males are larger than females: nevertheless this species follows the typical trend for bats using CF components in their calls in that males call at lower frequencies than do females. The spread in frequencies notes for *A. tridens* in group flight was not caused primarily by individuals shifting their frequencies when flying in a group compared with when flying alone. Three bats were flown separately and then together in a small room. The hypothesis that bats shift emitted frequencies in group flight to minimize confugin their own echoes with those from conspecifics was not supported. Rather, we suggest each bat has a personal CF frequency determined by sex, age and size, and that the variation created by these factors reduces confusion with other bats' echoes during group flight. Bats of the genus *Hipposideros* were separated into two groups by discriminant analysis on flight morphology. The two groups showed little overlap of CF frequencies used in echolocation. Bats identified as *H.*

ruber called with CF resting frequencies between 121 and 136 kHz, while *H. caffer* used 128 - 153 kHz. Our results support the classification of these bats into two sibling species. We compared the flight performance of *A. tridens* and *H. ruber* by flying bats through obstacle courses: *H. ruber* had a lower wing loading and was able to negociate more complex arrays of obstacles than could *A. tridens*. In the wild, *H. ruber* fed in more cluttered situations than did *A. tridens*. Both species were feeding mainly on Coleoptera during the study period, and in *H. ruber* individuals with higher aspect ratios and long wingspans tended to eat more moths than did bats with broader and shorter wings.

Jones, G. and R. D. Ransome (1993). Echolocation calls of bats are influenced by maternal effects and change over a lifetime.

The greater horseshoe bat, *Rhinolophus ferrumequinum*, is a model species in echolocation studies, and emits calls containing long constant-frequency (CF) components. The bats have auditory systems tuned sharply to frequencies close to the resting CF (RF) values. Call frequency and neural processing are both flexible within individual bats which use this mode of echolocation. The simple structure of the calls makes them ideal for sonagraphic analysis. Here, in a large-scale and long-term analysis of changes in the vocalizations of bats we show that: (i) the calls of *R. ferrumequinum* aged 1-28 years vary seasonally and over a lifetime in a predictable manner; and (ii) an infant's RF is at least partly determined by the RF of its mother. We consider the relative importance of genetic and learning factors upon the correlation between RFS of mothers and offspring.

Jones, G. and J. M. V. Rayner (1989). Foraging behavior and echolocation of wild horseshoe bats *Rhinolophus ferrumequinum* and *R. hipposideros* (Chiroptera Rhinolophidae).

1. Echolocation and foraging behavior of the horseshoe bats *Rhinolophus ferrumequinum* and *R. hipposideros* feeding under natural conditions are described. 2. The calls of both species consisted predominantly of a long CF segment, often initiated and terminated by brief FM sweeps of substantial bandwidth. 3. *R. hipposideros* typically flew close to vegetation, and fed by aerial hawking, gleaning and by pouncing on prey close to the ground. *R. hipposideros* called with a CF segment close to 112 kHz which is the second harmonic of the vocalization; its calls included low intensity primary harmonics, and had prominent initial and terminal FM sweeps of considerable bandwidth. When searching for prey on the wing it had longer interpulse intervals than *R. ferrumequinum*, but emitted shorter pulses at a higher repetition rate; overall it had a similar duty cycle to *R. ferrumequinum*. 4. *R. ferrumequinum*, calling with a CF segment close to 83 kHz, also used harmonics other than the dominant secondary in its calls, and modified its echolocation according to ecological conditions. This species showed certain parallels with *R. rouxi* of Asia. It was observed feeding by aerial hawking and by flycatching. When scanning for prey from a perch (perch hunting), calls were of shorter duration, and interpulse intervals were on average longer, than when bats were flying. Mean duty cycle was longer in flight, and the bandwidths and frequency sweep rates of the FM segments in the calls increased in comparison with perched bats. 5. FM information may facilitate determination of target range and the location and nature of obstacles; it may also be involved in the interpretation of echoes and the detection of moving targets among clutter. The rising FM sweep initiating the call in both species when flying (and to a lesser extent perch hunting) in the wild must have a significant adaptive role, and should be considered an essential component of the call; rhinolophids should be termed FM/CF/FM bats.

Jones, G. and S. M. van Parijs (1993). Bimodal echolocation in pipistrelle bats: are cryptic species present?.

The pipistrelle bat *Pipistrellus pipistrellus* is the most widespread in Europe, and is often the most abundant bat species in northern and central Europe. *P. pipistrellus* has traditionally been considered as one species throughout Europe. Here we show that: (i) the echolocation calls of pipistrelles fall into two distinct frequency bands in Britain, with frequencies containing most energy averaging 46 khz and 55 khz; (ii) roosts consist of bats which use only one form of echolocation; (iii) small but significant differences in average gross morphology exist between the phonic types; and (iv) the two phonic types

occur in sympatry over much of Britain. Recordings made from European populations show that bimodal echolocation is also typical of continentatl pipistrelles, with only one phonic type found in some areas, two types in sympatry in others. The sympatric occurrence of two phonic types, the lack of mixing of types between colonies, and the morphological divergence between phonic types suggests that *P. pipistrellus* may actually consist of at least two cryptic sibling species. The evolution of bimodal echolocation in bats is discussed, and a model involving disruptive selection is presented to show how sympatric speciation may occur.

Jordan, K. (1936). Dr. Karl Jordan's expedition to South-West Africa and Angola: Siphonaptera.

The mammals obtained on the Expedition were mainly collected for the sake of their Ectoparasites, particularly fleas. As I found little time for trapping, especially in Angola, we did not get large numbers of fleas, there being hardly ever anything on the mammals brought in dead or alive by the natives. Since my return to Europe, Herr. W. Hoesch, one of my companions in South-West, has send me from that country two consignments of fleas which add materially to the collection. Some of the species we obtained are new, the most interesting new flea being a subspecies combining characters of *Ctenocephalides felis felis* and *Ct. connatus*.

In order to make the report on the fleas more useful, I have included in it all the species known to me from South-West and Angola.

Jüdes, U. (1994). Methods for monitoring of bats using ultrasonic detectors. Abstract.

At the 2nd European Bat Detector Workshop in Spain (1993) participants agreed on a cooperation to improve their work and established a working group

- to exchange information about monitoring methods for bats used in different European countries,
- to stimulate methodological discussion, and
-.to optimize and - as far as possible - standardize methods.

The procedure for this cooperation will follow the so-called Delphi-method:

1. Each participant describes his/her specific method(s) and experience in a short paper, fills in a questionnaire and sends both to the coordinator.

2. Coordinator builds subgroups (e.g. on specific aims of field studies) and distributes papers of participants among all subgroup members.

3. Subgroup members discuss papers, give additional hints and critical notes to authors of papers and to organizer.

4. Results of subgroup discussions are circulated again by organizer to all members for final criticism.

The cooperation will result in many international contacts, spreading of ideas among participants, testing of single methods in different countries, and - if possible - in a written many-author-guide on well experienced methods for bat detector field work.

All interested scientists and bat workers in Europe are invited to cooperate in this group and should contact me

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Juste, J. and C. Ibáñez (1992). Taxonomic review of *Miniopterus minor* Peters, 1867 (Mammalia: Chiroptera) from western central Africa.

Western populations of *M. minor* from São Tomé Island, Zaire and the Republic of Congo are compared to one another and with the known eastern subspecies, using either quantitative and qualitative parameters. The analyses confirm the subspecific character of both the São Tomé population (described as *M. newtoni* Bocage, 1893) and the western continental population, distinguished by cranial relationships and qualitative characters from the other known populations and hereby described as a new subspecies.

In addition, a neotype for *newtoni* is designated.

Juste, J. and C. Ibáñez (1993a). An asymmetric dental formula in a mammal, the São Tomé Island fruit bat *Myonycteris brachycephala* (Mammalia: Megachiroptera).

The dental formula in heterodont mammals characteristically shows bilateral symmetry. Its expression is likely to be subject to very strong selective pressures, since it is associated with such basic functions as the acquisition and preparation of food. Here we report the exceptional finding of the first asymmetric dental formula in a heterodont mammal observed in the São Tomé Island (West Africa) frugivorous bat *Myonycteris brachycephala*. The asymmetry results from the absence of a lower internal incisor, occurring variably in the right or left mandible. This morphological innovation is possibly related to a developmental instability associated with the colonization by the island species.

La formule dentaire des mammifères hétérodontes est normalement caractérisée par la symétrie bilatérale. Son expression est en général le reflet de pressions de sélection très fortes parce qu'elle est associée à des fonctions aussi fondamentales que l'acquisition et la préparation de la nourriture. La formule dentaire asymétrique que nous décrivons ici, la première jamais rencontrée chez un mammifère hétérodonte, le chauve-souris frugivore *Myonycteris brachycephala* de l'île São Tomé (Afrique de l'ouest), reflète donc un phénomène tout à fait exceptionnel. Cette asymétrie résulte de l'absence d'une incisive inférieure interne, soit à gauche, soit à droite. Cette nouveauté morphologique est peut-être reliée à l'instabilité évolutive associée au processus de colonisation de cette espèce dans l'île.

Juste, J. and C. Ibáñez (1993b). A new *Tadarida* of the subgenus *Chaerephon* (Chiroptera: Molossidae) from Sao Tomé Island, Gulf of Guinea (West Africa).

We describe a population of the genus *Tadarida* (Molossidae) from São Tomé Island (Gulf of Guinea, West Africa), as a new species based on cranial and interaural-membrane morphology shown in three specimens. These features are shared only with *T. (Chaerephon) gallagheri* from Zaire and, in part, with *T. (C.) johorensis* from the Malayan Peninsula, two species that appear to be the closest allies. The families Molossidae (the new species and *T. (C.)pumila*) and Emballonuridae (*Taphozous mauritianus*) are recorded for the first time for the island of São Tomé.

Juste B. , J., Y. Álvarez, E. Tabarés, A. Garrido-Pertierra, C. Ibáñez and J. M. Bautista (1999). Phylogeography of African Fruitbats (Megachiroptera).

Joint sequences from the mitochondrial cytochrome *b* and 16S rRNA genes of a wide representation of Megachiroptera were employed to evaluate the traditional taxonomic arrangement of African fruitbats and to examine their origins and evolutionary relationships. The resulting phylogenetic hypotheses are inconsistent with the previously established morphology-based subdivisions of Megachiroptera at the suprageneric level. Findings indicate the existence of an African clade, which appears to be formed by two endemic clades: the epomophorines and the myonycterines. According to our topologies, the genus *Rousettus* is monospecific in mainland Africa. Its traditional subgenera *Stenonycteris* and *Lissonycteris* appear closer to the myonycterines than to *Rousettus*. Topologies also indicate that the

African genus *Eidolon* is not phylogenetically related to any other African fruitbat. It would seem that the arrival of fruitbats in Africa was a complex process involving at least three independent colonization events. One event took place probably in the Miocene via forested corridors that connected the African and Asian rain forest blocks, as for other groups of mammals. The resulting lineage diversified into most of the extant African fruitbats. Related to this clade, the *Rousettus* species group is thought to have arrived in Africa in more recent times, possibly by progressive displacement from the East through India. Finally, the present topologies suggest an independent colonization of Africa by ancestors of *Eidolon*.

Juste B. , J. and C. Ibáñez (1994a). Contribution to the knowledge of the bat fauna of Bioko island, Equatorial Guinea (Central Africa).

Although having been long studied, the bat fauna of Bioko island (formerly Fernando Poo, Equatorial Guinea, Central Africa), is still little known. The species *Hipposideros commersoni, Glauconycteris beatrix, Pipistrellus (P.) kuhlii, P. (N.) tenuipinnis*, and *P. (N.)* cf. *capensis* are reported for the first time. Furthermore, the species *Myonycteris torquata, Taphozous mauritianus, Nycteris arge, Hipposideros cyclops, Glauconycteris poensis, Mops (X.) spurrelli* and *M. (X.) thersites*, previously reported as doubtful, are confirmed on Bioko. These results increase the bat checklist for Bioko island by 25 %, and it now includes 26 species.

Juste B. , J. and C. Ibáñez (1994b). Bats of the Gulf of Guinea islands: faunal composition and origins.

The present study compares the bat faunas of the islands of the Gulf of Guinea. Species composition, endemism and hypothetical origins are discussed. All families present in the mainland region are found in Bioko, a typical landbridge island. Foliage gleaning guild species (Nycteridae) show limited colonization abilities. This is also true of the family Rhinolophidae, but not for the closely related family Hipposideridae. The majority of the oceanic island species are African bats which show a widespread distribution and, therefore, have a high ecological plasticity. The continental relatives of the two endemic species *Myonycteris brachycephala* and *Chaerephon tomensis* are restricted to relatively small forested areas. Bioko's bat fauna is the result of the recent isolation from a formerly land-connected community. The oceanic bat faunas originated from the establishment of incomers from other areas. Nevertheless, extinction appears in both vicariant and dispersal processes, as an important factor in modelling the current bat communities of the Gulf of Guinea islands.

Juste B. , J., C. Ibáñez and A. Machordom (1997). Evolutionary relationships among the African Fruit Bats: *Rousettus egyptiacus*, *R. angolensis*, and *Myonycteris*.

Genetic relationships among *Rousettus egyptiacus, R. angolensis, Myonycteris torquata*, and *M. brachycephala* were studied based on a starch-gel electrophoretic analysis of 31 presumptive loci encoding 22 enzymatic systems. Data were analyzed by both phenetic and phylogenetic procedures, considering both allele and loci as characters. All of the analyses (both quantitative and qualitative) showed a high level of concordance in establishing *R. (Lissonycteris) angolensis, M. torquata*, and *M. brachycephala* as a monophyletic group. Nevertheless, none of the analyses was clearly able to identify sister groups among these taxa. Based on the evidence generated here and from previous independent datasets, the maintenance of *Lissonycteris* within the genus *Rousettus* is not sustainable.

Juste B. , J., A. Machordom and C. Ibáñez (1996). Allozyme variation of the Egyptian Rousette (*Rousettus egyptiacus*; Chiroptera, Pteropodidae) in the Gulf of Guinea (West-Central Africa).

Genetic variation among the populations of *Rousettus egyptiacus* from the islands of the Gulf of Guinea (Bioko, Principe and São Tomé) and two other continental populations of *R. egyptiacus*, (Rio Muni and

Guinea Conakry) was studied in order to evaluate their systematic and evolutionary relationships. Insular and mainland populations had similar levels of genetic variation. The data support the subspecific assignment of the São Tomé and Principe populations of *R. egyptiacus*.

Justine, J.-L. (1989a). Une nouvelle espèce de *Capillaria* (Nematoda, Capillariinae) parasite de chauve-souris (Mammalia, Chiroptera) du Gabon.

Résumé. - Description de *Capillaria chabaudi* n. sp., parasite de l'estomac de *Rhinolophus silvestris* au Gabon. Le mâle possède deux ailes latéro-caudales de petites dimensions et épaisses, une bourse caudale membraneuse et un cirre inerme. La bourse caudale est soutenue par deux expansions pulpeuses bifurquées. Le spicule (long de 665 - 840 µm) est bien visible, peu sclérifié, sans stries transversales et à extrémité postérieure effilée. La femelle porte un appendice vulvaire. La face interne de la paroi du vagin utérin est striée transversalement. Les quatre espèces les plus proches morphologiquement de *C. chabaudi* n. sp. sont *C. speciosa* sensu Zdzitowiecki, 1970, parasite de chauves-souris d'Europe, *C. pipistrelli* sensu Wang, 1982, *C. kashmirensis* et *C. rhinolophi*, trois espèces parasites de chauves-souris d'Asie. *C. chabaudi* est la première espèce de *Capillaria* trouvée en Afrique centrale chez un Chiroptère.

Abstract. - Description of *Capillaria chabaudi* n. sp., a stomach parasite of *Rhinolophus silvestris* from Gabon (Africa). The male has two small and thick latero-caudal alae, a membranous caudal bursa and a non-spiny cirrus. The caudal bursa is supported by two forked expansions. The spicule (665 - 840 µm in length) is well visible, little sclerified, without transverse striations, and with a pointed posterior extremity. The female bears a vulvar appendage. The inner face of the wall of the vagina uterina shows transverse striations. The four species morphologically most closely related to *C. chabaudi* n. sp. are *C. speciose* sensu Zdzitowiecki, 1970, a parasite of european bats, *C. pipistrelli* sensu Wang, 1982, *C. kashmirensis* and *C. rhinolophi*, three species parasitic in asian bats. *C. chabaudi* is the first species of *Capillaria* found in central Africa in a Chiroptera.

Justine, J.-L. (1989b). Quatre nouvelles espèces de *Capillaria* (Nematoda, Capillariinae) parasites de Chiroptères du Gabon.

Résumé. - Description de quatre espèces de *Capillaria* parasites de microchiroptères du Gabon. Les trois premières espèces ont en commun: chez le mâle, deux ailes latéro-caudales, une bourse caudale membraneuse, un cirre inerme; chez la femelle, la présence d'un appendice vulvaire et des œufs à surface lisse. *Capillaria landauae* n. sp., de l'intestin et estomac de *Rhinolophus silvestris*, a un spicule fin strié transversalement, long de 650 µm, une bourse caudale de petite dimension soutenue par deux expansions pulpeuses bifurquées, et la femelle possède un prolongement fibreux à l'extrémité postérieure de l'ovaire et une petite bande bacillaire médiane en plus des bandes latérales. *C. brosseti* n. sp., de l'intestin de *Rhinolophus landeri* a un spicule non sclérifié, presque invisible, long de 300 µm, un cloaque à cuticule interne puissante, une bourse caudale de grande dimension soutenue par deux expansions massives portant chacune trois papilles. *C. gabonensis* n. sp., de l'intestin de *R. landeri*, est proche de *C. brosseti* mais est différencié par la forme des stichocytes et les dimensions des œufs. Une quatrième espèce, *C. magnova* n. sp., de l'estomac de *Miniopterus inflatus*, est décrite à partir de femelles seulement. Cette espèce a aussi un appendice vulvaire; elle se différencie des trois autres par ses œufs de dimensions importantes et pourvus de stries au niveau des pôles. L'existence de spicules non sclérifiés, visibles seulement avec un microscope équipé du contraste interférentiel de Nomarski (chez *C. brosseti, C. gabonensis* et probablement d'autres espèces), est considérée comme un argument contre la validité du genre *Skrjabinocapillaria* Skarbilovitsch, 1946.

Abstract. - Four new species of *Capillaria* parasites of microchiropterans, are described from Gabon. Three species share: two latero-caudal alae, a membranous caudal bursa and a non-spiny cirrus in the male; presence of a vulvar appendage and eggs with smooth surfaces in the female. *Capillaria landauae* n. sp. is found in the intestines and stomach of *Rhinolophus silvestris*. The male has a thin, transversally striated spicule 650 µm in length, and a small membranous caudal bursa which surrounds two forked protrusions; the female has an ovary provided with a posterior fibrous expansion and a small

median bacillary band in addition to the two usual lateral bands. *C. brosseti* n. sp. is found in the intestines of *Rhinolophus landeri*. The male has a non-sclerified, almost invisible spicule 300 µm in length, a cloaca with a powerful internal cuticle, and a large caudal membranous bursa which surrounds two massive protrusions each of which bears three papillae. *C. gabonensis* n. sp., found in the intestines of *R. landeri*, is similar to *C. brosseti* but is distinguished by the shape of stichocytes and the egg dimensions. A fourth species, *C. magnova* n. sp., is found in the stomach of *Miniopterus inflatus*, and is described only from females. This species also has a vulvar appendage and it is distinguished from the three above species by its eggs, which have greater dimensions and bear polar striations. The existence of non-sclerified spicules in *C. brosseti* and *C. gabonensis* (probably also found in other species) and which are only visible with a microscope equiped with Nomarski interference contrast is considered to be an argument against the validity of the genus *Skrjabinocapillaria* Skarbilovitsch, 1946.

Kalko, E. K. V. and H.-U. Schnitzler (1993). Plasticity in echolocation signals of European pipistrelle bats in search flight: implications for habitat use and prey detection.

We studied the echolocation and hunting behaviour of three aerial insectivorous species of bats (Vespertilionidae: *Pipistrellus*) in the field in order to characterize the signals used by the bats and to determine how call structure varies in relation to habitat structure ("uncluttered" versus "cluttered" space). We documented free-flying, naturally foraging wild pipistrelles in various habitats using multiflash stereophotography combined with simultaneous sound recordings. Then we reconstructed the bat's flight position in three-dimensional space and correlated it with the corresponding echolocation sequences. In all three species of pipistrelles, signal structure varied substantially. In echolocation sequences of the search phase we found a consistent association of signal types with habitat types. In uncluttered habitats (obstacles more than 5 m from the bat) pipistrelles emitted almost exclusively narrowband signals with bandwidths less than 15 kHz. In cluttered habitats (obstacles less than 5 m from the bat) they switched to signals with bandwidths of more than 15 kHz. Wideband signals were also used when the bats were turning in cluttered and uncluttered spaces and for an instant after turning away from obstacles. Prey detection occurred only when the outgoing signal did not overlap with the returning echo from potential prey. The bats also avoided overlap of echoes from potential prey and obstacles. Based on the results of this study, we propose an overlap-free "window" within which pipistrelles may detect potential prey and which allows predictions of minimum distances to prey and clutter-producing objects.

Kearney, T. C. and P. J. Taylor (1997). New distribution records of bats in KwaZulu-Natal.

New distribution records are documented for four species of Microchiroptera, including two which are new to South Africa (*Scotoecus albofuscus* (Thomas 1890) and *Eptesicus rendalli* (Thomas 1889)), one which is new to KwaZulu-Natal (*Laephotis* cf. *wintoni* Thomas 1901), and one which represents a significant range extension within KwaZulu-Natal (*Pipistrellus anchietai* (Seabra 1900)).

Keller, A. (1986). Etude comparative de la structure fine des poils des Pipistrelles d'Europe (Mammalia: Chiroptera).

Comparative study on the different hair structures of the European Pipistrelles (Mammalia: Chiroptera).

The author describes and uses the different forms of the cuticular scales of the second guard hair to distinguish the four species: *Pipistrellus pipistrellus, P. nathusii, P. kuhli* and *P. savii*. The author proposes an artificial identification key, principally based on the shape of the scaly cuticula observed in the middle and on the distal hair part.

Kemp, G. E. (1975). Viruses other than arenaviruses from West African wild mammals. Factors affecting transmission to man and domestic animals.

At least thirty-seven different viruses have been isolated from wild mammals in West Africa since 1962. Some of these, including Lassa virus, are already known to cause serious human morbidity and mortality. Crimean haemorrhagic fever-Congo virus, Dugbe virus, Mokola virus, and smallpox-like agent from a gerbil in Dahomey are briefly discussed. An account of social and ecologic factors affecting man, domestic animals, and their interaction with wild mammals is given.

Kemp, G. E., O. R. Causey, H. W. Setzer and D. L. Moore (1974). Isolation of viruses from wild mammals in West Africa, 1966-1970.

During the 5-year period 1966 - 1970, a total of 7497 wild mammals of at least 101 different species were collected from 36 locations in Nigeria, Dahomey, and Togo and sampled for virus. The collections were made in five ecologically distinct vegetative zones: high forest, Guinea, Sudan, and Sahel woodland, and the Jos Plateau. Sixteen different virus types, represented by 83 isolates, were recovered, as follows: Arumowot (6 isolates), Bhanja (2), bluetongue type 7 (1), Chandipura (1), Congo (2), Dakar bat (3), Dugbe (1), IbAn 17143 (1), IbAn 33709 (1), Lebombo (1), Mokola (4), poxvirus IbAn 34325 (1), Semliki Forest (1), SudAn 754/6 1 (53), Uganda 5 (3), and West Nile (2). Viruses were isolated from Nigeria, the principal area of mammal collecting, and Dahomey, but not from Togo. The possible relationship of these viruses to diseases of man and domestic animals is discussed.

Kershaw, P. S. (1921). IV. - On the collection of South African mammals in the Durban Museum.

Mr. E. C. Chubb, the Curator of the Durban Museum, Natal, recently sent to the British Museum a large collection of small mammals for identification, a description of which, it is thought, may prove of interest to mammalogists.

Specimens have been contributed by a great many collectors principally from Natal and Zululand, but also from Cape Colony, Portuguese East Africa and Rhodesia. Among the chief contributors may be mentioned Mr. P. A. Sheppard at Vumba, Gorongoya district, on parallel 20 S in Portuguese East Africa; Mr. W . E. Jones at M'Fongosi, Zululand; Mr. H. H. Swinny in the Port St. John district, West Pondoland; Mr. L. Bevis in Zululand and Natal; the Rev. R. Godfrey at Pirie, Kingwilliamstown, Cape Colony; and Mr. E. C. Chubb in various localities.

Out of the collection, two new forms, a *Pachyura* and a *Sylvisorex*, have emerged which are described in this paper. These together with nine other specimens have been presented to the British Museum.

Kershaw, P. S. (1923a). Notes on mammals collected by Dr. H. Schouteden in the Belgian Congo.

This part of the collection, which was made by Dr. SCHOUTEDEN on behalf of the Congo Museum, Tervueren, on the Lower Congo and Kasai Rivers, was sent to the British Museum for comparison, with the types and series of specimens from the Congo in the possession of the latter. It has been found necessary to describe as new three forms, *Petrodromus tordayi tumbanus, Funisciurus mayumbicus* and *Protoxerus stangeri personatus*.

The paratypes of these, and certain other specimens Dr. SCHOUTEDEN has kindly presented to the British Museum.

As many of the localities given do not appear on ordinary maps, I have thought it well, on the first occurrence of such a name in this paper, to indicate its approximate position.

Keymer, I. F. (1971). Blood protozoa of insectivores, bats and primates in Central Africa.

A survey was made of blood protozoa of wild mammals in Central Africa and the parasites of Insectivora, Chiroptera and Primates are described.

Trypanosoma petrodromi was rediscovered in *Petrodromus treadactylus* and redescribed. A similar trypanosome found in *Elephantulus brachyrhynchus* is considered to be a new subspecies, *Trypanosoma petrodromi chitali*. This elephant-shrew was also infected with "*Plasmodium*" [gen. indet.] *brodeni* and probably represents a new host record. *Rhynchocyon cirneu* also appears to be a new host record for *Sarcocystis* sp. An unidentified trypanosome was found in a *Crocidura* sp. of shrew.

A *Hepatocystis* sp (probably *H. epomophori*) was found in *Epomophorus labiatus* and a *Nycteria* sp. (probably *N. medusiformis*) in *Nycteris thebaica*. So called "broad trypaonosomes" were found in four species of insectivorous bats and *Trypanosoma vespertilionis* in *Hipposideros caffer*.

Trypanosoma perodictici was found in *Galago crassicaudatus; Hepatocystis kochi* in *Cercopithecus aethiops* and a *Hepatocystis* in *Papio ? cynocephalus*.

No parasites were found in the insectivores, *Crocidura luna* and *C. flavescens* or in the bats, *Tadarida (Mops) condylura* and *T. (Chaerephon) pumila*.

There was no evidence that any of the parasites were pathogenic.

Khajuria, H. (1988). A new species of rat-tailed bats (Chiroptera: Rhinopomatidae) from Iraq.

A new species of rat-tailed bats, *Rhinopoma hadithaensis* is described from the Iraqi western desert. It is, easily distinguished from the other three species of the genus by the characters of the baculum, external male genetalia, size, colouration and to some extent by the form of nasal inflations.

Khalil, L. F. (1975). Two new species of the nematode genus *Spirura* Blanchard, 1849, from bats in Tanzania.

Spirura hipposiderosi n. sp. from the stomach of *Hipposideros ruber* resembles *S. diplocyphos* but differs in the head structure, the shape and size of the spicules, the position of the vulva and the presence of a tuft of spines in the male tail. *Spirura nycterisi* n.sp. from *Nycteris thebaica* and *Hipposideros ruber* resembles *S. spinicaudata* but differs in the presence of a membrane round the posterior half of the left spicule, the presence of a tuft of spines at the tipe of the male tail, the position of the vulva and the size of the eggs. A key to the African species of *Spirura* is given.

Killick-Kendrick, R. (1973). Parasitic protozoa of the blood of rodents. III. Two new malaria parasites of Anomalurine flying squirrels of the Ivory Coast.

Stained films of heart blood of 37 specimens of flying squirrels in the Ivory Coast were examined for malaria parasites. Two new species were found in blood films from *Anomalurus peli*. The name *Plasmodium landauae* sp. nov. is proposed for one, and *Plasmodium pulmophilum* sp. nov. for the other. Differences between the new parasites and *P. anomaluri* Pringle, 1960 of *A. derbianus* in Tanzania are discussed.

Protozoaires parasites du sang des Rongeurs: III. Deux nouveaux parasites malariques d'écureuils volants de la Côte d'ivoire.

Des frottis de sang de 37 Ecureuils volants ont été examinés en Côte-d'Ivoire, à la recherche de parasites du Paludisme. Deux espèces de *Plasmodium* ont été trouvées dans le sang d'*Anomalurus peli*. L'une d'entre elles est nommée *Plasmodium landauae* n. sp. et la seconde *Plasmodium pulmophilum* n. sp. Les caractères différentiels entre les nouvelles espèces et *P. anomaluri* Pringle, 1960, parasite d'*A. derbianus* en Tanzanie, sont discutés.

King, A., P. Davies, Lawrie and A. (1990). The rabies viruses of bats.

In the 1930s rabies was shown to affect blood-, insect- and fruit-eating bats. We have prepared antinucleocapsid monoclonal antibodies (MAbs) using Mokola and bat (Lagos, Duvenhage and Denmark) rabies viruses as immunogens. With these MAbs we have examined rabies viruses from vampire, insectivorous and frugivorous bats from the Americas, Africa, Europe and the Soviet Union and have compared them with isolates from terrestrial species including man. As well as confirming the findings of others with viruses of African and American bat origin, the results revealed the presence of a second biotype in European bats and demonstrated the presence of serotype 1 as well as serotype 4 viruses in bats of the Soviet Union.

Kirsch, J. A. W., T. F. Flannery, M. S. Springer and F. J. Lapointe (1995). Phylogeny of the Pteropodidae (Mammalia: Chiroptera) based on DNA hybridisation, with evidence for bat monophyly.

We constructed DNA-hybridisation matrices comparing 18 genera of Megachiroptera and an outgroup microchiropteran, and eight species of *Pteropus* and two related genera. Three species each of Megachiroptera and Microchiroptera, two of Primates, and an outgroup armadillo were compared in another matrix; additional representatives of other mammalian orders figured in a further set of experiments. Among the megachiropterans examined, *Nyctimene* and *Paranyctimene* comprise the sistergroup to other pteropodids. Of the "macroglossines", only *Macroglossus* and *Syconycteris* are associated apart from typical pteropodines, while the four remaining nectar-feeders (*Eonycteris, Megaloglossus, Melonycteris, Notopteris*) are independently linked with non-nectar-feeding clades. Thus, *Megaloglossus* is the nearest relative of *Lissonycteris*; with *Epomophorus* and *Rousettus* successive sister-groups to both, while *Eonycteris* is the sister of all four; *Melonycteris* and *Pteralopex* form a trichotomy with the closely related *Acerodon* and *Pteropus*, and *Notopteris* is the sister-taxon to all four. It therefore appears that anatomical specialisations for nectar- and pollen-feeding evolved (or were lost) several times within Pteropodidae. *Cynopterus* and *Dobsonia* represent additional clades within the Pteropodinae, with which *Thoopterus* and *Aproteles* are respectively paired. Comparisons among species of *Pteropus* and related genera suggest that *Acerodon* may be congeneric with *Pteropus*, but that *Pteralopex* clearly is not. The ordinal-level matrices support bat monophyly: no order tested is closer to either of the chiropteran suborders than they are to each other, and bats are separated from Primates by at least two nodes. On the basis of previous rate determinations for mammals, we estimate that the African grouping (*Epomophorus, Megaloglossus, Lissonycterisi* is mid-Miocene in origin, that the two major pteropodid subfamilies (Nyctimeninae and Pteropodinae, including "Macroglossinae") separated in the Early Miocene, and that the divergence of chiropteran suborders dates from the latest Cretaceous or earliest Palaeocene. Arrangement of genera within Pteropodidae supports the family's Australo-Pacific or south-east Asian origin.

Kitchener, D. J. and N. Caputi (1985). Systematic revision of Australian *Scoteanax* and *Scotorepens* (Chiroptera: Vespertilionidae), with remarks on relationships to other Nycticeiini.

Classical and numerical taxonomic approaches based on morphology and utilising electrophoretic information have been applied to clarify the status of Australian species hitherto placed in the genus *Nycticeius*. Eight named forms have been reduced to five species; these are placed in existing genera: *Scoteanax (rueppellii)* and *Scotorepens* (*orion, balstoni, sanborni* and *greyii*).

Phylogenetic analysis of species representative of other Nycticeiini genera, and of geographic groupings of these Australian species, provides additional support for the above generic conclusions.

Indicators of gross morphology (skull, radius and lower tooth row lengths) in *Scotorepens* spp. vary in relation to their sex, and to latitude, longitude and several climatic variables, particularly average minimum temperatures in July.

Kitchener, D. J., N. Caputi and B. Jones (1986). Revision of Australo-Papuan *Pipistrellus* and *Falsistrellus* (Microchiroptera: Vespertilionidae).

A classical morphological taxonomic approach has been used to clarify the status of Australian and New Guinea species usually placed in the genus *Pipistrellus*. Multivariate phonetic and phylogenetic analyses of a suite of morphological characters were undertaken to determine the relationships between the taxa recognised in this study.

In tropical Australia, *Pipistrellus tenuis wenstralis* Koopman, 1984, from coastal and near coastal Kimberley, Northern Territory and western Queensland is elevated to species status. *Pipistrellus adamsi* sp. nov. is described from north Queensland and Northern Territory.

In New Guinea the following species of pipistrelles are recognised: *P. papuanus* (Peters and Doria, 1881); *P. angulatus* Peters, 1880; *P. collinus* Thomas, 1920 - as well as *P. wattsi* sp. nov. which is described from southeastern coastal New Guinea.

In more southern parts of Australia two species are recognised and placed in the genus *Falsistrellus* Troughton, 1943 [*F. tasmaniensis* (Gould, 1858) and *F. mackenziei* sp. nov.]. The former species is from Tasmania, Victoria, New South Wales and southeastern Queensland and the latter is described from southwestern Australia.

The phylogenetic and phonetic analyses support the generic distinction between *Falsistrellus* and *Pipistrellus* and suggest that the northern Australian pipistrelles have evolved independently from New Guinea species.

Kityo, R. M. and J. C. Kerbis (1996). Observations on the distribution and ecology of bats in Uganda.

Bat community patterns in Uganda are examined in relation to their occurrence in the different vegetation zones of the country. The data available so far cover only three of the country's floristic regions. These data suggest that the northern drier region U1 has more microchiropteran bats ancl that species diversity of megachiropteran bats tends to increase in the more forested western U2 and southern U4 regions. Species accounts in the appendix largely summarise the known information, they reveal that much more work is required to fully document the bats of Uganda.

Koch-Weser, S. (1984). Fledermäuse aus Obervolta, W-Afrika (Mammalia: Chiroptera).

The number of bat species known for Upper Volta is raised from 27 to 33 by further records of: *Rhinopoma hardwickei, Rh. Microphyllum, Taphozous nudiventris, Asellia tridens, Hipposideros jonesi, Pipistrellus rusticus*. For these and further 18 species locality records, measurements and biological data are given (i.e. for *Eidolon helvum, Epomophorus gambianus, Lissonycteris angolensis, Micropteropus pusillus, Taphozous perforatus, Nycteris hispida, N. macrotis, N. thebaica, N. gambiensis, Rhinolophus landeri, Rh. Fumigatus, Hipposideros ruber, H. abae, Eptesicus guineensis, Nycticeius schlieffeni, Scotophilus leucogaster, Tadarida pumila* and *T. majori*.

Vom 1.VII.1980-15.I.1981 wurden in Obervolta über 350 Mega- und Microchiropteren gefangen und vermesen. Insgesamt wurden 24 Arten gesammelt, darunder sechs Erstnachweise, die die Artenzahl in Obervolta von 27 auf 33 erhöhen: *Rhinopoma hardwickei, Rh. Microphyllum, Taphozous nudiventris, Asellia tridens, Hipposideros jonesi, Pipistrellus rusticus*. Alle 24 Arten warden beschrieben, gegebenenfalls die Taxonomie diskutiert. Verbreitungskarten, vor allem der Erstnachweise, Feldbeobachtungen und biologische Daten zur Lebenweise, Verhalten in Gefangenschaft, Fortpflantzung, Trink- und Nahrungsverhalten werden vergleichend diskutiert. Auf die Abwaderungen der im Sahel Obervoltas vorkommenden Arten während die Trockenzeit wird eingegangen.

Kock, D. (1967). Ein Neunachweis von *Myotis welwitschi* und der Status von *Myotis venustus* (Mammalia, Chiroptera).

Im Zusammenhang mit einem Neunachweis von *Myotis welwitschi* (Gray 1866) für Zambia wird eine kritische Revision der Nomenklatur, Systematik, Verbreitung und Variation der Färbung und Maße dieser Art vorgenommen. Die Form *venustus* Matschie 1899 hat keinen subspezifischen Wert.

In collection with the first record of *Myotis welwitschi* (Gray, 1866) from Zambia, a critical review of nomenclature, systematic, distribution and variation of colour and measurements of this species is given. The form described as *venustus* Matschie 1899 is not of subspecific value.

En relation avec la première trouvaille d'un *Myotis welwitschi* (Gray 1866) en Zambia, une revision critique du nomenclature, systématique, distribution et variation de couleur et des mensurations de cette espèce est faisée. La forme *venustus* Matschie 1899 n'est pas du valeur subspécifique.

Kock, D. (1969a). Die Fledermaus-Fauna des Sudan (Mammalia, Chiroptera).

Für den Sudan wird seit 1877 erstmals wieder eine Revision der Chiropteren-Fauna vorgenommen. Insgesamt sind 59 Fledermaus-Arten belegt, 5 weitere, darunter 2 nicht identifizierte werden diskutiert. Die sicher nachgewiesenen Arten verteilen sich wie folgt auf 9 Familien: 5 Pteropidae, 2 Rhinopomidae, 5 Emballonuridae, 5 Nycteridae, 1 Megadermidae, 7 Rhinolophidae, 5 Hipposideridae, 9 Molossidae, 20 Vespertilionidae. Die Systematik im Bereich der Arten und Unterarten wird kritisch untersucht und nach in anderen Bereichen gewonnenen Erkenntnissen revidiert. Eigene Aufsammlungen werden ergänzt durch Vergleichsmaterial. Feldbeobachtungen an 26 vom Verf. im Sudan selbst gesammelten Arten erweitern die Kenntnisse über die Biologie afrikanischer Chiropteren. Die Zoogeographie der sudanesischen Chiropteren, ökogeographische Variationen und ökologische Adaptationen werden diskutiert.

Since 1877 the first revision of the chiropteran fauna of the Sudan is given. Altogether 59 species of bats are represented, further 5 are discussed, including 2 unidentified. Those undoubtedly recorded are belonging to 9 different families (vide supra). The systematics of the species and subspecies level is critically studied and revised according to results from other fields. Personal collections are completed extensively by comparative material. Field observations of 26 species collected by the author in the Sudan add to the knowledge of African chiropteran biology. Zoogeographical aspects of the Sudanese bat fauna, ecogeographical variations, and ecological adaptations are discussed.

Pour le Soudan, la première révision depuis 1877 de la faune des chiroptères est faite. Les espèces des chauves-souris représentées sont au nombre de 59 et en outre 5 sont discutées, parmis eux 2 non identifiées. Les espèces assurément recordées se distribuent aux 9 familles (voyez en haut). La systématique au rang des espèces et sous-espèces est étudiée critiquement et révisée d'après les résultats d'autres domaines. Collections personnelles sont complétées par matériel comparatif. Observations faites par l'auteur sur 26 espèces au cour de rassemblement au Soudan élargissent les connaissances de la biologie des chiroptères africains. La Zoogéographie des chiroptères soudanais, variations écogéographiques et adaptations écologiques sont discutées.

Kock, D. (1969b). Ueber ein weibliches Exemplar des afrikanischen Bulldogg-Fledermaus, *Xiphonycteris spurelli* von Fernando Poo.

Ein weiterer Beleg für *Xiphonycteris spurrelli* DOLLMAN 1911 von Fernando Poo ist das zweite bekannte ? von dieser Art. Es zeigt bemerkenswerte Variation im Besitz von Praemolaren, wie sie als typisch für ? angesehen wurden, sowie eines überzähligen unteren Incisiven und stärkerer unterer Canini.

A further specimen of *Xiphonycteris spurrelli* DOLLMAN 1911 from Ferando Poo is the second known ? of this species. It is remarkable in its dental variations by possessing praemolars of such a kind as were considered to be typical for males, in having a supernumerary lower incisor and larger lower canini.

Un nouveau spécimen de *Xiphonycteris spurrelli* DOLLMAN 1911 du l'ile Fernando Poo est le deuxième connu. Il est remarquable pour ses variations dentales en y possédant des prémolaires dans une manière considérée typique pour des mâles, en y avoir un incisive inférieur supernumérair et des plus large canines inférieurs.

Kock, D. (1975). Ein Originalexemplar von *Nyctinomus ventralis* Heuglin 1861 (Mammalia: Chiroptera: Molossidae).

Die Untersuchung bisher unbekannter Strukturen und Dimensionen eines Original-Exemplares von *ventralis* HEUGLIN 1861 zeigt, daß diese Molossidae identisch ist mit und Priorität hat vor *africana* DOBSON 1876 und dieses Taxon als *Tadarida (Tadarida) ventralis* zu bezeichnen ist. Das HEUGLIN'sche Exemplar von Keren wird zum Lectotypus erwählt.

A study of the structures and dimensions, which were not yet known, of an original specimen of *ventralis* HEUGLIN 1861 proves this molossid bat to be identical with and having priority over *africana* DOBSON 1876; this taxon is to be named *Tadarida (Tadarida) ventralis*. HEUGLIN's specimen from Keren is chosen as lectotype.

L'étude des structures et des, dimensions inconnus d'un exemplair original du *ventralis* HEUGLIN 1861 établit le fait que cette molosse est identique avec et a priorité sur *africana* DOBSON 1876; il faut appeller cette taxon *Tadarida (Tadarida) ventralis*. L'exemplair d'HEUGLIN de Keren est choisi comme lectotype.

Kock, D. (1978a). Vergleichende Untersuchung einiger Säugetiere im südlichen Niger (Mammalia: Insectivora, Chiroptera, Lagomorpha, Rodentia).

Comparative study of some mammal species in southern Niger: *Crocidura flavescens, Erinaceus albiventris spinifex, Eidolon helvum, Epomophorus g. gambianus, Tadarida (Chaerephon) n. nigenae, Lepus capensis canopus, Gerbillus (G.) agag nigeriae*, of which a new large sized subspecies is described, *Tatera hopkinsoni, Mastomys erythroleucus* and *Acomys cahirinus johannis*.- *M. erythroleucus* is recorded from the Sudan, *G. agag* from Tchad. - The type localities of *E. a. spinifex* and *G. agag* are corrected. - Of the smaller gerbils, *asyutensis* SETZER 1960 is considered to be a subspecies of *gerbillus* OLIVIER 1801; *andersoni* DEWINTON 1902 is related with *eatoni* THOMAS 1902 and *inflatus* RANCK 1968 being different from *gerbillus; agag* THOMAS 1903 includes *nigeriae* THOMAS & HINTON 1920, *Rosalinda* ST. LEGER 1929 and *sudanensis* SETZER 1956, but not *dallonii* HEIM DE BALSAC 1936.

Neu für den Niger belegt wird *Tatera hopkinsoni*, zum zweiten Mal nachgewiesen werden *Crocidura ftavescens, Erinaceus albiventris spinifex, Eidolon helvum, Epomophorus g. gambianus* und *Tadarida (Ch.) n. nigeriae*; weitere Funde von *Lepus capensis canopus, Gerbillus (G.) agag nigeriae* mit *G. (G.) agag maradius* n. subsp., *Mastomys erytbroleucus* und *Acomys cahirinus johannis* werden vergleichend untersucht. - *M. erythroleucus* wird für den Sudan nachgewiesen, *G. agag* für den

Tschad. - Der Typenfundort von *E. a. spinifex* und *G. agag* wird korrigiert. - Von den kleineren Gerbillen wird *asyutensis* SETZER 1960 als Unterart von *gerbillus* OLIVIER 1801 betrachtet; *andersoni* DEWINTON 1902 ist näher mit *eatoni* THOMAS 1902 und *inflatus* RANCK 1968 verwandt und von *gerbillus* zu trennen; *agag* THOMAS 1903 umfaßt als Art *nigeriae* THOMAS & HINTON 1920, *Rosalinda* ST. LEGER 1929 und *sudanensis* SETZER 1956, aber nicht *dallonii* HEIM DE BALSAC 1936.

Kock, D. (1981a). Zwei Fledermäuse neu für Kenya (Mammalia: Chiroptera).

For *Taphozous (Liponycteris) hamiltoni* and *Nycteris grandis* first records from Kenya are given together with measurements and distributional remarks. A supernumerary upper incisor is reported for *N. grandis*.

Taphozous (Liponycteris) hamiltoni und *Nycteris grandis* werden erstmals für Kenya nachgewiesen. Maße und Bemerkungen zur Verbreitung beider Arten werden angegeben. Ein überzähliger oberer Incisiv wurde bei *N. grandis* festgestellt

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Kock, D. (1981b). Zur Chiropteren-Fauna von Burundi (Mammalia).

The bat species known for Burundi are briefly reviewed and further records are given; four additional species are reported: *Micropteropus pusillus, Taphozous mauritianus, Nycteris macrotis, Eptesicus flavescens*. A list of acceptable species records summarizes the bat fauna hitherto known.

Die Fledermaus-Arten von Burundi werden diskutiert, weitere Funde gemeldet und die Faunenliste durch vier Neunachweise (*Micropteropus pusillus, Taphozous mauritianus, Nycteris macrotis, Eptesicus flavescens*) ergänzt.

Kock, D. (1983). Fledermaus-Fliegen in Iran (Insecta: Diptera: Streblidae, Nycteribiidae).

Of four known (*Brachytarsina diversa, Nycteribia pedicularia, N. vexata, Penicillidia dufouri*) and four new records of Iranian bat-flies (*B. flavipennis, N. schmidli, Stylidia biarticulata, P. conspicua*), synonymies, distributional data and/or host specifities are discussed.

Kock, D. (1987b). *Micropteropus intermedius* Hayman 1963 und andere Fledermause vom unteren Zaire.

A fourth specimen is reported and additional measurements are given for a 5 *Micropteropus intermedius* from the mouth of Zaire River. The species is known only from moist savanna SW of the central African forest block. - A last century bat collection from lower Zaire River is reviewed (with fixation of a paralectotype for *Epomophorus zenkeri* MATSCHIE 1899) and an additional one listed in appendices. - Additional material examined of *M. pusillus* is from Cameroon, Equatorial Guinea, and Ethiopia.

Kock, D. (1999a). *Tadarida (Tadarida) latouchei*, a separate species recorded from Thailand with remarks on related Asian taxa.

The taxonomic status of *Tadarida (T) latoucbei* is discussed and revised; based on size and morphological characters it is ranked as a species separate from *T (T.) teniotis*. Its occurrence in NE

Thailand is recorded. A previous record of this species from the Ryukyu Islands and *T (T) teniotis insignis* in E Asia are discussed.

Der taxonomische Status von *Tadarida (T.) latouchei* wird diskutiert; an Hand der Körper- und Schädeldimensionen sowie morphologischer Merkmale wird *T latouchei* als deutlich von *T (T.) teniotis* verschiedene Art klassifiziert. Das Vorkommen in Nordost-Thailand wird belegt. Ein früherer Nachweis von den Ryukyu-Inseln und *T (T.) teniotis insignis* in Ostasien werden diskutiert.

Kock, D. (1999b). The Egyptian *Vespertilio pipistrellus aegyptius* Fischer 1829, a nomen dubium (Mammalia, Chiroptera, Vespertilionidae).

All relevant references to *Vespertilio pipistrellus* var. *aegyptius* FISCHER 1829 render evidence that it is not a senior synoym of *Pipistrellus deserti* THOMAS 1902, but has to be treated as nomen dubium. It cannot convincingly be identified with any Saharo-Sindian vespertilionid species known from or likely to occur in Egypt, the Sudan or in the Middle East.

Die verfügbaren Inforrnationen über *Vespertilio pipistrellus* var. *aegyptius* FISCHER 1829 erlauben nicht, dieses Taxon als alteres Synonym von *Pipistrellus deserti* THOMAS 1902 zu identifizieren. Es muß als Nomen dubiurn angesehen werden, da es auch mit anderen Vespertilioniden der Saharo-Sindischen Region nicht schlussig identifiziert werden kann, die fur Agypten, den Sudan oder Nahen Osten bekannt sind oder erwartet werden konnen.

Kock, D. and V. Aellen (1987). Cimicidae parasites de Chiroptera du Muséum de Genève (Insecta: Hemiptera).

Cimicidae parasites of Chiroptera in the Geneva Museum. - *Bucimex chilensis* is recorded for the first time from Argentine as a parasite on *Myotis aelleni*, and *Propicimex tucmatiani* for the first time from Paraguay as a parasite on *Molossus m. crassicaudatus*. *Cimex dissimilis* is confirmed from Switzerland, parasitic on *Nyctalus noctula* and *Myotis myotis*. *Paracimex borneensis* is recorded for a known locality in Sarawak with a range extension to Sabah/North Borneo, and *Aphrania recta* from Zaire on an additional host, *Eptesicus tenuipinnis*. Transport of *Propicimex tucmatiani* and *Cimex dissimilis* by flying hosts are stated. Specimens identified by W. E. China and linked with previous publications are included. *Cimex lectularius* from W-France on *Myotis myotis*, *Cacodmus sumatrensis* from Sumatra on *Cynocephalus variegatus*, *C. villosus* from S-Zaire in colony of *Laephotis* sp. and *Afrocimex leleupi* from S-Zaire.

Kock, D. and H. R. Bhat (1994). *Hipposideros hypophyllus* n. sp. of the *H. bicolor*-group from peninsular India (Mammalia: Chiroptera: Hipposideridae).

Hipposideros hypophyllus n. sp. Is described from Karnataka in Peninsular India. Skull characters place it in the *galeritus*-subgroup of the *H. bicolor*-group sensu HILL (1963). It is unique among small sized Asian species of the *bicolor*-group in the structure of its horseshoe which has a single pair of supplementary leaflets. Its affinities are discussed and differences from *H. pomona* emphazised.

Hipposideros hypophyllus n. sp. Wird aus Karnataka, Zentral Indien, beschrieben. Den Schadelrnerkmalen nach muß die Art der *galeritus*- Untergruppe der *H. bicolor*-Gruppe sensu HILL (1963) zugeordnet werden. Sie ist einzigartig unter den kleineren asiatischen Arten der *bicolor*-Gruppe in der Struktur ihres Nasenblattes mit einem Paar supplernentarer Blattchen. Ihre Verwandtschaft wird diskutiert und die Unterschiede gegenüber der metrisch ahnlich großen *H. pomona* (species inquirenda, ? Nom. Dubium) herausgestellt.

Kock, D., D. C. D. Happold and M. Happold (1998b). Cimicidae and Polyctenidae from Malawian Chiroptera (Insecta: Hemiptera).

Cacodmus villosus, C. sparsilis, Aphrania cf. *barys* (Cimicidae) and *Adroctenes horuathi* (polyctenidae) are recorded from Malawi, Central Africa. All except *C. villosus* are first records for Malawi. The known distribution and host associations for the four species are listed and discussed. One host, *Pipistrellus rusticus* was parasitised by both *C. villosus* and *C. sparsilis* simultaneously. *Pipistrellus rusticus, Scotoecus albigula* (hosts of *C. sparsilis*) and *Eptesicus melckorum* (host of *Aphrania* cf. *barys*) are new hosts for the Cimicidae, and *Rhinolophus fumigates* and *R. blasii* are new hosts for the Polyctenidae and for *Adroctenes horuathi*.

Kock, D. and K. M. Howell (1988). Three bats new for mainland Tanzania (Mammalia: Chiroptera).

Rhinolophus blasii empusa, Rh. swinnyi (Rhinolophidae) and *Laephotis wintoni* (Vespertilionidae) are added to the bat fauna of mainland Tanzania. Measurements are given and the ranges of the species are mapped. - The number of bat species presently known from Tanzania is 78.

Rhinolophus blasii empusa, Rh. swinnyi (Rhinolophidae) und *Laephotis wintoni* (Vespertilionidae) werden erstmals vom kontinentalen Tanzania gemeldet. Für diese Arten werden Maßen mitgeteilt und die Verbreitung dargestellt. Die Trennung der subsaharischen Unterarten von *Rh. blasii* und die mögliche Synonymie von *Rh. swinnyi* mit *Rh. denti* erfordert Untersuchungen umfangreichen Materials. - Bisher sind 78 Fledermaus-Arten für Tanzania nachgewiesen.

Kock, D. and I. A. Nader (1979). Two bat flies from the Kingdom of Saudi Arabia, their nomenclature, host specificity and zoogeography (Insecta: Diptera: Nycteribiidae).

Stylidia integra (THEODOR & MOSCONA 1954) and *Eucampsipoda aegyptia* (MACQUART 1851) are first records of Nycteribiidae for Saudi Arabia; the latter species is recorded for the first time from Jordan. Nomenclature, distribution and host associations are discussed.

Kofron, C. P. and A. Chapman (1994). Reproduction and sexual dimorphism of the West African fruit bat, *Epomops buettikoferi*, in Liberia.

Epomops buettikoferi is a savanna species of fruit bat that has entered the deforested zone in Liberia where it inhabits agricultural areas and secondary forest, but not rain forest. Contrary to the conclusions of Bergmans & Sowler (1992), the species is in no way vulnerable or endangered because of destruction of the Upper Guinea rain forest. Instead, as the remaining Upper Guinea rain forest is cut, it is predicted that numbers of *E. buettikoferi* will increase.

Sexual dimorphism was observed in the pelvic girdle, which by palpation allowed reliable determination of sex (100% accurate) of individuals of any age. This was useful in the field for distinguishing immature males, which lack an obvious penis and epaulettes, from females.

In central Liberia, female *E. buettikoferi* have a bimodal reproductive cycle, with two young borne annually about six months apart. The two births occur in February/March (end of dry/beginning of the wet season) and August/September (during heaviest rains in second half of the wet). Parturition is followed by oestrus, with immediate embryonic development and gestation spanning five to six months. Reproduction is timed so that both periods of lactation occur during the wet season.

Epomops buettikoferi est une espèce de chauve-souris frugivore qui a pénétré la région déforestée du Liberia où elle habite dans les régions d'agriculture et de forêt secondaire mais non de forêt humide. Contrairement aux recommandations de Bergmans & Sowler (1992), cette espèce n'est pas du tout vulnérable ni menacée par la destruction de la forêt humide de la Haute Guinée. Au contraire, alors qu'on coupe le reste de forêt humide en Haute Guinee, on prévoit que le nombre d'*E buettikoferi* va augmenter.

On a observé un dimorphisme sexuel au niveau de la ceinture pelvienne dont la palpation a permis une détermination liable du sexe (100% de certitude) pour les individus de toute âge. Ceci s'est révélé utile sur le terrain pour distinguer des femelles les mâles immatures qui n'ont pas encore de pénis visible ni d'épaulettes.

Au centre du Liberia, les femelles d'*E. buettikoferi* ont un cycle de reproduction bimodal, avec deux jeunes qui naissent chaque année à six mois d'intervalle.

Les deux naissances se passent en février-mars (fin de saison sèche-début de saison des pluies) et en août-mars (fin de saison sèche-début de saison des pluies) et en août-septembre (pendant les plus fortes pluies de la seconde moitié de saison des pluies). La mise-bas est suivie de l'oestrus, avec développement embryonnaire immédiat et une durée de gestation qui va de cinq à six mois. La reproduction est programér de façon à ce que les périodes de lactation tombent pendant les saisons des pluies.

Koneval, M. E. (1993). The systematic relationship of *Hipposideros commersoni matungensis* to other species of Rhinolophidae (Chiroptera).

The hyoid morphology of *Hipposideros commersoni matungensis* was dissected and compared to the morphology of other bats in the family Rhinolophidae. Several significant differences in morphology were found: a modified stylohyal, fused to the auditory bulla; loss of the stylohyoid; addition of a new muscle, possibly from the stylopharyngeus; a modified mylohyoid profundus; and insertion of the ceratohyoid onto only the stylohyal. Cladistic analysis suggests that of all bats examined, *H. commersoni* is most closely related to *H. armiger*, and *Triaenops persicus* is most closely related to *Rhinonycteris aurantius*. This result is unexpected because the ranges of the species are geographically distant: *H. commersoni* is an African bat, whereas *H. armiger* is from East Asia. *Triaenops* is also an African species, whereas *Rhinonycteris* is Australian.

Koopman, K. F. (1965). Status of forms described or recorded by J.A. Allen in "The American museum Congo expedition collections of bats".

In 1917, J. A. Allen, H. Lang, and J. P. Chapin published an important paper on the bats collected by the American Museum Congo Expedition. This collection of bats was apparently the first really important one made in the former Belgian Congo, even though most of it was limited to the northeastern part of the country. Part I of the paper, the "Systematic List," was written by J. A. Allen alone. In this account he listed 68 forms, three of which he described as new subspecies and 23 as new species. He also described two new subgenera. In the nearly 50 years which have elapsed since this publication, many additional specimens of bats have been collected in the Congo (see especially Schouteden, 1947), and considerable taxonomic work has been done on many of the genera involved. As a result of this work, some of the forms described by Allen have been recorded from other localities, and a few have been synonymized. A number of forms named for the first time by Allen, however, have not been recorded by later writers.

Since I have studied all the types and most of the remaining material mentioned by Allen in connection with a forthcoming paper on the bats of the Sudan, it seemed desirable to make a reassessment of Allen's identifications and to relate this material to other specimens collected in the former Belgian Congo (not including Ruanda-Urundi). In this connection, I have looked at much hitherto unreported material at the American Museum of Natural History. I list additional species of Congo bats in the

American Museum which are not represented in the Lang-Chapin collection. The specimens are discussed under the names by which they were identified by Allen.

This study was greatly facilitated by National Science Foundation Grant GB-l391 which enabled me to visit the British Museum (Natural History) in London, the Corynden Museum in Nairobi, and the National Museum in Bulawayo. I wish to thank the staffs of these institutions, particularly Mr. R. W. Hayman, Mr. J. E. Hill, and Miss Jean Ingles at the British Museum, Mr. John Williams of the Corynden Museum, and Mr. Graham Child of the National Museum. I wish to thank, also, Miss Barbara Lawrence of the Museum of Comparative Zoology at Harvard College for the loan of specimens. I had the benefit of stimulating conversations on many taxonomic problems from Dr. David Harrison in England and Mr. Frank Ansell in Rhodesia.

Koopman, K. F. (1966). Taxonomic and distributional notes on Southern African Bats.

Taxonomic and distributional notes are given for southern African Chiroptera of the genera *Rousettus, Epomophorus, Rhinolophus, Hipposideros, Cloeotis, Myotis, Pipistrellus, Miniopterus, Tadarida*, and *Platymops*. The known range of some species is extended, and the systematic position of several species is clarified. Some taxonomic questions, however, are left open pending availability of additional material.

Koopman, K. F. (1970). Zoogeography of bats.

The Order Chiroptera is the second largest order of mammals, with, according to my most recent revised figure, 846 species. Inasmuch as the group is world-wide, reaching many distant islands, and inasmuch as many species and higher groups are quite localized and some very distinctive, one might expect that a good deal of work on bat zoogeography would have been undertaken. However, such is not the case.

Darlington (1957, pp. 320-410) does discuss the general geographical patterns of bats, and Tate (1946) gives a useful analysis of the bats of the Malay archipelago. However, many writers on zoogeography have given them at best a very perfunctory treatment. This contrasts markedly with the attention given to bird zoogeography. From talking with various zoogeographers, I suspect the reason is that whereas birds are treated as a separate group in their own right, bats are treated as part of the Class Mammalia. Since all bats can fly, there seems to be a general assumption that they regularly cross various kinds of geographical barriers at will, with the result that they have been rather consistently downgraded with respect to flightless mammals in zoogeographical studies (see, e.g., Bigalke, 1968).

Actually, except for their ability at crossing narrow water gaps without too much difficulty, bats have several advantages in zoogeographical studies over various other groups of land vertebrates. With a very few exceptions, they are not likely to fly over the open ocean as part of their normal activities. They are almost entirely free of the problems of human introduction. I know of only one case where (unintentional) human introduction has played a role, and this has not resulted in an introduced population. This was a specimen of the North American *Myotis lucifugus*, collected in Iceland, that is believed to have been inadvertently transported by ship (see Koopman & Gudmundsson, 1966). Aside from the advantages mentioned above, the large number of species, at least in the tropics, means that there are enough individual cases to enable zoogeographical patterns to be worked out.

Koopman, K. F. (1971). Taxonomic notes on *Chalinolobus* and *Glauconycteris* (Chiroptera, Vespertilionidae).

The African genus *Glauconycteris* is shown to be a subgenus of the Australasian genus *Chalinolobus*. The two Pacific island taxa of *Chalinolobus* are here called *Chalinolobus tuberculatus* and *Chalinolobus gouldi neocaledonicus*. Three problematical species of the subgenus *Glauconycteris* are discussed and their suggested taxonomic status are represented by the names *Chalinolobus (Glauconycteris)*

variegatus machadoi, Chalinolobus (Glauconycteris) beatrix humeralis, and *Chalinolobus (Glauconycteris) alboguttatus*.

Koopman, K. F. (1975). Bats of the Sudan.

A revision of the species of bats (Chiroptera) occurring in the Republic of the Sudan (the former Anglo-Egyptian Sudan) is presented. Sixty-six species are definitely recognized as occurring within the boundaries of the country, whereas some 38 others are known from nearby areas and may cross its borders. All eight of the widespread Old World families are represented. Most of the Sudan lies within the Ethiopian region but a relatively small area in the north is best allocated to the arid southwestern Palearctic. The bat fauna is grouped into nine ecogeographical categories (forest, forest-savanna, savanna, east African, desert, savanna-Palearctic, desert-Palearctic, Palearctic, and unclassified), and the Sudanese distribution of the species in each category is summarized. A number of interesting taxonomic problems are discussed, but the final resolution of most of them will involve analysis outside the Sudan.

Koopman, K. F. (1978). Zoogeography of Peruvian bats with special emphasis on the role of the Andes.

The known distribution of each of 122 species of bats from Peru is summarized. The Andean mountain chain affects these distributions both as a barrier and as a creator of habitat differentiation. Three main distributional areas are distinguished, the humid Amazonian lowlands (below 1000 m.), the highlands within the Amazonian drainage (above 1000 m.), and the chiefly arid Pacific slopes. Some complications occur in northwestern Peru, where the Pacific slopes (particularly the higher portions) are not arid, there are a few relatively low passes across the Andes, and the upper portions of certain Amazonian tributaries are arid. Instances of ecological (including altitudinal) replacement and specific or subspecific representation between the major ecological zones are discussed.

Koopman, K. F. (1981). A progress report on the systematics of African *Scotophilus* (Chiroptera, Vespertilionidae). Abstract.

The present state of our knowledge of taxonomy of African *Scotophilus* is reviewed emphasizing controversial points. Four species, *nigritellus, borbonicus, leucogaster (= "nigrita")*, and *gigas* are recognized, with synonymies given. Maps of the overall African distributions are given for these species (with the exception of *gigas*, over which there has been no biological controversy). Infraspecific variation is discussed only where it has been involved in specific discrimination.

Koopman, K. F. (1984a). Taxonomic and distributional notes on Tropical Australian Bats.

The bats of tropical Australia are reviewed with some 51 species recognized, though a few are very poorly known. A new subspecies, *Pipistrellus tenuis westralis* is described and *Rhinolophus megaphyllus ignifer* is synonymized with *R. m. megaphyllus*. The two previously recognized subspecies of *Macroderma gigas* are also synonymized. A majority of tropical Australian bats are restricted to mesic areas, but a number are more or less arid tolerant. Only one species (*Taphozous hilli*) actually avoids mesic areas. The Cape York Peninsula has the greatest number of species with a falling off in numbers to the west and south. Of the three areas adjacent to tropical Australia, New Guinea shares a large number of species, whereas temperate Australia and the Lesser Sunda Islands share relatively few. New Guinea has probably been an important source area for tropical Australian bats, particularly those confined to the Cape York Peninsula. The low level of endemism among Australian bats strongly implies that there were no bats in Australia prior to the Miocene, when Australia

drifted far enough to the north to be able to receive species occurring on the extended Malay archipelago. Since then some low level endemism and adaptive radiation has developed in Australia.

Koopman, K. F. (1986). Sudan bats revisited: An update of "Bats of the Sudan".

Rousettus lanosus, Myotis welwitschii, and *Scotophilus borbonicus* were recorded previously from Sudan and *Pipistrellus crassulus* is reported here. In the Sudan, *Pipistrellus crassulus* is a forest bat, *Scotophilus borbonicus* a savanna one, *Rousettus lanosus* and *Myotis welwitschii*. East African *Hipposideros ruber*, as distinct from *H. caffer*, is a forest bat, H. caffer now a savanna one.

Koopman, K. F. (1989a). Distributional patterns of Indo-Malayan bats (Mammalia: Chiroptera).

The bats of southeastern Asia and its islands (northeastern India, southern China, and the Riukiu islands to the Philippines, Sulawesi, and the Lesser Sundas) are enumerated with relevant taxonomic and distributional remarks. Some 254 species occur in this area. A majority of the species occur either in the Indochinese region (north of the Isthmus of Kra) or else in Malaya and the islands of the continental shelf. In each of the portions of this continental area, endemism is relatively low, even though some islands, such as Borneo, are very species-rich. Endemism is much higher in Sulawesi and the Philippines, which have a depauperate bat fauna but a much higher percentage of endemism. The indications from the bat fauna are very strong that the continental islands (separated by relatively shallow water) were recently connected to the mainland, whereas other islands were not.

Koopman, K. F. (1989b). Systematic notes on Liberian bats.

Based on previously unreported material, 32 species of bats are recorded from Liberia, bringing the total species known for that country to 52. The following species are recorded from Liberia for the first time: *Rhinolophus guineensis, Hipposideros fuliginosus, Myotis tricolor* (first record for western Africa), *Pipistrellus eisentrauti, "Eptesicus" brunneus, Glauconycteris poensis, Mops brachyptera*, and *M. spurrelli*. Other noteworthy findings are the confirmation of an unusually large form of *Rhinolophus clivosus* from tropical western Africa (here described as a new subspecies), the revelation of additional complexity in what is here called *Hipposideros ruber*, clarification of the distinction between *H. caffer* and *H. beatus*, and a discussion of the problems of distinguishing *Mops spurrelli* and *M. annulus*. It is clear that a large number of forest species, some basically East African, have been able to extend as far west as Liberia and probably to the western limits of the high forest.

Koopman, K. F. (1992). Taxonomic status of *Nycteris vinsoni* Dalquest (Chiroptera, Nycteridae).

The type of *Nycteris vinsoni* has been re-examined and the tragus partially reconstituted. It is now evident that the tragus is semilunate rather than pyriform in structure. This character causes *N. vinsoni* to be transferred from the *thebaica* group, where I had previously put it, to the *macrotis* group. I would therefore regard it as a subspecies of *Nycteris macrotis*.

Koopman, K. F. (1993b). Modern equivalents of genera in Dobson's 1878 "Catalogue of the Chiroptera of the British Museum".

In 1878, George Edward Dobson published his catalog including all the bat genera and species that were known to him. In 1880, he published a supplement to his catalog with additions and corrections. It should be pointed out that during much of the 19th and into the early 20th century the British Museum catalogs were major vehicles for publication of systematic research in zoology. Far more than mere lists of specimens, particularly the later ones were taxonomic revisions with diagnoses and keys of taxa

whether represented by British Museum specimens or not. Dobson's 1878 catalog was such a work, giving, for each species, synonymy, diagnosis, distribution, and list of British Museum specimens, if so represented. This work was the standard source for almost 30 years until partially superseded by Miller's "Families and Genera of Bats." During this period, much was written on various aspects of bat biology, using the systematics of Dobson's catalog. Changes in systematics (particularly nomenclature) since Dobson, however, have made much of this literature difficult to use. At the original suggestion of Dr. William E. Rainey, I decided to compile a list of nomenclatural changes at the generic level since 1878, using my contribution to Wilson and Reeder's 1993 "Mammal Species of the World" as the present standard. I therefore list the genera as Dobson gave them with the present treatments of their contents. This, however, is based on Dobson's synonymies and does not guarantee that the British Museum specimens that he lists necessarily are referable to these species.

Koopman, K. F. (1997). The subspecies of *Emballonura semicaudata* (Chiroptera: Emballonuridae).

The four subspecies of the Pacific species *Emballonura semicaudata* are considered. Their taxonomic history, distribution, and characters are discussed. On the basis of size and morphology of skull, they form a linear series, *semicaudata-palauensis-rotensis-sulcata*.

Koopman, K. F. and J. K. Jones (1970). Classification of bats.

In the 10th edition of *Systema Naturae*, published in 1758 and the starting point of the binomial system of nomenclature currently employed in zoology, Linnaeus recognized seven species of bats, which he placed in a single genus (*Vespertilio*) and grouped with the primates and dermopterans. All of Linnaeus's seven species are recognized today, but as they now are classified each represents a distinctive genus, and the genera are arranged taxonomically in five different families of two suborders. In contrast to Linnaeus's scheme, the present classification of bats (long ago placed in a distinct order, Chiroptera) lists 847 Recent species, belonging to 169 Recent genera, 15 families (at least three other families are known only as fossils), and two suborders (see Table 1.)

Much work remains in elucidating the relationships of bats, even at the higher taxonomic levels. In the plethora of publications that have appeared in recent years on the distribution and systematics of bat genera and species, the trend has been to reduce the number of recognized taxa at these levels, even though some new species, and occasionally a new genus, are named annually. Several of the subsequent papers in this symposium touch on problems relating to classification.

Koopman, K. F., C. P. Kofron and A. Chapman (1995). The bats of Liberia: Systematics, Ecology, and Distribution.

Lists of bat species were (with critical taxonomic study when necessary) compiled for six countries of West Africa from Ghana to Guinea-Bissau (79 from Ghana, 62 from Ivory Coast, 57 from Liberia, 57 from Sierra Leone, 37 from Guinea, 24 from Guinea-Bissau) with a total (for all six countries) of 94 species. All but two species extend east of this region, 40 extend west of it, and two (*Rhinolophus guineensis, Hipposideros marisae*) appear to be confined to it. On the basis of overall distribution, 42 species are classified as basically forest, 18 as savanna, 29 ecologically widespread, and 5 (*Rhinolophus simulator, R. clivosus, R. maclaudi, Hipposideros marisae, Myotis tricolor*) as upland, at least in West Africa. A more detailed analysis is attempted for those species occurring in Liberia. This has revealed a number of uncertainties and alternative interpretations. Some of these are probably related to the progressive deforestation that has accompanied human impact in Liberia as elsewhere.

Koopman, K. F., R. E. Mumford and J. F. Heisterberg (1978). Bat records from Upper Volta, West Africa.

The bats of Upper Volta are reviewed, based chiefly on previously unreported material. For the 27 species recognized, locality, habitat, and reproductive data are given. Taxonomic notes are added where necessary, and the distributional patterns in Upper Volta are considered in relation to the vegetation belts in West Africa. All but two species occur in the Sudan savanna, but nearly half of these also occur in the Guinea savanna, to which the two additional species appear to be confined. Several species reach the Sahel savanna. Whereas 12 species are recorded from Upper Volta for the first time, only two represent significant range extensions: *Pipistrellus deserti* south from Algeria and *Tadarida demonstrator* west from Sudan. A gazetteer of bat collecting localities in Upper Volta is included.

Korine, C. and Z. Arad (1993). Effect of water restriction on temperature regulation of the fruit-bat *Rousettus aegyptiacus*.

1. The thermoregulatory responses of the fruit-bat, *Rousettus aegyptiacus*, the only fruit-bat out of 32 bat species in Israel, were studied over a wide range of ambient temperature during normal hydration and during water restriction.

2. The thermoneutral zone of the normally-hydrated fruit-bat ranged between 31 - 36°C. Oxygen consumption in this range averaged 0.95 ± 0.15 ml g^{-1} h^{-1}.

3. Evaporative water loss and respiration frequency during normal hydration increased as power functions of ambient temperature and were significantly correlated ($P < 0.02$). The normally-hydrated, heat exposed fruit-bat effectively regulated its body temperature and dissipated the total metabolic heat production by evaporative cooling.

4. In bats fed on oven-dried apples (water restriction), body mass decreased by 20.72 ± 2.78 %. Oxygen consumption between 32 - 36°C increased significantly and body temperature was relatively high. Evaporative water loss decreased significantly, except at 36°C where evaporative water loss was not significantly different from that during normal hydration, suggesting the preference for body temperature regulation at the cost of increased water loss. At this ambient temperature, dry thermal conductance increased significantly compared to normal hydration, facilitating non-evaporative heat loss.

5. We conclude that the Israeli population of *Rousettus aegyptiacus* is adapted to the relatively warm climate and can cope with a decreased water content in its exclusive fruit diet and effectively regulate its body temperature and metabolic rate.

Korine, C. and Z. Arad (1999). Changes in milk composition from early to peak lactation in the Egyptian fruit bat, *Rousettus aegyptiacus*.

Composition of milk of the free-ranging Egyptian fruit-bat (*Rousettus aegyptiacus*) was studied from early to peak lactation. Carbohydrates were the main component during early lactation and fats were the main component in milk from mid- to peak lactation. Dry-matter and energy content of the milk increased during mid-lactation and stabilized at peak lactation. Increases were consequence of increased fat content, but carbohydrate and protein contents remained relatively stable. We conclude that the milk composition of *R. aegyptiacus* is related to diet and frequent suckling by young. We suggest that the inability of *R. aegyptiacus* to produce concentrated milk of high fat and energy contents and a low protein content is compensated for by prolonged lactation.

Korine, C., I. Izhaki and Z. Arad (1998). Comparison of fruit syndromes between the Egyptian fruit-bat (*Rousettus aegyptiacus*) and birds in East Mediterranean habitats.

This study analyses the fruit syndrome of the Egyptian fruit-bat, *Rousettus aegyptiacus*, the only fruit-bat found in East Mediterranean habitats. Two different sets of bat-fruit syndromes were revealed. One follows the general bat-fruit syndrome and one represents a special case of bat-dispersed fruit syndrome only found in East Mediterranean habitats. The latter syndrome is characterized by dry fruits with a relatively high protein content. Fruit species that belong to this syndrome are available mostly in winter (when the fruit-bat faces a severe shortage in fruit availability and inadequate fruit quality). The fruit syndromes and dietary overlap between frugivorous birds (based on the literature) and the fruit-bat were also studied. Features associated with each set of fruit species generally follow the known bat and bird syndromes. Bird-dispersed fruits tend to be small, with a high seed mass to pulp mass, variable in fat content and characterized by a high ash content. However, when the shared fruit species were included in the analysis, no significant differences were found in fruit features between the bird-dispersed and bat-dispersed fruit syndromes. A limited and asymmetrical dietary overlap was observed between these two taxa, mainly between introduced and cultivated fruits.

Korine, C., I. Izhaki and D. Makin (1994). Population structure and emergence order in the fruit-bat (*Rousettus aegyptiacus*: Mammalia, Chiroptera).

Population size and emergence order of *R. aegyptiacus* were studied in the Abas cave. Haifa, Israel. Throughout the reproductive period adult females populated the cave and the adult population consisted mainly of adult females except during winter when higher numbers of adult males were recorded. The proportion of juveniles increased consistently from spring to winter. Thus, it is suggested that the Abas cave serves as a maternity roost. Adult females in the reproductive state emerged from the cave earlier that juveniles and adult males. Social factors and differences in nutritional demands which may correspond to this different emergence order are discussed.

Kowalski, K., J. Gaisler, H. Bessam, C. Issaad and H. Ksantini (1986). Annual life cycle of cave bats in northern Algeria.

The dynamics of bat populations in caves of northern Algeria were studied between 1978 and 1983. The 10 species represented were: *Rhinolophus ferrumequinum, R. mehelyi, R. blasii, R. euryale, R. hipposideros, Myotis blythi, M. emarginatus, M. nattereri, M. capaccinii* and *Miniopterus schreibersi*. Detailed reproductive data, including histological examination of reproductive organs, were obtained for *R. mehelyi* and *M. blythi* during a part of the annual cycle. All species examined except *Miniopterus schreibersi* reach their southern limits of distribution in Algeria. The duration of hibernation was shorter in Algeria than in Europe, but the reproductive cycle was similar in that insemination took place in autumn and fertilization in spring. Parturition occurred earlier than in European populations of the same species. Observations were made on the choice of roosts, formation of intra- and interspecific associations, as well as individual and geographic variation in dates of parturition. The tendency of *M. blythi* to form harems during the mating season was noted.

Krampitz, H. and F. Anciaux de Faveaux (1960). Ueber einige Haemosporidien aus Fledermäusen der Höhlen des Berglandes von Katanga.

Von einigen Haemoproteiden der Gattungen *Nycteria, Polychromophilus* und *Hepatocystis*, gesammelt aus Fledermäusen des Berglandes von Katanga, werden ergänzende strukturelle Eigentümlichkeiten mitgeteilt und miteinander verglichen. Diese vergleichende morphologische Betrachtung der im Blut verschiedener afrikanischer Chiropteren gesehenen Haemosporidien erbrachte die Bestätigung der Tatsache, daß sie sich strukturell um so mehr ähneln, je systematisch näher sich ihre Wirte stehen, so daß die Frage der genauen Arttrennung bei ähnlichen Parasiten aus nahe verwandten Wirten auf morphologischer Basis allein in den meisten Fällen kaum möglich ist. Deutlich charakterisiert ist *Nycteria medusiformis* aus *Nycteris macrotis* durch Filamentbildungen, die in Übereinstimmung mit

GARNHAM u. HEISCH (1953) als eine der Wirtszelle eigene degenerative Bildung gedeutet werden. Die in den beiden Hufeisennasen *Hipposiderus caffer centralis* und *Rhinolophus h. hildebrandti* gesehenen *Polychromophilus*-Formen werden als eine neue Art aufgefaßt. Für sie ist nach dem Fundort der Name *Polychromophilus congolensis* spec. nov. vorgeschlagen. Bei den Angehörigen der intraerythrozytär eifrig pigmentbildenden Gattung *Polychromophilus* vermißten wir in den Makrophagen der Milz und Leber in allen darauf untersuchten Fällen Pigmentspeicherungen. Die Existenz der entfernt an Vorstadien zur intraerythrozytären Schizogonie erinnernden Konfiguration, die RODHAIN (1926) bei *Hepatocystis epomophori* erstmals beobachtet und 1953 neu gedeutet hat, wird bestätigt, wobei wir uns der letztliehen Auffassung RODHAINs über deren Natur anschließen.

Morphological peculiarities of three species of Haemosporidia belonging to the family Haemoproteidae (*Nycteria, Polychromophilus, Hepatocystis*), which had been collected from bats in the rnountains of Katanga, were studied and compared. Evidently their structural conformity is the greater the closer the systernatic relationship of their hosts. Hence, differentiation of species frorn closely related hosts, merely on the basis of their morphology, is almost rendered impossible. *Nycteria medusiformis* from *Nycteris macrotis*, however, can be clearly distinguished by characteristic filaments which protrude from the parasitized blood cell. In accordance with GARNHAM & HEISCH (1953), these filaments are considered to be degenerative formations of the erythrocyte and not cellular structures of the parasite itself.

Parasites of the genus *Polychromophilus* found in two species of horseshoe hats (*Hipposiderus caffer centralis* and *Rhinolophus h. hildebrandti*) are believed to belong to a hitherto unknown species for which the narne *Polychromophilus congolensis* spec. nov. is proposed.

The lack of pigment storage in the macrophages of spleen and liver in all cases of *Polychromophilus* infections examined was striking, since the parasites of this genus readily produce pigment within the erythrocyte. The existence of peculiar configurations occuring in infections with *Hepatocystis epomopheri* which had been reported by RODHAIN (1926) for the first time, could be confirmed, although they are rarely found. These configurations, which somewhat resemble a preliminary stage of intraerythrocytic schizogony, are believed - as previously alleged by RODHAIN (1953) - to represent a certain stage of development prior to sexual maturing in the microgametocytes.

Dans le sang des chiroptères hahitantes particulierement dans les grottes des Montagnes du Haut Katanga (région du Congo) des formes différentes des plasmodides ont été trouvées. Elles appartiennent aux genres: *Nycteria, Polychromophilus* et *Hepatocystis*. Les formes qui apparaissent dans le sang sont discutées et comparées au point de vue de leurs propriétés morphologiques.

Une nouvelle espèce très répandue dans le sang de deux chauves-souries: *Rhinolophus h. hildebrandti* et *Hipposiderus caffer centralis* est postulée: *Polychromophilus congolensis* spec. nov.

Krumbiegel, I. (1943). Zur Kenntnis der Säugetierfauna von Fernando Poo. (8. Beitrag zu den wissenschaftlichen Ergebnissen der Forschungsreise H. Eidmann nach Spanisch-Guinea 1939/40).

Die EIDMANNsche Bereisung der Insel Fernando Poo ist gerade auch vom Standpunkt der Säugetierkunde aus recht zu begrüßen. weil das (zoologische) Schrifttum über diese Insel fast ausschließlich in englischer und spanischer Sprache erschienen ist - eine Ausnahme macht nur die umfangreiche ethnologische Bearbeitung von TESSMANN. Zoologische Arbeiten in deutscher Sprache von größerem Umfang stehen bis zum Erscheinen der EIDMANNschen Veröffentlichungen (vgl. EIDMANN; 1941) noch aus, die Säugetierfauna ist nur nebenher bei Bearbeitungen westafrikanischer Tiere mit erwähnt. Dabei ist die Insel schon seit 1472 bekannt und liegt von dem früheren deutschen Schutzgebiet Kamerun nicht allzuweit entfernt .

Als erster ging WATERHOUSE (1838, 1841) auf die Säugetierfauna der Insel ein und stellte eine Reihe von Typen auf, die sich z. T. in abgeänderten Formen später auch auf dem gegenüberliegenden Festland vorfanden. THOMSON berichtete im 2. Band der "Narrative of the Niger Expedition" (1841),

schließlich sind FRASERs "Zoologica tvpica" (1842) und seine Veröffentlichungen in den "Proc. Zool. Soc. London" (1852) zu nennen, sowie die Ornithologie *Hartlaub*s (1857). Moderne Arbeiten liefere CABRERA (1908, 1920, 1923, 1929).

Angesichts des relativen Mangels an zoologischen Arbeiten über die Insel an und für sich und an deutschem Anteil im besonderen ist das Material der EIDMANNschen Ausbeute doppelt wertvoll. Ich benutze die Gelegenheit, Herrn Prof. Dr. EIDMANN für die Überlassung der Säugetierausbeute zur Bearbeitung bestens zu danken, ebenso der Fachgliederung Forst- und Holzforschung des Reichsforschungsrates für die Überlassung von Mitteln.

Wissenschaftlich ist das Säugetiermaterial nicht bloß vom speziell systematischen Standpunkt aus interessant, sondern auch vom allgemein-zoologischen, da es einen Beitrag zum Problem der Inselfaunen überhaupt und der Isolierung bzw. Rassenbildung liefert. Hiervon ist im Anschluß an die systematische Durchsicht noch die Rede. Die vier Guinea-Inseln und ihre Entfernung vom Kontinent zeigt Abb. 1.

Kuhn, H. J. (1962a). *Scotonycteris zenkeri* Matschie, 1894 in Liberia.

Scotonycteris zenkeri aus der Zentral-Provinz von Liberia erweitern das bekannte Verbreitungsareal der Art nach Westen. Nach dem verfügbaren Material ist die Abtrennung einer Subspecies aus Oberguinea nicht aufrechtzuerhalten. Unterschiede im Gaumenfaltenmuster bei einem erwachsenen Weibchen und seinem halbwüchsigen Sohne werden beschrieben.

Kuhn, H. J. (1962b). Zur Kenntnis der Microchiroptera Liberias.

Zwischen Oktober 1960 und Februar 1961 konnte ich in der Central Province der Republik Liberia einige Microchiroptera sammeln. Ohne die Jungtiere sind es nur 43 Exemplare in 10 Arten. Es sei aber hier kurz über sie berichtet, weil die Arten *Nycteris intermedia, Nycteris aethiopica, Kerivoula phalaena* und *Tadarida thersites* früher in Liberia nicht gefunden worden sind, bei den beiden letzten ergibt sich durch die neuen Funde eine mitteilenswerte Erweiterung des bekannten Verbreitungsgebietes nach Westen.

Die Fundorte der Tiere sind erstens Harbel (50 km östlich von Monrovia) an der größtenteils entwaldeten Küste, zweitens die im Primärwald liegende Gbi-Stadt Freemanntown (schätzungsweise 30 km südlich von Tappita) und drittens das im sekundären Walde gelegene Deaple (Nyor-Clan, Saniquelli-District, etwa 40km südöstlich von Bahn).

Herzlich danke ich der American Foundation for Tropical Medicine, die mich in ihrem Institut in Harbel auf vielfache Weise unterstützte und dort besonders Herrn Dr. WALTER, der mir je ein Exemplar von *Nyteris hispida* und von *Nycteris intermedia* schenkte.

Kulzer, E. (1958). Untersuchungen über die Biologie von Flughunden der Gattung *Rousettus* Gray.

1. Flughunde der Gattung *Rousettus* GRAY wurden an verschiedenen orten in Ägypten und Britisch-Ostafrika in ihren natürlichen Lebensraumen beobachtet. Die Zusammensetzung der Tierkolonien, ihre Tagesquartiere und ihre nächtliche Nahrungssuche konnten beobachtet werden.

2. Genaueren Aufschluß über die Biologie der Tiere erhielt ich erst durch Laboratoriums-Untersuchungen. Die Tiere befinden sich zum Teil bereits über 4 Jahre in Gefangenschaft.

3. Ein Flughundschwarm aus 16 Tieren wurde längere Zeit in einem geeigneten Käfig mit anschließendem Flugraum gehalten und ständig beobachtet. Dabei zeigte sich, daß die Tiere einen

ausgesprochenen Tag- und Nachtrhythmus besitzen. Die aktive Zeit beginnt mit Einbruch der Dunkelheit. Durch Wechsel der Beleuchtungsverhältnisse laß sich dieser Rhythmus umkehren.

4. Die Nahrungsaufnahme und die damit verbundenen Futter- und ..htzkämpfe konnten beobachtet werden. Durch Elektronenblitzaufnahmen wurden die Flugbewegungen analysiert. Die Flughunde putzen sich häufig, um Nahrungsreste und Parasiten aus dem Fell zu entfernen. Auf rasche Bewegungen und Geräusche reagieren die Tiere mit einer Schreckreaktion. Das Fortpflanzungsverhalten und die damit verbundenen Lautäußerungen wurden beobachtet und registriert.

5. Es ist gelungen, die Flughunde in Gefangenschaft zur Nachzucht zu bringen und dabei die postembryonale Entwicklung der Jungen zu studieren. Das Junge bleibt mindestens 4 Monate beim Muttertier. Durch Stimmfühlungslaute ist der Zusammenhalt zwischen Muttertier und Jungem gewährleistet. Die Tiere erkennen sich gegenseitig an ihrem Individualduft. Beim ersten Ausflug sendet der junge Flughund bereits Ultraschall-Orientiesrungslaute aus. Die komplizierten Ohrbewegungen erfolgen bereits in der zweiten Wochen nach der Geburt. Der Flug des Jungen ist gewandt und sicher. Die Jungen wachsen ..fangs sehr rasch, später langsam und erreichen erst im Laufe eines Jahres die Größe des erwachsenen Tieres.

6. Durch Versetzungsversuche der Heimatkäfige konnte das Heimfindevermögen geprüft werden. Die Tiere besitzen ein hervorragendes Ortsgedächtnis, ihren "Stammplatz" finden sie aber immer mit der Nase.

7. Die Jugendentwicklung und das Orientierungsverhalten von Mikrochiroptoren und Flughunden werden verglichen.

8. Die Megachiropteren stehen wegen ihrer noch vielfältigen Ausdrucksformen und Sinnesleistungen den Ursprungsformen der Chiropteren nahe.

Kulzer, E. (1959). Fledermäuse aus Ostafrika. Ueber eine Sammlung van Chiropteren aus Kenia und Tanganyika mit ethologischen und ökologischen Beobachtungen.

1. Die im Verlauf einer Forschungsreise in Ostafrika (Kenia und Tanganyika) gesammelten 19 verschiedenen Formen (18 Arten) von Chiropteren, ihre geographische Verbreitung in Ostafrika sowie Beobachtungen im Freiland und in Gefangenschaft werden beschrieben.

2. Die Schwerpunkte der Verbreitung einiger Chiropterenarten liegen entlang ostafrikanischen Küste. Dies trifft sowohl für die Artenzahl als auch für die Individuenzahl zu.

3. Die Flughunde der Arten *Epomophorus wahlbergi* und *Rousettus leachii* bevorzugen als Lebensräume die Waldgebiete der Küstenzone und die Waldränder Hochlandzone (am Rande des Kulturlandes) bis zu den Seenprovinzen.

4. Besondere Anpassungsfähigkeiten einzelner Chiropterenarten begünstigen ihre Verbreitung in den verschiedenen klimatischen und landschaftlichen Zonen Ostafrikas:

a) Als typischer Vertreter der offenen Graslandzone (Savanne-Steppe) kann *Lavia frons* angesehen werden. Diese Tiere leben tagsüber in Büschen und Bäumen der Nähe von Wasservorkommen. Sie sind damit den Verhältnissen des offenen Landes am weitesten angepaßt. Sie sind auch tagsüber voll aktiv. Ähnliches Verhalten am Tage zeigen die Tiere der Art *Megaderma cor*; sie haben ein ähnlich weites Verbreitungsgebiet in Ostafrika.

b) Eine Möglichkeit, den starken Klimagegensätzen, wie sie z. B. in der Hochlandzone herrschen, zu begegnen, zeigen Tiere der Art *Scotophilus nigrita*: Sie haben einen ausgeprägten Tag- und Nachtrhythmus in bezug auf Ruhezeit und Aktivität. hierfür erforderliche Zeitsinn ist ebenfalls stark ausgeprägt. Ähnliche Fähigkeiten besitzen auch Molossiden.

c) Fledermäuse, die in allen klimatischen und landschaftlichen Zonen verbreitet und keine entsprechende körperliche Anpassungsfähigkeit besitzen, zeigen eine Vorliebe für höhlenartige Tagesquartiere, die gegen die Außenwelt klimatisch isoliert sind. Diese Arten sind auch tagsüber in der Hochlandzone und in der Graslandzone in ihren Tagesquartieren aktiv (z. B. Tiere der Gattungen *Rhinolophus, Hipposideros* und *Nycteris*.

d) Alle an der Küste gefangenen Tiere (Vertreter der Gattungen *Taphozous, Coleura, Triaenops, Rhinolophus, Hipposideros* und *Megadarma*) waren auch tagsüber auffallend aktiv.

4. Eine scharfe landschaftliche Trennung der verschiedenen Fledermausarten ist nicht zu erkennen, wenn auch einige Vertreter eine Vorliebe für bestimmte
regionale Gegebenheiten zeigen. Zahlreiche Arten kommen in allen drei erwähnten Zonen vor. Entscheidend für ihre Verbreitung ist das Vorhandensein geschützter Tagesquartiere und ein reichliches Nahrungsangebot.

Kulzer, E. (1961). Ueber die Biologie der Nil-Flughunde (*Rousettus aegyptiacus*).

1. Die von TH. ANDERSEN in Tanganyika gesammelten 17 verschiedenen Formen von Chiropteren, ihre Verbreitung in Tanganyika und Freilandbeobachtungen werden beschrieben.

2. Ein Vergleich der Fundorte und der Tagesquartiere der von ANDERSEN und mir gesammelten Arten zeigt. daß nur in wenigen Fällen deutliche Beziehungen zwischen der systematischen Stellung der Tiere und ihrem Lebensraum bestehen. Die einzelnen Gattungen und Arten stellen oft ganz unterschiedliche Ansprüche an ihre Tagesquartiere. Unter den *Megachiroptera* sind die Flughunde der Gattung *Rousettus* Höhlenbewohner; Flughunde der Gattung *Epomophorus* verbringen den Tag dagegen auf Bäumen. V on den Mikrochiroptera sind die Gattungen *Rhinolopbus, Hipposideros, Triaenops* und *Coleura* zu den primären Höhlenfledermäusen zu rechnen. Nur selten findet man sie in anderen Lebensräumen. Die Tagesquartiere der Gattungen *Megaderma, Nycteris, Taphozous* und *Scotophilus* sind unterschiedlich. Erdhöhlen, Baumhöhlen und Dächer menschlicher Behausungen werden bevorzugt. Als Kulturfolger zeigen sich verschiedene Arten der Gattung *Tadanda*, ferner die Bananenfledermaus *Pipistrellus n. nanus*. Als Parallele zu den in Bäumen lebenden *Megachiroptera* treten unter den *Mikrochiroptera* die Arten *Lavia frons* und *Nycteris hispida* auf.

Kulzer, E. (1965). Temperaturregulation bei Fledermäusen (Chiroptera) aus verschiedenen Klimazonen.

1. Die Fähigkeit zur Regulation der Körpertemperatur wurde an 18 Arten (18 Gattungen) von Fledermäusen aus verschiedenen Klimazoinen der Erde untersucht.

2. Der tägliche Verlauf der Körpertemperatur steht im Zusammenhang mit dem Wechsel von Ruhe und Aktivität; er wird von der Jahreszeit, von der Umgebungstemperatur und von den Gefangenschaftsbedingungen beeinflußt.

3. Alle Fledermäuse der gemäßigten Zone können in der Ruhephase ihre Körpertemperatur der Umgebungstemperatur weitgehend angleichen. Flughunde (*Megachiroptera*) sind von der Umgebungstemperatur unabhängig; rein tropische und subtropische Fledermäuse senken ihre Körpertemperatur nur in einem mittleren Bereich der Umgebungstemperatur.

4. Bei niederen Umgebungstemperaturen verfallen die Fledermäuse der gemäßigten Zone (v. a. *Vespertilionidae* und *Rhinolophidae*) in tiefe Kältelethargie. Bis auf einige lebenswichtige Reflexhandlungcn sind dann alle Bewegungen blockiert. Aus der Lethargie erwachen die Tiere spontan oder nach einem Weckreiz auch *ohne* künstliche Wärmezufuhr. Der Lethargiezustand ist geregelt.

5. Rein tropische und subtropische Fledermäuse werden durch Kälte in Alarmstimmung versetzt. Sie verfallen nicht in Kältelethargie. Dauernde Kältebelastung führt zu ungeregelter Hypothermie.

6. Die Atmung wird den Erfordernissen im Wachzustand und in der Lethargie angepaßt. Lange Atempausen und schubweise aufeinanderfolgende Atemzüge kennzeichnen die Lethargie-Atmung. Bei den untersuchten Megachiropteren gibt es dagegen keine Apnoezustände. Besondere Atmungsmuster zeigen auch die tropischen Fledermäuse (*Microchiroptera*).

7. Stoffwechsel und Atmung stehen in engem Zusammenhang: Während der Kältelethargie wird ein Minimalstoffwechsel aufrechterhalten; der Wachstoffwechsel wird auf ein Minimum gedrosselt. Die rein tropischen und subtropischen Arten steigern bei Kälte ihren Stoffwechsel entsprechend der Kältealarmierung.

8. Dauernde Kältebelastung führt bei den tropisch-subtropischen Fledermäusen zum Zusammenbruch der Temperaturregulation und zum Kältetod. Erfolgt rechtzeitig eine künstliche Aufwärmung, so kann die Hypothermie wieder aufgehoben werden.

9. Die Ordnung *Chiroptera* kann nicht mehr den poikilothermen Tieren zugerechnet werden. Alle untersuchten Megachiropteren haben sich als *homoiotherm* erwiesen. Die Kleinfledermäuse (*Microchiroptera*) reagierten in verschiedenem Grade *heterotherm*: Während die rein tropischen Arten die Fähigkeit zur Kältelethargie nicht besitzen, finden wir sie bei allen untersuchten Arten der Vespertilioniden und Rhinolophiden (auch in den Tropen). Diese Fähigkeit ist eine Voraussetzung zur Ausbreitung in der kühl temperierten Zone. Auf ihr bauen alle Anpassungen an die Lebensbedingungen auf. Es ist anzunehmen, daß die beiden Familien die Fähigkeit haben, ihre Körpertemperatur auf verschiedenen Ebenen zu regulieren.

The ability to regulate body temperature was studied in 28 species (18 genera) of bats from different climatic zones. All bats from the cool temperate zone show body temperatures which are close to the environmental temperatures during the daily resting phase. Fruitbats (*Megachiroptera*) are independent of the environmental temperature and are able to regulate their body temperatures above low ambient temperatures. Bats which live only in tropical and subtropical zones lower their body temperatures at medium environmental temperatures but not when it is very cold. While bats of the temperate zone enter deep torpidity during cold, tropical bats show an "alarm reaction". They elevate their body temperature and their metabolism äs long äs possible. The state of torpidity (Kältelethargie) in vespertilionid and rhinolophid bats is subject of physiological regulation: Even in deep lethargy there is a small difference between body temperature and the environment. Respiration and metabolism are regulated to minimum levels. Torpid bats are able to regulate their body-temperatures to activity level either spontaneously or after a short stimulus without artificial rewarming. In tropical and subtropical bats, with exception of vespertilionid and rhinolophid bats, extended exposure to cold leads finally to uncontrolled hypothermia and to death. Hypothermic animals are never able to rewarm themselves, neither spontaneously nor after stimulation. The only way to Interrupt the hypothermia is artificial rewarming. The Chiroptera are not poikilothermic animals as is still postulated in recent literature. All species of *Megachiroptera* studied are homeothermic animals. The *Microchiroptera* on the other hand show different degrees of heterothermism. While the pure tropical and subtropical bats are not able to enter deep torpidity, many species of the families *Vespertilionidae* and *Rhinolophidae* are able to enter lethargy even in the tropics. This ability was necessary to enter the cool temperate zone, where many adaptations evolved. It seems likely that both families are able to regulate their body temperatures at any given environmental temperature within the ränge of viability.

Kulzer, E. (1982). Nektar-Lecken beim afrikanischen Langzungen-Flughund *Megaloglossus woermanni* Pagenstecher, 1885.

The dorsal surface of the tongue of *Megaloglossus woermanni*, the African long-tongued fruitbat, is highly adapted to nectar-drinking. The anterior tip of the tongue is covered by rows of hair-like papillae which project posteriorly. The filiform papillae are 0.7 mm in length and 0.2 mm in width (at their base). They become shorter at the lateral surface of the tongue. The many filiform papillae not only occupy a large area on the tip of the tongue, the very short distances between them (0.2 mm) cause a felt-like structure in which the nectar is caught. These anatomical structures are generally similar to the surface of the tongue of the New World nectar-feeding bats, especially in *Glossophaga soricina*. The quick

movements of the tongue of *Megaloglossus woermanni* could be shown by motion pictures. Using honey-water as food, the fruitbats made 7 licking movements/sec.; the amount of fluid withdrawn from a glass tube was 0,18 ml/sec.

Kulzer, E. and R. Storf (1980). Schlaf-Lethargie bei dem Afrikanischen Langzungenflughund *Megaloglossus woermanii* Pagenstecher, 1885.

Sleep-lethargy in the African long-tongued fruit bat *Megaloglossus woermanni* Pagenstecher. 1885.

The thermoregulatory response in one of the smallest species of Megachiroptera, the long-tongued fruit bat *Megaloglossus woermanni* was studied.

At ambient temperatures (T_a) 20-35°C, body temperatures (T_b) and the rate of oxygen consumption in two adult female fruit bats (body mass 9 - 14 g) from Makokou (Gabon) were measured. In relation to T_a these fruit bats show two patterns of temperature control: they either regulate both functions on a relatively high level (T_b above 34°C; metabolic rate at T_a 31°C = 1.6 $mlO_2(g \cdot h)^{-1}$; oxygen consumption increased twice at T_a 25°C - or lower their body temperatures and enter a lethargic sleep (lowest T_b 26,2° at T_a 23°C; metabolic rate reduced to 1/2 the lowest value at T_a 31°C). During arousal (spontaneously or induced) metabolic rate increased to the fourfold of the lowest value at T_a 31°C and T_b increased to a level above 34°C. The facultative lethargy saves about 3/4 of the energy demand of a normothermic state at T_a 20-27°C. A correlation between the lethargy, the small body size and the highly specialized nutrition (nectar feeder) is assumed. The hypothesis of a rigid homeothermy in the fruit bats is true only in the relatively large Megachiroptera.

Untersucht wurden die thermoregulatorischen Fähigkeiten bei einer der kleinsten Arten der Megachiroptera, dem afrikanischen Langzungenflughund *Megaloglossus woermanni*.

Dazu wurden an zwei adulten ?? (Gewicht 9 - 14 g) aus Makokou (Gabun) 14 Tage lang Körpertemperaturen (Thermistor) und Stoffweichselraten (Beckman Oxygen Analyzer G2) in Beziehung zur Umgebungstemperatur gemessen. Die kleinen Flughunde zeigten zwei Muster der Temperaturkontrolle: Sie regulierten entweder beide Funktionen auf einem hohen Niveau (Körpertemperatur über 34°C; niedrigster O_2-Verbrauch bei 31°C Umgebungstemperatur = 1,6 mlO_2 $(g\ h)^{-1}$ und Verdoppelung des O_2-Verbrauches bei 25°C Umgebungstemperatur) - oder reagierten mit einer Absenkung und Übergang in einen lethargischen Schlaf (minimale Körpertemperatur 26,2°C bei 23°C Umgebungstemperatur; O_2-Verbrauch während der Lethargie etwa 1/2 des niedrigsten Verbrauches bei 31°C). Während des Wiedererwachens (spontan oder nach Weckreiz) steigt der Stoffwechsel auf den vierfachen Wert des minimalen O_2-Verbrauches bei 31°C an und die Körpertemperatur erreicht wieder den Normalwert. Die Schlaf-Lethargie von *Megaloglossus* steht wahrscheinlich im Zusammenhang mit der geringen Korpergröße und der spezialisierten Ernährungsweise (Nektarsauger).

Kumerloeve, H. (1974). Über die Balgsammlung Ludwig Graf von Huyns und weiteres äthiopisches Vogelmaterial im Zoologischen Forschungsinstitut und Museum Alexander Koenig.

Between about 1930 and 1934 Count Ludwig von Huyn (b. 14th September 1896, d. 20th May 1946) collected in central Ethiopia (province Shoa) more than 760 birds, 100 mammals, a few reptiles and some insects for the Museum Alexander Koenig, an interesting, still unpublished scientific material. A short review of the bird species and subspecies in this collection is given, including the remaining Ethiopian specimens in the Museum Alexander Koenig, mainly collected by G. Schrader (between 1897 and 1909), by Dr. J. Havestadt (about 1927/28) and by G. Nikolaus (in 1972) and by a few others, among these Prof. O. Neumann. On the whole, about 1435 bird specimens are reviewed. In an appendix, a list of the mammals collected by Count Ludwig von Huyn is given by Prof. E. von Lehmann.

Kunz, T. H. (1996). 3. Obligate and opportunistic interactions of Old-World tropical bats and plants.

Over half of the approximately 920 species of living bats use plants exdusively or opportunistically as resources for food and/or shelter. The 166 or so species of the Old-World family Pteropodidae (suborder Megachiroptera) depend on plants as their principal source of food including flowers (nectar, pollen, and petals), fruit, and leaves. Nectarivorous bats pollinate flowers in exchange for nectar and pollen rewards, and both bats and plants benefit when bats ingest high-energy fruit and subsequently disperse seeds away from parent plants. Most fruit-eating bats are effective seed dispersers, but only the large pteropodids can disperse the largest seeds. Folivory by leaf-fractionation may be important for species with limited access to alternative sources of dietary protein or minera!s, and some species may exploit secondary compounds of plants as cues for reproduction. Plants also provide shelter for many Old-World bats. Roosting bats use tree cavities, crevices in tree boles and branches, spaces beneath exfoliated bark, unaltered foliage, and spaces beneath altered leaves, stems, and flower/fruit clusters. Plant-visiting bats contribute to the maintenance of tropical diversity by dispersing pollen and seeds, promoting a diversity of roost and food resources which benefit bats that feed at other trophic levels.

Kunz, T. H., A. Allgaier, J. Seyjagat and R. Caligiuri (1994). Alloparental care: helper-assisted birth in the Rodrigues fruit bat *Pteropus rodricensis* (Chiroptera: Pteropodidae).

We report observations of allomaternal care, or epimeletic (care-giving) behaviour, exhibited by one female toward another, before, during. And after giving birth in the Rodrigues fruit bat, *Pteropus rodricensis* (Chiroptera: Preropodidae). Interactions between the expectant mother and other roost mates, from the onset to completion of birth, were observed continuously over a period of approximately three hours. The attending female assisted the mother when she. (1) intermittently groomed her anovaginal region; (2) grasped her with partially outstretched wings; (3) 'tutored' her in a feet-down birthing posture; (4) groomed the emerging pup; and (5) physically assured the mother by manoeuvring the pup into a suckling position. This is the first report of extensive assistance given by a female bat to another during parturition. We suggest that epimeletic behaviour may be common In the highly social Chiroptera, especially among primiparous or inexperienced females and/or when an expectant mother experiences difficulty during labour and parturition. Our observations support the hypothesis that roosting associations in bats may be as important as relatedness in explaining the occurrence of apparently altruistic acts.

Kurta, A. and T. H. Kunz (1987). Size of bats at birth and maternal investment during pregnancy.

This paper summarizes data on neonatal and maternal body mass and forearm length for 74 species of bats (order Chiroptera], representing both suborders and 10 out of 17 families. Maternal body mass ranged from 3.9 to 575 g. Newborn bats averaged 22.3 % (range: 12 - 43 %) of maternal body mass; non-volant eutherians of similar maternal size averaged only 7.8 %. Total maternal investment in terms of litter mass was approximately the same in bats as in other placental mammals of similar size. Neonatal body mass in bats increased by a factor of 0.93 with increasing maternal mass; litter mass scaled to a factor of 0.84 across the order. Using allometric analysis to correct for the effects of maternal body size, we found that phyllostornids and rhinolophids had the largest individual neonates, while vespertilionids with a litter size of two had the smallest. Vespertilionids that produce twins, however, invest the most in terms of litter mass (up to 50 % of maternal mass), while vespertilionids with a single young per litter, and the pteropodids, invest the least. Phyllosromids had the largest neonatal forearms, after the effects of maternal size were removed, and vespertilionids with two young per litter had the smallest. Despite a small litter size (generally only one or two offspring per litter), long gestation periods, and relatively large neonatal size, bats appear to be functionally altricial at birth. The energetic cost of pregnancy for a bat may be estimated using data from the literature and appropriate allometric relationships,

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Lancaster, W. C., S. C. Thomson and J. R. Speakman (1997). Wing temperature in flying bats measured by infrared thermography.

1. We collected data on the wing temperature of flying bats using infrared thermal imaging to assess the thermoregulatory function of wing membranes.

2. Thermographic images of two Egyptian Fruit Bats, *Rousettus aegyptiacus* were captured as they flew along a 12 m length of corridor.

3. Body temperature was measured before the first flight and immediately after flight sequences using a rectal thermister probe.

4. Temperatures across the wing ranged from 34°C near the forearm muscle mass, to less than 24°C at the trailing edge (mean ambient temperature 23°C). The majority of the wing was 1-2°C above ambient temperature.

5. We found small, but significant changes in body temperature during flight. These changes did not correlate with changes in wing temperature.

Landau, I. and A.-G. Chabaud (1978). Description de *Plasmodium cyclopsi* n. sp. parasite du Microchiroptère *Hipposideros cyclops* à Makokou (Gabon).

Plasmodium cyclopsi n. sp. est caractérisé par la petite taille des formes asexuées et par des gamétocytes de type "*malariae*". Il est proche de *P. anomaluri*, dont l'hôte vertébré a le même habitat: troncs d'arbres creux de la forêt tropicale. En raison de l'ancienneté de son hôte (Rhinolophoidea) et de son appartenance au groupe "*malariae*", *P. cyclopsi* est interprété comme une espèce très primitive.

Description of *P. cyclopsi* n. sp. a parasite of the Microchiropteran Bat *Hipposideros cyclops* in Gabon.

P. cyclopsi sp. nov. is characterized by the small size of the asexual stages and by gametocytes belonging to the type "*malariae*". It is related to *P. anomaluri* and the hosts of both species share the same habitat: hollow trees of the tropical forest. By the ancientness of its vertebrate host and its relationship with the "*malariae*" group of Haemosporidia *P. cyclopsi* is interpreted as a primitive species.

Landau, I., A.-G. Chabaud, F. Miltgen and D. Baccam (1980a). *Dionisia bunoi* n. gen. n. sp. Haemoproteidae parasite du Microchiroptère *Hipposideros cyclops* au Gabon.

Dionisia bunoi n.g. n. sp. est caractérisé par: - a) le dimorphisme sexuel des gamétocytes, le macrogamétocyte étant du type falciparum, le microgamétocyte du type malariae: - b) des schizontes se développant dans la lumière des vaisseaux du foie à l'intérieur d'une cellule hôte considérablement hypertrophiée; leur taille reste modérée et leur cytoplasme ne présente pas la basophilie intense habituelle chez la plupart des stades jeunes des Hémosporidies de Mammifères.

Le genre a des caractères morphologiques mixtes communs avec chacun des 4 autres genres d'Haemoproteidae de Mammifères.

Les hypothèses phylétiques fondées sur la morphologie des gamétocytes et celle des schizontes amènent à considérer *Bioccala* et *Dionisia* comme primitifs.

Dionisia bunoi ng. g., n. sp. is characterized by: - a) sexual dimorphism of gamétocytes, macrogamétocyte of the falciparum type, microgamétocyte of the type malariae: - b) schizonts developing in the lumen of liver blood vessels inside a greatly hypertrophied host cell; their size remains

moderate and their cytoplasm is not intensely basophilic as is usually observed in the young stages of Haemosporidia of Mammals.

The genus has morphological characters in common with each of the 4 other genera of Haemoproteidae of Mammals.

The phyletic hypothesis concerning the morphology of gametocytes and schizonts suggests that *Bioccala* and *Dionisia* are primitive.

Landau, I., G. Rosin, F. Miltgen, J.-P. Hugot, N. Leger, I. Beveridge and D. Baccam (1980b). Sur le genre *Polychromophilus* (Haemoproteidae, parasite de Microchiroptères).

Le genre *Polychromophilus* est constitué par deux ensembles d'espèces très différents que les auteurs ont groupés dans 2 sous-genres : a) le sous-genre *Polychromophilus*, avec pour espèce type *P. (P.) melanipherus* Dionisi 1899, telle qu'elle a été redéfinie par Garnham (1973): la morphologie des gamétocytes est de type *malariae*; b) le sousgenre *Bloccala*, avec pour espèce type *P. (B.) murinus* Dionisi 1898; la morphologie des gamétocytes est proche de celle des Hemoproteidae d 'Oiseaux.

Des *Polychromophilus* de Minioptères d'Europe, d'Afrique et d'Australie ont été étudiés et décrits, en particulier 2 espèces nouvelles africaines: *P. (P.) corradettii* chez *Miniopterus inflatus* au Gabon et *P. (P.) adami* chez *Miniopterus m. minor* au Congo-Brazzaville. Des formes de multiplication tissulaire nombreuses et variées ont été trouvées, mais les infections étant généralement mixtes, il n'est pas possible de rattacher avec certitude les différents schizontes observés à un sous-genre déterminé. Cependant, les auteurs proposent une interprétation s'inspirant des affinités phylétiques des parasites. Ainsi sont classés: a) dans le sous-genre *Polychromophilus* (gamétocytes de type *malariae*), les schizontes tissulaires de grande taille, siégeant dans une cellule hôte très hypertrophiée entourée par une capsule et dont les noyaux sont, chez les stades âgés, complexes et granuleux; b) au sous-genre *Bioccala* (gamétocytes de type *oiseau*), les schizontes de petite taille (type Mer et Goldblum). De même, la sporogonie observée chez les Nyctéribies par divers auteurs serait celle du sous-genre *Bioccala*.

The genus *Polychromophilus* contains two different groups of species, which we classify in two subgenera: a) subgenus *Polychromophilus* with, as type species, *P. (P.) melanipherus* Dionisi 1898 as redefined by Garnham (1973); the morphology of the gametocytes are of the type *malariae*; b) subgenus *Bloccala* with, as type species, *P. (B.) murinus* Dionisi 1898; the morphology of gametocytes resembles that of Haemoproteidae of birds.

Polychromophilus from Minoptera from Europe, Africa and Australia are studied and described i.e. two new species from Africa: *P. (P.) corradettii* a parasite of *Miniopterus inflatus* in Gabon and *P. (P.) adami* a parasite of *M. m. minor* in Congo-Brazzaville. Division stages in the tissues are abundant and varied but the infections are frequently mixed and it is not possible to relate the different types of schizonts to one or the other subgenus. Nevertheless the authors propose an interpretation based on the phyletic affinities of the parasites. Therefore schizonts found are classified as follows: a) in subgenus *Polychromophilus* (gametocytes of type *malariae*) the large tissue schizonts develop in a much hypertrophied host cell surrounded by a capsule and with complex, granular nuclei in the older stages; b) in subgenus *Bloccala* (gametocytes of the *avian* type) the schizonts are small (Mer and Goldblum's type). The stages of sporogony described by several authors in Nycteribid flies are assigned to parasites of the subgenus *Bioccala*.

Lane, H. C., N. Schönenberger and H. J. Huggel (1971). Quelques données sur l'innervation de l'artère et de la veine digitales alaires des Megachiroptères (*Rousettus aegyptiacus* et *Pteropus giganteus*).

The wall of vein and artery in the bat wing, on each side of the metacarpals receive both adrenergic and cholinergic fibres, as shown by specific histochemical methods. Adrenergic innervation takes the

form of an adventitial plexus which gives rise to terminal varicosities ending at the medio-adventitial border.

Cholinergic fibres do not form a plexus, but give rise to varicosities ending also at the external border of the media.

At this level myelinated and non-myelinated nerve fibres are seen in association with the muscle cells of the media.

ZUSAMMENFASSUNG

Mit Hilfe spezifischer histochemischer Methoden wird gezeigt, dass in den Wänden der Blutgefässe (Venen und Arterien), die sich zu beiden Seiten des Metacarpus der Fledermäuse befindet, sowohl adrenergische als auch cholinergische Nervenfasern auftreten.

Die adrenergischen Fasern bilden in der Adventitia einen Plexus mit variköser Versätelung. Die Nervenendigungen befinden sich an der Grenze zwischen Adventitia und Media. In der gleichen Region treten auch variköse cholinergische Endigungen auf, die im Gegensatz zu den adrenergischen Fasern keinen Plexus bilden.

An der Adventitia-Media-Grenze treten myelinisierte und nicht myelinisierte Nervenfasern zusammen mit Fasern der glatten Muskulatur der Media auf.

Lanza, B. (1961). Alcune particolarita delle pliche palatine e dell'accrescimento postembrionale del cranio in *Epomophorus* (Mammalia: Megachiroptera).

L'A. describe alcune particolarità delle pliche palatine e dell'accresimento postembrionale del cranio di *Epomophorus walbergi* Sund. e di *E. labiatus* Temm.

L'A. décrit quelque particularités des plis palatins et de l'accroissement postembryonnaire du crân de *Epomophorus wahlbergi* Sund. et de *E. labiatus* Temm.

In the *Microchiroptera*, at least in the European ones, the skull attains its definitive size within almost two months from the birth; in *Megachiroptera* the skull may increase for a long time after birth, as proved by specimens of *Epomophorus wahlbergi* Sund., which, though immature and with cranial sutures not yet obliterated, have a skull length equal with that of fully adult animals. Therefore, the study of the postembryonal development of the skull is, in such animals, especially interesting from a systematic point of view. In *E. wahlbergi* and in *E. labiatus* Temm. The postembryonal growth of some parts of the skull obtains in allometric manner: the skull length increases with the age, while the brain-case height is already definitive in the very young specimens (fig. 2); rostrum (fig. 1) and postdental palate (fig. 3) increase in positive allometric manner in comparison with the total skull and palate length respectively. The positive allomeric lengthening of the rostrum, already observed by ZUCKERMAN in the baboon, *Papio porcarius*, probably occurs in all the long-faced species of *Megachiroptera* (and, in general, of Mammals). The rostrum of the *Megachiroptera*, moderately variable in shapes, varies considerably both in relative and absolute length. The extreme ratios between rostrum and total skull length obtain in the male *Hypsignathus monstrosus* (48 %) and in the genus *Nyctimene* (less than 19 %); the correspondent values in *E. wahlbergi* are 39.3 % (??) and 36.4 % (??); in *E. labiatus* 34.2 % (??) and 33.9 % (??). It is not worthy that in the adults of *E. labiatus* the values of the relative rostrum length nearly overlap thos of the youngs of *E. wahlbergi* having the same skull length (fig. 1); that means that in *E. labiatus* the dimensional development of the rostrum stops at a stage that for *E. wahlbergi* is a transitory, juvenile one. Moreover, in the males of *E. labiatus* the rostrum is scarcely more developed than in the females, while for such character there is a marked sexual dimorphism in *E. wahlbergi*, in which, contrary to *E. labiatus*, the size of the males is definitely larger than that of females. On the contrary, the relative values of the postdental palate length are the same both in the two sexes of *E. labiatus* and in the males of *E. wahlbergi* (figs. 3, 4à; but the females of the latter species have a relatively shorter postdental palate, showing also for this character a sexual

dimorphism. A relatively short face is a juvenile character in *Epomophorus* and a definitive one in other genera of *Megachiroptera*; the same obtains for the basicranial angle, which in young specimens is less obtuse than in subadult and adult ones (in which the axis of the rostrum is almost parallel with the basicranial one); this obtains probably in all *Megachiroptera* and was described also in *Rousettus aegyptiacus* by EISENTRAUT. According ANDERSEN the deflection of the face is greatest, as a general rule, in genera or species with weak dentition. The greatest deflection is to be found in the *Macroglossinae* (especially in *Notopteris, Nesonycteris* and, above all, in *Melonycteris*), the smallest in nearly all genera of the *Pteropodidae* of the *Epomophorus* and *Cynopterus* sections. One may consequencty suppose that in the very young specimens of the heavy-toothed species (as those of *Epomophorus* and *Rousettus* are) the process which brings about the reduction or the disappearance of the deflection begins with the chewing function.

The palate ridges begin their development as dermal formations of the bony palate and till a certain stage of the embryonal life they remain hidden by the epithelium (figs. 5, 6); later on (perhaps before the birth) they become salient; in grown individuals the epithelium appears moderately confined and, in *E. labiatus*, produces denticulations.

As the number of the postdental palatine-ridges is of taxonomic significance, is important to emphasise that they, palallel with the backwards growth of the postdental palate, are less in very young animals than in more grown up individuals (fig. 4).

Der Verfasser beschreibt einige Besonderheiten der Gaumenfalten und der postembryonalen Vermehrung des Schädels von *Epomophorus wahlbergi* Sund. Und *E. labiatus* Temm.

Lanza, B. (1970). The baculum of *Pteropus* and its significance for the phylogenesis of the genus (Mammalia, Megachiroptera).

The Author describes the baculum of many species of *Pteropus* and discusses its phylogenetic and speciographic significance within the genus.

L'Autore descrive il baculum di molte specie di *Pteropus* e giunge alla conclusione che esso, benche provvisto talora di un notevole valore speciografico, non sembra suscettibile di essere usato per la risoluzione di problemi di ordine filogenetico nell'ambito del genere in questione.

Lanza, B. and M. L. Azzaroli (1971). I mammiferi delle Alpi Apuane.

I Mammiferi delle Alpi Apuane non sono perfettamente conosciuti; fino ad ora sono state trovate in questa regione solamente 38 - 39 specie, ma è probabile che in futuro ne verranno trovate altre, poichè nelle zone circostanti sono presenti circa 60 specie. Dal punto di vista biogeografico, le specie più interessanti sono *Microtus nivalis* e *Microtus arvalis*; il primo è un relitto glaciale già noto nell'Appennino Settentrionale e Centrale. il secondo è sconosciuto in Italia a sud delle Alpi Apuane.

The Mammals of the Apuanian Alps are not perfectly known; up till now only 38 - 39 species have been found in this district, but it seems likely that others will be discovered in the future, as about 60 species are present in the surrounding countries. From the biogeographical point or view, the most interesting species are *Microtus nivalis* and *Microtus arvalis*; the first is a glacial relict already known in the Northern and Central Apennines, the second is unknown South of the Apuanian Alps in Italy.

Lanza, B. and C. Calloni (1970). The buccal pad of *Scotophilus nigrita* (Schreber) and of *Nycticeius hirundo* (De Winton) (Mammalia, Chiroptera, Vespertilionidae).

Gli Autori sintetizzano i dati finora esistenti sui cuscinetto buccale dei Chirotteri e descrivono quello di due specie africane, nelle quali la presenza di questa formazione anatomica non era stata ancora osservata: *Scotophilus nigrita* (Schreber) e *Nycticeius hirundo* (De Winton).

Lanza, B. and D. L. Harrison (1963). A new description of the type specimen of *Nyctinomus aloysii-sabaudiae* Festa 1907.

Redescription of the type and only known specimen of *Nyctinomus Aloysii-Sabaudiae* Festa 1907 (Toro, Uganda). This bat is a distinct species, one of the little known larger African members of the Sub-Genus *Chaerephon*. It should be named *Tadarida (Chaerephon) aloysiisabaudiae* (Festa, 1907).

Neubeschreibung des typischen und einzigen bekannten Stückes von *Nyctinomus Aloysii-Sabaudiae* Festa 1907 (Toro, Uganda). Diese Fledermaus ist eine gute Art, zugehörig zur Gruppe der wenig bekannten größeren afrikanischen Arten der Untergattung *Chaerephon*. Sie sollte heißen: *Tadarida (Chaerephon) aloysiisabaudiae* (Festa 1907).

Nouvelle description de l'exemplaire typique (le seul qui est connu de l'espèce) du *Nyctinomus Aloysii-Sabaudiae* Festa 1907 (Toro, Uganda). Ce chauve-souris est une bonne espèce, laquelle appartient au group, peu conu, qui comprende les espèces africaines les plus grosses du sousgenre *Chaerephon*. Il doit être nommé *Tadarida (Chaerephon) aloysiisabaudiae* (Festa 1907).

Largen, M. J., D. Kock and D. W. Yalden (1974). Catalogue of the mammals of Ethiopia. 1. Chiroptera.

The present work summarises the known distribution of Chiroptera in Ethiopia. Seventy-two species are listed, of which 12 represent new records for the country: *Rousettus angolensis* (Bocage, 1898), *Taphozous mauritianus* E. Geoffroy, 1818, *Nycteris hispida hispida* (Schreber, 1775), *Hipposideros fuliginosus* (Temminck, 1853), *Eptesicus guineensis* (Bocage, 1889), *Mimetillus moloneyi* (Thomas, 1891), *Nycticeius hindei* (Thomas, 1901), *Nycticeius hirundo* (De Winton, 1899), *Scotophilus leucogaster* (Cretzschmar, 1830), *Otomops martiensseni martiensseni* (Matschie, 1897), *Tadarida condylura* (A. Smith, 1833), *Tadarida nanula* (J. A. Alien, 1917).

As far as possible, all collecting localities in Ethiopia have been gazetted and this record is supplemented with distribution maps for every species.

Sixty-two of the species recorded from Ethiopia are essentially African in distribution, six of the remainder are Palaearctic forms and four are associated with the arid Saharo-Sindian belt.

Only five species appear to be represented by more than one race and only four are potentially endemic to Ethiopia: *Asellia patrizii* De Beaux, 1931, *Myotis scotti* Thomas, 1927, *Myotis morrisi* Hill, 1971, *Kerivoula eriophora* (Heuglin, 1877). These figures low compared with those for other groups of small mammals and are, presumably, correlated with the comparative mobility of these flying animals.

La chirotterofauna dell'Etiopia annovera attualmente 72 specie, 12 delle quali sono qui ricordate per la prima volta come presenti nella regione considerata: *Rousettus angolensis* (Bocage, 1898), *Taphozous mauritianus* E. Geoffroy, 1818, *Nycteris hispida hispida* (Schreber, 1775), *Hipposideros fuliginosus* (Temminck, 1853), *Eptesicus guineensis* (Bocage, 1889), *Mimetillus moloneyi* (Thomas, 1891), *Nycticeius hindei* (Thomas, 1901), *Nycticeius hirundo* (De Winton, 1899), *Scotophylus leucogaster* Cretzschmar, 1830), *Otomops martiensseni martiensseni* (Matschie, 1897), *Tadarida condylura* (A. Smith, 1833), *Tadarida nanula* (J. A. Alien, 1917).

Gli Autori forniscono un elenco il piu possibile completo delle localita, con loro posizione geografica, in cui sono stati sinora raccolti pipistrelli e forniscono una carta di distribuzione di tutte le specie note dell'Etiopia.

Di tali specie, 62 hanno una distribuzione essenzialmente africana e sono paleartiche; di quest'ultime 4 sono proprie della fascia saharosindica.

Solo 5 specie sono rappresentate nel territorio da piu di una razza e solo 4 sono potenzialmente endemiche dell'Etiopia: *Asellia patrizii* De Beaux, 1931, *Myotis scotti* Thomas, 1927, *Myotis morrisi* Hill, 1971, *Kerivoula eriophora* (Heuglin, 1877). Il tasso d'endemismo e basso rispetto quello riscontrabile in altri ordini della stessa classe e presumibilmente e da mettere in relazione con la vagilita di questo ordine di mammiferi.

Lataste, F. (1880). Addition à la note précédente.

Mr. le docteur G. E. Dobson n'ayant eu sous les yeux. qu'une partie de ma récolte de Chiroptères algériens, je prends la liberté d'ajouter quelques renseignements à la très intéressante note qui précède.

Lataste, F. (1887a). Exploration scientifique de la Tunisie. Catalogue critique des mammifères apélagiques sauvages de la Tunisie.

Le présent Catalogue n'est pas un simple extrait, remanié, de mon *Catalogue des Mammifères de Barbarie*. Depuis la publication de ce travail, j'ai reçu de nouveaux matériaux, j'ai fait et j'ai appris de nouvelles observations qui ont modifié et accru ma connaissance de la faune barbaresque. J'ai corrigé des erreurs, tranché des questions encore pendantes et posé de nouveaux problèmes à résoudre. Ainsi, dans l'ordre des Insectivores, j'ai, me rangeant à l'opinion de M. le Dr G.-E. Dobson, réuni spécifiquement au *Crocidura Araneus* Schreber le *C. suaveolens* Pallas, que j'en avais d'abord distingué, et séparé de ce dernier le *C. Etrusca* Savi, que je lui avais réuni; et j'ai pu comparer à l'*Erinaceus Libycus* Hemprich et Ehrenberg, d'Egypte, les deux Hérissons de Barbarie que je n'avais précédemment comparés qu'entre eux et à l'espèce d'Europe. Dans l'ordre des Carnivores, je me suis préoccupé du problème de la distinction des différentes espèces de Chacal, dont deux, d'après Gray, se trouveraient en Barbarie, et j'ai résolu celui de la valeur du Renard d'Algérie par rapport au Renard d'Europe; d'après des statistiques officielles, j'ai serré d'un peu plus près la distribution géographique du Lion et de la Panthère en Barbarie et dans les trois provinces de l'Algérie, et j'ai montré avec précision le progrès de leur décroissance numérique dans cette région, progrès tel que la destruction du Lion sera vraisemblablement accomplie dans quelques années et celle de la Panthère dans une ou deux générations; enfin j'ai réuni spécifiquement à la Loutre commune d'Europe celle d'Algérie, que j'en avais d'abord distinguée. Dans l'ordre des Rongeurs, j'ai étudié de plus près les rapports du *Gerbillus hirtipes* de Barbarie, d'une part, avec des sujets égyptiens de la même espèce, et, d'autre part, avec les deux espèces voisines *G. Gerbillus* Olivier et *G. pyramidum* Geoffroy.

Je dois les matériaux de cette dernière étude à M. Walter Innes, conservateur du Musée de l'école de médecine du Caire, dont les envois me fournissent de précieux objets de comparaison, tant pour la continuation de mes recherches sur la faune des Mammifères de Barbarie que pour la préparation de mes Catalogues des Reptiles de Barbarie et de Tunisie, qui paraîtront bientôt; je le prie d'agréer ici le témoignage de ma reconnaissance. Je tiens aussi à adresser mes remerciements à M. H. Vaucher, de Tanger, qui a entendu mes paroles de regret de n'avoir aucun correspondant au Maroc, un pays dont la faune, encore si peu connue, nous cache bien des surprises et où il serait bon de constater directement la présence des espèces même qu'on y pourrait indiquer *a priori*. Le seul et petit envoi que M. H. Vaucher ait encore eu le temps de m'adresser contenait quelques Reptiles et seulement cinq Mammifères; or quatre de ceux-ci, *Canis Niloticus, Eliomys quercinus , Erinaceus Algirus* et *Crocidura Araneus*, vont être, grâce à cet envoi, pour la première fois cités dans la faune du Maroc.

Dans le présent Catalogue j'ai jugé inutile de reproduire les *Tableaux dichotomiques* qui composent la première partie de celui des *Mammifères de Barbarie*. Je renvoie à ce dernier ouvrage le lecteur désireux de se servir de ces tableaux, soit pour faciliter ses déterminations, soit pour contrôler les miennes.

Les Mammifères de la Tunisie n'avaient été, jusqu'à ce jour,l'objet d'aucune publication spéciale; quelques espèces seulement avaient été indiquées, çà et là, dans divers ouvrages, voyages, traités généraux, publications relatives à la faune barbaresque ou à la faune algérienne, etc., ouvrages qui seront cités quand il y aura lieu.

Cette faune était donc tout à fait neuve quand, sur la proposition de M. le professeur A. Milne Edwards, membre de la Commission des missions au Ministère de l'Instruction publique, et avec l'aurément de M. le Dr E. Cosson, président de la Mission de l'exploration scientifique de la Tunisie, je fus officiellement nommé membre de cette Mission pour la zoologie. L'étude préalable de la faune des Mammifères algériens et deux voyages en Algérie, dont l'un poussé dans le Sahara jusqu'au Mzab et à Ouargla, m'avaient d'ailleurs convenablement préparé à cette tâche. Malheureusement, malgré le précieux concours prêté à la Mission par les autorités militaires, l'exploration qui devait servir de base à l'étude de l'histoire naturelle de la Tunisie ne put être faite dans d'aussi bonnes conditions qu'il eût été désirable. Les fonds insuffisants mis par le Ministère à la disposition du président de la Mission ne lui permirent de m'allouer que 3000 francs. Avec cette somme, je ne pus faire qu'un seul voyage, qui dura trois mois et pendant lequel je ne visitai qu'une faible partie du pays; encore, par raison d'économie, et sur les conseils du président de la Mission, avais-je dû me joindre à mon collègue, M. A. Letourneux, ce qui me procura l'avantage de voyager en compagnie d'un homme aimable et savant, mais aussi l'inconvénient de renoncer à toute initiative personnelle. Je ne pus m'arrêter où j'aurais dû et je fis parfois des séjours inutiles; en outre le concours des autorités locales, absolument indispensable quand il s'agit de recueillir en peu de temps un grand nombre de Vertébrés, fut en grande partie absorbé par mon collègue, qui s'occupait à la fois de botanique, de malacologie, d'entomologie, de linguistique, etc. Aussi mes récoltes furent-elles pauvres.

Ainsi que j'en avais pris l'engagement avant mon départ, un sujet au moins de chacune des espèces que j'ai rapportées de ce voyage a été remis par moi à M. le professeur A. Milne Edwards, pour le Muséum d'histoire naturelle de Paris; les espèces dont j'ai pu me procurer plus d'un échantillon sont représentées aussi dans ma collection.

Laurent, P. (1937c). Essai d'une clef dichotomique des chéiroptères de la Barbarie.

The dichotomic catalogue proposed by the author enables one to determine the presently known forms of Barbay bats. There are 11 genera, 18 species, and 19 subspecies. Dr. Laurent gives the description of three new species:
Rhinolophus hipposideros vespa - Asellia tridens pallida - Plecotus auritus saharae,
recently published elsewhere and mentions also three new subspecies which have not yet been described.

Diet dichotomische Tafel, die der Verfasser vorschlägt, erlaubt die Formen der Fledermäuse zu bestimmen, die gegenwärtig in der Berberie bekannt sind: 11 Gruppen, 18 Arten, und 19 Unter-Arten. Dr. Laurent gibt die hauptsächlichsten Merkmal dreier neuer Formen:
Rhinolophus hipposideros vespa - Asellia tridens pallida - Plecotus auritus saharae,
die übrigens kürzlich veröffentlich worden sind, und nennt auch 3 andere neue Formen, die noch nicht beschrieben worden sind.

LaVal, R. K. (1973). A revision of the neotropical bats of the genus *Myotis*.

More than 650 specimens of bats of the Neotropical genera *Rhogeessa* and *Baeodon* were examined to determine the number of genera and species that should be recognized, as well as to evaluate geographic variation within each species. In addition to the usual morphological characters, large

numbers of bacula were measured and compared, and hairs were examined by scanning electron microscopy. The preliminary results of a study of karyotypic variation in *Rhogeessa* by R. J. Baker and associates were taken into account. Both multivariate and univariate statistical methods were utilized.

One species, *Rhogeessa alleni*, is assigned to the subgenus *Baeodon*, and is a large-skulled form restricted to western Mexico. The remaining five species are assigned to the subgenus *Rhogeessa*. *Rhogeessa parvula*, restricted to western Mexico, is characterized by a hairy uropatagium. *Rhogeessa gracilis*, also restricted to western Mexico, possesses much larger ears than do the other species. A new species, *R. mira*, is presently known only from two localities in Michoacan, and is substantially smaller than the other three species inhabiting western Mexico. *Rhogeessa tumida*, an extremely variable (and perhaps composite) species, ranges from Tamaulipas to Brazil and Bolivia. *Rhogeessa minutilla* a pale desert species, is restricted to Margarita Island, northwestern Venezuela, and the adjoining Guajira Peninsula of Colombia.

Con el fin de determinar el numero de generos y especies que deben ser reconocidos y tambien analizar la variacion dentro de cada especie, se examinaron mas de 650 especimenes de murcielagos neotropicales do los generos *Rhogeessa* y *Baeodon*. Ademas de los caracteres morfologicos usualmente empleados, se midieron y compararon los baculos, y se examinaron los pelos por medio de un microscopio electronico de "scanning." Fueron tomados ademas en consideracion, el estudio hecho por R. J. Baker y companeros, sobre la variacion en los kariotipos de *Rhogeessa*; y finalmente para el analisis estadistico se uso los metodos de univarianza y multivarianza.

Una de las especies, *Rhogeessa alleni*, una forma de craneo grande, restringida a el Occidente de Mexico, es asignada al subgenero *Baeodon*. Las otras cinco especies son asignadas a el subgenero *Rhogeessa*. *Rhogeessa parvida*, restringida a Mexico occidental, esta caracterizada por tener un uropatagio cubierto de pelo. *Rhogeessa gracilis*, tambien restringida a Mexico occidental, tiene orejas que son mas grandes que las de las otras especies. Una especie nueva, *R. mira*, conocida solamente de dos localidades de Michoacan, es la mas pequena de las quatro especies en Mexico occidental. *Rhogeessa tumida*, una especie extremadamente variable y posiblemente un "composite species" (compuesta de mas de una especie), se extiende desde Tamaulipas hasta Brasil y Bolivia. *Rhogeessa minutilla*, una especie de color palido, encon trada en areas deserticas, es restringida a la Isla Margarita, el Noroeste de Venezuela, y la peninsula de la Guajira de Colombia y Venezuela.

LaVal, R. K. and M. L. LaVal (1977). Reproduction and behavior of the African banana bat, *Pipistrellus nanus*.

Roosting behavior and the reproductive chronology of the banana hat *Pipistrellus nanus*, were studied in Natal, South Africa. These bats roost singly or in small groups in rolled leaves of bananas (*Musa* sp.) and *Strelitzia*. Sex ratios were 1:1 for adults but 2:1 (female:male) in juveniles. Group structure was facultative and ephemeral, and movements were for short distances. *P. nanus* is monestrous and seasonal, with births of single or twin infants in November and December. Males reached peak testis size in May, and had abdominal testes most of the remainder of the vear.

LaVal, R. K. and M. L. LaVal (1980). Prey selection by the Slit-faced bat *Nycteris thebaica* (Chiroptera: Nycteridae) in Natal, South Africa.

During much of the year, foraging slit-faced bats (*Nycteris thebaica*) in Natal, South Africa, preyed mainly on Orthoptera, especially katydids, crickets, and cockroaches. At times, substantial quantities of Lepidoptera, Isoptera, Homoptera and Coleoptera were also taken. Slit-faced bats seem to prefer those insects characterized by large body size, abundance and ease of location and capture. Many of these are captured, while stationary, or at least when at rest rather than it flight.

Lawrence, B. (1964). Notes on the horseshoe bats *Hipposideros caffer*, *ruber* and *beatus*.

Attempts to identify a small series of *Hipposideros*, collected in the Belgian Congo by Alvin Novick in 1956, have made necessary a re-examination of the distribution and specific characters of *caffer, ruber* and *beatus*. This has brought to light some new characters of the nasal swellings and of the nose leaves, and emphasizes the importance of the nasal region in general for showing specific differences.

Lawrence, B. and A. Novick (1963). Behavior as a taxonomic clue: relationships of *Lissonycteris* (Chiroptera).

Re-examination of the generic status and relationships of *Rousettus, sensu stricto*, and *Lissonycteris*, a supposed subgenus of *Rousettus*, has been prompted by the great differences observed between live specimens of the two genera. In 1955 and 1956, Novick was able to make extensive observations of living bats not only of these two genera but of six other pteropodids as well Novick, 1958). Of these, according to Andersen (1912), *Eidolon helvum* and *Pteropus g. giganteus* as well as *Rousettus* belong in the *Rousettus* section of the Pteropinae. *Cynopterus brachyotis luzoniensis, Cynopterus sphinx ceylonensis*, and *Ptenochirus jagorii* belong in the *Cynopterus* section of the Pteropinae, while *Eonycteris spelaea glandifera, Eonycteris robusta*, and *Macroglossus l. lagochilus* are in the subfamily Macroglossinae.

Lay, D. M. (1967). A study of the mammals of Iran resulting from the Street Expeditions of 1962-1963.

A narrative account cursorily describes the physiography and general ecology observed along the routes taken in Iran by the W. S. and J. K. Street Expedition. Separate from the narrative and arranged alphabetically by the name of the collecting locality, ecological description of each of the places where the expedition paused to study and collect tells what mammals were found in what sort of biotic communities. A gazetteer is provided with the coordinates of, or appropriate remarks on, every Iranian locality cited in the text.

The distribution data for Iran published before 1963, for each of the 99 species represented by the 1719 mammal specimens obtained by the expedition, and the 26 other species known from Iran is summarized for the first time since 1876.

The following advances in taxonomic knowledge of mammal species of southwest Asia beyond that presented by Ellerman and Morrison-Scott (1951) and Misonne (1959) result from this study of collections of the Street Expedition in relation to previously existing materials:

Crocidura leucodon lasia Thomas, 1906, is in fact *C. leucodon* Hermann, 1780, and not *C. lasiura* Dobson, 1890.

Crocidura russula caspica Thomas, 1907, is in fact *C. russula* Hermann, 1780, and not *C. lasiura* Dodson, 1890.

Rhinopoma hardwickei pusillum Thomas, 1920, is shown to be synonomous with *R. h. seianum* Thomas, 1913.

Pipistrellus Aladdin Thomas, 1905, is a synonym of *P. kuhli kuhli* Kuhl, 1819.

Miniopterus schreibersi pallidus Thomas, 1907, and *M. s. pulcher* Harrison, 1956, are shown to be junior synonyms of *M. s. schreibersi* Kuhl, 1819.

Microtus guentheri Danford and Alston, 1880, and *Microtus irani* Thomas, 1921, are synonymous with *Microtus socialis* Pallas, 1773.

Ellobius lutescens is a subspecies of *E. fuscocapillus*.

The subspecies *buxtoni* Thomas, 1919, and *insularis* Goodwin, 1939, are shown to be synonymous with *Nesokia indica indica* Gray and Hardwicke, 1832.

Glis glis persicus Erxleben, 1777, is shown to be the oldest available name for the south Caspian fat dormouse, and *G. g. caspicus* Satunin, 1905, is a junior synonym.

Collecting efforts of the expedition are shown to have resulted in discoveries in Iran of nine species not previously known to occur there:

Erinaceous europaeus
Neomys anomalus
Talpa streetorum
Rhinolophus Euryale
Rhinolopus blasii
Eptesicus nilssoni
Vespertilio murinus
Barbastella leucomelas
Microtus nivalis

One species entirely new to science, a mole of the family Talpidae, has been described from Hezar Darreh, Kurdistan, Iran and named *Talpa streetorum*.

Laycock, P.(A.) (1973). Distribution and abundance of bats in the Natal Midlands (Mammalia: Chiroptera).

The distribution and abundance of microchiropteran species in Town Bush cave, Pietermaritzburg, were studied throughout 1972. It was found that this cave serves as a wintering cave for *Rhinolophus simulator*, a permanent residence for a small group of *R. clivosus augur*, a maternity cave for *Myotis (Selysius) tricolor*, and as a prematernity and pre-wintering cave for *Miniopterus schreibersi natalensis*. No young *Miniopterus* or *Rhinolophus* were seen during the study period, although pregnant females were observed in October and November.

Other caves in the Pietermarirzburg area were visited as they became known but were too tar from Pierermaritzburg to allow regular visiting, thus no definite conclusions could be reached on the part they play in the migratory cycle of the bats seen occupying them.

Leconte, J. (1855). Observations on the North American species of Bats.

Notwithstanding all that has been written by Rafinesque, F. Cuvier and Dr. Bachman on the bats of North America, a diligent study has shown me considerable errors in the accounts of all. Before proceeding to a description of these animals, it is necessary to remark, that every bat which I have seen, has an uncertain number of transverse wrinkles or plaits on the outer portion of the ear, and has the toes furnished with rather long and fine hairs, as it were fimbriated, wherefore these two marks are omitted as furnishing no good specific characters. All our bats except the *Molossus* belong to the same genus; the trifling difference in the number of the teeth does not afford a sufficient reason for considering them as different. M. F. Cuvier in the first volume of the Nouv. Annales du Museum, divides the genus into three sections, the Serotinoids, the Noctuloids and the Murinoids. The form of the cranium seems to be the chief mark in distinguishing them from each other. The Serotinoids may be described as having the cranium somewhat inflated and rounded, the jaws short, widened and elevated at the extremity, the facial angle 43°. The European species as far as I can collect, have four upper incisors. In this country we have but two belonging to this section, the *Noveboracensis* and the *cinereus*, both of which have but two upper fore teeth. The Noctuloids have the skull rather straight and flat on the top, and the jaws more extended, the facial angle is 30°. They all have four upper incisors except the crepuscularis which has like those of the first division but two. The Murinoids are known by having the cranium inflated and rounded, the jaws elongated a little raised in front with a

considerable depression separating them from the cranium, the facial angle is 22*. The *V. pallidus* which has but two upper fore teeth appears to me to be a Murinoid ; all the rest have four upper fore teeth. As for what has been called a *Plecotus* (even by myself) it certainly belongs to this division: it differs considerably from the *Plecotus auritus* of Europe, in the form and position of the ears. I am not writing about the animals of a foreign country, and therefore I say no more on this head, than that the *P. auritus* as far as regards the skull appears to be a Serotinoid. My remarks on the Molossus will appear when I come to describe that species.

Legendre, S. (1982). Hipposideridae (Mammalia: Chiroptera) from the Mediterranean Middle and Late Neogene, and evolution of the genera *Hipposideros* and *Asellia*.

New fossils from the Burdigalian locality of Port-la-Nouvelle (southern France) add to our knowledge of the Hipposideridae. Four species of this family are represented, including a new species of the subgenus *Brachipposideros* Sigé (*Hipposideros aguilari* n.sp.). *H. vetus* (Lavocat) from Beni Mellal (Miocene of Morocco) and *H*. cf. *vetus* from Sète (late Pliocene of France), formerly attributed to *Asellia*, are placed in the subgenus *Syndesmotis* Peters, which includes the Recent East African species *H. (S.) megalotis*. The following genera and subgenera are recognized in this study: genus *Hipposideros* including the subgenera *Hipposideros, Brachipposideros, Syndesmotis* and *Pseudorhinolophus*, and the genus *Asellia*. Anatomy of teeth and jaws suggests new phyletic interpretations: *Pseudorhinolophus* could be ancestral to *Asellia*, and *Brachipposideros* to *Syndesmotis*; *Pseudorhinolophus* and *Brachipposideros* may both be represented in the Recent fauna by large and small *Hipposideros*, respectively; on the other hand, *Brachipposideros* is unlikely to have originated from *Pseudorhinolophus*, and neither of these genera can be derived from the Paleogene European genus *Palaeophyllophora* Revilliod.

Legendre, S. (1984). Étude odontologique des représentants actuels du groupe *Tadarida* (Chiroptera, Molossidae). Implications phylogéniques, systématiques et zoogéographiques.

The study of the dental morphology of the recent bats of the *Tadarida* group leads to distinguish four genera: *Rhizomops* nov. gen., *Nyctinomops*, *Tadarida* (including the sub-genera *Chaerephon* and *Mops*), and *Mormopterus* (including the sub-genera *Platymops, Sauromys*, and *Micronomus*, revalidated in this work). These genera are gathered together with *Otomops* within the Tadaridinae nov. subfam. as opposed to the Molossinae nov. subfam. and the Cheiromelinae nov. subfam. The systematic clarification, provided by an odontological approach of paleontological tradition, leads to consider the phylogenetical relationships between these taxonomical types. It also allows to reconstitute the zoogeographical history of the Molossidae, which are scattered in the warm areas of both OId and New World.

L'étude de la morphologie dentaire des représentants actuels des chauves-souris du groupe *Tadarida* amène à le découper en quatre genres: *Rhizomops* nov. gen., *Nyctinomops*, *Tadarida* (incluant les sous-genres *Chaerephon* et *Mops*) et *Mormopterus* (incluant les sous-genres *Platymops, Sauromys* et *Micronomus* revalidé dans ce travail). Ces genres sont regroupés avec *Otomops* dans les Tadaridinae nov. subfam., par opposition aux Molossinae nov. subfam. et aux Cheiromelinae nov. subfam. La clarification systématique, apportée par une approche odontologique de tradition paléontologique, permet d'envisager les relations phylogéniques de ces types taxonomiques. Elle autorise également une reconstitution de l'histoire biogéographique de la famille des Molossidae, qui sont dispersés dans les régions chaudes de l'Ancien et du Nouveau Monde.

Leirs, H., J. N. Mills, J. W. Krebs, J. E. Childs, D. Akaibe, N. Woollen, G. Ludwig, C. J. Peters, T. G. Ksiazek and other study group members (1999). Search for the Ebola virus reservoir in Kikwit, Democratic Republic of the Congo: Reflections on a Vertebrate collection.

A 3-month ecologic investigation was done to identify the reservoir of Ebola virus following the 1995 outbreak in Kikwit, Democratic Republic of the Congo. Efforts focused on the fields where the putative primary case had worked but included other habitats near Kikwit. Samples were collected from 3066 vertebrates and tested for the presence of antibodies to Ebola (subtype Zaire) virus: All tests were negative, and attempts to isolate Ebola virus were unsuccessful. The investigation was hampered by a lack of information beyond the daily activities of the primary case, a lack of information on Ebola virus ecology, which precluded the detailed study of select groups of animals, and sample-size limitations for rare species. The epidemiology of Ebola hemorrhagic fever suggests that humans have only intermittent contact with the virus, which complicates selection of target species. Further study of the epidemiology of human outbreaks to further define the environmental contact of primary cases would be of great value.

Loche, V. (1858). Catalogue des mammifères et des oiseaux observés en Algérie par le capitaine Loche.

Le goût des sciences naturelles est aujourd'hui universellement répandu; chaque localité pourvue de galeries zoologiques voit la foule s'y presser, et, non moins que les naturalistes et les savants, les simples curieux en sont les visiteurs assidus.

C'est que cette infinie diversité des êtres, auxquels la Providence a assigné un rôle dans les harmonies générales de l'univers, parle à l'âme de tous les hommes, l'élève vers le Créateur, et fait naître cette envie d'apprendre qui caractérise- nôtre époque et conduira peut-être à soulever le voile qui noiis-'cache encore tant d'impôrtantes vérités.

Malheureusement beaucoup de personnes sont arrêtées, dès les premiers pas qu'elles essayent de faire dans cette intéressante étude, par le défaut de moyens d'instruction et de termes de comparaison.

Le prix élevé des livres ayant des planches coloriées les rend peu accessibles, et les galeries zoologiques manquent à la plupart des localités.

Sans ces ressources, la détermination des sujets par les seuls procédés zoologiques exige un long apprentissage et n'est pas exempte de difficultés, même pour ceux qui ont à leur disposition de nombreux ouvrages spéciaux.

Nous avons fait, depuis noire enfance, de l'histoire naturelle notre science de prédilection, et, comme nous avons souvent été entravé par ces obstacles, nous comprenons toute la vocation et la persévérance dont il faut être doué pour ne pas s'en laisser rebuter.

Ces inconvénients sont plus frappants et plus vivement sentis en Algérie qu'ailleurs, par la difficulté d'y traîner avec soi les livres et les éléments de confrontation indispensables à quiconque veut étu dier la faune ou la flore de ce pays dépourvu détablissements scientifiques.

Et pourtant l'histoire naturelle a une importance énorme; elle conduit, par l'observation intelligente., à la connaissance de l'homme, des animaux, du monde entier, mieux qu'une dissertation théologique; elle démontre la puissance du Dieu qui a tout créé, et c'est par elle qu'on est le plus certain d'arriver à. la découverte des vérités qui sont du ressort de l'esprit humain. Ne doit-on donc pas avoir à coeur de l'encourager, de la diriger en lui offrant aide et hommage?

Parler aux yeux est toujours le moyen le plus .certain d'arriver à l'esprit; en rendant l'étude facile et attrayante on attire à elle, et c'est en lui donnant une bonne direction qu'on préserve la jeunesse de fâcheux écarts.

Cette multitude d'êtres différents que la nature a libéralement répartis sur la surface de notre globe, et dont les analogies, les aptitudes et jusqu'aux dissemblances frappent si vivement l'esprit qu'elles le

poussent vers l'investigation des causes, serait à-coup sûr un sublime enseignement qui, en échauffant le coeur, imprimerait à l'imagination un noble essor et pourrait conduire à l'intelligence des lois suprêmes.

Persuadé, par ces considérations qu'un assez long séjour en Afrique nous avait rendues plus palpables, des incontestables services que la science, la jeunesse studieuse, les savants et les voyageurs retireraient de la création à Alger d'un jardin zoologique et d'un muséum d'histoire naturelle ayant pour annexe une bibliothèque spéciale, nous en proposâmes, il y a trois ans; la fondation à M. le gouverneur général.

Pour contribuer autant qu'il était en nous à la prompte édification de ces précieux monuments, nous n'offrîmes pas seulement nos services ; mais étant parvenu, par un travail opiniâtre pendant plus de trente années et au prix d'immenses sacrificesi à réunir des collections considérables, nous offrîmes de les donner à ces établissements, qui, au moyen de ces importants matériaux, auraient pu être presque immédiatement inaugurés.

Nous n'avons; point été informé des motifs qui ont pu, malgré la haute approbation de M. le gouverneur général et les éloges par lui publiquement exprimés sur ce qu'il appelait notre généreux désintéressement, et l'importance et la beauté de nos collections, empêcher nos offres d'être acceptées; mais, n'ayant été déterminé à cette libéralité que par un sincère désfr d'être utile, nous n'avons nullement été froissé qu'elle né fût .pas agréée, et nous avons attendu des circonstances plus favorables pour prouver à l'Algérie, à ce pays de nos prédilections, notre dévouement à ses intérêts. Il y a un peu plus d'un an, Son Excellence M. le maréchal gouverneur général de l'Algérie, qui a créé à Alger une exposition permanente des produits de ce pays, nous attacha à cet. établissement, qui, sous la direction aussi habile qu'éclairée de M. le colonel de Neveu, a réalisé des progrès non moins importants que rapides.

Les productions zoologiques seules continuaient, à lui faire défaut par des motifs faciles à comprendre: les unes exigent de patientes et minutieuses recherches, les autres des préparations manuelles délicates et que peu de personnes savent exécuter.

Heureux de pouvoir combler en partie cette lacune, nous nous sommes empressé de doter l'Exposition de toutes les espèces du règne animal que nous avions pu jusqu'ici colliger en Algérie, et de nous-mettre à la recherche des autres.

La tâche que nous accomplissons, moins étendue que celle que nous voulions entreprendre, n'en a pas moins une incontestable utilité: réunir, classer et déterminer toutes les productions qui constituent la richesse zoologique de l'Algérie, et mettre ainsi tous ceux qui s'intéressent aux sciences naturelles et à l'avenir de ce beau pays à même d'embrasser d'un regard synthétique l'ensemble et les détails de sa faune, nous a semblé une mission non moins patriotique que scientifiquement utile, et nous l'avons embrassée avec ardeur.

Nous ne nous sommes point dissimulé que, pour réunir toutes les productions naturelles d'un si vaste pays, le concours de tous ceux qui regardent la nature animée d'un oeil affectueux et intelligent pouvait nous être d'un grand secours ; mais, nous étant dit aussi que, pour l'invoquer avec chance de succès, il fallait qu'un commencement d'exécution vînt prouver plus éloquemment que notre faible voix ne le saurait faire le but que nous nous proposions d'atteindre, nous nous sommes mis à l'oeuvre avec courage, menant de front les travaux d'installation, les préparations taxidermiques, les explorations qui pouvaient nous faire espérer l'augmentation de nos collections, et la recherche des documents qui nous manquent encore pour pouvoir donner à la' publication d'un ouvrage sur la Mammalogie et l'Ornithologie de l'Algérie, dont la rédaction nous est confiée, l'étendue et l'exactitude que l'état actuel de la science exige. Chacun sera à même, en visitant l'exposition permanente, de juger si les résultats que nous avons réalisés dans un si court espace de temps sont satisfaisants et peuvent inspirer bon espoir pour l'avenir.

Une pénible exploration que nous avons récemment accomplie dans le Sahara nous y a fait découvrir des espèces nouvelles pour la science, d'autres non encore signalées comme algériennes; nous les avons adressées à M. le maréchal Vaillant, ministre de la guerre, qui s'est empressé de les communiquer à l'Académie des Sciences, dont il est membre. Cette nouvelle preuve du bienveillant intérêt que cet illustre et savant ministre ne dédaigne pas de nous témoigner, et le flatteur accueil qu'il

a bien voulu nous faire, nous imposent la douce obligation de redoubler de zélé et d'efforts pour justifier une confiance qui nous honore autant qu'elle nous touche.

C'est encouragé par ces premiers succès que nous venons aujourd'hui, avec plus d'assurance, faire un appel à tous ceux qui peuvent nous aider à accomplir la tâche qui nous est dévolue; nous craindrions que- nos efforts personnels ne fussent trop lents à la mener à bien, si l'active collaboration que nous osons solliciter nous était refusée.

Nos récentes explorations, en nous prouvant que la faune algérienne était encore bien imparfaitement connue, nous ont démontré que, pour en colliger tous les éléments, un long séjour dans chaque localité serait non moins indispensable que des perquisitions ardues et consciencieuses; et encore, que d'intéressantes espèces échapperaient aux regards, que d'individus vainement poursuivis par les zoologistes deviendraient la proie peu appréciée de personnes qui en ignoreraient la valeur relative, et les laisseraient se perdre sans soupçonner le dommage qu'elles occasionneraient ainsi à la science!

Nous espérons donc que les chasseurs, les pêcheurs, les agriculteurs, aussi bien que les naturalistes, les fonctionnaires civils ou militaires, les commandants des ports, des cercles, des bureaux arabes, les membres du corps médical, les ingénieurs, les employés des forêts, les officiers de l'armée d'Afrique, aussi bien que toutes les autres personnes dont nous venons indistinctement solliciter le concours, voudront- bien, en nous adressant les spécimens qu'ils pourront recueillir, hâter l'achèvement d'une œuvre qui, en faisant, mieux connaître les richesses de l'Algérie, contribuera infailliblement à la faire aimer davantage.

Tous les mammifères, oiseaux, oeufs, reptiles, poissons, mollusques, insectes et zoophytes, aussi bien que les végétaux, les minéraux et les objets ouvrés donnés à l'Exposition, seront pourvus d'étiquettes reproductives des inscriptions des catalogues; elles indiqueront donc scrupuleusement le nom du donateur, le nom et la provenance dé chaque sujet; l'honneur de la découverte sera par nous toujours attribué à son auteur, et c'est une règle dont nous ne nous départirons jamais.

Comme les classifications de Son Altesse le prince Charles-Lucien Bonaparte ont été appliquées au Muséum d'histoire naturelle de Paris, et que ses ouvrages sont actuellement dans les mains de toutes les personnes, qui s'occupent un peu sérieusement d'histoire naturelle, nous avons cru faire une chose bonne et utile en suivant la méthode d'un aussi célèbre zoologiste.

L'intérêt aussi bienveillant qu'affectueux dont cet illustre savant nous honorait, les lumières et les encouragements que nous puisions dans ses conseils, nous feront à tout jamais regretter qu'une mort prématurée soit venue enlever à la science et à ses'amis ce zélé et incomparable naturaliste.

Pour que les personnes non encore-familières avec les nouvelles appellations génériques ou spéciales puissent immédiatement se rendre compte de leur relation avec celles auxquelles elles sont habituées, nous faisons suivre, autant que possible, les noms français et latins des sujets d'une courte synonymie. Le but d'utilité pratique que nous nous sommes imposé ne nous permettant pas de négliger un seul moyen de faciliter les recherches, nous avons ajouté aux noms scientifiques et vulgaires des espèces les noms arabes, écrits en caractères français et en caractères arabes; de la sorte, les indigènes ou les personnes qui désireront s'en aider seront immédiatement renseignés. Nous ferons observer que les noms arabes sont en général plutôt génériques que spécifiques, et que la même dénomination est souvent appliquée par les indigènes à des espèces différences dont les caractères instinctifs leur ont échappé.

La conservation des collections exige qu'elles soient déposées dans des armoires; leur étude en est par cela même rendue par fois un peu difficile. C'est un désagrément inévitable; nous l'avions reconnu et déploré bien avant qu'il nous fût signalé, mais nous n'y connaissions point de remède.

De judicieux observateurs, auxquels nous serons toujours charmé de prouver notre déférence, nous ont conseillé, afin d'obvier autant que possible à cet inconvénient, de publier des catalogues reproductifs des indications dont les sujets sont porteurs;.de la sorte, ceux placés trop haut pour que leurs étiquettes soient lues aisément ne seraient pas des énigmes pour les visiteurs, que le catalogue, facile à consulter, renseignerait toujours. Ce moyen nous semblant, en effet, le seul capable de remédier au mal, nous nous hâtons de l'employer, et nous publions pour commencer le catalogue des mammifères et celui des oiseaux.

Toutes les espèces que nous avons été à même d'observer en Algérie seront inscrites sur ces catalogues. Les noms des donateurs, l'indication de sexe et de provenance désigneront celles déjà installées à l'Exposition.

Nous ferons suivre chaque catalogue, mais seulement à titre de renseignement, d'une liste supplémentaire de quelques autres espèces qui nous ont été signalées comme se trouvant en Algérie, mais dont la présence en ce pays ne nous est pas assez prouvée pour que ,nous puissions l'affirmer. Nous nous sommes imposé la loi de ne pas indiquer une seule espèce sur la foi d'autrui ou sur des renseignements vagues ; tous les animaux mentionnés sur les catalogues que nous, publierons auront donc été vus et examinés par nous.

Nous ne terminerons pas ce trop long préambule sans offrir à Son Excellence M. le maréchal Vaillant, ministre de la guerre, à M. le maréchal Randon, gouverneur général de l'Algérie, à MM. Les généraux Renault, Yusuf, de Chabaud-Latour, de Liniërs de Tourville, et à M. le colonel de Neveu, un public témoignage de notre gratitude; la flatteuse approbation qu'ils ont bien voulu nous témoigner est la plus douce récompense de nos persévérants efforts.

Nous serions, ingrat, et, Dieu merci, nous ne le sommes pas, si nous ne venions pas ici prier M. le commandant Marguerite de vouloir bien agréer un sincère témoignage de notre vive reconnaissance. Ayant été autorisé par M. le gouverneur général à nous joindre à la colonne qui, sous les ordres de cet officier supérieur, a, pendant l'expédition de 1856-57, parcouru le Sahara, nous avons dû à sa généreuse obligeance, à son excellent et efficace concours, la majeure partie des résultats par nous obtenus; le souvenir de sa gracieuse bonté nous sera à jamais précieux, et nous espérons que les bons offices qu'il a bien voulu nous rendre auront leur utilité pour la science. Nous renouvelons aussi à M. le docteur Reboud et à M. le lieutenant Philibert, qui, pendant cette expédition du Sahara, nous ont si activement secondé, nos affectueux remefcîments, et nous les prions, ainsi que M. le docteur Guyon, monsieur Schousboë, MM. les capitaines Garnis et Guyon-Vernier, et tous ceux qui nous sont déjà venus en aide, de vouloir bien nous continuer leur amicale assistance.

Loche, V. (1867). Exploration scientifique de l'Algerie pendant les années 1840, 1841, 1842. Histoire naturelle des mammifères. Ordre des Chéiropteres Chiroptera (pp. 73 - 83).

La difficulté de parcourir l'Algérie pendant la domination des deys a laissé planer sur la Zoologie de ce pays une obscurité regrettable, que tous les efforts de quelques savants, parvenus à pénétrer dans cette contrée, n'ont pu entierenrent dissiper.

Le gouvernement français, toujours jaloux d'imprimer à la science une.énergique impulsion, constitua en 1839 une commission scientifique, qui, durant les années 1840, 1841 et 1842, explora l'Algérie et fut chargée, sous ses auspices, de publier le résultats de cette exploration.

Plusieurs des naturalistes qui faisaient partie de cette commission, ont accompli leur tâche, quelques-uns ne l'ont pas entièrement achevée, et l'un d'eux s'est abstenu; c'est par suite de cette abstention, dont nous n'avons pas à examiner les motifs, que la rédaction de la Mammalogie et de l'Ornithologie de cet ouvrage nous a été inopinément confiée.

Nous ne nous sommes pas dissimulé qu'il faudrait plus de talent et,de science que nous n'en possédons, pour mener à bien cette tâche ardue: la Mammalogie et l'Ornithologie de l'Algérie étant encore si incomplètement connues! Un désir, qui pour nous est un ordre, ne nous a cependant pas permis d'hésiter, alors surtout que les hommes les plus considérables de la science daignaient nous encourager, nous offrir le secour de leurs lumières et accorder à nos efforts la plus flatteuse; approbation.

Nous étions déjà redevable à M. Isidore Geoffroy-Saint-Hilaire du titre de correspondant du Muséum d'histoire naturelle de Paris cet illustre savant; dont les travaux ont eu un si grand retentissement, a bien voulu encore faire, mettre à notre disposition les incomparables richesses de l'établissement dont il est une des gloires.

Son Altesse le prince Charles-Lucien Bonaparte, ce zoologiste éminent dont la science déplore si amèrement la perte, n'a pas dédaigné non plus d'encourager nos efforts; ses judicieuses observations nous ont fourni les moyens de rendre notre travail moins inparfait, et il nous est bien pénible de ne pouvoir plus consigner qu'ici le profond sentiment de reconnaissance dont son affectueuse bienveillance nous avait pénétré.

M. Z. Gerbe, naturaliste, dont la modestie égale la science, et à l'affection duquel nous devons tant, nous a prêté un concours que son profond savoir nous a rendu do.blement précieux.

M. Schousboë, interprète principal de l'armée, a bien voulu nous fournir, sur les appellations des animaux de l'Algérie, d'utiles renseignements.

M. Jules Verreaux, cet infatigable zoologiste-voyageur, qui cultive avec le même succès toutes les branches de l'Histoire naturelle, mais que l'Ornithologie surtout toujours passionné, et à laquelle il a consacré la meilleure part de sa vie, ses si heureuses aptitudes et une incroyable activité d'esprit, ce judicieux et si sagace observateur qui plus que personne a vu et comparé, et qui plus que personne aussi a su mettre à profit les exceptionnelles facilités d'examen qu'il a eues, Jules Verreaux, avec une bonne grâce et une obligeance parfaite, nous a favorisé de conseils et d'indications qui nous rendent à jamais son sincère obligé.

Combien aussi ne devons-nous pas au savant M. Lemercier, sous-bibliothécaire au Musée d'histoire naturelle de Paris? C'est à son inépuisable obligeance que nous avons dû les précieuses facilités de recherches qui nous étaient si nécessaires pour notre travail bibliographique.

Pourquoi faut-il qu'en Algérie, où nous avons dû accomplir la majeure partie de notre travail, nous ayons manqué de toutes les ressources'qui, à Paris, nous étaient libéralement offertes? Malheureusement il n'existait point ici de collections publiques ni privées, et les documents scientifiques n'y faisaient pas moins défaut. C'est donc très souvent, sans avoir à notre disposition les moyens d'arriver à une exacte et rigoureuse détermination des sujets, que nous avons dû procéder: aussi, de quelque minutieuses précautions que nous nous soyons entouré pour éviter lés causes d'erreur, n'osons-nous pas nous flatter d'y être toujours parvenu.

Nous avons souvent envoyé à Paris des sujets sur lesquels nous ne pensions pas pouvoir prononcer avec certitude, mais malgré cette précaution nous n'avons pas toujours obtenu des renseignements suffisants.

Diverses excursions accomplies dans le Sahara nous permirent de recueillir un certain nombre de Mammifères et d'Oiseaux, dont les uns nous semblèrent nouveaux pour la science, et les autres non encore signalés comme se trouvant en Algérie. Ils méritaient certainement un examen spécial; nous les adressâmes à M. le maréchal Vaillant, alors ministre de la guerre, qui s'empressa de les soumettre à l'Académie des sciences; dont ce savant ministre est un des membres les plus distingués: cette nouvelle preuve du bienveillant intérêt dont cet illustré savant daigne nous honorer, a mis le comble à la gratitude que nous lui avons vouée, mais nous avons eu le regret d'être forcé d'imposer nous-même des dénominations à ces espèces, dont on rencontrerai description dans le cours de cet ouvrage; car après avoir été soumis.à la docte assemblée, par des motifs qui nous sont restés inconnus, ces sujets nous sont revenus sans être détermines.

Comme la Botanique et l'Entomologie ont en Algérie de nombreux et savants adeptes, l'on s'étonnerait à bon droit que deux des plus importantes classes du Règne animal y en rencontrassent aussi peu, si l'on ne se rendait pas compte des difficultés spéciales dont l'étude de certains vertébrés y est entourée.

Quelque restreints que soient les loisirs dont on peut disposer, ils:permettent toujours de colliger les plantes ou les insectes de la localité qu'on habite, on sait où les rencontrer, et c'est presque toujours à coup sûr qu'on procède à leur recherche; une fois récoltés, leur aménagement est facile, il exige peu d'espace, la préparation des sujets se fait sans apprentissage, n'oblige qu'à des dépenses minimes, et les ouvrages sur la matière, depuis les plus élémentaires jusqu'aux plus savants, sont nombreux. Il en est tout autrement pour les Mammifères et pour les Oiseaux doués d'une grande perfection d'organes et de puissants moyens de locomotion, les individus qui composent ces deux grandes classes due Règne animal sont difficiles à capturer; les observer vivant est malaisé, leurs dépouilles mêmes, pour être conservées, exigent les préparations immédiates, souvent pénibles et répugnates,

toujours délicates et que très-peu de personnes savent exécuter; dès qu'il s'agit d'animaux de grande taille, qui vivent loin des centres habités, les moyens de transport manquent souvent dans un pays non encore pourvu de voies de communication: toutes ces causes apportent au zèle des explorateurs des obstacles trop souvent insurmontables. Néanmoins, une collection est-elle réunie, elle exige un vaste local, l'installation en est longue, coûteuse, elle réclame des travaux et des soins continuels; les ouvrages sur la matière sont assez rares, leur prix très-élevé et encore n'est-il pas toujours facile de se les procurer.

Tels sont en abrégé les obstacles qui tout d'abord entravent l'étude de la Mammalogie et de l'Ornithologie. Cette étude, cependant, recèle un attrait si vif, que si l'on en surmonte les premières difficultés, on s'en éprend ardemment et on souscrit à toutes ses exigences! Nous le savons par expérience, car après lui avoir consacré tous les loisirs de notre vie, lui avoir sacrifié tous nos intérêts et nos plus légitimes espérances d'avancement, nous ne regrettons qu'une chose, c'est de n'être pas parvenu à faire davantage pour elle, et nous ne nous en consolons qu'en cherchant constamment à la glorifier et à lui créer des prosélytes.

Nous nous sommes dit que parler aux yeux est toujours le chemin le plus sûr pour arriver au coeur et à l'esprit, et faire naître cette envie d'apprendre, qui ira toujours s'augmentant si elle trouve à sa portée des moyens de satisfaction.

Pénétré de cette conviction, nous avons saisi avec empressement l'occasion de mettre nos théories en pratique, et M. le maréchal comte Randon, gouverneur général de l'Algérie, ayant créé à Alger une Exposition permanente des produits de ce pays, et nous ayant attaché à cet établissement, nous nous sommes résolument mis à l'oeuvre, et là, sans négliger la tâche qui nous est confiée, tâche que nos recherches au contraire doivent (nous l'espérons du moins) mieux nous mettre à même de remplir, nous sommes enfin parvenu à fonder une galerie zoologique exclusivement algérienne, où sont déjà réunis et classés les principaux types de la faune de ce pays, ce qui n'est pas un des moindres attraits qu'offre à ses visiteurs l'Exposition permanente des produits de l'Algérie.

Aux soixante-dix espèces de Mammifères et aux trois cent cinquante-sept espèces d'Oiseaux, mentionnés dans le catalogue que nous avons précédemmènt publié, nous devons déjà ajouter quinze espèces de Mammifères et douze espèces d'Oiseaux; ce résultat de nos récentes explorations nous fait bien augurer de l'avenir.

Les dépouilles de presque toutes les espèces mentionnées dans cet ouvrage figurent dans les galeries de notre Exposition permanente, et seront certainement le meilleur et le plus utile commentaire de ce traité de Mammalogié et d'Ornithologie algériennes.

Les collections d'OEufs, de Reptiles, Crustacés, Insectes, Mollusques, etc., que nous achevons de réunir dans l'établissement dont la direction nous est confiée, et les riches herbiers qui y sont mis à la disposition du public, ont aussi déjà fourni de très-utiles renseignements à ses visiteurs toujours plus nombreux.

Espérant populariser promptement en Algérie le goût des sciences naturelles, nous avons donné à nos recherches toute l'étendue qu'il nous a été possible; nous n'avons pas reculé devant la nécessité d'aller même, pendant les ardeurs de l'été, explorer les localités les plus malsaines, et d'où la crainte des fièvres éloignait jusqu'aux indigènes en d'autres circonstances, nous avons suivi nos colonnes expéditionnaires jusqu'aux extrêmes limites de nos possessions, fournissant chaque jour notre étape comme le soldat: nous avons ainsi pu poursuivre dans les immenses solitudes du Sud, au risque de nous y égarer, les espèces qui s'y confinent; malheureusement nous n'avions aucun auxiliaire, et obligé, comme nous l'étions, de consacrer nos nuits à la préparation des sujets et à la rédaction de nos notes, nous craignons, malgré toute la peine que nous avons prise et les sacrifices que nous avons accomplis, de n'avoir qu'imparfaitement réussi.

Il reste beaucoup à faire dans un pays aussi richement doté, et qui est encore bien imparfaitement connu; nous serions heureux que nos faibles travaux pussent attirer sur l'Algérie l'attention des savants et des naturalistes, qui peuvent seuls achever la tâche que nous n'avons fait qu'ébaucher: nous pouvons promettre à nos successeurs des facilités qui nous ont manqué; les collections que nous avons réunies dans les galeries de l'Exposition leur fourniront des indications dont l'absence nous a fait perdre un temps énorme, forcé que nous étions d'effectuer nos courses au hasard ; nous avons

pourvu, autant que possible, les sujets de leur synonymie, ainsi que de leurs noms vulgaires et arabes, et de celui des localités où ils ont été capturés; des voies de communication perfectionnées se créent chaque jour en Algérie, les moyens de circulation s'y améliorent, l'étendue de nos possessions, la sécurité que le zèle éclairé et l'active surveillance, de l'administration sont parvenus à faire régner jusqu'à leurs extrêmes' limites, permettront d'explorer ce pays avec autant d'agrément que de fruit. Par un heureux privilège, cette contrée devenue française, offre au naturaliste le plus rare et le plus curieux assemblage de productions. La configuration de l'Algérie; sa position, son immense littoral, son Sahel, ses admirables plaines, ses hautes montagnes, ses forêts séculaires et même ses déserts, la mettent dans des conditions de température telles que peu de contrées du globe peuvent lui être comparées et montrer, sur un espace relativement peu étendu, une aussi grande variété des êtres auxquels la Providence assigne un rôle dans les harmonies de la nature. Tout invite à venir visiter ce pays, la bienfaisance de son climat ajoute à tous ses charmes un précieux attrait: que de personnes déjà lui doivent le retour d'une santé que les rigueurs des hivers européens avaient délabrée? Aux portes de la France, à laquelle il est relié par un rapide et régulier service de bateaux à vapeur et par un câble électrique, les rapports sont faciles et presque instantanés! Aussi espérons-nous que l'appel que nous nous permettons d'adresser aux amis des sciences naturelles, sera entendu. S'il en était ainsi, avant peu nous en ayons la conviction, l'attention du monde savant serait fixée sur la faune et sur la flore de cette admirable contrée, et combien nous nous féliciterions si, pour si peu que ce soit, nous pouvions contribuera ce résultat!

Il résulte des observations consécutives que nous avons réalisées sur les Mammifères et les Oiseaux de l'Algérie, que les espèces qui se rencontrent dans les parties septentrionales de ce pays, offrent de très-grands rapports avec leurs congénères de l'Europe méridionale, que beaucoup sont communs aux deux contrées, mais qu'à mesure qu'on s'avance vers le sud, l'analogie s'amoindrit et s'efface, d'abord pour les Mammifères, pour les Oiseaux ensuite; puis on remarque alors entre nos espèces algériennes et celles qui se trouvent en Nubie, en Abyssinie, au Sennaar, des similitudes de plus en plus frappantes.

Contrairement à ce que la différence de climat pourrait, *a priori*, faire supposer, la reproduction des Mammifères et surtout celle des Oiseaux s'effectue plus tardivement en Algérie qu'en France; il en est de même.pour la mue qui, ici, n'a guère lieu qu'un mois plus tard qu'en France.

Cette apparente anomalie a sa raison d'être et sa réelle utilité. Cette tardive reproduction évite aux nichées les inconvénients que les pluies du printemps, torrentielles en Algérie, ne manqueraient pas de leur occasionner.

La taille des Mammifères et des Oiseaux est en Algérie généralement un peu inférieure à celle de leurs congénères d'Europe, ce qu'on peut attribuer à une nourriture trouvée en moins grande abondance, dans un pays où de très-vastes espaces sont incultes.

Pour élucider cette question de l'influence que peut avoir sur la taille des individus l'abondance ou la disette de nourriture, nous rappellerons un fait que tous les chasseurs ont observé en France, à savoir: que les Perdrix qui vivent sur les montagnes sont bien moins grosses, que celles qui vivent dans les plaines. Les Perdrix étant particulièrement granivores, trouvent en conséquence, dans nos plaines de France bien cultivées et très-fertiles, une nourriture plus considérable que celle à laquelle sont réduites les Perdrix des pays de montagnes, où les céréales sont rares; de là certainement leur différence de taille.

En Algérie, les Perdrix préfèrent aux céréales des graminées sauvages, que la culture fait disparaître des plaines, et qui, au contraire, sont très-abondantes sur les montagnes; de là la taille supérieure des Perdrix de montagne. Ajoutons, comme argument corroboratif, que, dans le Sahara algérien, la taille de la Perdrix est encore bien plus petite que dans toutes les autres localités de ce pays.

La livrée des Mammifères et des Oiseaux offre, en Algérie, des teintes plus pures, plus nettes et plus brillantes que celle de leurs congénères d'Europe, mais ces différences, dues à une température plus élevée surtout en hiver, ne suffisent pas, avec la différence de taille mentionnée plus haut, pour constituer, en l'absence d'autres diagnostics, des caractères spécifiques.

Il nous a été indiqué, comme se trouvant en Algérie, quelques espèces de Mammifères et d'Oiseaux que nous n'y avons point rencontrées, et dont la présence en ce pays ne nous semble pas assez

certaine pour que nous pensions devoir les admettre. Nous ne signalerons donc, comme espèces algériennes, que celles dont nous ayons constaté la capture en cette contrée.

Dans le but de venir en aide aux personnes qui voudront effectuer des recherches zoologiques en Algérie, nous ajoutons aux noms vulgaires et scientifiques des espèces ceux sous lesquels les Arabes les désignent, afin de faciliter ainsi aux explorateur, les moyens de s'entendre avec les indigènes. C'est principalement à M. Schousboë interprète principal, que nous devons ces utiles renseignements.

Nous ferons remarquer que les indigènes, loin de donner à chaque espèce un non spécial, désignent par la même appellation toutes celles qui leur semblent avoir quel que conformité d'orgànisation, de mœurs ou de physionomie. Le nom arabe correspond donc plus généralement à un nom de genre, et même parfois de famille, qu'celui d'une espèce.

Parmi les Mammifères, le Magot commun (la seule espèce de l'ordre des Primates que nous ayons rencontrée en Algérie) est connu des Arabes sous le nom de Chadi.

Le Chacal est appelé Dib.
Les différentes espèces de Renards sont confondues sous la dénomination de Tsaalb.
L'Hyène est connue sous le nom de Debaâ;
La Mangouste sous celui de Zerdi;
Les deux espèces de Genette sous la même appellation de Khot-el-Ghali.
Le Lion est désigné par les Arabes sous le nom de Sebaà. Les Marocains le nomment Axed.
La Panthère est appelée Nemeur, et probablement aussi le Serval?
Le Guépard a un nom spécial, celui de Fehed.
Le Caracal est nommé Anag-el-Ard.
Les divers Félis se nomment indistinctement Kot-el-Khla.
La Belette d'Algérie ou Putois Boccamele est appelée Far-el-Kheil.
La Loutre est désignée sous le nom de Kilb-el-Ma.
Le Sanglier est connu sous la dénomination de Hallouf-el-Ghaba.
Le Chameau est appelé Djemel, et le Chameau-coureur Mehari.
L'Antilope Addax est connue dans le Sud sous le nom de Meha.
Les .deux espèces de Gazelles portent le mênre nom, Ghzala ou Bezala.
Le Bubale est nommé Begra-el-Ouahch;
Le Moufflon à manchettes, El-Arouy.
Tous les Vespertilionidés sont connus des Arabes sous la dénomination générale de Their-Ellil, tandis que les Marocains les nomment Onthouith.
Les diverses Musaraignes, aussi bien que les petits Rongeurs, sont indiqués par le même nom de Far-el-Khla.
La Macroscélide, selon les contrées, est nommée Far-el-Kheil, comme la Belette, ou Erbib-el-Helalif.
Le Hérisson est nommé Ganfoud.
Les diverses espèces de Gerboises ont la même dénomination, Djerboa.
Le Cténodactyle, et probablement quelques espèces de Gerbilles, sont nommés Gird ou Djird.
Le Rat rayé ou de Barbarie est nommé Zordani.
Le Porc-Epic est appelé Darban.
Le Lièvre se nomme OErneb.
Le Lapin Gounïn.

Il nous a été impossible d'obtenir aucun renseignement sur les noms de quelques Mammifères, que les Arabes ne veulent pas considérer comme tels; le Dauphin et le Phoque sont pour eux des Poissons, voilà tout; mais quant à une autre désignation spécifique, ils n'ont pas pu nous l'indiquer.

Si, parmi les Oiseaux, quelques espèces sont connues des Arabes sous des noms spéciaux, il en est d'autres auxquels ils n'ont même pas appliqué une dénomination générique.

Tout Vulturien est nommé Ennesser ou Nesser.
Le Gypaëte, comme les Aigles en général, a reçu des Arabes le nom de El-Ogab.
Le Néophron, probablement en raison de sa petite taille et de sa coloration, possède un nom particulier, Rähhma ou Errakhma.
Les habitudes spéciales-du Balbusard et sa manière de vivre, le font désigner sous celui de Boukhatem.

Tous les Milans sont confondus sous le nom générique El-Essaf. Les Marocains les nomment Siouna.
Les Faucons, que cependant les chefs arabes utilisent pour la chasse, sont tous désignés sous la même appellation, Taïr-el-Hor.
Les Busards et les Buses, que nous avons parfois entendu nommer Taïr-el-Baz, sont le plus souvent nommés comme les Milans, Essaf.
Toutes les grandes espèces de nocturnes, et surtout la Chouette-Hulotte, que les Arabes connaissent bien, sont appelés par eux Bourourou, par onomatopée probablement.

Les petites espèces sont plus spécialement, désignées sous le nom de Youka ou Moukha, qu'ils appliquent, aussi aux Engoulevents.
Les Martinets et les Hirondelles sont tous nommés Khothaïfa.
L'aspect particulier de la Huppe lui a valu un nom spécial, Hadhoid.
Le Coucou, par analogie avec son chant, est appelé Tekouk.
Pour tous les Pics, il n'est qu'un nom, Nekkab-Essedjàr.
Le Martin-Pêcheur porté seul le nom de Mekkiet-el-Ma.
Les Guépiers sont nommés Elliamoun. Les Européens, les nomment Chasseurs .d'Afrique.
Le Rollier, que les Arabes nomment Cherrekhbrok, est le Geai bleu des Européens
Toutes les Mésanges sont nommées, par les Arabes, Bou-Reziza.
Les Bergeronnettes, Emsissi ou Messissi.
Le Merle, le Turdoïde, et peut-être quelques autres espèces encore, sont désignés sous le nom de Djahmouna.
Le Rossignol et la plupart des Becs-Fins chanteurs sont tous indistinctement nommés Belbel ou Oum-el-Hassem.
Toutes les Pies-Grièches n'ont qu'un seul nom, Bousseround.
Le Geai, qui, en Algérie, est appelé Djirire, se nomme Derraz au Maroc.
La Pie, que par imitation de son cri les paysans nomment si généralement Agasse en France, est probablement, par le même motif, appelée par les Arabes Agâag.
Les Corvidés sont connus sous le nom générique El-Ghorab.
Le Crase Coracias est désigné, par les Arabes, sous le nom d'Ogrieb-N'sara, ou, Corbeau des chrétiens.
L'Étourneau vulgaire et l'Unicolor n'ont qu'une même désignation, Zerzour.
Le Bruant Proyer, et nombre d'autres espèces que les Arabes n'en distinguent pas sont compris sous une même désignation, celle de Dorriz ou Derris.
Les Moineaux, que les Arabes nomment Zaouch, sont appelés Borthal par les Marocains.
Le Chardonneret est nommé Mokhnim.
Le Pigeon Ramier ou Palombe est spécialement appelé Zaotoul.
Le Biset et le Colombin sont nommés l'un et l'autre Hamman-el-Berri.
Les Gangas sont désignés sous le nom deKoudri.
Les Caâtas portent celui de El-Guetâa.
La Perdrix porte le nom harmonieux de Hadjel.
Le Craterope fauve ou numide, Errebib el Hadjela (fils adoptif de la Perdrix).
La Caille et aussi le Turnix sont indifféremment désignés sous les noms de Melloh, Melloha ou Semmana.
La Foulque macroule et la Foulque à crête ont la même dénomination de El-Ghor que partage peut-être encore la Poule-d'eau
Le Courre-Vite Isabelle est nommé Souaq-el-Ibe (piqueur de Chameaux).
La Grue, qui n'est cependant que de passage en Algérie,.est connue des Arabes sous le nom de Gharnouy, sous lequel est- aussi désignée probablement la Grue-Demoiselle.
L'Outarde cannepetière, si connue des Européens en Algérie sous le nom de Poule de Carthage, est nommée par les Arabes Râad, et par les Marocains Sefsaf.
Les Otis, Tarda, Arabs, Houbara, n'ont qu'une seule désignation, celle de Hobara.
L'Outarde par excellence des Européens en Algérie est l'Outarde Houbara, celle que les chefs arabes chassent au Faucon.
L'OEdicnème porte le nom de Kirouna.
Le Vanneau, celui de Bibetli.
Le Pluvier doré, et probablement aussi le Guignard, se nomment Dorrich ou Dorridj.
L'Ibis Falcinelle est plus connu des Marocains que des Arabes, sous le nom de Mâazet-el-Ma.
Les Hérons sont en général nommés en Algérie Bou-Ank, et au Maroc Aichauch.
Le Butor a un nom spécial, celui de Sebou-eî-Merdja.

La Cigogne, très-répandue en Algérie, et qui niche sur les gourbis des Arabes, est nommée par eux Belaredj et Boucherkchakh.
La Spatule est appelée Bouquerquaba.
Le Phénicoptère se nomme Nihof ou Nehof.
L'Oie est appelée Onza, et le Cygne n'a probablement pas d'autre désignation.
Le Canard sauvage partage, avec toutes les espèces de sa famille, la dénomination générique de Zergue-Erras.

Nous n'avons pu obtenir aucun renseignement sur les noms des petits Echassiers et des Pélagiens, assez nombreux cependant en Algérie.

Les Mammifères et les Oiseaux de l'Algérie qui sont les plus connus, sont ceux qui, communs à cette contrée et à quelque autre partie du globe, ont été décrits et figurés dans des ouvrages devenus claissiques.

Les espèces plus récemment découvertes ou d'aspect moins remarquable, ne possèdent pas les mêmes avantages; ce n'est que dans des ouvrages spéciaux ou des publications périodiques, peu faciles à consulter, qu'on peut en trouver les descriptions quelques-uns même sont encore inédits.

Ces différences nous imposeront l'obligation de décrire d'autant plus longuement une espèce, qu'elle-sera moins connue. Quand faire se pourra, nous citerons, *in-extenso*, la description, de l'auteur initial; mais s'il l'avait publiée dans une langue avec laquelle nous serions trop peu familiers pour en être un traducteur suffisant, nous nous bornerons à reproduire sa diagnose.

La synonymie, dont chaque espèce sera accompagnée, en donnant pour les individus que nos grands maîtres ont si bien fait connaître, les moyens de se reporter à leur ouvrages, pourra nous permettre d'abréger nos descriptions, et de n'y ajouter que les détails qui nous paraîtront susceptibles d'intéresser.

Le système de classification de Son Altesse le prince Charles-Lucien Bonaparte ayant été appliqué aux galeries ornithologiques du Muséum d'histoire naturelle de Paris, magnifique établissement que d'immenses richesses, des moyens d'étude et de comparaison hors ligne et sans cesse accrus par le zèle de ses administrateurs, font chaque jour consulter avec plus de fruit, et les ouvrages de cet illustre savant, étant d'ailleurs entre les mains de toute personne s'occupant un peu sérieusement de Zoologie, nous avons cru faire une chose bonne et utile en nous conformant, pour l'arrangement systématique de cet ouvrage, comme nous l'avions fait pour les catalogues qui l'ont précédé, à la méthode de classification de ce célèbre zoologiste.

Nous savons bien que, n'ayant à nous occuper que des espèces d'une seule contrée, de nombreuses lacunes existeront nécessairement; mais c'est un inconvénient qui eût toujours été inévitable, quel que fût le système auquel nous nous fussions arrêté; nous conviendrons au surplus que, tout en reconnaissant les services qui pourraient être rendus à la science par une méthode de classification dont la perfection ne serait pas contestée, nous craignons qu'une telle méthode ne soit vainement espérée, et nous avons préféré suivre celle du prince, déjà expérimentée, que de venir, nous aussi, essayer d'innover et compliquer ainsi des difficultés qui n'ont que trop éloigné des sciences naturelles les personnes qui ne peuvent y consacrer que de courts loisirs, et auxquelles l'impossibilité de se reconnaître au milieu de tant de divisions et d'appellations nouvelles a fait abandonner cette intéressante étude, qui est ainsi menacée de devenir l'apanage exclusif d'un petit nombre d'initiés.

Trop de .personnes aujourd'hui semblent croire que l'établissement d'un système de classification est le but, au lieu d'être le moyen; quant à nous, qui voudrions populariser la science, au lieu d'en faire le monopole de quelques privilégiés pouvant lui consacrer tous leurs instants, et qui n'estimons un système que pour les facilités d'étude qu'il procure, bien convaincu que celui avec lequel on est déjà familier rendra plus de .services qu'aucun autre, nous ne changerons rien à celui d'après lequel ont été rédigé nos catalogues.

Lönnberg, E. (1908c). Notes on some mammals collected in the Congo Free State.

The following small collection of mammals was delivered to the R. Natural History Museum in Stockholm some time ago by the Swedish Missionary, Mr K. E. LAMAN, who previously has shown his interests for the zoology by collecting birds and insects, and thus in a valuable manner has increased our knowledge about the fauna of Lower Congo. The mammals mentioned below, and partly described as new, have been collected at Mukirnbungu below Manvanga , about an hours way from Congo River in Lower Congo.

Lönnberg, E. (1917a). Mammals collected by H.R.H. Prince Vilhelm's Expedition to British East Africa, 1914.

When H. R. H. Prince VILHELM had returned from his shooting expedition to British East Africa it pleased H. R. H. to present to the R. Natural History. Museum a valuable collection of mammals in addition to the collection of birds which I have had the honour of describing before. This collection of mammals contains about 115 specimens of various small mammals and in addition to this several heads of antelopes and other game. Especially among the former there are several forms of special interest and even new ones. Among the latter I have the honour of dedicating a new *Dendrohyrax* to H. R. H. to whom the Museum is indebted for this valuable donation.

The specimens have been mostly collected at Donya Sabuk and are prepared by Mr. CH. A. TURNER,who has done his work very well.

Lönnberg, E. and N. Gyldenstolpe (1925). Zoological results of the Swedish expedition to Central Africa 1921. Vertebrata. 3. Preliminary diagnoses of four new mammals.

The following mammals were collected during the expedition mentioned by H. R. R. Prince WILHELM and Count GYLDENSTOLPE. The type-specimens are all kept in the R. Nat. Hist. Museum in Stockholm.

Lopes, F. J. and J. Crawford-Cabral (1992). Catálogo dos Chiroptera em colecçao no Centro de Zoologia.

São listados neste trabalho 433 exemplares de Chiroprera, em colecção no Centro de Zoologia do Instituto de Investigação Científica Tropical, pertencentes a 30 espécies. Três dessas espécies são registadas pela primeira vez para a fauna da Guiné (*Taphozous perforatus, Eptesicus somalicus* e *Pipistrellus nanus*) e duas para a de Macau (*Pipistrellus abramus* e *Miniopterus schreibersi*).

The authors report 433 specimens of Chiroptera housed in Centro de Zoologia of Instituto de Investigação Científica Tropical. As many as 30 species are listed. Three of these species are recorded for the first time from Guiné (*Taphozous perforatus, Eptesicus somalicus* and *Pipistrellus nanus*) and two from Macau (*Pipistrellus abramus* and *Miniopterus schreibersi*).

Loveridge, A. (1923). Notes on East African mammals, collected 1920 - 1923.

The present paper may be looked upon as supplementary to the 1915 - 1919 notes, as localities then recorded are not repeated (except in one or two instances) or similar observatins duplicated.

A new feature of the present paper is the inclusion of carefully ascertained native names from only those tribes in whose district the specimens were collected. I consider it of importance that these names should be collected as soon as possible for, with the increasing facilities for travel, many tribes - especially along the Central Railway - are rapidly forgetting their specific names for animals and adopting the blanket-names of the town bred coast Swahili, who call every rat, excepting Cricetomys,

"Panya." The rat-eating Wagogo and Wanyaturu, on the other hand, have specific names for almost every species.

I have avoided using names supplied by other tribes until that particular animal has been collected in their particular district, as when a native is asked for the name of an animal he is not familiar with he will invariably supply you with the name of the nearest creature in appearance to it that he knows, and at times these may not be even related (e.g., lemurs and squirrels, or mole-rats and blesmols). For these reasons a very large percentage of names collected by travellers and given by Matschie are quite wrong (e.g. on p. 65, "Uma mwitu" is given for the jackal instead of "Mbweha"). Umba ya mwitu is the hunting dog, and means "dog of the bush." Matschie gives for its Chigogo (not Kigogo) name "Mbua ya porini," which is mererly the concoction of a bright native, as Iminzi is the correct Chigogo equivalent. None but a naturalist can hope to obtain native names of animals with any degree of accuracy, and only then by a lengthy cross-questioning can he be certain there is no confusion.

In this connection I should like to express my thanks to the Rev. John Briggs, who very kindly and thoroughly revised my whole vocabulary of Chigogo names, to Messrs. Thomas and Kershaw, for identifying all the primates, bats, and rodens, and a good many in the other groups (most of the ungulates were not submitted owing to the expense of freighting them); to Dr. Baylis, Mr. Stanley Hirst, and the late Hon. N.C. Rothschild, for kindly determining the parasitic worms, ticks, and fleas; and lastly, but not least, to my chief, C.F.M. Synnerton, Esq., for the encouragement and interest he has shown in my work, and for permission to publish various notes jotted down whilst on official journeys.

The material mentioned in the following pages consists of 920 skins and skulls, comprised as follows:

Order - Families - Genera - Species - No. of specimens.
Primates: 2 - 4 - 10 - 40
Chiroptera: 8 - 14 - 22 - 200
Insectivora: 3 - 5 - 13 - 43
Rodentia: 9 - 25 - 46 - 417
Carnivora: 5 - 15 - 28 - 120
Ungulata: 5 - 20 - 24 - 100
Totals: 32 - 83 - 144 - 920

As for two years of the time the writer was stationed at Kilosa, in the office of the Game Department, he had to rely on native collectors to a great extent. The success of the collecting is largely due to the enthusiasm of two brothers, Salimu and Nikola, who collected over 600 skins and exhibited the greatest keenness in looking for novelties. It need not be supported that the skins are poor on this account; on the contrary, I think they will compare very favourably with any made by Europeans.

It is to be regretted that in the great majority of cases the taking of the measurements had to be left to Nikola, but after checking him on many occasions I have sufficient confidence to believe that they are of some value, though it should be borne in mind that a native does not usually see the necessity for such accuracy as does the mammalogist. Where measurements are given in this paper they are always in this order: - (i.) Length from nose to vent. (ii.) Length of tail withoug terminal hairs. (iii.) Length of hind foot without claws. (iv.) Length of ear from tip to notch. In the case of bats a fifth measurement is added: (v.) Lengto of wing, sometimes across outstretched wings as well. All figures are in millimetres.

Four new species and one new race have already been described from this material by Mr. P.S. Kershaw, viz., *Nycteris marica, Elephantulus renatus, Steatomys muansæ, Arvicanthis tenebrosus*, and *Rattus chrysophilus singidæ*.

Lundberg, K. and R. Gerell (1986). Territorial advertisement and mate attraction in the bat *Pipistrellus pipistrellus*..

A South Swedish population of the vespertilionid bat *Pipistrellus pipistrellus* was studied by means of bat boxes from April to the beginning of October in 1984. The mating system of the pipistrelle bat is a "resource defence polygyny". Three territorial males were studied to determine the relative importance

of two potential resources, food and roost sites, for male reproductive success. The day roost was found to be the crucial resource for the male's chances to get access to females. A territorial male advertises the location of his day roost to the females by a songflight display. The male who spent most time in songflight display was visited by the greatest number of females.

Lunde, D. P. and P. Beresford (1997). Noteworthy records of bats from the Central African Republic.

The bat fauna of the Central African Republic is among the most poorly known in Africa. Schlitter et al. (1982) provided a comprehensive survey of what little was known of that fauna, along with 20 new species records for the country. The following year Hill (1983) reported an additional four species, bringing the total species count to 49.

During November and December 1996, the American Museum of Natural History initiated a collecting expedition to the Dzanga Sangha Special Dense Forest Reserve, in southernmost Central African Republic. We netted at the confluence of the Sangha and Babongo Rivers, approximately 6 km north of Bayanga, Habitats sampled include dense, inundated forest, characterized by stilt-rooted trees (*Uapaca* sp.) and vast areas of herbaceous plants of the Marantaceae family, and secondary forest along logging roads (Carroll, 1988).

Eleven bat specimens were collected, representing eight species from four families; only towards the end of the collection effort was it discovered that the local residents were regularly taking bats form nets to supplement their diet. Yet despite the small sample size, three of the eight species collected were new records for the country. We report on these specimens and provide an amended list of all species known from the Central African Republic (Table 1). This addition to the chiropteran fauna of the southwestern Central African Republic augments the expectations of Schlitter et al. (1982) that several dozen species remain as of yet unreported from this poorly collected region of central Africa. The specimens are housed in the Department of Mammology of the American Museum of Natural History.

Lynch, C. D. (1975). The distribution of mammals in the Orange Free State, South Africa.

Distribution records of mammals in the Orange Free State are scantily mentioned in ROBERTS (1951), ELLERMAN, MORRISON-SCOTT &. HAYMAN (1953), MEESTER (ed.) (1966 to 1969), and MEESTER & SETZER (eds.) (1971). For many species only a generalized distribution pattern is given e.g. the distribution is given as eastern O.F.S. or semi-arid regions. The distribution in the O.F.S. of some mammal groups are discussed by VON RICHTER (1972), VON RICHTER, LYNCH, & WESSELS (1972), and DAVIS (1974), while that of certain genera are dealt with by MEESTER (1963), MEESTER & LAMBRECHTS (1971), and ROWE-ROWE (1972).

Lynch, C. D. (1994). Mammals of Lesotho.

This is the first scientific publication, based on comprehensive collecting, describing the occurrence of mammals in the Kingdom of Lesotho. The object of this study was to produce a checklist of mammals occurring in Lesotho which lies between latitudes 28° 33' and 30° 41'S and longitudes 27° 00' and 29° 28'E. Particular attention was paid in this checklist to distribution patterns and how these relate with those of mammals from adjacent areas such as the Orange Free State, north-eastern Cape Province and Natal. Thirteen localities were surveyed, while information for several additional localities was obtained through other sources. Fifty-two species of 43 genera of the orders Insectivora, Chiroptera, Primates, Carnivora, Hyracoidea, Artiodactyla, Rodentia, Lagomorpha and Macroscelidea were found to occur in Lesotho. These have been discussed under the subheadings of distribution, habitat, breeding, linear measurements and mass, and records of occurrence. Additionally, 13 species of another 11 genera possibly occur.

Lynch, C. D. and J. P. Watson (1990). The mammals of Sehlabathebe National Park, Lesotho.

An annotated checklist of mammals occurring in Sehlabathebe National Park, Lesotho which lies between latitudes 29° 51' 05" and 29° 58' 00"S and longitudes 29° 04' 00" and 29° 10' 24"E is given. The low mammal diversity found at Sehlabathebe is ascribed to the high altitude, harsh climate, and relatively uniform topographic relief as well as the paucity of woody vegetation in the Park. Nevertheless a total of 32 species are currently recorded in the Park, with a further predicted 11 species and a further five, now extinct, used to occur in the area. These 48 species represent the orders Insectivora, Chiroptera, Primates, Carnivora, Hyracoidea, Artiodactyla, Rodentia and Lagomorpha. Seven of these species are included in the South African Red Data Book under the categories vulnerable, rare and indeterminate while eight species are endemic to greater South Africa and two to southern Africa.

MacDonald, K., E. Matsui, R. Stevens and M. B. Fenton (1994). Echolocation calls and field identification of the Eastern Pipistrelle (*Pipistrellus subflavus*: Chiroptera: Vespertilionidae), using ultrasonic bat detectors.

In the field, *Pipistrellus subflavus* produces 5-ms-long, broadband, echolocation calls when flying in search of airborne prey. These calls typically have two strong harmonics, the first with energy between 35 and 19 kHz and the second with energy between 70 and 38 kHz. To an observer with two narrowband bat detectors, one tuned to 40 kHz and the other to 20 kHz echolocation calls of *P. subflavus* are distinct from those of other syrnpatric species in the northern part of its geographic range.

Madkour, G. A. (1977). A comparative study of certain features of the alimentary canal and disposition of the viscera in egyption bats.

The general structure of the alimentary canal has been studied in fourteen species of Egyptian bats belonging to the family Pteropidae of the Megachiroptera, and the families Rhinopomatidae, Emballonuridae, Nycteridae. Rhinolophidae, Hipposideridae, Vespertilionidae, and Molossidae of the Microchiroptera.

The tongue of the megachiropteran bat, *Rousettus aegyptiacus*, differs from that found in the Microchiropteran species studied in bearing: only two kinds of papillae - the circumvallate and the filiform. The fungiform papillae are absent, although they are found in all the Egyptian Microchiroptera investigated, where they are located usually on the margins of the tongues.

Three circumvallate papillae occur in *R. aegyptiacus* and they are similar in appearance. In *Rhinopoma*, however, the apical third papilla is slit-like, whereas in all the other Microchiroptera studied there are only two circumvallate papillae.

The filiform papillae occur on most of the area of the tongue, but they vary in distribution, size and form in the different species. In *Rousettus* two kinds of these papillae are predominant: the large papillae and the horny ones. The latter are tridentate. In the Egyptian Microchiroptera the filiform papillae are of three types: the small, the large, and the horny (mono- or trifid) ones.

The palatal rugae also differ in the different species. Nine such rugae are present in *R. aegyptiacus* and a central raphe extends between them from the sixth to the eighth. *Nycteris, Rhinolophus* and *Asellia* form a distinct group in which these rugae do not extend beyond the level of the anterior third portion of the second molar teeth. In the other bats the last rugae extend behind this level. Accessory rugae occur in most of the microchiropteran bats, but not in *Rousettus*.

The various parts of the alimentary tract showed marked differences in size, shape and length. The stomach in *Rousettus* is long and tubular, whereas in the microchiropteran bats it is much wider, almost mallet-shaped. The longest intestinal canal was found in *Rousettus*. The species of *Nycteris,*

Rhinolophus and *Asellia* form a difinite group as regards the length of this region; it is nearly of the same length in each of them. Simpson (1945) grouped these bats in the superfamily Rhinolophoidea and Wassif and Madkour (1969, 1972 a, 1973) found similarities in them in the presence of laryngeal pouches, the location of the palatal rugae, and the structure of the pelvis.

Madkour, G. A. (1978). Significance of the distal part of the humerus in the identification of Egyptian bats.

This investigation deals with a comparative study of the distal part of the humeri of fourteen bats which are *Rousettus aegyptiacus aegyptiacus* (Pteropidae - Megachiroptera - *Rhinopoma hardwickei sennaariense, R. microphyllum microphyllum* (Rhinopomatidae), *Taphozous perforatus perforatus, T. nudiventris nudiventris* (Emballonuridae), *Nycteris thebaica thebaica* (Nycteridae), *Rhinolophus clivosus brachygnathus* (Rhinolophidae), *Asellia tridens tridens* (Hipposideridae), *Pipistrellus kuhli marginatus, P. rüppelli rüppelli, Otonycteris hemprichi hemprichi, Plecotus austriacus christiei* (Vespertilionidae), *Tadarida aegyptiaca aegyptiaca, T. teniotis rüppelli* (Molossidae) - Microchiroptera. This distal part of the humerus shows no remarkable specialization in the Megachiroptera, while in the Microchiroptera the entocondyloid tuberosity is large. Other structures were also described in these bats.

Fourteen species of bats were collected from different localities of Egypt, and the distal parts of their humeri were used for comparison between them. The bats belong to the family Pteropidae of the Megachiroptera, and Rhinopomatidae, Emballonuridae, Nycteridae, Rhinolophidae, Hipposideridae, Vespertilionidae, and Molossidae of the Microchiroptera.

The most complicated end of the humeri in these bats, is that of *Nycteris thebaica*, and the least specialized, is that of *Rousettus aegyptiacus*. In this latter bat, the capitulum is smaller and the medial epicondyle is stout. Although members of a definite genus may look similar in many anatomical structures, yet, they differ in the shape of the distal part of their humeri. The medial epicondyle of the *Rhinopoma hardwickei* is blunt and bigger than that of *R. microphyllum*. In *Taphozous perforatus*, the epicondyle is long and terminates distally by a pointed projection. This structure in *T. nudiventris* differs, and is prismatic in shape.

Members of the genera *Nycteris, Rhinolophus*, and *Asellia* are usually grouped in one Superfamily Rhinolophoidae SIMPSON 1945. They are similar in may anatomical features concerning the presence of laryngeal pouches, the palatal rugae, the structure of the pelvis (WASSIF and MADKOUR 1969, 1972, and 1973) and the dimensions of the intestine (MADKOUR 1977). *Asellia tridens* differs in having a very long styloid process, whereas in *Nycteris thebaica* the medial epicondyle projects medially forming a very long and broad process. This epicondyle in *Rhinolophus clivosus* is least specialized, and is prismatic in shape.

Each member of the family Vespertilionidae differs from the others. In *Otonycteris hemprichi*, the distal end of the humerus is robust with a large capitulum. The medial epicondyle is the largest and projects cranially. A pointed lateral epicondyle is found in *Pipistrellus kuhli* and *P. rüppelii* which is projected laterally in the former, and cranially in the latter. The distal end of the humerus in *Plecotus austriacus* is simpler than those of the other bats.

Of the family Molossidae, the trochlea of *Tadarida aegyptiaca* is much larger than that of *T. teniotis*.

Madkour, G. A. (1988). Faces of Microchiroptera from Egypt.

The morphology of faces of Microchiroptera found in Egypt, is very important for the identification of these animals. The present study contains brief descriptions of the faces of thirteen microchiropterous bats collected from the various localities of Egypt. These bats are *Rhinopoma hardwickei, R. microphyllum* (Rhinopomatidae); *Taphozous perforatus, T. nudiventris* (Emballonuridae); *Nycteris thebaica* (Nycteridae); *Rhinolophus clivosus, Asellia tridens* (Rhinolophidae); *Pipistrellus kuhlii, P.*

rueppelli, Otonycteris hemprichi, Plecotus austriacus (Vespertilionidae); *Tadarida aegyptiaca* and *T. teniotis* (Molossidae.

Maeda, K. (1972). Growth and development of large noctule, *Nyctalus lasiopterus* Schreber.

Cette étude qui traite de quelques aspects de la croissance et du développement de la Grande noctule, *Nyctalus lasiopterus* Schreber, a été effectuée à Sapporo en 1966 et en 1967 à notre laboratoire, sur les terrains de l'Université de l'Hokkaido et au Jardin des plantes. Nous avons au préalable captué quelques femelles au filet sur les terrains de l'Université et au Jardin des plantes. Notre travail est principalement basé sur l'observation des petits qui sont nés en laboratoire de ces femelles. Nous avons aussi intégré a notre étude des observations sur le terrain.

Several aspects on the growth and development of the Large noctule, *Nyctalus lasiopterus* Schreber were described. This work is mainly based upon the observations of the young which were born in our laboratory from captive bats netted in the botanical garden and on the campus of Hokkaido University, Sapporo. In addition to the study of the captive animals, field observations were also carried out in these habitats.

The young are born between about the 20th of June and about the 10th of July in Sapporo.

At birth, the young had vibrissae and hairs on the lower base of their claws of their thumbs and of their hind feet. Some of them had no hairs on the body but others had sparsely scattered thin hairs on the back and belly of the body. The pinnae and tragi of the young were folded over or unfolded and held erect. The lids of the eyes were sealed at birth. The measurements of the new born young are shown in Table 2.

The opening of the eyes occurred at 4 to 11 days of age. All the ears and tragi unfolded and were held erect by 7 days of age. The body hairs began to grow from the dorsal side of rump to the head, and to the ventral sides a little later and finally spread all over the body. At about 40 days of age the body hairs of young reached about the same lenght as those of the adult. The colour of hairs of young was darker than the adult's. The growth curves of several dimensions were shown in Fig. 1 to 4. The young began to fly at about 40 days of age when they grew up to nearly the same size as the adult.

The common litter size was two, but some females had only one young. Sex ratio (♂/♀) of young was 0.77.

Different growth and development were observed between singleton and twin.

Generally, the young are left in the roost during the time when the mothers fly out to get food.

Mainoya, J. R. and K. M. Howell (1979). Histology of the neck 'glandular' skin patch in *Eidolon helvum, Rousettus aegyptiacus* and *R. angolensis* (Chiroptera: Pteropodidae).

The histology of the neck ‘glandular’ skin patch has been examined in three Pteropodid bat species, *Eidolon helvum, Rousettus aegyptiacus* and *R. angolensis*. In *E. helvum* the neck skin patch contains a large sebaceous gland complex, which is better developed and more active in males than in females.

A comparable area in *R. aegyptiacus* contains rather non-specialized sebaceous gland alveoli in association with hair follicles and which are more active in males than in females. In *R. angolensis* the brush-like hair of the neck skin patch is much longer and coarser in the male than in the female, but in neither sex was the skin patch glandular.

On the basis of histological observations, the neck skin patch in *E. helvum* would appear to be important for scent emission while in *R. aegyptiacus*, the same structure would be less so. In *R. angolensis*, the neck skin patch, though covered by longer brush-like hair than in other species, contained almost no glandular tissue and perhaps functions to provide visual rather than olfactory behavioural cues.

L'histologie des régions cervicales de peau 'glandulaire' a été examinée chez trois espèces de chauve-souris Ptéropodides (*Eidolon helvum, Rousettus aegyptiacus* et *R. angolensis*). Chez *E. helvum*, cette région contient une grande glande sébacée complexe mieux développée et plus active chez les mâles que chez les femelles. Chez *R. aegyptiacus*, cette même région contient des alvéoles d'une glande sébacée assez peu spécialisée, associées à des follicules pileux, qui est plus active chez les mâles que chez les femelles. Chez *R. angolensis*, la fourrure hérissée de la région cervicale est plus longue et plus raide chez le mâle que chez la femelle, mais la peau n'est glandulaire chez aucun des deux sexes.

Sur la base d'observations histologiques, la région cervicale de la peau chez *E. helvum* semble responsable de l'émission d'odeur alors que chez *R. aegyptiacus*, la même structure l'est à un degré moindre. Chez *R. angolensis*, bien que couverte par des poils plus longs et hérissés que chez les autres espèces, la région cervicale de peau ne contient presque pas de tissu glandulaire et fonctionne peut-être pour fournir des indications comportementales plus visuelles qu'olfactives.

Makanya, A. N. and J. N. Maina (1994). The morphology of the intestine of the insectivorous horseshoe bat *Rhinolophus hildebrandti*, Peters): a scanning electron and light microscopic study.

The gastrointestinal tract of the horseshoe bat, *Rhinolophus hildebrandti* (Peters), was studied macroscopically, with the light microscope and with the scanning electron microscope. Macroscopically, the stomach was of the simple type and the intestine was a short convoluted tube with an almost uniform diameter. A caecum, an appendix and a colon were absent, and the only portion of the large intestine observed was a short rectum which had a distinctly greater diameter than the rest of the intestine. The proximal part of the intestine showed a brief 'honeycomb' segment preceding the ridge-like transverse villi that occupied the rest of the foregut. In the region immediately proximal to the rectum the villi joined in a geometrical pattern to form chambers resembling 'reticular cells' of the ruminant stomach. The villi were covered with a prominent columnar epithelium occasionally interrupted by goblet cells. Generally, the intestine of *Rhinolophus* resembles that of the other bats which have been studied, but showed structural details suggestive of an increased surface area.

Le tractus intestinal du Rhinolophe, *Rhinolophus hildebrandti* (Peters) a été étudié au moyen d'un microscope simple et d'un microscope électronique. Macroscopiquement, l'estomac est de type simple, et l'intestin est un tube court enroulé d'un diamètre presque constant. Il n'y a ni caecum, ni appendice, ni colon, et la seule portion de gros intestin observée était un rectum court d'un diamètre nettement plus grand que le reste de l'intestin. La partie proximale de l'intestin présente un court segment en "nid d'abeille" qui précède le reste de l'intestin strié transversalement. Dans la partie qui précède directement le rectum, les villosités transversales rejoignent un schéma géométrique pour former des chambres semblables aux "cellules réticulaires" de l'estomac des ruminants. Les villosités étaient couvertes d'un épithélium en colonnes très visible, interrompu çà et là par des cellules en gobelet. Globalement, l'intestin du Rhinolophe ressemble à celui des autres chauves-souris qui ont déjà été étudiées mais présente des détails de structure qui suggèrent une augmentation de la surface.

Makin, D. (1989). Age groups in the fruit bat *Rousettus aegyptiacus.* Abstract. Eigth International Bat Research Conference, Sydney, Australia, 9 - 15 July 1989.

During the procedure of "capture-mark-recapture" research conducted in Israel on the local fruit bat *R. aegyptiacus* I from 1982 through 1989, 4725 bats were marked. The age of suckling and 'of growing bats was determined by the forearm length, the stage of physical development and the bats' weight. These bats constitute the known age groups. Adults were subjectively sorted into relative age groups according to the extent of abrasion of the canines. The age of recaptured adults which had been marked first as juveniles was evaluated by adding the interval period between the captures. The recapture of adult specimens first caught as adults provided data on the rate of canine abrasion. On

the basis of these recaptures each of the relative age groups was given a range of possible values in terms of absolute age. Among the oldest bats captured most were males, probably indicating that in nature females have a shorter life span. A comparison of the average forearm lengths of the different age groups showed that in both sexes older bats were significantly larger than younger adults indicating that there is a selective pressure favoring large size.

Makin, D. (1990). Annual weight cycle in the fruit bat *Rousettus aegyptiacus*. Abstract.

In the process of a capture-mark-recapture research conducted in Israel on the local fruit bat *R. aegyptiacus*, 6000 bats were marked, during the period of 1982-1990.

The adult specimens were subjectively sorted into relative age groups according to the abrasion of the canines.

The absolute age of the relative groups were estimated on the basis of the recaptures of known-aged specimens. The recapture of adult specimens provided information to the age determination by providing data on the rate of the abrasion of canines.

The relations between body weight, month of capture, time of capture, and age were investigated. The results show that body weight in adults has a circannual cycle, a daily cycle and is influenced by age.

Maloney, S. K., G. N. Bronner and R. Buffenstein (1999). Thermoregulation in the Angolan free-tailed bat *Mops condylurus*: A small mammal that uses hot roosts.

The Angolan free-tailed bat (*Mops condylurus*) uses roosts that often exceed 40° C, an ambient temperature (T_a) that is lethal to many microchiropterans. We measured the physiological responses of this species at T_a's from 15° to 45° C. Torpor was commonly employed during the day at the lower T_a, but the bats generally remained euthermic at night, with a mean body temperature (T_b) of 35.2° C. Metabolic rate reflected the pattern of T_b, increasing with falling T_a at night but decreasing during the day. Metabolic rate and evaporative losses were lower in torpid than in euthermic bats. Body temperature increased at each T_a > 35° C and was 43° C at T_a of 45° C. At T_a of 40° C bats increased dry thermal conductance and evaporative heat loss compared to lower T_a. At 45° C dry thermal conductance was lower than at 40° C and evaporative heat loss was 132 % of metabolic heat production. At high T_a there was only a slight increase in metabolic rate despite the employment of evaporative cooling mechanisms and an increase in T_b. Collectively our results suggest that *M. condylurus* is well suited to tolerate high T_a, and this may enable it to exploit thermally challenging roost sites and to colonise habitats and exploit food sources where less stressful roosts are limiting.

Manfredi Romanini, M. G., C. Pellicciari, F. Bolchi and E. Capanna (1975). Donnees nouvelles sur le contenu en ADN desnoyaux postkinetiques ches les chiroptees.

L'évaluation du contenu en ADN des noyaux postkinétiques (lymphocytes moyens) a été réalisée chez les Chiroptères par la méthode histophotométrique à l'aide d'un microdensitomètre intégrateur à balançage Vickers M86. Cinq espèces ont été soumises à l'analyse, un Mégachiroptère : *Pteropus giganteus*, et 4 Microchiroptères : 3 Vespertilionidés, *Myotis mystacinus, Eptesicus fuscus* et *Barbastella barbastellus*, et un Molosse, *Eumops perotis*. Ces résultats ont été comparés avec les données d'un précédent travail que les auteurs ont réalisé à propos de 8 autres espèces de Chiroptères : 3 Rhinolophidés et 5 Vespertilionidés. Les valeurs du contenu en ADN se sont révélées très faibles, inférieures à 71 % de la valeur présente chez l'homme.

The evaluation of DNA nuclear content in postkinetic nuclei has been made in the Chiroptera by the histophotometric method. Five species have been analysed. The results have been compared with earlier data obtained on other species. The values of DNA content are rather low.

Marandat, B. (1994). Premier catalogue des spécimens-types paléontologiques déposés dans les collections de l'Université de Montpellier II (Sciences et techniques du Languedoc).

Plus de 400 spécimens types paléontologiques déposés dans les collections de l'Université de Montpellier II sont inventoriés dans le présent catalogue qui comprend des charophytes, végétaux du Paléozoïque, brachiopodes, mollusques, arthropodes et des vertébrés (sélaciens, amphibiens, reptiles, oiseaux et mammifères). Les vertébrés ont été traités exhaustivement dans le catalogue et on peut donc considérer que ce dernier rassemble la quasi-totalité des spécimens types déposés à l'Université de Montpellier II.

More than 400 paleontological type-specimens housed in the Montpellier University collections have been inventoried in this catalogue which includes charophytes, Paleozoic plants, brachiopodes, molluscs, arthropodes and vertebrates (selachians, amphibians, reptiles, birds and mammals). The vertebrates have been treated exhaustively in the catalogue and one can consider that it includes most of the type specimens deposited in the Montpelier II collections.

Maree, S. and W. S. Grant (1996). Description of electrophoretic loci and tissue specific gene expression in the horseshoe bat genus *Rhinolophus* (Rhinolophidae).

The number of loci encoding an enzyme system, tissue specificity of gene expression and the degree of gene expression in various tissues are often not mentioned in evolutionary studies, but could indirectly provide evidence of evolutionary relationships. Protein electrophoresis was used to study the distributions and tissue specificity of gene expression of enzymes encoded by 42 loci in *Rhinolophus clivosus* and *R. landeri*, the genetically most divergent of the ten species of southern African horseshoe bats. No differences in gene expression were found between *R. clivosus* and *R. landeri* and isozyme patterns may be compared with other bat species to derive possible phylogenetic relationships.

Marshall, A. G. (1983). Bats, flowers and fruit: evolutionary relationships in the Old World.

Old World phytophagous bats (Megachiroptera: Pteropodidae) number 173 species of which 79 % are Asian and 21 % African. Bats arose, presumably monophyletically, in the early Tertiary, the Megachiroptera soon diverging from the Microchiroptera. By the Cretaceous-Tertiary boundary the major groups of modern angiosperms were present, some of these probably being pollinated nocturnally by large insects and non-flying mammals and others with seeds dispersed by terrestrial vertebrates. Early bats were perhaps initially attracted to such flowers and fruit by the insects found around them, later finding the plants themselves nutritious. Megabats today feed upon floral resources, fruit and leaves from a total of at least 183 plant genera in 64 families. They may effect both pollination and seed-dispersal, and both bat-flower and bat-fruit syndromes are commonly recognized. Individual species are generally catholic in their feeding, favoured food varying with locality and season. Depending upon roosting habits and season, megabats may travel considerable distances each night to feed and may undertake seasonal migrations. Their feeding in orchards may sometimes require their control, but the future of certain species is more seriously threatened by slaughter for food and particularly by habitat destruction.

Marshall, A. G. (1985). Old World phytophagous bats (Megachiroptera) and their food plants: a survey.

The Megachiroptera, with a single family, 43 genera and 174 species, are confined to the Old World tropics and subtropics where they are exclusively phytophagous, feeding upon floral resources (largely

nectar and pollen but also petals and bracts), fruit, leaves and water. A literature survey revealed information on the food sources for only 21 genera of bats, these feeding upon 75 genera of flowers, 145 genera of fruit and 10 genera of leaves in a total of 34 orders, 66 families and 198 genera. The bats are likely to pollinate flowers of at least 31 genera and presumably may disperse the seeds of the majority of fruits consumed. Despite our ignorance about the relationship between Megachiroptera and plants, it appears that most bats are catholic in their choice of food, and most plants are visited by a diversity of bats.

Mathias, M. da Luz (1988). An annotated list of the mammals recorded from the Madeira islands.

Twenty five species of extant mammals are cited for the Madeira Islands, including 13 species of marine mammals. Vernacular names and the world distribution for each species are given together with biological and ecological comments.

These species include five bats (Chiroptera), two carnivores (Carnivora), two seals (Pinnipedia), ten toothed whales (Cetacea, Odontoceti), one baleen whale (Cetacea, Mysticeti), one even-toed ungulate (Artiodactyla), three rodents (Rodentia) and one lagomorph (Lagomorpha).

Neste trabalho são referidas, com anotações, as 25 espécies de mamíferos actuals que ocorrem no Arquipelaqo da Madeira, incluindo as 13 espécies de mamíferos marinhos. As areas de distribuìção e os nomes vernaculos das espécies vão indicados juntamente com alquns comentários sobre a biología e ecologia das mesmas.

Mathias, M. L., M. G. Ramalhinho, M. Santos-Reis, F. Petrucci-Fonseca, R. Libois, R. Fons, G. Ferraz de Carvalho, M. M. Oom and M. Collares-Pereira (1998). Mammals from the Azores islands (Portugal): an updated overview.

Nine species of mammals arc recorded for the Azores islands: one insectivore (*Erinaceus europaeus*), two bats (*Myotis myotis, Nyctalus azoreurn*), one lagomorph (*Oryctolagus cuniculus*), three rodents (*Rattus norvegicus, R. rattus. Mus musculus domesticus*) and two carnivores (*Mustela nivalis, M. furo*). Here, notes on the origin and known distribution are given for each species, together with taxonomical and ecological comments. Except for bats all the remaining species seem to have been introduced under the influence of man's exploratory and commercial activities.

Neuf espèces de mammifères sont citées de l' Archipel des Açores: un insectivore (*Erinaceus europaeus*), deux chiroptères (*Myotis myotis, Nyctalus azoreum*), un lagornorphe (*Oryctolagus cuniculus*), trois rongeurs (*Rattus norvegicus, R. rattus, Mus musculus domesticus*) et deux carnivores (*Mustela nivalis, M. furo*). Le present travail apporte des données sur l'origine et la distribution, ainsi que certains aspects de la taxonomie et l'ecologie de chaque espèce. Exception faite des chiroptères, routes les espèces semblent avoir été introduites, suite à des activités humaines (exploration et commerce).

Matschie, P. (1897). Zur Faunistik Deutsch-Ost-Afrikas. 5. Säugethiere.

Seit dem Erscheinen meines Buches: "Die Säugethiere Deutsch- Ost-Afrikas. Dietr. Reimer, Berlin, 1895." ist unsere Kenntniss der ostafrikanischen Säugethiere erheblich gefördert worden. Nicht nur die Zahl der für das Schutzgebiet bekannten Arten hat zugenommen, sondern auch über die geographische Verbreitung der einzelnen Species und über die Unterschiede der Säugethier-Fauna in den verschiedenen Gegenden unseres Gebiets ist etwas mehr Licht verbreitet worden. Allerdings sind wir noch weit entfernt von einem ein germaassen befriedigenden Ueberblick über die Vertheilung der Sängethierwelt in Deutsch-Ost-Afrika.

Ich habe in meiner grösseren Arbeit (p. X) die Ansicht ausgesprochen, dass in Deutsch-Ost-Afrika zwei Faunen-Gebiete zusammenstossen, ein südliches und ein nördliches, und habe als Grenze für das südliche Gebiet eine Linie angegeben, die vom Kilima-Ndjaro über Umbugwe und West-Nguru nach Mpapwa verläuft. Ich glaube jetzt auf Grund neuerer Sammlungen diese Linie ergänzen zn können.

Ziemlich sicher erscheint es, dass das gesammte Küstengebiet in der Zusammensetzung seiner Fauna einen einheitlichen Charakter aufweist. Natürlich werden im Urwalde andere Arten leben als in der Steppe, und die Ebene wird uns ein anderes Bild zeigen als das Gebirge; aber die Urwald-Fauna des deutschostafrikanischen Küstengebietes wird überall da, wo im Gebiet Urwald vorhanden ist, ungefähr gleichartig sein, und ebenso wird in den Steppen allüberall dort eine ganz bestimmte Zusammensetzung der Säugethier-Fauna obwalten. Als Hinterlandsgrenze dieses Gebietes sehe ich eine Linie an, welche die Flusssysteme des Rovuma, Rufiji, Kingani, Wami, Mligasi, Msangasi und Pangani umfasst. - Sehr verschieden von diesem Gebiet ist die Massai-Steppe in der Zusammensetzung ihrer Fauna. Als drittes Untergehiet ist das übrige Hinterland von der Wembaere-Steppe nach Westen anzusehen und als viertes Untergebiet erscheint das System des Kagera im Westen des Victoria-Nyansa und der äusserste Nordzipfel von Deutsch-Ost-Afrika nördlich vom Speke-Gold im Osten des Nyanusa. Dieses letzte Gebiet zeigt unverkennbar westafrikanische Einflusse, das Massai-Gebiet solche des Nordostens, die Küste solche des Südens und das Hinterland scheint eine Mischfauna zu besitzen, in der nördliche und südliche Einflüsse bemerkbar sind. Wahrscheinlich wird die Ost- und Nordküste des Nyassa und das Kondeland ein fünftes Untergebiet bilden, in welchem die reine Zambese-Fanna vorhanden sein dürfte.

Sehr eigeuthümlich zusammengesetzt ist die Fauna des Kilima-Ndjaro. Hier finden wir sehr viele Formen, welche in der Massai Nyika ihre Südgrenze haben. Wenn man berücksichtigt, dass auf dem Kilima-Ndjaro der zum Indischen Ocean fliessende Pangani entspringt, dass aber andererseits dort die Massai-Steppe beginnt, so werden wir uns nicht wundern, hier Faunen zweier verschiedener Untergebiete neben einander zu finden.

Matschie, P. (1899b). Die Fledermäuse des Berliner Museums für Naturkunde. 1. Lieferung. Die Megachiroptera des Berliner Museums für Naturkunde.

Professor Dr. Peters, 1857 - 1883 Direktor des Berliner Zoologischen Museums, hatte beabsichtigt, unter dem Namen: Museum: Zoologicum Berolinense. Chiroptera eine Monographie der Fledermäuse herauszugeben. Während der Jahre 1865 - 1883 sind für diesen Zweck 75 lithographirtr Tafeln durch die bekannten, inzwischen verstorbenen Thiermaler Franz Wagner und Gustav Mützel hergestellt worden. Im Frühjahr 1883 starb Peters und in seinem Nachlasse fand sich keinerlei Manuskript über Fledermäuse. Die Verlagsbuchhandlung von Georg Reimer, welcher die Tafeln gehören, bemühte sich Jahre lang vergeblich, einen Herausgeher für die werthvollen Abbildungen zu finden. Erst jetzt, 34 Jahre nach der Herstellung der ersten Tafel, erscheint der erste Theil des Werkes.

Die Verlagsbuchhandlung hat in ausserordentlich weitgehender Weise dafür gesorgt, dass die vorliegenden Tafeln soweit ergänzt werden konnten, wie der heutige Stand unserer Kenntniss der Fledermäuse es verlangt. Nicht weniger als 15 neue Tafeln sollen zu den schon vorhandenen 75 treten; 11 von ihnen wurden gezeichnet und lithographirt durch meine Frau Anna, geb. Held, und dürfen sich gleichwerthig den von Wagner und Mützel gearbeiteten an die Seite stellen. Der Tod hat meine Frau verhindert, ihr Werk zu vollenden.

Bei der Aufgabe, einen Text zu diesen Tafeln zu schreiben, habe ich darauf verzichten müssen, eine Monographie der Fledermäuse zu schaffen, weil das im Berliner Museum für Naturkunde aufbewahrte Material nicht ausreicht für die Bearbeitung dieser nicht leichten Aufgabe, und ein längerer Aufenthalt in Paris, London und Leyden zum Studium der dortigen Sammlungen mir nicht möglich war.

Ich habe mich deshalb damit begnügt, nach zoogeographischen Gesichtspunkten die Arten, welche mir vorlagen, in Gruppen zusammenzustellen, die von mir nicht untersuchten Arten nach Möglichkeit neben die am nächsten verwandten Formen einzureihen, in Bestimmungstabellen die Unterschiede anzugeben, welche ein Erkennen der einzelnen Arten erleichtern, und die im Berliner Museum vorhandenen Exemplare aufzuzählen.

Besonderen Werth habe ich auf eine genaue Feststellung der Fundorte gelegt.

Die Litteratur wurde im allgemeinen nur insoweit genannt, als sie nicht in Trouessart's und Dobson's Werken zu finden ist.

Durch die Liebenswürdigkeit des Herrn Geheimen Hofraths Dr. A. B. Meyer, Direktor des Zoologischen Museums in Dresden, ist es mir vergönnt gewesen, einen Theil des Dresdener Materials an Flughunden hier in Berlin untersuchen zu dürfen.

Mit seiner Bewilligung habe ich diese Exemplare in meiner Arbeit aufgeführt.

Ich sage hier Herrn Geh. Hofrath Dr. A. B. Meyer meinen herzlichsten Dank. Auch Herrn Dr . Jentink , Direktor des Leydener Museums, haue ich für eine freundliche Auskunft auf eine Fruge zu danken, vor allem aber meinem verehrten Herrn Chef, Geh. Regierungsrath Professor Dr. K. Möbius, welcher mich in weitgehender Weise unterstützte.

Den ersten Theil meiner "Fledermäuse des Berliner Museums für Naturkunde" lege ich hiermit vor. Er umfasst die *Megachiroptera*. In 4 Lieferungen soll der gesammte Stoff bewältigt werden. Eine allgemeine Einleitung in die Fledermauskunde werde ich der Ietzten Lieferung beigeben.

Matthews, L. H. (1937). The form of the penis in the British rhinolophid bats compared with that in some of the vespertilionid bats.

1. Although the penis of the Chiroptera is generally described as pendulous, it is directed cranially in *Rhinolophus ferrum-equinum insulanus* and *R. hipposideros minutus*.

2. In five species of British Vespertilionid bats the penis varies from the cranially directed type to the completely pendulous type.

3. The glans penis in the Rhinolophidse is large and complicated in architecture, but in the Vespertilionids it is very small and comparatively simple.

4. The form and structure of the glans penis and prepuce in *R. ferrum-equinum insulanus* and *R. hipposideros minutus* are briefly described and compared with those of five species of British Vespertilionid bats.

5. The biological correlations and taxonomic importance of the differences in the form and structure of the glans penis in the Rhinolophidae and the Vespertilionidae are indicated.

Matthews, L. H. (1941). Notes on the genitalia and reproduction of some African bats.

1. The anatomy and histo-physiology of the genitalia of nine species of African bats are described. The species are *Cœlura afra* Peters, *Taphozous* sp. indet. (Fam. Emballonuridæ); *Nycteris luteola* Thos. and *N. hispida* Schreb. (Fam. Nycteridæ); *Cardioderma cor* Peters (Fam. Megadermidæ); *Hipposideros caffer* Sund. and *Trænops afer* Peters. (Fam. Hipposideridæ); *Miniopterus minor* Peters and *M. dasythrix* Temm. (Fam. Vespertilionidæ).

2. The glans penis is large and complicated in structure in *C. cor* and *T. afer*, smaller in *N. luteola, N. hispida* and *H. caffer*, and minute in *Taphozous, M. minor* and *M. dasythrix*. The prepuce is thin and retractile in the first five; thick and glandular in the last three.

3. An os penis of complicated architecture is .present in *N. luteola, C. cor* and *T. afer*. It is of simple form, in *N. hispida, Taphozous* and *H. caffer*. It is comparatively large in the first four species and extends into the penis proximal to the glans. In the last two it is minute and confined to the glans. There is no os penis in *M. minor* and *M. dasythrix*.

4. Accessory erectile bodies, in addition to the corpora cavernosa and corpus spongiosum, are present in all species. They are "particularly conspicuous in *N. luteola* and *C. cor*. The corpora cavernosa are fused for the whole or part of their length in all species ; in some they are separated by a septum of tunica albuginea, in others they are completely fused.

5. The scrotum is post-anal, the testes are oval and the epididymides have long tails in *M. minor* and *M. dasythrix*. The testes and epididymides are similar but lie beneath the integument of the base of the penis in immature specimens of *Taphozous*. The scrotum is pre-arial, the testes are subglobular and the. epididymides do not have greatly elongated tails in *N. luteola* and *C. cor*. The testes and epididymides are similar in form in *N. hispida* and *H. caffer*, but in *T. afer*, though the testes are subglobular, the tails of the epididymides are long. In the first species they lie in the inguinal canals at the sides of the base of the penis; in the last two cranial to the base of the penis. In all three free spermatozoa are present in the genital tract. It is possible that the testes have been withdrawn from pre-anal scrotal pouches, though no structural evidence for this was found.

6. Vesiculæ seminales are present in *T. afer* and *Taphozous*. They are large glandular bodies, whose ducts open into the urethra near the openings of the vasa efferentia in *T. afer*, and unite with the vasa efferentia near their openings in *Taphozous*. Vesiculæ seminales are absent in the other species.

7. The ampullæ of Henle are represented by a slight convolution of the vas deferens in *T. afer* and by small glandular swellings in *Taphozous*. In all the other species they are large glandular swellings of the ends of the vasa deferentia and are comparable in structure with the vesiculæ seminales in the two species where those bodies occur. In *H. caffer* they are divided into two unequal lobes.

8. The prostate is a large glandular mass below the neck of the bladder. It surrounds the urethra, having large anterior and posterior lobes, in all species except *N. luteola* and *N. hispida*. In the latter two species it is confined to the posterior surface of the urethra. In several species the ampullæ of Henle are partly embedded in the prostate.

9. The urethral gland is large in *C. cor* and *H. caffer*, small in *T. afer, M. minor* and *M. dasythrix*. It is absent in *Taphozous, N. luteola* and *N. hispida*.

10. A utriculus prostaticus is present in *Taphozous, N. luteola. H. caffer* and *C. cor*. It is comparatively large in *Taphozous* and ends in a number of diverticula; it is small and simple in the other three. No sign of a utriculus prostaticus was found in *N. hispida, T. afer, M. minor* or *M. dasythrix*.

11. Cowper's glands are comparatively large in all species.

12. The vulvar opening is transverse in all species. The clitorideal pad is large in *C. cor* and *T. afer*, less developed in *C. afra, N. luteola* and *N. hispida*, and small in *Taphozous, M. minor* and *M. dasythrix*.

13. Pubic teats, unconnected with a mammary gland, are present in *C. cor* and *T. afer*. In both species they contain canals which are identical in histological appearance with true milk-ducts. The canals end blindly at the base of the teats. No pubic teats occur in the other species. Rudimentary pubic teats are present in the males of *C. cor*.

14. The uterine cornua are approximately equal in size in *C. afra*. One cornu is slightly larger, on the right side in *Taphozous* and *N. hispida*, and on the right or left side in *N. luteola* and *T. afer*. It is considerably larger on the right side in *M. minor* and *M. dasythrix*. A pregnancy was present, or had occurred, on the right side in *C. afra* (one specimen), *N. hispidia* (three),*M. minor* (thirteen), and *M. dasythrix* (six). In *N. luteola* occurrences were right side, six; left side, seven. In *T. afer* and *C. cor* the pregnancy fills the cornua of both sides, together with the body of the uterus which are thrown into one large cavity. Assuming that the pregnancy started on the side to which the placenta is attached, it started in the left side in two specimens of *T. afer* and once each on the left and right in *C. cor*.

15. There is no internal uterine body in *N. luteola* and *N. hispida*, where each cornu communicates with its own cervical canal which opens separately into the vagina. There is a completely divided septate uterine body communicating with a- single cervical canal in *Taphozous*. The undivided uterine body is very short in *T. afer, M. minor* and *M. dasyihrix*, and short and wide in *C. afra*.

16. The epithelium of the vagina, is thrown into high longitudinal ridges in *N. luleola, N. hispida, C. cor* and *T. afer*, and into comparatively low ones in the other species. The epithelium becomes strongly cornified at oestrus. In one pregnant specimen of *C. afra* the urinogenital canal was strongly constricted and its lumen nearly occluded by cornified epithelium.

17. The urethra is asymmetrical, being displaced to the right of the vagina, in the females of *C. afra, N. luteola* and *T. afer*. In all the other species it is symmetrical.

18. A "female prostate" is well developed in *C. afra, Taphozous, N. luteola* and *C. cor*, less conspicous in *M. minor*, and absent in *N. hispida, T. afer* and *M. dasythrix*.

19. One corpus luteum was present in each ovary of two pregnant *C. cor* which were near full term. One was present in the ovary of the side of pregnancy in a *C. afra* containing an early pregnancy. One was present in .the ovary of the opposite side from the pregnancy in six *M. dasythrix* containing unattached blastocysts in the enlarged right cornu. No corpora lutea were present in either ovary of pregnant' examples of *N. luteola* (nine) or *T. afer* (two).

20. A post partum œstrus occurs in *N. luteola*. All the nine pregnant specimens were.also in full lactation.

21. In the localities of provenance birth occurs approximately at the following times: - in early December, *N. hispida* and *M. minor*; in early January, *C. cor* and *T. afer*; late in January, *C. afra*; in November and again late in January, *N. luteola*, where one pregnancy immediately follows another.

22. In all species the mammary gland fills the axilla and extends well on to the back over m. serratus magnus. The nipples are thoracic in position and lie towards the median border of the gland.

Mayoux, A., E.-R. Brygoo and J.-R. Simond (1971). Bilan d'une année d'étude de *Pteropus rufus* à Madagascar son rôle comme réservoir de virus d'entérobactéries.

Le rôle de réservoir de virus pour les entérobactéries pathogènes pour l'homme, de la roussette de la côte est de Madagascar est maintenant bien démontré avec l'isolement de 45 souches de *Salmonella typhi*, d'une souche *S. typhimurium* et d'une *Salmonella* nouvelle en même temps que de 16 souches de *Shigella flexneri* et de 5 souches d'*Escherichia coli* pathogènes. Ces souches ont été obtenues par l'examen de 438 animaux. Le bacille d'Eberth appartient au lysotype E_{Ia}, le plus fréquemment rencontré en pathologie humaine.

Les rapports de la chauve-souris et de *S. typhi* doivent encore être précisés. La salmonelle se comporte comme un germe de sortie, n'apparaissant le plus souvent, dans le sang, et surtout dans les selles, que chez des animaux soumis à des agressions.

McBee, K., J. W. Bickham, S. Yehbutra, J. Nabhitabhata and D. A. Schlitter (1986). Standard karyology of nine species of Vespertilionid Bats (Chiroptera: Vespertilionidae) from Thailand.

Karyotypes of nine species of vespertilionid bats from Thailand are described. *Pipistrellus mimus* (2n = 34, FN = 46), *Tylonycteris robustula* (2n = 32, FN = 50), *Murina leucogaster* (2n = 44, FN = 50), and *Miniopterus schreibersi* (2n = 46, FN = 52) have karyotypes essentially identical to ones previously reported from other regions. *Pipistrellus pulveratus* (2n = 32, FN = 50) is reported for the first time and differs by six Robertsonian fission/fusion events from the primitive *Myotis*-like karyotype. Karyotypes for *Hesperoptenus tickelli* (2n = 32, FN = 50) and *H. blanfordi* (2n = 34, FN = 60) are reported for the first time and parallel the extreme morphological differences between the two species. *Harpiocephalus mordax* (2n = 40, FN = 62) is very distinct from other members of the subfamily Murininae but is apparently derived from a *Murina*-like ancestor. *Kerivoula papillosa* (2n = 38, FN = 52) though considered little differentiated from primitive vespertilionines has a relatively highly derived karyotype similar to *Vespertilio*.

McBee, K., D. A. Schlitter and R. L. Robbins (1987). Systematics of African bats of the genus *Eptesicus* (Mammalia: Vespertilionidae). 2. Karyotypes of African species and their generic relationships.

Bats of the genus *Eptesicus* are characterized by extreme consistency in karyotypes. All species of *Eptesicus* for which karyotypes have been reported have 2n = 50, FN = 48 (Baker and Patton, 1967; Williams, 1978; Bickham, 1979a) except the African *E. capensis*, which has 2n = 32, FN = 50 (Peterson and Nagorsen, 1975). We report standard karyotypes for four more species of African *Eptesicus*, none of which possess the 2n = 50 karyotype considered typical of the genus. *Eptesicus rendalli* (2n = 38), *E. brunneus* (2n = 36), *E. tenuipinnis* (2n = 34), and *E. somalicus* (2n = 26) all apparently have experienced numerous Robertsonian events and do not mirror the karyotypic conservatism of their New World and Palearctic relatives. These data are discussed as they apply to the currently recognized systematics of the genus *Eptesicus* and the proposed primitive karyotype of the family Vespertilionidae.

McDonald, J. T., I. L. Rautenbach and J. A. J. Nel (1990a). Foraging ecology of bats observed at De Hoop Provincial Nature Reserve, southern Cape Province.

Prey preferences, foraging strategies, foraging zones, activity regimes and habitat selections of the five species of insectivorous bats at the Guano Cave on the De Hoop Provincial Nature Reserve, were investigated. It is evident that the cave is used on a seasonal basis by the different species. A measure of temporal and spatial separation of resources between species could be demonstrated, particularly of airspace and prey, and this differentiation correlates with differences in specific wing morphology and echolocation attributes. It would appear that bats do not feed extensively over nearby wheat fields, and available evidence suggests that the potentially deleterious effect of insecticide poisoning does not presently seem to be a major threat to the bat populations.

Prooivoorkeure, jagstrategiee, jagsones, aktiwiteitsritmes en habitatvoorkeure van die vyf insekvretende vlermuisspesies in die gwanogrot gelee in die De Hoop Provinsiale Natuurreservaat, is ondersoek. Dit is duidelik dat die grot seisoenaal deur die onderskeie spesies benut word. 'n Mate van ruimtelike en temporele skeiding van bronne tussen spesies is demonstreerbaar, veral van die lugruim en van prooi, en hierdie differensiasie korreleer met verskille in vlerkmorfologie en egolokasie-kenmerke tussen spesies. Dit blyk dat vlermuise nie ekstensief oor nabygelee graanlande jagmaak nie, en beskikbare gegewens dui daarop dat die vermeende nadelige gevolge van insekdoder-vergiftiging dus nie huidig 'n bedreiging vir die vlermuisbevolkings inhou nie.

McDonald, J. T., I. L. Rautenbach and J. A. J. Nel (1990b). Roosting requirements and behaviour of five bat species at De Hoop Guano Cave, southern Cape Province of South Africa.

The roosting requirements and behaviour of five obligatory cave-dwelling bats occurring in the De Hoop Guano Cave, is reported. A measure of interspecific temporal and spatial partitioning of this resource is demonstrable. The cave is characterized by structural and thermal complexity, and was found to be an important breeding site for two species during summer, whereas it served as winter residence for the other three. *M. schreibersii* was by far the most abundant species, and predominated in the warmest sections of the cave, where it further modified temperatures towards optimal levels.

Die skuilplek-behoeftes en -gewoontes van vyf grotvlermuise wat in die De Hoop Gwanogrot voorkom, word gerapporteer. Ons bevindinge dui op 'n mate van interspesifiese ruimtelike en temporale be nutting van hierdie bron. Die grot word gekenmerk deur strukturele en termo-kompleksiteit, en is daarom 'n belangrike aanteelplek vir twee spesies gedurende die somer, terwyl dit dien as oorwinterings-verblyfplek vir die ander drie. *M. schreibersii* was verreweg die getalsterkste spesies,

en het hoofsaaklik in die warmste dele van die grot gekonsentreer, waar hul ook temperature aangepas het na optimale vlakke.

McFarland, D. C. (1998). Forest vertebrate fauna study for a comprehensive regional assessment in south-east Queensland. Stage IA: Data audit and gap assessment.

This report has been prepared for the joint Commonwealth/State Steering Committee which oversees the Comprehensive Regional Assessment (CRA) of forests in the South East Queensland CRA region.

The Comprehensive Regional Assessment provides the scientific basis on which the State and Commonwealth governments will sign a Regional Forest Agreement (RFA) for the forests of the South East Queensland CRA region. This agreement will determine the future of the region's forests, providing a balance between conservation and ecologically sustainable use of forest resources.

This report was undertaken to a) collate existing fauna information concerning the distribution (and where possible habitat use, abundance and breeding activity) of freshwater and terrestrial vertebrates and selected invertebrates for the South-east Queensland Comprehensive Regional Assessment region, and b) identify significant gaps in the dataset.

A total of 306,269 records was collected for 586 native and 44 feral forest using taxa known from the region. The number of records per species ranged from 1 to 7,496.

Across the entire region, major taxonomic gaps are apparent for threatened insects, freshwater fish, reptiles and bats. At a finer spatial scale, data are limited for most animal groups in conservation (National Park) and forestry (State Forest/Timber Reserve) areas in those environmental provinces outside the south-east corner (Provinces 5, 6, 7, 8, 10 and 16). The deficiencies in most provinces are real and not simply a reflection of the spatial extent of various tenures and habitat types. On the environmental scale, there are fauna in particular vegetation types which would benefit from a greater spatial coverage (distribution of species in the extensive dry forests of Spotted Gum and ironbark). In addition several rainforest, wet sclerophyll forest and non-eucalypt dominated types, despite relatively intense work, may still yield new fauna species with more survey effort.

The audit of the historical data reinforces the need for an extensive systematic survey of terrestrial vertebrates in the region to address deficiencies and provide more recent information on the abundance and distribution of forest-dwelling species.

McLellan, L. J. (1986). Notes on bats of Sudan.

Based upon recent collections ofbats from Bahr-el-Ghazal and Equatoria provinces in southern Sudan, *Epomophorus minor* is added to the list of species known from that country, and the geographic ranges of *Micropteropus pusillus, Eptesicus capensis, Eptesicus somalicus*, and *Chaerephon major* are extended within Sudan. Examples of species poorly represented in museum collections were also collected, including *Nycteris thebaica, Chalinolobus variegates*, and *Scotoecus hirundo*. Ecological notes were recorded; embryos and parasites were collected and preserved. Seventy-one species of bats are now known to occur in Sudan.

McWilliam, A. N. (1982). Adaptive responses to seasonality in four species of Microchiroptera in coastal Kenya.

A field study on the ecology of a multi-species association of insectivorous cave-bats was conducted on the south coast of Kenya from December 1976 to November 1979, to examine the seasonality of the climate and its effect, through the insect food supply and the body condition of selected bat species,

on the timing of the reproductive cycles of these bats (*Hipposideros commersoni, Hipposideros gigas, Taphozous hildegardeae* and *Miniopterus minor*) and to investigate their social organisation.

The environmental seasonality of the study area, induced principally by the rainfall regime, led to relatively high numbers of insects becoming available as food for bats in both the long (April-June) and the short (November-December) rains, with a pronounced drop in insect numbers occurring in the long dry season (July-October) and less markedly in the short dry season (January-March).

Correlated with these fluctuations in their food supply, all the studied bat species showed very marked body weight cycles largely due to the deposition of fat during the rains, and low body weights were found in the dry seasons.

The more resource demanding reproductive activities (regeneration of the reproductive tract and competitive mating in males, late pregnancy and early lactation in females) and the growth of young, were in all species coincident with the periods of higher food availability. The long cold dry season, when body condition was at a nadir, was avoided for all but the least demanding activities, such as early pregnancy among females. Reproductive adaptations of these monoestrus species to this seasonality are described.

H. commersoni, H. gigas and *M. minor* seasonally migrated from the study area, apparently in response to the earlier onset of rain inland and improvement in food supply. These species have seasonally polygynous mating systems that involve competition between males for mating sites and females. Although *T. hildegardeae* also have a polygynous mating system, females did not migrate and suitable roost sites were limiting, resulting in the annual retention of territories and associated groups of females by competing males. Behaviours, displays and dispersion patterns associated with the social organisation of these species are described.

McWilliam, A. N. (1987a). Territorial and pair behaviour of the African false vampire bat, *Cardioderma cor* (Chiroptera: Megadermatidae), in coastal Kenya.

Cardioderma hangs from habitual perches to wait for mainly terrestrial prey. Their broad wings provide the lift at low speeds necessary to capture such prey from the ground. Male-female pairs were found in the long dry season, a period when reduced insect availability led to lower body weights and males used song to delineate their feeding territories. Males moved between perches more frequently during the first half-hour of nightly singing. An enlargement of foraging area was associated with earlier singing, as well as an increase in song rate, movement between perches and pair contact-vocalizations. Females are larger than males and the sex ratio favoured the latter. There was evidence of long-term territories and breeding throughout the year. These results are discussed in relation to pair-bonding and environmental seasonality

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McWilliam, A. N. (1988a). Social organisation of the bat *Tadarida (Chaerephon) pumila* (Chiroptera: Molossidae) in Ghana, West Africa.

The social organisation of the polyoestrous bat, *Tadarida pumila*, was studied in northern Ghana (W. Africa). Although this small (8.5 g) free-tailed bat is not sexually dimorphic in size, adult males develop an odorous inter-aural crest of long hairs. A social system based on female defense polygyny was found which, however, also involved elements of resource defense. Harems, each generally established in the roof space of separate dwelling houses with restricted access, consisted of an adult male and up to 21 females, with their young, and the larger harems were held by heavier males. Harem composition was stable and both harem males and females showed high site fidelity over the study span of 16 months. Some female young were recruited to their natal harems, at a sufficient rate to replace the annual loss of harem females. However, most young, which were born in three successive cohorts during the rainy season, apparently dispersed over the dry season, following early sexual maturation. The potential causes and benefits of female associations are discussed.

McWilliam, A. N. (1988b). The reproductive cycle of male tomb bats, *Taphozous hildegardeae* (Chiroptera: Emballonuridae), in a seasonal environment of the African tropics.

Two cave populations of Hildegarde's tomb bat had a reproductive cycle that corresponded closely to the rainfall-induced seasonality of coastal Kenya (4s). Males had pronounced bimodal cycles of body weight due to the deposition of fat during periods of relative food abundance in both rainy seasons, and fat depletion during competitive mating and the dry seasons, when numbers of moths were lowest. The main period of sexual regeneration coincided with the increase in body weight experienced during the 'long rains' [April-June) and led to mating. A secondary peak in the weights of male sexual glands, associated with the increase in body weight that occurred in the 'short rains' (October-December), did not result in reproduction. It is suggested that this latter period of sexual activity was related to the maintenance of year-round harems, and may represent the male response to a vestigial, bimodally polyoestrous, reproductive cycle.

Meester, J. A. J. (1962). Some mammals from the Namib Desert.

The following is an account of the mammal specimens collected on the Bernard Carp expedition to the Namib desert during May 1959. It is a pleasure to acknowledge the generous sponsorship of Mr Bernard Carp, of Cape Town, which made this expedition possible. Sincere thanks are also due to the following: Dr C. K. Brain, of Salisbury, for collecting some of the specimens, and kindly placing at my disposal his habitat notes on these specimens; the late Dr W. Heesch, of Okahandja, for material collected by him in the course of the expedition, as well as some specimens from his private collection; Mr O. P. M. Prozesky, of Pretoria, for also assisting in collecting, and for supplying useful information regarding collecting localities; and the Transvaal Museum skinner, Samson Maseko, for his part in collecting, preparing and caring for the collections.

Meester, J. (A. J.) (1965). The origins of the southern African mammal fauna.

Southern Africa can be geographically subdivided into different biotic zones, differing from each other climatically and vegetationally, and also in respect of the animal species occurring in them. The purpose of the present paper is to consider the nature of the mammal faunas associated with these biotic zones, and to speculate about their origins.

Mein, P. and Y. Tupinier (1977). Formule dentaire et position systématique du Minioptère (Mammalia, Chiroptera).

La présence constante d'une prémolaire vestigiale antérieure au maxillaire supérieur des *Miniopterus* amène les auteurs à discuter des affinités de cette forme et à proposer pour elle la création d'une nouvelle famille (Miniopteridae).

Miniopterus is shown to possess a supplementary vestigial tooth between upper canine and the first premolar. The authors think this form does not belong to the Vespertilionidae and suggest to create a new family called Miniopteridae and include this genus into it.

Meirte, D. (1981). New data on *Casinycteris argynnis* Thomas, 1910 (Megachiroptera - Pteropodidae). Abstract.

The cranial and external measurements of the thirteen specimens of *Casinycteris argynnis* in the possession of the Koninklijk Museum voor Midden-Afrika, Tervuren (Belgium), are presented.

A comparison with published data on three other records is made, remeasurements of the type in the British Museum (Natural History) are included.

Females are clearly larger than males: forearm-length is highly discriminative: adult males 50.4 - 54.2 mm, adult females 56.1 - 61.6 mm. One juvenile specimen with the wing dimensions of an adult male is concluded to be a female.

Color and color patterns are very homogeneous throughout the series. The variation in palatal ridges is described.

Principal component analysis could not detect significant allometrical relations, the width of the skull is clearly a size independent variate. There is a slight indication that the western (Cameroon) specimens are more heavily built than the eastern ones.

This poor known forest species is so far only found in the central African forest bloc and is thought to be locally quite abundant.

Meirte, D. (1983). New data on *Casinycteris argyinnis* Thomas 1910 (Megachiroptera, Pteropidae).

The external morphology and the external and cranial morphometries of the *Casinycteris argynnis* specimens in the possession of the Koninklijk Museum voor Midden-Afrika, Tervuren, Belgium, were studied. Of thirteen specimens eleven are new records which add seven new localities for this poor-known species. Variation in color, teeth and palatal ridges was studied. Morphometrical data reveal significant sexual dimorpbism; especially in forearm length females are larger than males. Apparently also decrease in size from west to east is present. The species remains restricted to the central forest block in Africa.

Menu, H. (1984). Révision du statut de *Pipistrellus subflavus* (F. Cuvier, 1832). Proposition d'un taxon generique nouveau: *Perimyotis* nov. gen.

L'examen de la denture de *P. subflavus*, effectué dans le cadre d'une étude cornparative des rangées dentaires des Vespertilioninés, permet de mettre en évidence des structures qui justifient le retrait de cette espèce du genre *Pipistrellus*. En outre, certains caractères odontologiques s'avèrent être communs à *subflavus* et aux Myotini: ils témoignent d'une ascendance commune. Concurremment, quelques points de la morphologie dentaire sont particuliers; ils résultent d'une évolution indépendante et différenciatrice. Par ailleurs, des arguments ostéologiques ont été recherchés; ils apparaissent, par exemple, aux niveaux de l'articulation distale de l'humérus et de l'os pénien. Ces considérations justifient la création d'un taxon générique nouveau (*Perimyotis* nov. gen.), concrétisant l'appartenance de *subflavus* à la tribu des Myotini.

Within a comparative study of the tooth rows of vespertilionine bats, the *subflavus* species let appear structures which justify the removal of this species from the genus *Pipistrellus*. Moreover sorne features shared by *subflavus* and the Myotini tribe give evidence of a common ancestry of both. Concurrently, a few peculiar characters of the *subflavus* dental rnorphologv appear the result of subsequent differential evolution.

Skeletal features have also been investigated. Sorne arguments can be obtained from the elbow articulation of the humerus and from the penian bone.

These facts justify the erection of a generic taxon, *Perimyotis* nov. gen., making allowance for the relationships between it and the Myotini group.

Menu, H. (1985). Morphotypes dentaires actuels et fossiles des chiropteres vespertilionines. I Partie: Etude des morphologies dentaires.

Les classifications des vespertilioninés actuels étaient bâties sans qu'il soit tenu compte de la morphologie dentaire, ce qui restreignait les possibilités de comparaisons avec les fossiles connus. L'utilisation des formules dentaires était abusive: cette pratique a notablement contribué à l'admission de genres artificiels. Ces conditions ont retardé la valorisation de caractères susceptibles de structurer les bases d'une phylogénie de la sous-famille.

Dans la première partie du travail, les morphologies dentaires sont décrites et analysées. Des types morphologiques de référence sont établis pour chaque dent des rangées supérieure et inférieure; ils sont destinés à faciliter l'élaboration de critères de différenciation. Les réponses des espèces à ces critères permettent de les regrouper en genres homogènes, et d'appréhender le degré de parenté que ces derniers ont entre eux.

La seconde partie du travail (à paraître) commentera les implications systématiques des observations et proposera les bases d'une approche phylogénique.

The classifications of the recent vespertilionine bats were made without taking in account the teeth morphology; this resulted in a reduction of the possibilities of comparison with the available fossils. The generalized use of dental formulae was abusive: this contributed to the admission of artificial genera. These conditions have long delayed the consideration of characters able to frame the phylogeny of the sub-family.

In the first part of the study, the teeth morphologies are described and analysed. Morphological reference types are established for cach upper and lower tooth: they should make an easier elaboration of criteria for the ditterenciation at generic level. The position of the species in view of these criteria allows one to group them in to homogeneous genera, and to appreciate the degree of relationship that the latter have between them.

The second part of the study (next publication) will develop inferences dealing with systematics and phylogeny.

Menu, H. (1987). Morphotypes dentaires actuels et fossiles des chiroptères vespertilioninés. 2eme partie: Implications systematiques et phylogeniques.

La première partie de cette étude était consacrée à la description et à l'analyse des morphologies dentaires des vespertilioninés; elle conduit à une tentative synthétique de reconsidération des affinités et de la systématique.

Les résultats s'ordonnent par rapport à trois objectifs distincts mais intimement liés: 1 - l'apurement des contenus génériques pour tendre à faire des genres des taxons homogènes susceptibles de représenter les aboutissants de lignées évolutives; 2 - la recherche du degré de parenté entre les genres actuels afin d'en déduire les possibilités d'origines communes; 3 - en fonction des éléments précités, mais aussi des tendances évolutives constatées, l'élaboration d'une hypothèse phylogénique modeste et prudente.

De nombreux contenus génériques ont été apurés: le sous-genre *Leuconoe* prend rang de genre, et *Myotis* devient sous-genre du premier; les espèces myotodontes sont retirées du genre *Pipistrellus; Glischropus* et *Scotozous* tombent en synonymie de *Pipistrellus; Hypsugo* est élevé au niveau générique; des espèces provenant du genre *Pipistrellus*, constituant un ensemble hétérogène, sont provisoirement rassemblées en un Groupe Collectif: *Attalepharca* nov.; le genre *Eptesicus* est démembré, les espèces exclues constituent le genre *Nycterikaupius* gen. nov.; la tribu des Nycticeini est redéfinie après le retrait des genres *Otonycteris, Scotoecus, Scotophilus* et l'adjonction du genre *Hesperoptenus; la io* et *Pipistrellus tasmaniensis* sont mutées dans le genre *Eptesicus* (n. s.); *Pipistrellus dormeri* est rattaché au genre *Scotoecus*.

La considération des divers modes évolutifs de I1/, principalement, soutient la notion de regroupements de genres en des ensembles dont la valeur est souvent corroborée par la proximité morphologique d'autres dents. Cette tentative est à la base de la distinction des radiations majeures survenues dans l'histoire du groupe.

La schématisation proposée à la fin de ce travail met en évidence la parenté odontologique qui existe entre les genres actuels, et représente l'infrastructure d'une phylogénie présumable. Deux points prépondérants sont à souligner : l'isolement précoce du rameau leuconoïde, les accessions successives à la myotodontie par les formes issues du courant nyctaloïde. Les éléments paléontologiques connus d'après la littérature sont intégrés ponctuellement dans cette trame évolutive, à titre hypothétique.

The first part of this study was devoted to a descriptive analysis of teeth morphologies among the vespertilionine bats. This leads now to a tentative synthesis, providing views on the systematics of the group. The results could be seen according to three distinct but closely related purposes: 1 - the sorting of the genera contents in order to conform the genera units to homogeneous taxa that could represent natural issues of evolutionary lineages; 2 - the investigation of relationships between extant genera in order to infer the possibilities of common origin; 3 - according to the preceeding items and to the observed evolutionary trends, a tentative phylogeny, modest and cautious.

The contents of many genera are sorted: *Leuconoe* is removed from subgeneric to generic position, whereas *Myotis* becomes a subgenus of it; the myotodont species are cleared away from the *Pipistrellus* genus; *Glischropus* and *Scotozous* are synonymized within *Pipistrellus ; Hypsugo* is raised to the generic level; some species previously ranged within *Pipistrellus* will form provisionally a collective group, *Attalepharca* nov.; the *Eptesicus* genus is broken up, the excluded species being grouped within *Nycterikaupius* gen. nov.; the Nycticeini tribe is defined again after exclusion of *Otonycteris, Scotoecus, Scotophilus*, and addition of *Hesperoptenus*; the species *Ia io* and *Pipistrellus tasmaniensis* are removed to *Eptesicus* (n.s.) and *Pipistrellus dormeri* to *Scotoecus*.

Groupings of genera are stated according to the main evolutionary trends of I1/. The relevance of these is often warranted by close morphologic similarities of other teeth. This leads to a recognition of the major evolutionary radiations which occurred in the group.

The filiations schematized at the end of the work show the dental relationships observed between the extant gênera, and could represent a phylogenic framework. Two major facts are to be underlined: 1 - the early divergence of leuconoids; 2 - the successives crossings to myotodonty from the nyctaloid flow.

Fossil data from the literature are punctually and tentatively incorporated within phylogenic sketches.

Menzies, J. I. (1973). A study of Leaf-nosed Bats (*Hipposideros caffer* and *Rhinolophus landeri*) in a cave in northern Nigeria.

Two species of leaf-nosed bats were netted as they emerged from their roosting cave at dusk. Collecting was repeated four times in 1966 and twice in 1967. Color of pelage, age, and reproductive condition of the bats were noted. From these data I conclude that the bats copulate late in the year, undergo a brief period of delayed implantation, give birth about April, and molt between May and July. The natural hair color of the adult is gray but quickly changes to reddish gold. Association between the breeding cycle and climate of the region is suggested.

Mertens, R. (1925). Verzeichnis der Säugetier-Typen des Seckenbergischen Museums.

Im vorliegenden Verzeichnis sind 136 Typen von Säugetiereh angeführt, die sich im Besitze des Senckenbergischen Museums in Frankfurt a. M. befinden. Für viele Formen, deren Originalbeschreibung auf Grund von 2 oder mehr Exemplaren erfolgt ist, von denen aber vom Autor

kein bestirnmtes Stück als Typus bezeichnet wurde, habe ich stets eine nachträgliche Typen-Fixierung vorgenommen ("Lektotypus").

Mit Ausnahme des Typus von *Meriones melanurus* RÜPPELL (Mus. Senck. III, S. 95, Taf. VII. Fig 3; 1845), der im Britischen Museum ist (vgl. THOMAS, Ann. Mag. Nat. Hist. 9. III. S, 264; 1919), befinden sich alle Typen aus den wertvollen Sammlungen RÜPPELL's im Senckenbergischen Museurn. Bei der Durcharbeitung der Fledermaus-Sammlung des Landesgeologen Dr. C. KOCH, die nach seinem Tode in den Besitz des Senckenbergischen Museurns übergegangen ist, habe ich zu folgenden 4 Formen keine Belegstücke gefunden, die als Lektotypen betrachtet•werden könnten: *Rhinolophus ferrum-eauinun* var. *italicus* KOCH (Jahrb. Ver. Naturk. Herzogth. Nassau XVIII, S, 523; 1863), *Rhinolophus hipposideros* var. *alpinus* KOCH (a. a. O. S, 530), *Rhinolophus hipposideros* var. *pallidus* KOCH (a. a. O. S. 531) und *Cateorus serotinus* var *pallidus* KOCH (a. a. O. S, 467). Auch der Typus von *Herpestes ornatus rufescens* LORENZ-LIBURNAU (Abh. Senck. Nat. Ges. XXI, S. 462; 1898) ist nicht in unserem Museum.

Zu den Literatur-Zitaten ist zu bemarken daß RÜPPELL's "Atlas zu der Reise im nördlichen Afrika" lieferungsweise in einzelnen Heften herausgegeben worden ist. Mit freundlicher Hülfe von Herrn P. CAHN, der ein teilweise mit Lieferungsumschlägen versehenes Exemplar becsitst, konnte ich für den von CRETZSCHMAR bearbeiteten Säugetier-Teil die Erscheinungsjahre der einzelnen Lieferungen feststellen: im Jahre 1826 ist Lieferung 1 - 2 (mit Taf. I - VII). im Jahre 1827 Lieferung 3 - 6 (mit Taf. VIII - XV), im Jahre 1828 Lieferung 7 - 8 und 11 (mit Taf. XVI - XXVI) und im Jahre 1830 Lieferung 18 - 19 (mit Taf. XXVII - XXX) erschienen. Auch die Herausgabe des zweiten Hauptwerkes von RÜPPELL "Neue Wirbelthiere zu der Fauna von Abyssinien gehörig", von dem sich ein vollständiges Exemplar mit Original-Lieferungsumschlägen in der Bücherei des Herrn P. CAHN befinced, erfolte in einzelnen Lieferungen; und zwar ist vom Säugethier-Teil im Jahre 1835 Bogen 1 - 4 (mit Taf. I - VI), im Jahre 1936 Bogen 5 - 9 (mit Taf. VII - XII), im Jahre 1838 Taf. XIII - XIV (ohne text) und im Jahre 1840 Bogen 10 (ohne Tafeln) erschienen.

Für freundlihe Hülfe und Auskunft in verschiedenen Fragen bin ich den Herren P. CAHN in Frankfurt a. M., Prof. P. MATSCHIE in Berlin und Dr E. SCHWARZ in Frankfurt a. M., der auch für einige Namen verantwortlich ist, zu großem Danke verpflichtet.

Messana, G., L. Chelazzi and N. Baccetti (1985). Biospeleology of Somalia. Mugdile and Showli Berdi caves.

During an expedition (March 1984) made to study the stygofauna of Somalia the authors discovered two caves: Mugdile and Showli Berdi, 3 km apart and probably communicating. These are large cavities formed by the erosion of an ancient underground river on the Jurassic limestones of the area. The first cave has been explored for about 200 m and the second for about 500 m. Showli Berdi is about 40 m below ground level, and Mugdile a little less. Numerous specimens of various systematic groups have been collected; very important are some new species of Isopoda, Orthoptera, Pseudoscorpionida and Coleoptera. Of great interest is the existence of a fish of the Cyprinidae family (*Labeo boulengeri* Vinciguerra, 1913) found in the waters of Showli Berdi next to the phreatobic crustacean isopods, *Skotobaena monodi* Ferrara & Lanza, 1978 and a new species of the *Stenasellus* genus. This fish shows no sign of adaptation to underground life and its presence in the cave water is still to be explained.

Nel marzo 1984, durante una missione per lo studio della fauna stigobia della Somalia, gli Autori hanno rinvenuto due grotte, Mugdile e Showli Berdi, distanti tra loro circa 3 km, le quali sono probabilmente comunicanti. Si tratta di rilevanti cavita risultato dell' azione erosiva di un antico fiume sotterraneo sui calcari giurassici della zona. Sono stati esplorati circa 200 m della prima e circa 500 m della seconda. 11 dislivello rispetto al piano di campagna e di circa 40 m per Showli Berdi e di poco meno per Mugdile. Sono stati raccolti numerosi esemplari di vari gruppi sistematici, tra cui importanti alcune specie nuove di Isopodi, Ortotteri, Pseudoscorpioni e Coleotteri. Di notevole interesse e la presenza nelle acque di Showli Berdi, accanto ai Crostacei Isopodi stigobi, *Skotobaena monodi* Ferrara & Lanza, 1978 e una nuova specie del genere *Stenasellus*, di un pesce della familia dei Cyprinidae (*Labeo boulengeri*

Vinciguerra, 1913), privo di adattamenti alla vita in ambiente sotterraneo e la cui presenza in queste acque dovra essere spiegata.

Metselaar, D., M. C. Williams, D. I. H. Simpson, R. West and F. A. Mutere (1969). Mount elgon bat virus: A hitherto undescribed virus from Rhinolophus hildebrandtii eloquens K. Anderson.

A hitherto undescribed virus was isolated from salivary glands of fruitbat of the species *Rhinolophus hildebrandtii eloquens* (K. Andersen). Some of its properties are discussed. Of the viruses, isolated from organs of bats only and not from other sources, this virus is the first of which multiplication in mosquitoes - *Aedes aegypti* - was demonstrated.

Transmission to infant mice or to a blood reservoir through a batwing membrane was not achieved. The implications of the finding are discussed. The name Mount Elgon Bat virus (MEB) is proposed for the isolate.

Michelmore, A. J., D. J. Keegan and B. Kramer (1998). Immunoctochemical identification of endocrine cells in the pancreas of the fruit bat, *Rousettus aegyptiacus*.

The fruit bat, *Rousettus aegyptiacus*, is able to absorb large amounts of glucose in very short periods of time. This ability is partly reflected by the structure of the gastrointestinal tract and pancreas. The aim of this study was to confirm preliminary histochemical studies of the bat pancreas and to identify and quantitate endocrine cells by immunocytochemical techniques in order to understand the ability of the bat to absorb these large amounts of glucose. Endocrine cells were distributed in islets throughout the gland and also occurred as discrete cells in the exocrine ducts. Three-dimensional reconstruction and quantitation showed that the endocrine component of the pancreas occupied 9.1 % of the total volume. This is far more than that reported in any other species. Four endocrine cell types were demonstrated. Insulin (ß) cells (51.4 %) were located throughout the islet and extended between the glucagon (a) cells (30.6 %). Somatotostatin (`d) cells (8.8 %) and pancreatic polypeptide (PP) cells (17.1 %) were irregularly scattered throughout the islets. While the percentage of a, b, and d cells was similar to that in other species, the percentage of PP cells was higher. The high percentage of endocrine tissue found in the pancreas of the fruit bat may reflect metabolic adaptations involved in the absorption of the high carbohydrate diet of this animal.

Middleton, G. J. (1998). Lava caves of the republic of Mauritius, Indian Ocean.

In their *Underground Atlas*, Middleton & Waltham (1986) dismissed Mauritius as: "very old volcanic islands with no speleological interest". Recent investigations indicate this judgement as inaccurate; there are over 50 significant caves, including lava tube caves up to 687 m long (one 665 m long was surveyed as early as 1769) and 35 m wide. Plaine des Roches contains the most extensive system of lava tube caves with underground drainage rising at the seashore.

Notable fauna includes an insectivorous bat and a cave swiftlet (*Collocadia francica*), the nests of which are unfortunately prized for "soup". The caves are generally not valued by the people and are frequently used for rubbish disposal or filled in for agricultural development.

Bien que les îles Maurice ne soient pas connues pour leur intéret spéléologique, de récentes recherches indiquent qu'il ya plus de cinquante cavernes importantes, comprenant des tunnes de lave allant jusqu'à de 687 m de long et 35 m de large, l'un d'entre eux, de 665 m de long a été découverte dès 1769.

La Plaine des Roches contient le système le plus étendu de tunnels de lave avec un écoulement souterrain qui s'élève au niveau du rivage. La faune importante de ces caves comprends de chauves-souris insectivores et de petites hirondelles (*Callocalia francica*), les nids desquelles sont

malheureusement recherchés pour soupes de gourmets. Les caves ne sont généralement pas appréciées par les habitants qui trop fréquemment s'en servent comme dépôts d'ordures ou d'entrepôts agricoles.

Miller, G. S. , Jr. (1897). Revision of the North American bats of the family Vespertilionidae.

Writers on American bats have published a large mass of facts concerning the distribution and comparative anatomy of members of the family *Vespertilionidæ*: Unfortunately, however, no work has yet appeared in which the numerous species by which this group is now known to be represented in North America are treated from the standpoint of the systematic zoologist. In other words it has hitherto been impossible for anyone not thoroughly acquainted with the extensive and scattered literature of North American bats to identify specimens correctly. The present paper has been prepared with special reference to the long-felt want of a ready means to accomplish this object.

Miller, G. S. , Jr. (1900). A collection of small mammals from Mount Coffee, Liberia.

In 1897 Mr. R. P. Currie spent about fourteen weeks, February 1 to May 10, as the guest of the New York State Colonization Society, at Mount Coffee, Liberia, where he made extensive collections in the interest of the United States National Museum. Though principally occupied with entomology, he secured a collection of small mammals, which proves to be of particular interest. Only twenty-eight species are represented, but nine of these are additions to the known fauna of Liberia, and seven are new to science. That so large a proportion of forms new to the region should be included in the collection is especially remarkable, in view of the fact that Mount Coffee, situated on the St. Paul River, about twenty-five miles from Monrovia, is within the area covered by the explorations of Büttikofer, Sala, and Stampfli; who obtained no less than ninety species of mammals.

The country in which the Currie collection was made calls for no detailed description. Mount Coffee lies in a damp, densely forested region, and its elevation above sea level is only 400 or 500 feet.

A few of the specimens were obtained by Professor O. F. Cook, but when no collector's name is mentioned it is to be understood that were taken by Mr. Currie, who is, in all cases, responsible for the native names and, unless the contrary is stated, for the measurements of the total length, tail vertebræ, and hind foot. I am much indebted to Mr. Wm. E. de Winton for aid in determining many of the rodents, and also for identification of most of the Cameroon material on which comparisons are based. Dr. F. A. Jentink has kindly compared a specimen of *Pipistrellus minusculus* with the type of *P. stampflii* in the Leyden Museum. This paper is published here by permission of the Secretary of the Smithsonian Institution.

Miller, G. S. , Jr. (1905). A new bat from German East Africa.

Two bats of the genus *Lavia* collected by Dr. W. L. Abbott at Taveta, German East Africa, in 1889, prove to differ too considerably from the West African *Lavia frons* to be regarded as the same species.

Miller, G. S. , Jr. (1907). The families and genera of bats.

In 1758, Linnæus knew seven bats, all or which he placed in *Vespertilio*, the fourth and last genus of the order Primates. The work of the next fifty years, as recorded by Tiedemann in 1808, though it had resulted in the recognition of the order Chiroptera, had not increased the species beyond 14, while the number of genera, even with the addition of the flying lemur, was still only seven. The first subdivision of the order into families appears to be due to Goldfuss, who, in 1820, arranged the genera in four groups, one of which still comprised the flying lemur. To each group he definitely applied the name "Familie." The real foundation for the current classification was, however, not laid by Goldfuss, but by

Gray, who published the first of his many papers on bats in 1821. Gray excluded the flying lemur, recognized the two main subdivisions of the order, and applied to the names of families the system of nomenclature now in use. According to this scheme there were two suborders, the Fructivoræ and Insectivoræ, the former containing the families Pteropidæ and Cephalotidæ, the latter the Noctilionidæ and Vespcrtilionidæ. Though Gray's system was not followed very closely during the succeeding fifty years, it was finally given definite form by Gill in 1872 and Dobson in 1875, and since then has been almost universally adopted. The new classification now presented is, in fact, little more than an amplification of that founded by Gray. The increase in our knowledge of the Chiroptera since 1821 has been, however, very great. As we have seen, Linnæus recognized only one genus of bats; Gray placed the number comprised in his four families at about 14. In 1865 Peters divided the group into 10 families and subfamilies, containing, in all, 59 genera. When Dobson published his Catalogue of the Chiroptera in the British Museum, in 1878, he described 401 species, 80 genera, and 14 families and subfamilies. As might have been anticipated, this work, the only complete special monograph of the order, was such a stimulus to the study of bats that since it appeared these animals have received more attention than ever before. In 1904 Trouessart recorded no less than 851 species, 122 genera, and 18 families and subfamilies. It appears, however, that even these numbers are much too small. Detailed study of the skeleton, particularly of the wing and shoulder girdle and of the structure of the tooth cusps, leads me to the conclusion that among the known species at least 173 genera and 36 families and subfamilies should be recoguized. With regard to the species, recent work shows that an enormous increase is to be expected as the characters on which distinctions are based come to be better understood. It seems highly probable that the total number of recognized bats will eventually exceed 2,000 named forms.

Miltgen, F., I. Landau and J. Bradbury (1980). *Hepatocystis* d'*Hypsignathus monstrosus* (Pteropinae) au Gabon. II. Description d'*Hepatocystis carpenteri* n. sp.

Hepatocystis carpenteri n. sp. parasite d'*Hypsignathus monstrosus* au Gabon se différencie d'*Hepatocystis epomophori* et d'*Hepatocystis brosseti*, parasites d'autres Megachiroptères africains par la morphologie et la taille de ses schizontes intrahépatiques: *H. carpenteri* a une taille beaucoup plus grande et possède une paroi d'aspect spongieux qui n'a jamais été rencontrée chez d'autres *Hepatocystis*.

Hepatocystis of *Hypsignathus monstrosus* (Pteropinae) in Gabon. II. Description of *Hepatocystis carpenteri* n. sp.

Hepatocystis carpenteri n. sp. parasite of *Hypsignathus monstrosus* in Gabon is different from *Hepatocystis epomophori* and *Hepatocystis brosseti*, parasitic in other African Megachiroptera. *H. carpenteri* has bigger intrahepatic schizonts and a wall with a spongy appearance which has not been seen in other *Hepatocystis*.

Miltgen, F., I. Landau, G. Rosin and C. Erard (1977). *Hepatocystis brosseti* n. sp., Haemoproteidae, parasite d'*Epomops franqueti*, Pteropinae, au Gabon.

L'examen sanguin et histologique des *Epomops franqueti* (Pteropinae) capturés aux alentours de Makokou (Gabon) a montré que ces chauves-souris sont fréquemment parasitées par un Hépatocyste que nous nommons *Hepatocystis brosseti*. Le foie est l'organe de prédilection des schizontes, qui, à maturité, sont extracellulaires, polylobés, de taille modérée (250 µ) et pourvus d'une abondante colloïde en flaques. Un seul schizonte a été trouvé dans la rate.

Hepatocrstis brosseti n. sp., Haemoproteidae, parasite of *Epomops franqueti*, Pteropinae, in Gabon.

Epomops franqueti (Pteropinae) trapped around Makokou (Gabon) are frequently infected with *Hepatocystis brosseti* n. sp. Blood smears and tissue sections were made; all schizonts were found in the liver except a single one in the spleen. In liver, near maturity the schizonts are extracellular, convoluted, medium sized (250 µ) and filled with abundant colloidal substance.

Monadjem, A. (1998b). Distributional patterns and conservation status of mammals of Swaziland, southern Africa.

Distributional patterns (mapped at the quarter-degree square scale) of species richness of 121 species of mammal recorded from Swaziland were examined in relation to the distribution of protected areas (reserves), privately-owned ranches and six vegetation types. The richness of mammal species was highest in the NE and NW, and lowest in the SW areas of Swaziland. Total mammal species richness was positively and highly significantly correlated with the presence of reserves. Similar patterns were shown by artiodactyls, rodents and carnivores. Total mammal species richness, as well as for most mammalian orders, was positively correlated with moist grassveld and moist savanna vegetation types but negatively correlated with dry grassveld. Mammal species richness. especially for the larger species, was very low on Swazi Nation Land, which covers about 60 % of the country. The mammalian fauna of the high-lying areas (Highveld) was distinct from that of the low-lying areas (Lowveld). The Middleveld region supported elements of both Highveld and Lowveld species. A large proportion (87.6 %) of Swaziland's mammal species have been recorded from reserves. Two species (*Alcelaphus lichtensteini* and *Lycaon pictus*) no longer occur in Swaziland. For effective conservation of Swaziland's mammals, the issue of how to maintain viable populaions on Swazi Nation Land will have to be addressed.

Monard, A. (1935). Contribution à la mammalogie d'Angola et prodrome d'une faune d'Angola.

La Mammologie d'Angola est relativement peu connue; tandis qu'en Ornithologie, l'ouvrage capital de BARBOZA DU BOCAGE paru en 1877-1881 donnait déjà un tableau bien complet de cette partie de l'Histoire naturelle, auquel relativement peu de choses ont pu être ajoutées, la Mammologie ne faisait l'objet que d'un mémoire beaucoup moins étendu, paru en 1889-1891. Quelques traités spéciaux sur les Damans, les Rats-Taupes, les Antilopes ont complété sur ces points les données primitives de BOCAGE. Depuis lors les principaux auteurs ont été SEABRA qui s'occupe des Chiroptères, THOMAS, WROUGHTON, DE WINTON, HINTON, BLAINE, STATHAM, FRADE, qui étudient des collections des sujets spéciaux particuliers, en général peu étendues, on se placent au point de vue du chasseur. Aucun ouvrage d'ensemble, aucune faune générale n'a été entreprise depuis l'essai de BOCAGE.

Or, les difficultés d'identification des Mammifères sont grandes; leurs espèces ont été considérablement multipliées depuis une trentaine d'années, passant pour le total des formes actuelles de 3500 environ, à 13.000; des modifications incessantes de nomenclature ont contribué, dans une recherche souvent vaine de la priorité, à compliquer la besogne, si bien que certaines espèces ont changé trois ou quatre fois de genres depuis le *Catalogus Mammalium*: de TROUESSART (ex: *Herpestes*, devenu *Mungos, Ichneumon, Atilax, Myonax* ou *Ichneumia*); les anciens grands genres ont été divisés en nombreux sous-genres, puis ceux-ci élevés au rang supérieur et engendrant à leur tour de nouveaux genres et sous--genres (ex: *Mus*); les monographies de genres et familles sont pour certains groupes, et surtout les plus difficiles, ou périmées, ou inexistantes; l'analyse des caractères a été poussée à un tel degré qu'on a distingué dans les anciennes espèces des quantités de formes; des espèces nouvelles, basées uniquement sur les mensurations des crânes, bases à notre avis bien chancelantes, ont fait leur apparition; en sens contraire INGOLDBY réunit en une seule les 45 formes de l'écureuil *Heliosciurus*, envisageant ses nombreuses espèces et variétés comme des phases climatiques d'un seul type; ajoutons à ces difficultés d'ordre scientifique celles qui résultent d'une extrême dispersion des mémoires originaux qui ne sont souvent que de simples notes éparpillées, la nécessité absolue de posséder le *Zoological Record* qui donne les références indispensables et une vaste bibliothèque scientifique - et l'on comprendra qu'il est vain de vouloir faire de la Mammologie précise sur le terrain et de chercher, pour un profane, un colon ou un missionnaire, à identifier là-bas les espèces recueillies.

C'est pourquoi, à la demande de quelques uns de nos amis d'Angola, nous nous sommes décidés à donner à ce mémoire une forme plus pratique et plus étendue qu'une simple liste additionnelle de noms avec localités. Nous avons cherché à en faire, non pas une "Faune d'Angola" ce qui serait prématuré et d'une trop grande envergure, mais le "Prodrome d'une faune". Cela nous permettra de

développer inégalement les parties de ce mémoire, de nos attarder plus longuement aux espèces sujettes à discussion, ou d'homologation difficile (en l'espèce surtout les petits Marnmifères) et de passer plus rapidement ou d'énumérer simplement les espèces d'identification facile. Les collections importantes, recueillies dans nos deux voyages restent à la base de notre étude, qui sera donc une contribution à la Mammologie de ce pays; mais nous avons traité les espèces découvertes par nos devanciers de façon a donner un aperçu aussi complet que possible de la faune d'Angola. Nous ne nous dissimulons nullement les imperfections de ce travail; elles proviennent de l'impossibilité dans laquelle nous sommes d'examiner les types originaux et les collections des autres musées puis des oublis et des erreurs presque inévitables dans une oeuvre si compliquée et de si vaste envergure. Mais nous pensons néaumoins que l'essai devait être tenté et que notre oeuvre sera utile à beaucoup, qu'elle contribuera dans la population cultivée d'Angola à la connaissance de l'histoire naturelle, qu'elle encouragera l'étude zoologique du pays.

Pour chaque espèce nous donnons dans la règle une description originale ou tirée d'une monographie classique (DOBSON, pour les Chiroptères, ou SCLATER, *Fauna of South Africa*, etc.], sa distribution connue en Angola, le nom indigène en une ou plusieurs langues, des détails sur son habitat ou ses moeurs. Pour faciliter les recherches nous avons disposé des tableaux dichotomiques d'un usage aussi facile que possible; les synonymes des auteurs qui ont écrit sur l'Angola ont seuls été cités de manière à pouvoir se rapporter facilement à leurs oeuvres. Enfin nous avons donné souvent des mensurations crâniennes qui contribuent à la connaissance scientifique de l'espèce. Toutefois, le souci de ne pas allonger trop ce mémoire nous a fait supprimer les détails de moeurs donnés par les grands traités tels que celui de BREHM.

Monard, A. (1939). Résultats de la mission scientifique du Dr. Monard en Guinée Portugaise 1937-38. III. Chiroptères.

Nous connaissons très peu de choses concernant les Chiroptères de la Guinée portugaise, et l'étude que nous présentons ici est certainement la plus complète qui ait été écrite, Et cependant, elle ne contient qu'un tableau bien imparfait de la riche faune de Chauves-souris que possède cette colonie. Chaque soir, en saison sèche comme en hivernage, on voit évoluer ces animaux en nombre; leur variété n'est pas moins grande que leur fréquence. Mais on sait combien la chasse de ces animaux est difficile; si on n'a pas la chance de découvrir leurs retraites, leur capture est presque impossible. C'est en s'adressant aux Noirs qu'on a plus de facilité à s'en procurer,

Dans une liste de Vertébrés de la Guinée portugaise, BARBOZA DU BOCAGE (Jorn. Sc. Math. phys. nat. 2, 1890, p. 179) ne cite que deux espèces de Chiroptères: *Epomophorus gambianus* et *Nycteris hispida*. En outre, il avait cru devoir faire d'un exernplaire de la première espèce le type d'une forme nouvelle, *Epomophorus guineensis* qui n'a pas été conservé par les auteurs modernes. On trouve aussi, par ci par là, la mention de la Guinée portugaise dans les ouvrages généraux consacrés à ces animaux. C'est en cela que se bornent les connaissances actuelles sur la faune des Chiroptères de ce pays.

Montfort, A. (1992). Première liste commentée des mammifères du Rwanda.

A preliminary checklist is presented for the marnrnals of Rwanda based on the literature and our own observations. For several important groups as such bats in Nyungwe or small carnivores, data are certainly incornplete and details of large collections of rodents obtained by W.N. Verheyen and colleagues have yet to be published. Under such circumstances, this paper can not present more than a first provisional list of the rnammals of Rwanda.

Cet article fait l'état des connaissances sur les espèces et le statut des rnammifères sur l'ensemble du Rwanda à partir de la litérature existante et des observauons de l'auteur. Certains groupes n'ont pas encore fait l'object d'études importantes (petits carnivores) ou n'ont été que peu étudiés dans certains habitats (chauves-souris à Nyungwe par ex.) et. les détails des irnportantes collections de rongeurs réalisées par W. Verheyen et ses collègues ne sont pas encore publiés. Compte tenu de ces

restricuons, la liste qui suit doit être considérée comme une première tentative d'inventorier les marnrnifères du Rwanda.

Morales, J. C., S. W. Ballinger, J. W. Bickham, I. F. Greenbaum and D. A. Schlitter (1991). Genetic relationships among eight species of *Eptesicus* and *Pipistrellus* (Chiroptera: Vespertilionidae).

Genetic relationships among eight species of *Eptesicus* and *Pipistrellus* were analyzed by use of horizontal starch-gel electrophoresis. It has been suggested that a 2n = 50 and FN = 48 karyotype defines the genus *Eptesicus*, and that related forms of differing karyotype should be placed in the genus *Pipistrellus*. Three species of *Eptesicus* with 2n = 50 and FN = 48, three species with lower diploid numbers, and two species of *Pipistrellus* were assayed in this study. The results show that the species of *Eptesicus* with 2n = 50 and FN = 48 form a homogeneous group with high similarity values, despite the included taxa coming from two continents. Species with lower diploid number show a lesser degree of similarity.

Morales Agacino, E. (1933). Datos y observaciones sobre algunos mamiferos marroquies.

Durante una excursión entomológica organizada por esta SOCIEDAD bajo los auspicios de la Dirección General de Marruecos y Colonias, en la que acompañé al Sr. Martínez de la Escalera (D. Fernando), en el mes de agosto de 1932, por la zona de Protectorado español en Marruecos, he podido tomar algunos datos sobre unas cuantas especies de mamíferos, muy pocas y muy vulgares, pero que el ser principalmente casi todas de la región del Rif - región tan poco conocida zoológicamente - hace me incline a redactar esta pequeña nota, pues tal vez pueda contribuir al mejor conocimiento de la fauna mastozoológica marroquí.

Morales Agacino, E. (1943). Algunos datos y observaciones sobre mamiferos marroquies.

En el transcurso de la- pasada excursión entomológica que en compañía de los buenos amigos los señores Dr. Werner Harten y D. Anselmo Pardo realizamos por distintos puntos del Marruecos español, recogimos una serie de datos de tipo mastozoológico que creemos muy conveniente publicar, ya que las novedades que encierran son una aportación más que añadimos a nuestros conocimientos sobre la fauna de este territorio.

Morel, P.-C. and J. Mouchet (1965). Les tiques du Cameroun (Ixodidae et Argasidae) (2e note).

Ce texte est un complément à notre note de 1958. Il comporte essentiellement une étude du genre *Ixodes*, qui n'avait pas été envisagée dans le travail précédent, car sa systématique était alors en cours de révision. A l'heure actuelle l'abondant matériel dont nous disposons (surtout du Cameroun et de Côte-d'Ivoire) permet d'effectuer les diagnoses de tous les stades. Il a donc été possible d'étudier les collections du Cameroun et d'en obtenir d'importants renseignements quant à la distribution de ce genre dans les diverses zones de végétation.

Nous apportons également des renseignements complémentaires sur la systématique, la terminologie et la répartition, notamment dans le nord du pays, des espèces précédemment citées (une partie de ceux-ci avait d'ailleurs été publiée dans un travail sur les tiques des animaux domestiques de la région du lac Tchad)

Morrison-Scott, T. C. S. (1939). Some Arabian mammals collected by Mr. H.StJ.B. Philby, C.I.E.

Arabian mammals were first discussed systematically by Cretzschmar (1826), Lichtenstein (1827-34) and Hemprich & Ehrenberg (1828-33). Since then little was written till Thomas (1894B) wrote on the mammals of Oman. This was quickly followed by discussions of the Aden mammals by Yerbury & Thomas (1895) and Thomas (1900). Since that time there have been many papers (see Appendix I) on individual forms, notably by Thomas, but only three papers dealing with any considerable collections: Cheesman & Hinton (1924) on mammals collected by Cheesman between Riyadh and the east coast, Dollman (in B. Thomas 1932) on collections by Bertram Thomas in the south-east and Pocock (1935A) on Thomas's specimens once more and on a collection from various parts of Arabia presented to this museum by Philby.

Now Philby has sent home another fine collection, the results of his recent journey to the Hub al Khali (Philby 1938), and it is with these specimens that this paper is principally concerned though the earlier material has been reexamined.

Apart from the fact that Arabia is still relatively unknown zoologically, natural history collections from that country are of the greatest interest from the zoogeographical point of view. Arabia lies between the Ethiopian, Palaearctic and Indian regions and the extent to which each region has contributed to the fauna has been a matter of speculation ever since 1866 when Murray wrote on the geographical distribution of mammals.

The Red Sea is almost certainly a rift valley and the land connexion between Aden and Somaliland does not appear to have been broken until late in the Tertiary period. Pilgrim (1919. PI. I: 1925A, p. 73; 1925B, p. 202) shows that the land bridge across the Straits of Hormuz between Oman and Persia lasted at all events until the end of the Pliocene and probably till the late Pleistocene.

In view of the above it might be expected that south-eastern Arabia should show faunistic affinities with Africa and that Oman should have Persian and Indian relationships, and this is in fact the case. The Arabian Tahr (*Hemitragus jayakari* Thos.), a goat-like animal living in the mountains of Oman, is an interesting case. It is a close relative of the Tahr which is found on the southern slopes of the Himalaya and the one in the hill ranges of southern India. It is essentially a mountain animal and there do not appear to have been mountains along the land route which the Tahr would have had to have followed if there had been no bridge across the Straits of Hormuz. Oman has not been explored from the mammal point of view since Dr. Jayakar's time, and it would be interesting to find out if there are any Oriental forms there; that is, truly Oriental as opposed to Indian.

Some elements of the fauna are common to India and Africa. Philby's latest collection includes some gerbils of the genus *Tatera* (a new record for Arabia) which ranges as far as Ceylon on the one hand and S. Africa on the other, but the connexion between these two extremes may be independent of land bridges across the south end of the Red Sea and the Persian Gulf, as the genus has been recorded from the top end of the Persian Gulf.

The largest of the Arabian foxes (*Vulpes vulpes* L.) is common to N. Africa, Arabia and N.W. India, but it is not to be regarded as a true Ethiopian or Indian form, but as a Palaearctic intruder.

Lastly there are some Arabian mammals such as the hyrax (*Procavia*) which are found elsewhere only in Africa, Palestine and Syria.

The Arabian fauna, therefore, is of mixed origin and offers many interesting problems. More specimens are needed to solve these, apart from the entirely philosophical object of finding out what mammals live in Arabia, and any specimens sent to the British Museum will be gratefully acknowledged.

Throughout this paper the use of parentheses for the names of authors of species which have been moved to another genus has been discontinued for reasons given by Dr. Osgood (1939). *Science*, **89**: 9. Conventions used with regard to certain measurements have been explained in Appendix II and a list of the co-ordinates of those Arabian localities which are hard to find in maps has been giyen in Appendix III.

I should like to take this opportunity of thanking my colleagues in the Mammal Room for their various suggestions and help, especially Mr. R. I. Pocock. F.R.S.

Morvan, J. M., V. Deubel, P. Gounon, E. Nakouné, P. Barrière, S. Murri, O. Perpète, B. Selekon, D. Goudrier, A. Gautier-Hion, M. Colyn and V. Volehkov (1999). Identification of Ebola virus sequences present as RNA or DNA in organs of terrestrial small mammals of the Central African Republic.

The life cycle of the Ebola (EBO) virus remains enigmatic. We tested for EBO virus in the organs of 242 small mammals captured during ecological studies in the Central African Republic. EBO virus glycoprotein or polymerase gene sequences were detected by reverse transcription PCR in RNA extracts of the organs of seven animals and by PCR in DNA extract of one animal. Neither live virus nor virus antigen was detected in any organ sample. Direct sequencing of amplicons identified the virus as being of the Zaire/Gabon subtype. Virus-like nucleocapsids were observed by electron microscopy in the cytoplasm of the spleen cells of one animal. The animals belonged to two genera of rodents (Muridae; *Mus setulosus, Praomys* sp1 and *P.* sp2) and one species of shrew (Soricidae; *Sylvisorex ollula*). These preliminary results provide evidence that common terrestrial small mammals living in peripheral forest areas have been in contact with the EBO virus and demonstrate the persistence of EBO virus RNA and DNA in the organs of the animals. Our findings should lead to better targeting of research into the life cycle of the EBO virus.

Muhmenthaler, M., J. P. Müller and A. Wehrli (1999a). Altitudinal distribution (3100-4430 masl) of small mammals on Mt. Bwahit (Ethiopia). Abstract.

Mt. Bwahit is situated at the border of the Simen Mountains National Park in Northern Ethiopia. Between January and February 1997 the altitudinal distribution of small mammals was investigated on its northern slope. Beginning at 3100 masl up to the mountain top at 4430 masl at every 100 m altitudinal step, life traps were set. 216 individuals of six rodent species were trapped, amazingly no shrew was caught.

The lower zones (ericaceous forest) were dominated by *Myomys albipes, Mus mahomet* and *Lophuromys flavopunctatus*. *Stenocephalomys griseicauda* was not present at this altitude. From 3600 masl upwards *Stenocephalomys griseicauda* was dominating at all trapped altitudinal steps followed by *Otomys typus* and *Lophuromys flavopunctatus* in varying succession. A zone with especially high trapping rate was found between 3800 and 4100 masl for all these tree species. From 4200 masl up to the mountain top almost all trapped individuals belonged to the species *Stenocephalomys griseicauda*. The higher the traps were set, the more males of this species were trapped.

It can be said, that in the investigated altitudes a change from a *Myomys albipes-, Mus mahomet-* and *Lophuromys flavopunctatus*-community in the lower zones to a *Stenocephalomys griseicauda-, Otomys typus-* and *Lophuromys flavopunctatus*-community in the upper zones could be found. The borderline between these communities lies at 3500 to 3600 masl next to the timber line that is situated at 3600 masl in the Simen Mountains.

Le Mont Bwahit est situé à la limite du Pare National des Montagnes de Simen, dans le nord de l'Ethiopie. Entre janvier et février 1997, la distribution altitudinale des petits mammifères a été étudiée sur son versant nord. Entre 3100 m d'altitude et le sommet (4430 m), des pièges ont été poses tous les 100 m. 216 individus de 6 espèces de rongeurs ont été captures. Les zones basses (forêts à Ericacés) étaient dominées par *Myomys albipes, Mus mahomet* et *Lophuromys flavopunctatus*. *Stenocephalemys griseicauda* n'a pas été trouvé a ces altitudes, mais a partir de 3600 m, cette dernière espèce dominait les piégeages, suivie par *Otomys typus* ou *Lophuromys flavopunctatus*. Les taux de capture de ces 3 espèces ont été spécialement élevés entre 3800 et 4100 m. Plus haut, l'essentiel des individus capturés étaient des *Stenocephalemys griseicauda*. Dans cette espèce, la proportion de males augmentait avec l'altitude.

On assiste donc au passage d'une communauté à *Myomys albipes, Mus mahomet, Lophuromys flavopunctatus* dans les zones basses a une communauté à *Stenocephalemys griseicauda, Otomys typus, Lophuromys flavopunctatus* dans les zones plus hautes, la transition se faisant entre 3500 et 3600 m d'altitude, soit juste avant la limite supérieure des arbres qui est située a 3600 m dans les Montagnes de Simen.

Muhmenthaler, M., A. Wehrli and J. P. Müller (1999b). Human impact on small mammals in the highlands of Simen Mountains National Park (Ethiopia). Abstract.

Human impact on small mammals was investigated in the Simen Mountains National Park (UNESCO World Heritage Site) in northern Ethiopia as part of a diploma thesis at Zurich University. The central part of the park consists of a plateau lying between 3200 and 3930 masl. There is a high human impact from the village of "Gich" situated in the west of the plateau, caused mainly by cattle-grazing and the cutting of firewood.

The abundance of various small mammals was measured for each type of vegetation and category of human impact by spot checking with life traps. Highest trapping rates resulted in natural habitats with a severe reduction in trapped individuals in habitats with increasing human impact. In and around the village a completely different small mammal community was found.

The data was evaluated with a Geographical Information System (GIS). The main goal was an estimation of the hypothetic increase of the small mammal biomass in the case of no human influence. The calculated factors of increase varied between 1.2 and 3.3 in the investigated species.

During the field work faeces of carnivores (mainly *Canis simensis* and *Canis aureus*) were collected and analyzed for small mammal remains in a laboratory. Small mammals were proved to be an important part of the carnivorous diet.

L'impact de l'homme sur les petits mammifères a été évalué dans le Parc National des Montagnes de Simen (Site du Patrimoine Mondial de l'UNESCO), dans le nord de l'Ethiopie. La partie centrale du parc est un plateau entre 3200 et 3930 m d'altitude. L'impact humain lie au village de "Gich", dans l'ouest du plateau, est du essentiellement au pâturage du bétail et a la coupe de bois de chauffage.

L'abondance des petits mammifères a été estimée dans chaque milieu et catégorie d'impact humain par piégeage. Les taux de capture les plus élevés ont été enregistrés dans les habitats naturels, alors qu'une réduction nette a été notée dans les habitats perturbes par l'homme. Dans et autour des villages, une communauté de petits mammifères complètement différente a été trouvée.

Les données ont été évaluées par un Système d'information Géographique, dans le but d'estimer l'accroissement hypothétique de la biomasse mammalienne en cas d'arrêt de l'influence humaine. Les facteurs d'augmentation calcules ont varie entre 1,2 et 3,3 pour les espèces considérées.

Pendant le travail de terrain, des fèces de Carnivores (essentiellement *Canis simensis* et *Canis aureus*) ont été collectés et analyses au laboratoire. Les petits mammifères se sont révélés être des proies importantes pour ces carnivores.

Müller, J. (1858). Eine neue Fledermausart aus Nordafrika.

Wir erhielten aus einer Partie Fledermäuse, die, der Präparateur des kais. Hofnaturalienkabinets, der glückliche und eben so unermüdliche, als umsichtige Sammler Hr. Zelebor aus Aegypten mitgebracht und dem Prof. Dr. Kolenati ebenfalls mitgetheilt hatte, eine sehr kleine Fledermaus, welche bei sorgfältiger Untersuchung und Vergleichung mit *Vesperugo macuanus* Peters, mit *V. Rüppelii* Fischer, mit *V. nanus* Peters, mit *V. platycephalus* Smuts, mit *V. minutus* Temmink, mit *V. Kuhlii* Natterer, mit *V. ursula* Wagner - mit keiner der angeführten Arten die Charaktere gemein halle, von jeder viel mehr in mehreren wesentlichen Merkmalen differirte, wie wir diess weiter unten, im Anhange darthun

werden. Wir konnten daher um so beruhigter zur Aufstellung dieser ausgezeichneten Art schreiten, als wir bei dem kritischen Chiropterologen Prof. BIasius (in der Fauna der Wirbelthiere Deutschlands I. S. 63) bei *Vesperugo Kuhlii* Natterer die schon entschiedenen Synonyme: *V. vispistrellus* Bonaparte, *Alcythoe* Bonaparte, *marginatus* Cretschmar in Rüppel, und *albolimbatus* Küster fanden, als wir ferner bei dem eben so scharfsinnigen als im Geiste der vorschreitenden Neuzeit die Chiroptern bearbeitenden Naturforscher, Prof. Kolenati, alle Tafeln zu dessen grossartigem neuen Werke über Chiropterologie direct nach der Natur gezeichnet haben. Wir fanden in einem Schreiben des Herrn Zelebor an Dr. Kolenati, vom 6. October 1856 datirt, die Bemerkung, ob nicht dieser Art der Name "Kolenatia" gegeben werden dürfte, und in der Antwort des Dr. Kolenati an Hrn. Zelebor vom 15. October 1856 die widerstrebende Bemerknng, dass diese Art erst die .vergleiche mit den obengenanuten Afrikanischen bestehen müsste. Wir nehmen gegenwärtig um so weniger Anstand, sie im Geiste des Finders nach unserem Chiropterologen, der uns schon, wie allbekannt, so viele schlagend neue Beiträge zur Naturgeschichte der Handflügler geliefert hatte und noch immer siefert, zu benennen, und nach dem Muster seiner nunmehr unübertrefflichen Diagnosen zu beschreiben.

Müller, J. P., M. Muhmenthaler and A. Wehrli (1999). Small mammals checklist of the highlands of the Simen Mountains National Park (Ethiopia). Abstract.

The Simen Mountains are a unique landscape in northern Ethiopia with a very particular flora and fauna. In 1969, a National Park was established in the core area of the Simen Mountains, in order to protect this unique ecosystem, and especially the endangered Walya-Ibex. The total surface of the National Park is 165 km^2. In 1978, the Simen Mountains National Park was put on the UNESCO-list of World Heritage Sites.

The small mammals of the highlands were studied in 1971/72 (Mueller), 1996 (Guttinger et al.) and 1996/97 (Muhmenthaler and Wehrli). The studies were mainly carried out in the Tree-heather forest and in the afroalpine grassland from 3 400 masl up to 4 430 masl. The main topic of the studies was the role of the small mammals in the grassland - ecosystem.

A total of 12 species of small mammals were captured, of which not less than 6 are endemic to Ethiopia, namely *Crocidura bailey, Dendromus lovati, Stenocephalemys griseicauda, Myomys albipes, Muriculus imberbis* and *Mus Mahomet*. The range of species was relatively similar in the different study periods. The most frequent species were *Stenocephalemys griseicauda, Lophuromys flavopunctatus, Otomys typus* and *Crocidura bailey*. The diurnal *Arvicanthis abyssinicus* was found in high numbers as well, but its distribution is very locally.

A comparison of the Simen Mountains with the Bale Mountains, also an afroalpine landscape, is interesting from a biogeographical point of view. These two regions, separated by the Rift Valley, are situated on different plateaus. On both plateaus there is a high number of small mammal species endemic to Ethiopia. The number of species confined to only one plateau is higher for the Bale (eastern plateau) than for the Simen Mountains (western plateau).

Les Monts Simen sont un paysage unique du nord de l'Ethiopie, avec une faune et une flore très particulières. En 1969, un Parc National a été établi dans la zone centrale de ces montagnes, dans le but de protéger cet écosystème unique, et en particulier l'Ibex de Walie, espèce en danger. Ce parc national de 165 km^2 a été liste en 1978 par l'UNESCO comme site du Patrimoine mondial.

Les petits mammifères de ces zones d'altitude ont été étudiés en 1971/72, 1996 et 1996/97, principalement dans la foret a bruyères et les prairies d'altitude entre 3400 et 4430 m, dans le but d'évaluer leur rôle dans l'écosystème herbacé.

Un total de 12 espèces de petits mammifères a été capturé, dont 6 endémiques d'Ethiopie, a savoir *Crocidura bailey, Dendromus lovati, Stenocephalemys griseicauda, Myomys albipes, Muriculus imberbis* et *Mus mahomet*. La distribution des espèces a été très semblable aux différentes périodes. Les espèces les plus régulièrement trouvées étaient *Stenocephalemys griseicauda, Lophuromys flavopunctatus, Otomys typus*, et *Crocidura bailey*. L'espèce diurne *Arvicanthis abyssinicus* a été trouvée en grands nombres également, mais de façon très localisée.

Il est intéressant de comparer les peuplements des Monts Simen et Bale, situes sur des plateaux différents séparés par la vallée du Rift. Sur ces deux plateaux, il y a un grand nombre d'espèces endémiques d'Ethiopie. Le nombre d'espèces confirmés à un plateau est plus grand a Test (Bale) qu'a l'ouest (Simen).

Mutere, F. A. (1967). The breeding biology of equatorial vertebrates; reproduction in the fruit bat *E. helvum*, at latitude 0º20'N.

The African fruit bat, *Eidolon helvum* Kerr, is known to occur only south of the Sahara where its distribution is localized. At 0°20' N, this bat exhibits seasonal and synchronized breeding the rhythm of which appears to correspond with the two rainfall peaks typical of Uganda. Quite unexpectedly and unprecedently, this bat exhibits delayed implantation lasting about three months. Evidence for this phenomenon comes from the histological examination of the adult female genital tracts which indicate that mating occurs only in April-June, but implanted embryos are only in evidence in October-November. The male sexual cycle corresponds to such a rhythm and shows a maximum testicular weight at the mating time. Births take place in February-March thus giving a gestation period of about four months. Only one young is born at a time and births occur just before the onset of the higher of the two rainfall peaks, presumably creating favourable conditions for the maximum survival of the young bats when weaned.

Mutere, F. A. (1970). Bat studies in Uganda.

The author reviews the results of recent studies of the hahitat, breeding and feeding habits, viruses, and flight behaviour of the rich bat fauna of Uganda. Some bats breed seasonally (either once or twice a year) whereas others breed aseasonally throughout the year. Fruit bats fulfill the role of both pollination and seed dispersal. Some of the bats of Uganda act as hosts to viruses, and, as such, are important from the aspect of public health studies.

Mutere, F. A. (1973a). A comparative study of reproduction in the populations of the insectivorous bats, *Otomops martiensseni*, at latitudes 1° 5' S and 2° 30' S.

The insectivorous bat under review, *Otomops martiensseni* (Matschie) is essentially an African bat with a distribution from down south to as far north as Kenya. It is cave-dwelling and does not appear to occur in West Africa. In this study, reproduction of two populations, one at Suswa in the Rift Valley, latitude 1° 5' S and the other at Ithundu in the Chyulu Hills, latitude 2° 30' S was investigated and compared. Regular monthly samples from both populations were collected commencing in March 1970 and running on to February 1972. The bats were processed in the laboratory for pregnancies, weights of testes and foetuses and other measurements and observations. Seasonality in the occurrence of pregnancies was observed in both populations, that is, from October to January only. Also the adult males realized a peak in their mean testicular weight in August, a short period just before the onset of pregnancies thus indicating the most likely time of mating. The female sexual cycle at Ithundu appears to be geared to the rainfall regime as measured at Makindu Meteorological Station about 10 krn away. The male sexual cycle, on the other hand, shows a peak in the very dry months suggesting that such a dry spell may be more important than the rain. Molossid bats exhibit variation in their breeding cycles.

Mutere, F. A. (1973b). Reproduction in two species of equatorial free-tailed bats (Molossidae).

(1) The insectivorous bat *T. pumila* living at Entebbe latitude 0°6' N breeds throughout the year. However, it exhibits peaks in its breeding cycle which appear to coincide with the two rainfall peaks which occur at Entebbe and in Uganda generally; a low one in October-November and a higher one in April-May.

(2) The other insectivorous bat *T. condylura* living at Bukalasa latitude 0°43' N exhibits a bimodal breeding rhythm also closely correlated with the rainfall pattern at Bukalasa which is similar to that at Entebbe.

(3) Rain may therefore be an important proximate factor in the breeding of these bats while food (insects) may play an important ultimate role.

(4) One young per bat is the rule and implantation which always takes place in the right horn of the bicornuate uterus of both species is unilateral.

(5) The gestation period in *T. condylura* is about 2 months and in *T. pumila*, it may be shorter than this.

(6) Both species develop and mature rapidly and as they are often found living together, the difference in their breeding patterns is advantageous in that it helps to reduce competition between them.

Myers, P. (1978). Sexual dimorphism in size of vespertilionid bats.

Sexual dimorphism in body size of mammals is usually explained in terms of competition among members of one sex for members of the other or as a means of reducing intraspecific competition for resources such as food. Sexual dimorphism in vespertilionid bats, often characterized by females exceeding males in body size, does not seem to fit either explanation. A third hypothesis that female body size is influenced by the need to fly with and nourish large fetuses (and occasionally young), is probably unique to bats. If true, it should follow that the greatest degree of sexual dimorphism would occur in those species the greatest fetal or neonatal weight. Examination or data concerning size (skull and lengths) and reproduction for vespertilionid bats reveals that the total weight and modal number of young born per pregnancy per species are strongly, positively correlated with the degree of sexual dimorphism in wing size. Further, covariance analysis shows that the wings of females of several species of vespertilionids are larger than those of males even after statistical adjustment of the data to make the body size of each sex the same. These observations suggest that sexual dimorphism in size of vespertilionid bats is influenced by the demands of large fetuses.

Nadachowski, A., J. Smielowski, B. Rzebik-Kowalska and A. Daoud (1990). Mammals from the Near East in Polish collections.

Mammals from Turkey, Syria, Lebanon, Israel, Cyprus and Iraq stored in Polish collections are described. Additional records of 47 taxa of mammals are given from the Near East.

Nader, I. A. (1975). On the bats (Chiroptera) of the kingdom of Saudi Arabia.

As part of a study of the mammalian fauna of the kingdom of Saudi Arabia, a number of interesting bat specimens have been collected. The Egyptian fruit-eating bat, *Rousettus aegyptiacus*, and the Greater mouse-tailed bat, *Rhinopoma microphyllum*, are recorded for the first time from the country. Distributional notes and comments on the biology of these two and on five other species of bats from Saudi Arabia are mentioned. Previous distributional records of the other eight species known from the country are summarized. A map showing collecting localities is included.

Nader, I. A. (1982). New distributional records of bats from the kingdom of Saudi Arabia (Mammalia: Chiroptera).

Hipposideros caffer (Sundevall, 1846) and *Miniopterus schreibersi* (Kuhl, 1819) are recorded for the first time from Saudi Arabia. Additional information and second records in addition to measurements

are reported form six other bats: *Rhinopoma m. microphyllum, Taphozous n. nudiventris, Rhinolophus clivosus, Rhinolophus hipposideros minimus, Tadarida midas* and *Eptesicus nasutus*. Distribution maps of *Rhinolophus clivosus* and *Eptesicus nasutus* are included.

Nader, I. A. (1985). First record of *Eidolon helvum sabaeum* (K. Andersen, 1907) for the kingdom of Saudi Arabia (Chiroptera: Pteropodidae).

The chiropteran fauna of the Arabian peninsula was reviewed by Harrison (1964, 1972) who recorded thirteen species of bats from the kingdom of Saudi Arabia. Additional information and new records of bats for the kingdom were given by Nader (1975, 1982), Nader and Kock (1980, 1983 a and b) and Jennings (1979) bringing the number of bat species recorded from the kingdom to nineteen. The present record brings the total of Saudi Arabian bats to twenty species. Further collecting most likely will add new species to the chiropteran fauna of the kingdom.

Nader, I. A. and D. Kock (1980). First record of *Tadarida nigeriae* (Thomas 1913) from the Arabian peninsula (Mammalia: Chiroptera: Molossidae).

Tadarida nigeriae (Thomas 1913) is recorded for the first time from the Arabian peninsula; measurements, zoogeographical notes and a key to the Arabian molossid bats are given.

Nader, I. A. and D. Kock (1983a). A new slit-faced bat from central Saudi Arabia (Mammalia: Chiroptera: Nycteridae).

Nycteris thebaica najdiya n. subsp. is an extremely pale coloured population in central Saudi Ambia, extending species range by 920 km from nearest known localities. Zoogeographical relations are discussed.

Nader, I. A. and D. Kock (1983b). *Rhinopoma microphyllum asirensis* n. subsp. from southwestern Saudi Arabia (Mammalia: Chiroptera: Rhinopomatidae).

Rhinopoma microphyllum asirensis n. subsp. is described from the Asir region, SW-Saudi Arabia. It differs from neighbouring conspecific populations by smaller size and in skull characters.

Nader, I. A. and D. Kock (1987). First record of *Miniopterus schreibersi* (Kuhl 1819) (Mammalia: Chiroptera) from North Yemen with zoogeographical relationship evidenced by wing mites (Acarina: Spinturnicidae).

Miniopterus schreibersi is recorded for rhe first time from North Yemen. Because of slightly smaller measurements and geographical proximity we identifiy the SW Arabian population as *M. s. arenarius*, described from E-Africa. - For the first time Spinturnicidae are recorded from Saudi Arabia: parasitic wing mites from *M. schreibersi* are identified as *Spinturnix semilunaris*. This is an Aethiopian faunal element, replaced by *S. psi* on *M. s. pallidus* in the Near East. This finding supports our classification of the SW-Arabian host population with the E-African subspecies, *M. s. arenarius*.

Nader, I. A. and D. Kock (1990). *Eptesicus* (*Eptesicus*) *bottae* (Peters, 1869) in Saudi Arabia with notes on its subspecies and distribution.

Eptesicus bottae is een additional species to the bat fauna of Saudi Araibai and data for the nominate subspecies are given for the first time since its original description. Additional measurements and notes are given for recognition of the known subspecies *innesi, hingstoni, anatolicus* (new material) *taftanimontis*, and *ognevi* (new materialà; lists of synonyms are attempted for these subspecies and their distribution is mapped. Data on reproductive activity are included. - *E. hingstoni* collected at Shanna/SE-Arabia actually represents *E. nasutus*; *E. nilssoni* recorded for Iraq had been re-identified as *E. bottae*.

Nel, J. A. J. and J. J. L. Pretorius (1971). Note on the smaller mammals of the Mountain Zebra National Park.

Collecting in April 1971 yielded 74 specimens of 16 species. Of these, seven species (*Elephantulus rupestris, Lepus saxatilis, Pronolagus crassicaudatus, Graphiurus murinus, Aethomys namaquensis, Desmodillus auricularis* and *Gerbillurus paeba*) are new records for the park. Distribution in habitat-types for each species known to occur are described.

Niort, P. L. (1970). Contribution à la connaissance des chiroptères du Burundi (Afrique Centrale).

La présente communication concerne les Chiroptères du Burundi, Ordre de Mammifères qui n'a jamais été étudié précédemment sur le territoire de ce jeune Etat. Cet exposé a pour but de présenter les études entreprises par le Laboratoire de Zoologie e Biologie Animale de la Faculté de Sciences de l'Université de Bujumbura, en mettant en évidence l'intérêt actuel de ces études, et faire connaître les résultats obtenus durant la première phase de ces recherches. Dans le domaine de la faunistique, 18 espèces de Chauves-souris - dont 15 non encore signalisées dans cette partie de l'Afrique - ont été observées et enregistrées. D'autre part, 35 stations où furent faites des observations, sont notées avec précision et localisées sur la carte. Ces résultats ne doivent être considérés que comme le début d'une série de travaux qui porteront sur la physiologie, le comportement et l'écologie de ces animaux.

The present paper deals with the Bats of Burundi (Central Africa), a country whose Mammals have been very little studied up to this day. It is first showing the research which has begon in the Biological Laboratory of the University of Bujumbura, and the ecological and social interest of this work.

Then we give a list of the records, with some remarks about the circumstances of the captures and the behaviour of the animals concerned. We presently know in Burundi at least seven families, fifteen genus or subgenus and eighteen species of Chiroptera, a great number of them have been observed and nearly 250 specimens are kept in our collections. Some mistakes about Burundi which had been written in precedent works have here been corrected.

But, in spite of great difficulties following the lack of laboratory material and scientific workers, this research must be continued during the next years, we will certainly identify many other species. Inquiries of physiology, ecology and behaviour which have been undertaken about these Bats will be continued;

Noack, Th. (1887). Beiträge zur Kenntnis der Säugethier-Fauna von Ost- und Central-Afrika. Nach Sammlungen und Aufzeichnungen des verstorbenen Dr. Richard Böhm.

Durch die Güte des Herrn Dr., ANTON REICHENOW in Berlin erhielt ich zur Bearbeitung eine Kollektion von Säugethierbälgen und Schädeln, welche von dem leider schon im Anfange einer voraussichtlich glänzenden zoologischen Laufbahn zu Katapäna in Urua (Central-Afrika) verstorbenen Dr. RICHARD

BÖHM auf der Reise von Sansibar bis über den Tanganika-See hinaus gesammelt und von Herrn PAUL REICHARD, dem einzigen Ueberlebenden der Expedition, nach Berlin gebracht wurden. Die aus zwei Antilopen, 1 Carnivoren, 2 Insectivoren, 11 Nagern, 19 Chiropteren und 3 Affen bestehende Kollektion, zu welcher. noch 2 schon von Herrn Dr. REICHENOW im "Zoologischen Anzeiger" beschriebene Thiere, *Sciurus böhmi* und *Rhynhocyon reichardi*, gehören, ist freilich nur ein geringer Rest der umfangreichen, leider zu Grunde gegangenen Sammlungen BÖHM's; aber er gewinnt erheblich durch 2 erhaltene, mir gleichfalls durch Herrn Dr. REICHENOW zur Verfügung gestellte Aufzeichnungen desselben Reisenden, ein zoologisches Notizbuch und eine für den unterdessen auch verstorbenen Professor Dr. PETERS in Berlin bestimmte systematische Arbeit über die Säugethier-Fauna von Ost- und Central-Afrika, sowie durch eine reichhaltige Sammlung vortrefflicher Farbenskizzen, deren Einsicht und Benutzung mir Frau Geheimrath BÖHM in Berlin gütigst gestattete. Durch Verarbeituug und Kombinirung dieses Materials lässt sich eine genügende Uebersicht über die Säugethier-Fauna in den von den Herren REICHARD, BÖHM und KAISER durchzogenen Gebieten gewinnen.

Die Bestimmung der Säugethiere, unter welchen sich manche neue Arten befinden, wurde mir hauptsächlich durch die Güte des Herrn Professor Dr. PAGENSTECHER in Hamburg ermöglicht, welcher mir in liberalster Weise die Benutzung. Der Hamburger Sammlung gestattete und dem ich für seine sehr freundliche Unterstützing in jeder Beziehung hierdurch meinen herzlichsten Dank ausspreche.

Indem ich im Folgenden eine Uebersich über die von Dr. BÖHM in Ost- und Central-Afrika gefudenen Säugethiere gebe, lege ich seine eigene Arbeit zu Grunde, welche sich allerdings nur auf das Gebiet Zwischen Sansibar und dem Tanganika-See bezieht, dieselbe durch seine Notizen über das Gebiet im Westen des Tanganika und durch meine bearbeitung der mir übergebenen Thiere vervollständigend. Ich werde dabei BÖHM's eigene Worte jedesmal durch Anführungszeichen hervorheben. Wenn die Arbeit eine Ungleichmässigkeit zeigt, indem manche Partien rein biologisch, andere rein anatomisch und physiologisch sind, und wenn viele Arten nach kurzen Notizen BÖHM's von mir nicht bestimmt werden konnten, ohne dass ich in werthlose Konjekturen verfallen wäre, so liegt das in der Art der Entstehung.

Das faunistische Gebiet, welches von BÖHM erforscht wurde, zieht sich von Sansibar dem 6.° S. B. folgend nach Westen durch den Besits der deutsch-ostatrikanischen Gesellschaft bis Usagara, geht dann durch Ugogo nach Ugunda und Kawende bis an den Tanganika-See und schweift nördlich von Ugogo in Unyamnesi bis zum 4.° S. B. nach Norden. Jenseit des Tanganika-Sees erstreckt es sich nach Südwesten durch Marungu, woher die meisten von mir untersuchten Thiere stammen, über den Lualaba nach Urna, bis zu den Kongo-quellflüssen, dem Lufire und Likulve, etwa bis zum 10.° 0 S. B. reichend. Es bildet also in Unyamuesi ungefähr einen rechten Winkol und reicht von Ost-Afrika bis in das zoologisch noch fast jungfräuliche Gebiet des oberen Kongo. (Vergl. Die Karte von Central-Ostafrika von Dr. ENGELARDT u, J. v. WENSIERSKY Berl. 1886 und für Marungu und die westlich vom Tanganika gelegenen Gegenden die Kartenskizze von REICHARD in: Mittheil. Der afrikanischen Gesellschaft, Bd. VI, Taf. 10, 1886.) Das Hochland um den fast 90 deutsche Meilen langen, 814 m hoch gelegenen Tanganika bildet die grosse Wasserscheide zwischen den 3 Seiten Afrikas, zwischen Nil, Kongo und Sambesi. Daraus erklärt sich, dass die Säugethiere, deren Verbreitung besonders durch die Flüsse (Nager, Antilopen, Dickhäuter) bedingt wird, hier Formen aufweisen, welche ebensowhl der durch TEMMINCK von Guinea wie der durch HEUGLIN aus den Nilländern und durch PETERS aus Mosambique bekannt gewordenen Fauna verwandt sind. Bedingt wird diese Fauna ferner durch die Gestaltung des Landes: es ist ein wasserreiches, mehrere Tausend Fuss hohes, von höheren Gebirgen durchzogenes Plateau, bedeckt in der Höhe von lichtem Buschwald, sowie an den Flüssen und Gewässern von dichtem Urwald, in der Ebene von hohen Grassavannen mit vereinzelten Bäumen (östlich vom Tanganika boga, westlich buga genannt), dazwischen hier und da Kulturen der Eingeborenen.

Unyarmuesi, die Wasserscheide zwischen Tanganika und Ukerewe, ist, wie Dr. BÖHM in siener zu Gonda (Norden von Ugunda, südlich von Unyamuesi und Ubyaniembe) verfassten Uebersicht bemerkt, abgesehen von Hufthieren, ausserordentlich arm an Säugethieren, woran wohl die Dürftigkeit und Einförmigkeit des "pori", des liecten Waldes, der das Land, Ebene wie Gebirge, fast durchaus bedeckt, und dem es an Dickichten, Wiesengründen selbst üppig belaubten Baumgipfeln ganz gehricht, die Hauptschuld tragen mag. Besonders auffallen muss die Artenarmuth an Sciuriden, Herpestiden und Affen. Aermer noch erscheint die Säugethier-Fauna, weil eine grosse Zahl ihrer Glieder wegen ihrer nächtlichen Lebensweise nur äusserst selten zu sehen oder aber wirklich selten ist. Dagegen ergiebt sich aus BÖHM's Notizen, dass die Säugethier-Fauna um den Tanganika-See,

besonders auch im Westen desselben nach den Kongoquellflüssen hin, ausserordentlich an Artenreichthum zunimmt. Auf dem Wege von Sansibar bis Ugogo und Ugunda ist die Fauna schon erheblich durch den Einfluss des Menschen gemindert worden, während sich um den Tanganika und jenseit mehr der Urzustand der Dinge erhalten hat.

Noack, Th. (1889). Beiträge zur Kenntnis der Säugethierfauna von Süd- und Südwest-Afrika.

Von zwei Afrikareisenden, Herrn Dr. HANS SCHINZ in Riesbach bei Zürich und Herrn P. HESSE, jetzt in Venedig, resp, dem Senckenbergischen Museum in Frankfurt a, M., in dessen Besitz die Sammlungen des letzteren Herrn übergegangen sind, wurde mir die Bestimmung und Bearbeitung einer Anzahl von Säugethieren übertragen. Die von Herrn Dr. SCHINZ gesammelten Specimina stammen aus Damara- und Ovamboland und der Kalahari-Wüste, welche Gebiete derselbe auf einer 2 1/2 jährigen, besonders botanischen Studien gewidmeten Forschungsreise bis zum Kunene und Ngamisee durchzog (vergl. Seinen Bericht in: Verhandl. Gesellsch. Erdkunde, Berlin, Bd.14, 7, p. 322-334). Herr HESSE erwarb seine umfangreichere Sammlung im Gebiete des unteren Kongo, wo derselbe mehrere Jahre Beamter der Nieuwe Africaansche Vernootschap war. Sein Bezirk deckt sich im Grossen mit dem von der deutschen Loango-Expedition 1873-76 erforschten Gebiete, reicht aber über Boma nach Stanleypool aufwärts, und seine Funde ergänzen besonders in Bezug auf die Chiroptera wesentlich die von Dr. PECHUEL-LOESCHE: (Deutsche Loango-Expedition, Bd. 3, Cap. 4) gegebene Uebersicht. Die mir übergebenen Objecte bestanden theils in Körpertheilen, Schädeln und vollständigen oder unvollständigen Bälgen, theils und besonders zahlreich von Herrn HESSE gesammelt, in vollständigen Spiritus-Exemplaren.

Die beiden Sammlungen gehören wesentlich der ostafrikanischen Subregion von SCLATER-WALLACE an, und zwar die des Herrn HESSE der nordwestlichen Grenze desselben, welche nach WALLACE gerade mit dem unteren Laufe des Kongo abschneidet, während die des Herrn Dr. SCHINZ in den Norden der südafrikanischen Subregion eingreift, deren Grenze von der Walfischbai in östlicher Richtung durch die Kalahari- Wüste bis zum Limpopo zieht und von da landeinwärts von der Ostküste bis nach Mosambique verläuft (vergl, die Karte bei WALLACE, Die geographische Verbreitung der Thiere , deutsch von A. B. MEYER, p. 294). Da das untere Kongo-Gebiet nicht mehr wesentlich in das der westafrikanischen Hyläa hinüberreicht, anderseits Ovamboland und der Ngami-See , bis wohin Dr. SCHINZ vorgedrungen ist, noch dem Süden der ostafrikanischen Sub egion angehören, so wird es sich empfehlen, die Besprechung der beiden Collectionen zu vereinigen. Für die specielle Characterisirung des von Herrn HESSE zoologisch erforschten Gebietes verweise ich auf die classischen Schilderungen von PECHUEL-LOESCHE, besonders im 3. und 4. Cap. des 3. Bandes der deutschen Loango-Expedition , sowie auf die grosse Uebersichtskarte von LANGE, Bd, 1 und die Karte des Kuïlu-Gebietes von PECHUEL-LOESCHE, Bd. 3. Der letztere bestätigt ebenfalls Bd, 3, p. 124 die von SCLATER-WALLACE bestimmte Nordgrenze durch die Bemerkung, dass die letzten grossen Wälder der westafrikanischen Subregion in dem breiten Mündungsgebiete des Kongo gedeihen und südlich davon die Gegend den Oharacter der Savanne und Campine trägt, in welcher der Busch vorherrscht, vereinzelt zum Buschwalde, an den Flüssen zu dem von Dr. SCHWEINFURTH so malerisch geschilderten Galeriewalde, ja zum wirklichen Hochwalde sich potenzirt. Dem widerspricht nicht, dass nach den Berichten von FRANÇOIS, KUND und TAPPENBECK das zoologisch noch der Erforschung harrende Gebiet der grossen südlichen Kongozutlüsse, des Kassai und Sankuru, vielfach wieder den Character der Hyläa trägt. In dem von Herrn HESSE besonders erforschten Küstenstrich ist noch der Mangrove-Sumpf, welcher manchen Säugethieren, selbst Atlen zum gelegentlichen Aufenthalte dient, eine besonders characteristiscbe Erscheinung. Das von Dr. SCHLNZ durchzogene Gebiet, in welchem die die südafrikanische Subregion so gut characterisirenden Proteaceen gar nicht mehr vorkommen, während die Euphorbien sich auch in der ganzen ostafrikanischen Region finden, wurde vor ein paar Jahren ebenfalls von Dr. PECHUEL-LOESCHE im Westen der Walfischbai besucht, und seine 1885 auf dem 5. Geographentage in Harnburg ausgestellten Aquarelle . . .

Norberg, U. M. (1972). Functional osteology and myology of the wing of the dog-faced bat *Rousettus aegyptiacus* (É. Geoffroy) (Mammalia Chiroptera).

The muscles moving, directly or indirectly, the anterior extremity, the action of the muscles, and the skeletal elements on which these muscles attach are described in *Rousettus aegyptiacus* (É. Geoffrey) (Pteropodidae). On the whole the morphological pattern and action of the muscles are the same as in microchiropteran bats, though there are some differences. The description, high-speed films, and flash photographs are made the basis of functional aspects.

1. *Rousettus aegyptiacus* has a very low midventral sternal ridge. The sternum also has three keels, on which a median ligamentous sheet attaches. This ligament and the keels form an enlarged area of attachment for the pectoralis muscle without any appreciable increase in weight.

2. The cross sections of the digits are described. The digits are shaped in such a way as to have their largest diameters in those planes where the bending forces are largest, thereby keeping low the weight while still possessing rigidity in the important directions. However, this flattening of the digits in certain planes is less pronounced in *Rousettus aegyptiacus* than in many micro chiropteran species.

3. The metacarpals are short in relation to the entire digits, as compared with many microchiropteran species. This permits the bat to get a potentially high camber of the wing during the downstroke. During the later part of the upstroke the digits are highly flexed, folding the hand wing, to reduce the drag. A relatively short metacarpal contributes to giving a small area of the hand wing meeting the airstream during the upstroke.

4. The rigid unit formed by the second and third digits is very broad in megachiropteran bats. Musculus palmaris longus is very powerful in *Rousettus aegyptiacus* in comparison with most microchiropteran bats so far investigated. These features contribute to giving high camber of the wing.

5. *Rousettus aegyptiacus* has a powerful flexor muscle of the radius, Musculus brachio-radialis, which is unusual in microchiropteran bats.

6. Megachiropteran bats, so far investigated, possess more powerful membrane muscles than do the small microchiropteran bats.

Flight characteristics: The wing loading for females is ca. 21 Nm^{-2}, for males ca. 30 Nm^{-2}, the aspect ratio ca. 5.8, and the stroke frequency ca. 8 per sec in slow level flight, ca. 3.3 m per sec.

Novacek, M. J. (1987). Auditory features and Affinities of the Eocene Bats *Icaronycteris* and *Palaeochiropteryx* (Microchiroptera, incertae sedis).

The earliest known bats are skeletons of *Icaronycteris index* from the early Eocene of western Wyoming and a few less well-represented species from the early Eocene of France. Also known are *Palaeochiropteryx tupaiodon* and several other species from the middle Eocene of western Germany. These taxa have been regarded as primitive forms, either "ancestral" to echolocating microchiropterans or "ancestral" to both micro- and megachiropterans. Details of basicranial structure suggest that these Eocene forms were, however, specialized echolocators comparable to Recent microchiropterans. Moreover, quantitative analysis reveals that the Eocene bats have a more pronounced expansion of the cochlea than many Recent microchiropteran species. There is clear justification for reference of *Icaronycteris* and *Palaeochiropteryx* to the Microchiroptera. Conversely, there is no reason to recognize a "primitive ancestral" group, Eochiroptera, that is excluded from Microchiroptera or Megachiroptera. The relationships of *Icaronycteris* and *Palaeochiropteryx* within Microchiroptera remain uncertain. Association of these taxa and several other Eocene forms within the microchiropteran superfamily Palaeochiropterygoidea fails to clarify these relationships. Palaeochiropterygoidea has not been defined by derived characters, and *Icaronycteris* and *Palaeochiropteryx* are more accurately designated Microchiroptera incertae sedis. Several primitive features shown by *Icaronycteris* suggest that the development of a sophisticated system for echolocation within Microchiroptera occurred earlier than certain modifications of the postcranial skeleton.

Oelofsen, M. J. and M. S. Smith (1993). Rabies and bats in a rabies-endemic area of southern Africa: application of two commercial test kits for antigen and antibody detection.

In southern Africa, isolates of rabies-related viruses (Le, Duvenhage virus and Lagos bat virus) have been made from insectivorous and frugivorous bats. As no recent formal bat virus survey has been reported in southern Africa, a survey of bats in rabies-endemic areas was undertaken. Five hundred and fortyseven bats (13 species) were collected from 21 localities in the Orange Free State, Lesotho and the northern Cape Province. None of the 190 bat sera tested using the "Trousse Platelia Rage" ELISA kit (Diagnostic Pasteur), had antibodies to rabies virus glycoprotein G. Rabies virus nucleocapsid antigen was also sought for in the brains of 530 bats (13 species) by means of the "Rapid rabies enzyme irnrnunodiagnosis" (RREID) test (Diagnostics Pasteur). No positive results were obtained. These results show that bats are unlikely to play an important role as hosts of rabies in these parts of Africa, although a low rate of infection cannot be excluded.

Oelofsen, M. J. and E. Van der Ryst (1999). Could bats act as reservoir hosts for Rift valley fever virus?.

The inter-epizootic reservoir host of Rift Valley fever virus (RVFV) remains unknown, although the namaqua rock rat, *Aethomys namaquensis*, as well as bats have been implicated. Bats can be asymptomatically infected with rabies, as well as several arboviruses; the possibility that they can act as host for RVFV therefore exists. To examine this possibility, 350 different samples (brain, liver, salivary glands and brown fat) obtained from 150 bats (comprising seven species) were tested for RVFV antigen using an enzyme linked immunosorbent assay (ELISA). None of the samples tested positive, but the ELISA proved to have limited sensitivity (>= 10^3 $TCID_{50}$/ml). In order to determine whether bats could be infected with RVFV, one *Miniopterus schreibersii* and two *Eptesicus capensis* bats were inoculated by the oral or intramuscular route with 100 ml and 30 ml, respectively, of a RVFV suspension with a titre of 106 $TCID_{50}$/ml. None of the bats developed any clinical signs. A low concentration of RVFV antigen was found in the liver and urine of *M. schreibersii*, but not in brain tissue. A third *E. capensis* bat was inoculated by the intramuscular route and sacrificed on day 18. A low level of antigen was detected in the brown fat. These results demonstrate that bats can be infected with RVFV, and that further studies should be done to determine the potential of different bat species to act as reservoir hosts for RVFV during inter-epizootic periods.

Ogen-Odoi, A. A. (1981). The influence of seasonality of food and rainfall on some aspects of the ecology of bats on Entebbe Penninsular, Uganda.

The influence of availability of food (fruits and insects) and rainfall on some aspects of the ecology of Chiropteran fauna on Entebbe Peninsular was investigated in a twelve month intensive study, and the data presented are discussed in relation to survival, competition and adaption of the bats in the area. The bats were sampled, regularly using Nylon Mist Nets.

Observations and records were made of the fruiting phenology of the most abundant fruit plants within the Peninsular through the study and aerial insect count data were noted of the insects caught using light traps.

Epomophorus anurus (Hegluin) and Tadarida species showed the highest incidence and widest spatial distribution amongst the frugivorous and insectivorous bats respectively.

The numbers, spatial dispersion and activities of the bats were strongly correlated with rainfall patterns and the subsequent food availability. Numbers of individual bat species progressively decreased, but species diversity increased after the high rainfall peaks, when food become abundant. The activities of the fruit bats were randomly distributed at various levels above ground during seasons of food

scarcity, but became restricted to higher levels during food abundance. Flight patterns of the insectivorous bats were however not affected by changes in seasons and food availability.

During the peaks of high rainfall and low food supply,
flight and foraging activities started early in the evening (1800 hrs local time) and ended some two hours after mid-night, before the characteristic early morning heavy rains. In addition, their activities were secondarily influenced by the intensity of moon light causing the bats to disappear.

The abundance of insects and fruits coincided with similar bimodal peaks. There was no sex difference in activity patterns in all the bats, although there was a marked female dominance in numbers over males. Over all, more fruit bats were caught in the mist nets than insectivorous bats.

Ogen-Odoi, A. A. (1983). The influence of seaonality of food and rainfall on some aspects of ecology of bats in Entebbe Peninsula, Uganda.

Studies showing correlations between various environmental factors, e.g. rainfall, temperature, photo and others with seasonal fluctuation of various parameters of populations of different living organisms, have been conducted in different parts of the world. In particular, how these factors influence reproductive and breeding cycles and activity patterns have been reported in bats (Marshall, 1947; Mutere, 1967 + 1968; Wimsatt & Trapido, 1952; Okia, 1973; Gaisler, 1973).

Previous work involving mist-netting of bats in the Entebbe Peninsula (Mutere, 1967; Ogen-Odoi, pers. observ.), revealed interesting fluctuations in number of catch and species of bats with seasons. Detailed investigations to determine the nature of the patterns and possible factors involved have not been made. This paper reports the findings of research whose major aim was to understand the possible influences of rainfall and seasonality of food on patterns of foraging and flight activities, spatial dispersion and distribution and species composition of bats in Entebbe Peninsula.

Ognev, S. I. (1927). A synopsis of the Russian bats.

The Russian Chiroptera hitherto have not been well known. Our knowledge has not only been deficient concerning the biology of these interesting mammals, but also as to the number of species found in Russia and their distnbution. K. A. Satunin in his "Conspectus Mammalium Imperii Rossicae" (1914) enumerates thirty-nine species and subspecies of Chiroptera which are found in this country. Nevertheless in Satunin's list it is doubtful whether some of the bats can be regarded even as weak subspecies, for example *Rhinolophus ferrum-equinum colchicus* Satun. and *R. euryale nordmanni* Satun.; the systematic relations of different species of *Barbastella*, etc., are also not clear. If we take into consideration an this the list of bats in Satunin's book must be shortened to thirty-five species and subspecies.

In the interesting little paper by W. L. Bianchi (Notes preliminaires sur les chauve-souris ou Chiroptera de la Russie, Annuaire du Musée Zoologique de l'Académie des Sciences, Petrograd, vol, 21, 1916, pp. lxxiii-lxxxii) thirty-eight species and subspecies of Russian bats are enumerated. If we delete from this list the wrongly included *Otonycteris cinereus* Satunin and *Barbastella walteri* Bianchi, the synopsis contains only thirty-six forms.

Having examined a very considerable collection of bats, I estimate that in Russia (considering the borders as they were at the time of the past Russian Empire) we meet with forty-nine species and subspecies. It is very possible that new investigations will essentially complete this sufficiently long list, in which I have included some quite new species and subspecies.

Three families of these animals are found in Russia, as follows: Rhinolophidae, Vespertilionidae, and Molossidae, the distinctive peculiarities of which are well known.

Ohlendorf, B. (1999). Zur korrekten Schreibweise der naturwissenschaftlichen Namen europäischer Fledermausarten.

Der Artikel dient dem Zweck, den Autoren fledermauskundlicher Arbeiten, aber auch den Schriftleitern und Herausgebern von entsprechenden Publikationsorganen nahezulegen, zukünftig die korrekte, international eindeutig geregelte Schreibweise der naturwissenschaftlichen Namen europäischer Fledermausarten anzuwenden. Auf die bisherigen Fehler und Inkonsequenzen wird ausdrücklich aufmerksam gemacht. Alle in Europa nachgewiesenen Fledermausarten sind mit der gültigen Schreibweise der naturwissenschaftlichen Namen einschließlich Autor und Jahreszahl aufgelistet.

The article serves the purpose to suggest not only to the authors of works dealing with bats but also to the editors and publishers of corresponding literature to use from now on the correct, international definitely regulated spelling of the scientific names of European bat species. The previous errors and inconsistencies are clearly named. All bat species recorded for Europe are listed containing the valid spelling of their scientific names, the author and the date of the year.

Okafor, F. C. (1988). *Oochoristica agamae* Baylis, 1919 (Eucestoda, Linstowiidae) in one reptile and two bat species from Nsukka (Anambra State, Nigeria).

The same cestode parasite was recovered from the small intestines of different insectivorous hosts: a lizard *Agama agama*, two bats *Tadarida chaeraphon nigeriae* (Thomas, 1913) and *Hipposideros caffer tephrus* (Cabrera, 1906) at Nsukka. Various measurements and observations on gross anatomy (eg. number and arrangement of the ovary, dimensions of the cirrus sac, etc.) show that all specimens of the parasites belong to the same species. The different hosts feed on a common intermediate host in the same environment which may account for this phenomenon. The prevalence of the worms and the intensity of infection in the three hosts are also presented. There is a significantly high prevalence in the males, but no explanation for this trend is given.

Okia, N. O. (1974a). The breeding pattern of the Eastern Epauletted bat, *Epomophorus anurus* Heuglin, in Uganda.

Continuous monthly observations of the reproductive organs of the Eastern epauletted bat, *Epomophorus anurus*, has revealed its breeding to be cyclic with two distinct breeding seasons separated by about a month. Gestation appeared to last between 5 to 6 months, and occurred from April to September and October to March. Testes were heaviest from February to April and from September to December, and a majority of young bats were caught in late March and early October during the short intervals between breeding. This study supports the findings of earlier workers showing that breeding in tropical fruit bats is seasonal and closely related to rainfall. It further supports an earlier suggestion that this fruit bat is polyoestrous and breeds continuously.

O'Shea, T. J. (1980). Roosting, Social organization and the annual cycle in a Kenya population of the bat *Pipistrellus nanus*.

The tiny (3.1 - 3.8 g) vespertilionid bat *Pipistrellus nanus* was studied in Kenya palm thatched roofs from May 1973 to July 1974. Roosting social organization and related activities and behavior are described. MM held diurnal roosting territories where FF gathered in small and compositionally labile groups, attracted to the most vocal MM. Annual variation in population-wide aspects of social organization follows predictable seasonal changes in climate and predator abundance. Variability between individuals follows a common mamrnalian pattern: high male competition for FF, variance in presumed male reproductive success, and a mating system resembling one based on resource defense polygyny. Social organization in this population contrasts with that known from studies of other *P. nanus* populations.

O'Shea, T. J. and T. A. Vaughan (1980). Ecological observations on an East African bat community.

L'etude de la faune de chauves-souris du centre-sud du Kenya a été entreprise de mai 1973 à julllet 1974: vingt-cinq espèces de chauves-souris appartenant à 7 familles ont été collectées; 24 d'entre elles étaient insectivores. Cette faune est pauvre quand on la compare aux régions subtropicales en raison de l'absence de non-insectivores. Le nornbre d'espèces et de familles de chauves-souris insectivores, cependant, est presque identique a celui de Costa-Rica où un climat semblable est réparti de manière comparable.

La région subit une saison sèche prolongée de mai à la fin d'octobre, deux saisons des pluies en novembre et en mars-avril, et une saison sèche courte et moins sévère de decembre à fevrier. La moitié seulement des espèces ont été trouvées au cours de la longue saison sèche et beaucoup entre elles paraissent avoir de faibles densités. On pense que des migrations saisonnières vers des régions où il y a des pluies supplementaires peuvent expliquer ces différences. Toutes les espèces sauf une se reproduisent avec les pluies les plus constantes de novembre, quelques-unes mettent bas au cours de la saison des pluies de mars-avril, mais aucune ne se reprodutt pendant la longue saison sèche. La plupart des résidents annuels se reproduisent seulement en novembre et la plupart de ces espèces qui mettent bas en mars-avril sont probablement migratrices. Celles qu'on croit migratrices ont tendance à donner des portées plus petites.

The bat fauna of a south-central Kenya study area was monitored from May 1973 to July. Twenty-five species of bats in seven families were collected: 24 of these were Insectivores. This fauna is depauperate compared to neotropical areas due to a lack of non-insectivores. The number of species and families of insect eating bats, however, is nearly identical to that found at a Costa Rican site with a similar clirnate sampled in a comparable manner (Laval and Fitch 1977).

The area had a pronounced dry season from May to late-October, two rainy seasons in November and March-April, and a short and less severe dry season from December through February. The maximum number of species was detected from November to May. Only about half of these species were found during the long dry season, and many oft.hose present seemed to occur in lower densities. Seasonal migration to areas with complementary rainfall patterns is suggested to account for these differences. All but one species reproduced with the more predictable November rains, a few also gave birth in the March-April rainy season, but none bred in the long dry season. The annnual residents bred only in November and most of those species which gave birth in March-April were suspected to be migratory. Suspected migrants tended towards smaller litter sizes.

Several foraging-related characters were examined as indicators of food resource partitioning. Aspect ratio was significantly correlated with estlmates of foraging height. It is suggested that all the common non-molossid insectivorous bat species could coexist on the basis of differences in pursuit strategy, prey size, orientation pulses or feeding heights. A greater proportion of migrating species overlap in size during the period from November-May than during the long dry season. This may indicate a greater degree of selective feeding when insect abundance is high, greater partitioning on the basis of size when abundance is low.

Oustalet, E. (1894). Les mammifères et les oiseaux d'Obock et du pays des çomalis, (Première partie).

J'espérais pouvoir apporter aujourd'hui un exposé complet de nos connaissances relatives à la faune des Mammifères et des Oiseaux de la portion de l'Afrique orientale qui comprend le pays des Danakil, notre colonie d'Obock et le pays des Çomalis; mais, comme cela arrive souvent en pareil cas, j'ai reconnu, en rassemblant les éléments de cette étude, que les matériaux à réunir étaient plus nombreux et plus épars que je ne le supposais, que la faune des Vertébrés du Çomal était plus riche que je ne le croyais et que, par conséquent, je n'aurais pas le temps nécessaire pour terminer à la date fixée mon travail dont l'étendue aurait dépassé d'ailleurs les limites qui me sont tracées. Je me bornerai

donc aujourd'hui à donner la première partie de mes recherches, celle qui est relative aux Mammifères d'Obock.

Cette colonie a été visitée en 1893 par notre collègue M. le Dr Jousseaume et par M. Maurice Maindron. Le premier de ces voyageurs, tout en s'adonnant de préférence à la recherche des Mollusques, a recueilli pour le Muséum des nids et des oeufs de Balbuzard, de Tisserin, de Fauvette, et M. Maindron a rapporté un assez grand nombre de dépouilles de Mammifères et d'Oiseaux, ainsi que des nids et des oeufs de Tisserin, de Guépier et de Ganga. C'est à l'aide de ces matériaux que j'ai pu dresser les listes suivantes:

Overal, W. L. and L. R. Wingate (1976). The biology of the batbug *Stricticimex antennatus* (Hemiptera: Cimicidae) in South Africa.

A colony of *Stricticimex antennatus* Ferris & Usinger from a bat-roost near Pietermaritzburg. Natal, was estimated to contain more than 50 000 individuals. The bat bugs were observed to feed on *Myotis tricolor, Rhinolophus simulator, R. clivosus, Nycteris thebacia*, and *Hipposideros caffer*. People entering the bat-roost were bitten, and several developed skin sensitivity to the bites. In the laboratory batbugs were ted on rabbits and rats, and round to undergo five nymphal instars. Moulting did not take place in unfed individuals. The aggregating and orientation behaviour of the batbugs in response to simple stimuli is described.

Owen, R. D. and M. B. Qumsiyeh (1987). The subspecies in the Trident leaf-nosed bat, *Asellia tridens*: homomorphism in widely separated populations.

Examined univariate and multivariate morphometric variation in populations of a desert bat, *Asellia tridens*, from most of its range in Africa and Asia. Morphometric and color variation in this species suggest that two distinct taxonomic groups exist. One of these represents at least two widely disjunct populations with a large intervening region occupied by the other morphologically distinct group. The existence of widely separated homomorphic populations may prove to be more common than previously believed in mammalian species with large ranges, and may cause difficulty in recognizing subspecies based on classical taxonomic criteria.

Pagenstecher, H. A. (1885b). Die von Dr. G.A. Fischer auf der in Auftrage des geographischen Gesellschaft in Hamburg unternommenen Reise in das Massai-Land gesammelten Säugethiere.

Die von Herrn Dr. *G. A. Fischer* auf seiner im Auftrage der geographischen Gesellschaft zu Hamhurg im Jahre 1883 in das Massailand ausgeführten Reise gesammelten Thiere und Mineralien sind von der gedachten Gesellschaft als ein höchst dankenswerthes Geschenk dem Naturhistorischen Museum überwiesen worden.

Die Bearbeitung der Reptilien, Amphibien und Fische durch Herrn Dr. *J. G. Fischer* und die der Käfer in der Hauptsache durch Herrn Professor Dr. *Gerstücker* wurden in 1884 bereits so zeitig fertig, dass diese Arbeiten als Beilagen zum Jahresberichte des Museums für 1883 im Jahrbuche der Hamburgischen wissenschaftlichen Anstalten I. Jahrgang erscheinen konnten.

Eine Uebersicht der Vögel hat Herr Dr. *G. A. Fischer* seitdem selbst in der Zeitung für die gesammte Ornithologie 1884 (Budapest) gegeben.

Ueber die Säugethiere soll hier Bericht erstattet werden. Wie mehrfach zu den Vögeln früher gesammelte Stücke, so hat zu den Säugern Herr Dr. *Fischer* den auf Zanzibar erlegten Colobus Kirkii als sein Geschenk beigelegt. Eine annähernd volle Vertretung der Fauna des durchwanderten Gebietes liegt nicht vor. In seiner Reiseskizze hat Dr. *Fischer*" von Säugern als beobachtet noch angeführt Elenantilope, Giraffe, Zebra, gestreiftes Gnu, Warzenschwein, Büffel, Nilpferd, Rhinoceros, Hyaena crocuta, Löwe, Cynocephalus babuin, Hase: als von den Massai zum Mantel benutzt

Cercopithecus pygerythrus. Hyrax, "Wildkatze"; (unzweifelhaft Lynx sp.), Leopard: von der Jagd und den Spuren des Elephanten ist die Rede.

Das grosse Wild war besonders reich in den lichten Waldungen und dem Graslande bei Klein-Aruscha, aber die reichste Fauna gab der dichte Wald bei Gross-Aruscha am Maeruberge.

Palmeirim, J. M. (1991). A morphometric assessment of the systematic position of the *Nyctalus* from Azores and Madeira.

The Atlantic archipelagoes of Madeira and Azores both have populations of small *Nyctalus*, which have been described as separate species. But their systematic situation remains unclear because of the difficulty in assigning a taxonomic status to geographically isolated forms, and to the lack of a comprehensive study of the genus. In this paper a comparative craniometric study of all the widely recognized species of *Nyctalus* is done, and in this context the taxonomic status of *verrucosus* and *azoreum* is assessed. It is concluded that *N. azoreum* from the Azores should be regarded as a separate species, and the Madeiran form, *verrucosus*, as a subspecies of *N. leisleri*.

Les petites noctules-des archipels de Madère et des Acores ont été décrites cornme des espèces différentes. Leur position systématique reste douteuse en raison de la difficulte de classement de formes géographiques isolées et aussi a cause de l'étude insuffisante du genre. Notre étude craniométrique comparative de toutes les espèces qui ont été rapportées au genre *Nyctalus* conduit à la conclusion que la forme *azoreum* des Acores doit être considerée comme une espèce, *N. azoreum*, et que la forme *verrucosus* de Madère peut être considerée comme une sous-espèce de *N. leisleri*.

Panouse, J. B. (1951). Les Chauves-souris du Maroc.

Au Maroc, pays ouvert à l'investigation scientifique organisée depuis un demi-siècle à peine, nos connaissanccs faunistiques comportent de nombreuses et larges lacunes. L'inventaire des formes animales vivant sur le territoire de l'Empire Chérifien et dans les mers qui le bordent, a été entrepris par l'Institut Scientifique Chérifien dès la fondation de ce dernier en 1920. Malgré l'aide apportée par les Services qui, à un titre ou à un autre, s'occupent au Maroc de la vie animale, malgré les recherches effectuécs par les naturalistes sur le matériel récolté, cet inventaire est loin d'être complet. Aussi les zoologistes spécialistes, certains de voir dans un avenir prochain le catalogue des animaux étudiés par eux s'enrichir de formes non encore rencontrées au Maroc ou même entièrement nouvelles pour la Science, sont-ils peu enclins à punlier des mises au point de quelque importance sur leur groupe de prédilection. Le nombre des svstématiciens est très réduit et de tous côtés on leur envoie du matériel: aussi est-il difficile de les blâmer lorsqu'ils hésitent à entreprendre une révision qui s'avérera sûrement incomplète et périmée au bout d'un temps très court.

Il me semble cependant indispensable de présenter dès à présent des mises au point sur les groupes les mieux connus. Combien de fois m'a-t-on posé la question: "Pouvez-vous m'indiquer un travail d'ensemble sur tel ou tel groupe animal existant au Maroc"? Lorsqu'il ne s'agissait pas des serpents ou des poissons d'eau douce, force m'était de répondre par la négative. C'est pourquoi je crois nécessaire la parution de notes destinées à permettre l'identification des principaux représentants de la faune marocaine, notamment des Vertébrés. Pour pouvoir être utilisés par tous ceux qu'intéresse la Nature, ces travaux, ébauche d'une Faune du Maroc, doivent présenter certaines caractéristiques. Les termes techniques utilisés ne doivent pas être trop nombreux: il convient cependant de ne pas tomber dans un excès inverse, car le langage scientifique est seul capable de désigner avec précision et sans ambiguïté certaines structures et certains fails. Les tableuux de détermination doivent être aussi clairs que possible: les caractères qu'ils utilisent doivent pouvoir être facilement appréciés et permettre un choix sans équivoque. Ils doivent être conçus non pour des spécialistes disposant d'une collection de comparaison, mais pour des naturalistes qui désirent simplement nommer un animal rencontré peut-être par hasard. Cela implique une illustration abondante, car une figure décrit souvent mieux et plus qu'un long texte. Toutes ces exigences sont difficiles à réaliser ou même à concilier,

mais elles doivent constituer un idéal à satisfaire dans la plus grande mesure possible. Le présent travail sur les Chauves-souris du Maroc est une première tentative dans ce sens.

Je suis heureux de remercier ici tous ceux dont l'aide m'a été précieuse. M. NEMETH s'est chargé de mesurer les Chiroptères des collections de l'I.S.C. M. le Professeur BERLIOZ, Directeur du Laboratoire de Mammalogie du Muséum National d'Histoire Naturelle de Paris a bien voulu me confier des échantillons de la plupart des espèces qui manquent dans les collections de Rahat, M. le Professeur HEIM DE BALSAC, le spécialiste certainement le plus éminent en ce qui concerne les Mammifères d'Afrique du Nord, à bien voulu examiner le manuscrit.

L'illustration est en partie originale, en partie tirée des travaux de CABRERA, MILLER, DIDIER ET RODE et RODE. La plupart des figures ont été dessinées par M. de BRETTES, dessinateur de l'Institut Scientifique Chérifien et la représentation du Grand Rhinolophe est due à M^me^• Luce de CHAMPRIS.

Panouse, J. B. (1953). Observations sur les chauves-souris du Maroc et addition d'une nouvelle espèce *Myotis mystacinus* (Kuhl 1819) à la faune marocaine.

Depuis la parution, en 1951, de mon travail sur les Chauves-Souris du Maroc, j'ai pu, avec l'aide de correspondants dévoués, recueillir un certain nombre de renseignements nouveaux qui permettent de préciser la répartition de quelques espèces, de confirmer la présence de l'Oreillard par la capture de deux spécimens et enfin d'enrichir la faune du Maroc et même de l'Afrique d'une forme connue jusqu'ici d'Europe et d'Asie. La publication de ces données récentes constitue le but de cette note.

Panouse, J. B. (1958). Présence au Maroc de *Nycteris thebaica*.

Récemment le Docteur BLANC, Directeur de l'Institut Pasteur du Maroc m'a communiqué une chauve-souris qu'il venait de capturer en compagnie de son adjoint, M. ASCIONE. Un bref examen de l'animal me permit de constater qu'il s'agissait d'un *Nycteridae* dont plusieurs autres examplaires furent pris ultérieurement.

Une étude plus précise de ces chiroptères et leur comparaison avec des exemplaires du Museum de Paris m'amènent à considérer qu'il s'agit de *Nycteris thebaica* E. Geoffroy 1813, espèce décrite d'Egypte et fréquente en Afrique noire mais jusqu'ici inconnue en Afrique du Nord, comme d'ailleurs tous les autres *Nycteridae*.

Cette forme est suffisamment connue des spécialistes pour que sans doute une nouvelle description soit pour eux superflue. Mais l'accès aux documents originaux n'est pas toujours facile aux naturalistes amateurs qui lisent ce Bulletin, aussi je crois bien faire en donnant de cette espèce une description sur le type de celles publiées dans mon travail de 1951.

Park, K. J., J. D. Altringham and G. Jones (1996). Assortative roosting in the two phonic types of *Pipistrellus pipistrellus* during the mating season.

The European pipistrelle, *Pipistrellus pipistrellus*, consists of two phonic types that echolocate with frequencies of maximum energy (*FMAXE*) averaging 46 kHz and 55 kHz (named the 45 kHz and 55 kHz phonic types for simplicity). These two phonic types occur in sympatry over much of Britain. Between 1993 and 1995 mating groups of *P. pipistrellus* were located in bat boxes between August and October, the main mating period for these bats. Mating groups comprised a single male and up to three females. Broadband, time-expanded recordings of search-phase echolocation calls were made from bats immediately after release. The average *FMAXE* of each bat was calculated: bats with an *FMAXE* less than 49 kHz were classed as 45 kHz phonic types and bats with an *FMAXE* greater than 52 kHz were classed as 55 kHz phonic types. A total of 16, 45 kHz groups and ten 55 kHz groups were located. No mating group ever contained more than one phonic type, although both types were known to be present at several of the study sites. Males emitted calls of higher frequency than females

for both phonic types. The study suggests that the two phonic types are reproductively isolated and supports the hypothesis that *P. pipistrellus* should be considered as two cryptic sibling species.

Parsons, S., C. W. Thorpe and S. M. Dawson (1997). Echolocation calls of the Long-tailed bat: A quantitative analysis of types of calls.

The echolocation calls of long-tailed bats (*Chalinolobus tuberculatus*) were recorded in the Eglinton Valley, Fiordland, New Zealand, and digitized for analysis with signal-processing software. Univariate and multivariate analyses of measured features facilitated a quantitative classification of the calls. Cluster analysis was used to categorize calls into two groups equating to search and terminal-buzz calls described qualitatively for other species. When moving from search to terminal phases, the calls decrease in bandwidth, maximum and minimum frequency of call, and duration. Search calls begin with a steep-downward FM sweep followed by a short, less-modulated component. Buzz calls are FM sweeps. Although not found quantitatively, a broadband pre-buzz group of calls also was identified. Ambiguity analysis of calls from the three groups shows that search-phase calls are well suited to resolving the velocity of targets, and hence, identifying moving targets in stationary clutter. Pre-buzz and buzz calls are better suited to resolving range, a feature that may aid the bats in capture of evasive prey after it has been identified.

Pedersen, S. C. (1998). Morphometric analysis of the chiropteran skull with regard to mode of echolocation.

I compared simple morphometric data with cephalometric data on the angular arrangements of the facial and neural components of the skull of bats. The morphological dichotomy between oral and nasal emission of the echolocation pulse in the Microchiroptera is presumably under strong selective pressure to provide an acoustical horn for efficient emission of the echolocative call. Cephalometric and morphometric data compliment each other in the distinction between oral and nasal *baupläne*. However, fine taxonomic resolution provided by morphometric data is subject to the otherwise plastic functional matrix of the head conforming to the acoustical axis of the skull.

Perret, J. L. and V. Aellen (1956). Mammifères du Cameroun de la collection J.L. Perret.

Les Mammifères qui font l'objet de cette étude ont été recueillis par l'un de nous (J.-L. P.) dans le sud du Cameroun Français, principalement aux environs de Sangmelima, durant la période 1953 - 1955. Ils sont représentés par 405 spécimens et 91 espèces. Toute la collection est déposée au Muséum d'Histoire naturelle de Genève.

Leur préparation, leur détermination provisoire et les mesures sur le terrain, ainsi que les noms vernaculaires et les indications biologiques sont l'oeuvre de J.-L. P.

La détermination définitive, les mesures craniennes et les discussions taxinomiques sont le travail de V. A.

Cette riche collection apporte peu de formes nouvelles pour le Cameroun, mais son étude permet d'utiles précisions biogéographiques et systématiques. Quelques espèces rares ou peu connues, telles que *Casinycteris argynnis, Miniopterus i. inflatus, Epixerus wilsoni*, etc. y sont représentées.

Sont nouveaux pour le Cameroun Français:
Graphiurus surdus Dollm., *Mus m. musculus* L., *Rhinolophus alcyone* Temm. et *Pipistrellus c. culex* Thom.

Perrin, M. R. (1982). Prey specificity of the barn owl, *Tyto alba*, in the Great Fish River valley of the Eastern Cape Province.

The responses of barn owls preying on a community of small mammals in the Great Fish River valley of the Eastern Cape have been determined by pellet analysis. The species composition of the prey was compared with the results of intensive trapping in adjacent habitat. Differences were apparent and their probable causes are discussed. The age-structure of several prey species found in the pellets was recorded following the establishment of relative age classes based on tooth wear, and interpreted in relation to the theory of prudent predation. There was no common pattern of age specific mortality. It was concluded that prudent and non-prudent behaviour may occur irregularly in space and time in these polyphagous barn owls, since the prey species varied in size and density, and were characterized by different reproductive strategies and survivorship patterns.

Die reaksies van nonnetjie-uile wat jag maak op 'n gemeenskap van klein soogdierspesies in die Groot-Visriviervallei van die oostelike Kaapprovinsie is vasgestel deur ontleding van hul pilvormige onverteerde kosrestes. Die spesiesamestelling van die prooi is vergelyk met die opbrengs van omvattende valstrikvangste in die naburige habitat. Daar was duidelike verskille en die waarskynlike oorsake daarvan word bespreek. Die ouderdomstruktuur van verskeie prooispesies wat in die uilklonte aangetref is, is na vasstelling van die betreklike ouderdomsklasse volgens tandslytasie aangeteken, en met inagneming van die teorie van selektiewe buitmaak geïnterpreteer. Geen algemene patroon van ouderdomspesifieke sterflikheid is opgemerk nie. Daar is tot die gevolgtrekking gekom dat selektiewe en nie-selektiewe gedrag dalk onder hierdie polifage nonnetjie-uile tegelyk voorkom, aangesien die prooispesies volgens grootte en bevolkingsdigtheid verskil het en gekenmerk is deur verskillende voortplantingstrategiee en oorlewingspatrone.

Peters, W. C. H. (1869a). Ueber neue oder weniger bekannte Flederthiere, besonders des Pariser Museums.

Die Osterferien während des Aprilmonats d. J. habe ich zu einer Reise nach Paris verwandt, um die berühmen reicher Sammlungen des Jardin des plantes zu untersuchen. In Be.ag auf die Säugethiere und Vögel wurde mir mit der größten Liberalität und Gastlichkeit Alles von unserem Mitgliede Herr H. Milne-Edwards zur Dispositions gestellt und hatte ich mich dabei der besonderen Unterstützung des bereits rühmlich bekannten Hrn. A. Milne-Edwards zu erfreuen, während Hr. A. Duméril mir mit der ihm eigenen Liebenwürdigkeit hin..ich der Untersuchung der Amphibien un Fische entgegenkam. Bei der nur kurz zugemessenen Zeit habe ich vielen ununterzucht lassen müssen, nur die Flederthiere, mit deren Monographie ich seit Jahren beschäftigt bin, habe ich vollständig durgehen können, was besonders wegen der dort beßudlichen typischen Exemplare, welche den Publication von Geoffroy St. Hilaire, Fr. Cuvier, Gervais, H. de Saussure u. A. zu Grunde liegen und die z. Th. Noch nicht den neueren Anforderungen entsprechend untersucht worden sind, von Wichtigkeit war. Ich erlaube mir daher hierüber einei meine früheren Mittheilungen über diesen Gegenstand ergänzende Zusätze vorzulegen.

Peters, W. C. H. (1876). Ueber die von dem verstorbenen Professor Dr. Reinhold Buchholz in Westafrika gesammelten Säugethiere.

Indem ich der übernommenen Verpflichtung nachkommen über die von dem Professor Dr. Buchholz gesammelten Säugethiere der Akademie Nachricht zu geben, kann ich dieses nicht thun, ohne das lebhafteste Bedauern über den unerwarteten frühen Tod des rastlos thätigen und ausgezeichneten Forschers zu wiederholen. Obgleich dieser Theil der Zoologie nicht in solchem Maße sein Interesse in Anspruch nahm, wie die Gliederthiere, zeigen doch sowohl seine Sammlungen, wie die brieflich an mich gerichteten Mittheilungen, dass er auch in diesem Zweige mit beschränkten Kräften und Mitteln Bermerkenswerthes geleistet had. Es ist mir daher eine angenehme Pflicht, mit voller Berechtigung hervorheben zu können, dass die dem Verstorbenen bewiesene thätige Theilnahme von Seiten der Akademie un die ihm von dem Curatorium der Humboldt-Stiftung gewährte Unterstützung eine wohlbegründete und wohlverdiente ware. Wen auch die Mehrzahl der in der folgenden Übersiche

enthaltenen Arten bereits bekannt waren, haben doch die genauen Nachrichten über ihr Vorkommen in bis dahin wenig oder noch gar nicht erforschten Gegenden ein beseonderes Interesse.

Peters, W. C. H. (1879). Ueber die von Hrn J.M. Hildebrandt während seiner letzten ostafrikanischen Reise gesammelten Säugethiere und Amphibien.

Die meisten der von Hrn. Hildebrandt mitgebrachten Gegenstände stammen von dem Festlande und sind hauptsächlich in den Districten von Taita und Ukamba auf einer Tour von Mombassa nach dem Kenia, der jedoch selbst nicht erreicht wurde, gesammelt.

Peterson, R. L. (1965). A review of the flat-headed bats of the family Molossidae from South America and Africa.

Among the molossid bats. three genera have become adapted for living in the thin crevices of rocks or similar situations and each reflects this adaptation in an extreme tlattening of the skull. To date all three have been quite rare in collections and our knowledge of them quite meagre. *Platymops* is known to occur in the thin crevices between rocks in east Africa. *Sauromys* has been discovered in south Africa underneath stones where scorpions were being sought. The first *Neoplatymops* discovered in British Guiana was also found underneath a stone out in the savannahs. The three genera are rather widely separated geographically and each has fundamentally distinct morphological characteristics which indicate that although related, the relationships among them are not particularly close. The closest affinities with other genera seem to be exhibited by *Sauromys* which cranially resembles a *Tadarida* with an extremely flattened skull, and externally resembles *Mormopterus*. Both *Sauromys* and *Platymops* of Africa share with *Mormopterus* a wide separation of the ears. Which differs from *Tadarida*, but show a relationship with *Tadarida* in the conformation of the palate (both fore and aft). *Platymops* differs in (1) the development of the wart-like granulations on the forearm; (2) the development of gular glands; (3) an extreme antorbital expansion of the lachrymal ridges. a modification undoubtedly associated with the great flattening of the skull; and (4) a reduction of the hypocones of M^1 and M^2. These latter four characteristics are shared with *Neoplatymops* but the South American genus is more distinct from the *Tadarida* line in the conformation of the palate (both fore and aft). The fusion of the premaxillary bones to form a solid palate in *Neoplatymops* appears to represent an intermediate condition between *Tadarida* on the one hand and the *Molossops-Cynomops* complex on the other. While the palate is complete in all *Neoplatymops* known (both juvenile and adult) the spacing between the upper canines would suggest that fusion of the anterior portion of the palate represents a transitional condition moving toward the *Molossops-Cynomops* line. *Neoplatymops* shows other affinities with that line in the shape of the upper incisors which are strongly hooked forward. The conformation of the posterior margin of the palate as well as other details of the skull suggest that *Molossops* could be derived from *Neoplatymops* by the loss of the anterior premolar and one of the lower incisors or that *Cynomops* could be similarly derived by the loss of the anterior premolar and the third commissure of the last upper molar and a corresponding reduction of the posterior lobe of M_3. In each case, however, a deepening of the skull and an expansion of the hypocone of M^1 and M^2 would have to accompany the reduction in dentition along with the loss of the wart-like granulations on the forearm.

The flat-headed rnolossid bats may thus be regarded as three distinct genera with the following forms known at present. The geographic races of *S. petrophilus* are listed provisionally pending a critical review of the species.

Peterson, R. L. (1967). A new record for the African molossid bat *Tadarida aloysiisabaudiae*.

A specimen of *Tadarida aloysiisabaudiae* from Western Uganda, Africa, appears to represent the third known example of this species since its original discovery in 1907 and the first specimen to be collected since 1913. External and cranial measurements agree closely with the type specimen. It is compared

with *Tadarida bivitata* and confirmed as a distinctively different species. The lateral view of the lower jaw and anterior aspect of the upper and lower canines and incisors are illustrated for the first time.

Peterson, R. L. (1969). Further notes on the African molossid bat *Tadarida aloysiisabaudiae*.

Four additional specimens of *Tadarida aloysiisabaudiae* are recorded. bringing the total known number to seven. Two are fully adult males, the first known. Sexual dimorphism is described and illustrated in the relative sizes of the anterior premolars. The conformations of the basisphenoidal pits are described and their taxonomic value discussed. *Tadarida russata* is shown to be the closest known living relative, differing primarily in relative size (shorter skull and forearm length), and its only known locality is mapped along with those of *T. aloysiisabaudiae*.

Peterson, R. L. (1971a). The African molossid bat *Tadarida russata*.

Five specimens of *Tadarida russata* obtained from Cameroun, West Africa, appear to be the first collected since the original series was obtained in 1910 from near Medje, Congo. Both the new and the original specimens were taken along the junction of the so-called "high forest" and "Guinea forest" zones but some 1200 miles apart. The Cameroun specimens were compared with the original type series and additional morphological data provided as well as the illustrations of facial and cranial features. *T. bivittata*, of similar size, is shown not to be closely allied with *T. russata* nor any member of the subgenus *Chaerephon*. *T. russata* is closely related to *T. aloysiisabaudiae* but differs in size, skull proportions. and details of the basisphenoid pits.

Peterson, R. L. (1971b). Notes on the African long-eared bats of the genus *Laephotis* (family Vespertilionidae).

The third known specimen of *Laephotis wintoni* is compared with the other two known examples, and morphological details are analyzed and compared with examples of *Laephotis angolensis*. Details of the face and ear of *L. wintoni* are illustrated, and photographs of the skulls of both species are provided for the first time.

Peterson, R. L. (1971c). The systematic status of the African molossid bats *Tadarida bemmeleni* and *Tadarida cistura*.

Twenty-four specimens of *Tadarida bemmeleni*, collected in Cameroun in 1970, to be the first taken since the holotype was collected in 1875 from Liberia. Morphological comparisons with *T. cistura* from East Africa indicate that the two taxa are subspecies of the same species. Systematic relations, and sexual variation, as well as ecological notes, are provided. The facial feautures, caudal glands, ridges, and cranial details are illustrated for the first time.

Vingt-quatre spécimens de *Tadarida bemmeleni* recueillis au Cameroun en 1970 semblend être les premiers qui aient été pris depuis que l'holotype a été recueilli au Liberia en 1875. Des comparaisons morphologique avec *T. cistura* de l'Afrique de l'Est indiquent que les deux taxa sont des sous-cspcccs de la même espèce. Les relations systématiques, la variation sexuelle ainsi que des notes écologiques sont données. Les traits faciaux, les glandes caudales, les rides palatales et certains détails du crâne sont illustrés pour la première fois.

Peterson, R. L. (1972). Systematic status of the African molossid bats *Tadarida congica*, *T. niangarae* and *T. trevori*.

A series of *Tadarida congica*, including the first known males, is the first to be reported since the species was originally described from Medje, Congo (now Zaire) by J. A. Allen in 1917 and extends the known range of the species in Africa from Uganda to Cameroun. *T. niangarae* is considered to be a synonym of *T. trevori*, and an earlier report of *T. trevori* from Garamba Park, Congo (Zaire), is shown to be erroneous and to be of *T. aloysiisabaudiae*. Morphometric data from *T. congica* and *T. trevori* are analyzed and compared by sex and age, and the taxa are shown to be distinct but related species. Sexual dimorphism and variation with age are analyzed in both species. The relationships of *Tadarida congica* and *T. trevori* with *T. aloysiisabaudiae, T. anchietae, T. brunnea*, and *T. midas* are discussed, and distinguishing characters are provided for each taxon. Facial characters, the upper right third molar, postpalatal features, and the arrangements of the ridges of the soft palate are illustrated for the first time.

Une série de *Tadarida congica*, comprenant les premiers mâles connus, se trouve actuellement dans le Musée Royal de l'Ontario. Elle est la première à être signalée depuis que l'espèce fut decouverte à Medje au Congo (maintenant Zaire) et fut décrite par J. A. Allen en 1917. L'aire connue de cette espèce s'étend maintenant en Afrique de l'Uganda au Cameroun. *T. niangarae* est considéré comme synonyme de *T. trevori*. Dans une rapport précédent une espèce trouvee au Parc Garamba, Congo (Zaire) fut identifiée par erreur comme *T. trevori* alors qu'elle était en fait *T. aloysiisabaudiae*. Les données morphométriques de *T. congica* et *T. trevori* sont analysées et sont comparées par le sexe et par l'âge, et on demontre que les taxa sont les espèces distinctes mais apparentées. Le dimorphisme sexuel et la variation de l'âge sont analysées dans les deux espèces. Les parentés de *T. congica* and *T. trevori* avec *T. aloysiisabaudiae, T. anchietae, T. brunnea* et *T. midas* sont déliberés et des caractères distinctifs sont donnés pour chaque taxon. Les physionomies, les molaires troisièrnes supérieures à droite, les traits postpalatales, et les disposition des crêtes du voile du palais sont illustrées pour la première fois.

Peterson, R. L. (1973). The first known female of the African long-eared bat *Laephotis wintoni* (Vespertilionidae: Chiroptera).

A subadult *Laephotis wintoni* Thomas taken west of Mount Kenya in Kenya on 22 June, 1972, represents the fourth specimen and the first known female of that taxon. Measurements are compared with those of three males, and systematic relations within the genus are discussed. The soft palate is illustrated for the first time.

On a capturé un *Laephotis wintoni* Thomas subadulte, a l'ouest du Mont Kenia, au Kenia, le 22 juin 1972; ceci représente le quatrièrne spécimen et la première femelle connue de cette espèce. On en compare les mensurations avec celles des trois mâles et on discute des relations systématiques au sein de ce genre. On donne ici, pour la première fois, une illustration du voile du palais chez cette espèce.

Peterson, R. L. (1974). Variation in the African bat, *Tadarida lobata*, with notes on habitat and habits (Chiroptera: Molossidae).

Known specimens of *Tadarida lobata* are increased from three to 23 with the addition of a specimen from the Kapenguria area about 80 km SSW of the type locality in northwestern Kenya, and a series of 19 specimens from Maungu Hill in southeastern Kenya. Statistical comparisons of adults of the latter series showed sexual dimorphism in 14 of 23 cranial characters but none in external features. The white interscapular spot is shown to be characteristic of *T. lobata* and may be associated with a glandular area of the skin that is best developed in adults. The palatal ridges number six, the last ridge extending posterior to the level of M^2. Field observations indicate that *T. lobata* emerge late and are most active around midnight. They are fast, solitary flyers and apparently feed high above the ground.

Peterson, R. L. (1982). A new species of *Glauconycteris* from the east coast of Kenya (Chiroptera: Vespertilionidae).

A unique specimen of *Glauconycteris* differs from any known species of bat in colour. facial markings. and cranial characteristics and is diagnosed as a new species.

Un spécimen unique de *Glauconycteris* diffère de toutes les espèces connues de chauves-souris par sa coloration, les marques de sa face et ses caractéristiques crâniennes; on y reconnait une nouvelle espèce.

Peterson, R. L. (1987). Notes on systematic variation in the *nanus* group of African *Pipistrellus*.

The *nanus* group shares the following characters; a distinctive "hatchet" shaped tragus; a more-or-less elevated frontal: I1 usually weakly bifid; I2 relatively long; anterior upper premolar moderate in size; C and P4 usually separated by a space, mensural data have been subjected to various multivariate statistical analysis programs in an attempt to clarify the taxonomic status of the taxa that are allied in this group. *Pipistrellus nanus* (Peters, 1852) is widespread across central Africa. *P. minusculus* (Miller, 1900) includes *P. fouriei* (Thomas, 1926) and *P. culex* (Thomas, 1911). *P. helios* (Heller, 1912) is widespread. *P. musiculus* (Thomas, 1913) appears valid but is known only by the type series from Cameroun. *P. n. australis* (Roberts, 1913) is an invalid name but is a valid taxon which we propose to rename as a distinct species that is occasionally sympatric with *P. nanus*.

Peterson, R. L., J. L. Eger and L. Mitchell (1995). Faune de Madagascar: Chiroptères.

Notre connaissance de la faune des Chauves-Souris malgaches ne s'est développée qu'assez lentement depuis que E. Geoffroy a décrit le *Pteropus rufus* en 1803.

Quelque soixante-cinq ans plus tard, on ne connaissait encore guère que six espèces de la région, une ou deux d'entre elles n'étant même citées que de la Réunion. Ces espèces étaient énumérées par Pollen et van Dam (1868) à l'occasion d'une étude sur divers Mammifères et Oiseaux de Madagascar: il s'agissait de:
Pteropus dupreanus (= *Eidolon dupreanum*), pp. 13, 164, 172.
Pteropus edwardsi (= *P. rufus*), pp. 25, 164, 172.
Taphozous leucopterus (= *T. mauritianus*), p. 26.
Dysopes (= *Mormopterus*), pp. 26, 164 (la Réunion), 172.
Vespertilio ? (la Réunion), p. 164.
Rhinolophus commersonii (= *Hipposideros c.*), p. 172.

La plupart de ces espèces et de celles qui ont été découvertes, par la suite, de Madagascar, proviennent de petites collections occasionelles, ne permettant pas d'étudier leurs véritables relations avec des taxa semblables d'autres provenances. L'examen des principales collections mondiales confirme la rareté des spécimens de Chauves-Souris d'origine malgache possédant une provenance précise. La plupart d'entre eux ont été réunis à l'occasion de recherches faunistiques de caractère général ou à la suite de la rencontre accidentelle d'individus isolés. La plus importante et la plus complète des collections de Chauves-Souris malgaches existant avant nos recherches personnelles, était sans doute celle de G. Grandidier, qui vécut plusieurs années à Madagascar. Sa collection, acquise par le Musée de Zoologie comparée de Harvard, vers 1957, n'a été disponible pour l'étude que vers 1979. G. Grandidier, qui a décrit *Triaenops aurita* (1912), *Rousettus madagascariensis* (1929) et *Nycteris madagascariensis* (1937), était le fils du célèbre explorateur et naturaliste A. Grandidier qui travailla longtemps à Madagascar et décrivit, pour sa part, *Mops miarensis* (1870) et, avec A. Milne-Edwards, *Myzopoda aurita* (1878).

La révision la plus récente de la faune malgache de Chiroptères est due à J. Dorst (1947) qui a publié aussi une révision du genre *Triaenops* (1948b) et a décrit *Otomops madagascariensis* (1953).

En 1967, le premier auteur du présent ouvrage eut la chance de pouvoir mener une courte étude, intensive, de la faune malgache, avec la généreuse coopération des autorités malgaches et des responsables du Centre O.R.S.T.O.M. de Tananarive. Avec le concours compétent de MM. John Williams d'Oakharn, Leics., Angleterre et Robert Glen, de Nairobi, et de Madame Noreen Curry, à l'époque de Winnipeg, Manitoba, Canada (actuellement en Californie), nous avons pu récolter assez d'exemplaires de plusieurs taxa pour être en mesure d'entreprendre une étude précise de leurs rapports systématiques.

Mais, une fois cette étude engagée, il apparut que la position systématique des taxa les plus proches, se retrouvant ailleurs, était, elle aussi, peu ou mal comprise ou même inconnue. Il devint, par suite, nécessaire d'étendre nos recherches bien au-delà des limites de Madagascar pour éclairer les affinites systématiques et zoogéographiques complexes, surprenantes, hautement intéressantes, de plusieurs formes.

Dans un certain nombre de cas, c'est le taxon malgache qui a fourni la clef des affinités existant entre taxa vivant en Afrique, en Asie ou ailleurs.

Plusieurs taxa malgaches restent encore insuffisamment connus et il faudra attendre qu'un matériel et une information plus riches soient réunis avant de pouvoir en entreprendre une étude satisfaisante. Le présent travail s'efforce de rassembler toute l'information disponible pour fournir la base des travaux futurs.

On sait, depuis longtemps, que la faune des Chiroptères malgaches est constituée par un mélange de formes à affinités zoogéographiques et systématiques différentes, avec des éléments endêmiques et d'autres liés aux faunes africaines, asiatiques ou pacifiques. Nous essaierons de préciser ces affinites, là où le matériel s'a vèrera suffisant.

Dans ce travail, nous essayons de combiner les résultats fournis par notre expérience personnelle, l'examen d'exemplaires vivants, la préparation et la récolte de spécimens destinés à la recherche, la description systématique traditionnelle et une étude statistique faisant appel à l'ordinateur et en utilisant des programmes de regroupement.

Peterson, R. L. and D. L. Harrison (1970). The second and third known specimens of the African molossid bat, *Tadarida lobata*.

A specimen of *Tadarida lobata* (Family Molossidae) from Salisbury, Rhodesia, in the David L. Harrison Collection and one recently taken on the Oxford University Expedition to the Cherangani Hills, Kenya, 1969, represent the second and third known examples of this species, originally described in 1891 from Turkwell, Suk, northwestern Kenya. The species is illustrated, and its pelage colour described for the first time. Photographs of the skin and skull are provided. Comparative measurements and discussion of taxonomic characteristics and systematic relationships are included.

Peterson, R. L. and D. W. Nagorsen (1975). Chromosomes of fifteen species of bats (Chiroptera) from Kenya and Rhodesia.

Karyotypes of 15 species of African Chiroptera (*Epomops franqueti, Epomophorus crypturus, E. gambianus, E. wahlbergi, Nycteris thebaica, Hipposideros caffer, Rhinolophus hildebrandti, R. darlingi, R. denti, Pipistrellus nanus, Eptesicus hottentotus, E, capensis, Scotophilus nigrita, Tadarida bivittata*, and *T. fulminans*) were studied. An XO male sex chromosome system was discovered in *E. crypturus* and *E. gambianus*. Distinctive marker chromosomes occurred in 14 species.

Peterson, R. L. and D. A. Smith (1973). A new species of *Glauconycteris* (Vesptertilionidae, Chiroptera).

In a systematic study of the African genus *Glauconycteris* Dobson, we have found a series of white-winged specimens that represent a new species that has not been previously described. The genera (or subgenera) *Chalinolobus* Peters of the *Australasian* region and *Glauconycteris* from Africa are closely related as discussed by Dobson (1875, 1878), Miller (1907), Ryan (1966), Hayman (1967), Hayman and Hill (1971), and Koopman (1971). Arguments have been advanced that all species belong to one genus (*Chalinolobus*), that the two should be considered subgenera, or that generic distinction should be retained for the two taxa, an option that has been widely followed in recent years. We tentatively recognize *Glauconycteris* as a genus pending the results of our own analysis of variation within each of the African species, now in progress.

We have compared the new taxon with all previously described species of *Glauconycteris*, but in our opinion, it needs critical comparison only with *G. argentata* (Dobson) and *G. variegata* (Tomes) as it differs so distinctly either in size or in pelage and wing coloration (or both) from all other known species. We are pleased to name this new species after Mr. Robert Glen, Nairobi, Kenya, who collected the holotype, assisted in the collection of the Uganda series of the new species, and who has been a field companion *extraordinaire*.

Petit, E. and F. Mayer (1999). Male dispersal in the noctule bat (*Nyctalus noctula*): where are the limits?.

Studying the dispersal behaviour of small, volant, and nocturnal animals such as microchiropterans with direct methods (banding - recapture, telemetry) is a very difficult task. The development of easily scorable and highly variable genetic markers nowadays allows us to study some aspects of dispersal indirectly, using population genetics. Here, we applied these indirect methods to characterize male dispersal behaviour in a European bat species. The eight microsatellite loci analysed were highly variable in all the nursing colonies assessed (h = 0.63 - 0.69). Contrary to what we found in the mtDNA, an AMOVA and F-statistics showed that the overall European population structure of the noctule bat was very weak, indicating a high male dispersal rate. Nevertheless, the population was not toally panmictic (theta = 0.006, $p < 0.001$), and neither isolation by distance, nor influence of migration could account for this result. Rather, an alaysis of pairwise theta-values showed that the population structure might be explained partly by a geographical barrier to gene flow (the Alps), and partly by the fact that there is some limit to the distance the males can disperse.

Pettigrew, J. D. (1991a). Wings or Brains? Convergent Evolution in the Origins of bats.

On the Monopophyly of bats .....

Pettigrew, J. D. and J. A. W. Kirsch (1998). Base-compositional biases and the bat problem. I. DNA-hybridization melting curves based on AT- and GC-enriched tracers.

We explored the interordinal relationships of mammals using DNA - DNA hybridization, with particular reference to the much-debated problem of whether the megabats and microbats are more closely related to each other than the megabats are to primates. To try to improve resolution when taxa are distantly related and the melting points of hybrids are low and difficult to distinguish, we increased the GC content of DNA by a fractionation method that used the same melting-point apparatus used in the hybridization studies. When we used GC-rich DNA as the tracer to make hybrids, the melting point of the self-hybrid shifted to a higher temperature as expected, but the behaviour of heterologous hybrids varied with the taxa being compared. When the melting point of the heterologous hybrid also shifted to a higher temperature so that the two compared taxa maintained the same or proportional distance, we called this 'following behaviour', because the heterologous hybrid made with GC-rich tracer 'followed' the GC-rich self-hybrid to higher temperatures, We also commonly saw anomalous

behaviour, where the melting point of the heterologous hybrid shifted to a lower temperature when compared with an AT-rich hybrid. In these anomalous cases, the distance measured between the taxa increased markedly as a result of GC-enrichment, indicating that an underestimate of distance may have resulted from AT bias in DNA. This inference was supported by the finding that it was rare to observe a decrease in measured distance between taxa using GC-rich DNA, but very common to find an increase as would he expected from the generally higher AT contenls of eutherian DNAs. Moreover, the most extreme cases, where distances changed most using GC-rich DNA, were usually those involving comparisons between taxa known to have the most extreme AT-biases arnong mammals, such as the megabats and rhinolophoid (including megadermatid) microbats. Our results show consistent underestimates of measured differences between eutherian taxa with extreme AT-biases.

Pienaar, U. de V. (1964). The small mammals of the Kruger National Park - A systematic list and zoogeography.

The Kruger National Park, covering some 7,340 square miles in the north-eastern Transvaal Lowveld between 22° 25' to 25° 32' latitude south and 30° 50' to 32° 2' longitude east, forms an integral part of the southern savanna subregion of the great Aethiopian geographical region south of the Sahara (Darlington '57).

The secondary subdivision by Roberts (1951) of the primary biotic zones in Southern Africa into a number of secondary zoogeographical sub-zones acquires significance in an analysis of the distribution patterns of small mammals in the Kruger National Park and elsewhere. The area under consideration lies in what is designated by Roberts as the Eastern Low Country, with its inherently distinctive fauna and flora.

Although the Lebombo mountain range, forming the eastern boundary of the Park can not be regarded as a faunal barrier in the true sense of the word, it does exclude from the Transvaal Lowveld faunistically as well as florislically, a number of species which are essentially endemic to the eastern tropical littoral. At two points among the boundary line, however, an encroaching sandveld plateau from Moçambique carries with it a number of inhabitants of this zone into the extreme eastern sections of the Park (Pienaar, 1963).

Similarly, marginal encroachment of other typical inhabitants of the Natal and south-eastern Transvaal midlands, as well as the Eastern Transvaal forested area on the eastern side of the Drakensberg escarpment, is evident in the south-western portion of the Park.

As a broad basis for understanding the diversified faunal patterns of the Transvaal Lowveld, these subdivisions of biotic zones are important, but an interpretation of the individual distribution pattern of each small mamrnal species in the precincts of the area under discussion, and within the primary biotic zone, can only be sought in their specific habitat preferences.

Pienaar, U. de V. (1972). A new bat record for the Kruger National Park.

The first record of the Midas bat, *Tadarida (Mops) midas midas* (Sundevall), a large, tropical species of free-tailed bat, is noted from the vicinity of Skukuza, and it is also the first specimen of this species for South Africa.

Pierquin, L. (1960). Note complémentaire sur les tiques du Congo belge et du Ruanda Urundi.

L'auteur a examiné un lot de tiques provenant de diverses régions du Congo belge et du Ruanda-Urundi. Dans la présente note, il commente les acquisitions récentes dans la littérature, met à jour le répertoire qui comporte, sur un total de 67 espèces, 62 au Congo belge et 29 au Ruanda-Urundi, soit 24 communes aux deux pays; il termine par une liste des localisations nouvelles, en y incorporant ses propres identifications.

Pierquin, L. and K. Niemegeers (1957). Répertoire et distribution géographique des tiques au Congo belge et au Ruanda-Urundi.

Les auteurs ont dressé le répertoire des différentes espèces de tiques signalées pour le Congo belge et le Ruanda-Urundi, la distribution géographique de chacune d'elles, et la bibliographie complète des travaux les concernant.

Les auteurs se sont abstenus de prendre parti en faisant cette synthèse des publications sur la distribution géographique des tiques. Une étude critique dépasserait le but qu'ils se sont fixé, notamment de faire le point des connaissances actuelles, base de départ pour des travaux futurs.

Sur les 128 publications citées dans la bibliographie, 91 ont été consultées par les auteurs. Parmi les 37 publications non consultées, 24 sont antérieures à 1931, les renseignements qui s'y trouvent sont donc repris dans le "Synopsis" de BEQUAERT 1931. Quant aux 13 publications postérieures à 1931 et non consultées, elles concernent souvent des points litigieux repris par H. HOOGSTRAAL ou G. THEILER.

Il est remarquable qu'en reportant tous les lieux de récolte de tiques, renseignés dans la littérature, sur une carte du Congo belge et du Ruanda-Urundi, on arrive à couvrir la presque totalité de ces territoires.

Que les régions du Bas-Congo et du Kivu aient été plus fréquemment prospectées que la province de l'Équateur et que le Nord du Kasai, est fort compréhensible. Dans l'ensemble cependant, si l'on tient compte du fait que les premiers chercheurs récoltaient tout ce qu'ils trouvaient, sans viser plus spécialement une espèce plutôt qu'une autre, on peut admettre que nous avons une vue assez précise de la fréquence des espèces.

En ce qui concerne la distribution géographique, les espèces qui sont en nombre suffisant et bien localisées ont été reprises sur les cartes 1, 2 et 3. Pour d'autres espèces, le nombre de spécimens trouvés est trop peu élevé pour qu'il puisse être tiré des conclusions. Enfin, certaines espèces sont réparties sur l'entièreté des territoires.

Le présent travail ne se prête pas à être autrement résumé, et le lecteur interessé est invité à se référer au texte original.

De schrijvers hebben een tabel opgemaakt waarin de verschillende soorten teken opgesomd worden die in Belgisch-Congo en Ruanda- Urundi gevonden werden; tevens wordt de geografische verspreiding gegeven en een volledige bibliografie over de teken.

Zij geven een objektieve samenvatting van de publicaties handelend over de geografische verspreiding van de teken zonder echter zelf stelling te nemen. Het lag niet in hun bedoeling hier over een kritische studie te maken maar wel al wat tot nu toe hierover gekend is samen te brengen als basis voor latere opzoekingen.

De bibliografie citeert 128 publikaties, daarvan hebben de schrijvers er 91 bestudeerd. Onder de 37 niet geconsulteerde werken, zijn er 24 die dateren van voor 1931 en waarvan derhalve de gegevens te vinden zijn in de "Synopsis" van BEQUAERT (1931, 5). De 13 publikaties van na 1931 die niet geraadpleegd werden, handelen meestal over twistvragen die uitvoerig behandeld werden door H. HOOGSTRAAL en G. THEILLER.

Het is merkwaardig dat wanneer men alle vindplaatsen van teken, zoals zij opgegeven zijn in de litteratuur op een kaart van Belgisch Congo en Ruanda-Urundi aantekent, bijna alle gewesten aangestipt worden.

Dat de streken van Neder-Kongo en Kivu veelvuldiger geprospekteerd werden dan de Evenaarsprovincie en het noorden van Kasai is zeer begrijpelijk. Maar als men rekening houdt met het feit dar de eerste onderzoekers alles noteerden wat zij vonden, zonder voorkeur voor een

bijzondere soort, dan mag men aannemen dat wij aldus ook een vrij nauwkeurig overzicht hebben van de frekwentie van de soorten.

Wat de geografische verspreiding aangaat werden de soorten, die een voldoende aantal malen gevonden werden en waarvan de vindplaars nauwkeurig opgetekend werd, weergegeven op de kaarten.

Voor andere soorten kan men wegens het te kleine aantal gevonden specimen geen besluit nemen. Tenslotte zijn bepaalde soorten over het gehele gebied verspreid.

Pine, R. H. (1993). A new species of *Thyroptera* Spix (Mammalia: Chiroptera: Thyropteridae) from the Amazon basin of northeastern Perú.

A new and large species of disk-winged bat of the genus *Thyroptera* Spix, sympatric with *Thyroptera tricolor* Spix, is named and described from the Departamento de Loreto, Peru. Morphological characters separating the new species from currently recognized species of *Thyroptera* are presented and characters which have been previously used to characterize these latter species are discussed and evaluated.

Une nouvelle et grande espèce de chauve-souris du genre *Thyroptera* Spix, sympatrique de *Thyroptera tricolor* Spix, est nommée et décrite du departernent de Loreto, Perou. Les caractères morphologiques qui separent la nouvelle espèce des espèces de *Thyroptera* actuellement reconnues sont présentés et les caractères qui étaient utilisés pour caractériser les espèces de ce genre sont discutés et evalués.

Poché, R. M. (1975). The bats of the National Park W, Niger, Africa.

Quinze espèces de Chiroptères ont été collectées dans le Parc National du W au Niger. Elles appartiennent à une famille de Mégachiroptères (1 espèce) et à sept familles (10 genres) de Mlcrochiroptères. Pour chacune l'auteur donne des précisions portant sur la reproduction, la répartition géographique et d'autres aspects de la biologie, ainsi que les mesures corporelles et crâniennes comparées à celles de spécimens de régions voisines.

This paper documents the first chiropterans collected from Niger's National Park W. A total of 15 species representing one family of Megachiroptera (1 species) and seven families (10 genera) of Microchiroptera was netted. Reproduction, geographic distribution and other aspects of the biology of each species are noted. Body and cranial measurements are recorded and compared with representatives from neighboring countries.

Pocock, R. I. (1935). The mammals collected in S.E. Arabia by Mr. Bertram Thomas and Mr. H. St. J. Philby.

Provisionally nominal lists of the mammals forming the subject-matter of this paper were published by my colleague, Capt. J. G. Dollman, in Mr. Bertram Thomas's 'Arabia Felix,' pp. 339 - 341, 1932, and in Mr. H. St. J. Philby's ' The Empty Quarter,' p. 394, 1933. But more detailed examination of the material and closer comparison of it with the skins and skulls of the same species already preserved in the British Museum, from Arabia and the adjoining countries of Asia, brought to light a number of unrecorded facts, showing that both the collections were instrumental in adding very considerably to our knowledge of the mammal fauna of south-western Asia.

Although Mr. Bertram Thomas secured a larger number of species and the representatives of all the new forms described, Mr. Philby's series is particularly valuable for the careful preparation of the skins,

with a complete record of their flesh-measurements, localities, and dates. Only those who have had actual experience in the field can appreciate the time and labour expended over these processes. All the flesh measurements quoted were taken from his labels.

Poll, M. (1939). Mammifères de la région de Rutshuru recoltés par M.J. Ghesquière.

Dans deux articles successifs, le Dr. H. SCHOUTEDEN a eu l'occasion, dans cete Revue (*Rev. Zool. Bot. Afr.*, XXV, 3, 1934. et XXVI, 2, 1935) de décrire une première liste de Mammifères connus du Secteur méridional (Volcans) et du Secteur septentrional (plaines du lac Edouard) de la région située entre les lacs Kivu et Edouard et notamment du Parc National Albert.

Ces listes, déjà longues, donnaiend 65 espèces pour le Secteur méridional (où le Dr. SCHOUTEDEN lui-même fit des récoltes au cours d'un bref séjour en 1926) et 49 espèces pour le Secteur septentrional: soit au total 95 noms différents.

Pendant son séjour au Parc Albert, en 1933-35, M. DE WITTE a pu y réunir une collection de Mammifères à laquelle M. S. FRECHKOP a recemment consacré une étude dans laquelle 85 espèces sont signalées comme probables pour le Parc (*Institut des Parc Nationaux du Congo Belge. Exploration du Parc National Albert*, mission G. F. DE WITTE (1933, 1935). Fasc. 10. Mammifères. Bruxelles 1938.

Ainsi qu'en témoigne la série de Mammifères que M. J. GHESQUIERE a bien voulu envoyer au Musée du Congo Belge durant les années 1937 - 1938, il est encore possible d'allonger la liste des Mammifères de la région. Sur un total de 45 espèces réunies pare lui en région de Rutshuru, 8 espèces ne sont pas mentionnées dans les listes publiées par M. SCHOUTEDEN, et 10 ne figurent pas dans celle de M. FRECHKOP.

La région d'où proviennent les Mammifères envoyés par M. GHESQUIERE; c'est-à-dire la région de Rutshuru doit évidemment se rattacher en son ensemble au point de vue faunistique au Secteur septentrional du Parc Albert: M. SCHOUTEDEN l'a déjà indiqué, en signalant toutefois ainsi que je dis également le faire, que certaines localités ou zones se rattachen au contraire au fascies du Secteur méridional, montagneux.

Il m'a paru intéressant de donner l'inventaire complet de la collection de M. GHESQUIERE. Elle apporte, en effet, une contribution importante à la faune de la région. On notera cependant que M. GHESQUIERE s'est moins intéressé à la récolte des grands Mammifères, plus fréquemment rapportés, ainsi que précisément le note M. SCHOUTEDEN. C'est ainsi que sa collection ne renferme qu'une seule Antilope et qu'il n'a pas rapporté des types fréquemment vus, tes les Topi, le Waterbuck, etc. De même le Lion, fréquemment noté par lui, notamment à 8 kms. de Rutshuru et en direction de Ngoma ne figure pas dans la liste des espèces récoltées, pas plus que l'Hyène, vue à deux reprises à Rutshuru même, le Léopard, noté entre Rutshuru et Ngoma, la Loutre à gorge tachetée, *Lutra maculicollis* commune à 17 kms. de Rutshuru et à 18 kms. vers l'intérieur à l'est de la route de Rutshuru à Ngoma, ni enfin la Phacochère, vu à 20 kms. au nord de Rutshuru.

Poulet, A. R. (1970). Les Rhinopomatidae de Mauritanie.

Des chauves-souris de la famille des Rhinopomatidae ont été capturées à Akjoujt (Mauritanie).

L'étude des mensurations corporelles a permis d'identifier *Rhinopoma microphyllum* Brunnich et *Rhinopoma hardwickei* Gray.

Les deux espèces vivent ensemble dans des grottes et des galeries de mines désaffectées.

R. microphyllum est déjà connue de l'Adrar mauritanien. *R. hardwickei*, signalée dans l'Air, est une espèce nouvelle pour la Mauritanie

Bats of the family Rhinopomatidae were captured at Akjoujt, Mauritania. *Rhinopoma microphyllum* Brünnich and *Rhinopoma hardwickei* Gray were identified by their body measurements. These two species live side by side in caves or in released mine galleries. *R. microphyllum* is already known from Adrar; *R. hardwickei*, previously reported from Aïr, is a new species for Mauritania.

Poulet, A. R. (1972). Recherches écologiques sur une savane sahelienne du Ferlo Septentrional, Senegal: Les mammifères.

Twenty eight species of wild mammals have been observed in the 100 km^2 area surrounding the 1 Km^2 reference quadral of Fété-Olé. Six other species have been found in similar habitats in the immediate vicinity and their occasional occurrence in the study area is theefore probable. During the last century most of the wild ungulates (and one large carnivore, the lion) have disappeared from the Ferlo and have been replaced by the cattle herds of nomadic Fulani tribesmen.

Taterillus pygargus is the commonest terrestrial rodent in the area. After a short period of juvenile nomadism (dispersion phase of the population) adults settle for life on very small home ranges. That of an adult female averages 300 m^2, and that of an adult male 1100 m^2. The home-range of an adult male overlaps those of several adult females. Gestation lasts 3 weeks and the most frequent litter size is 4 young. A female may have a litter every 6 weeks changing its burrow each time. However births only take place after the rains, from November to March. The population turnover is high, mortality rate among adults averaging 25 % per month. Data are given on population fluctuations over two consecutive years. Reproduction in a given year is strongly influenced by the importance of the previous rains. On quadrat QR, production (fresh weight was 392.8 g/ha in 1969-70 after "normal" rains, and only 12.1 g/ha in 1970-71 after sub-normal rains. On quadrat QF, the respective figures were 599.0 g/ha in 1969-70 and 63.6 g/ha in 1970-71. A first estimation of seeds is made: out of the 60 Kg/ha produced, 2.1 to 6.6 Km/ha are consumed by this species alone.

Püscher, H. (1972). Über die Schultertaschen von *Epomophorus* (Epomophorini, Pteropodidae, Megachiroptera, Mammalia).

Die Präparation der Kopf-Hals-Gegend mehrerer Vertreter der Tribus Epomophorini, Pteropodidae, ergab, daß eine spezielle Muskulatur vorhanden ist, die auf die Beweglichkeit der Tasche Einfluß nimmt. Ein Teil dieser Muskulatur leitet sich vermutlich von den Muskeln des Propatagiums ab.

Die histologische Untersuchung der Schultertaschen zeigte, daß sie keine speziellen Hautdrüsen enthalten und daher die Bezeichnung "Drüsentasche" nicht zutreffend ist.

Summary

Studies on the Shoulder Pouches in some Epaulet Bats

The region of the Shoulder pouches has been dissected in some epaulet bats. There are special muscles which can move the dermal pouch. It is supposed that these muscles may be derived from the musculature of the propatagium.

The skin of the shoulder pouch has been studied histologically, but no special cutaneous glands have been found, whereas a reduction of the sabaceous glands can be seen.

Pye, J. D. (1972). Bimodal distribution of constant frequencies in some hipposiderid bats (Mammalia: Hipposideridae).

Constant frequency echolocation signals of the Rhinolophidae and Hipposideridae have generally been found to occupy narrow bands, at least within single populations. Examination of three species of

Hipposideridae from a cave in Kenya shows a wide spread of frequencies in each case. In *Hipposideros commersoni* the pulses occur in two bands at 56 and 66 kHz with a silent interval of 8 kHz. Single individuals in isolation use only one of these frequencies and this is correlated with their forearm length. It may be that two forms of subspecific rank were cohabiting, but it may be significant that the width of the silent band is just wide enough to prevent interference from band-spreading due to reflection from beating wings when several bats are flying together. In *Triaenops afer* and *Hipposideros caffer* there is a suggestion that the bats leave silent bands when in groups but use more varied individual frequencies when isolated. This impression might be due to sampling error and the position is little clarified by examining other populations. A group of *Asellia tridens* from Egypt occupied a single, fairly narrow band of frequencies. Further examination of these and other constant frequency species with a simple detector would be of interest in resolving the position.

Qumsiyeh, M. B. (1985). The bats of Egypt.

Egypt occupies the northeastern portion of Africa and provides the major connection between the land masses of Africa and Asia. As such, this area is an important connection between the Palearctic and Ethiopian faunas and a study of the composition of this fauna can prove very important.

This report reviews the systematics, zoogeography, and ecology of the bats of Egypt (including Sinai) based on the examination of available museum specimens, original field work, and literature review. The Medical Zoology Department of the U.S. Naval Medical Research Unit Number Three (NAMRU-3) in Egypt collected much of this material as part of other collections made on parasites and their mammalian hosts in Egypt. Most of the bat material collected by NAMRU-3 was preserved in alcohol and is deposited in the U.S. National Museum, Washington, D.C., and the Field Museum of Natural History, Chicago. Collectors for NAMRU-3 included H. Hoogstraal, Ibrahim Helmy, Sobhy Gaber, Sayed Metwally, Hassan Touhamy, W. H. Wells, G. M. Malakalis and various local field assistants particularly from the village of Abu Bawash. The land mammals observed or collected by NAMRU-3 were studied by Osborn and Helmy (1980). The present paper is intended to complement that study by focusing on the bats.

Numerous old reports exist dealing either in part or in total with the bats of Egypt. Several species of bats have been described by E. Geoffroy Saint-Hillaire in 1810, 1813, and in the monumental "Description de la Egypte" of 1818. Many of Geoffrey's original descriptions were augmented with figures and most of his names are still used. Later reports on bats of northeast Africa include those of Riippel (1842) and Heuglin (1861, 1877). Dobson's (1878) Catalogue of the Chiroptera at the British Museum includes many specimens from Egypt and presents an update of the taxonomic work at that time. The earliest and most exhaustive treatment of the bats of Egypt is Anderson's (1902) Zoology of Egypt: Mammalia. This work also covered much of what is now the Sudan and treated specimens obtained by Anderson himself and the growing collection of the British Museum (Natural History) from the Nile Valley made by R. H. Brown, A. L. Butler, W. E. de Winton, S. S. Flower, W. Innes, J. Rogers, N. C. Rothschild, and others.

In 1932, S. S. Flower updated and reviewed Anderson's work, but restricted his discussion to Egypt in the modern sense (without Sudan). The section on Chiroptera in Flower's work was based on additional specimens acquired by the British Museum (Natural History) mainly through the efforts of the previously mentioned collectors, and those of L. W. Bough, M. Mackilligin, M. J. Nicoll, and W. H. Witherby, among others.

Professor Kamal Wassif of Ain Shams University in Cairo made extensive collections of mammals in Egypt and published several reports dealing with bats (1949, 1953, 1959a, b, 1962). Contributions to the morphology of Egyptian bats were made by Madkour (1961, 1975, 1976a-e, 1977c, d, 1978, 1982), Wassif (1969) and Wassif and Madkour (1963, 1969, 1971, 1972a, b, c, 1973, 1974). The collections made by NAMRU-3 were studied by Setzer (1952) for the Nile Delta region and later by Hoogstraal (1962). In addition, Sanborn and Hoogstraal (1955) presented a key to the identification of Egyptian bats. The most recent report is that of Gaisler, Madkour, and Pelikan (1972) who listed 21 species of bats for Egypt, including Sinai.

The taxonomy of Egyptian bats has been included in larger regional works such as Alien (1939), Ellerman and Morrison-Scott (1951), Hayman (1967), Hayman and Hill (1971), and Corbet (1978). Special reference must also be made to Kock's (1969) "Die Fledermaus-Fauna des Sudan" and Koopman's (1975) "Bats of the Sudan." Both of these excellent works extend their taxonomic and zoogeographical discussions to bats occurring in the Nile Valley.

The material examined is the largest collection of Egyptian bats available for a single review, and most of it has been little examined in the previous works. Though the present work is not intended to be a final answer to even some of the basic questions of chiropteran taxonomy in Egypt, it seems timely to review the available knowledge and to summarize previous contributions. Egyptian bats do not seem to play a role in the transmission of rabies (El Sabban et al., 1967) or any other human disease (Dr. Harry Hoogstraal, personal communication). Only one species, *Rousettus aegyptiacus*, is suspected of becoming an economic menace (Madkour, 1977a). Inasmuch as all Egyptian bats but this one are insectivorous, it would be ecologically and economically harmful to apply such control measures as fumigating caves and ruins. In Israel, this kind of treatment resulted in the almost complete extinction of many useful insectivorous bats and the target species, *Rousettus*, still survives in large numbers. Much field work remains to be done, especially from an ecological perspective, and it is hoped that the present review at least would spark an interest in this fastdeveloping country, especially in nature protection and management.

Qumsiyeh, M. B., Z. S. Amr and R. M. Al-Oran (1998). Further records of bats from Jordan and a synopsis.

Recent records along with a synopsis of the known bats of Jordan are given. Twenty-four species of bats are reported from Jordan, including two additional records, *Rhinolophus mehelyi* and *Asellia tridens*. Five other bat species are suspected to occur.

Qumsiyeh, M. B., A. M. Disi and Z. S. Amr (1992). Systematics and distribution of the bats (Mammalia: Chiroptera) of Jordan.

The order Chiroptera (bats) represent the second (second only to the rodents) most diverse group of mammals, with some 950 species known. Most species of bats belong to the suborder Mlcrochiroptera or insect-eating bats. In Jordan, there is only one species of fruit-eating bat (suborder Megachiroptera); the Egyptian fruit-eating bat, *Rousettus aegyptiacus*. The extent of damage this species causes to certain crops in Jordan is unknown, and ecological studies are needed. On the other hand, this species Is known to help pollinate many of the fruit trees on which it feeds. Thus, all but perhaps one species of bats in Jordan are highly beneficial. Their role in controlling agricultural pests and as an Integral part of the balanced ecosystem cannot be overemphasised. Yet, there is continuous habitat destruction accompanying development in Jordan. Many bat caves are visited frequently or used by humans, which results In the loss of the bat populations inhabiting these caves. Conservation efforts in Jordan by concerned citizens under the guidance of the Royal Society for the Conservation of Nature (RSCN) would benefit significantly by the presence of baseline data on the distribution and status of bats in Jordan.

There are very few studies of bats in Jordan, and our knowledge of the bat fauna Is still preliminary. Recent field work in Jordan yielded significant new records and distributional data. We are presenting these data here as well as reviewing our knowledge of the bat fauna of this region. Keys to the species of bats occurring or potentially occurring in the region can be found in previous publications.

Qumsiyeh, M. B., R. D. Owen and R. K. Chesser (1988). Differential rates of genic and chromosomal evolution in bats of the family Rhinolophidae.

Data for nondifferentially stained chromosomes from 10 species of *Rhinolophus* (Chiroptera: Rhinolophidae) suggest a conserved chromosomal evolution. G-banded chromosomes for three well

differentiated species (*Rhinolophus hipposideros, Rhinolophus blasii*, and *Rhinolophus acuminatus*) corroborate a low level of gross chromosomal rearrangements. Additionally, a comparison between G-banded chromosomes of *Rhinolophus* (Rhinolophidae) and *Hipposideros* (Hipposideridae) suggests extreme conservatism in chromosomal arms between these two distantly related groups. On the other hand, we report extensive genic divergence as assayed by starch gel electrophoresis among these 10 species, and between *Rhinolophus* and two hipposiderid genera (*Hipposideros* and *Aselliscus*). The present chromosomal data are not sufficient for phylogenetic analysis. Phylogenies based on electrophoretic data are in many aspects discordant with those based on the classical morphological criteria. Different (and as yet not clearly understood) evolutionary forces affecting chromosomal, morphologic, and electrophoretic variation may be the reason for the apparent lack of concordance in these independent data sets.

Des données sur la coloration non-différentielle des chromosomes de 10 espèces de *Rhinolophus* (Chiroptera: Rhinolophidae) suggèrent une évolution conservatrice des chromosomes. Les bandes G des chromosomes de trois espèces bien differenciées (*Rhinolophus hipposideros, Rhinolophus blasii* et *Rhinolophus acuminatus*) corroborent l'existence d'un faible niveau de réarrangements palpables des chromosomes. De plus, une comparaison entre les bandes G des chromosomes de *Rhinolophus* (Rhinolophidae) et d'*Hipposideros* (Hipposideridae) suggère un conservatisme extrême des bras chromosomiques entre ces deux groupes relativement distants. D'autre part, des électrophorèses sur gel d'amidon permettent de rapporter l'existence de differences géniques extensives entre ces 10 especes, ainsi qu'entre *Rhinolophus* et deux genres d'Hipposideridae: *Hipposideros* et *Aselliscus*. Les présentes données chromosomiques sont insuffisantes pour les fins d'analyses phylogénetiques. Les phylogénies basées sur les données obtenues par electrophorèse basées sur les critères morphologiques. Ce manque apparent de concordance entre groupes de données independants pourrait bien relever de forces évolutives différentes, qui affectent la variation chromosomique, morphologique et électrophoretique.

Qumsiyeh, M. B. and D. A. Schlitter (1981). Bat records from Mauritania, Africa (Mammalia: Chiroptera).

The occurrence of seven species of bats previously unknown in Mauritania are documented, making a total of 11 species of bats recorded from the country. The new records include *Taphozous perforatus, Nycteris hispida, Hipposideros caffer, Asellia tridens, Pipistrellus rueppelli, Scotophilus leucogaster*, and *Tadarida condylura*. Additional information is provided on three species of bats (*Rhinopoma hardwickei, R. microphyllum*, and *Nycticeius schlieffeni*) already known to occur in Mauritania.

Qumsiyeh, M. B. and D. A. Schlitter (1982). The bat fauna of Jabal Al Akhdar, Northeast Libya.

Fifty nine specimens of bats representing eight species in three families are reported from the region of Jabal Al Akhdar in northeastern Libya. *Nyctalus lasiopterus* is reported for the first time from Africa, while *Pipistrellus pipistrellus, Miniopterus schreibersii* and *Tadarida teniotis* are new additions to the fauna of Libya. *Rhinolophus clivosus, R. mehelyi, Pipistrellus kuhlii*, and *Plecotus austriacus* are additional distributional records from Libya. Taxonomic comments are given. Although distinctive, the bat fauna of Jabal Al Akhdar is considered of Mediterranean origin and includes taxa seemingly closely associated with those from southcentral Europe rather than the Eastern Mediterranean and Maghreb regions.

Qumsiyeh, M. B., D. A. Schlitter and A. M. Disi (1986). New records and karyotypes of small mammals from Jordan.

Presented new distributional records for 14 species of mammals in Jordan. Of these, two species of bats are new to the fauna of the country, *Myotis capaccinii* and *M. emarginatus*. Karyotypic data are presented for 11 species that have not been previously studied from Jordan. The diploid number in

Rhinolophus hipposideros from Jordan is different from that reported for European specimens. The rare *Gerbillus nanus* is confirmed in Jordan by karyotypic data. *Acomys lewisi* has the same chromosome number as *A. russatus*, a fact which is compatible with the idea that these two forms are conspecific.

Rahm, U. (1965). Distribution et écologie de quelques mammifères de l'est du Congo.

Si on mettait sur carte la répartition de tous les mammifères existants au Congo, on remarquerait une grande lacune dans la partie est de ce pays, entre le fleuve Congo et le Graben Centre-Africain. Grâce au matériel récolté jadis par Lang et Chapin et par Christy dans le nord-est du Congo, nous connaissons assez bien les mammifères de cette région. Le Ruwenzori et les volcans au nord du lac Kivu ont été explorés par plusieurs missions scientifiques. Nous nous sommes efforcés depuis 1958, d'explorer au moins une partie de la région forestière de l'est du Congo afin de connaître les mammifères y existants. Nous avons particulièrement prêté notre attention à la région située entre le premier et le quatrième parallèle sud et délimitée par le fleuve Congo et le Graben Centre-Africain. Politiquement, cette région du Congo comprend une grande partie de la Province du Kivu ct au point de vue botanique elle se compose de forêt équatoriale, de forêt de montagne et de prairies de montagnes (carte 1).

La forêt équatoriale (ou forêt dense humide) de notre région explorée est du même type que celle au nord-est du Congo. Nous y avons récolté jusqu'à présent 86 espèces de mammifères, les crocidures non comprises. Notre recensement a démontré que la faune de la forêt équatoriale de l'est du Congo ne diffère guère de celle connue de la forêt de l'Ituri au nord-est du Congo. Par contre le fleuve Congo représente une barrière zoogéographique importante vers l'ouest et de nombreuses espèces de mammifères n'existent pas sur la rive gauche de ce fleuve. Parmi ceux-ci nous ne citons que quelques-uns: *Cercocebus albigena, Gorilla gorilla, Pan troglodytes, Cercopithecus hamlyni, Cercopithecus l'hoesti, Galago inustus, Rhynchocyon stuhlmanni, Genetta victoriae, Osbornictis piscivora, Hylarnus harrisoni, Funisciurus pyrrhopus, Tamiscus alexandri, Idiurus, Anomalurus pusillus, Deomys ferrugineus*.

La forêt de montagne à l'ouest du lac Kivu est semblable à celle qu'on trouve tout le long du Graben. *Lophuromys woosnami, Thamnomys kempi, Aethosciurus ruwenzorii, Funisciurus carruthersi* et *Chlorotalpa stuhlmanni* sont des représentants typiques de ces montagnes. La forêt équatoriale et la forêt de montagne ont plusieurs espèces en commun, d'autres ne se trouvent qu'en forêt équatoriale et font défaut en forêt de montagne (voir graphiques et cartes).

Nous donnons ci-après des notes et cartes sur la répartition de quelques mammifères qui sont d'un intérêt particulier.

Rahm, U. (1966). Les mammifères de la forêt équatoriale de l'est du Congo.

Le but de cette publication est de donner un aperçu des mammifères de la forêt équatoriale de l'Est du Congo. Le Nord et le Nord-Est du Congo ont été explorés par plusieurs naturalistes, notamment par LANG et CHAPIN, et par CHRISTY, mais nous avons très peu de données concernant les mammifères de la région forestière de l'Est du Congo. La région explorée est située, grosso modo, entre le Graben Centre Africain et le fleuve Lualaba-Congo d'une part, et entre les fleuves Lowa-Oso et Elila (à peu près entre 1° S et 30° 30' S) d'autre part.

Nous avons effectué un voyage le long de la Lowa en 1960 et M. CHRISTIAENSEN a parcouru la région de Shabunda en 1959. La plus grande partie de notre étude a été faite dans la région d'Irangi et dans les alentours de Niamiringi, où nous avons séjourné plusieurs fois depuis 1959. A Niamiringi, nous avons joui de l'hospitalité de M. et M^{me} Ch. CORDIER qui y séjournèrent jusqu'en 1960; à Irangi, l'IRSAC possède un gîte bien aménagé.

Après avoir étudié les mammifères de la région occidentale du lac Kivu (RAHM et CHRISTIAENSEN, 1963), nous souhaitions comparer la faune de la forêt de montagne de la dorsale du Kivu avec celle

de la forêt équatoriale à l'Ouest du Graben Centre Africain. Un aperçu général de l'écologie et de la répartition de quelques mammifères a été publié ailleurs (RAHM, 1965).

Au point de vue botanique la région explorée se compose de forêt équatoriale à *Macrolobium* et de forêt équatoriale non caractérisée (carte 2). La plupart des villages sont situés le long des routes. Près des villages habités ou abandonnés, il y a généralement de la forêt secondaire, des champs indigènes ou de la brousse à *Pennisetum*. Dans la région d'Irangi et de Niamiringi, les bananeraies sont particulièrement nombreuses.

Rahm, U. and A. Christiaensen (1966). Les mammifères de l'île Idjwi (Lac Kivu, Congo).

Dans le cadre d'une étude sur les mammifères de l'Est du Congo et du Graben Centre Africain, un recensement des mammifères existant sur l'île Idjwi a été effectué par intermittence en 1959 et 1960. Idjwi est de loin la plus grande île du lac Kivu dont elle occupe l'axe Nord-Sud. Elle a une longueur d'un peu plus de 40 km et une largeur maximale de 10 km. Idjwi est extrêmement montagneuse, le plus haut sommet dépassant 2.200 m d'altitude, alors que le niveau du lac Kivu est de 1.463 m. La moitié Nord de l'île est de moindre altitude que le centre et le Sud.

D'après la carte géologique du Kivu par BOUTAKOFF (1939) le Sud-Ouest d'Idjwi est recouvert de laves basaltiques anciennes, tandis que le restant de l'île est formé de roches du système de la Ruzizi, ainsi que de granites. Les terrains alluvionnaires récents sont d'étendue très limitée (voir carte). Le lac Kivu occupe une cuvette du Graben Centre Africain, formée par des épanchements de lave qui ferment le lac au Nord et au Sud; au Nord, issus des volcans récents des Virunga et au Sud, issus des monts Biega, Kahuzi et autres centres volcaniques datant de lafin de l'ère tertiaire. L'âge de ce lac, et donc l'âge d'Idjwi en tant qu'île séparée de la terre ferme, doit être de l'ordre de 10.000 à 15.000 ans.

Les pluies sont abondantes sur Idjwi (environ 1.500 mm par an) et interrompues par une saison sèche, de sévérité variable suivant les années, durant les mois de juin, juillet et août et une partie des mois de mai et septembre. Une petite saison sèche, d'une durée d'une quinzaine de jours, s'intercale parfois au sein de la période pluvieuse, vers le mois de décembre ou janvier. La majeure partie de l'île Idjwi est déboisée, bien qu'un très beau massif de forêt de montagne en occupe la partie centrale qui est, en même temps, le point le plus élevé. La composition de cette forêt est identique à celle des forêts de montagne de la dorsale Ouest du Graben il altitude égale (fig. 2). Quelques parcelles de forêt de faible étendue subsistent au bord du lac, surtout dans le Nord de l'île. L'arbre dominant y est *Newtonia buchanani*, qu'accompagnent quelques *Schrebera alata*. On y rencontre comme végétal épiphyte fréquent la très belle et très grande orchidée *Ansellia africana*, sous les touffes desquelles s'abritent souvent des petites colonies de chauves-souris. Les collines sont couvertes, sur de larges étendues, de savanes plus ou moins arborées, parmi lesquelles notons: *Albizzia gummifera, Erythrina abyssinica, Putada abyssinica, Millettia dura, Bridelia micrantha, Fourea* sp., divers *Ficus, Sapium ellipticum*, etc., toujours chargés de nombreuses plantes grimpantes. La graminée *Hyparhenia cymbaria* domine dans les savanes nues au niveau du lac (fig. 3). On trouve également des massifs de *Pennisetum purpureum* et des collines entières couvertes de *Pteridium aquilinum*. Quelques plantations industrielles de caféiers se rencontrent au Sud-Ouest et à l'extrémité Nord de l'île. Un grand boisement d'*Eucalyptus* couvre la presqu'île de Mamvu.

L'île est habitée par l'ethnie des Bahavu, qui peuple la plupart des îles du lac Kivu, ainsi que la partie centrale de la côte Ouest. L'occupation humaine est surtout très dense au Sud du massif forestier central. Cette région est très cultivée et on y remarque d'immenses bananeraies servant principalement à la fabrication de bière. Les principales cultures vivrières sont les haricots, le sorgho et le manioc (*Manihot utilissima*). On rencontre partout des petits troupeaux de grand et de petit bétail. Au dire des autochtones, le gros bétail serait en régression par suite du recul des pâturages, causé tant par l'extension des cultures vivrières que par la diminution de fréquence des feux de brousse contre lesquels oeuvre ou oeuvrait l'Administration; ce qui a permis par ailleurs un reboisement et une pullulation progressive des broussailles en savane.

Feux de brousse, déboisement, reboisement et broussailles ont vraisemblablement eu une influence sur la faune de l'île, spécialement sur les mammifères.

A cause des événements politiques de 1960, nous n'avons pu malheureusement explorer l'extrême Sud-Est de l'île.

Antérieurement à notre prospection, quelques récoltes avaient déjà été faites par ALLEN et LOVERIDGE (1942) (voir "Conclusions").

La méthode de travail fut celle que nous avons utilisée lors de nos enquêtes précédentes. Les piégeages ont été effectués avec des "clapettes à rats" et lies "Oxford Longworth".
L'indicatif "L" et les numéros mentionnés au paragraphe "Collection" se réfèrent à la collection qui se trouve à l'IRSAC-Lwiro.

Rand, A. L. (1935). On the habits of some Madagascar mammals.

The following notes were made during the period 1929 - 1931, while I was collecting birds and mammals as member of the Mission Zoologique Franco-Anglo-Américaine à Madagascar. General accounts of the work of this expedition have been published by Jean Delacour (1930) and myself (1932).

A partial list of the mammals secures has been published by Delacour (1932), but the collection as a whole has not been critically studied. The present paper consists of field observations, made by myself unless otherwise stated.

Ransome, R. D. (1989). Population changes of Greater horseshoe bats studied near Bristol over the past twenty-six years.

Bat, Greater horeshoe bat, population, hibernacula, birth timing, growth

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Rautenbach, I. L. (1985). A new technique for the efficient use of Macro-mistnets.

A cheap and simple method of adapting yacht masts to allow quick and efficient stringing and versatile manipulation of a 6,0 * 30,0 meter macro-mistnet, is described

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Rautenbach, I. L. (1986). Karyotypical variation in Southern African Rhinolophidae (Chiroptera and non-geographic morphometric variation in *Rhinolophus denti* Thomas, 1904.

Karyotypical properties of all ten species of Southern African *Rhinolophus* are evaluated as a parameter for clarifying species identities. No interspecific variation in diploid numbers, minor variation in fundamental numbers and a greater degree of variation in sex chromosomes render this technique of limited value concerning rhe confirmation of species identities. A series of 104 specimens of *R. denti* from the northern Cape Province, South Africa, is analysed for nongeographic variation. Significant variation is recorded betwen sexes in five mensural characters.

Rautenbach, I. L., G. N. Bronner and D. A. Schlitter (1993). Karyotypic data and attendant systematic implications for the bats of southern Africa.

The standard karyotypic properties of 60 of the 73 species of bats known to occur in southern Africa, are reviewed. The karyotypes of 23 microchiropteran species are described for the first time; our results on a further 14 species are compared with earlier reports for those taxa. The previously published chromosomal information pertaining to 23 species for which we had no information, are cited. Systematic implications of observed patterns of karyotypic variation are briefly discussed. In particular,

we conclude that the taxon *Cistugo* (currently recognised as a subgenus of *Myotis*) should be afforded full generic rank; hypothesise that the karyotypes of the two species - *M. (C) seabrai* and *M. (C) lesueuri* - in *Cistugo* are probably ancestral for all vespertilionids; and question the wisdom of redefining the taxonomic limits of the genera *Eptesicus* and *Pipistrellus* until molecular data are available to resolve the dilemma posed by conflicting morphological and cytogenetic data suites.

Rautenbach, I. L., G. De Graaff and U. de V. Pienaar (1979a). Records of seven small mammal species (Insectivora, Chiroptera) new to the Kruger National Park.

On a recent collecting expedition in the Kruger National Park the occurrence of seven species of small mammals (one shrew and six bats) within the confines of this sanctuary was confirmed for the first time. One species (*Pipistrellus rusticus*) is reported for the first time from within the borders of the Transvaal, whereas another species (*Myotis bocagei*) is reported for the first time for the Republic of South Africa. The seven
species are briefly discussed and the collections where the specimens have been accesioned are indicated.

Rautenbach, I. L., N. J. Dippenaar, J. Meester and D. A. Wolhuter (1981a). The status of Southern African mammal taxonomy. Abstract.

A generally accepted belief persists within the ranks of zoologists that the 'taxonomy' of southern African small mammals are adequately documented; that the classificatory frameworks are near finite; that nomenclatural problems are resolved in the greatest majority of taxa; and that infraspecific variation is so well understood as to render further collecting and taxonomic study superfluous or of trivial importance.

Meester (1954), followed by Ansell (1958), Meester, Davis and Coetzee (1964), as well as Meester and Eloff (1973) reviewed the status of the taxonomy of the small mammals of this subcontinent, whereupon all stressed the need for continued and more detailed taxonomic work. Regardless of this circumscribed need, little was being done at that time. Since then some powerfull taxonomic procedures (*viz.* multivariate morphometric analyses, cytotaxonomy) were incorporated in local taxonomic research endeavours. In the light of such powerful but demanding taxonomic procedures, we have re-examined the status of southern African small mammal taxonomy.

We conclude that in southern Africa, not only does the progress in taxonomic research fail to keep up with contemporary work on European and North American mammals, but is in fact falling progressively further behind. A discussion on possible causes for this situation is offered. It is our belief that in southern Africa in particular and Africa in general, enough important taxonomic work within the field of small mammal taxonomy remains to occupy the fulltime attention of a score of taxonomists. Concern is expressed that unless the rates and standards of taxonomic research on local small mammals are significantly increased, much time, energy, funds and manpower could be applied uneconomically and in vain in those disciplines of mammal research relying on a sound classification.

Rautenbach, I. L., M. B. Fenton and L. E. O. Braack (1985). First records of five species of insectivorous bats from the Kruger National Park.

Five: species of insectivorous bats arc reported time from the Kruger National Park. One of these, *Pipistrellus anchietai*, represents a new record for the southern African Subregion, and two *Laephotis botswanae* and *Nycteris woodi* are recorded for the first time for the Republic of South Africa. The remaining species, *Eptesicus melckorum* and *Tadarida ansorgei* are first records of occurrence for the Transvaal. The species richness of the bat fauna of the Kruger National Park, and particularly of the Pafuri area, is reviewed.

Rautenbach, I. L., M. B. Fenton, A. C. Kemp and S. J. Van Jaarsveld (1990). Home range and activity of African goshawk *Accipiter tachiro* in relation to their predation on bats.

Winter radio-tracking of three African goshawks *Accipiter tachiro* showed that they each occupied well-wooded home ranges of at least 28 hectare. They perched and roosted mainly within densely foliaged tree and an adult female changed perches on average 4,7 times per hour. No crepuscular predation of bats was recorded, in contrast to regular summer predation on colonies of little free-tailed bat *Tadarida pumila*, but winter emergence rates of these bats at dusk had dropped to <= 5 % of the previous summer. We predict that many accipiters will be regular predators of bats and that skewed sex ratio and high fecundity may be two means by which bats counter this predation.

Rautenbach, I. L., M. B. Fenton and M. J. Whiting (1996). Bats in riverine forests and woodlands: a latitudinal transect in southern Africa.

Using captures in mist nets and monitoring echolocation calls, we quantified bat distribution and activity and measured insect abundance as numbers of insects attracted to black lights at 15-min intervals. These data were collected simultaneously at pairs of sites in riverine and dry woodland savannah along a transect of ca. 350 km from north to south in the Kruger National Park, South Africa. The sites were situated in the north, central, and south of the park and data were collected in January 1993. Our study involved 18 sites, three pairs each in the areas of the Luvuvhu, Letaba, and Sabie rivers. Half of the sites were in riverine woodland, the others in dry woodland. No statistical association exists between bat captures and either bat activity or insect abundance. Bat activity, however, was related significantly to insect abundance. Although bats were significantly more abundant (captures) in riverine habitats than in dry woodland savannah, comparisons of bat diversity and evenness (rarefaction curves, species abundance curves, and Whittaker plots) showed no differences between these habitats. The data neither demonstrate a decline in bat diversity away from the equator nor suggest specific bat communities associated with riverine habitats. The data do demonstrate the important influence of insects on the activity patterns of insectivorous bats.

Nous avons utilisé des données sur la capture dans des filets japonais et des enregistrernents de cris d'écholocation pour quantifer la répartition des chauves-souris et leurs activités et nous avons également rnesuré l'abondance des insectes capturés dans des pièges aux ultra-violets a 15 min d'intervalle. Les données ont été recueillies simultanément a des paires de sites, dans un habitat riverain et une savane boisée sèche, le long d'un transect nord-sud d'environ 350 km dans le parc national de Kruger en Afrique du Sud. Les sites étaient situés dans les parties nord, centre et sud du parc et les données ont été recueillies en janvier 1993. Nous avons choisi 18 sites, trois paires à chaque endroit, soiit dans les bassins des rivières Luvuvhu, Letaba et Sabie. La moitié des sites se trouvaient dans des milieux riverains boisés, l'autre rnoitié dans des milieux secs boisés. Aucune relation statistique n'a été trouvée entre le nombre de chauves-souris capturées et leur activité ou l'abondance des insectes. L'activite des chauves-souris était cependant en correlation significative avec l'abondance des insectes. Les chauves-souris étaient significativement plus abondantes dans les captures éffectuées en milieu riverain qu'en milieu sec, mais la comparaison entre la diversité des chauves-souris aux deux endroits et leur regularité (courbes de rarefaction, courbes d'abondance des espèces et diagrammes de Whittaker) n'a révélé aucune différence entre ces deux types d'habitats. Les données n'indiquent pas de diminution de la divérsite des chauves-souris a mesure qu'on seloigne de l'equartur et ne signalent pas non plus l'existence de communautes de chauves-souris spécifiques des habitats riverains. Les données soulignent cependant l'influence importante des insectes sur l'activité des chauves-souris insectivores.

Rautenbach, I. L., A. C. Kemp and C. H. Scholtz (1988). Fluctuations in availability of Arthropods correlated with Microchiropteran and Avian predator activities.

Aerial arthropods were sampled by driving a standard transect along the riparian forest of the Luvuvhu River, South Africa, to assess hourly and seasonal variations in available biomass. Sampling, with an

air-plankton net mounted on a vehicle, was conducted hourly over 48-hour period during the fullest phase of the moon for each of eight months during 1986/87. Seasonal variation in availability of terrestrial arthropods was assessed by means of six pitfall traps set in the riparian forest. On a daily basis the available biomass of aerial arthropods was found to increase markedly at and during the two hour following sunset, with a slight peak at or in the two hours preceding dawn. Highest monthly availability was found to correspond with the warm summer rainy season, with a marked increase after the first rains. The peak for terrestrial arthropods was found to occur later in the summer than for aerial arthropods. These patterns of arthropod availability correlate well with the daily activity rhythms and seasonal reproduction of microchiropteran bats and their avian predators.

Rautenbach, I. L. and J. A. J. Nel (1978a). Coexistence on Transvaal Carnivora.

How coexisting carnivore species avoid interspecific competition is examined by consideration of their more prominent physical and behavioral characteristics. An attempt is made to explain coexistence of the 33 Transvaal carnivore species. The behavioral characteristics, which are considered here in various combinations, are daily activity regimen, food preference, habitat preference, geographical distribution, and social structure. The mean species body weight as an indicator of the size of prey on which a carnivore exists is also incorporated. Eighty-two % of the carnivores are shown to form a trend ranging from a nocturnal/solitary mode of life to an entirely diurnal/gregarious existence.

Rautenbach, I. L. and J. A. J. Nel (1978b). Three species of microchiropteran bats recorded for the first time from the south-west Cape Biotic zone.

New distribution records are reported for three species of bats. The presence of *Tadarida (Tadarida) aegyptiaca* in the South-West Cape biotic zone is confirmed. *Tadarida (Chaerephon) pumila* is recorded for the first time from the Cape Province, whereas the known range of *Laephotis wintoni* is shown to extend some 1 000 km further south than previously recorded, to within the borders of the Republic of South Africa.

Rautenbach, I. L. and J. A. J. Nel (1980). Mammal diversity and ecology in the Cedarberg wilderness area, Cape Province.

This report deals with the results of mammal surveys in the Cedarberg Wilderness Area, Cape Province, Republic of South Africa. Specimens collected by a combined Transvaal Museum/University of Pretoria (Department of Zoology) expedition during February 1978, as well as unreported material previously accrued by the Smithsonian Institute's 'African Mammal Project' field teams, are dealt with. Material and/or other records of the 50 mammal species now known to occur in the study area, are reported. Ecological aspects of some smaller mammals are discussed, such as trapping results, species diversity and relative densities, cover preference and breeding activity.

Rautenbach, I. L., J. A. J. Nel and G. A. Root (1981b). Mammals of Itala Nature Reserve, Natal.

Itala Nature Reserve is situated in rolling hills south of the Pongola river. Historically the area was in the Vryheid Republic, and bordered on South Africa's first game reserve, the Ponzola Game Reserve. Proclaimed in 1973 with an area of 8094 ha, Itala was subsequently enlarged through the acquisition of additional farmland to its present size of 26 305 ha. While parts of the present reserve are in a fairly pristine state, others have been farmed or were the sites of kraals. These are still, and will rernain so for many years to come, in a state of floristic and presumably also faunal succession. As the process of recovery from farming practices continues the species surviving at the time of proclamation, as well as those reintroduced, will in all probability resettle those areas occupied historically.

The geographical position and variation in topography, altitude, climate and vegetation types of !tala Nature Reserve present an area of great ecological and zoogeographical interest with which to compare the mammal fauna of other parts of southern Africa. The present paper documents the current state of the mammal fauna, and also lists those species known to occur in the past, but now absent.

Rautenbach, I. L., D. A. Schlitter and L. E. O. Braack (1984). New distributional records of bats for the Republic of South Africa, with special reference to the Kruger National Park.

Data on the distributions of seven species of bats in South Africa are discussed. Four species, *Hipposideros commersoni, Pipistrellus rueppellii, Tadarida ansorgei* and *T. fulminans* are reported for the first time from South Africa and all but *T. ansorgei* from the Kruger National Park. *Rhinolophus simulator* and *Kerivoula lanosa* are recorded for the first time from the Kruger National Park. The subspecies relationship of *Eptesicus hottentotus* in the eastern part of South Africa is reviewed.

Rautenbach, I. L., D. A. Schlitter and G. de Graaff (1979b). Notes on the mammal fauna of the Augrabies falls National Park, and surrounding areas, with special reference to regional zoogeographical implications.

An annotated checklist of the mammals recorded by direct or indirect means on or near the Augrabies Falls National Park, is provided. Speculations are offered as to which species have become extinct during historical times. The Orange River as a faunal dispersal corridor and barrier, is considered. A numerical analysis to determine whether the Augrabies Falls district falls within the Namib or the South West Arid biotic zone, is discussed.

Reason, P. F., W. J. Trewhella, J. G. Davies and S. Wray (1994). Some observations on the Comoro rousette *Rousettus obliviosus* on Anjouan (Comoro Islands: Western Indian Ocean).

During a capture operation for the endangered fruit bat *Pteropus livingstonii* in the Comoro Islands (Comores) in 1992, two other fruit bat species were also caught: I P. seychellensis comorensis and *Rousettus obliviosus*. Very little is known about the population biology and ecology of *R. obliviosus*. Morphometric data for this bat are presented, along with discussion of its feeding ecology and reproductive biology. Although this species appears to be common, *R. obliviosus* is found in forest habitat, which is rapidly disappearing in the Comores.

A l'occasion d'un programme de capture de la roussette de Livingstone, *Pteropus livingstonii*, aux iles Comores en 1992, deux autres espèces, *P. seychellensis comorensis* and *Rousettus obliviosus*, furent aussi capturées. La biologie et l'écologie de *R. obliviosus* sont très peu connues. Des données morphométriques sont présentées pour cette espèce, ainsi qu'une discussion sur son écologie, son alimentation et sa reproduction. Bien que *R. obliviosus* reste apparemment commune, son habitat, la forêt primaire, disparait rapidement aux Comores.

Rees, A. (1964). A check list of the mammals and amphibia of Ulanga District.

The following list of animals found in Ulanga Range is submitted, not only as part of the natural history records of this District, but also as an indication of the variety of wildlife to be found in a comparatively small area of Tanganyika. Many, in fact most, of the animals listed occur in the Selous Game Reserve, and some, such as Sharpes grysbuck and Impala have not been recorded outside the Reserve.

No attempt has been made to comment on the distribution of the animals listed, as considerably more collecting and wider observation is needed.

Apart from the larger and more easily identifiable mammals only those which have been collected personally and identified by some competent authority have been listed.

Large gaps occur, notably in the *Murinae, Herpestinae* and *Soricidae*. Very few specimens have been collected from these groups. The *Chiroptera* however have been dealt with more thoroughly and members of this order which are not listed but which may occur in this range are probably rare, very locally distributed. or by their habits or habitat, solitary and difficult to collect.

The absence of *Platymops* from the records of Tanganyika mammals is, for example, probably more likely to be due to a lack of collectors than to the non-occurrence of this bat.

In this district I have managed to collect only a single specimen of *Trianops afer*, a bat which is reputed to live in caves and which should not, one would think, be so elusive.

Notes on a collection of snakes were published in the "Tanganyika Notes and Records" (Vol 54 of March 1960). Dr. Freyvogel has since done more collecting and it is hoped that he may soon be able to add to the list.

It is emphasised that the following list is far from complete and it is only offered as a basis for further collecting and study.

Little is known about the habits and food preferences of even the larger mammals, particularly in the type of country occuring in this District and through most of the Selous Game Reserve, and a study of the association of the animals with various vegetational types would be both interesting and valuable.v- and would, of course have an important and direct bearing on conservation problems.

The local migration of elephant and buffalo, the extremely local occurence of puku, the irregular and local distribution of greater kudu in the Western Selous Reserve, and the probability of certain species of grass having an important effect, when in various stages of maturity, on the movement and distribution of the animals which occur, are all phenomena which could perhaps be understood with a greater knowledge of the feeding habits of these animals.

Reuven, Y. (1991). Foraging habits, hunting and breeding success of Lanner Falcons (*Falco biarmicus*) in Israel.

The distribution of Lanner Falcons (*Falco biarmicus*) is restricted to the Mediterranean region and Africa. During 1987-89, data were collected on foraging habits and reproductive success on two breeding pairs of Lanner Falcons at Sede Boqer, in the Negev Desert highlands, Israel. Three hundred and thirty two capture attempts of birds, mammals and insects by the Lanner Falcons were observed, of which 163 (49.1 %) were successful. The falcons also pounced on 9 rodents from a perch, or walked on the ground and gathered invertebrates on 27 occasions. A male also hunted bats. Pairs hunted cooperatively during the courtship period prior to egg laying and also when young accompanied one of the parents on hunting forays. During the fledging period, the male and the female again hunted cooperatively. The overall hatching success for both pairs during the five pair-years was 95.2 % and total fledging success was 78.3 %.

Robbins, C. B. (1978b). The Dahomey gap - A reevaluation of its significance as a faunal barrier to west african High Forest Mammals.

The Dahomey Gap as a faunal barrier to high forest mammals is reevaluated. Past researchers, utilizing incorrect or incomplete data, were led to the conclusion that the Gap was the major factor influencing high forest animal distribution in West Africa. Recent data on climate, vegetation, soil type, and mammalian taxonomy, ecology, and distribution indicate that the Dahomey Gap has not influenced mammal distribution or evolutionary changes. Rather, it is the Volta and Niger rivers, which have affected mammalian distribution and speciation in West Africa.

Robbins, C. B. (1980). Small mammals of Togo and Benin. I. Chiroptera.

Liste des chauves-souris collectées par les membres du Smithsonlan African Mammal Project au Togo et anu Bénin. Trois espèces sont nouvelles pour le Togo. Cette liste comprent les premières mentions de la faune des chauves-souris du Bénin. L'auteur discute de problèmes taxonomiques posés par les *Scotoecus* et de problèmes de nomenclature concernant les *Scotophilus*.

Bats collected by members of the Smithsonian African Mammal Project in Togo and Benin are listed. Three species reported are new for Togo. This list includes the first account given for the bat fauna of Benin. Problems regarding taxonomic determinations in *Scotoecus* are discussed as well as nomenclatural problems concerning species of *Scolophilus*.

Robbins, C. B. (1981). A new high forest species of the bat genus *Scotophilus* (Mammalia: Vespertilionidae). Abstract.

Research on a revision of the African bat genus *Scotophilus* (with Frits De Vree - see following abstract) included examination of many specimens referable to *S. nigrita nux* Thomas, 1904. De Vree and I have found that *S. nux* is specifically distinct and distinguishable from *S. dinganii* (previously and incorrectly called *S. nigrita*).

Examination of over 80 specimens of *S. nux* revealed that six specimens (four from Ghana, one from NE Zaire, and one from Uganda) could not be referred to *S. nux* or any other described taxon in *Scotophilus*. Although they are very similar in external appearance including pelage color, their cranial and wing measurements are markedly smaller.

Two of the Ghana specimens are, in fact, sympatric with typical *S. nux*. That locality (1 mi N Nkawkaw) will be designated as the type-locality for the new species. Both *S. nux* and the new species are restricted in distribution to the West, Central, and East African high forest blocs and remnant forest areas. The formal description of the new species will be published as a part of the Proceedings of this Colloquium.

Robbins, C. (B.) (1983). A new high forest species in the African genus *Scotophilus* (Vespertilionidae).

Analysis of the systematics of the African *Scotophilus* (Robbins, De Vree & Van Cakenberghe, 1982) revealed that the subspecies *S. nigrita nux* Thomas, 1904, was instead a distinct species (*S. nux*). Statistical analyses were used to examine population and geographic variation in over 100 specimens referred to *S. nux*. Some population samples had unusually large ranges of measurements. The specimens from those localities were then examined individually. I found that there were some individuals with smaller wing and cranial measurements than typical *S. nux* from the same or nearby localities. Additional research was necessary to clarify the characters that identify *S. nux* and distinguish the smaller specimens.

Robbins, C. B. and F. De Vree (1981). Systematic revision of African *Scotophilus* (Chiroptera, Vespertilionidae). Abstract.

The systematics of the African members of the genus *Scotophilus* are very confused and controversial at several points. Apart from size and color they do not show striking morphological differences.

In the present study approximately 2000 specimens were examined, using multivariate statistical techniques, including discriminant, principal component and cluster analysis. All analyses are based on seven cranial and one wing measurement.

A total of six species are now recognized on the mainland of Africa: *S.nigrita (=gigas), S.nux, S.dinganii, S.leucogaster* and *S.viridis*. A new species will be discussed by Brian Robbins and is included in the previous abstract; it will be described in the published proceedings of the Colloquium.

The distribution of the genus on the mainland of Africa ranges from Senegal and Mauretania in the West to Ethiopia and Somalia in the East, throughout Central Africa to South Africa. *S.nux* and the new species are restricted in distribution to the high forest zone from Sierra Leone to Kenya. Our analysis shows that *S. viridis* and *S. nigritellus* are conspecific. *S. leucogaster* and *S. viridis* occur throughout the range given for the genus in Africa and are sympatric at several localities in West Africa. However south of Ethiopia they have not been found together, but are usually found with *S. dinganii*.

Robbins, C. B., F. De Vree and V. Van Cakenberghe (1983). A review of the systematics of the African bat genus *Scotophilus* (Vespertilionidae).

The systematics of the African vespertilionid genus *Scotophilus* Leach, has been confused and at times controversial. Since the description of the earliest species in this genus, *S. nigrita* (Schreber, 1774), eighteen other taxa have been described as being African species or subspecies. The number of species recognized by various authors for the African mainland ranged from two to seven, with the usual numbers being three, four or five distinct species. The taxonomic history and the taxonomy of *Scotophilus* using multivariate statistical techniques to examine morphology, plus analysis of ecology and distribution of African mainland species, are detailed by Robbins, De Vree and Van Cakenberghe, 1982, Ann.Roy.Afr.Centr., Ser. 8. We present here a review of that paper.

Adults from a total of 2094 specimens were examined from 21 museum collections in the US, Europe and Africa. Statistical analyses were made using one wing and seven cranial measurements. Multivariate analyses included discriminant function analysis and principal component analysis. Standard univariate techniques were also used.

Morphological analyses were divided by geographical regions and habitat because many previous taxonomic treatments were regional and also to facilitate taxon recognition and allow comparisons between the regions. These regions and habitants were: the West African savanna; the savanna from West to East Africa; the high forest from West to East Africa; the southern Africa savanna; and total distribution. *S. nigrita* Schreber was excluded from these analyses because its large size distinguished it from all other *Scotophilus* species.

Analysis of the West African savanna species indicated the presence of three distinct morphological species which corresponded to *S. dinganii* (A. Smith), *S. leucogaster* (Cretzschmar), and *S. nigritellus* De Winton. Combining the West African specimens with population samples from East Africa indicated that these three species remained distinct. The West to East African high forest vegetation zone was found to have two species distinguishable from those in the savanna - as *S. nux* Thomas and a new species described in these Proceedings as *S. nucella* Robbins.

It was apparant that southern Africa also had two or three distinct species. Using specimens from previous analyses (West to East Africa) plus southern Africa specimens, confirmed that the smallest species in West Africa (previously referred by other authors to *S. nigritellus*) was conspecific with and should be recognized as a part of the southern African *S. viridis*. Also, West Africa specimens of *S. leucogaster* were found to be conspecific with specimens from Namibia and Botswana. To complete the analyses, the largest West African *Scotophilus* (excluding *S. nigrita*), *S. dinganii*, was compared with and found to be conspecific with southern African specimens. Statistical analyses using specimens from throughout the range for each morphologically distinct species confirmed the presence, on the African mainland, of six distinct species of *Scotophilus*. Therefore, we recognize *S. dinganii, S. leucogaster, S. nigrita, S. nucella, S. nux* and *S. viridis*.

We also considered the possibility that specimens from the Madagascar area corresponded to those on the African mainland. Based on only a few available specimens, we found three morphologically distinct forms. The large specimens had been described as *S. robustus* Milne-Edwards and do not correspond morphologically to any African mainland specimens. Another specimen corresponded to the lectotype of *S. borbonicus* (E. Geoffroy St. Hilaire). An additional specimen has measurements which fit those of the smallest representatives of the mainland *S. viridis*. For the present and because of a lack of Madagascar material and the inadequate description and condition of the lectotype of *S. borbonicus* we reject the use of *S. borbonicus* and *S. robustus* for species or subspecies on the African mainland.

Robbins, C. B., F. De Vree and V. Van Cakenberghe (1985). A systematic revision of the African bat genus *Scotophilus* (Vespertilionidae).

The systematics of African members of the genus *Scotophilus* has been confused and at times controversial. Apart from size and pelage color, they do not show many non-mensural differences. Multivariate statistical analyses are used with seven cranial and one wing measurement on over 2000 specimens. Six species are recognized. Two species, *S. nux* and *S. nucella*, are restricted to the high forest zone in West and Central Africa. The other four species, *S. dinganii, S. leucogaster, S. nigrita*, and *S. viridis*, occur throughout sub-Saharan Africa in the savanna vegetation zones. African mainland distribution of the genus is from Senegal and Mauritania in the west to Ethiopia and Somalia in the east, and throughout Central Africa to southern Africa.

Robbins, L. W. and R. J. Baker (1978). Karyotypic data for African mammals, with a description of an *in vivo* bone marrow technique.

Basic information, which should be included in any publication on the chromosomes of mammals, is given. A field-tested bone marrow-in vivo method of karyotyping is presented. A review of the literature concerning karyotypes of African mammals was done and these karyotypic data are listed for 292 species and subspecies of African mammals.

Robbins, L. W., M. W. Haiduk and D. A. Schlitter (1981). Chromosomal banding studies and their systematic implications in African fruit bats (Chiroptera: Pteropodidae). Abstract.

Analysis of data derived from standard karyotypes can give information concerning differences between individuals, species, and genera, and similarities can be only inferred. New techniques utilizing differentially stained chromosomes (G- and C-banding) now allow a more quantitative approach for the determination of homologies as well as types and magnitude of chromosomal differences. Standard and banded karyotypes of *Epomops franqueti, Hypsignathus monstrosus*, and two species of *Epomophorus* are compared and contrasted. The chromosomal banding data are then used to place nine species and eight genera in a systematic arrangement based on the occurrence of homologous elements and shared rearrangements.

Robbins, L. W. and V. M. Sarich (1988). Evolutionary relationships in the family Emballonuridae (Chiroptera).

Protein electrophoresis and immunology were used to test hypotheses concerning phylogenetic relationships within the family Emballonuridae and the relationship of the family Rhinopomatidae to the Emballonuridae. These data indicate the presence of three major subdivisions within the family. The eight genera from the New World form one monophyletic group, the Old World genera *Taphozous* and *Saccolaimus* form the second, and *Emballonura* and *Coleura* the third. The *Emballonura-Coleura* lineage is more closely related to the New World genera than to the other Old World group. The family Rhinopomatidae was found to be distantly related to both the Emballonuridae and the Vespertilionidae.

Roberts, A. (1914). Supplementary list of African Mammals in the collection of the Transvaal Museum, with descriptions of some species.

Since the catalogue of African Mammals in the collection of the Transvaal Museum was published last year (Ann. T.M., Vol. III, part 2, pp. 65-109), some notable additions have been made by an expedition to south-eastern Rhodesia, undertaken by the Taxidermist and the writer, for the purpose of procuring specimens to replace those formerly in the mounted collection, and skeletons of some of the larger antelopes. A few specimens have also been acquired by purchase or donation, and a number of specimens of scientific value have been found in the store of flat skins in charge of the Taxidermist. In addition to these the names of a few species found amongst the exotic specimens and overlooked in my former paper are now included to complete the list of species.

Roberts, A. (1946). Descriptions of numerous new subspecies of mammals.

During the course of critically examining the collection of mammals in the Transvaal Museum, numerous undefined subspecies were found to need naming, and they are given hereunder. There can be no doubt that we have much more to learn about the forms and distribution of the mammals in South Africa, and as new material is acquired, more will have to be named. As a result of this critical examination, it is becoming more and more apparent that there are certain ecological conditions which produce somewhat similar results in the local forms of mammals, often repeated in sedentary species of birds, going to show the importance of such studies in the evolution of species, for, in some cases, isolation of the subspecies has led to specific establishment. This is most evident in those of very local habitat, while those which tend to wander and intermingle with individuals from adjacent territories seldom become specifically isolated in the modern forms. Thus in the two species of hares of the genus *Lepus*, the range of variation under extremely different conditions of environment is very wide, but links between these subspecies exist, whereas in the genus *Pronolagus* there are more species, some of which overlap in distribution, and in some of these species subspecies may be noted.

Roche, J. (1972). Recherches mammalogiques en Guinée forestière.

Une collection de Mammifères de Guinée forestière (République de Guinée) a été rassemblée dans la région de Sérédou. A côté d'une forte proportion de représentants du milieu forestier, figurent quelques espèces d'origine savanicole. Le matériel ainsi réuni est étudié par groupes zoologiques, avec des discussions concernant la systématique, la répartition géographique, éventuellement l'écologie et les rapports avec l'homme, des différentes espèces.

A collection of Mammals from the forested part of the Republic of Guinea has been made in the region of Seredou. Next to a large proportion of forest animals stand a few savanna species. This material is studied by zoological groups and discussions concern systematic, geographical distribution and eventually the ecological aspect and the relations with man, of the different species.

Rode, P. (1937). Etude d'une collection de mammifères de l'Afrique occidentale.

Au cours d'une mission en Afrique occidentale française (déc-1935-mars 1936), mission qui avait pour but essentiel de recueillir la documentation nécessaire à la mise au point d'un ouvrage sur les Primates de l'Afrique, nous avons pu récolter quelques spécimens de Mammifères, en Guinée, au Soudan et au Sénégal. Cette petite collection d'Ongulés, de Carnivores, Rongeurs, Chiroptères et Primates, présente un certain intérêt pour les collections de Zoologie des Mammifères, puisqu'elle a permis d'inscrire 51 pièces, dont un certain nombre appartiennent à six espèces ou sous-espèces qui n'existaient pas au laboratoire.

Nous avons volontairement laissé de côté l'énumération de pièces histologiques et d'organes divers destinés à des recherches dont les résultats paraîtront ultérieurement.

Rode, P. (1941). Catalogue des types de mammifères du Muséum Nationale d'Histoire Naturelle. Ordre des Chiroptères.

La présente liste de types fait suite aux deux articles précédemment publiés, le premier sur les types de Simiens, le second sur les types de Lémuriens.

La collection de Chiroptères du Laboratoire de Zoologie des Mammifères du "Muséum National d'Histoire Naturellle de Paris comprend des animaux montés, des animaux en peau et des spécimens conservés en alcool, soit 140 pièces au total.

Les types contenus dans ces trois séries ont été retirés, classés et font l'objet du présent catalogue dont le plan est le même que celui qui a été adopté dans les deux précédents 1 et 2.

Rode, P. (1947). Les mammifères de l'Afrique du Nord. 1.

Les biogéographes englobent dans la zone dite "palearctique" le Nord de l'Afrique, c'est-à-dire, en principe, la région séparée de la zone éthiopienne par le Sahara, aujourd'hui désertique.

Si l'on considère l'histoire du peuplement de cette région nord-africaine on y retrouve, d'une part, des éléments eurasiatiques et d'autre part des éléments tropicaux. Au début.du Quaternaire, le nord de l'Afrique était peuplé d'un faune d'aspect surtout tropical, le Sahara étant, à cette période, une région habitée et fertile. En raison de la présence en Afrique du Nord d'organismes d'origine très variée, mais dont les rapports sont cependant plus étroits avec la zone tropicale qu'avec la zone palearctique, nous considérons que cette région doit être plutôt incluse dans le système éthiopien, le Sahara n'étant pas encore entièrement dépeuplé, mais pourvu d'une faune mammalogique variée et intéressante.

Il y a lieu, sans, doute, de considérer l'Afrique du Nord comme un domaine de transition entre le monde paléarctique et le monde tropical: mais c'est surtout une zone du système tropical. La Berbérie, limitée au nord par la mer et au sud par les chaînes montagneuses n'est pas une région isolée, mais, en dehors de quelques formes paléarctiques, c'est un simple territoire de bordure.

L'étude des Mammifères est, à cet égard, particulièrement démonstrative. Nous allons essayer de synthétiser, en quelques courts chapitres, les éléments actuels de cette faune, en montrant du point de vue zoologique les rapports avec les types purement tropicaux et, quand il y a lieu, la présence de types paléarctiques en donnant, chaque fois que cela ser.a possible, les caractères biologiques essentiels. Mais plus encore que pour les Mammifères européens il faut reconnaître que nous n'avons pas, maigre les nombreux travaux publiés, une connaissance complète de cette faune surtout en ce qui concerne les micromammifères sahariens ou marocains et que des découvertes sont encore possibles.

Nous' serions très heureux si cette ébauche de mise au point pouvait servir de guide à des chercheurs pour préciser nos connaissances et leur donner le désir d'apporter de nouveaux documents indispensables pour nue étude complète.

Notre étude des Mammifères de l'Afrique du Nord se limitera aux territoires suivants: Maroc, Algérie et Tunisie. La zone algérienne comprendra la région admiuistrativement désignée sous le nom de Territoires du Sud. En fait, au point de vue géographique, nous mentionnerons autant que possible toutes les espèces comprises au nord du tropique du Cancer.

La faune de-l'Afrique du Nord a été particulièrement étudiée par LOCHE (1), LATASTE (2), CABRERA (3), H. HEIM DE BALSAC (4). Citons également la contribution importante et répartie dans de nombreuses notes, de O. THOMAS, JOLEAUD, MORALES AGACINO, P. LAURENT.

Les Mammifères représentés en Afrique du Nord appartiennent aux ordres suivants: Primates, Insectivores, Chiroptères, Carnivores, Rongeurs et Ongulés.

Rodgers, W. A. and K. M. Homewood (1982). Species richness and endemism in the Usambara mountains forests, Tanzania.

The East Usarnbara Mountain forests constitute what is probably one of the richest biological communities in Africa in terms of plant and animal species numbers and endemic taxa. This review presents brief accounts of the flora and of three invertebrate and four vertebrate groups and shows the percentage endemic taxa to vary from 2 % (mammals) to 95 % (millipedes) as a proportion of the true forest species.

Notes are given on the geology, soils, climate and present land use of the Usambaras. Biological richness is considered to be due to long periods of isolation and geological stability coupled with periods of species immigration during times of re-establishment of a continuous forest cover. The nature of the endemic elements is brieflv discussed.

Evidence is given to show that the forests are subject to increasing pressure from legal and illegal encroachment due to agriculture (tea, cardamon, subsistence) and forestry timber operations. Air photograph analysis shows a forest decrease of some 50 % in the vicinity of Amani from 1954 to 1976.

The low conservation status of most forest reserves and the lack of detailed knowledge on the distribution, status and biology of the endemic species means present conservation efforts are poor and haphazard. This review calls for greatly increased research inputs and a complete halt to all exploitation of natural forest areas until a long term conservation land use plan can be implemented.

Rodgers, W. A., C. F. Owen and K. M. Homewood (1982). Biogeography of East African forest mammals.

This paper analyses the distribution of seventy-three mammal species in seventeen East African forest sites of differing geological history (recent volcanic, ancient block faulted and lowland alluvial). Association analysis and principal coordinate analysis indicate four groupings (West, North, South and Coast) based on species presence. The levels of similarity between these groups are used to test previous ideas on spread of forest mammals through East Africa. The western sites have the highest richness and endemism and represent the main refuge and colonization source. The North group show overall impoverishment, low endemism and high dependence on the western fauna. The South group shows higher cndcnusm, the Coast fauna is the most impoverished, and highly dependent on South group elements. These findings are discussed with respect to current interpretations of bioclimatic events and forest environments in the East African Pleistocene and are used to investigate a specific example concerning the distribution of a recently discovered rare forest primate.

Rodríguez-Durán A. (1995). Metabolic rates and thermal conductance in four species of neotropical bats roosting in hot caves.

Data are presented on metabolic rates and thermal conductance for four species of neotropical bats, *Pteronotus quadridens, Mormoops blainvillii* (Mormoopidae), *Monophyllus redmani* and *Erophylla bombifrons* (Phyllostomidae). Each of these bats predominantly or exclusively roosts in hot caves (28 - 40° C) in Puerto Rico. Basal metabolic rates (BMR) for these four species were 55 %, 48 %, 66 %, and 66 % of values expected from the Kleiber curve, respectively. Thermal conductance was 93 %, 55 %, 175 %, and 158 % of values expected from the Aschoff curve, respectively. These data indicate that, in addition to food habits, variation in BMR is highly correlated to roost microclimate. *Pteronotus* and *Mormoops*, like other insectivorous species, have low BMRs. The low BMR of the nectar/fruit eating *Monophyllus* and *Erophylla*, as well as the low termal conductance in *Mormoops*, is consistent

with their habit of roosting in hot caves, suggesting that roost microclimate is an important selective force in the physiological adaptation of these bats.

Roer, H. (1970). Zur Wasserversorgung der Microchiropteren *Eptesicus zuluensis vansoni* (Vespertilionidae) und *Sauromys petrophilus erongensis* (Molossidae) der Namibwüste.

On the central Kuiseb in the southem Namib insectivorous bats are to be found at an important density. The following species could be approved: *Eptesicus hottentotus pallidior (Vespertilionidae), Eptesicus zuluensis vansoni (Vespertilionidae), Sauromys petrophilus erongensis (Molossidae)* and *Nycteris thebaica damarensis (Nycteridae)*.

Under the extreme climatic conditions the microchiroptera find prey enough, at least during the summer months, because this dry river-bed with its trees that partially are compact like a forest, offers favourable conditions of development to insects (above all to *Coleoptera, Lepidoptera* and *Hymenoptera*). It is being examined in which way these desert bats provide for their need of water in a region where we hardly find open water places during a large period of year. Feeding experiments have shown that *Eptesicus zuluensis vansoni* and *Sauromys petrophilus erongensis* can do without having water for several months if they find enough insects. During the observation period a female of *E. zuluensis vansoni* gave birth to twins, one young of which was nourished up to the end of the lactation period.

Roer, H. (1971). Zur Lebensweise einiger Microchiropteren der Namibwüste.

Am mittleren Kuiseb in der südlichen Namibwüste kommen insektenfressende Fledermäuse in erheblicher Populationsdichte vor. Es wurden folgende Arten nachgewiesen: *Eptesicus hottentotus pallidior (Vespertilionidae), Eptesicus zuluensis vansoni (Vespertilionidae), Sauromys petrophilus erongensis (Molossidae)* und *Nycteris thebaica damarensis (Nycteridae)*. Wenn diese Microchiropteren unter den dortigen extremen Klimabedingungen zumindest währens der Sommermonate genügend Beutetiere finden, so deshalb, weil dieser Trockenfluß mit seinem teilweise galerieartigen Baumbestand Insekten (vor allem Coleopteren, Lepidopteren und Hymentopterenà günstige Entwicklungsmögelichkeiten bietet. Es wird undersuch, wie diese Wüstenfledermäuse ihren Wasserbedarf in einem Gebiet decken, das während eines großen Teils des Jahres kaum offene Wasserstellen aufweist. Füttungsversuche haben ergeben, dass *Eptesicus zuluensis vansoni* und *Sauromys petrophilus erongensis* mehrere Monate ohne Trinkwasseraufnahme leben können, wenn ihnen genügend Insektennahrung zur Verfügung steht. Ein *zuluensis vansoni*-Weibchen hat während der Versuchszeit Zwillinge geboren, von denen ein Junges bis zum Ausgang der Laktationsperiode ernährt wurde.

On the central Kuiseb in the southem Namib insectivorous bats are to be found at an important density. The following species could be approved: *Eptesicus hottentotus pallidior (Vespertilionidae), Eptesicus zuluensis vansoni (Vespertilionidae), Sauromys petrophilus erongensis (Molossidae)* and *Nycteris thebaica damarensis (Nycteridae)*. Under the extreme climatic conditions the microchiroptera find prey enough, at least during the summer months, because this dry river-bed with its trees that partially are compact like a forest, offers favourable conditions of development to insects (above all to Coleoptera, Lepidoptera and Hymenoptera). It is being examined in which way these desert bats provide for their need of water in a region where we hardly find open water places during a large period of year. Feeding experiments have shown that *Eptesicus zuluensis vansoni* and *Sauromys petrophilus erongensis* can do without having water for several months if they find enough insects. During the observation period a female of *E. zuluensis vansoni* gave birth to twins, one young of which was nourished up to the end of the lactation period.

Rosevear, D. R. (1962). A review of some African species of *Eptesicus* Rafinesque.

The confusion of nomenclature and identity existing amongst early species of *Eptesicus* and its causes are detailed. From the original measurements and other "classic" descriptions, set forth in Table 1, a proper allocation of names is deduced. In Table 2 it is shown that British Museum spirit specimens largely conform to the grouping disclosed in Table 1; but measurement of connected series available in the dried collection, summarized in Table 3, demonstrates a complete bridge between two supposed size groups, and reveals that an apparently homogeneous series is in fact divisible on cranial features as well as length of fur. Probable specific size ranges and the correct names to apply to these are shown in Table 4. *E. capensis* is regarded as a complex species widely spread over the continent, variable in size, colour and perhaps other characters at a subspecific level, possibly more in relation to climate than locality; but material at present available is insufficient to serve as a proper foundation for any permanently useful subdivision. Synonymy is indicated. Characters which now appear to separate *somalicus* from *capensis* may in time be shown not to be specific. *E. pusillus* may possibly not exist. The value of diagnostic characters used in *Eptesicus* and colour variation are both discussed.

La confusion qui règne dans la nomenclature et la systématique des especes anciennement decrites du genre *Eptesicus* et ses causes sont exposées. D'après les mensurations originales et les descriptions "classiques", resumées dans le Tableau 1, une synonymie est proposée. Dans le tableau 2, il est montré que les spécimens conservés en alcool au British Museum sont conformes en tous points au groupement systématique du Tableau 1; mais la mensuration d'une série correspondante de la collection de peaux, résumée dans le Tableau 3, traduit une série continue entre deux groupés supposés séparables par leur tail le. Il révèle, de plus, qu'une série apparemment homogène est, au fait, divisible par des caractères craniologiques ainsi que par la longueur du pelage. Les limites de variation probables des espèces et les noms applicables à celles-ci sont indiqués dans le Tableau 4. On peut considérer *E. capensis* comme une espèce polymorphe, répandue sur tout le continent, variable en taille, en coloration, et aussi quant à ses autres caractères, permettant de distinguer des sous-espèces peut-être plus en rapport avec le climat qu'avec la répartition géographique; mais le matériel disponible ne suffit pas a subdiviser l'espèce d'une manière utile. La synonymie est indiquée. Les caractères qui paraissent actuellement permettre de separer *somalicus* de *capensis* pourraient se révéler un jour ne pas être spécifiques. *E. pusillus* n'est peut-être pas valable. La valeur des caractères de diagnostic utilisés dans le genre *Eptesicus* et les variations de couleur sont discutées d'une manière critique.

Rosin, G., I. Landau and J.-P. Hugot (1978). Considérations sur le genre *Nycteria* (Haemoproteidae) parasite de Microchiroptères africains avec description de quatre espèces nouvelles.

Cinq espèces de *Nycteria* ont été étudiées en Afrique centrale (Gabon et Congo-Brazzaville). Elles se répartissent en 2 groupes distincts: les parasited de *Nycteris* ayant de gamétocytes "en cocarde": *N. medusiformis, N. houinin* n. sp. Et *N. erardi* n. sp.: les parasites de *Rhinolophus* qui ont des gamétocytes "diffus": *N. gabonensis* n. sp. Et *N. krampitzi* n. sp.

Les caractères du genre *Nycteria* et sa place parmi les autres Hémosporidies sont analysés.

5 species of *Nycteria* from Central Africa (Gabon and Congo-Brazzaville) were studied. They can be divided into two distinct groups: the parasites of *Nycteris* with gametocytes "en cocarde": *N. medusiformus, N. houini* n. sp. And *N. erardi* n. sp.; the parasites of *Rhinolophus* with gametocytes of the "diffus" type: *N. gabonensis* n. sp. And *N. krampitzi* n. sp.

The characteristics of the genus *Nycteria* and its place amongst the other Haemosporidia are analysed.

Rowe-Rowe, D. T. and P. J. Taylor (1996). Distribution patterns of terrestrial mammals in KwaZulu-Natal.

Distribution patterns, plotted by eighth-degree squares (7.5' x 7.5'), of the 162 mammal species recorded in the province of KwaZulu-Natal, South Africa were examined in relation to the combined factors of vegetation type, climate, and altitude (= bioregions); and in relation to protected areas within the nine bioregions. Highest species richness was recorded in the warmest most heterogeneous (vegetation) bioregions, and lowest in a cool montane region. Species richness was intermediate in relatively homogeneous, predominantly grassland bioregions. Mammalian biodiversity in KwaZulu-Natal is concentrated in the savanna regions in the north-east of the province, although further species-rich areas are found in the north-west and south-west for carnivores, and in the central region for many of the smaller mammals (Insectivora, Chiroptera, Rodentia). Analysis of taxonomic resemblances between bioregions distinguished taxonomically distinct 'savanna' and 'grassland' groups. Taxonomic resemblances between bioregions were generally lowest in bats (i.e. greatest bioregion specificity) and highest in carnivores (i.e. lowest specificity). In total, 92% of the mammal species occur in one or more protected areas. The percentages of species within protected areas in each of the bioregions are generally high (68 - 100%). In four of the bioregions the amount of land occupied by protected areas is adequate (6 - 96%) and protected areas are large, but in the other five bioregions the opposite holds (< 2% protected) and populations within them may not be viable.

Ruedi, M. and R. Arlettaz (1991). Biochemical systematics of the Savi's bat (*Hypsugo savii*) (Chiroptera: Vespertilionidae).

In order to assess the controversial systematic position of the Savi's bat (*Hypsugo savii*), 43 vespertilionid bats belonging to 10 species were analyzed by mean of isozyme electrophoresis. The results were interpreted in two ways: first, we found that the amount of genetic differentiation between *Hypsugo* and the true *Pipistrellus* (D = 0.719) is of the same magnitude as the mean distance which separates the other pipistrelloid genera (D = 0.738). Secondly, the cladogram based on these biochemical results confirms the splitting of these "pipistrelles ", as *Hypsugo* is more closely related to *Vesperitlio* than to any other palearctic genus. The other species analyzed in this study group themselves in a different clade, including *Pipistrellus, Eptesicus* and *Nyctalus* . This phylogenetic interpretation presents a testable hypothesis, which could be confirmed by an analysis or other loci or other allied species.

Rushton, A. R. (1970). Cytotaxonomy and chromosomal evolution of the bats (Mammalia - Chiroptera).

An extensive literature search has compiled diploid chromosome numbers for 110 species of bats. Karyotypes for 87 of these have been reported and are used as the basis for defining tentative cytological relationships within the families Pteropodidae, Rhinopomatidae, Phyllostomatidae, Desmodonlidae, Rhinolophidae, and Vespertilionidae. Before more definitive intrafamilial relationships can be established, karyotypes from more species of the order Chiroptera must be reported.

Une compilation extensive a fourni le nombre diploïde des chromosomes de 110 espèces de Chauves-Souris. A partir de 87 caryotypes connus, on s'est efforcé d'établir les relations cytologiques existant à l'intérieur des familles suivantes: Pteropodidae, Rhtnopomatidae et Vespertilonidae. Pour établir des relations interfamiliales absolument certaines, la connaissance du caryotype de nouvelles espèces est encore nécessaire.

Russo, D. and G. Jones (1999). The social calls of Kuhl's pipistrelles *Pipistrellus kuhlii* (Kuhl, 1819): structure and variation (Chiroptera: Vespertilionidae).

The aim of this study was to describe the structure of social calls produced by Kuhl's pipistrelles *Pipistrellus kuhlii*. Bats foraging around street lamps in the Campania region, Southern Italy, were

recorded. Calls were produced by bats during chases and, similarly to those of *Pipistrellus pipistrellus*, were probably used to repel conspecifics from hunting sites. Calls often had three components, lasted on average 34 ms and contained most energy at about 17 kHz. A positive correlation was found between the frequencies of maximum amplitude of echolocation and social calls. Social calls from two adjacent populations differed in their peak frequencies, and possible hypotheses for this variation are given. The structure of *P. kuhlii* social calls was compared with those of the 45 and 55 kHz *P. pipistrellus* phonic types. Kuhl's pipistrelle calls lasted longer and showed lower values of minimum and peak frequencies. These differences can help to discriminate between field recordings of *P. kuhlii* and *P. pipistrellus* where the two species occur sympatrically.

Ruxton, A. E. (1926). On mammals collected by Captain C.R.S. Pitman, Game Warden, Entebbe, Uganda.

This collection has been made, except where otherwise stated, in the Eastern Trans-Nzoia district, the Cherangani Hills, and on the river Kerio Suk, Kenya Colony, lat. 0° 56' N, 35° 16' E.

The altitudes for all specimens except those with the word "Suk" after the collector's number, are from 6000' to 6400'; thos from the River Kerio Suk, 3500'.

The collection contains a fine series of six skins and five skulls of a new species of oribi from Lake Nakivali, Ankole, Uganda.

Rydell, J. and R. Arlettaz (1994). Low-frequency echolocation enables the bat *Tadarida teniotis* to feed on tympanate insects.

The European free-tailed bat, *Tadarida teniotis*, forages in uncluttered airspace by using intense narrowband echolocation calls with low frequency (11-12 kHz), and feeds on relatively large flying insects, mainly (90 % by volume) of the tympanate orders Lepidoptera and Neuroptera. The use of low-frequency echolocation calls without strong harmonics appears to be a specialization for long-range detection of large, tympanate insects, which are less well represented in the diet of most other aerial-hawking bats. The results provide evidence in support of the allotonic frequency hypothesis, i.e. that use of echolocation calls with frequencies above or below the best hearing of tympanate insects is an adaptation to increase the availability of these insects.

Rydell, J. and D. W. Yalden (1997). The diets of two high-flying bats from Africa.

The diets of two fast-flying, aerial-hawking bats from north-east Africa (Ethiopia) were investigated by means of faecal analysis. *Otomops martiensseni* (Molossidae; c. 35 g body mass), which is remarkably specialized morphologically with very long, narrow wings and large ears, and which uses low frequency echolocation (10 kHz), feeds almost exclusively (97 % by volume) on moths, mostly of large species. The smaller (20 g) *Taphozous perforatus* (Emballonuridae) also has long, narrow wings but short ears and is less morphologically extreme than *Otomops*. It feeds on moths (56 %), but also on many other insect groups such as Isoptera (14 %), Coleoptera (10 %), Orthoptera (8 %), as well as Hemiptera, Neuroptera, Hymenoptera and Diptera. *Otomops martiensseni*, in particular, appears to be a highly specialized moth predator.

Sabatier, M. and S. Legendre (1985). Une faune à rongeurs et chiroptères plio-pléistocènes de Madagascar.

Une faune de vertébrés fossiles, contenant principalement des mammifères, a été découverte dans le Sud-Ouest de Madagascar, près du lac Tsimanampetsotsa. Trois ordres de mammifères sont

représentés: les insectivores Lipotyphla avec une espèce, les chiroptères avec cinq espèces et les rongeurs avec quatre espèces. Un âge pliocène ou pléistocène ancien est proposé pour le gisement.

A fossil vertebrate fauna, containing mainly mammals, was found in southwestern Madagascar, near the lake Tsimanampetsotsa. Three orders of mammals are represented: insectivores Lipotyphla, with one species, Chiroptera, with five species, and rodents, with four species. A Pliocene or early Pleistocene age is proposed for this locality.

Salleh, M. A., E. S. U. Hang, M. A. Rahman and M. T. Abdulla (1999). Isolation of genomic DNA from fruit bats of Kelabit Highlands for DNA archiving and determination of genetic variation.

A total of 40 fruit bats belonging to five species, namely *Cynopterus brachyotis* (34), *Aethalops alecto* (3), *Pipistallus tenius* (1), *Balionycteris maculate* (1) and *Megaerop ecaudatus* (1) were captured from two sites during the expedition to Bario in April 1995. Whole blood and liver tissue samples were taken from freshly killed bats and stored in liquid nitrogen in the field before transferring to a -70º C deep freezer in the laboratory. Genomic DNA was successfully isolated from whole blood samples derived from 13 bats using SDS-lysis followed by phenol-extraction methods. Pure DNA samples were dissolved in tris-EDTA buffer and stored at -20º C for DNA archiving and determination of genetic variations within and between the different species.

Sanborn, C. C. (1936). Descriptions and records of African bats.

This paper contains a complete list of the bats collected by the Straus West African Expedition and descriptions and notes on others collected by the Conover-Everard African and Chicago Daily News Abyssinian Expeditions of Field Museum. The taking of certain forms in French Sudan and Nigeria which were known only from Belgian Congo is of special interest.

I am indebted to Mr. Gerrit S. Miller, Jr., and to Dr. H. E. Anthony for the loan of many specimens

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Sanborn, C. C. (1939). Eight new bats of the genus *Rhinolophus*.

During recent work on a revision of the bats of the genus *Rhinolophus* eight new forms were discovered. These are described here in advance of a complete report, which will appear later.

I wish to thank Mr. M. A. C. Hinton and Mr. T. C. S. Morrison-Scott for their help while I was at the British Museum (Natural History) and for permission to describe two of these new forms. Through the generosity of Dr. H. Boshma and Dr. G. C. A. Junge of the Rijksmuseum van Natuurlijke Historie in Lieden, I am able to describe two others.

This work was done with the aid of a Fellowship from the John Simon Guggenheim Memorial Foundation and with the permission of Field Museum of Natural History, during parts of 1938 and 1939

Sanborn, C. C. (1949b). Bats of the genus *Micronycteris* and its subgenera.

The bats of the genera *Micronycteris, Glyphonycteris*, and *Xenoctenes* were originally placed in the genus *Schizostoma* Gervais 1856. This name was preoccupied by *Schizostoma* Bronn 1835, a genus of Mollusca. *Micronycteris* Gray 1866 is the next available name. The genus *Glyphonycteris* was erected by Thomas in 1893 for three of the species and *Xenoctenes* by Miller in 1907 for one of the species.

The genera *Micronycteris* and *Glyphonycteris* were revised in 1906 by Dr. Knud Andersen (1906, pp. 50-65). His material totaled 59 specimens, and he examined all but three species (*M. microtis, M. hypoleuca*, and *G. brachyotis*). The genus *Glyphonycteris* is not represented in collections in the United States. A photograph of the type skull of *G. sylvestris* is reproduced here (fig. 49). Specimens of bats closely related to these genera have recently been received from the Trinidad Zoological Expedition, 1947, of Chicago Natural History Museum; from Brother Niceforo Maria of Bogota, Colombia; and by loan from the American Museum of Natural History, New York.

When the characters of the three described genera and the characters of the three series of bats from Trinidad, Colombia, and Brazil are tabulated it may be seen that the differences consist of various combinations of characters rather than diagnostic characters that might be regarded as of generic importance. The relationship of these bats may be more clearly indicated by placing them all as subgenera of *Micronycteris*. This will combine the bats of the Subfamily Phyllostominae, in which the tail extends to the middle of the interfemoral membrane and the middle lower premolar (pm_3) is not reduced.

I wish to thank Dr. H. E. Anthony of the American Museum of Natural History, New York, for the loan of very helpful material and for permission to describe a new subgenus and species from the American Museum specimens. Thanks are due also to Brother Niceforo Maria of the Instituto de La Salle, Bogota, Colombia, for the gift of five specimens representing another new subgenus and species.

Sanborn, C. C. (1950). Chiroptera from Dundo, Lunda, North-eastern Angola.

The bats on which this report is based were collected by Dr. A. de Barros Machado in . . . Dundo, Lunda, Northeastern Angola, a region where practically no mammals have been collected. The bat fauna, while largely like that of the Belgian Congo also contains representatives from other areas. There are 18 species represented in the collection of which six are common to both Angola and the Congo; four have been recorded from the Congo but not . . . two from Angola but not the Congo; and six have not been taken in either country. Of the 18 species, 10 are here recorded from Angola for the first time (denoted by an asterisk). Another is described as new.

The collection brings the total number of bats known from Angola to 65, which about equals the number recorded from the Congo. There are now fifteen species that have been taken . . . Angola and the Belgian Congo. Our knowledge of the distribution of African bats has greatly augmented by this material and it is hoped that further collections from the region be made.

Sanborn, C. C. (1953). Notes sur quelques mammifères de l'Afrique équatoriale française.

Une collection d'une centaine de mammifères a été réunie par H. A. BEATTY au cours des années 1951 et 1952 pendant qu'il était occupé à collecter des oiseaux pour le Chicago Natural History Museum au Gabon et dans le Moyen Congo, en l'Afrique Equatoriale Française. Outre de nombreuses espèces communes, déjà mentionnées par MALBRANT et MACLATCHY (1949), la collection contient une nouvelle espèce d'écureuil et quelques autres particulièrement intéressantes.

These notes list seven of the rarer mammals from the Gabon and Moyen Congo and contain the description of a new species of squirrel. *Rhinolophus fumigatus* is recorded for the first time from western Africa; color variations are described and measurements given for *Hipposideros gigas*; and an unusual specimen of *Glauconycteris beatrix* is listed.

Sanborn, C. C. and H. Hoogstraal (1953). Some mammals of Yemen and their ectoparasites.

Late in 1950, His Majesty Imam Ahmad bin Yahya Hamid al-din, King of Yemen, invited Captain J. J. Sapero, M.C., U.S.N., Director of the United States Naval Medical Research Unit, Cairo, Egypt, to send a group of experts to make a brief medical survey of the Yemen for His Majesty's guidance in future

disease control administration. The group, which became known as the United States Naval Medical Mission to the Yemen, was composed of Commander Robert A. Mount, epidemiologist; Lieutenant Commander Kenneth L. Knight, entomologist; Lieutenant Robert E. Kuntz, parasitologist; Mr. Harry Hoogstraal, medical zoologist; Hospital Corpsman Joseph R. Baranski, bacteriological technician; and Abdel Azis Salah Effendi, general technical assistant and interpreter. The specimens collected by the Mission .were sent to Chicago Natural History Museum and were identified by the senior author.

In order to learn as much as possible about parasite-bearing mammals in the short period of six weeks, during which other professional and social duties had to be fulfilled, it was decided to specialize on the common species in or near populated areas. For this reason little or no attempt was made to secure rarities. The work began at Ta'izz, in an area representative of middle altitude flora and fauna, on January 7, 1951, and continued through January 24. The facilities and period for study in the Ta'izz region were the best encountered during the survey, and the collections from this region are probably the most broadly representative of any of those from the three altitudinal areas visited.

On January 25 and 26 the party drove down to the coastal desert lowlands (*Tihama*) and at Hodeida commenced operations which lasted till February 4. Although the Hodeida stay was short, and facilities for work were not equal to those of Ta'izz,the collections obtained in this area well represent the common fauna at this season.

On February 4 the party lest Hodeida by jeep and climbed upward, via Bajil, 'Obal, and Hammam' Ali, through rich lower middle altitude country that we heartily recommend to fture biologists who study the natural history of Yemen. On February 5 the expedition reached Ma'bar, at 7,400 feet elevation, and remained there until February 10. The rather barren Ma'bar plateau furnished some interesting material, and the fertile valleys and hills around it are of evident intereste. Tha last highland station, reached in a few hours' drive from Ma'bar, was at San'a, 7,100 feet elevation, where the party remained till February 19, when it departed by plane. The Ma'bar and San'a collections provide a useful picture of the upland fauna, though field work at San'a was seriously curtailed.

All small mammals,except as otherwise noted, were either shot and placed in a bag to be examined for ectoparasites or were live-trapped and killed as quickly as possible afterwards, so that their parasites could be collected. The party had been erroneously advised not to take firearms to the Yemen and so was unable to collect many of the larger mammals. Thanks to the Crown Prince, Seif el Islam Albadr, the expedition was furnished with a Royal Guard, who provided some game with his gun.

The work in the Yemen was done during the height of the dry season. Hunting, trapping, and parasite infestation would probably be quite different during the rainy season.

For an excellent general account of the Yemen, with emphasis on the biological features, the reader is referred to Hugh Scott's *In the High Yemen* (1942, John Murray, London). The experiences of the U. S. Naval Medical Mission to the Yemen have been presented in the National Geographic Magazine (February, 1952). Geomedical observations made by the mission have been reported by Mount (1953).

Besides the mammals mentioned below, no others were seen except baboons, which were very common around Ta'izz. The party was told that none occurred in the coastal lowlands or in the high mountains around Ma'bar and San'a, and none were seen in these places. Hedgehogs were said to be common in the lowlands where the coastal lowlands meet the foothills, and in the foothills. The African Arabic word for mongoose never elicited a response of recognition. The Yemeni insist that the giraffe and lion exist in their hinterlands. Whether they now do is of course doubtful, but we would not be surprised to learn that the lion and giraffe were there until recent times. One man in San'a insisted that a large,striped *nam'r* ("tiger"') exits in the mountains to the east; he may have seen a picture in a book!

We are indebted to Dr .T. C. S..Morrison~Scott and to Mr. R. W. Hayman of the Mammal Department, British Museum (Natural History), for comparing the types in their care with our specimens of *Meriones* and *Gerbillus* and for advice regarding the identification of the gazelles.

Sanborn, C. C. and H. Hoogstraal (1955). The identification of Egyptian bats.

Means for identifying Egyptian bats in the form of keys to their external characters and to their dentition are provided. The type locality, known distribution in Egypt, and dental, skull, and external features are described for the following bats: *Rousettus a. aegyptiacus, Rhinopoma hardwickei cystops, R. microphyllum, Taphozous p. perforatus, T. (L.) nudiventris, Nycteris t. thebaica, Rhinolophus c. clivosus, R. c. brachygnathus, R. mehelyi, R. hipposideros minimus* (from Sinai, first Egyptian specimens), *Asellia t. tridens, Plecotus auritus christiei, Otonycteris h. hemprichi, (Nycticeius s. schlieffeni), (Eptesicus isabellinus innesi), Pipistrellus k. kuhli, (P. ariel), (P. r. ruppelli); (Barbastella l. leucomelasà, Tadarida teniotis ruppelli*, and *T. a. aegyptica*. All species except those enclosed in parentheses above have been collected in Egypt by the Medical Zoology Department of U.S. Naval Medical Research Unit Number Three (Cairo).

Satunin, K. A. (1905). Neue und wenig bekannte Säugetiere aus dem Kaukasus und aus Transkaspien.

Die Poststation Gudaur der Grusinischen Heerstrasse befindet sich auf dern Südabhang dicht beim Pass Krestovy-Pereval, der hier über das Hauptgebirge führt, und ist ein sehr bequemer Ort zur Erforschung der alpinen Fuana dieses Gebirgs. Dieser Pass liegt in 2431 M. H. und die Station selbst in 2208 M. Um sie herum befinden sich alpine Wiesen, stellenweise jedoch ist der Boden steinig un hier un da treten steile Felsen zu Tage. Etwas weiter unten trifft man auf ausgedehnte Bestände von *Azalea pontica* (= *Rhodo flavum*). Bei Gudaur wurde im Jahre 1900 das interessanteste Tier des Kaukasus gefunden, die einzige im Kaukasus endemische Gattung der Vertebraten repräsentierend - *Prometheomys schaposchnikowi* SATUNIN. Vom Wunsche beseelt dieses originelle Nagetier weiter zu erforschen, reiste ich im Juni 1901 zum Krestovy- und Bursacilj-Pass. Während meines zweitägigen Aufenthalts auf der Station Gudaur erbeutete ich hier, ausser *Prometheomys*, noch folgende Säugetiere: *Crocidura güldenstaedti* PALL., *Putorius boccamela caucasicus* BARR.-HAM., *Mus sylvaticus arianus* BLANF. und *Microtus arvalis* PALL. Nachfragen ergaben, dass hier nich selten auch Wölfe und Füchse vorkommen, auf dem umgebenden Bergen kommen Ture vor *Capra cylindricornis* BLYTH. Direktor A. N. KAZNAKOV vom Kaukasischen Museum hielt sich während einer seiner Exkursionen im Juli 1908 auch in Gudaur einige Tage auf, haupsächlich gerade um Exemplare von *Prometheomys* zu erhalten, von denen bis zu der Zeit nur zwei Stück bekannt waren. Währen dieser Tage nun erbeutete er nicht nur eine ganze Familie dieses Nagers, sondern auch eine andere Tiere un lehrte ausserdem einem Einwohner der Station das Sammeln von kleinen Säugetieren, welcher in der Folge eine bedeutende Anzahl von *Prometheomys* und verschiedene Feldmäuse erbeutete und dem Kaukasischen Museum zuschickte. Auf diese Weise erreicht die Zahl der Arten von Mikromammalia aus Gudaur schon die Ziffer 8 und dieser Ort is daher der einzige Punkt der ganzen alpinen Zone des Kaukasischen Hauptebirgs, dessen mikromammalogische Fauna schon ziemlich genau bekannt ist. Ich führe hier weiter unten die Liste von der von dort bekannten Tiere an.

XIV. Von A.M. Sugurov im Gouvernement Kutais gesammelte Säugetiere.

Was die Säugetiere anbetrifft, so repräsentiert das Gouvernement Kutais in dem allergrössten Teile seines Territoriums buchstäblich eine "Terra incognita", wesswegen auch jede Sammlung uns einen wertvollen Beitrag zur Kenntnis über die Verbreitung der Säugetiere liefert. Die Sammlung A. M. SUGUROVS, Lehrers der Naturwissenschaften am Kutaiser Gymnasium, erhält 8 Arten, von denen besonders interessant, *Vespertilio murinus* L. ist, von dem das Museum bisjetzt keine Exemplare aus dem westlichen Transkaukasien hatte.

XI. Von Satunin und Rostovtsev in Bakuriani 1908 gesammelte Säugetiere.

Währen einer meiner Dienstreisen im Sommer 1908 verbrachte ich einige Tage in Bakuriani (bei Borzom). Ich nutzte dies aus und stellte im Walde verschiedene Fallen auf, wobei ich den Studenten des Kais. Forstinstituts ROSTOVTSEV darum bat auf sie aufsupassen. In freundlichster Weise erfüllte Herr ROSTOVTSEV meine Bitte und sandte mir nach tiflis asse Erbeutete. Ich benutze hier die Gelegenheit ihm meinen herzlichsten Dank auszusprechen.

XVI. Mammalia des Kaukasus un der angrenzenden Länder aus den Sammlungen des Zoologischen Museums der Kaiserl. Akademie der Wissenschaften in St. Petersburg.

Im November 1908 hatte ich die Möglichkeit dank der Frundlichkeit des Direktors des Zoologischen Museums der Kais. Akad. Der Wissenschaften einen Einblick in die Sammlungen des Museums, speziell der *Chiroptera* und *Insectivora* zu tun. Zweck meiner Arbeit war die Durchsicht sämmtlichen Materials vom Kaukasus, welches sich hier befand. Leider war ich durch Krankheit veranfasst mit dieser Arbeit aufzuhören bevor ich mein Ziel erreichen konnte. Aber auch unter dem schon durchmusterten fand sich viel interessantes vor, viele Fundorte diverser Arten, von wo das Kaukasische Museum keine Exempare besitzt. In Anbetracht dessen, dass diese Angaben unsre Kenntnisse der geographischen Verbreitung dieser Arten sehr erweitern, auf die baldige Publikation der Kataloge des Zoologischen Museums aber gar keine Hoffnung ist, entschliesse ich mich dazu meine Resultat hier zu veröffentlichen.

Scaramella, D. (1975). I mammiferi dello Yemen (Y.A.R.) controllati al livello della sottospecie.

L'autore elenca i mammiferi presenti nel territorio della Rep. Araba dello Yemen. Di ciascun esemplare viene trattata la posizione sistematica fino al livello della sottospecie, l'area di distrìbuzione geografica ed altre notizie, in particolare sulla consistenza, e conservazione delle specie.

The author rnakes a list of the mammals wich live in the Y.A.R. He deal with each mammal, giving its position in the sistem up to t he subspecies level through distinctive characrers: together with its geographical distribution, and few notes especially on it possibilitv of surviving

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Schätti, B. (1984). Fledermäuse als Nahrung von Schlangen.

A further record of *Nyctalus leisleri* (Kuhl, 1818) from Afghanistan is verified by a specimen from the stomach of a snake (*Coluber rhodorachis*). A study of the literature on snakes preying on bats makes it clear that chiropterophagy seems not to be uncommon for some populations of various snake species. Most of the observations concern giant snakes and larger climbing colubrid species.

Not only caves with large bat populations attract the interest of potential predators; snakes seem to be equally successful in hunting bat species which live together in small groups and different types of roosting places. Under favorable conditions a snake's diet can largely consist of bats. According to the type of roosting place snakes use various hunting techniques and are even capable of capturing their prey in total darkness.

Schlitter, D. A. and I. R. Aggundey (1986). Systematics of African bats of the genus *Eptesicus* (Mammalia: Vespertilionidae). 1. Taxonomic status of the large serotines of Eastern and southern Africa.

The taxonomic status of large serotine bats (*Eptesicus*) from eastern and southern Africa is studied. *Eptesicus loveni* Granvik, 1924. known from Mt. Elgon, Kenya, by only the holotype, is a junior synonym of *Myotis tricolor* (Temminck, 1832). A new subspecies is proposed for *Eptesicus hottentotus* from Njorowa Gorge, Kenya. *Eptesicus hottentotus pallidior* Shortridge, 1942, from the northwestern Cape Province, South Africa, and Namibia is synonymized wilh the nominate subspecies from the Cape Province.

Schlitter, D. A., I. R. Aggundey, M. B. Qumsiyeh, K. Nelson and R. L. Honeycutt (1986). Taxonomic and distributional notes on bats from Kenya.

Taxonomic and distributional comments are given for six species in three families of bats from Kenya. Two species (Hipposideros camerunensis and Tadarida russata) are reported from Kenya for the first time.

Schlitter, D. A. and A. F. DeBlase (1974). Taxonomy and geographic distribution of *Rhinopoma microphyllum* (Chiroptera: Rhinopomatidae) in Iran, with the description of a new subspecies.

L'étude des collections de *Rhinopoma microphyllum* a permis de préciser l'aire de répartition de cette chauve-souris en Iran et de rendre compte de nombreux nouveaux spécimens provenant de nouvelles localites. Une sous-espèce nouvelle, *R. m. harrisoni* a pu être décrite du sud-ouest de l'Iran où elle se trouve souvent à proximité de *R. m. microphyllum*. Cette dernière a été collectée à des altitudes plus élevées et dans des zones plus froides que *R. m. harrisoni*.

The taxonomy and geographic distribution of *Rhinopoma microphyllum* from Iran are reviewed and numerous new specimens and localities are reported. A new subspecies of *R. microphyllum* is from southwestern Iran and is shown to exist in close proximity to the nominate subspecies.

Schlitter, D. A. and M. J. Delany (1985). Geographic areas of Africa poorly represented in mammal research collections.

Two major areas of Africa are still poorly represented by specimens in mammal research collections. These areas include the Central Sahara and Subsaharan region, especially in western Africa and the western and southern Equatorial forest block. Countries, or parts thereof included, are southern Algeria, Chad, Niger, Mali, Mauritania and the former Spanish Sahara and Gabon, Republic of Congo, western and southern Zaire and Angola, especially the northern part. Additionally, the Horn of Africa, including Somalia, Djibouti, Ethiopia and northern and eastern Kenya are poorly represented. Other smaller areas such as the mountains of southern and eastern Tanzania, the provinces of northern Mozambique, the massifs on either side of the Central African rift and southern Sudan require additional, careful collecting. It is difficult to assess the real situation regarding representatives by each country as much unreported material exists in various museums of the world, particularly in those in North America. Because of financial restraints numerous faunal or regional studies and taxonomic revisions have not included the extant specimens available in African, European and North American museums. Large collections of mammals from West, East and South Africa are present, but unreported in North American Museums.

Schlitter, D. A. and S. B. McLaren (1981). An additional record of *Myonycteris relicta* Bergmans, 1980, from Tanzania (Mammalia: Chiroptera).

A fourth specimen of the East African relict collared fruit bat, *Myonycteris relicta* Bergmans, 1980, is reported. This specimen, from the Nguru Mountains of central Tanzania, supports the contention of a previous connection between East African mountain forests with central African counterparts. External and cranial measurements of the new specimen are compared with other reported *M. relicta* and a sample of *M. torquata*.

Schlitter, D. A., I. L. Rautenbach and D. A. Wolhuter (1980). Karyotypes and morphometrics of two species of *Scotophilus* in South Africa (Mammalia: Vespertilionidae).

Karyotypes for *Scotophilus dinganii* (A. Smith, 1833) and *S. viridis* (Peters, 1852) are presented. Based on retfrence samples from the northern Kruger National Park, individual and secondary sexual variation are analysed for each species. Discriminant function analysis was performed with these reference samples and discriminant scores were computed to assist in accurately identifying specimens of the two species in South Africa.

Schlitter, D. A., L. W. Robbins and S. A. Buchanan (1982). Bats of the Central African Republic (Mammalia: Chiroptera).

The bats of the Central African Republic are reviewed. The occurrence of 45 species is documented, with locality, habitat, reproductive data, and other natural history information given. Taxonomic notes are discussed where necessary and selected measurements are listed for the species. Twenty species are reported for the first time for the Central African Republic.

Schlitter, D. A., S. L. Williams and J. E. Hill (1983). Taxonomic review of Temminck's trident bat, *Aselliscus tricuspidatus* (Temminck, 1834) (Mammalia: Hipposideridae).

Specimens of Ternrninck's trident bat (*Aselliscus tricuspidatus*) from Australasia were analyzed for morphological variation. Univariate and multivariate analyses were used to determine individual secondary sexual, and geographic variation within the species. Individual variation was greater in females than in males although this variation generally was minor in all cases. Females were found to be significantly larger than males in four of seven measurements tested. The analysis of geographic variation revealed that four subspecies can be recognized within the species; two of these are described as new.

Schmidt, U. and G. Joermann (1983). Untersuchungen zur Echoortung um Gruppenflug bei Mausschwanzfledermäusen (*Rhinopoma microphyllum*).

Investigated were the echolocation sounds of *Rhinopoma microphyllum* during single and group flights under laboratory conditions. In a 3-m-flight-tunnel and when flying in a large room exclusively FM-sounds with 5 to 7 harmonics were registered. Each of the 6 experimental animals had an individual frequency range of the harmonics that remained unchanged during group flights. Duration and temporal pattern of the sounds did not alter under these conditions either. The only response to the acoustic activiry of conspecifics consisted in a rise of sound intensity up to 20 dB. A similar reaction was observed when flying in the presence of noise.

Schönenberger, N. and H. C. Lane (1971). Quelques données sur le cordon nerveux digital alaire des Megachiroptères (*Rousettus aegyptiacus* et *Pteropus giganteus*).

Summary

The nerve bundle found between artery and vein on either side of the metacarpals in the bat wing are composed of fascicles. Each fascicle contains myelinated and non myelinated fibres. In these fascicles small capillaries are found.

Between the main nerve bundle and the artery and vein, interstitial tissue (collagen, fibrocytes) small blood vessels and myelinated and non myelinated nerve fibres are found. Some of these nerves react positively to an histochimical test for catecholamine.

Zusammenfassung

Der Hauptnervenstrang zwischen Flügelarterien und -venen von Megachiropteren setzt sich zusammen aus Nervenbündeln, die, neben einigen Blutkapillaren, myelinisierte und unmyelinisierte Nervenfasern enthalten.

Zwischen Hauptnervenstrang und Hauptblutgefässen finden sich neben Bindegewebe (Collagen, Fibrocyten usw.) und feinen Blutgefässen, myelinisierte und nicht myelinisierte Nervenfasern. Ein Teil dieser Fasern reagiert positiv auf histochemische Nachweismethoden fur Catecholamin.

Schutt, W. A. , Jr. and N. B. Simmons (1998). Morphology and homology of the chiropteran calcar, with comments on the phylogenetic relationships of *Archaeopteropus*.

Most researchers have considered the calcar to be a unique and homologous structure within Chiroptera (e.g., the presence of this structure and its associated musculature has been cited as a synapomorphy supporting bat monophyly). However, we report that significant morphological variation exists between Microchiroptera and Megachiroptera. In microchiropterans, a calcified or cartilaginous element articulates directly with the calcaneal tuberosity of the ankle and projects into the uropatagium. In megachiropterans, a cartilaginous structure projects from the tendon of the gastrocnemius muscle into the uropatagium and has no articulation with the calcaneal tuberosity. Considerable variation also exists in the musculature associated with these structures. Phylogenetic interpretation of hindlimb morphology of extant and fossil taxa indicates that the calcar may not be homologous in all bats. We suggest retention of the term "calcar" for the microchiropteran structure and propose a new term, "uropatagial spur," for the megachiropteran structure. The fossil bat *Archaeopteropus transiens* (Oligocene) has long been presumed to be a megachiropteran; however, this form has a microchiropteran-type calcar. Reconsideration of morphological evidence from this and previous studies indicates that *Archaeopteropus* is not a megachiropteran but, rather, a basal member of the microchiropteran lineage.

Schwann, H. (1905). A list of the mammals collected by the Hon. N.C. Rothschild, the Hon. F.R. Henley, and Mr. A.F.R. Wollaston in Egypt and the Soudan in January, February and March 1904.

Several of the species mentioned in this list - notably *Acomys witherbyi, Gerbillus pygargus, Dipodillus watersi, Lepus isabellinus*, and *Hystrix cuvieri* - have not been taken hitherto in so northern a locality, and their range must accordingly be extended.

A few notes supplied by Mr. Rothschild on some of the less-known localities, where specimens were obtained, will be a great assistance in properly understanding their geographical relationships.

Nakheila, where the battle of the Atbara was fought, is about fifty miles up the Atbara River, on the north bank.

Merowe and Kerma are both in the Dongola Province. The former is at the commencement of the fourth cataract, while the latter is the terminus of the railway from Wady Halfa to the Dongola Province.

Shereik is a railway station at the little-known Abu Haschim cataract, some fifty miles south of Abu Hammed.

Schwann, H. (1906). A list of the mammals obtained by Messrs. R.B. Woosnam and R.E. Dent in Bechuanaland.

This very interesting collection, made by Messrs. R. B. .Woosname and R. E. Dent in Bechuanaland, was obtained chiefly at two localities, viz. Kuruman and Molopo. The former is situated about 100 miles south-west of Vryburg on the Kuruman River, whose course flows parallel to the range of hills

bearing the same name. The river was originally fringed with dense reeds, providing excellent shelter for game of all kinds; but in some parts clearings have bene made by the natives, and the ground drained and cultivated with corn and fruit-trees.

The Molopo River, lying considerably to the north of Kuruman, is dry most of the year, but in the rainy season may be as much as 16 feet deep. The water remains in stagnant pools till about mid-August, when it is gradually evaporated, leaving the river-bed dry until next year. The country surrounding the river is covered with dense camel-thorn forest and patches of soft sand.

The particular interest of this collection lies in its providing the British Museum with many valuable topotypes of Dr. Smith's now well-worn and rather faded specimens. His main collections, described in the 'Illustrated Zoology of South Africa,' were made at Kuruman and Old Latakoo, lying in S. lat. 27°, E. long. 24°, a place not marked on modern maps, but in his day of considerable importance. As was to be expected, the prevailing colour of the specimens is sandy and considerably lighter than that of animals inhabiting well-wooded areas. Among the species now described for the first time may be mentioned *Crocidura deserti*, a pale-coloured Shrew, probably a desert form of Sundevall's *argentata*, and *Mus woosnami*, a striking species both in colour and tooth-structure.

Setzer, H. W. (1952). Notes on mammals from the Nile Delta Region of Egypt.

From July 12, 1946, to April 9, 1947, Ens. P. Quentin Tomich collected mammals from the Nile Delta while serving with Naval Medical Research Unit No. 3. In addition to the large collection made by Ensign Tomich, Lt. S.M. Wheeler, of the United States Typhus Commission, obtained some specimens in the Cairo area. Earlier, in 1924, Miss Annie M. Alexander obtained a small collection from the Cairo area and from the Fayum. The former two collections are on deposit in the United States National Museum while the latter is on deposit at the Museum of Vertebrate Zoology of the University of California (MVZ) and has been made available for study at this time by Dr. Alden H. Miller.

Since impetus is being given study of the role wild mammals play in diseases of man, a brief diagnosis of the external characters plus comments on taxonomic problems as relating to the commoner mammals from Egypt, as based on the above-metioned material, will be useful to epidemiologists working in the Nile Delta region.

It will be noted that in certain cases names have been validated from Etienne Geoffroy St.-Hilaire, 1803. The "Catalogue des Mammifères du Muséum National d'Histoire Naturelle" meets all requirements for Linnaean names as established by the International Commission on Zoological Nomenclature. In all instances the descriptions are clearly recognizable. It is believed that the statement of Isidore Geoffroy St.-Hilaire, to the effect that his father never intended to above work for a scientific treatise, should not be accepted, inasmuch as the work is clear, concise, and was published and circulated.

The Tomich collection is perhaps the largest and most complete single collection known from the Nile Delta region. Even so, several species that have occurred and presumably still occur in that region were not taken by the collectors on whose work this paper is based. For the sake of completeness, references to these have been extracted from the literature.

In addition there are four species which have been taken from the Delta region within historic time but have since been extirpated. They are: Wild sheep, *Ammotragus lervia*; dorcas gazelle, *Gazella dorcas*; saberhorned oryx, *Oryx algazel*; and addax, *Addax nasomaculata*.

Capitalized color terms are from Ridgway, "Color Standards and Color Nomenclature" (1912). All measurements are given in millimeters and all weight in grams.

No comments have been made in regard to habitats or habitat preference, since Tomich hopes to publish an account of the natural history of these animals and their role in epidemiology.

Setzer, H. W. (1971). New bats of the genus *Laephotis* from Africa (Mammalia: Chiroptera).

The Smithsonian Institution African Mammal Project has had field parties collecting small mammals and their ectoparasites in southern Africa since 1963.

These field teams obtained two specimens of the genus *Laephotis* from South West Africa and one specimen from northwestern Botswana. None of these individuals agree with other known taxa in the genus *Laephotis*. We have made repeated efforts to obtain additional specimens, especially from South West Africa, but have been unsuccessful. All measurements are in millimeters and capitalized color terms are from Ridgway "Color Standards and Color Nomenclature, 1912."

Owing to the degree of distinctness of these specimens two new taxa are here proposed and may be known as:

Sheil, D. (1992). Tanzanian coastal forests - unique, threatened, and overlooked.

Tanzania's remaining fragments of coastal forests support rich biological communities, but these are extremely vulnerable to exploitation and land-use pressures because of their very limited size. Until recently little attention has been paid to these areas and and it is probable that all the most important forest areas have not yet even been recognized. Conservation measures are needed urgently and while these have been incorporated into the Tanzanian Forestry Action Plan, funding has not been identified.

Shepherd, R. C. and M. C. Williams (1964). Studies on viruses in East African bats (Chiroptera) I. Haemagglutination inhibition and circulation of arboviruses.

Serum samples from 172 bats captured in 5 locations in Uganda were examined for antibodies to a number of arboviruses in the haemagglutinationinhibition test. Group A antibodies were found in 5 sera, Bunyamwera in 1, and group B in 108. The low incidence of group B virus isolations in mosquitoes in Uganda suggests that transmission of these viruses may be effected by other vectors or directly from bat to bat. Details of the species of bat examined and the arboviruses used in the tests are presented in 2 tables.

Shope, R. E., F. A. Murphy, A. K. Harrison, O. R. Causey, G. E. Kemp, D. I. H. Simpson and D. L. Moore (1970). Two African viruses serologically and morphologically related to rabies virus.

Lagos bat virus and an isolate from shrews (IbAn 27377), both from Nigeria, were found to be bullet-shaped and to mature intracytoplasmically in association with a distinct matrix. They were related to, but readily distinguishable from, rabies virus and each other by complement fixation and neutralization tests. The three viruses, including rabies, form a subgrouping within the rhabdoviruses.

Shortridge, G. C. (1942). 2. Field notes on the first and second expeditions of the Cape Museum's Mammal Survey of the Cape Province; and descriptions of some new subgenera and subspecies.

Expedition No. 1: Little Namaqualand (October 1936 - February 1937)

On a collection of approximately 2500 mammals from Little Namaqualand, including records of species collection between Upingon and the Aughrabies Falls in 1921.

LITTLE NAMAQUALAND is here regarded as comprrsmg the region lying between the Orange River in the north, latitude 31° in the south, longitude 19° in the east, and the Atlantic Ocean on the west. It is the

most, arid part of the Cape Province. The yearly winfall at Springbok averages 7 inches, and at Port Nolloth 2 1/2 inches.

Except on the Kamiesberg there is practically no surface water. The mountains and plateaux known as the Kamiesbergen, which rise to over 5000 feet, (Welkom Kop, 5589 feet; Eselkop, 5456 feet), attract a much more adequate rainfall and have a contrastingly temperate climate. In consequence the vegetation on the higher slopes and plateaux is relatively luxuriant.

The Kamiesberg, frequeutly under cloud, forms a fertile oasis, and the mountain scenery between Garies and Leliefontein is very beautiful. Elsewhere the general aspect of Little Namaqualand during the greater part of the year is barren in the extreme: the sandy plains are sparsely clothed with dwarf desert plants, many of which are succulents. Apart from a narrow fringe along the Orange River, there are no trees of any description.

Between September and October, however, after the first light spring rains, Namaqualand changes, almost overnight, into one of the world's most magic gardens; the plains and hillsides for the short period of about six weeks become brilliantly carpeted with wild flowers, innumerable in variety and colours. On the Kamiesberg the flowering season continues until about the middle of December. Except in the extreme south, along the eastern border, and close to the coast, there are almost everywhere masses of outcrop, stony kopjes and rocky mountain ranges. Camps were made at the following places: -

1. *Witwater*: altitude: 3500 - 3800 feet, a plateau high up in the Kamiesberg almost entirely surrounded by stony hills. There are a few farms, and small plots under cultivation.

2. *Eselfontein*: altitude 4300 - 4350 feet, close to Leliefontein Hottentot Mission, the highest plateau on the Kamiesberg.

These plateaux are watered by small perennial mountain streams which disappear underground before reaching the plains. The vegetation on the higher slopes is heathy and not unlike that on the mountains of the south-western Cape. Light crops ofwheat are grown; goats and a few cattle and sheep are kept.

3. *Platbakkies*: altitude 3460 feet, about, 20 miles east of the Kamiesberg. Arid high-karooveld with occasional rocky ridges and rough stony tracts. Country quite typical of "Bushmanland."

4. *Goodhouse*: altitude: 300 feet approx., on the south bank of the lower Orange River at Raman's Drift. At this point the Orange River flows between almost unbroken chains of highly mineralized hills which rise from 500 - 1200 feet. All level country consists of heavy white sand. For the greater part of the year hardly a trace of vegetation is visible, except along the river's edge where there is a thin fringe of tree growth. In contrast to these desert surroundings is the intensely green citrus Estate of Goodhouse, irrigated by a system of canals which lead off from the river (owner, Mr. C. Weidner).

5. *Eenriet*: altitude 3300 feet approx., 7 miles north of Steinkopf. A waterhole close to rocky hills which rise between 500 and 800 feet above the surrounding level. Beyond the hills there are wide stretches of sandveld scantily clothed with low karoo scrub and intersected here and there by dry watercourses.

6. *Port Nolloth*: A camp (altitude 50 fieet approx.) was made about 15 miles inland where the white coastal sand-dune belt meets the firmer reddish-sandy country and near the first broken line of wind-swept hills which rise to about 600 feet.

7. *Kameelboom*: altitude 800 feet approx., in the bd of the dry Spoeg River, about half-way between Garies and Hondeklip Bay. Surrounding hills rise to about 1000 feet. Red and white sandy country much broken up by rocky outcrop. Vegetation largely succulent; shrubby bushed amongst the rocks and between the hills.

During the British and Kaffrarian Museuma' Expedition to the middle Orange River in 1921, collections were made close to *Upington, Swartkop, Louisvale*, and the *Aughrabies Falls*, The Upiugton and Aughrabies camps were on the north bank of the Orange River, those near Swartkop and Louisvale on the south bank.

Out of 106 species recorded, 78 were collected; 20 are extinct, or nearly so; 4 are of doubtful occurrence. Names of species in brackets indicate that specimens were not obtained.

Contributors towards the Cape Museums' Mamrnal Survey include The Museum of Comparative Zoology (at. Harvard Uuiversity, United States of America), The South African Museum (Cape Town), The Natal Museum (Pietermaritzburg), The Albany Museum (Grahamstown), The McGregor Museum (Kimberley), The Port Elizabeth Museum, The East London Museum, The Kaffrarian Museum (King William's Town), The National Research Council, and Dr. H. Merensky.

Sidiyène, E. A. and M. Tranier (1990). Données récentes sur les Mammifères de l'Adrar des Iforas (Mali).

The Adrar des Iforas, in Mali, is zoologically a poorly known massif. Located in Southern Sahara, and with sorne 100 mm annual rainfall, it retains some elements of the ethiopian fauna. In 50 years, largest rnammals disappeared almost compterely through the combined effect of drought, gun and car. Only Barbary sheep, *Ammotragus lervia*, common gazelle, *Gazella dorcas*, and striped hyaena, *Hyaena striata*, remain there. Three bat species were recently caught: *Nycteris thebaica* (first record for Mali), *Asellia tridens* (first record for Mali), and *Nycticeius schlieffeni*. Three rodents species, too, were hand-caught: the Southern gundi *Massoutiera mzabi* (first recorded in Mali, where it was expectce, as it is known from nearby Hoggar), the Small sand gerbil, *Gerbillus gerbillus*, and the Nile rat, *Arvicanthis* sp, (northernmost capture in Mali for this genus).

Le massif de l'Adrar de, Iforas, au Mali, est zoologiquement peu connu. Situé au sud du Sahara, il retient quelques éléments de la faune éthiopienne, avec une pluviosité annuelle oscillant autour de 100 mm. La grande faune mammalienne a pratiquement disparu en 50 ans, victime de la sécheresse et de l'association du fusil et de l'auromobile; il ne subsiste que le mouflon, *Ammotragus lervia*, et la gazelle, *Gazelta dorcas*, parmi les Ongulés; la hyène rayée est le plus gros des Carnivores qui subsistent. Parmi les Chiroptères, les auteurs signalent la capture de *Nycteris thebaica* (première mention au Mali), d'*Asellia tridens* (première mention au Mali), et de *Nycticeius schlieffeni*. Parmi les Rongeurs, le goundi *Massoutiera mzabi* a été collecté pour la première fois au Mali; la présence de cet animal, connu au Hoggar proche, était attendue dans l'Adrar. *Gerbillus gerbillus* a été capturé également, ainsi qu'*Arvicanthis* sp.; un individu de ce dernier genre a été capture dans un oued: c'est la capture la plus septentrionale connue au Mali pour ce genre.

Simmons, J. A., S. A. Kick and B. D. Lawrence (1984). Echolocation and hearing in the mouse-tailed bat, *Rhinopoma hardwickei*: acousting evolution of echolocation in bats.

1. Mouse-tailed bats (*Rhinopoma hardwickei*) use short-duration, multiple-harmonic, constant-frequency (CF) or slightly frequency-modulated (FM) signals for echolocation of flying insect prey. The frequency components are 18 - 20 kHz (first harmonic), 36 - 40 kHz (second harmonic), 56 - 60kHz (third harmonic), and 75 - 80 kHz (fourth harmonic). The second harmonic is the strongest component, with the third harmonic 2 to 10 dB weaker, and the first and fourth harmonics about 10 to 20 dB weaker than the second.

2. The bat's hearing, as indicated by N 4 auditory evoked potentials, is moderately sharply tuned to the second harmonic, broadly sensitive to the first harmonic and to lower frequencies, and moderately sensitive to the third and fourth harmonics. The degree of tuning is sufficient to indicate some specialized function for the second harmonic, perhaps in the task of detecting targets at maximum range, since this is the lowest of the strong harmonics and least affected by atmospheric attenuation. These bats probably do not perform the Doppler compensation response even though their hearing is tuned.

3. The pattern of emission of sonar sounds (repetition rate, duration) during interception of prey is similar to that observed in most other species of bats. The signals are emitted at repetition rates of 10 - 20/s during the search stage, 20 - 40/s during the approach stage, and about 100/s during the terminal

stage of the pursuit process. The sonar sounds emitted during the search stage are 6 - 10 ms long, during the approach stage they are 2 - 4 ms long, and during the terminal stage they are less than 1 ms long.

4. The principal acoustic dimension of echolocation sounds that relates to perception of targets is signal bandwidth, which *Rhinopoma hardwickei* manipulates throughout the pursuit process by shortening the duration of its sonar sounds and also by slightly broadening the FM sweeps in its terminal-stage sounds. The onset-time of the long, search-stage sounds and the longer, early approach-stage sounds is more abrupt than for the shorter, late approach-stage and the short terminal-stage sounds. This apparently deliberate transient beginning broadens the signal's bandwidth at the onset relative to the narrower bandwidth prevailing for the rest of the CF harmonic structure which follows. In the shorter sounds, which are emitted during the late approach stage and terminal stage, the onset is more gradual, but the duration (the envelope) and the offset-time are now short enough that the bandwidth of the signal as a whole is increased. The bandwidth is manipulated primarily by these changes in signal envelope and secondarily by the increased FM sweep-width in the terminal stage.

5. Except for duration these signals are relatively inflexible and suggestive of a primitive kind of echolocation in which only one dimension is changed to achieve qualities which most other species of bats obtain by changing a variety of signal dimensions simultaneously. The abrupt signal onsets may be an indication that multiple-harmonic CF and FM echolocation sounds evolved from click-like echolocation sounds of the type emitted by *Rousettus* and some terrestrial mammals.

Simmons, N. B. (1994). The case for Chiropteran Monophyly.

The current controversy concerning bat monophyly centers on relationships of Microchiroptera, Megachiroptera, Primates, and several other groups of mammals. Despite claims to the contrary, studies of both molecular and morphological data strongly support bat monophyly and a single origin for powered flight in mammals. Analyses of some molecular data sets have yielded inconclusive results (e.g., rDNA restriction sites, aA-crystallin amino acid sequences, and cytochrome oxidase subunit I gene nucleotide sequences). However, analyses of most biochemical and molecular data support monophyly of bats (e.g., albumin immunological distances, DNA-DNA hybridization, a-globin + ß-globin amino acid sequences, nucleotide sequence data from the e-globin gene, interphotoreceptor retinoid binding protein gene, 12S rRNA gene, and cytochrome oxidase subunit II gene). In no instance have molecular data provided unambiguous support for bat diphyly. Morphological data show a slightly different pattern. Neural and penial characters support diphyly of bats, but other data subsets clearly support bat monophyly (e.g., characters of the cranium and postcranial skeleton, vascular system, muscles, and fetal membranes). When all of the morphological data are considered together, the combined data set strongly supports bat monophyly. Over 25 morphological synapomorphies-many of which consist of complex suites of modifications-diagnose the monophyletic order Chiroptera. The fact that these synapomorphies represent many different anatomical systems further strengthens the case for chiropteran monophyly.

Simmons, N. B. (1998). A reappraisal of interfamilial relationships of bats.

Higher-level relationships of bats remain poorly understood despite recent advances in our understanding of relationships at lower taxonomic levels. Although most bat species can be assigned easily to one of several monophyletic families, there is little agreement concerning relationships among the latter taxa. This is not just a problem of resolution: Previous hypotheses of interfamilial relationships are largely incongruent. Lack of a well-substantiated phylogeny has hampered systematic studies at lower taxonomic levels, hindered attempts to understand patterns of morphological, karyotypic, and molecular change, and complicated interpretation of biogeographic and ecological data. In this context, the purpose of the current study is to provide a working hypothesis of interfamilial relationships of bats based upon a "total-evidence" analysis of available morphological and molecular data.

Simmons, N. B. and J. H. Geisler (1998). Phylogenetic relationships of *Icaronycteris*, *Archaeonycteris*, *Hassianycteris*, and *Palaeochiropteryx* to extant bat lineages, with comments on the evolution of echolocation and foraging strategies in Microchiroptera.

The Eocene fossil record of bats (Chiroptera) includes four genera known from relatively complete skeletons: *Icaronycteris, Archaeonycteris, Hassianycteris*, and *Palaeochiropteryx*. Phylogenetic relationships of these taxa to each other and to extant lineages of bats were investigated in a parsimony analysis of 195 morphological characters, 12 rDNA restriction site characters, and one character based on the number of R-1 tandem repeats in the mtDNA d-loop region. Results indicate that *Icaronycteris, Archaeonycteris, Hassianycteris*, and *Palaeochiropteryx* represent a series of consecutive sister-taxa to extant microchiropteran bats. This conclusion stands in contrast to previous suggestions that these fossil forms represent either a primitive grade ancestral to both Megachiroptera and Microchiroptera (e.g., Eochiroptera) or a separate clade within Microchiroptera (e.g., Palaeochiropterygoidea). A new higher-level classification is proposed to better reflect hypothesized relationships among Eocene fossil bats and extant taxa. Critical features of this classification include restriction of Microchiroptera to the smallest clade that includes all extant bats that use sophisticated echolocation (Emballonuridae + Yinochiroptera + Yangochiroptera), and formal recognition of two more inclusive clades that encompass Microchiroptera plus the four fossil genera.

Comparisons of results of separate phylogenetic analyses including and subsequently excluding the fossil taxa indicate that inclusion of the fossils changes the results in two ways: (1) altering perceived relationships among extant forms at a few poorly supported nodes; and (2) reducing perceived support for some nodes near the base of the tree. Inclusion of the fossils affects some character polarities (hence slightly changing tree topology), and also changes the levels at which transformations appear to apply (hence altering perceived support for some clades). Results of an additional phylogenetic analysis in which soft-tissue and molecular characters were excluded from consideration indicate that these characters are critical for determination of relationships among extant lineages.

Our phylogeny provides a basis for evaluating previous hypotheses on the evolution of flight, echolocation, and foraging strategies. We propose that flight evolved before echolocation, and that the first bats used vision for orientation in their arboreal/aerial environment. The evolution of flight was followed by the origin of low-duty-cycle laryngeal echolocation in early members of the microchiropteran lineage. This system was most likely simple at first, permitting orientation and obstacle detection but not detection or tracking of airborne prey. Owing to the mechanical coupling of ventilation and flight, the energy costs of echolocation to flying bats were relatively low. In contrast, the benefits of aerial insectivory were substantial, and a more sophisticated low-duty-cycle echolocation system capable of detecting, tracking, and assessing airborne prey subsequently evolved rapidly. The need for an increasingly derived auditory system, together with limits on body size imposed by the mechanics of flight, echolocation, and prey capture, may have resulted in reduction and simplification of the visual system as echolocation became increasingly important. Our analysis confirms previous suggestions that *Icaronycteris, Archaeonycteris, Hassianycteris*, and *Palaeochiropteryx* used echolocation. Foraging strategies of these forms were reconstructed based on postcranial osteology and wing form, cochlear size, and stomach contents. In the context of our phylogeny, we suggest that foraging behavior in the microchiropteran lineage evolved in a series of steps: (1) gleaning food objects during short flights from a perch using vision for orientation and obstacle detection; prey detection by passive means, including vision and/or listening for prey-generated sounds (no known examples in fossil record); (2) gleaning stationary prey from a perch using echolocation and vision for orientation and obstacle detection; prey detection by passive means (*Icaronycteris, Archaeonycteris*); (3) perch hunting for both stationary and flying prey using echolocation and vision for orientation and obstacle detection; prey detection and tracking using echolocation for flying prey and passive means for stationary prey (no known example, although *Icaronycteris* and/or *Archaeonycteris* may have done this at times); (4) combined perch hunting and continuous aerial hawking using echolocation and vision for orientation and obstacle detection; prey detection and tracking using echolocation for flying prey and passive means for stationary prey; calcar-supported uropatagium used for prey capture (common ancestor of *Hassianycteris* and *Palaeochiropteryx*; retained in *Palaeochiropteryx*); (5) exclusive reliance on continuous aerial hawking using echolocation and vision for orientation and obstacle detection; prey detection and tracking using echolocation (*Hassianycteris*; common ancestor of Microchiroptera). The transition to using echolocation to detect and track prey would have been difficult in cluttered envionments owing to

interference produced by multiple returning echoes. We therefore propose that this transition occurred in bats that foraged in forest gaps and along the edges of lakes and rivers in situations where potential perch sites were adjacent to relatively clutter-free open spaces. Aerial hawking using echolocation to detect, track, and evalute prey was apparently the primitive foraging strategy for Microchiroptera. This implies that gleaning, passive prey detection, and perch hunting among extant microchiropterans are secondarily derived specializations rather than retentions of primitive habits. Each of these habits has apparently evolved multiple times.

The evolution of continuous aerial hawking may have been the "key innovation" responsible for the burst of diversification in microchiropteran bats that occurred during the Eocene. Fossils referable to six major extant lineages are known from Middle-Late Eocene deposits, and reconstruction of ghost lineages leads to the conclusion that at least seven more extant lineages were minimally present by the end of the Eocene.

Simpson, D. I. H., M. C. Williams, J. P. O'Sullivan, J. C. Cunningham and F. A. Mutere (1968). Studies on arboviruses and bats (Chiroptera) in East Africa. II. Isolation and haemagglutination-inhibition studies on bats collected in Kenya and throughout Uganda.

Three previous papers have dealt with arbovirus haemagglutination-inhibition studies on sera from a variety of East African bats, with virus isolation studies from various bat tissues and also with the experimental infection of four bat species with arboviruses of African origin (Shepherd and Williams, 1964; Williams, *et al.*, 1964; Simpson and O'Sullivan, 1968). Transmission attempts with Bukalasa bat and Entebbe bat viruses, both isolated from salivary glands of *Tadarida* spp., in *Aedes (Stegomyia) aegypti* (Linnaeus) were also reported. The mechanisms of transmission of these bat viruses and the role that bats play in the epidemiology of arbovirus diseases have been discussed. Comparisons were made with the results of workers in West Africa and in the New World.

This communication reports further isolations of Group B viruses from *Tadarida* species collected throughout Uganda and also reports further haemagglutination-inhibition (III) studies on a large variety of bats collected in Kenya and Uganda over a 12-month period.

1. The isolation is described of 20 strains of group B viruses from the salivary glands of *Tadarida* species. The strains were either Bukalasa or Dakar bat viruses, according to the species of bat from which they were isolated.

2. The group B antibody results in both *Tadarida* species and in a wide variety of other bat species are compared with previous results described by other workers.

3. Mechanisms of virus transmission from bat to bat are discussed; it is thought that mosquitoes play little part in the cycle of infection.

Smith, S. A., J. W. Bickham and D. A. Schlitter (1986). Karyotypes of eleven species of Molossid bats from Africa (Mammalia: Chiroptera).

Standard karyotypic data are reported for 11 species of rnolossid bats collected from Somalia and Cameroun, Africa. Chromosomal data are reported for the first time for *Chaerephon ansorgei, C. aloysiisabaudiae, Mops midas, M. spurrelli, M. thersites, M. brachypterus, M. petersoni, M. demonstrator*, and *M. annulus* (all were formerly members of the genus *Tadarida*). Karyotypes for two of the species we examined have been reported previously. Although our data corroborate the karyotype of *C. pumila* described by Dulic and Mutere (1973), our karyotypic analysis of *M. condylurus* differs substantially from that presented by these authors. In addition to these data, we provide a summary of the available karyotypic data for molossid bats studied to date.

Smithers, R. H. N. and V. J. Wilson (1979). Checklist and atlas of the mammals of Zimbabwe Rhodesia.

Until the publication of Roberts (1951) "*The Mammals of South Africa*", which included Rhodesia as part of the South African Subregion, with its northern limits at the Cunene - Zambezi Rivers, no attempt had been made to present a list of the species of mammals known to occur in Rhodesia.

In spite of the fact that the material available to Roberts from this territory was sparse, he was able, nevertheless, to include in this work some 109 species, as against the 190 known to occur at the present time.

Surprising omissions included such species as the antbear, *Orycteropus afer*, and the erroneous inclusion of others such as the silver fox, *Vulpes chama*. The omissions and erroneous inclusions were due to the fact that very little had been published on the mammals of Rhodesia and Roberts' personal experience of the territory was limited.

In spite of this, Roberts' work was a major factor in stimulating interest in the mammals of southern Africa and, together with an awakening interest in the future of its wildlife, led to a greatly increased and growing volume of regional study in most of the countries comprising the area, including Rhodesia.

Historically, the accounts of a number of early hunters and explorers throw interesting lights on the status of mammals in the territory.

Thomas Baines' diaries of 1869 - 1870 (Wallis, 1946), contain many interesting references, including drawings, with measurements in some cases, of mammals shot or observed by him during his wanderings.

The famous hunter F. C. Selous contributed substantial collections of mammals and accurate observational data from what is now Rhodesia. The great majority of the specimens he collected are housed in the collection of the British Museum (Nat. Hist.) in London and were catalogued by Dollman (1921), although many found their way into other Museums, including the South African Museum in Cape Town, as well as private collections.

Selous visited the western part of Rhodesia (Matabeleland) for the first time in 1872 in the search for elephant, although it was not till 1881 that, on a return expedition to the territory, he seriously devoted himself to the procuring of specimens of Rhodesian mammals for Museums and private collectors.

His interest in the territory continued over the years and in 1891 he was a member of the pioneer column which set up camp in what is today Salisbury.

In 1895 he settled temporarily on his farm in Essexvale where he pursued his interest in wildlife, collecting and sending back to the British Museum (Nat. Hist.) many smaller specimens, including a new species of spiny mouse, *Acomys selousi (A. spinosissimus)*, and a gerbil, *Tatera lobengulae (T. leucogaster)*. (de Winton, 1896; Dollman, 1921; Selous, 1908).

W. H. Brown, an American citizen, then a collector for the Smithsonian Institution, Washington, D.C., was also a member of the pioneer column and, on its arrival in Mashonaland, was detailed off to find meat for the camp. With the true instinct of a collector he recovered skins and skulls of the game animals he shot from the vicinity of what is today Salisbury, which have happily been preserved in collections of Museums in the United States, including the United States National Museum, Washington, D.C.; the Carnegie Museum, Pittsburgh, and others. He was granted a farm near Salisbury, Arlington, on which today the Salisbury Airport is situated.

When the pioneer column was disbanded he moved widely in Mashonaland collecting specimens, this collection including square-lipped rhinoceros, *Ceratotherium simum*, which later became extinct in the territory, and other species from areas where they no longer exist, for example, lion, *Panthera leo*, shot adjacent to what are today the suburbs of the City of Salisbury. Brown also made a valuable collection from Arlington, part of which the senior author had the privilege of examining in the Carnegie Museum.

Regrettably, no paper was published on this collection, but a number of his specimens, examined in Pittsburgh, are commented upon in this paper.

J. ffolliott Darling and Mr. (later Sir) Guy A. K. Marshall collected in the Mazoe district in Mashonaland in 1895 while the former was engaged in mining in the area (Thomas, 1895; de Winton, 1896). This collection consisted predominantly of rodents and is now in the British Museum (Nat. Hist.).

From 1907 till 1911, E. C. Chubb of the Rhodesia Museum (later the National Museum), Bulawayo, collected extensively and published papers on his collections and on the collections of this Museum, these being the first papers on material from the territory (Chubb, 1909).

Although a lot of Chubb's specimens found their way into the collection of the British Museum (Nat. Hist.) or the Transvaal Museum, Pretoria, such as were retained in the National Museum formed the nucleus of the research collections as they are today.

In 1908 C. F. M. Swynnerton, then living at Mt. Selinda, Melsetter, collected small mammals for the British Museum (Nat. Hist.), this being the first material available from the Eastern Districts of Rhodesia.

A further stimulus to the study of mammals came with the publication of a reclassification of the mammals of southern Africa by Ellerman, Morrison-Scott & Hayman (1953), the limits of which extended as far north as Angola, Nyasaland (Malawi) and Mocambique and, therefore, like Roberts (1951), included Rhodesia.

Child & Savory (1964), published a paper on the distribution of the larger mammal species occurring. This was based on a questionnaire, widely distributed in the territory, supplemented by their own visual observations, and was the first attempt to define the distribution of a range of 40 of the larger species, all of which were considered to be recognisable with some degree of accuracy by the range of persons to whom the questionnaire was directed.

From 1964 onwards an increasing number of papers on Rhodesian mammals have appeared annually including the results of surveys in two of Rhodesia's National Parks (Wilson, 1969; 1975) and comprehensive works on individual species (e.g, Cumming, 1974).

In spite of the fact that the National Museums of Rhodesia did not have a Keeper of Mammals until 1962, staff members had been active in collecting material from 1947 onwards and had encouraged others to assist in building up the collection. This activity has continued over the years and today the collections number some 45 000 specimens from Rhodesia alone.

It is unfortunate that it was not until 1961 that new systems were introduced at the National Museums of Rhodesia to ensure that the fullest possible data were recorded on each specimen collected. Prior to this, apart from date of collection, sex and locality, nothing was recorded on the habitat in which the specimen was taken, its reproductive status, its behaviour, or its food.

As a consequence this earlier material, while providing valuable taxonomic and distributional data, lacks sufficient information for its proper evaluation from these other points of view. In this paper such information of this type as is presented is gleaned from data available from material handled from 1961 onwards and is, therefore, limited in its scope.

With the continuation of collecting on this basis, it is hoped that, in time, it will be possible to present fuller data. In the meantime the emphasis in this work will be on the presentation of a list of species now known to occur, based predominantly on material records, with notes, where appropriate, on their taxonomy and information on their distribution. In addition, from the meagre data presently at our disposal, we have added notes on the types of habitat in which the species occur, their habits, food and times of breeding.

We hope that by the presentation of these data in the present incomplete form we may actuate others to fill in the many gaps in the knowledge of our mammals.

Sowler, S. G. (1980). Tooth eruption in known age specimens of *Epomophorus wahlbergi*.

Descriptions of the deciduous and permanent dentition, dental development and variations in ages of eruption in 14 known age specimens of *Epomophorus wahlbergi* are presented. Tables showing the relationship between tooth eruption and age from birth to 14 weeks are given and the use of these as an age determination technique is discussed.

Beskrywings word gegee van melk- en permanente tande, dentale ontwikkeling en wisseling in ouderdomme van deurbraak van 14 eksemplare van *Epomophorus wahlbergi* waarvan die ouderdom bekend is. Tabelle wat die verhouding aantoon tussen die deurbraak van die tand en ouderdom vanaf geboorte tot 14 weke word aangegee en die gebruik hiervan as 'n tegniek om ouderdom vas te stel, word bespreek.

Speakman, J. R. and P. I. Webb (1993). Taxonomy, status and distribution of the Azorean bat (*Nyctalus azoreum*).

The taxonomic status of the Azorean bat (*Nyctalus azoreum* Thomas 1901) was assessed, by a principal components analysis of measurements of the external morphology of the bat, together with specimens of the closest related *Nyctalus* species from mainland Europe (*Nyctalus leisler*). This analysis confirms the recent suggestion, based on a similar analysis of skull morphology, that the Azorean bat represents a good species, distinguished from *N. leisleri* by its smaller size -forearm lengths for *N. azoreum* in range 35.7 - 42.0 mm (n = 14), compared with 42.0 - 45.8 mm (n = 8) for *N. leisleri*. The status and distribution of the Azorean bat was assessed by a survey conducted in the Islands in September and October 1988. We assessed the presence or absence of bats, in 62 (1' latitude x 1' longitude) plots at the west end of the island of Sao Miguel. The study area covered 6 % of the total land area of the archipelago and contained representative areas of all the major island habitat types. A less intensive survey throughout four other islands, literature review and information from other sources revealed that the bat is probably distributed throughout the entire archipelago, with the possible exception of Flores and Corvo. Bats were active both in the day and at night. At night, bats were mostly active in coastal villages where they were closely associated with street lighting. During the day, most bats were active in the inland areas near to Caldeira lakes. The maximum number of bats observed simultaneously active in the day was six whilst at dusk swarms of up to 55 (± 5) bats were observed together. At night, bats were also active over approximately 1.5 x the area they occupied in the day. By assuming the bat is found throughout the archipelago, and that our study area was representative, we estimated the maximum population to be between 1750 (from daylight activity) and 23,650 (from nocturnal activity). This latter estimate implies a population density throughout the archipelago of around 0.1 bats per hectare.

Spiewak, R., S. G. O. Johansson and B. Wüthrich (1996). Der interessante Falll. Berufsbedingtes Asthma auf Fledermäuse (Chiropteren).

Es wird ein 31-jähriger Patient mit atopischer Konstitution beschrieben, bei dem es infolge heruflicher Exposition mit Fledermäusen zur Asthmaentwicklung kam. Aufgrund der duchgeführten Untersuchungen (Hauttests und RAST mit Fledermausallergenen) konnte eine IgE-abhängige Reaktion bestätigt werden. Da der Patient, als engagierter Wissenschaftler, auf die Kontakte mit Chiropteren nicht verzichten wollte, wurde eine Desensibilisierungstherapie mit Fledermaus-allergenextrakt unternommen. Nach einem Behandelungsjahr verspürte der Patient bei erneuten Chiropteren-Kontakten kein Beschwerden mehr.

We describe a 31 years-old atopic patient, in whom after occupational exposure to Chiroptera bronchial asthma developed. The performed tests (skin test and RAST with bat allergens) confirmed the presence of an IgE-dependent allergic reaction to bat allergens. While the patient, as an engaged scientist, was not able to abandon the contact with Chiroptera, a specifi immunotherapy with bat

allergen extracts was undertaken. After one year of therapy the patient had no more symptoms at contact to the Chiroptera.

Spinage, C. A. (1988). First steps in the ecology of the Bamingui-Bangoran National Park, Central African Republic.

A description is given of the 11,560 km^2 Bamingui-Bangoran National Park situated in the mid-Sudanian phytogeographic domain of the Central African Republic. Attention is drawn to the interest of the ecology of this little-known zone, which lies between north-south and east-west ecotones, of the sahel-tropical forest and oriental region west Africa, respectively. Preliminary collections of plants and small mammals were made. An analysis of the flora and the large mammals observed suggests a predominantly West African affinity. The subspecific endemism shown by the large mammals appears more probably linked to Pleistocene isolation by the Chari-Logone river system, than to a mega Lake Chad as has been postulated elsewhere.

Spitzenberger, F. and K. Bauer (1979). Die Säugetierfauna Zyperns. Teil II: Chiroptera, Lagomorpha, Carnivora und Artiodactyla

Auf Zypern leben 1 Megachiropteren- und 11 Microchiropterenarten (davon erstmals bestätigt: *Myotis blythi, Eptesicus serotinus, Nyctalus noctula*), ferner *Lepus europaeus, Vulpes vulpes* und *Ovis ammon*. Die vom frühen Neolithikum bis in die späte Bronzezeit durch Knochenreste nachgewiesene *Dama mesopotamica* wird als autochthones Säugetier betrachtet. - Die von ANDERSEN 1918 vorgenommene Zuordnung zypriotischer *Rhinolopus hipposideros* zu *midas* wird bestätigt. Die *Myotis blythi*-Population Zyperns entspricht in der Größe *omari*, weicht jedoch in der Schnauzenproportion davon ab. - Eine tiergeographische Analyse der Säugetierfauna Zyperns ergibt ein Überwiegen mediterrano-turkestanischer, bzw. irano-turanischer Elemente und gleicht verblüffend der pflanzengeographischen Analyse durch ZOHARY 1973. Bei vielen Arten lassen sich Verbindungen zum angrenzenden Festland (vorwiegend SE-Anatolien) nachweisen. Die Eigenständigkeit vieler Populationen weist auf relativ lange Isolierungszeit hin. Es wird daraus auf eine natürliche Einwanderung der rezenten Säugetierfauna im (Oberen ?) Pleistozän geschlossen. - Körper- und Schädelmaße von 258 *Rousettus aegyptiacus* werden auf Alters- und Geschlechtsvariabilität untersucht. Die beiden Phasen des bimodalen Fortpflanzungszyklus sind bei der zypriotischen Population in Anpassung an das mediterrane Klima zeitlich so eng zusammengerückt, daß ein ? in der Regel nur an einem Zyklus pro Fortpflanzungsperiode teilnimmt. Superfoetation kommt vor.

The Mammal Fauna of Cyprus, Part II: Chiroptera, Lagomorpha, Carnivora and Artiodactyla

In Cyprus live 1 species of Megachiroptera and 11 species of Microchiroptera (from which confirmed for the first time: *Myotis blythi, Eptesicus serotinus, Nyctalus noctula*) as well as *Lepus europaeus, Vulpes vulpes* and *Ovis ammon*. *Dama mesopotamica*, recorded from the Neolithic to the Bronze Age, is regarded as an autochthonous member of the island fauna. - ANDERSEN's 1918 allocation of the Cyprus *Rhinolophus hipposideros* to *midas* is confirmed. The Cyprus *M. blythi* population matches *Omari* in size, but shows peculiarities in proportion of rostrum. A zoogeographical analysis of the Cyprus mammal fauna shows, that mediterrano-turkestanian and irano-turanian elements predominate and displays close parallelism to the phytogeographical analysis by ZOHARY 1973. In many species relationships to neighbouring mainland-populations (mainly S-Anatolia) can be traced. Morphological peculiarities indicate a more or less complete isolation for a rather long time. It is therefore held, that recent mammals invaded the island through natural land bridges probably in the (Upper ?) Pleistocene. - Age- and sex-variations of skull and body-measurements of 258 *Rousettus aegyptiacus* were investigated. Probably as an adaptation to the mediterranean climate in Cyprus the succession of the two phases of the bimodal reproduction cycle of *R. aegyptiacus* is so quick, that one female usually takes part in only one cycle. Superfetatio does occur.

Stanhope, M. J., J. Czelusniak, J.-S. Si, J. Nickerson and M. Goodman (1992). A molecular perspective on mammalian evolution from the gene encoding interphotoreceptor retinoid binding protein, with convincing evidence for bat monophyly.

The evolutionary relationships of the various orders of placental mammals remain an issue of uncertainty and controversy. Molecular studies of mammalian phylogeny at the DNA level that include more than just a few orders are still relatively meager. Here we report results on mammalian phylogeny deduced from the coding sequence of the single-copy nuclear gene for the interphotoreceptor retinoid binding protein (IRBP). Analysis of 13 species representing eight eutherian orders and one marsupial yielded results that falsify the hypothesis that megachiropteran bats are "flying primates," only convergently resembling microchiropteran bats. Instead, in agreement with more traditional views, as well as those from other recent molecular studies, the results strongly support a monophyletic Chiroptera (micro- and megabats grouped together). The IRBP results also offer some rare molecular support for the Glires concept, in which rodents and lagomorphs form a superordinal grouping. Also in congruence with other recent molecular evidence, IRBP sequences do not support the view of a superorder Archonta that includes Chiroptera along with Dermoptera (flying lemur), Scandentia (tree shrew), and Primates. IRBP was not however, without its shortcomings as a molecular phylogenetic system: high levels of homoplasy, evident in the marsupial outgroup, did not allow us to properly root the tree, and several of the higher level eutherian clades were only weakly supported (e.g., a Carnivora/Chiroptera clade and an Artiodactyla/Carnivora/Chiroptera clade). We suggest that these shortcomings may be diminished as the phylogenetic density of the data set is increased.

Stanley, W. T., J. C. Kerbis Peterhans, R. M. Kityo and L. Davenport (1996). New records of bats for Uganda and Burundi.

The collection of *Myotis welwitschii* and *Pipistrellus kuhlii fuscatus* in Uganda and *Pipistrellus kuhlii fuscatus* from Burundi is reported. These species were previously unknown from these countries. External and skull measurements are presented, as well as descriptions of pelage coloration and collecting locality and comments on distribution of the taxa.

Lors de récentes recherches sur la faune en Ouganda et au Burundi, on a récolté deux espèces de chauves-souris qui n'avaient jamais été signalées dans ces deux pays. On a récolté un spécimen de *Myotis welwitschii* Gray sur le Ruwenzori en Ouganda et des spécimens de *Pipistrellus kuhlii* Kuhl sur le Ruwenzori et sur le mont Elgon, en Ouganda et au Parc National de Kibira, au Burundi. On présente des mesures corporelles et craniennes, ainsi que des descriptions de la couleur du pelage, de l'endroit exact de la récolte et des commentaires sur la distribution des taxons. Le but premier de ces études était de récolter des données de base au sujet de la distribution et l'écologie des oiseaux et des petits mammifères à différentes altitudes dans les aires protégées et les zones avoisinantes. Ces informations sont essentielles pour la conception des plans de gestion des ces régions et pour l'évaluation de l'efficacité des efforts de conservation actuels et futurs.

Stanley, W. T., P. M. Kihaule, R. Hutterer and K. M. Howell (1999). Small mammals of the Eastern Arc Mountains, Tanzania. Abstract.

The Eastern Arc Mountains (EAM) in Tanzania are remarkable in the number of endemic plants and animals that inhabit the forests of this archipelago. The small mammals (insectivores, bats and rodents) of these forests are poorly known and the habitat in which they live is severely threatened. For these reasons, we are studying the natural history of the small mammals of this archipelago. Through our preliminary surveys we have greatly increased our knowledge of the faunal components of each of these mountains and gained a perspective on the dynamics of the species richness in this island-like ecosystem. Importantly, we have found very few introduced or exotic species in our surveys of undisturbed forest even when these forests are in close proximity to disturbed areas or human habitation. The rodent fauna we have documented is widespread across the archipelago, although restricted to montane and submontane habitats. Shrew species are much more patchy in distribution with each EAM or subset of mountains holding at least one endemic species. Some mountains are

richer in shrew species than others, but further analysis is required to discern how dispersal, extinctions and/or speciation have contributed to this pattern.

Les montagnes de l'Arc oriental en Tanzanie sont remarquables par le nombre de plantes et d'animaux endémiques qu'hébergent les zones forestières de cet archipel. Les petits mammifères (insectivores, chauves-souris, rongeurs) de ces forets sont mal connus alors que l'habitat dans lequel ils vivent est sérieusement menace. Pour ces raisons, nous étudions l'histoire naturelle des petits mammifères de cet archipel. Grace a nos recensements préliminaires, nous avons améliore grandement notre connaissance des composants fauniques de chacune de ces montagnes, et acquis une perspective de la dynamique de la richesse spécifique dans cet écosystème de type insulaire. De façon importante, nous n'avons trouve que peu d'espèces introduites ou exotiques dans les forets non perturbées, même quand ces dernières sont proches de zones dégradées ou d'installations humaines. La faune de rongeurs est bien distribuée a travers l'archipel, bien que limitée aux habitats montagnards et sub-montagnards. Les espèces de musaraigne ont une distribution plus fragmentée, chaque montagne ou sous-groupe de montagnes renfermant au moins une espèce endémique. Certaines montagnes sont plus riches en musaraignes que d'autres, mais d'autres analyses sont nécessaires pour faire la part de la dispersion, de l'extinction et/ou de la spéciation dans ce schéma de distribution.

Start, A. N. (1969). A note on three species of bats (Chiroptera) not previously recorded from Kenya.

Les conditions de capture des spécimens de *Tadarida cistura* au Kenya laissent penser qu'ils effectuaient un important déplacement. La présence de *Tadarida nanula*, connue des forces humides de l'ouest africain (du Congo à la Sierra Leone), dans la savane a acacias du Kenya (avec seulement quelques forets galeries peu denses) implique un déplacement de l'espèce vers l'est à travers des régions au climat peu propice. Ce déplacement a probablement été favorisé par la dernière période pluviale du Pleistocène. *Mimetillus moloneyi* n'est commune dans aucune des régions occidentales ou centrales de l'Afrique où elle était connue jusqu'à présent, un seul spécimen de cette espèce a été capturé dans l'ouest du Kenya.

Three species of bat not previously recorded from Kenya are noted. The first, *Tadarida cistura*, was taken in circumstances suggesting long distance travel. The second, *Tadarida nanula*, previously known from West African forests as far east as the Congo, provides a large eastward extension to the previously known range, across unsuitable habitat, apparently explained by past climatic factors. The last is *Mimetillus moloneyi* which is widely known from west and central Africa, though nowhere is it common.

Stebbings, R. E. (1973). Size clines in the bat *Pipistrellus pipistrellus* related to climatic factors.

Adult female *P. pipistrellus* from colonies have been caught and measured in various parts of Britain. Sample sizes averaged 91 bats for 21 sites. Forearm means ranged lrom 31.00 - 32.88 mm and many were significantly different. Clines of increasing bat size radiated from west central England indicating the existence of discreet breeding populations. Significant correlations were obtained between increasing bat size with decreasing temperatures and saturation deficit, and with increasing relative humidity. Thus *P. pipistrellus* seemed to conform to Bergmann's rule for a homeotherm.

Stephan, H., H. D. Frahm and G. Baron (1987). Brains of Vespertilionids. I. Subfamily characteristics.

Macromorphology and encephalization (EI) of brains were compared in 58 Vespertilionid species, brain composition in 36 species: 46 or 27 species of Vespertilioninae, 8 or 5 species of Miniopterinae, 2 species of Kerivoulinae, and 2 species of Nyctophylinae. Subfamily differences were found in the extent of the cover of the mesencephalon. It is nearly fully covered in *Keriuoula papillosa*

(Kerivoulinae), at least half covered (by the cerebellum in Miniopterinae, and free (cornpletely or nearly so) in Nyctophilinae and Vespertilioninae. In relative brain size, the Kerivoulinae are highest (average EI = 130), followed by the Miniopterinae (111), Nyctophilinae (102) and Vespertilioninae (95). The higher encephalization of Kerivoulinae and Miniopterinae is accompanied by a marked increase of relative size in cerebellum and striarurn, and in Kerivoulinae, in hippocampus and neocortex as well.

St Leger, J. (1936). Dr. Karl Jordan's expedition to South-West Africa and Angola: Mammals.

The series of Mammals collected for the British Museum on the Expedition contains several species of particular interest. The specimens of two squirrels belonging to the genera *Anomalurus* and *Heliosciurus* represent new subspecies recently described by me from this material. Until Dr. Jordan obtained *Anomalurus* in Western Angola, the Flying Squirrel was not known to occur west of the Congo basin. The capture of *Platymops haagneri* at the Waterberg, *Nasilio brachyurus* at Mt. Moco, *Taterona schinzi* at Lobito, and *Leggada bella induta* at Bullsport has also considerably extended the known range of these mammals.

St Leger, J. (1937). Mammals collected by the Lake Rudolf Rift Valley Expedition, 1934.

Although the chief object of the Lake Rudolf Rift Valley Expedition was to make a geological survey and report on this region, a small and interesting collection of mammals was obtained and presented to the British Museum. The majority of the specimens were collected by Dr. W.S. Dyson, the acting medical officer of the Expedition, and by Mr. D.G. MacInnes, who accompanied the party as palaeontologist.

The country is for the main part sand and gravelly subdesert, with patches of rock and stony hills. Acacias and dom palms occur in the vegetation of the river valleys. The only forest is confined to a high altitude on the mountains, but from these no specimens were obtained. The Lake Rudolf Basin is cut off from Uganda by an escarpment 1500 feet in height, and the maximum rainfall east of this escarpment is 5"-10", as opposed to the (estimated) rainfall of 25"-30" of the Uganda plateau. This escarpment, together with the difference in the mount
of rainfall, appears to form an insurmountable barrier for the majority of species. Exceptions are the bats and a tree-squirrel, described below, which ranges, probably along the river valleys, as far west as the Nakwai Hills.

The fauna of the Lake Rudolf region, as was indicated by the collection obtained by the previous expedition in 1930-31, proves to be nearly related to that of Somaliland and the plains of Northern Kenya and South Abyssinia.

Strelkov, P. P. (1989a). New data on the structure of baculum in Palaearctic bats. 1. The genera *Myotis*, *Plecotus*, and *Barbastella*.

The structure of bacula of selected species and subspecies of Palaearctic bats from the genera *Myotis, Plecotus*, and *Barbastella* has been investigated for taxonomical purposes. Bacula of *M. ikonnikovi* and *B. leucomelas* are described for the first time. The former exhibits a very specific state, different from both *mystacinus* and *muricola*. Differences between *B. leucomelas* and *B. barbastellus* suggest these are the separate species.

Strelkov, P. P. (1989b). New data on the structure of baculum in Palaearctic bats. 2. Genus *Eptesicus*.

The diversity in the shape of the baculum has been investigated in the Palaearctic species of the genus *Eptesicus*. The possible ways of re-arrangements of this organ are discussed.

Strinati, P. (1951). Note sur les chauves-souris du Maroc.

La Mission scientifique suisse composée de MM. VILLY AELLEN, ASEN BALIKÇI, RAYMOND GIGON, HENRI GYGAX et PIERRE STRINATI, a exploré, pendant l'été 1950, plusieurs grottes dans la région du Moyen Atlas située au sud de la ville de Taza. Plusieurs dizaines de chauves-souris ont été récoltées et diverses observations ont été faites.

Strinati, P. (1953). Deuxième note sur les chauves-souris du Maroc.

In a previous note of the author (*Mammalia* 15, 23•31), the bat taken for a *Myotis myotis* was in reality a *Myotis oxygnathus*. The author further gives confirmation to the presence in Morocco of *Pipistrellus savii* and adds sorne complementary informations on bats observed in the region of Taza during april 1953.

Strinati, P. (1960). La faune actuelle de trois grottes d'Afrique équatoriale française.

Campagne de prospection biospéologique en Afrique Equatoriale Française. Description de deux grottes du Gabon et d'une grotte au Moyen Congo. Enumération de la Faune de ces grottes.

Biospeological prospection in French Equatorial Africa. Description of two caves in Gabon and of a cave in the Middle Congo. Enumeration of the fauna of these caves.

Stuart, C. T. (1975). Preliminary notes on the mammals of the Namib Desert Park.

The known distribution of sixty three species of mammals occurring in the Narnib Desert Park, South West Africa is given. Notes on the habitat preferences of most of the species as well as some taxonomic data are included

Stuart, C. T. and H. H. Braack (1978). Preliminary notes on the mammals of the Bontebok National Park.

A check-list of the mammals known to occur in the Bontebok National Park, Republic of South Africa, is presented, including general observations.

Stuart, C. T., T. D. Stuart and H. H. Braack (1987). New mammal records for the Karoo National Park, with notes on several other species.

Five species of mammal are recorded for the first time in the Karoo National Park: *Suncus varilla, Nycteris thebaica. Aethomys granti, Petromyscus collinus* and *Desmodillus auricularis*. The presence of a golden mole, Chrysochloridae,
is noted. Notes on three previously recorded species are presented.

Sudman, P. D., L. J. Barkley and M. S. Hafner (1994). Familial affinity of *Tomopeas ravus* (Chiroptera) based on protein electrophoretic and cytochrome *B* sequence data.

Analyses of protein electrophoretic and mitochondrial cytochrome *b* sequence data support association of *Tomopeas ravus* with the chiropteran family Molossidae. Although analyses of protein electrophoretic data present no clear placement of *Tomopeas* within the Molossidae, analyses of the sequence data support the recognition of *Tomopeas* as a basal and phylogenerically distant member of Molossidae. As a result of these analyses, we present a new taxonomic placement of this distinctive and taxonomically problematic bat.

Swanepoel, P., R. H. N. Smithers and I. L. Rautenbach (1980). A checklist and numbering system of the extant mammals of the southern African subregion.

A checklist of 292 terrestrial and 43 marine mammals currently known to occur in the Southern African Subregion is presented. The scientific name of each species is given together with the author's name, the date of its original description. and its English and Afrikaans vernacular names. Each species is assigned a number in order to facilitate handling of data in computer systems.

Tabuce, R. and M. Mahboubi (1999). Contribution du gisement de Bir El Ater (Algérie) à la connaissance des petits mammifères de l'Eocène africain. Abstract.

Les mammifères placentaires africains du Tertiaire ancien sont très mal connus. Au Paléocène et a l'Yprésien, les gisements du bassin de Ouarzazate (Maroc) ont livre une faune ou dominent les "insectivores". Ces gisements puis celui des phosphates au Nord du pays ont également offert les plus anciens téthythères et primates connus. A l'Eocène inferieur et moyen, les gisements algériens de Glib Zegdou, Gour Lazib et El Kohol puis celui de Chambi en Tunisie ont largement contribué a notre connaissance des primates et des groupes endémiques: hyracoïdes, macroscelididés et proboscidiens. A l'Eocène supérieur, le gisement égyptien de Qasr El Sagha n'a livre a ce jour aucun mammifère de petite taille; celui de Bir El Ater (Algérie) a permis d'identifier des rongeurs et un primate anthropoïde.

Ce travail présente la liste faunique de l'ensemble des gisements éocènes africains et résume l'étude des mammifères inédits de Bir El Ater. Cette faune constitue un intermédiaire entre les riches gisements oligocènes d'Egypte et ceux, plus anciens, du Maghreb.

Hormis les nombreux restes dentaires de *Moeritherium* (Proboscidien), l'ensemble du matériel se rapporte a des mammifères de petite taille. Un carnivore ou créodonte et un "insectivore" restent indéterminés. Un hyracoïde (*Bunohyrax* sp.) apparait proche du morphotype ancestral des Saghatheriidae. Un nouveau genre de Macroscélididé étaye l'origine condylarthre du groupe et constitue l'un des deux plus anciens représentants de l'ordre. Enfin, la diversité des primates est notable avec trois nouvelles formes reconnues. Un Adapidae (?) rappelant certains cercamoniinae européens constituerait le plus ancien adapidé africain si *Djebelemur* de Chambi est un anthropoïde primitif. Le genre *Algeripithecus* de Glib Zegdou est reconnu mais il ne permet pas de statuer sur la position systématique de ces "petits primates bunodontes". Un Oligopithecinae clairement rattaché à cette sous-famille constitue la première occurrence stratigraphique de ce groupe en Afrique et pourrait influer sur le problème de l'origine des anthropoïdes: est-il le témoin d'une immigration asiatique a l'Eocène supérieur ou le représentant d'un groupe africain plus ancien?

The African placental mammals of the early Tertiary are poorly known. The Paleocene and Ypresian localities of the basin of Ouarzazate (Morocco) yielded a fauna where the " insectivores" are very numerous. These sites and that in the north phosphate basin also recorded the oldest tethytherian and primate known. The early-middle Eocene locality of Chambi from Tunisia and the Algerian localities of Glib Zegdou, Gour Lazib and El Kohol have largely contributed to our knowledge of the primates and the endemic groups: hyraxes, macroscelidids and proboscideans. Up to now, the late

Eocene Egyptian locality of Qasr El Sagha has not revealed any small sized mammal, and finally the site of Bir El Ater (Algeria) has yielded rodents and an anthropoid.

This work presents the faunal lists of the African Eocene localities and summarises the study of the new mammals of Bir El Ater. This fauna constitutes an intermediary between the well-known Oligocene sites of the Fayum (Egypt) and those, older, of the Maghreb.

Except the many dental remains of *Moeritherium* (Proboscidean), the whole of the material refers for small mammals. A carnivore or a creodont and an "insectivore" are still undetermined. A hyrax (*Bunohyrax* sp.) appears close to the ancestral morphotype of Saghatheriidae. A new genus of elephant-shrew supports the condylarthran origin of the group and constitutes one of the two oldest representatives of this order. Lastly, the diversity of the primates is remarkable with three new forms. An Adapidae (?) which shows similarities with some European cercamoniinae would constitute the oldest African adapid if *Djebelemur* from Chambi is a primitive anthropoid. The genus *Algeripithecus* from Glib Zegdou is recognised but no phylogenetic relationship establish the systematic position of these "small bunodont primates". An Oligopithecinae, clearly reported to this subfamily, constitutes the first stratigraphic occurrence of this group and could influence the problem of the origin of the anthropoids: is it the witness of an Asian immigration during the late Eocene or the representative of an older African group?

Tamsitt, J. R. and D. Valdivieso (1969). Hemoglobin electrophoresis in the systematics of bats (Microchiroptera).

Electrophoresis is a most useful procedure for systematically comparing proteins of different organisms, and data from electrophoretic studies of blood proteins have aided in the clarification of phylogenetic relationships and in grouping higher taxonomic categories (Foreman, 1960; Dessauer, 1966; Johnson, 1968). Hemoglobins, unlike some serum proteins, are not affected by diet, age, reproductive state, temperature or other variables. There are, however, few electrophoretic data on bat hemoglobin. Manwell and Kerst (1966) and Mitchell (1966) found considerable individual variation and only minor differences between species in the hemoglobins of temperate bats of the family Vespertilionidae. Valdivieso *et al.* (1969) compared electrophoretic properties of hemoglobin from Puerto Rican bats of the families Phyllostomatidae, Vespertilionidae and Molossidae and found differences and similarities correlated with taxonomic affinity. Although hemoglobins of closely related species were indistinguishable, Valdivieso *et al. (op. cit.)* concluded that haemoglobin electrophoresis may be used to add additional evidence to estimates of relationships derived from traditional criteria.

Two distinct electrophoretic phenotypes of hemoglobin occur in bats of the family Vespertilionidae (Manwell and Kerst, *op. cit.*; Mitchell, *op. cit.*; Valdivieso *et al., op. cit.)*, but only one phenotype is known in bats of the families Phyllostomatidae and Molossidae (Valdivieso *et al., op. cit.*). Extensive sampling of additional taxa should indicate whether Neotropical phyllostomatid and molossid bats possess the considerable hemoglobin polymorphism found in temperate vespertilionid bats, whether there are geographic differences in hemoglobins of disjunct populations of the same taxa, and should help determine the worth of haemoglobin electrophoretic properties in systematic studies of microchiropteran bats. We therefore describe here results of new electrophoretic studies on bat hemoglobin which confirm and extend previous observations.

Tate, G. H. H. (1941a). Results of the Archbold Expeditions. Nr 36. Remarks on some Old World leaf-nose bats.

When reviewing recently the genus *Hipposideros*, it became necessary to study other available hipposiderine genera, to re-examine *Rhinolophus*, and to some extent to study the remaining leaf-nosed bats, the Megadermidae and Nyeteridae.

Material referable to *Asellia, Anthops, Cloeotis, Triaenops, Coelops, Rhinolophus, Megaderma, Lavia, Nycteris, Lyroderma* was examined. (*Rhinonycteris* is apparently unrepresented in American collections.) Notes made upon their comparative structures are presented herewith. The hipposiderine

genera are considered first, then briefly the Nycteridae and Megadermidae. The isolated position of *Coelops* is pointed out. Only incidental remarks are offered on the Rhinolophinae, reviewed two years ago and now in course of extensive revision by C. C. Sanborn.

A list of materials belonging to these genera contained in the Archbold collections is appended.

Tate, G. H. H. (1942). Results of the Archbold Expeditions. Nr 47. Review of the vespertilionine bats, with specific attention to genera and species of the Archbold collection.

This paper is the eighth and last of a series of publications devoted to the study and determination of a large number of Microchiroptera assembled by Mr. Richard Archbold, which are deposited in The American Museum of Natural History, New York.

The bats in question form a part of a large collection of mammals assembled by Mr. Archbold during the decade 1930 - 1940, mainly by means of his own expeditions to Madagascar, New Guinea and Australia, but also through the work of collectors whom he sent from time to time to Celebes, Borneo, Java and Sumatra.

Our interest in the oriental region has centered upon the mammal fauna of the island of New Guinea. But in order properly to study the mammals of that island it has been necessary to work intensively with those of Australia on the one hand and of southeastern Asia and the East Indian islands on the other.

Reports based upon the fruits of Mr. Archbold's tireless collecting have been published with considerable regularity, the field of research extending far beyond mammalogy to ornithology and other zoological departments. Numerous papers on the botanical material assembled have also appeared.

The present work on the Vespertilioninae has been facilitated by the use of specimens generously lent by the curators at the museums at Chicago, Cambridge and Washington. In addition, numerous photographs of types, made by the kind permission of the authorities at various European and Australian museums, have aided materially in establishing the exact characteristics of species inadequately described.

One new species, *Pipistrellus anthonyi*, is described.

Preliminary papers relating to the Vespertilionidae have been published in which the subfamilies Miniopterinae, Murininae, Kerivoulinae and Nyctophilinae were successively dealt with. *Myotis*, the most primitive genus of the remaining subfamily, the Vespertilioninae, had been previously reviewed. But it was found in practice that the remaining vespertilionine genera were often too closely integrated one with another to permit satisfactory treatment one by one. Instead, a procedure is here adopted under which the subfamily is reviewed as a whole, and the interrelationships of the genera are pointed out, as far as understood. In many instances the data upon which certain species or races have been founded are so vague that it has not been possible to reach a conclusion regarding their status. I do not hesitate to assert that many of the names will go into synonymy. This action should occur, however, only after ample facts have been marshaled in proof. As much evidence is needed to prove synonymy of a species as to demonstrate the distinctness of a new one. It was with the above mentioned idea of an inclusive review of this very complex subfamily that the work following was undertaken.

Despite the modern concept of "the species," based upon populations relatively homogeneous both morphologically and functionally, whose individuals normally interbreed freely and breed rarely or never with other species even when they inhabit the same environment-despite this knowledge and theory and the understanding that one should deal with large samples statistically, in practice the museum student is still compelled to found his assumptions or "conclusions" upon quite small samples or often upon random individuals taken from different localities. To a great extent also he must rely upon other men's observations. Thus he still builds "species" upon morphological distinctions seen in single specimens (types). But he is nevertheless aware of his handicaps and awake to the shortcomings of methods which he must use.'

Taufflieb, R. (1965). Contribution à l'étude des *Trombiculidae (Acarina)* d'Angola.

L'auteur passe en revue 24 espèces de *Trombiculidae* connues actuellement d'Angola, principalement de la région du Nord-Est, parmi lesquelles figurent 4 spèces nouvelles et un nouveau genre: *Machadella*, décrits dans cette note. Au point de vue zoogéographique, la région de Dundo fait la preuve de son caractère frontalier entre la Sous-Région Occidentale et la Sous-Région Orientale. La spécificité parasitaire est faible et n'explique qu'imparfaitement la répartition des larves.

Twenty-four *Trombiculidae* species are known now from Angola, chiefly from the northeastern region. Four new species and a new genus: *Machadella*, are described. From the zoogeographical point of view, the region of Dundo is situated on the boundaries between Western and Eastern Sub-Regions. Larva host specificity is not of great importance and distribution of these chiggers seems to be due more likely to ecological requirements of adults.

Taufflieb, R. (1972). Trois nouveaux Trombiculidae (Acarina) du Sénégal.

Au cours d'une tournée de prospections arbovirologiques dans la région de Kédougou, au Sénégal Oriental, nous avons pu récolter un nombre important de Trornbiculidae parmi lesquels les trois espèces nouvelles suivantes.

Three new species of Trombiculidae are dcscribed from Sénégal. Genus *Chiroptella* is mentionned from Etliiopian Region for the first t.irne.

Taufflieb, R. and J. Mouchet (1959). Revue des Trombiculidae du Cameroun et description de huit espèces et sous-espèces nouvelles.

Les premiers trombiculides camerounais ont été récoltés par J. RAGEAU et déterminés par M. ANDRE (1952); il s'agissait de *Trombicula mastomyia giroudi* André, 1951 dont l'hôte était *Rattus norvegicus* capturé à Douala. Depuis 3 ans, l'examen de nombreux rongeurs, insectivores, virerridés, chauve-souris, oiseaux, nous a permis de reconnaître l'existence de 18 espèces et sous-espèces parmi lesquelles huit nouvelles que nous décrivons dans cette note.

Taylor, P. J. (1999a). The role of amateurs in the growth of bat conservation and research in South Africa.

During the 1980s and 1990s, Britain experienced an unprecedented increase in scientific and public interest in bat conservation, culminating in 90 'bat groups' by 1992. In South Africa, bats are poorly protected or unprotected, and most of the country's 54 species are poorly known. With the formation of bat interest groups in KwaZulu-Natal and Gauteng in 1994 and 1995, the British 'bat group' conservation model was applied in a South African context. The primary aim of South African bat groups has been to promote bats, bat research and bat conservation through public participation and education, and the training of amateur 'bat workers' by scientists. I evaluate the success of this approach, based on activities of the Durban Bat Interest Group (DBIG) over four years (1994-1997 inclusive), and on estimates of media impact available for 1994-1996 inclusive. The number of public activities increased by between 14% and 44% per year. Some 12 million South Africans have been exposed to a positive message about bats. A database containing 316 bat roost visit records from 239 individual bat roosts (mostly in buildings) has been compiled. Two species of bats were recorded for the first time in South Africa. Conservation efforts have focussed on a roof-dwelling species restricted to the Durban area, the large-eared free-tailed bat (*Otomops martiensseni*); this species and one other,

the short-eared trident bat, *Cloeotis percivali*, have recently been protected in terms of provincial legislation.

Taylor, P. J. (1999b). Echolocation calls of twenty southern African bat species.

Echolocatoin data and sonograms are reported for twenty southern African bat species from 13 localities, recorded with the Pettersson D980 time-expansion bat detector. Data for eight species have not previously been reported. For seven species, two or more individuals were analysed in a range of situations, including hand-held, tethered and free-flying (in a room and in different natural habitats). Sonograms, and seven echolocation call parameters agreed, with a few exceptions, with the published data for individual species. Although intraspecific variation in echolocation call structure was documented, species tended to have recognisable 'vocal signatures', particularly when dominant frequency and harmonic structure were considered. The latter variables are readily retrieved by time expansion detectors, but not by frequency division or heterodyne detectors. Although generally they should be interpreted with caution, recordins from room-flown (five species) and hand-held (six species) bats obtained during this study matched, reasonably closely, additional recordings and observation of naturally flying individuals of the same species, using time expansion and heterodyne bat detectors. In four species, recordings obtained from a known species flying in a room or hand-held enabled the accurate, *a posteriori* species identification of unknown call sequences obtained during subsequent general recordings from bat feeting areas.

Taylor, P. J., C. Cheney and C. Sapsford (1999). Roost habitat evaluation and distribution of bats (Chiroptera) in the Durban Metropolitan Region.

Based on data collected between 1994 and 1998 by a number of volunteers, distribution patterns and roost habitat preferences within the Durban Metropolitan Region (DMR) were investigated for 16 species of bats for which one or more roosts were visited during the study. Notwithstanding sampling biases, house roosts ('anthrophilic') were most commonly recorded, followed by tree roosts ('phytophilic') and underground cave-like roosts ('lithophilic'). Estimates of roost entrance height, facing direction and colony size varied widely within and between species. Species distribution patterns of roosts within the DMR were compared with individual specimen records of bats collected during a rabies scare in 1980/1981. The highest density of roosts was recorded in the Berea suburb close to the city centre, on the slopes of a prominent ridge featuring a number of older double-storey houses (suitable for house-roosting species) and tall exotic trees (suitable for tree-roosting species). The six species which were most frequently recorded in roosts visited in residential areas of Durban were: *Epomophorus wahlbergi* (29 roosts), *Taphozous mauritianus* (28 roosts), *Chaerephon pumila* (26 roosts), *Otomops martiensseni* (24 roosts), *Scotophilus dinganii* (14 roosts), and *Tadarida aegyptiaca* (five roosts). Analysis of spatial aggregation of roosts for five species revealed clumped patterns in four cases, and a random distribution in the fifth. Observed differences in distribution patterns between species could be explained by sampling biases, inter-specific competition, differing habitat requirements, and differing abilities of different species and families of bats to withstand colder temperatures by means of hibernation and torpor.

Taylor, P. J., E. J. Richardson, J. Meester and L. Wingate (1994). New distribution records for six small mammal species in Natal, with notes on their taxonomy and ecology.

New distribution records are documented for six small mammal species, including three new to Natal (*Crocidura maquassiensis* Roberts, 1946, *Chlorotalpa sclateri* (Broom, 1907), *Cloeotis percivali* Thomas, 1901) and three species showing significant range extensions within Natal (*Grammomys cometes* Thomas and Wroughton, 1908, *Scotophilus borbonicus* (E. Geoffroy, 1803) and *Otomys laminatus* Thomas and Schwann, 1905). Discriminant analysis of *C.* cf. *maquassiensis* from four localities in Natal in relation to known samples of *C. maquassiensis, C. cyanea* and *C. silacea* confirm their identity with minimal overlap between species. Finally, equivocal records of *Graphiurus ocularis* (A. Smith, 1829) and *G.* cf. *murinus* (Desmarest, 1822) are discussed. The occurrence of *G. ocularis*

in Natal is equivocal due to the antiquity of one skin from Natal and the ambiguous label data of another specimen. Specimens collected from Swaziland, Mkuzi Game Reserve and Waterpoort (Transvaal) are similar to *G. murinus* in size, colour and skull shape but differ significantly in having reduced M1 and markedly enlarged bullae, and may be an undescribed species.

Theodor, O. (1956). On the genus *Tripselia* and the group of *Basilia bathybothyra* (Nycteribiidae, Diptera).

Some species of Nycteribiidae have been recorded from widely different faunistic regions. Thus, *Eucampsipoda hyrtlii* has been recorded from Africa, Ceylon, Burma and Sumatra. Other species have been recorded from Europe and China or from Europe and South Africa. Re-examination of the material has proved in most cases that the species were wrongly identified and no species has been found so far to exist both in Europe and in East Asia. There remained finally two species which been recorded the Ethiopian and the Oriental region, *Tripselia blainvillii* and *Basilia bathybothyra*. Material of these two species from as many localities as possible was therefore brought together, in order to determine whether this wide distribution does in fact occur or whether, in these cases as well, there existed different forms, species or subspecies, with a narrower range of distribution.

The material for examination consisted of over 70 specimens of *Tripselia blainvillii* (either identified as *T. amiculata* or unidentified), of new species of *Tripselia* from Borneo, Sumatra and New Guinea and of about 150 specimens of '*Basilia bathybothyra*' from the Eastern Mediterranean, Africa, India and Indonesia. In addition, a number of specimens from Australia were examined, which also proved to belong to the genus *Tripselia*. Of these only the specimens of *Tripselia falcozi* were identified and will be included in the present paper. Some of the others have probably been described by Musgrave as species of *Nycteribia*, others are obviously new. There is, however, too little material available at present to deal with these forms.

I have to thank the authorities of the British Museum (Nat. Hist.), Dr R. Wenzel of the Natural History Museum, Chicago, Dr J. Bequaert of the Museum of Comparative Zoology, Cambridge, U.S.A., Dr V. Aellen of the Muséum d'Histoire Naturelle, Geneva, Dr. P. Basilewski of the Musée du Congo Belge, Tervueren, Dr. E. Séguy of the Muséum d'Histoire Naturelle, Paris, and the Director, Indian Museum, Calcutta, for placing their material at my disposal.

The material in the British Museum included the collection by Dr H. Scott and the Rothschild collection, both of which contained very rich and interesting material.

Theodor, O. (1968). A revision of the Streblidae (Diptera) of the Ethiopian Region.

Keys for the identification of subfamilies, genera, species-groups and species of the African Streblidae are given. A fist of species is given, and the host-parasite relationships are discussed. Two new subspecies of *Brachytarsina* are described. The genus *Raymondia* (including the Oriental species) is revised, new characters for the definition of the species are introduced and the genus is divided into species-groups. A number of species are re-described, and two new and two possibly new species are described. The nomenclature of the African species of *Ascodipteron* is revised, a number of descriptions are amplified, and a new species is described.

Thewissen, J. G. M. and S. A. Etnier (1995). Adhesive devices on the thumb of Vespertilionoid bats (Chiroptera).

We describe pads on the thumb of five vespertilionoid bats based on microanatomy and scanning microscopy and make inferences about their function. The pad of *Thyroptera* adheres by means of suction, and that of *Tylonycteris* uses dry adhesion. The pad of *Glischropus* has no true adhesive function and probably functions using friction. Topography of the pad of *Pipistrellus nanus* could

interlock with substrate features, but the pad may have a minor function as a suction device. Glueing is most likely involved in the adhesion of *Myzopoda* to its substrate.

Thollesson, M. and U. M. Norberg (1991). Moments of inertia of bat wings and body.

The moments of inertia of the wings about the shoulder joint and about the roll axis were estimated in eight species of bats, using strip analysis. The moment of inertia of the bat's trunk about the roll axis was estimated by assuming the body and head to be ellipsoids. The slopes of the regressions of moment of inertia of one wing about the shoulder joint (J_W) versus body mass (m_{tot}), wing span (b) and wing area (S) were as expected for geometrically similar animals of different size. The exponent for J_w versus body mass in bats deviates from that found for birds, while the exponent for J_w versus wing span does not. A multiple regression was used to show that J_W may be estimated by:

$J_w = 4.49 \times 10^{-3}\ m_{tot}^{0.53} b^{2.15} S^{0.65}$.

The mean value of the moment of inertia originating from the trunk is 7 % of the bat's total moment of inertia (of wings and body combined) about the roll axis. The mass of one wing (m_w) was plotted against body mass for the eight bat species, which gives:

$m_w = 0.112 m_{tot}^{1.11}$.

The slope for our bats, 1.11, is similar to that obtained for birds, 1.10. Adaptations to reduce the moments of inertia may be more important for increasing a bat's flight agility (roll acceleration) than for decreasing the total mechanical power required to fly. The influences of wing moment of inertia and wing shape on manoeuvrability and agility are discussed.

Thomas, D. W. (1981a). The role of fruit bats in seed dispersal and regeneration in a Southern Guinea Savanna. Abstract.

This study was undertaken to quantify the importance of Megachiropteran fruit bats relative to frugivorous birds in some aspects of seed dispersal and regeneration. Bats consume 75% of the fruit crop of *Ficus capensis* while birds account for 15%, In the savanna/ gallery forest edge zone 86 - 93% of the fecal seed rain comes from bats. This bat-generated rain amounted to 7, 000 - 24, 000 feces / hectare / year which, after a measured ant predation rate of 74% per 24 hours, left a seed bank of 64 - 219 feces / hectare / year for regeneration. A census of an experimental fire protected plot showed a regeneration comparable to that predicted. Thus, bats appear as the most important consumers and dispersers of some secondary colonizing plants.

Bat biomass, however, appears to be lower than that of frugivorous birds. Reasons why bats, despite low biomass may be more effective dispersers are discussed in an accompanying paper.

Thomas, D. W. (1982). The ecology of an African savanna fruit bat community: resource partitioning and role in seed dispersal.

This study was undertaken to examine the structure of a fruit bat community, its seasonal variation in composition, the mechanisms of partitioning of fruit resources, and the role of the bats as seed dispersers in southern Guinea savanna in Africa.

The community is structured on two levels. A group of four species remain resident in the savanna-forest mosaic zone year round and three species invade the community from the southern forest zone seasonally. Diets indicate that the resident species (*Epomops buettikoferi, Hypsignathus monstrosus, Lissonycteris angolensis*, and *Micropteropus pusillus*) forage in three mutually exclusive zones and the diet overlaps between these species are low, except in the case of *E. buettikoferi* and *M. pusillus*. The latter two species overlap heavily-in both diet selection and in foraging zone, and evidence is presented

showing them to be in severe competition when resources are limiting. They co-exist only in high fruit density patches.

The migrant species (*Eidolon helvum, Myonycteris torquata*, and *Nanonycteris veldkampi*) invade the community at the onsert of the rains when the diversity of fruit resources increases over the dry season low. Each uses one of the three foraging zones and co-existence is mediated through: 1) the use of different fruit sizes and 2) overlap with the resident species only on fruits that are super-abundant. Dry season limitation of the resident species' populations appears to be important in permitting the invasion of this community.

The seed rain generated by bats and birds was measured with ground-based collecting sheets on transects through the savanna. Seed rains were impressively high, with each square metre receiving on the average 3.3 seed loads annually. Bats accounted for 95.7-98.2% of the measured rain. The bat dominance appears due to the higher proportion of time spent in flight compared with birds.

Thomas, D. W. (1984b). Fruit intake and energy budgets of frugivorous bats.

Paleotropical fruit bats (Pteropodidae) ingest up to 2.5 times their body mass in fruits nightly. On a mass-specific basis, this is about double the amount reported for neotropical fruit bats (Phyllostornidae). By manipulating the energy and protein contents of their diets, I found that the pteropodids' high fruit intakes are determined by the protein content of the fruits they exploit. Pteropodids appear to be obliged to overingest energy in order to obtain sufficient protein. Phyllostomid fruit bats may escape this protein constraint by supplementing their diets with insects,.thus increasing the overall protein content of the diet. Differing abilities to supplement their diets may result in important differences in how pteropodid and phyllostornid bats nutritionally evaluate fruits, regulate their intakes, and function as seed dispersers.

Thomas, D. W. and M. B. Fenton (1978). Notes on the dry season roosting and foraging behaviour of *Epomophorous gabianus* and *Roussettus aegyptiacus* (Chiroptera: Pteropodidae).

We studied the movements and foraging behaviour of *Epomophorug gambianus* and *Rousettus aegyptiacus* during the dry season in Rhodesia. The nightly activity of both species was concentrated in the riparian forest where they fed on the fruits of *Diospyros senensis*. *Epomophorus gambianus* roosted during the day high in the thick canopy of *Trichelia emetica* or *Kigelia Africana* along the river banks and began foraging, each one in a preferred *D. senensis* shrub, before 1845 hrs. *Rousettus aegyptiacus* arrived in the study area approximately one hour later and appeared to forage in groups. The temporal separation of the feeding times of the two species of bats may provide a basis for the partitioning of a single species food resource.

Thomas, D. W. and A. G. Marshall (1984). Reproduction and growth in three species of West African fruit bats.

This study outlines the reproduction periods of the African fruit bats *Epomops buettikoferi, Epomophorus garnbianus*, and *Micropteropus pusillus* at two West African savanna sites: a wet southern Guinea savanna and a drier southern Sudanese savanna. At both sites the two annual birth periods were timed such that both lactation by only one weaning period coincided with the rainy season peaks in fruit availability. On this basis we propose that lactation rather than weaning was the important determinant of the timing of reproduction. There was no evidence of cycling of testes size in males corresponding with the seasonal mating periods. *E. buettikoferi* and *M. pusillus* females mated at six months and gave birth at the age of 12 months. Males of the two species reached puberty by 11 months and seven months, respectively. Growth rates did not differ between cohorts growing through the wet and dry season and *E. buettikoferi* and *M. pusillus* grew at rates of 276 mg/day and 116 mg/day, respectively.

Thomas, N. M. (1997). A systematic review of selected Afro-Asiatic Rhinolophidae (Mammalia: Chiroptera): an evaluation of taxonomic methodologies.

A taxonomic review of five members of the *Rhinolophus ferrnmequinum* group (Mammalia: Chiroptera: Rhinolophidae) from Africa and Asia is undertaken. The study incorporates a suite of taxonomic methods, using both morphological data and sequence data of the cytochrome *b* gene of mitochondrial DNA.

Six species of *Rhinolophus* are recognised from within the region, namely *R. ferrumequinum, R. clivosus, R. bocharicus, R. rouxii, R. sinicus* and *R. affinis*. *R. sinicus* is promoted to species rank, having previously been considered to represent a subspecies of *R. rouxii*. Intra-specific variation, both geographic and non-geographic is analysed, and revised classifications presented. Synonyms, and their original descriptions, are given for each species, and species limits and distributions are defined. Diagnostic characters are described, and tables of measurements included.

Inter- and intra-specific relationships are examined using classical taxonomic methods, numerical phenetics, cladistic analysis, molecular techniques, and the total evidence approach. Each method is discussed in detail, and the literature relevant to each technique reviewed. This rigorous methodological approach is undertaken in order to provide robust taxonomic classifications, and to allow for each of the methods employed to be evaluated in terms of their ability to solve a complex taxonomic problem.

The use of a combination of methods is found to provide a high degree of taxonomic resolution. The relationships of the five study taxa are clarified, with the hitherto unresolved relationship between *R. ferrumequinum, R. clivosus* and *R. bocharicus*, and the taxonomic status of *R. sinicus* being of particular note. In addition, taxa requiring further systematic investigation are identified for future research, such as *R. rouxii* from southern India and Sri Lanka, and *R. ferrumequinum Nippon* from Japan.

The evolutionary history of the *R. ferrumequinum, R. clivosus* and *R. bocharicus* complex is discussed in the light of the results of systematic analysis, as are the specific and subspecific relationships of *R. rouxii* and *R. affinis*. It is concluded that *R. clivosus* and *R. bocharicus* may have evolved from populations of *R. ferrumequinum* as a result of allopatric speciation occurring during periods of climatic change in the Pliocene and Pleistocene. Methodologically, it is concluded that the comparison of results from a number of techniques provides a robust base from which to formulate taxonomic conclusions. The optimal approach is considered to be a combination of molecular analysis and classical morphological investigation.

Thomas, N. M., D. L. Harrison and P. J. J. Bates (1994). A study of the baculum in the genus *Nycteris* (Mammalia, Chiroptera, Nycteridae) with consideration of its taxonomic importance.

The bacula of 11 of the 15 species commonly recognised within the genus *Nycteris* (Cuvier & E. Geoffroy, 1795) have been examined. The bacula are described and illustrated, and notes on the systematics of the genus, with particular refererice to bacular morphology, are included. *N. parisii* is considered distinct from *N. woodi* on the basis of bacular morphology. The baculum of *N. woodi* separates it from the other members of the *macrotis* group. *N. grandis* has a particularly distinctive baculum.

Thomas, O. (1880). XXII. On bats from Old Calabar.

Through the kindness of Dr. J. A. Smith, of Edinburgh, the British Museum has recently received a small collection of Bats obtained at Old Calabar by Dr. A. Robb, of the United Presbyterian Mission at that place.

The collection consists of four specimens of *Epomophorus comptus*, All., concerning which Dr. Smith has himself published a most valuable notice, one specimen each of *Nycteris grandis*, Ptrs., *Vesperugo nanus*, Ptrs., a new species of *Vesperugo*, a new species of *Kerivoula*, and an immature specimen of a species allied to, or identical with, *Vesperugo Kuhlii*, Natt., but which is not in a condition to be certainly determined.

Thomas, O. (1886). 2. On the mammals presented by Allan O. Hume, Esq., C.B., to the Natural History Museum.

Accompanying the magnificent donation of Indian birds recently made to the National Museum by Mr. A. O. Hume, there is a collection of nearly 400 mammals, "which, although appearing of small account beside the enormous ornithological series, is yet, viewed on its own merit, one of the finest collections of mammals ever received by the Museum. This is due not only to the large number of the specimens and the excellence of the skins, which are both in preparation and conservation very far above the average, but also to the careful manner in which they have been labelled, nearly all of them having their exact localities and dates recorded. Thus of the 371 specimens retained in the Museum, only 59 are undated, and only some 10 or 12 are without exact localities, while such large series of perfect skins, especially of the Squirrels and other small mammals, have probably never before been brought together.

The collection consists of a few specimens respectively from Simla. Delhi, the Nilghiris, and the Andaman and Nicobar Islands, but the great mass of it came from four separate localities, viz. Sambhar, in Rajpootana, Manipur, Tenasserim, and the Malay peninsula, and I have thought it better not to give one list of the whole, thereby confusing the localities and destroying any use the list might have for faunistic purposes, but to give four separate lists, each of which forms a distinct contribution to the fauna of a well-defined locality.

The total number of species represented in the collection is 106, of which 19 are from Sambhar, 19 from Manipur, 25 from Tenasserim, and 28 from the Malay peninsula, the remainder being from the other localities above mentioned.

Before commencing ihe detailed lists, I must express my obligations to Mr. W. T. Blanford for the assistance he has given me in working out this collection, an assistance the more valuable as he is himself preparing a work on the mammals of India, and has therefore the whole subject at his fingers' ends. For help also in making out details of localities, dates, &c. I must thank my colleague Mr. R. Bowdler Sharpe, who himself fetched the collection from Simla, and to whose careful packing the excellent condition in which the specimens now are is partly due.

Thomas, O. (1888). 1. On a collection of mammals obtained by Emin Pasha in Equatorial Africa, and presented by him to the Natural History Museum.

The Mammals recently received by the Natural History Museum from Dr. Emin Pasha number 115, belonging to 39 species - a collection which is of the utmost value as a contribution to our knowledge of the Central-African fauna, and one which reflects the highest credit on the energy and scientific spirit of the man by whom it was formed. When the cares and anxieties of a person in the position of responsible governor of a large and turbulent. African province are considered, it seems wonderful that Emin should have been able to make any collections at all, and still more should have made such a collection as the present, nearly every specimen of which has been carefully labelled in his own handwriting, with the date, sex, and exact locality - particulars which add enormously to its scientific value.

The great mass of the collection was not obtained at Dr. Emin's headquarters, on the Upper Nile, but in a district called Monbuttu (lat. 2° 30' N., long. 27° 50' E.), just within the Congo basin, and separated by the Congo-Nile watershed from the Wadelai region. There, practically, all the interesting forms were collected; and, considering their number, and especially their strongly marked geographical character,

the general affinities of the mammal-fauna of this district may now he looked upon as settled; their affinities are discussed at the end of the present paper.

Of the more recent papers on the Central-African mammal-fauna the three following are the most important: -

1. Pagenstecher, Dr., "Die von Dr. G. A. Fischer, auf der im Auftrage der geographischen Gesellschaft in Hamburg unternommenen Reise in das Massai-Land gesammelten Saugethiere ".

2. Noack, H., "Beiträge zur Kenntniss der Säugethier-Fauna von Ost-und Central-Afrika"

3. Leche, W., "Ueber einige von Emin Pascha gesammelte afrikanische Säugethiere"

The first of these contains notes on 31 species of mammals, but the region explored by Dr. Fischer has so different a fauna from Monbuttu, that only some three or four species, and those very widely spread, are common to both collections.

Dr. Noack's paper also, based on the mammals collected by Dr. Böhm in the Marungu country, on the south-west coast of Lake Tanganyika, refers to a fauna very different to that of Monbuttu, although several species, and those some of the-most interesting (e. g. *Sciurus boehmi* and *Mus kaiseri*), are found in both districts.

Finally, Dr. Leche's paper is founded, like the present one, upon specimens collected by Emin Pasha. Fifteen species are enumerated, but these come chiefly from the Upper Nile district, only three of them occurring also in the Monbuttu collection. The localities given are so widely scattered that the paper, although important for the histories of the individual species, gives but little definite faunistic information.

There is also a list of 71 species observed in Niam-niam-land, given at the end of Dr. Schweinfurth's "Im Herzen von Afrika," but the list is a merely nominal one, except that the different native names of the animals are all carefully recorded. Two of Dr. Emin's West-African animals, the Chimpanzee and *Galago demidoffi*, occur in the list.

The 39 species in the present collection consist of 3 Primates, 8 Carnivora, 1 Insectivore, 3 Bats, 1 Ungulate, 1 Edentate, and no less than 22 Rodents, Dr. Emin having wisely paid most attention to the latter group, in which our knowledge of the smaller forms is still so exceedingly incomplete.

Thomas, O. (1890a). 3. On a collection of mammals obtained by Dr. Emin Pasha in Central and Eastern Africa.

The Mammals now described were collected partly on Dr. Emin's return march from his Equatorial Province, and partly by himself or by friends of his during his stay at Bagamoyo. The former, like the magnificent collection sent over in 1887, were presented by him direct to the Natural History Museum, and the latter were given to the Zoological Society, whose Council have in their turn passed them on to the Museum for comparison and preservation.

Afther the collections described in the previous papers were dispatched in 1887; Dr. Emin continued to investigate the fauna of the region of the grea lakesn, and it speaks volumes for his energy and enthusiasm that after all the collections then made had most unfortunately been lost, he should, nevertheless, have perseveringly continued to collect all the way down during the painful march from Equatoria to Bagamoyo, and should, under such difficulties, have been able to obtain so many valuable specimens as are here de'scribed. Later, while at Bagamoyo, he exercised his influence among his friends, and the specimens recorded as from Monda, in the Nguru Mountains, and from Mandera, a place equidistant from Saadani and Bagamoyo, about 25 miles from the coast, were obtained for him in this way. Those from the latter locality were collected by Lieut. Langheld, to whose friendly exertions we owe some of the most interesting specimens obtained.

Every skin collected during the march has been most carefully labelled by Emin himself, many of the particulars so recorded being of the utmost value, and increasing very considerably the interest of the specimens.

Thomas, O. (1890b). Description of a new *Scotophilus* from the Gambia, with remarks on some of the allied species.

In a further consignment of,bats sent to the Natural History Museum from Bathurst; on the River Gambia, by my friend Dr Percy Rendall, I find two examples, one adult :and the other immature, of the following interesting new species, of *Scotophilus*:

Thomas, O. (1894a). 1. On the mammals of Nyasaland: third contribution.

The present paper contains an account of the third and fourth collections of Mammals made and presented to the National Museum by Mr. H. H. Johnston, C.B., Consul-General for British Central Africa, with the help of his able assistant, Mr. Alexander Whyte, F.Z.S. Papers on the two previous collections have already been published.

The series now described bears out the prophecy I ventured to make in 1892, that as Mr. Whyte's knowledge of the locality increased he would be able to obtain the rarer and more local species, and that among these there would certainly be some novelties. For although there are not a very large number of species altogether represented in the present collection, yet several are new to the locality, one is a rediscovered species described thirty years ago, and two are new to science.

The Mammal-fauna is therefore evidently far from worked out, and Messrs. Johnston and Whyte should be encouraged, to continue their explorations until, after the receipt of five or sis more similar collections, we may perhaps be in a position to say that our knowledge of the Mammals of the district approaches completion.

Thomas, O. (1894b). 4. On some specimens of mammals from Oman, S.E. Arabia.

Dr. A. S. G. Jayakar, whose magnificent collections and donations of Muscat fishes are known to all ichthyologists through the papers upon them by Mr. Boulenger, has, during the past few years, collected and presented to the National Museum a certain number of mammals, and he has now sent home a further consignment, of such value as to demand a proper account.

So far as I am aware, no list of mammals from this very interesting region has ever been published, and Mr. Blanford's description of *Erinaceus niger*, the same author's passing reference to a Muscat specimen of *Vulpes leucopus*, Sir V. Brooke's description of *Gazella muscatensis*, and Sir O. St. John's notes on *Oryx beatrix* appear to be the only references to this locality that occur in mammalian literature. Dr. Jayakar having obtained examples of all these four species, his collection includes specimens of all the mammals known to occur in this part of Arabia.

The geographical relationships shown by the mammals of Muscat are, as might be expected, about equally with Africa and India, three of the species being distinctly African in affinities, three Indian, and the remainder either peculiar ,or widely-spread and of no special significance.

Of the 17 species included in the list, two are new, one of them, *Hemitragus jayakari*, the new Goat, forming a most striking and interesting discovery, on which Dr. Jayakar is much to be congratulated. The new Hare, *Lepus omanensis*, is also markedly distinct from any of its allies.

Thomas, O. (1897a). 1. On the mammals of Nyasaland: fourth Notice.

The present paper contains an account of all the mammals which have been received by the British Museum from Nyasaland since the beginning of 1894, and forms a continuation of my three previous papers on the subject. As before, it is to the generosity and scientific spirit of Sir Harry Johnston that we owe most of the specimens referred to, but in addition some other members of the British Administration have been good enough to contribute specimens on their own account, and thus to further the cause of scientific research.

Among these contributors may be specially mentioned the names of Mr. Alfred Sharpe, Dr. Percy Rendall, and Mr. H. C. McDonald, each of whom has been lucky enough to send home specimens sufficiently distinct to be described as new.

In the following pages, where the name of tbe collector is put in brackets the specimens have been obtained as part of his official duties in the administration, and are to be considered as presented by Sir Harry Johnston; while direct donations to the Museum are shown by the words "Presented by" before the name of the collector. As usual, the majority of Sir Harry Johnston's specimens have been obtained by that indefatigable naturalist, Mr. Alexander Whyte.

In order to make the list of Nyasa mammals as complete as possible, I have here inserted the name of every species obtained during the whole of Sir H. Johnston's explorations of Nyasaland, with references to the places in the previous three papers where the species are noticed or described, and, in addition, those mentioned by Mr. Sclater in his various papers. As a result the present paper contains a complete list of all the mammals as yet received by the Museum from Nyasaland, numbering 82 in all.

Thomas, O. (1897b). 6. On the genera of Rodents: An attempt to bring up to date the current arrangement of the order.

Just over twenty years ago, in 1876, Mr. E. R. Alston contributed to this Society his invaluable paper "On the Classification of the Order Glires," a paper which in its broad outlines has formed the basis for almost every Museum Catalogue, compiler's list, and general text-book that has been written since it appeared. Based as it was on the earlier works of Waterhouse, Gervais, Brandt, and Lilljeborg, Alston's arrangement has in this way received almost universal sanction, and the present writer is far from wishing to alter the essential characteristics of the scheme.

But, owing partly to Alston's not having seen examples of many of the genera included, and partly to the great increase in the number of known forms that has taken place since he wrote, his paper has gradually become somewhat obsolete in its detailed arrangement of the subfamilies and genera, however correct his positions for the suborders and families may still be considered to be.

Now, every Museum-curator when arranging his specimens, and every writer either of a text-book or of a faunistic work, is constantly being confronted by the difficulty as to where to place in the system this or that genus of Rodents, for which he has perhaps himself neither time, inclination, or opportunity to search out a proper and appropriate position. It is for the object of helping such persons that the present paper has been prepared, so bold a venture being due to the fact that the increase in the British Museum collections has fully kept pace with the general increase of knowledge, and that there are very few genera known from any part of the world of which specimens are not in that collection. With such unrivalled material available, the opportunities for mistaken work have been reduced to a minimum; and in the following list it may be said that the specimens have been allowed to sort themselves, and where my alterations are found to be strikingly different from those of Alston it will generally be found that the forms referred to were not available for examination in his time.

One recent author only has diverged much from Alston's system, namely Dr. Winge of Copenhagen, who, in connection with his work on the Rodents of Lagoa Santa in Brazil, has written a revised general arrangement of the Rodents. His classification, however, is a rather one-sided one, being based almost entirely on the structure of the masseter muscles and the bones related to them, and, however thoughtful and clever it may be in many ways, is so widely divergent from all previous classifications

that without much stronger reasons than he adduces I should not be prepared to follow it. No doubt many of his alterations are admirable, such, for example, as the reference of *Sminthus* to the *Dipodidæ*; but when we find *Pedetes* placed with *Anomalurus*, and *Platacanthomys* combined with *Myoxus* in a group set over against *Graphiurus*, we see that a good deal of confirmation will be needed before the classification the world is accustomed to is abandoned in favour of that proposed by Dr. Winge. Prof. Zittel and Dr. Tullberg have also contributed to the revision of the classification of the Rodents. The former gets rid of the difficulties by putting all the awkward families into a separate group, the Protrogomorpha. The latter largely follows Winge, but does not as yet enter into details.

Dr. Trouessart's most useful list of Rodents is entirely based on Alston's arrangement, and is so admittedly a compilation that no special criticism of it is here necessary.

No attempt has been made to follow Alston's example of giving diagnoses of the groups and genera, partly for the simple reason that the labour and time demanded woud have rendered the preparation of the paper at all quite impossible, and partly because such diagnoses can never be really full and accurate unless prepared in connection with the working out of the species of each genus. Moreover, of all the groups he recognizes, Alston's paper contains diagnoses, and it would be superfluous to repeat them here. Where I differ from his conclusions full reasons are giyen in the footnotes.

Comparing the numbers of recent families and genera recognized in the two papers, we have 18 families in Alston against 21 now, the difference being due to the *Lophiomyidæ* being suppressed, and the *Bathyergidæ, Heteromyidæ, Erethizontidæ*, and *Pedetidæ* added. Of genera Alston recognized 100, as against 159 now considered valid; of the additional 59 just about half are formed by the breaking up of old genera and half are altogether new discoveries.

Nomenclatural questions have of necessity cropped up here and there, and the recent work of American authors in this respect has been fully utilized. It is with the greatest regret that I have had to use a good many names unfamiliar to English naturalists, but the evidence in every case is so clear as to leave no room for doubt, and none are mere matters of opinion. Recognizing that the ultimate use of these names is inevitable, I think the sooner a knowledge of them is disseminated the sooner will the intermediate stage of confusion be passed through and done with. Where comparatively unfamiliar names are used, the better-known terms are placed in brackets after them, as also are any special synonyms which it seems of importance to mention.

It should bo again repeated that the special object of the list is the proper allocation of the genera in their respective subfamilies, and I have purposely been as conservative as possible with regard to the groups of higher rank, following Alston wherever there has not been very special reason for departing from his arrangement.

In regard, however, to *Anomalurus* and *Aplodontia*, both placed by him in the Sciuromorpha, I have had to give in my adhesion to the views expressed by more recent authors, that these two aberrant genera cannot rightly be placed with the Squirrels. But where they should go is by no means clear - Winge, Zittel, and Tullberg all differing in the matter; nor can I say that I agree with any one of them. As it seems a pity to abolish the convenient and time-honoured groups Sciuromorpha, Myomorpha, arid Hystricomorpha, just for the sake of these genera, I have thought it best to put each of them under a special group-name, leaving it for further research to show their true relationships. Fortunately, their serial position in the list, like that of *Pedetes*, may be left almost exactly as in Alston's paper.

Thomas, O. (1898a). 2. On the mammals obtained by Mr. A. Whyte in Nyasaland, and presented to the British Museum by Sir H.H. Johnston, K.C.B.; being a fifth contribution to the mammal fauna of Nyasaland.

In June and July 1896 Mr. Alexander Whyte, the well-known collector, made an expedition into Northern Nyasaland for the purpose of investigating the fauna of that part of the territories administered by Sir Harry Johnston. The expedition proved remarkably successful, for besides the large number of specimens of other groups obtained, Mr. Whyte brought back the fine collection of mammals of which the present paper gives an account.

The chief localities where Mr. Whyte collected were the Nyika Plateau (about 10° 30' S., and 33° 30' E.), the Masuku Plateau, slightly further northwards, and Fort Hill (about 9° 40' S., 33° 20' E.), these localities all lying just to the west of the north of Lake Nyasa, and at altitudes of from four to seven thousand feet. A few odd specimens were also obtained at Karonga Ruarwe on the lake shores.

I have also included in the list some few additional specimens from Zomba and the south end of the lake, and among others very interesting results of a trip made by Mr. Whyte to Mount Malosa, just north of Mount Zomba, in November, where he obtained examples of several species not previously recorded Nyasaland.

Now that Mr. Whyte has retired from his labours in tropics, it is only fitting that in this, the last paper that will appear on his Mammals, special reference should be made to the great value of the services he has rendered to zoology in general, and to knowledge of mammals in particular, and to the way in which, during the past six years, he has utilized the opportunities given him the generosity and public spirit of Sir Harry Johnston.

As in previous papers, a few specimens are included which Museum owes to other members of the Nyasa Administration, notably to Mr. Alfred Sharpe, and now that Mr. Sharpe succeeded to Sir Harry Johnston's post, we may hope that by his help our knowledge of the riches of the Nyasa Protectorate will still continue to increase.

The northern region visited by Mr. Whyte proves to have very close affinity with that explored by the German travellers Böhm, Reichard, and Kaiser south and south-west of Tanganyika, the mammals collected by whom were worked out by Dr. Noack. Thus Mr. Whyte has obtained examples of several characteristic species described from their collections, notably *Rhynchocyon reichardi* and *Gerbillus böhmi*, both of which are forms quite new to the fauna of Nyasaland.

The following is a list of the new species contained present collection, those marked with an asterisk having described in a previous preliminary communication to the Society.

Thomas, O. (1898b). VIII. On the mammals obtained by Mr. John Whitehead during his recent Expedition to the Philippines.

Mr JOHN WHITEHEAD, whose exploration of Mount Kina Balu has already, rendered him famous as a collector, has during the last three years been engaged in the exploration of the islands of the Philippine group, partly at his own expense, and partly at that of the "subscribers to the Whitehead Fund," to whose generosity the National Museum owes the donation of the whole of the specimens that the subscribers had a claim to under Mr. Whitehead's agreement with them.

As the exploration has been so remarkably successful, it is only fitting that an acknowledgment of their generosity should be appended to this account of the Mammals obtained during the expedition. Their names are as follows: - Messrs. Matthew, James, and Andrew Arthur, the Duke of Bedford, Major Cooper Cooper, the late Mr. Alexander Dennistoun, Mr. John Dennistoun, the late Lady Huntingtower, the late Mr. Henry Seebohm, Mr. J. G. Sandeman, and Mr. J. T. Thomasson.

The Philippine Islands, however rich in birds, have always previously been looked upon as a group very poor in Mammals, especially in comparison with the rich faunas of the other islands of the East Indian- Archipelago. This poverty was particularly evident in regard to really peculiar indigenous Mammals; for, with the exception of *Phlœomys cumingi*, scarcely a Mammal was known from the group other than members of widely-distributed genera, of which the Philippine species were either identical with or closely allied "to Palawan, Bornean, or Celebean forms.

Little, therefore, could have been expected from the expedition further than the discovery of a few fresh species of genera known to inhabit the group, and this, so far as regards the islands other than Luzon, is just what has occurred. But in the great northern island of the group Mr. Whitehead has made a most-wonderful and unexpected discovery, that of a new and peculiar Mammal-fauna inhabiting the Luzon highlands, and, so far as is yet known, mostly isolated on a small plateau on the top of Monte Data, in the centre of Northern Luzon, at an altitude of from 7000 to 8000 feet.

The plateau itself, as will be seen by Mr. Whitehead's notes below, is of extremely small size, but in spite of this fact he obtained there specimens of the following remarkable series of animals.

Thomas, O. (1900). 2. On the mammals obtained in South-western Arabia by Messrs. Percival and Dodson.

On the initiative of Mr. Ogilvie Grant, and by the active assistance of General Creagh, Governor of Aden, an expedition was arranged during the past autumn to South-western Arabia for the purpose of obtaining zoological specimens for the British Museum. The expedition consisted of Mr. A. B. Percival and Mr. W. Dodson, the latter having especial charge of the mammal-collecting.

Mr. Dodson had already had some experience as a collector of .small mammals during a trip to Roumania in the spring, and he had shown such keenness and aptitude for the work that he would evidently have become an exceptionally able collector, but most unfortunately he contracted fever at El Khaur, and having been brought back to Aden by Mr. Percival, died there on the 20th of October.

The present collection, in the formation of which Mr. Dodson took, to the last, the most vivid interest, is naturally very similar in character to that obtained by Col. Yerbury in the same region in the spring of 1895, of which an account was given by its collector and myself in the Society's ' Proceedings' for that year. Further examples of the interesting Gerbilles discovered by Col. Yerbury were obtained and valuable series of various other forms.

The following species are additional to those recorded in the previous list: - *Papio arabicus, Canis pallipes, Vulpes leucopus, Mellivora ratel, Gerbillus gerbillus, Procavia syriaca jayakari*.

The animal that proves to be of greatest interest is the Baboon, of which one specimen, unfortunately a female, but fully adult, and in good condition, was obtained. This specimen is so different from the African *Papio hamadryas* as to require specific distinction.

Tho collection was made mainly in two districts - the one at and around Lahej, Col. Yerbury's chief collecting-ground, and the other in the neighbourhood of El Khaur, a place about forty miles north-east of Aden, and some twenty-live miles west of Shukra. But, as might be expected, no definable difference is to be found in the animals of the two localities.

The notes on habits &c. placed in inverted commas have been contributed by Mr. Percival.

Thomas, O. (1901b). XXXIII. A new Scotophiline bat from British East Africa, with the description of a new genus of the group.

Among some small mammals sent to the British Museum by Mr. S. L. Hinde occurs the skin, with skull, of a Scotophiline bat which does not appear to have been described, and which I propose to name in honour of its collector, who has contributed large numbers of specimens at various times to the National Museum.

It is allied only to *Scotophilus albofuscus*, Thos., and *S. hirundo*, de Wint., and with them forms a special group, which, on a reconsideration of the question, and fortified by the published opinion of Mr. de Winton, I propose to regard
as a genus.

Thomas, O. (1901c). List of mammals obtained by Dr. Donaldson Smith during his recent journey from Lake Rudolf to the Upper Nile.

On his return from his recent adventurous journey to the Upper Nile from Somaliland via Lake Rudolf, Dr. Donaldson Smith has been so good as to entrust to rne for description the specimens of mammals that he obtained, and has further been generous enough to present a number of them, including all the types, to the British Museum.

Owing to the great difficulties of transport large series of specimens were not brought home, nor were many small mammals obtained, but, from the knowledge gained on his previous expeditions, Dr. Smith was enabled to select those that were most likely to be interesting, and this knowledge has been rewarded by the considerable proportion of novelty that the examination of his specimens reveals.

The specimens were mostly prepared by Mr. W. Carlile Fraser, who accompanied Dr. Smith as collector and taxidermist.

Thomas, O. (1901f). XXXVIII. On a collection of small mammals from the Upper Nile obtained by Mr. R.M. Hawker.

Mr. R. MACDONALD HAWKER, to whom the National Museum already owes many valuable mammals collected by him during his various expeditions into northern and northeastern Africa, has now presented to the Museum the specimens obtained during his last winter's trip to the Soudan. They were mostly obtained on the White Nile between Fashoda and Khartoum, and are highly valuable both as supplementing the Museum collection, still very incomplete, from the Soudan, and as illustrating the many species described by Heuglin from specimens no longer in existence. The definite identification of these species of Heuglin's is a matter of
the utmost value.

The number of species in Mr. Hawker's collection is not very large, but among them there are a new hare and a new gerbille; and I have also taken the opportunity to describe a new member of the latter group obtained by Lord Delamere in East Africa.

Thomas, O. (1902). 1. On the mammals collected during the Whitaker Expedition to Tripoli.

Mr. J. I. S. Whitaker, F.Z.S., who has already done so much for the exploration of the Vertebrate Fauna of Northern Africa, and to whom our National Museum is indebted for importand collections of Mammals from Sicily, Tunis, and Morocco, has long wished to send a collecting expedition into the little-known country of Tripoli. Last year, by the kind intervention of the Foreign Office, permission was obtained from the Sultan for Mr. Edward Dodson and a companion, Mr. Drake, to travel through that country, collecting specimens, and it is the Mammalian results of this expedition of which the present paper gives an account.

The expedition was carried out entirely at Mr. Whitaker's expense, and, as in the case of the previous Moroccan expedition, he has generously presented the great majority of the Mammals collected to the National Museum, to which they form a most valuable addition.

As so often happens in such cases, the material available for comparison with the Tripoli collection is most imperfect, and badly needs supplementing by specimens collected in modern fashion. Indeed, of Barbary Mammals the only modern specimens are those of Mr. Eaton from Biskra, and Mr. Dodson's own previous collections from Morocco. Zoologists, therefore, who spend their winters in the south would do a great service to Science and the Museum if they would collect any mammals, however common, at the places they go to

Mr. Dodson left the town of Tripoli on April 2nd, 1901, and travelled southwards by way of Sokna to Murzuk, then returned to Sokna, and from there travelled north-eastwards to the Syrt district, where he worked eastwards along the coast to Ben-Ghazi.

His localities are thus divisible into four groups, as follows: -
I. Inland country north of Sokna. March 1901 and middle of June to middle of July. Specimens collected at Tarhuna, Wadi Sofedjin, W.' Nefed; W. Bey; Bonjem; Erdeul; Ain Hammam; W. Titti; W. Agarib; W. Wagis ; Oumsinerma; Limhursuk; Gebel Binsertia.

This is a desert region, without marked elevations; interspersed with small oases.

II. Soda Mountain district just south of Sokna (28° 55' N., 16° 15' E.). Beginning of May and second week of June. *Localities*. Tamari-Ferdjan; W. Sultan; Getefa; Linzerat.

The Soda Mountains rise to about 3000 ft. above the general level of the plain, not high enough therefore to have any noticeable climatic or faunal peculiarity. There is a map of this distinct in Rohlf's 'Kufra' (1881).

III. Level and descending country southwards to Murzuk (sea-level or below). *Localities*. Shup; Oum el Abid; Zighen; Sebha; Ghodua; Murzuk.

IV. Coast district eastwards from Syrt towards Ben Ghazi. End of July and beginning of August. W. Aggar; Elcusher; Bon Cheifa; Sidi Sweya; Sidi Faradje.

From a geographical standpoint, therefore, the region traversed is of a very good representative character. But, zoologically, there must be many more species which, on account of the hurried nature of the march, and the difficulties in collecting in so wild and semi-hostile a country, must have been missed by Mr. Dodson's party. Indeed, under the circumstances it is surprising how admirable a collection has been made.

As might be expected from the position of Tripoli between Egypt and Algeria, and the homogeneous nature of all three regions, the mammals have no marked general affinity or peculiarity. Some, such as *Acomys, Gerbillus pyramidum, G. eatoni*, and *Dopodillus vivax*, are Egyptian in affinity; and others, notably the *Ctenodactylus*, are distinctly Algerian; but these affinities are evidently only the eastward and westward extensions, hitherto unknown, of Algerian and Egyptian forms, and there seems to be no special faunal relationship with either of the two countries more than the other.

The proportionate number of new forms in the collection is remarkable, the most notable being the *Ctenodactylus* and the fine Hare which I have named in honour of Mr. Whitaker, to whose enterprise and generosity the expedition is due, and who is to be congratulated on its very successful outcome.

Thomas, O. (1903b). LXXII. On the species of the genus *Rhinopoma*.

The Egyptian Pyramids are inhabited by large numbers of bats of the genus *Rhinopoma*, the mouse-tailed bat, first recorded by Belon as long ago as 1554. By Dobson, in his Catalogue, the members of this genus, whether from Egypt or India, were all combined under one heading, *R. microphyllum*, "Geoffrey," although both Peters and Heuglin had pointed out that in Egypt two forms were present, a larger and a smaller, the former having the tail shorter than the forearm, the latter longer.

But in giving new names the two German authors, misled by their belief that Geoffrey's measurements were the original ones, affixed the names to the larger form. Now, however, that Anderson and de Winton's work has drawn attention to the fact that it was Brünnich, and not Geoffroy, who first described the species, I am able to state, on measurements kindly furnished me by Dr. Winge, that the type, still preserved in the Copenhagen Museum, is the large form with short tail (forearm 67.5 millim., tail 61). The smaller one, as to whose distinction from the larger no one who had compared the skulls could doubt for one moment, will therefore require a new name, and may be called.

Thomas, O. (1904a). XXII. New bats from British East Africa collected by Mrs. Hinde, and from the Cameroons by Mr. G.L. Bates.

The British Museum owes to the kindness of Mrs. Hinde, wife of Dr. S. L. Hinde, of Fort Hall, British East Africa, a further collection of bats, and these include three well-marked new forms, which I have described below, in conjunction with two others obtained by Mr. Gr. L. Bates in West Africa.

The new *Myotis* from Fort Hall, which I have named in honour of its captor, is an especially noticeable discovery.

Thomas, O. (1904c). XLVIII. On mammals from northern Angola collected by Dr. W.J. Ansorge.

During 1903 the well-known collector Dr. W. J. Ansorge, to whom the British Museum is already indebted for series of specimens from British East Africa, Uganda, and Nigeria, made a collecting-trip to Northern Angola, and obtained about two hundred specimens belonging to forty-six species, and of these a complete set has been acquired for the Museum.

The mammalogy of Angola has hitherto remained almost entirely in the hands of the Portuguese, as represented - most admirably - by Prof. Barboza du Bocage in Lisbon and by M. Anchieta and other collectors in the country under consideration. Thanks to the enlightened generosity of Prof. Bocage many institutions, and notably the British Museum, had received specimens representing the species discovered in Angola by the Portuguese naturalists, and on these specimens such comments on the Angolan fauna as have been made by Gray, de Winton, myself, and others have been based.

But these specimens, valuable as they have proved to be, have been all preserved in spirit, and the freshly made skins obtained by Dr. Ansorge are therefore of very great interest for comparison with similarly made specimens from other regions of Africa.

Complete as have been Prof. Bocage's researches on the subject, the present collection contains a fair number species not included in his lists, while, owing to my having been able to compare the remainder directly with typical specimens from other localities, I have found it necessary describe several of those he mentions as local species subspecies.

Dr. Ansorge has therefore to be congratulated on the considerable number of new and interesting forms which collection has enabled me to discriminate.

Thomas, O. (1904d). XXIV. On some small mammals collected by Mr. A.M. Mackilligin in the Eastern Desert of Egypt.

MR. ARTHUR M. MACKILLIGIN has recently collected some small mammals in the eastern desert of .Egypt, near the Soudan frontier, about lat. 22° and long. 35°, and these prove to be of much interest; for even with the magnificent accession to our knowledge of the mammals of Egypt represented by the late Dr. Anderson's work on the subject, this eastern desert has by no means been worked out, and Mr. Mackilligin has now discovered two new species, a bat and a gerbille, while an examination of his specimens of another bat, already obtained by Dr. Anderson, show this also to need a special name.

Besides the species described in detail below Mr. Mackilligin obtained in the same district examples of *Asellia tridens, Gerbillus gerbillus, Acomys* sp., and *Jaculus jaculus*.

Thomas, O. (1910d). XXXVI. List of mammals from Mount Kilimandjaro, obtained by Mr. Robin Kemp, and presented to the British Museum by Mr. C.D. Rudd.

By the generous assistance of Mr. C. D. Rudd, whose zoological exploration of S. Africa is known to all mammalogists, a collector - Mr. Robin Kemp - has been employed for the past year in obtaining

small mammals in British East Africa for the benefit of the National Museum. A considerable number of new species have been obtained, and these have been described on arrival in successive numbers of the 'Annals.'

Mr. Kemp has recently sent a collection from Mount Kilimanjaro, and it is thought that a complete list of them may in this case prove of utility to other workers on African mammals.

The collection was obtained at two localities - Taveta, alt. 2500', at the foot of the mountain, on the British East African side; and Rombo, a mission station on the German side of the frontier, at an altitude on the mountain of about 6000'. Mr. Kemp was much indebted to the missionaries at Rombo for help and hospitality.

In nearly all cases the species obtained at the two places prove to be different, those from Rombo being Kilimanjaro mountain forms, while those from Taveta belong to the hot country and desert fauna which stretches northwards through Voi arid Kitui to the:region north-east of Mount Kenya.

Thomas, O. (1911). XIII. List of small mammals obtained by Mr. G. Fenwick Owen on the Upper Gambia and in Fouta Djallon.

During the early part of 1910 Mr. G. Fenwick Owen made an expedition to Western Africa in search of large game, with the especial wish to obtain a male Derby's eland for the National Museum. In this latter purpose he was unsuccessful, but he brought home a female eland, besides specimens of the local buffalo, hartebeest, water-buck, roan antelope, ovibi, and blue-backed duiker.

Of small mammals he obtained a considerable series, and these prove to be of such interest as to deserve a special list, in addition to the descriptions already published of *Tatera gambiana, Arvicanthis linulus*, and *Uranomys oweni*.

Mr. Fenwick Owen's collecting was mostly done in French Gambia, on the upper part of the river of that name; but some of the specimens came from rather further south, in the Fouta Djallon district of French Guinea - a region about 3000 - 4000 feet in altitude. More complete collections from this latter region might prove of great interest.

Mr. Owen was accompanied by Mr. G. Russell Roberts, 'who assisted in making the collection.

The whole series has been presented to the National Museum by Mr. Owen, and forms a very valuable addition to its African collections.

Thomas, O. (1912c). A new Vespertilionine bat from Angola.

A few years ago, by the kindness of the authorities of the Lisbon Museum, the British Museum obtained an example of a peculiar Vespertilionine bat which had been received from Angola, and whose systematic position seemed by no means readily determinable.

I have now been able to make a careful study of this specimen, and have come to the conclusin that it represents a new genus, which may be called:

Thomas, O. (1913a). On some specimens of *Glauconycteris* from the Cameroons.

Among some mammals from the Cameroons sent for determination by Prof. E. Lampe, of the Wiesbaden Museum, there occur three examples of *Glauconycteris*, representing three different species, one being new and the others of sufficient interest to deserve some notice.

Specimens of this genus are somewhat rare in collections, and any addition to our knowledge of them is very welcome. The type of the new species and a selection of specimens of the other mammals represented (including *Crocidura dolichura*, Peters) have been generously ceded to the British Museum by the authorities at Wiesbaden

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Thomas, O. (1915a). On three new bats obtained by Mr. Willoughby Lowe in the Sudan.

During Mr. Abel Chapman's recent expedition to the Sudan, Mr. Willougnby Lowe obtained a considerable collection of mammals, and among them a number of bats. These include, besides *Coleura afra, Mops demonstrator*, and others, examples of the three following new species.

Thomas, O. (1915b). Notes on bats of the genus *Coleura*.

A study of the British Museum collection of the genus *Coleura*, amounting to nearly sixty specimens from more than a dozen localities, shows that on the mainland of Africa there are two species: a north-eastern, inhabiting Suakin, Aden, Somaliland, and the Upper Nile; and a southern, which ranges from the Congo to the Zambezi. The former is separable into two colour-races.

Then in the Seychelles there are two forms, both distinguished from those on the mainland by their proportionally longer wings.

Thomas, O. (1915d). List of mammals (exclusive of Ungulata) collected on the Upper Congo by Dr. Christy for the Congo Museum, Tervueren.

In the 'Annals' for last August I published a few of the more striking novelties from the fine series of Mammalia brought home from the Congo by Dr. Cuthbert Christy, who had been employed by the Congo Museum to make a collection for them on the Ituri and Welle, and, by request of the Belgian authorities, I now give a list of all the species obtained by him, with the exception of the Ungulates.

Such a list is always valuable for zoo-geographical reasons, and Dr. Christy's fine collection so supplements those made in the same region by Emin Pasha, the Alexander-Gosling Expedition, and the members of the Ruwenzori Expedition, as to make the complete list a very long one.

In a general way, there is a great uniformity in the Mammal life from the Cameroons to Uganda, as might be expected from the uniform nature of the country, but in a few cases there is enough local difference to authorise the distinction of special subspecies for the Upper Congo forms.

In all, Dr. Christy's collection contains 74 species and subspecies, of which 10 have proved to need description as new. Five of these were described in the previous paper.

Dr. Christy's numbers run up to 1530, but the present account only deals with the latter two-thirds of the collection, the earlier series having either been already named by Mr. Dollman or else gone elsewhere for determination.

The great majority of the mammals here referred to were obtained at two localities, Medje, on a branch of the Ituri, about 27° 40' E., 2° 20' N., and Poko, some 20 or 30 miles north-west of it, but across the watershed in the Welle basin. The latter is not very far from Emin's locality, Tingasi. The other localities mentioned are mostly in the Aruwimi-Ituri basin.

By the generosity of the authorities at Tervueren, the British Museum has been allowed to retain examples of nearly all the species obtained, including all those described as new. In particular, we have to thank Dr. Schouteden for his kindness both in placing the collection in our hands for determinatin and for the liberality with which we have been allowed to select duplicates. The sum of these latter forms a very valuable donation to the British Museum.

In normal times this list would have been prepared by Mr. Dollman in continuation of the papar he published in the Tervueren Journal in 1914, but he has gone to serve his country, and it is quite impossible for publication to take place in Belgium. With the consent of the Belgian authorities the paper is therefor prepared by me and published in the 'Annals.'

Thomas, O. (1917). XXIII. A new bat of the genus *Scotæcus*.

Among a series of well-prepared skins from Nyasaland presented to the National Museum by Mr. Rodney C. Wood, there occur examples of several rare bats, notably *Myotis welwitschii* and *bocagei, Glauconycteris papilio, Eptesicus megalurus*, and a *Scotoecus* which appears to be new. The last may be called:

Thomas, O. (1919). Some new mammals from Mesopotamia.

Among some mammals obtained by members of the Mesopotamian Expeditionary Force, and submitted to me for determination by the Bombay Natural History Society there are examples of the following five new species. In pursuance of its habitual public-spirited policy the Society has presented all the types to the National Museum.

Thomas, O. (1920). A new *Taphozous* from the Sudan.

Among a number of small mammals collected in the Sudan by Major J. Stevenson Hamilton, and sent to the British Museum for determination by the Wellcome Research Laboratories, Khartoum, there occurs a specimen of the following new bat, which I have great pleasure in naming in honour of its discoverer:

Thomas, O. (1922). XXXII. The generic classification of the *Taphozous* group.

When, in 1915, I wrote my "Notes on *Taphozous* and *Saccolaimus*", and recognized the latter as a distinct genus from the former, as had Hollister previously under another name, I did not sufficiently weigh the characters which separate *Taphozous nudiventris* and its allies from the typical members of *Taphozous*.

On reconsidering the subject, I now think that these remarkable half-naked bats should be separated as a distinct genus from the ordinary hairy species, and would suggest that the whole group .might be synoptically arranged as follows:

Thomas, O. (1925). On the mammals (other than Ruminants) collected by Captain Angus Buchanan during his Second Saharan Expedition, and presented by him to the National Museum.

Following his first expedition into the Sahara, when he visited Asben (Aïr) and made the highly interesting collection of small mammals of which Mr. Hinton and I gave an account in two previous papers, Captain Angus Buchanan started again in March 1922 for the same little-known country, and this time he was able to traverse it completely from south to north, arriving at Algiers on 7th June, 1925. During this adventurous journey he collected a considerable number of mammals, mostly in Asben and the Ahaggar Mountains, and these he has been so generous as to present partly to the British Museum and partly to that of Edinburgh. As before, the skins are quite exceptionally well prepared, and, being

from so interesting an area, the donation is one of very great value, for which the National Museum has every reason to be grateful to its patriotic donor.

With the many Algerian and Saharan collections that we already owe to the generosity of Lord Rothschild, combined with the possession of the Lataste collection from Algeria and the Fox collection from Nigeria, we thus have a very fine representation of the mammals of North Africa on the line connecting these two countries - a region which only a few years ago was completely unknown zoologically.

The present paper gives a full list of the specimens obtained, with the exception of a small number which have been added to the Tring Museum, where they will probably form the basis of papers by Lord Rothschild. The serial number of every specimen is recorded, in ordinary type for those now in the British Museum and in italics those that have gone to Edinburgh, the paper thus forming a record of both.

As might be expected, the collection contains several interesting novelties, such as the Asben ratel and porcupine, and there is a very pretty new dormouse which I have named in honour of Mrs. Buchanan.

In addition, he has made a most noteworthy rediscovery in the capture of an example of Loche's *Felis margarita*, described in 1858, but never obtained since. The specimen is to be preserved in the Tring Museum, and Lord Rothschild proposed to give some notes on it, so that further reference to it is here unnecessary.

On the other hand, the specimens from the mountains of the Ahaggar region are disappointingly similar to those of southern Algeria, no evidence occurring of the presence of a special local fauna.

Thomas, O. (1926). On mammals from Ovamboland and the Cunene river, obtained during Capt. Shortridge's third Percy Sladen and Kaffrarian Museum Expedition into South-West Africa.

For the third time, during the southern winter, Capt. Guy C. Shortridge, so well known for his collecting abilities in various parts of the world, and now Curator of the King William's Town Museum, has made a most successful expedition into the little-explored regions of South-West Africa. This he has been able to do owing to the continued generosity of the Percy Sladen Trustees, who provided the necessary funds, and of the Trustees of the Kaffrarian Museum, King William's Town, who found Capt. Shortridge's time, personal expenses, and other local necessities. Special credit has also to be given to Mr. G. R. Hofmeyr, C.M.G., the Government Administrator of S.W. Africa, on whose recommendation this further expedition was made, to whose action and official help Capt. Shortridge was enormously indebted in all sorts of ways, such as local help, transport, both by rail and wagon, and in many other respects.

Capt. Shortridge's first expedition of 1922 was to the region of the Middle Orange River, approximately lat. 28° 30' S., long. 21°.20'E.; the second (1923) into Damaraland, lat. 22° 25' S., long. 16° 18' E., some 200 to 500 miles north-west of the first-named region; and then this third expedition of 1924 was carried some 200 - 300 miles farther north still, through Ovamboland to the Lower Cunene River, the southern boundary of Angola.

Accounts of the Mammalia obtained dining the two first expeditions have already been published in the 'Proceedings' of the Society.

The collection now obtained proves that in this region Capt. Shortridge penetrated into a region strikingly different, from a zoological standpoint, from those he had previously explored, and one hitherto almost completely unknown. As a result, quite a large number of the small in animals have proved to be peculiar, equally different from those of Central Damaraland to the south and of Angola to the north, and having a quite special facies.

For, no doubt due to the general coloration of the environment, the peculiar mammals are nearly all of a very pale greyish colour, not the pale buffy so usual in deserts in other parts of the world, but of a

much more greyish, less buffy tone. The same tendency to grey is also found in many of the Kalahari mammal and presumably results from an environment more or less common to these two contiguous and practically continuous areas.

Of previous collections in this region there are almost none to be recorded, apart from a few specimens obtained at Elephant Vley (18° S., 17° 30' E.) by the famous Swedish explorer Andersson about 1859, though those obtained by Messrs. Woosnam and Dent in the Central Southern Kalahari, and worked out by Mr. Schwann and Capt. Dollman, have commonly had a bearing on the zoological relationships of the animals mentioned.

Ungulates and other large mammals from the same region are also referred to in the work by Dr. Zukowsky quoted in the paper on the results of Capt. Shortridge's second expedition.

The very special thanks of all Mammalogists are due to the generous co-operators who have enabled Capt. Shortridge to make the three magnificent collections of which this is the third and most important. The present series consists of about 500 specimens, referable to 55 species and subspecies, and containing no less than 22 new forms.

The many field-notes and accounts of habits written by Capt. Shortridge are not now published, but have been postponed for a later occasion, when it is hoped that they may appear under the collector's own authorship.

In the papers on the mammnls of the two former expeditions I had the advantage of Mr. Hinton's co-operation, but on this the pressure of his other work, he has been unable to take a share, and I have had to bear sole responsibility for the whole.

Miss Jane St. Leger has been good enough to give me valuable and much appreciated assistance in the sorting and handling of the considerable number of skins and skulls.

Thomas, O. (1929). On mammals from the Kaoko-Veld, South-West Africa obtained during Captain Shortridge's Fifth Percy Sladen and Kaffrarian Museum Expedition.

The high region of the Kaoko-Veld, in South-West Africa, north-west Damaraland and south of the Cunene River, has long been a *terra incognita*, it is only recently, since the general region has become a constituent part of British Empire, that any exploration of it has been possible.

Now, however, Captain Guy C. Shortridge has been enabled to make one of his wonderful collecting expeditions, the fifth of the series, into this hitherto unknown area, and the present paper gives an account of the collection he made, the largest of the whole series.

With some help from the British Museum itself, this expedition has been made possible by the generosity of the Percy Sladen Trustees, the Administrator of South-West African Territory, the South African Research Fund Board, of Mr. Abel Chapman, whose sporting instincts have made him sympathetic towards such exploratory adventures. To all of these thanks are due for material advancement in our knowledge of the South African Fauna represented by this really remarkable fifth collection. And equally to the Trustees of Kaffrarian Museum for their very generous co-operation in the work by sparing Captain Shortridge from King William's Town for so long a period.

The collection itself numbers nearly 1500 specimens, and considering that was made by a single man with only native help, it is a great tribute to Captain Shortridge's enthusiasm and powers of work.

It is accompanied by very ample field-notes on the habits and distribution the various species. These notes, however, are so full and excellent that they ought not to be used merely as a supplement to a technical paper on the mammals, and I therefore do not now publish them, but hope that they will in due course be brought out in South Africa under Captain Shortridge's own supervision. Native names, distribution, and habits are all included, and we may hope these observations will form a basis for a general work on such lines.

After the successive collections from (1) the Orange River, (2) Namaqualancl, (3) Ovamboland, and (4) Eastern Damaraland that we already owe to Captain Shortridge's expeditions, it is natural that there should not be very many novelties to be described from Kaokoland, which, in a broad sense, is of the same faunistic nature, and whose mammals prove to be generally the same as those of the areas previously explored. This is a little disappointing, as we had hoped that forests and mountainous areas of the Kaoko-Veld might prove to be inhabited various special forms. But numbers of them had already been obtained Captain Shortridge in the outlying regions of the faunal area - on the Cunene in the north, in Ovamboland to the east, and at Karibib in the south-east - so that we ought not to be surprised if there were not a large number more to be discovered.

None the less several well-marked new forms have been obtained, notably the two black Mungooses, *Myonax nigratus* and *Helogale parvula nero*, the Ground-Squirrel *Geosciurus princeps*, quite unexpectedly peculiar, and the Rooi-haas *Pronolagus caucinus*.

In all, 70 species are contained in the collection, while the presence and ranges of some few others are recorded in Captain Shortridge's field-notes.

The localities at which Captain Shortridge made collections are 21 in number, and are situated broadly on a north and south line about 100 - 200 miles from the coast, and running from the Cunene River to Outjo in South Kaokoland, at about 20° South latitude. These localities are mostly at a considerable elevation, from 1000 to 4000 feet altitude.

Their names are: in the Outjo district of Damaraland - Outjo, Otjikondo, and Cauas Okawa; in S. Kaoko - Kamanjab, Otjitemba, Qoabendus, Kovares, Otjijekua, Katijhuru; in Central Kaokoland - Otjitundua, Ombombo, Kaoko-Otavi, Okorosave; in north Kaokoland - Otjipongo, Ombathu, Epembe, Otjitambi, Mount Ehomba; and in the close neighbourhood of the Cunene, which is here about 100 yards in breadth - Tshimhaka, Hondoto-Cunene Junction, and Otjimbundu.

Detailed accounts of their local characteristics are contained in Captain Shortridge's field-notes.

Thomas, O. and M. A. C. Hinton (1920). Captain Angus Buchanan's Aïr Expedition. I. On a series of small mammals from Kano.

By the kindness of the authorities of the Tring Museum we have been entrusted with the examination of a number of small mammals obtained by Captain Angus Buchanan, while stopping at Farniso, near Kano, North Nigeria (altitude 1,700 ft.), in December 1919, on his way to explore the unknown regions farther north.

These Kano Mammals have proved to be of so much interest and to include so many novelties that we have thought it worth while to give a complete list of them.

The most striking form from a zoological point of view is undoubtedly the little short-tailed Gerbil *Desmodilliscus buchanani*, which represents, a genus only discovered in 1917 and hitherto not included in the British Museum collections.

The handsome little carnivore *Pœcilictis rothschildi* is also a discovery of some interest, as it greatly extends the known range of its genus, which has only recently been distinguished from *Ictonyx*.

By the generosity of Lord Rothschild, a set of the species obtained by Captain Buchanan, including the types of new species and subspecies, has been presented to the British Museum.

The only place towards Kano from which the British Museum has hitherto received any noticeable collection of mammals is the Bauchi Plateau, some 160 miles to the south-east, where the missionary brothers G. T. and J. C. Fox collected a number which formed the basis of papers by Thomas in 1911-12. Practically all the species, however, prove .to be different, and show that the two places are in different fauna! areas, of which Kano is strikingly more of a desert character.

Thomas, O. and M. A. C. Hinton (1923a). On the mammals obtained in Darfur by the Lynes-Lowe Expedition.

Thanks to the generosity and public spirit of the two explorers, the British Museum has received as a donation the whole of the fine collection of Mammals made by Rear-Admiral Hubert Lynes and Mr. Willoughby P. Lowe during their recent expedition to Darfur.

The expedition took place during the whole of 1921 and the early part of last year, and a complete survey of the country was made, equally of the comparatively flat desert region round El Fasher, the capital of Darfur, the still more desert area northward to the bare find unproductive Jebel Maidob, the zoologically unknown dominating mountain Jebel Marra, running up to a height of 10,000', and, finally, of the lower region of Wadi Aribo, in the south-western part of Darfur, where the drainage is to wards Lake Chad.

No mammal collection had ever been made In this area, so that the present fine series (which numbers upwards of 800 specimens) adds very greatly to the material available for the study of African Mammalia, and we have reason to be most grateful to the donors for the generosity and patriotism which have resulted in this notable accession to the Museum - the largest: single collection that the latter has ever received.

On the whole, the species contained in the collection are most nearly related, as is natural, to those of Kordofan and other parts of the Egyptian Sudan, and are generally different from those of the more humid Bahr-el-Ghazal.

So far as the mammals are concerned, Darfur would seem to be just on the southern boundary of the northern desert fauna, the collection containing quite a number of forms which are either the most southern records of northern species (*Jaculus jaculus, Dipodillus campestris* group, etc.) or the most northern records of southern ones (*Steatomys*, &c.).

The great mountain Jebel Marra, isolated as it is from other, high ground, has naturally a number of interesting forms peculiar to it and different from those of the plains. Thus there is a mountain species of Striped Mouse (*Lemniscomys*) found on it, which we have named in honour of Admiral Lynes, and a Gerbil (*Dipodillus lowei*), whose nearest ally is found in Algiers.

In all, the collection proves to consist of 62 species, of which we have had occasion to describe 19 as new, either as species or subspecies.

A few mammals were obtained by Admiral Lynes on a previous visit to the country, and these have been here incorporated. Their immbers run from 1 to 24, while those of the main collection start at 400.

Thomas, O. and H. Schwann (1905b). The Rudd exploration of South Africa. III. List of mammals obtained by Mr. Grant in Zululand.

[The complete account of the new species described in this communication appears here; but as the names and preliminary diagnoses were published in the ' Abstract,' such species are distinguished by the name being underlined. - EDITOR.]

In continuation of the collecting-work carried on by Mr. C.. D. Rudd's generosity, by which our National Museum has already been so large a gainer, Mr. C. H. B. Grant spent November and December 1903, and again, after a visit to the Transvaal, June to September 1904, in Zululand, where he collected the specimens of which the present paper gives an account.

It was at Mr. Rudd's own suggestion that Mr. Grant went to Zululand, and the resulting collections have more than fulfilled any expectations that could have been formed as to the value and interest of a series obtained there, for quite a number of the species have proved to be altogether new to science, while

in other cases forms only hitherto known from isolated or unlocalised specimens are now illustrated by good series of trustworthy skins.

In several instances we have been able to revise confused or little-known groups, such as *Myosorex* and the Golden Moles, with the result that a number of new forms have proved to need description.

Of these by far the most noteworthy is the handsome Hare which we have named *Pronolagus ruddi*, while other interesting species are the Golden Moles, *Amblysomus iris* and *A. chrysillus*, and the different forms of *Myosorex*.

The localities at which the specimens were obtained are as follows: -
Eshowe. Altitude 550 m.
Sibudeni and the Jususie Valley, about 20 miles to the N.W. of Eshowe. Altitudes 1100 to 1700 and 350 m. respectively.
Ngoye Hills, 15 miles E. of Eshowe, and about 8 miles inland from the coast. Altitude 200 - 300 m.
Umvolosi Station, 3 miles from the river of the same name and about 15 miles from the sea. Altitude 30 - 60 m.
Hlupluwe Stream; about 20 miles N. of Umvolosi.

Of the last localities Mr. Grant says: -
"Round the Umvolosi Station sandy grass-covered flats and undulating country stretch away to the south and east, dotted with palms and thorn-bush, the thorns in places forming patches and thickets interspersed with a few good-sized trees, the surface broken with both dry and swampy pans and vleys, and deep swampy sluits filled with dense reeds intersect the country towards the river. A low range of hills runs along the coast. To the north the country becomes more broken and hills and deeper ravines begin to appear.

"About 8 miles to the south of the station is a dense thorn-forest of considerable size, called by the natives the 'Dukuduku,' which joins and disappaers in the great swamps and reed-beds through which the Umvolosi River runs.

"Towards the Hlupeuwe and opposite the north end of the Lake the country is broken and hilly, palms are not so noticeable, but the thorns become common and more regular in appearance; often as one looks across some hillside or down a long valley they look park-like in their regularity. One would almost believe they had been planted by hand. Belts of thick bush fringe nearly all the rivers, often being very dense and wide."

After putting aside the duplicates, the Zulu collection, which, as in the previous cases, is presented to the Museum by Mr. Rudd, numbers 222 specimens belonging to no less than 49 species. It thus forms not only one of the most important accessions that the National Collection has ever received from this part of Africa, but, owing to the number of the new forms contained in it, affords a remarkable example of the need for such a scientific survey of the fauna as Mr. Rudd is carrying on in South Africa. Mr. Grant, the actual collector, is also to be congratulated on the striking results that have been obtained from his materials.

Thomas, O. and H. Schwann (1906a). 3. The Rudd exploration of South Africa. IV. List of mammals obtained by Mr. Grant at Knysna.

Owing to its possession of one of the few forest areas in Cape Colony, Knysna, at the centre of the southern coast, has always occupied an important position in the history of South African zoology. The name occurs again and again in the literature, from the date of Sir Andrew Smith onwards, and it was therefore thought advisable that a series from so interesting a locality should be obtained by Mr. Grant as part of Mr. C.D. Rudd's magnificent exploration of South African Zoology.

Mr. Grant therefore went to Knysna in December 1904, and stayed until the middle of January 1905, when he went for a month to Plettenberg Bay, in the near neighbourhood, after which he again worked at Knysna until April 23rd, when he left for the Transvaal. He was thus in the Knysna district throughout the southern summer.

The series now dealt with consists of about 150 specimens belonging to 31 species and subspecies, of which four have required descriptions as new. Of these by far the most interesting is the district Forest Golden Mole, named in honour of Mrs. Rudd *Amblysomus corriæ*, of which Mr. Grant obtained a good series. The species was described in an earlier communication, in order that its skull might be figured in company with that of the Zululand form discovered previously by Mr. Grant.

As usual, the whole series is and will be of the utmost value in more fully working out the details of S. African Mammalogy. Indeed, the lists we are giving of the Rudd collections as they come in are only a first commencement of the use that they will be to Science. For as they accumulate different specialists are enabled to take up group after group, and such useful revisions as that of the *Arvicanthis pumilio* group by Mr. R. C. Wroughton, or of the South African *Rhinolophi* by Mr. Knud Andersen, are thereby rendered possible. To such revisions our lists are a mere preliminary, though we hope that in addition to fulfilling the necessary work of describing the new forms they may also serve a useful purpose from a geographical point of view.

Mr. Grant's notes on the collection are as follows:

The country around Knysna is decidedly mountainous, varying from sea-level to over 4000' within a few miles. The highest point of the Outeniqua Mountains is 4666'.

Many miles of the country, especially to the N.E. of Knysna, are covered with dense forest, which becomes more patchy to the east and west, and in many parts is confined to the kloofs and rivers. The principal trees are yellow wood, iron-wood, stinkwood (laurel), witel, and coomassie. In the more open places along the banks of the main road ferns are very plentiful.

The open parts are grassy downlands, covered here and there with scrub (fine bush) and sugar-bush.

The first half of my visit was spent in the forest-region and the latter half in the open veldt at Plettenberg Bay, which is about 20 miles east of Knysna.

Thomas, O. and H. Schwann (1906b). 1. The Rudd exploration of South Africa. V. List of mammals obtained by Mr. Grant in N.E. Transvaal.

After completing the work at Knysna, of which we gave an account in our last paper, Mr. Grant journeyed by way of Delagoa Bay and Pretoria to the Zoutpansberg District of the Transvaal, a region hitherto practically untouched, so far as the collections in the National Museum are concerned. Indeed, the whole drainage-area of the Limpopo had been remarkably little worked, such few collection as had been sent from within it having been from its northern part in Matabililand or the western in Bechuanaland, the Limpopo part of the Transvaal having been quite neglected.

In this interesting region Mr. Grant has worked with his usual energy and success, and his collection includes 250 specimens belonging to 51 species. This fine series, by Mr. Rudd's generosity, is as before, added to the treasures of our National Museum.

The localities at which the collection was made were two - Klein Letaba on the low veldt, and Woodbush on the high veldt; and these localities are so distinct from each other both geographically and zoologically, that we have thought it advisable to separate altogether the collections received from them and to write two distinct lists as follows: -

I. Klein Letaba.
Klein Letaba is situated in about 23° 21' S. and 30° 40' E., on a branch of the Letaba River, which runs south-eastwards to ??? the Olifants River, uniting again still further eastwards with the main stream of the Lower Limpopo. It is at an altitude of about 1000 feet to the east of and below the high range of the ???kensbers.

Its mammal fauna proves to be more like that of the high veldt than one would have expected from the difference in altitude, so that we are disappointed to find fewer of the coast and tropical forms than we had hoped, and it is evident that to get the true coast fauna a still lower level must be visited.

Even here, however, several interesting northern forms have been added to the South African list, the most notable being a representative of the Nyasan *Raphicerus sharpei*, an Antelope so strikingly different from any South African species that the tardiness of its discovery is somewhat surprising. Other interesting forms are a new *Helogale* and two new Genets.

Mr. Grant's notes on the Klein Letaba district are as follows: "The low veldt, that is the country under the Berg, is mainly undulating grass country with long stony rises and some few kopjes and mountains.

"It is thickly timbered, principally with Mopani (Shinatsi of the Tchangaan); a large, fine-growing tree called Ntuma, which bears a small green fruit; the Marula, on the berries of which *Funisciurus cepapi* feeds and from which the natives make beer; 'wait-a-bit' thorns ("Ikaya"); and wild fig and cream-of-tartar trees.

"Water is scarce in the dry season and only to be found in the main rivers that intersect the country, except for some few pools left in the rocks in some of the spruits. The soil is sandy and very fertile in good rainy seasons. The climate is not healthy, and the weather generally very warm. The thermometer frequently records 106° and seldom less than 90° in the shade.

"The natives are tribe called the Tchangaan, and are an offshoot of the Zulu nation. They have a language of their own, but all understand Zulu and speak it readily. Though very keen on hunting big game, they gave but little assistance in securing small mammals."

Thomas, O. and H. Schwann (1907). 4. The Rudd exploration of South Africa. VI. List of mammals obtained by Mr. Grant in the Eastern Transvaal.

During April and May, before going down into the hotter coast-belt, Mr. Grant made a stay at Legogot, a village in the northern part of the Barberton district, at an altitude of about 3000 feet. There he obtained the Mammals recorded in the following list.

One species, a Shrew, is new, while the most valuable of the other animals are the additional specimens of *Pronolagus ruddi*, the large ally of the Rooi-haas, the description of which was based on a specimen collected in Zululand at an earlier stage of the Rudd Exploration.

Before going to Legogot Mr. Grant made a small collection at a place called Turfloop, between Pietersburg and Woodbush, in the North-Eastern Transvaal; but as he obtained no examples of species not mentioned in our list of his Woodbush collection, we do not think any list of them.is necessary.

Thomas, O. and R. C. Wroughton (1908a). The Rudd exploration of South Africa. VIII. List of mammals obtained by Mr. Grant at Beira.

Long as the region of Beira and the Pungwe River has been known as a paradise for sportsmen, no scientific collection of mammals appears ever to have been made there, and certainly our own National Museum has never received any specimens from the district. Consequently the present collection, obtained by Mr. Grant for the Rudd Exploration, is of very great value as filling in the geographical gap between Inhambane, whence came the magnificent series enumerated in our previous paper, and the better known regions of the Zambezi and Nyasaland.

The results, from the point of view of geographical distribution, are in many cases most curious and interesting, and show the necessity for such systematic explorations as this of Mr. Rudd's before we can consider our knowledge on the subject to be at all complete. For example, in the case of *Petrodromus* one would have supposed that the same form would occur as at Inhambane further southwards, since a closely allied one is found on the coast further north in East Africa. But instead a

member of quite another group - *P. tetradactylus*, an inhabitant of the higher inland region from Nyasa to S. Rhodesia - here reaches the East coast area, and isolates the Inhambane species from its northern ally.

Then, again, the *Georychus* is much more closely allied to the Bechuanaland *G. lugardi* than to *G. darlingi* of Mashonaland, intermediate in geographical position.

There are evidently therefore very many interesting problems still to be determined about the geographical distribution of the species, and about the faunal areas into which the country should be divided.

Twenty-nine species are included in the present collection, represented by 129 specimens, all, as before, added to the National Museum by the generosity of Mr. C. D. Rudd.

The collection was made in two localities, the one just outside Beira, and the other, Masembeti, on the Railway 23 miles from that place.

Mr. Grant's report on the region is as follows:

"The Beira District may briefly be described as low lying, flat country, with patches and stretches of forest alternating with open plains clotted with palmetto, bamboo brakes and ant-heaps, and with vleis and lakes in the lowest parts.

"In the wet season the whole country, except the higher forested portions, is one vast swamp and the vegetation is both thick and high.

"Natives are few and scattered, as there is little habitable veldt on which crops can be grown.

"The climate during the wet season is by no means healthy, and although the thermometer may not always record high temperature, it is generally sultry and muggy. Collecting work is difficult and the damp heat is most enervating.

"Throughout the trip the weather was warm, average temperature 86° in the shade. There was plenty of rain, especially during the latter half, which was undoubtedly bad for trapping work; this combined with the scarcity of mammals in the district, and the ravages of ants which completely destroyed numbers of trapped specimens, prevented the collection made from being larger.

"The scarcity of mammals, especially the smaller ones, is probably due to the annual flooding of the country, as numbers must be drowned out and killed during the rainy season."

Thomas, O. and R. C. Wroughton (1908c). The Rudd exploration of South Africa. X. List of mammals collected by Mr. Grant near Tette, Zambesia.

We now come to the final collection of the Rudd Exploration, for after making it Mr. Grant had a severe attack of fever, and by arrangement with Mr. Rudd he has now come home, so that this magnificent exploration, which has been going on for the last five years, thus comes to an end.

Further details of the papers written on the different collections are appended to the present account, but we may here say that the results of Mr. Rudd's splendid generosity have far surpassed, in their great and permanent value, our most sanguine -expectations - a fact for which the fullest credit must also be given to the collector, Mr. C. H. B. Grant, who has risen in the ablest manner to the great opportunity afforded him by Mr. Rudd.

The total results form the largest collection of Mammals ever received by the National Museum from any one source, the nearest approaches to it being the products of the Simons and Robert expeditions to S. America, and the Duke of Bedford's Exploration of Eastern Asia, the last-named being still in progress.

In all 1541 mammals, exclusive of duplicates, have been registered as presented to the National Museum by Mr. Rudd, while duplicates have been presented to the Royal Scottish Museum, Edinburgh, and the South African Museum, Cape Town.

A considerable and quite unexpected number of new species and subspecies have been discovered, and, what is quite as important, most of the old species, insufficiently or inexactly described on specimens now deteriorated, have been definitely identified by topotypes, and are represented by good modern material, which may be made the basis of further progress.

In this connection the Tette series, of which we give an account in the present paper, is of especial importance; for every worker on South African zoology has been hampered by the difficulty of making out with exactitude the species obtained during Dr. Peters's famous expedition to Zambesia, and described by him in his 'Reise nach Mossambique,' of which the 'Saugethiere' was published in 1852.

In order, therefore, to get a series of the species described by Peters, Mr. Grant went to Tette, Peters's chief collecting-place, and formed the series enumerated below.

While we were working out this series, the definite determination of Peters's species has enabled us to sort out a number of the groups, with the result that many forms hitherto assigned, in our papers and elsewhere, to Peters's species, now prove to need description.

Mr. Grant's notes on the Tette district are as follows:

"It was the driest time of the year when I reached Tette, and, except in the main rivers, there was practically no water anywhere, and as, on the Zambesi near Tette, there were too many natives present for it to be possible to collect, I moved southwards and pitched my camp at the junction of the Luenya and Mazoe Rivers, which is some 20 miles due south of Tette.

"The country there is exactly similar to that along the Zambesi, being hilly, and in places somewhat mountainous; the soil is sandy and very stony, especially on the hill-sides, but there are no krantzes that would harbour dassies or red hares.

"All the vegetation, except along the rivers, was dried and dead and the trees leafless, the course of the rivers being plainly shown from a distance by the verdure of the trees on their banks.

"Everywhere the veldt is well bushed, amounting to thickets in most parts, with a fair amount of larger timber, mainly *mopani* and 'cream-of-tartar,' the latter being very plentiful and growing to an enormous size.

"Except in favourable situations, grass does not seem to grow freely, and the cereal crops of the natives are not nearly so good as in many districts to the southward, although tomatoes, onions, &c. are grown freely on the banks and in the beds of the rivers.

"The natives are mixed local tribes variously known as Nyungwis, Tongas, Baruds, &c. When not too lazy they give much of their time to the capture of small buck, cats, squirrels, rats, &c., the majority of which they utilize for food.

"The climate cannot be considered healthy, even in the dry season, and the temperature is generally high during the day and makes good collecting difficult.

"In the five weeks I spent in the Mazoe camp the average temperature was 95°, 104° being the highest recorded; no rain fell."

Thomas, O. and R. C. Wroughton (1910). Ruwenzori expedition reports. 17. Mammalia.

The collection of Mammalia formed by the members of the Ruwenzori Expedition is, perhaps, both for number and quality, the finest ever made in any one locality in Africa, the British Museum set alone consisting of 363 perfectly prepared modern skins and 62 spirit-specimens, representing 85 species

and subspecies, of which no less than 34 have proved to be new. In addition, a considerable number of duplicates have been distributed.

This excellent result is due partly to the extreme richness of the Fauna, which combines elements of Congo, Cameroons, Uganda, and Great Lakes origin, and partly to the fact that no less than three members of the Expedition had had previous and successful experience in mammal-collecting - Messrs. Woosnam and Dent in Bechuanaland, and Mr. Carruthers in Palestine. All were trained and enthusiastic trappers, and, as a result, in spite of the climatic conditions under which they worked, the preparation of the skins is absolutely perfect.

So rich and varied, however, is the Fauna of Ruwenzori that no doubt much still remains to be done, especially among such forms as are not to be obtained by trapping, the list of Monkeys, Bats, and Ungulates being particularly likely to be increased in the future, while the series of Rodents is probably more complete in proportion than that of any other group.

As was to be expected, a considerable number of new species were discovered by the Expedition, many of them of a very striking and distinct character. Particularly noticeable are *Cercopithecus denti, Rousettus lanosus* (the Mountain Fruit-Bat), *Lophuromys woosnami, Otomys dartmouthi*, and *Funisciurus carruthersi*,

The following is a complete list of the new forms discovered, with references to the original notices. A. is the first set of descriptions published by Thomas (Ann. Mag. N. H. (7) xviii. pp. 136 *et seqg.*, 1906) and B. the second (*op. cit.* six. pp. 118 *et seqq.*, 1907).

Thonglongya, K. (1973). First record of *Rhinolophus paradoxolophus* (Bourret, 1951) from Thailand, with the description of a new species of the *Rhinolophus philippinensis* group (Chiroptera, Rhinolophidae).

Une collection récente de chauves-souris de Thailand comprend un spécimen de *Rhinolophus paradoxolophus*, (Bourret, 1951) décrit du nord Vietnam et connu seulement jusqu'à présent par l'holotype. Dans cette collection se trouve également un spécimen d'une espèce nouvelle, *Rhinolophus marshalli*, du groupe de *R. philippinensis*, alliée à *R. paradoxolophus* et a sa faune la plus proche, *R. rex* Allen, 1923.

A new species of the *Rhinolophus philippinensis* group is described from Thailand as *Rhinolophus marshalli*, and the second known specimen of *Rhinolophus paradoxolophus* Bourret is reported from that country. The affinities of both to *Rhinolophus rex* Allen are examined, with an appraisal of the taxonomic position of the three species within the *philippinensis* group.

Thorn, E. (1988a). Re-evaluation of *Pipistrellus capensis capensis* (A. Smith, 1829) (Chiroptera, Vespertilionidae) and neighbouring subspecies in Southern Africa.

The considerable differences typifying several subspecies of *Pipistrellus capensis*, and the overlapping distribution of these forms in South Africa, suggest that they have evolved for some time in isolation but are presently re-integrating and sporadically interbreeding as a result of recent ecological changes. Confusion has been superimposed on this unusual situation by the choice as lectotype for *P. c. capensis* of a specimen typical of the larger western subspecies, and subsequent designation of its type locality in a place marginal to that form.

Les tres importantes différences qui existent entre plusieurs sous-espèces de *Pipistrellus capensis*, et le fait que leur répartition se superpose en Afrique du Sud, permet de penser qu'elles ont évolué de facon isolée pendant un certain temps et qu'ensuite leurs populations se sont étendues et se sont par place métissées a la suite de récentes modifications écologiques. Une certaine confusion a été introduite dans la systématique du fait qu'on a choisi comme lectotype de *P. c. capensis* un specimen

d'une plus grande sous-espèce occidentale, dans une localite type qui est marginale dans la répartition de cette forme.

Thorn, E. (1988b). The status of *Pipistrellus capensis notius* (=*Scabrifer notius* G.M. Allen, 1908) as prior synonym for *Eptesicus melckorum* Roberts, 1919).

From the study of type specimens and other material it is now concluded that *Eptesicus melckorum* Roberts is a junior synonym of *Pipistrellus capensis notius* (G. Allen), the largest and most southern subspecies of this common Vespertilionid bat.

La description par G. Allen (1908) de *Scabrifer notius* a tenu compte de "verrues" sur les avant-bras; à cause de cela l'holotype (qui est resté unique) avait été longtemps apparenté à d'autres espèces garnies de boutons sur les ailes et originaires du Soudan et d'ailleurs. En 1975, Koopman a suggéré que *notius* n'est pas autre chose qu'un representant de *P. capensis* parasité par des nematodes. L'examen par l'auteur de l'holotype de *notius* et de celui de *melckorum*, et des échantillons attribués à ce dernier, montre ici que *melckorum* de la région du Cap doit être considéré cornme synonyme de *Pipistrellus capensis notius*. Des spécimens additionnels indiquent la répartition normale de *P. c. notius*, et parmi quelques individus vagabonds l'un a pénétré à mille kilomètres au nord. Il y a d'autres exemples de *P. capensis* avec des vésicules sur les ailes. D'après certains témoignages, on peut aussi reconnaître comme une espèce distincte *P. "melckorum"* (*sensu* Ansell 1960, 1967) de Zambie, Tanzanie, Mocambique, et récemment découvert au nord-est du Transvaal.

Tomes, R. F. (1861b). 1. Notes on a collection of bats made by Mr. Andersson in the Damara country, South-western Africa, with notices of some other African species.

Through the kindness of J. H. Gurney, Esq., M.P., I have been enabled to examine a very interesting, though not very extensive, collection of Bats, made by Mr. Andersson in South-western Africa during the year 1859. It contains three new species; and I propose, when describing them, to add notices of some others previously collected by Mr. Andersson at Lake Ngama, and of one or two species which, although already well known, may, from their affinity with some of those in the present collection, be advantageously introduced here. To prevent any confusion regarding the species forming the collection recently received from Mr. Andersson, they may be mentioned here, as follows: - *Kerivoula argentata*, n. s., *Nycticejus planirostris*, Peters, *Scotophilus minutus*, Temm., *S. rusticus*, n. s., and *S. variegates*, n. s.

The remaining species mentioned in this paper are - *Scotophilus capensis*, from the Cape of Good Hope, collected by M. Verreaux, *Miniopteris schreibersii* and *Molossus limbatus*, both collected by Mr. Andersson at Lake Ngama, and *Scotophilus kuhlii*, collected in Algeria by the Rev. H. B. Tristram.

Toschi, A. (1954). Elenco preliminare dei mammiferi della Libia.

A tassonomic checklist of species and subspecies of the Mammals known for the Lybian territory and its southern boundaries is given.

Besides some mammals recently collected by Mr. KENNETH GUICHARD in the last country have bepu identified and mentioned.

The checklist is completed by some kies and outlines for the identification of genera aud species and comments on the validity and systematic position of some forms.

Toschi, A. (1956). Missione del prof. G. Scortecci in Somalia nel 1955. Mammiferi.

Ringrazio il Chiar.mo Prof. Scortecci per avermi offerta la opportunità di studiare la piccola collezione di Mammiferi da Lui raccolti in Somalia ed il Sig. R. W. Hayman del British Museum (Natural History) di Londra per l'assistenza prestatami nelle determinazioni.

La raccolta comprende n. 29 esemplari appartenenti a 15 forme diverse e non manca di interesse sistematico e faunistico, poiché comprende esemplari scarsamente raccolti e studiati di un paese in cui questo gruppo di animali non può certo ritenersi ben noto.

Trewhella, W. J., P. F. Reason, K. M. Clark and S. R. T. Garrett (1998). The current status of Livingstone's flying fox (*Pteropus livingstonii*) in the Federal Islamic Republic (RFI) of the Cornores.

Pteropus livingstonii is an Old World fruit bat (Megachiroptera Pteropodidae) from the RFI Comores. Recent surveys show a population estimate of around 400 individuals, with natural forest being its preferred habitat. *P. livingstonii* is currently categorized as Critically Endangered (A1c+2cd, B1+2c, C2a) in the IUCN Red List categories for animals. In light of the survey results and the known distribution of this species, it appears that this categorization may be over-cautious. Although more data are desirable, we conclude that Endangered (A1c+2cd, B1+2c, C2a) is presently a more appropriate category for this species.

Trujillo, D. (1992). Murcielagos de las Islas Canarias.

Desde TOMES (1859) hasta HUTTERER (1979), la información conocida sobre murciélagos de las Islas Canarias, como muy bien señalan IBÁÑEZ y FERNANDEZ (1985b), era más bien escasa, reduciéndose a citas aisladas y a otras que formaban parte de publicaciones faunísticas más amplias.

En 1985, IBÁÑEZ y FERNANDEZ recopilan y amplían los datos existentes sobre quirópteros de la Comunidad Canaria y publican también ese año un trabajo sobre el estatus taxonómico de *Plecotus teneriffae*. Posteriormente, en 1988, TRUJILLO, BARONE y GONZALEZ citan *Nyctalus leisleri* para las islas, elevando a siete el número de especies conocidas para esta región.

Desde junio/julio de 1980, que fue el primer contacto que tuvimos con este orden de mamíferos, hasta el 10 de mayo de 1988, junto con RUBEN BARONE TOSCO, habíamos realizado los trabajos de campo sin ningún tipo de financiación oficial. Además, del 9 al 26 de septiembre del 87, la recogida de datos se llevó a cabo junto con el Dr. CARLOS IBÁÑEZ ULARGUI.

A partir del 10 de mayo del 88, hasta el 31 de diciembre de ese mismo año, el ICONA financió un estudio sobre los murciélagos de las Islas Canarias, com especial dedicación al conocimiento de esta fauna en sus Parques Nacionales al autor de este trabajo.

Los objetivos que se fijaron fueron:
- Conocer las especies de quirópteros que habitaban en los Parques Nacionales de las Islas Canarias.
- Ampliar los conocimientos sobre biología, ecología, distribución y estatus de las especies.
- Establecer las medidas necesarias para proteger y conservar estas especies.

Considero que, dado el escaso presupuesto con el que se contaba, el insuficiente material y el corto período de estudio, los resultados han sido positivos y los objetivos han sido alcanzados e incluso ampliados, ya que la información que se ofrece en este trabajo no se limita tan sólo a los cuatro Parques Nacionales de las Islas Canarias, sino que recoge todo nuestro trabajo llevado a cabo desde 1980.

Señalar algunas consideraciones generales que permiten entender mejor las características biológicas de los murciélagos de Canarias. El hecho de que las Canarias Occidentales tengan mayor número de espécies de quirópteros que las Orientales (al menos que Lanzarote y Fuerteventura) se debe a la

mayor altitud de las primeras y, consiguientemente, a que poseen una gran diversidad de hábitats, como ya señalaron IBÁÑEZ y FERNANDEZ (1985b).

Los insecticidas utilizados en la década de los años 50 para combatir las plagas de langosta africana *Schistocerca gregária*, debieron de diezmar de manera muy notable las poblaciones de murciélagos de las Islas Canarias, sobre todo em las islas de Gran Canaria y Tenerife, a tenor de los numeroros comentarios de los lugareños de ambas islas, y a nuestra propia experiencia. Como ejemplo decir que en un viaje realizado a la isla de Gran Canaria en julio de 1987, visitamos 11 cuadrículas, de las cuales, sólo en una detectamos la presencia de quirópteros, concretamente 2 *Pipistrellus* sp.

Es interesante señalar que en Canarias se observan quirópteros durante todos los meses del año, al menos en las zonas bajas y medias de las islas; evidentemente este hecho se produce debido a la benignidad del clima del Archipiélago Canario.

Por otro lado, parece un tanto curioso, teniendo en cuenta la peculiaridad anteriormente señalada del clima de estas islas, que la fenología de la reproducción tenga lugar, en principio, y basándonos en los escasos datos de que disponemos, en los mismos meses que en la Península Ibérica. No obstante, este hecho hay que tomarlo con ciertas reservas, no descartando la posibilidad de que en islãs como Fuerteventura, de poca altitud y muy árida, pudiera ocurrir más tempranamente.

Comentario aparte merece la isla de Lanzarote. En las dos visitas realizadas a esa isla y al Parque Nacional de Timanfaya, no observé ni un sólo ejemplar de murciélago viviente. Además de las cuevas prospectadas (ver Anexo II), se registraron tres galerías de agua en el Risco de Famara, colocando redes japonesas en ellas, sin obtener resultado alguno.

También coloqué redes japonesas en el Jameo de los Almecenes (donde se han hallado restos óseos de *Pipistrellus kuhli*), y nylon s en el estanque del Barranco de Chafarís. Realicé varias visitas a la Presa de Mala y al Barranco de Tenegüime ... , en definitiva, recorrí la mayor parte de los lugares que pudieran resultar adecuados para los murciélagos, y la búsqueda resultó infructuosa. Probablemente, la razón principal estriba en la escasez de vegetación, lo que trae consigo una densidad baja de lepidópteros nocturnos. En todos los trayectos realizados por la isla, durante la noche, no se veían apenas insectos. Por las mismas fechas en la isla de Fuerteventura, se podía observar gran densidad de lepidópteros nocturnos, y también de quirópteros.

Trujillo, D. and R. Barone (1991). La fauna de quiropteros del archipelago Canario.

La fauna de quirópteros Del Archipiélago Canário está compuesta por um total de siete espécies: *Pipistrellus kuhlii, P. maderensis, H. savii, Nyctalus leisleri, Barbastella barbastellus, Plecotus teneriffae* y *Tadarida teniotis*.

En esta artículo se amplían y actualizan los conocimientos sobre cada uma de las espécies (corologia, ecologia, biologia, estatus y conservacíon).

El Orejudo Canario (*P. teneriffae*) ES uma espécie endêmica del Archipiélago Canário, mientras que el Murciélago de Madeira (*P. maderensis*) es um endemismo macaronésico (Canarias y Madeira). También es muy probable que el murciélago de Bosque (*B. barbastellus*) represente un táxon exclusivo a nível subespecífico en nuestra Comunidad Autônoma.

In Canary Islands bat fauna is composed by seven species: *Pipistrellus kuhlii, Pipistrellus maderensis, Hypsugo savii, Nyctalus leisleri, Barbastella barbastellus, Plecotus teneriffae* y *Tadarida teniotis*.

In this paper knowledges on corology, ecology, biology and conservation of all Canary species are updated.

Plecotus teneriffae is an endemic species of this islands, being *Pipistrellus maderensis* as macaronesic endemism (Madeira and Canary Islands). *Barbastella barbastellus* could also likely represent an endemic subspecies of our Islands.

Tsita, J. N. (1993). Reproductive biology of the Egyptian free-tailed bat, *Tadarida aegyptiaca*.

The reproductive biology of *Tadarida aegyptiaca* was studied using specimens collected in the Cape Province of South Africa. The morphology of the reproductive tract of the species was generally similar to that of other molossids, however, the absence of Cowpers glands was unusual. Spermatogenesis began in February and spermatozoa were released to the cauda epididymis during August and September. Follicular development started in March and culminated with the appearance of Graafian follicles in July. Ovulation probably occurred in August and specimens were pregnant by September. Gestation length was estimated to be four to five months and a single young was born in December. The data suggest that *T. aegyptiaca* is monotocous and monoestrous.

Tuttle, M. D. and D. Stevenson (1982). Growth and survival of bats.

The literature on bat growth and survival is extensive. Nevertheless, few studies have made or permit within or among species comparisons of performance under varied combinations of biological and physiological parameters. In particular, surprisingly few studies have taken advantage of the fact that many species occupy wide ranges of environmental conditions. Growth and survival frequently have been treated as species-specific constants. Such treatment neglects many important determinants of success and likely has inhibited meaningful hypothesis testing and further investigation. Despite these limitations, existing studies demonstrate impressive variation. In fact, available literature indicates that few if any details of growth and survival are constant over time, even for individual colonies within a single species.

Detailed descriptions of growth and developmental stages in bats are already available (Orr, 1970). Krátky (1970), Fenton (1970b), Kunz (1973), and Pagels and Jones (1974) provide additional observations on the development of dentition and pelage, and Buchler (1980), and Brown and Grinnell (1980) review and report on the ontogeny of echolocation. Further specifics of growth and development and maternal care in phyllostomid bats are provided by Kleiman and Davis (1979). A number of survival studies are available and will be cited along with a discussion of their methods of analysis. Where possible, we will not restate previously available details of chiropteran growth and survival, but we will emphasize within and among species comparisons of adaptive responses to different environments. Our discussion will focus on variation and its probable causes, in an attempt to stimulate future investigations of a comparative nature.

Uchikawa, K. (1985a). Mites of the genus *Calcarmyobia* (Acarina, Myobiidae) with information on the taxonomy of their host bats of the genus *Miniopterus* (Chiroptera, Miniopteridae).

The tendency to regard the genus *Calcarmyobia* Radford as monotypic was prevalent until the beginning of the 1970s. The eight known species of the genus have been described on strict definition of each species (Uchikawa, 1982), and it is gradually proved that the mites of the genus *Calcarmyobia* are specific parasites of bats of the genus *Miniopterus*. Referring to the present knowledge of the mites, such formerly proposed specific names *Calcarmyobia miniopteris* and *C. parenzani* for species from South Africa and Europe, respectively, as well as some host records, should be revised (Uchikawa, 1984).

Mites of the genus *Calcarmyobia* have been evaluated as good indicators in the taxonomy and phylogeny of their host bats (Uchikawa & Harada, 1981). As the taxonomy of *Miniopterus* is not in a satisfactory state, an accumulation of records of the mites is believed to give a clue for solving some complicated problems in this area.

The present author had an opportunity to examine for ectoparasites the bat specimens deposited in the collections of the big museums in Europe and the United States. The present paper presents the

records of the five species of the genus *Calcarmyobia* taken during the trip to add to the knowledge of the mites themselves and their host taxonomy.

Uchikawa, K. (1985b). *Calcarmyobia* from the Ethiopian region (Acarina, Myobiidae).

The author has sought to locate as many species and specimens of bats of the genus *Miniopterus* from the Ethiopian region as possible in the collections of the big museums in the United States and Europe for mites of the genus *Calcarmyobia*. All the four known species of the mites from the region were again recorded in the present study (Uchikawa, 1985*b*), and the five new species or subspecies were also found as described below.

All the specimens dealt with in the present paper will be deposited in the collections of the American Museum of Natural History, New York (AMNH), the British Museum (Natural History), London (BMNH), the Museum National d'Histoire Naturelle, Paris (MNHN), Forschungs-Institut Senkenberg, Frankfurt (SMF) or the US National Museum (USNM), where they were collected.

The scales for Figures are the same to those in Figs 1-6.

As the present paper is the fourth and last report on the mites of the family Myobiidae taken from the bats of the genus *Miniopterus* in the big museums, a summary of the mites themselves and, adopting them as indicators, problems in host systematics will be made in discussion.

Uchikawa, K. (1985c). Mites of the genus *Pteracarus* (Acarina, Myobiidae) taken from the bats of the genus *Miniopterus* (Chiroptera, Miniopteridae).

Despite the examination of a large number of specimens of various bats of the genus *Miniopterus*, any mite of the genus *Pteracarus* other than the so far known species, *P. faini* Uchikawa and *P. miniopteri* Uchikawa, was not found from them. This strongly suggests that only the two species represent the *Pteracarus* fauna of *Miniopterus*. It is proved that *P. miniopteri* is prevailing in almost whole range of *Miniopterus*, while *P. faini* is distributed in the Oriental, Australasian and estern Palearctic regions. Based on the host records of the mites, it is suggested that the specific name *schreibersi* has been adopted indiscriminately for so many forms of the bats of the genus *Miniopterus*.

Uchikawa, K. (1991). *Glauconyssus*: a new genus associated with African bats (Acari: Macronyssidae).

Glauconyssus, n. g., is elected for *Glauconyssus tarizaniensis*, n. sp., a parasitic mite of *Glauconycteris poensis* from Mt. Kilimanjaro, Tanzania.

Uchikawa, W. and D. Kock (1989). Revision of the Genera *Hipposiderobia, Triaenomyobia*, and *Binunculoides* (Acarina: Myobiidae) associated mainly with the chiropteran family Hipposideridae (Mammalia).

The 3 myobiid genera, *Hipposiderobia, Triaenomyobia*, and *Binunculoides* are redefined on the basis of recently acquired knowledge on chiropteran Myobiidae. The genus *Hipposiderobia* is divided into the nominate subgenus and new subgenus *Orientobia* represented by 6 and 9 species, respectively. Two new species and a new synonymy within the genus *Hipposiderobia* are presented. The genera *Triaenomyobia* and *Binunculoides* are still monotypic. Measurements and key characters for all species of those genera are tabulated.

Valdivieso, D., R. L. Peterson and J. R. Tamsitt (1979). Morphology of the basisphenoid pits and related structures of the bat *Otomops martiensseni* (Chiroptera: Molossidae).

The morphology and histology of the basisphenoid pits were studied in the bat *Otomops martiensseni* (Chiroptera: Molossidae). The pits are deep and well-defined bony cavities located posteriorly in the nasal pharynx. They are juxtaposed to the opening between the nasal and laryngeal pharynges and anatomically communicate with the middle ear through the auditory tube. Basisphenoid pits may function as resonating chambers for sound waves emitted by the larynx, but experimental research is needed to determine their importance in the sonar system.

Van Cakenberghe, V. (1990). Notes on the systematics of the Rhinopomatidae Dobson, 1878. Abstract.

The Afro-Asiatic family of the Rhinopomatidae of Mouse- or Rat-tailed bats only contains one genus: *Rhinopoma* Geoffroy, 1813, which can be divided into four species: *R. microphyllum* (Brunnich, 1782), *R. hardwickei* Gray, 1831, *R. muscatellum* Thomas, 1903 and *R. macinnesi* Hayman, 1937. This conclusion is based on the study of 15 skull and 14 external measurements and 5 morphological characters of approximately 1150 specimens.

The metrical data were examined using uni- and multivariate statistical techniques. The multivariate analyses substantiate that *R. macinnesi*, which up until now was considered to be a subspecies of *R. hardwickei*, is much smaller than any other representative of *R. hardwickei* and should be retained as a separate species.

The univariate analyses of external measurements show that *R. muscatellum* and *R. macinnesi* can only be separated with great difficulty. This might be an explanation for the literature citations of *R. muscatellum* in Africa. Based on the size of the narial inflations and the dimensions, all these African specimens are considered to belong to *R. macinnesi*. The specimens from Genji represent the first material of *R. muscatellum* from India. *R. muscatellum* is divided into two subspecies: *R. m. muscatellum* and *R. m. seianum*.

Three of the currently recognized subspecies of *R. hardwickei* are retained: *R. h. hardwickei, R. h. cystops* and *R. h. arabium*. *R. hardwickei* has also been examined from the Sundae archipelago. The large geographical separation between these specimens arid their nearest neighbours, *R. h. hardwickei*, in India might lead to the recognition of another subspecies.

Four subspecies are recognized in *R. microphyllum: R. m. microphyllum, R. m. sumatrae, R. m. kinneari* and *R. m. asirensis*. Almost no metrical differences were found between the specimens from Indian and these from Sumatra. However, based on the large geographical separation, the animals from both regions are considered to belong to different subspecies: *R. m. sumatrae* in Indonesia and *R. m. kinneari* in India. Finally, the holotype of *R. m. asirensis* seems to be quite different and is retained as a separate subspecies for the Arabian peninsula.

Van Cakenberghe, V. and F. De Vree (1985). Systematics of African *Nycteris* (Mammalia: Chiroptera).

Based on a number of morphological characters, including the shape of the tragus and the upper incisors and the height of the second lower premolar, four species groups couldbe identified in African *Nycteris*. Of these, only the *N. arge* and the *N. macrotis* groups are discussed in this paper.

Using multivariate statistical techniques on 1343 specimens, we were able to retain four species in the *N. arge* group and only two in the *N. macrotis* group. The distribution and the dimensions of all six species are discussed, along with some remarks on the status of certain forms. Lists of literature citations and material examined are given as well.

Van Cakenberghe, V. and F. De Vree (1993a). The systematic status of Southeast Asian *Nycteris* (Chiroptera: Nycteridae).

Based on multi- and univariate statistical analyses on 233 Southeast Asian *Nycteris* specimens, two species are recognized: *Nycteris javanica* and *Nycteris tragata*. The represent the single, separate *Nycteris javanica* group, which is distinct from the four African species groups: the *hispida, thebaica, macrotis* and *arge* groups.

Par les analyses statistiques multi- en univariées sur 233 spécimens provenant du sud-est de l'Asie, deux espèces de *Nycteris* sont reconnues: *Nycteris javanica* et *Nycteris tragata*. Ces deux espèces représentent un seul groupe: le groupe *Nycteris javanica*, qui se distingue des quatre groupes d'espèces africaines: les groupes *hispida, thebaica, macrotis* et *arge*.

Van Cakenberghe, V. and F. De Vree (1993b). Systematics of African *Nycteris* (Mammalia: Chiroptera) Part II. The *Nycteris hispida* group.

In this paper the systematics of the African *Nycteris hispida* species group is discussed. Using multivariate statistical techniques, three species can be distinguished in this grou: one extremely large *Nycteris grandis* Peters, 1865, and two smaller species: *Nycteris hispida* (Schreber, 1771) and *Nycteris aurita* (K. Andersen, 1912). It is shown why both latter species are generally lumped together, since they are very alike when externa measurements are compared univariably. None of the three species shows sufficient geographical differences to permit subspecific division. Besides biometrical data, the distribution of the three species is discussed and a review of all publications concerning the various forms is presented. Additionally the sexual dimorphism is the different species was examined, indicating that one must be very careful in attributing sexual dimorphism if the specimens originate from a large geographic area.

Van Cakenberghe, V. and F. De Vree (1994). A revision of the Rhinopomatidae Dobson 1872, with the description of a new subspecies (Mammalia: Chiroptera).

The bat family Rhinopomatidae DOBSON 1872 only contains a single genus: *Rhinopoma* GEOFFROY 1813, which can be subdivided into four species: *R. microphyllum* (BRÜNNICH 1782), *R. hardwickei* GRAY 1831, *R. muscatellum* THOMAS 1903 and *R. macinnesi* HAYMAN 1937. This conclusion is based on a biometrical study of 15 skull and 14 external measurements on approximately 1150 specimens. In addition six morphological characters were evaluated. In *R. microphyllum* four subspecies are retained, whereas only two subspecies are recognised in *R. muscatellum* and non for *R. macinnesi*. In addition to the three already known subspecies of *R. hardwickei*, a new one from the Sunda archipelago is described.

Van Cakenberghe, V. and F. De Vree (1999a). Systematics of African *Nycteris* (Mammalia: Chiroptera) Part III. The *Nyteris thebaica* group.

In this paper, the systematics of the African *N. thebaica* group is discussed. Based on multi- and univariate statistical tests, two species are retained within this group: *N. thebaica*, which occurs over almost the entire African continent and the Arabian Peninsula, and *N. gambiensis*, which is limited to West Africa. Based on literature data, the species status of *N. vinsoni* is confirmed. Literature data, measurements and lists of material examined are presentes for each of these species. Unfortunately, even the vast amount of specimens available for this study is still insufficient to decide definitely the status of forms such as *brockmani* and *damarensis*, which at present are considered synonyms of *N. thebaica*.

Van Cakenberghe, V. and F. De Vree (1999b). The Molossid bats (Chiroptera: Molossidae) from Kikwit, Democratic Republic of Congo. Abstract.

The 538 bat specimens in the collection of vertebrates made in Kikwit in the aftermath of the 1995 Ebola haemorrhagic fever epidemic covered 18 species. More than half of these animals (364 specimens) were representatives of seven species belonging to the Molossidae: *Chaerephon ansorgei* (Thomas, 1913), *Chaerephon pumila* (Cretzschmar, 1826), *Mops (Mops) condylurus* (A. Smith, 1833), *Mops (Xiphonycteris) nanulus* J.A. Alien, 1917, *Mops (Mops) niveiventer* Cabrera & Ruxton, *Mops (Xiphonycteris) thersites* (Thomas, 1903), and *Myopterus whitleyi* (Scharff, 1900). The number of specimens per species varied between 1 for *M. thersites* to 213 for *C. pumila*.

On all of these specimens 28 cranial and 14 external measurements were taken and a number of morphological characters were evaluated, e.g. the shape of the last upper molar, the presence of a sagittal crest, the size and position of the basisphenoid pits.

Since it is often rather difficult to distinguish between the representatives of *M condylura* and those of *M. niveiventer*, some of the morphological differences between these species as well as the results of multivariate statistical analyses will be presented.

Les 538 spécimens de chauve-souris de la collection de vertèbres de Kikwit datant du regain de l'épidémie de la fièvre hémorragique Ebola de 1995 ont livre 18 espèces. Plus de la moitié de ces animaux (364 spécimens) appartiennent a 7 espèces de Molossidae: *Chaerephon ansorgei* (Thomas, 1913), *Chaerephon pumila* (Cretzschmar, 1826), *Mops (Mops) condylurus* (A. Smith, 1833), *Mops (Xiphonycteris) nanulus* J.A. Alien, 1917, *Mops (Mops) niveiventer* Cabrera & Ruxton, *Mops (Xiphonycteris) thersites* (Thomas, 1903), et *Myopterus whitleyi* (Scharff, 1900). Le nombre de spécimens par espèce varie de 1 pour *M. thersites* à 213 pour *C. pumila*.

Pour tous ces spécimens on a mesuré 28 caractères crâniens, 14 caractères externes tandis que plusieurs caractères morphologiques ont été évalues comme la forme de la molaire 3 supérieure, la présence d'une crête sagittale, la taille et la position du trou basisphenoïde.

Bien qu'il soit difficile de distinguer *M. condylura* de *M. niveiventer*, quelques-unes des différences morphologiques ainsi que les résultats des analyses statistiques multivariées seront présentés.

Van Cakenberghe, V., F. De Vree and H. Leirs (1999). The bats (Chiroptera) from Kikwit, Democratic Republic of Congo. Abstract.

The collection of vertebrates made in Kikwit in the aftermath of the 1995 Ebola haemorrhagic fever epidemic included 538 bat specimens, representing 18 species. This collection contains large numbers of a very common species, *Chaerephon pumila* (Cretzschmar, 1826), but also of *Chaerephon ansorgei* (Thomas, 1913), which was not yet reported in such large numbers. Other rather common African bat species - e.g. *Pipistrellus (Pipistrellus) nanus* (Peters, 1852) - are represented with a limited number of specimens only. Surprisingly, some rare species were found to be present in the collection: e.g. *Casinycteris argynnis* Thomas, 1910, *Miniopterus minor* (Peters, 1866), *Myopterus whitleyi* (Scharff, 1900), especially when the limited time over which the collection is made (10 June till 28 August), is considered.

The remaining species include: *Epomops franqueti* (Tomes, 1860), *Micropteropus pusillus* (Peters, 1867), *Megaloglossus woermanni* Pagenstecher, 1885, *Nycteris hispida* (Schreber, 1775), *Eptesicus (Neoromicia) somalicus* (Thomas, 1901), *Eptesicus tenuipinnis* (Peters, 1872), *Myotis (Leuconoe) bocagei* (Peters, 1870), *Scotophilus dinganii* (A. Smith, 1833), *Mops (Mops) condylurus* (A. Smith, 1833), *Mops (Xiphonycteris) nanulus* J.A. Alien, 1917, *Mops (Mops) niveiventer* Cabrera & Ruxton, 1926, and *Mops (Xiphonycteris) thersites* (Thomas, 1903).

For each of these species, the distribution in relation to the outbursts of the Ebola epidemics is discussed.

La collection de vertèbres faite a Kikwit au cours du regain de l'épidémie de fièvre hémorragique Ebola de 1995 comprend 538 spécimens de chauve-souris, représentant 18 espèces. Cette dernière comprend de très grandes quantités d'espèces très communes, comme *Chaerephon pumila* (Cretzschmar, 1826), mais aussi *Chaerephon ansorgei* (Thomas, 1913), qui n'avait pas encore été signalée en si grand nombre. Les autres espèces communes de chauves-souris africaines, par exemple *Pipistrellus (Pipistrellus) nanus* (Peters, 1852), sont présentés en nombre limite ici. De façon plus surprenante, surtout quand on considère la durée limitée des collections (10 juin au 28 août), quelques espèces rares ont été trouvées, comme *Casinycteris argynnis* Thomas, 1910, *Miniopterus minor* (Peters, 1886), et *Myopterus whitleyi* (Scharff, 1900).

Les autres espèces collectées comprennent: *Epomops franqueti* (Tomes, 1860), *Micropteropus pusillus* (Peters, 1867), *Megaloglossus woermanni* Pagenstecher, 1885, *Nycteris hispida* (Schreber, 1775), *Eptesicus (Neoromicia) somalicus* (Thomas, 1901), *Eptesicus tenuipinnis* (Peters, 1872), *Myotis (Leuconoe) bocagei* (Peters, 1870), *Scotophilus dinganii* (A. Smith, 1833), *Mops (Mops) condylurus* (A. Smith, 1833), *Mops (Xiphonycteris) nanulus* J.A. Allen, 1917, *Mops (Mops) niveiventer* Cabrera & Ruxton, 1926, et *Mops (Xiphonycteris) thersites* (Thomas, 1903).

Pour chacune de ces espèces, leur distribution en fonction du déclenchement des épidémiques d'Ebola est discutee.

Van Den Bussche, R. A., R. J. Baker, J. P. Huelsenbeck and D. M. Hillis (1998). Base compositional bias and phylogenetic analyses: a test of the "Flying DNA" hypothesis.

Phylogenetic methods can produce biased estimates of phylogeny when base composition varies along different lineages. Pettigrew (1994, Curr. Biol. 4: 277 - 280) has suggested that base composition bias is responsible for the apparent support for the monophyly of bats (Chiroptera: megabats and microbats) from several different nuclear and mitochondrial genes. Pettigrew's "flying DNA" hypothesis makes several predictions: (1) that metabolic constraints associated with flying result in elevated levels of adenine and thymine throughout the genome of both megabats and microbats, (2) that the resulting base compositional bias in bats is sufficient to mislead phylogenetic methods and account for the support for bat monophyly from several nuclear and mitochondrial genes, and (3) that phylogenetic analysis using pairwise distances corrected for compositional bias should eliminate the support for bat monophyly. We tested these predictions by analyzing DNA sequences from two nuclear and three mitochondrial genes. The predicted base compositional bias does not appear to exist in some of the genes, and in other genes the differences in AT content are very small. Analyses under a wide diversity of criteria and models of evolution, including analyses that take base composition into account (using log-determinant distances), all strongly support bat monophyly. Moreover, simulation analyses indicate that even extreme bias toward AT-base composition in bats would be insufficient to explain the observed levels of support for bat monophyly. These analyses provide no support for the "flying DNA" hypothesis, whereas the monophyly of bats appears to be well supported by the DNA sequence data.

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van der Merwe, M. (1973a). Aspects of temperature and humidity in preferred hibernation sites of the Natal clinging bat *Miniopterus schreibersi natalensis* (A. Smith, 1834).

In the Transvaal, *Miniopterus schreibersi natalensis* forms hibernating colonies during May-July on the highveld where the ambient and cave temperatures are lower than in the lowveld. In two highveld caves, mating and hibernating colonies were resident from January to the end of July, but only one cave was occupied for hibernating during the winter. In the cave selected for hibernation humidity was lower, and fluctuated more, than in the other cave. Temperature also fluctuated more, but tended to average lower, than in the unused cave. It appears that low temperature rather than high humidity determined the choice of a hibernating cave.

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van der Merwe, M. (1973b). Aspects of social behaviour of the natal clinging bat *Miniopterus schreibersi natalensis* (A. Smith, 1834).

Les chauves-souris appartenant à l'espèce *Miniopterus schreibersi* sont de véritables troglodytes; elles se groupent en un ou plusieurs essaims très denses au plafond ou sur les parois. Ces essaims sont de tailles très variables allant de quelques individus à plusieurs milliers (jusqu'à 100000). A Uitkmost, Transvaal, les males arrivent dans les grottes d'hibernation au mois de Janvier, les femelles en avril. Il est probable que l'accouplement ait lieu dans les grottes d'hibernation, juste avant celle-ci, au mois d'avril. Il a été trouvé des colonies de pré-mise-bas dans une grotte du Bushveld, au Transvaal, ou des milliers tant de males que de femelles (ces dernières étant généralement gravides) s'étaient groupés avant le départ des femelles vers les lieux de mise-bas. Des colonies de mise-bas ont été trouvées dans deux grottes situées également au Bushveld, où des milliers de femelles s'étaient assemblées afin de mettre bas. Les premiers jeunes sont nés vers la fin du printemps: fin octobre et début novembre.

The Natal clinging bat, *Miniopterus schreibersi natalensis*, is one of the most widespread and abundant Microchiropteran forms in Southern Africa, distributed throughout most of the Republic of South Africa, Mocambique, Rhodesia, Botswana, South West Africa, Zambia, Malawi and southern Zaire. Between May 1967 and December 1968 social organization was studied at several roosts, most intensively in two adjoining caves, in the Jack Scott Private Nature Reserve on the southern Transvaal high veld. Bats were closely observed and periodically collected at roosts by hand-picking or netting. Bats were also frequently banded and recaptures recorded. *M. s. natalensis* are typically cave dwellers, where they usually form tightly packed clusters against the roof or walls. These clusters varied greatly in size, from a few individuals to a few thousand per cluster as sometimes found at the maternity colonies, where numbers of up to 100 000 adults were estimated. Some clusters occurring at Uitkomst can be considered as permanent colonies as they have used the same cave year after year for the same activities. The first males arrived at Uitkomst from their summer quarters during January while the females and young arrived only in April. The place and period of mating is still uncertain. However, it appeared to take place at the wintering caves, such as Uitkomst, prior to hibernation, from the beginning until the end of April. Pre-maternity colonies were formed in one cave, Rookpoort Guano Cave, Rooiberg, where thousands of females and males congregated before the females dispersed to the various maternity caves to give birth. During the spring and summer (October-February) thousands of females congregated at the maternity caves, Sandspruit Cave No. 1, Rooiberg, and Peppercorn's Cave, Makapansgat. The first juveniles were born at the end of October and the beginning of November.

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van der Merwe, M. (1979a). Foetal growth curves and seasonal breeding in the Natal clinging bat *Miniopterus schreibersi natalensis*.

Growth of the foetus of *Miniopterus schreibersi natalensis* is described. The gestation period in this subspecies is 240 days of which 120 days is the period of delayed implantation. Birth mass is taken as 2.7 g from measurements of near-term foetuses. Foetal growth follows a typical *J*-shaped curve during the last half of the gestation period. Young of *M. s. natalensis* are proportionately lighter at birth than many other mammals.

Fetale groei in *Miniopterus schreibersi natalensis* word beskryf. Ole dragtigheidsperiode in hierdie subspesies is 240 dae, waarvan 120 dae 'n periode van vertraagde implantering is. Geboortemassa is 2.7 g en is bereken uit gegewens verkry van fetusse net voor geboorte. Fetale groei volg 'n tipies *J*-vormige kurwe gedurende die laaste helfte van die dragtigheidsperiode. Die kleintjies van *M. s. natalensis* is proporsioneel ligter by geboorte as baie ander soogdiere.

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van der Merwe, M. (1979b). Growth of ovarian follicles in the Natal clinging bat.

Growth and atresia of the ovarian follicles of *Miniopterus schreibersi natalensis* (A. Smith, 1834) were studied from females collected on the southern Transvaal Highveld. In this hibernating subspecies no

storage of sperm or delayed ovulation occur and females enter hibernation in a pregnant condition. Only one Graafian follicle develops, which is characterized by a large antrum with the ovum-bearing mass of cells occupying only a relatively small portion of the antrum. Many follicles develop to a medium size before undergoing regression. Basically two types of regression occur; usually destruction of the stratum granulosum takes place before the oocyte is affected. The reverse condition was also observed but was very uncommon. Corpora lutea atretica resulting from the luteinization of medium-sized Graafian follicles were commonly found.

Die groei en atresie van die ovariumfollikels van *Miniopterus schreibersi natalensis* (A. Smith, 1834) is bestudeer by wyfies wat versamel is op die Suid-Transvaalse Hoëveld. In hierdie hibernerende subspesie vind geen storing van sperms of vertraagde ovulering plaas nie, en wyfies is alreeds dragtig met die aanvang van hibernasie. Slegs een Graaffollikel ontwikkel en dit word gekenmerk deur 'n groot antrum en relatief klein eierdraende selmassa wat slegs 'n relatief klein gedeelte van die antrum in beslag neem. Baie follikels ontwikkel tot 'n mediumgrootte voordat hulle regressie ondergaan. Twee tipes regressie is waargeneem: Gewoonlik vind vernietiging van die stratum granulosum eers plaas voordat die oösiet beïnvloed word. Die omgekeerde proses is ook waargeneem, maar dit kom baie selde voor. Korpora lutea atretika wat ontstaan as gevolg van die luteïnisering van mediumgrootte Graaffollikels het algemeen voorgekom.

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van der Merwe, M. (1980a). Importance of *Miniopterus schreibersi natalensis* in the diet of barn owls.

Miniopterus schreibersi natalensis does not appear to rank very highly in the diet of the barn owl *Tyto alba*, but there are indications that there is an increase in the catches of *Miniopterus* during periods when there is a general decrease in the numbers of terrestrial and subterrestrial prey species.

Dit blyk dat *Miniopterus schreibersi natalensis* nie 'n hoë posisie beklee in die dieet van die nonnetjiesuil *Tyto alba* nie. Daar is egter aanduidings dat daar 'n toename in the vangste van *Miniopterus* is gedurende periodes wanneer daar 'n algemene afname is in die getalle van terrestriële en subterrestriële prooi-spesies.

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van der Merwe, M. (1981). Fetal development of the bat *Miniopterus schreibersi natalensis*.

Prenatal development in the fetus of *Miniopterus schreibersi natalensis* is discussed. Due to the long period of delayed implantation in this subspecies, the age of even the smallest fetuses, where the fore-limb buds just become visible will be around 150 days. The most reliable criterion for age determination proved to be body mass, and all fetal ages were estimated by using the equation $t = W^{1/3}/0.0145 + 144$.

Voorgeboortelike ontwikkeling van die fetus van *Miniopterus schreibersi natalensis* word bespreek. As gevolg van die lang periode van vertraagde implantering in hierdie subspesie is die ouderdom van selfs die kleinste fetusse, waar die voorste ledemaatknoppies net sigbaar word, alreeds ongeveer 150 dae. Die betroubaarste maatstaf vir ouderdom is liggaamsmassa, en die ouderdomme van al die fetusse is bereken met die formule $t = W^{1/3}/0.0145 + 144$.

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van der Merwe, M. (1982b). Histological study of implantation in the Natal clinging bat (*Miniopterus schreibersii natalensis*).

In the Natal clinging bat, *Miniopterus schreibersii natalensis*, implantation is centric and superficial in the right uterine horn. The blastocyst implants during the bilaminar stage with the inner cell mass orientated antimesometrially. During the preimplantation period the blastocyst becomes completely enclosed by uterine mucosae with the trophoblast in close contact with the surrounding uterine epithelium. Just before implantation the trophoblast becomes bilaminar over the greater part of the

embryonic hemisphere of the blastocyst. The uterine epithelium is very persistent and parts were still present mesometrially although penetration of the uterine endometrium had already occurred on the antimesometrial side.

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van der Merwe, M. (1985a). Deciduous teeth and their replacement in *Miniopterus schreibersii natalensis*.

The sequence of replacement of the deciduous teeth by permanent teeth in *Miniopterus schreibersii natalensis* is described. A table showing the changes in tooth characteristics from birth until seven weeks of age is given.

Die volgorde van melktandvervanging deur permanente tande in *Miniopterus schreibersii natalensis* word beskryf. 'n Tabel wat die veranderinge in tandkenmerke vanaf geboorte tot en met die sewende week na geboorte beskryf, word gegee.

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van der Merwe, M. (1985b). The vestigial teeth of *Miniopterus fraterculus* and *Miniopterus inflatus*.

Both *Miniopterus fraterculus* and *Miniopterus inflatus* have a vestigial tooth on the maxilla situated between the canine and following premolar.

Beide *Miniopterus fraterculus* en *Miniopterus inflatus* het 'n vestigiale tand op die maksilla wat geleë is tussen die slagtand en daaropvolgende voorkiestand.

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van der Merwe, M. (1987b). Other bat species in maternity caves occupied by *Miniopterus schreibersii natalensis*.

During visits to known maternity caves of *Miniopterus schreibersii natalensis* in the Transvaal (where vast numbers of females arrive seasonally to give birth and suckle their young), it has become apparent that these caves are not frequently used by other species during those periods when large numbers of *M. s, natalensis* females are present.

Gedurende besoeke aan bekende broeigrotte van *Miniopterus schreibersii natalensis* in Transvaal (wat seisoenaal deur groot getalle wyfies beset word om geboorte te gee en hul kleintjies te soog) het dit duidelik geword dat hierdie grotte nie gereeld deur ander vlermuisspesles benut word ten tye van *M. s. natalensis* wyfies se teenwoordigheid nie.

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van der Merwe, M. (1989a). Reproduction in the Rusty Bat, *Pipistrellus rusticus* in the Northern Transvaal Bushveld, South Africa. Abstract. Eigth International Bat Research Conference, Sydney, Australia, 9 - 15 July 1989.

Rusty bats are seasonally monoestrous and give birth to twins between mid November and mid December. Spermatozoa are present in the epididymides from March to August but absent from the testes from April until September. Spermatozoa are therefore stored in the epididymides for five months of the year (April-August). Copulations are initiated during April with females having increasingly more spermatozoa in their uterine horns from then towards the end of July. Ovulations and fertilization occur between mid August and mid September.

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van der Merwe, M. (1989b). Longevity in Schreibers' long-fingered bat.

Longevity in a hibernating and migratory vespertilionid, *Miniopterus schreibersii natalensis*, was studied with mark-recapture techniques. Data from this study suggest that 13 years may be the maximum life expectancy of this species in the wild.

Langslewendheid in 'n hibernerende en migrerende vespervlêrmuis, *Miniopterus schreibersii natalensis*, is bestudeer deur middel van merk-hervangmetodes. Gegewens uit hierdie studie toon dat 13 jaar die maksimum lewensverwagting van hierdie spesie in die natuur kan wees.

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van der Merwe, M. (1990). Polytocy in the Cape serotine bat *Eptesicus capensis* (A. Smith 1829) from the southern African subregion.

Polytocy is described in the Cape serotine bat, *Eptesicus capensis*, and discussed in relation to the occurrence of multiple births in other microchiropteran bat species in the southern African subregion. Although twins appear to be characteristic of the Cape serotine bat, triplets and even the occasional quadruplets occur.

Politokie in die Kaapse dakvlermuis, *Eptesicus capensis*, word beskryf en bespreek met verwysing na die voorkoms van veelvoudige geboortes in ander mikrochiroptera vlermuisspesies in die Suider-Afrikaanse substreek. Alhoewel dit wil voorkom asof tweelinge kenmerkend is by die Kaapse dakvlermuis, blyk dit dat drielinge en selfs die periodieke vierling voorkom.

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van der Merwe, M. (1994). Reproductive biology of the Cape serotine bat, *Eptesicus capensis* in the Transvaal, South Africa.

The reproductive biology of the Cape serotine bat, *Eptesicus capensis*, was investigated histologically. The study was based on 67 specimens collected over a six-year period. This species is seasonally monoestrous, normally giving birth to twins during November. Spermatogenesis peaks during autumn (March-May) when masses of spermatozoa are released into the epididymides, and spermatozoa are present in the epididymides from March to October. Copulations are initiated during this period from the end of March to the beginning of April, with the first ovulations occurring during August. During the pre-ovulation period leucocytes are commonly found within the uterine lumen and uterine glands of females.

Die voortplantingsbiologie van die Kaapse dakvlermuis, *Eptesicus capensis*, is histologies ondersoek. Die studie is gebaseer op 67 monsters wat oar 'n periode van ses jaar versamel is. Hierdie spesie is seisoenaal monestrus, en skenk gewoonlik geboorte aan tweelinge gedurende November. Spermatogenese bereik 'n piek gedurende die herts (Maart-Mei) wanneer massas sperme in die epididimi gestort word, en sperme is teenwoordig in die epididimi vanaf Maart tot Oktober. Kopulasie neem 'n aanvang gedurende die periode einde Maar! en begin April, terwyl die eerste ovulasies gedurende Augustus plaasvind. Gedurende die preovulasie periode is leukosiete algemeen in die uteruslumen en -kliere van wyfies gevind.

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van der Merwe, M. (1996). Amniogenesis in Schreiber's long-fingered bat *Miniopterus schreibersii natalensis*.

Schreiber's long-fingered bat, *Miniopterus schreibersii natalensis* is seasonally monoestrous, carrying a single foetus in the right uterine horn. Implantation is superficial, the amnion being a pleuramnion. Lateral folds, originating from the ends of the caudal and cephalic folds, are the main contributors in

the formation of the definitive amnion. The formation of the amnion by folding is preceded by the development of a primitive amniotic cavity within the inner cell mass which eventually disappears.

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van der Merwe, M. (1997). Vestigial teeth in the genus *Scotoecus* (Mammalia: Chiroptera): adapted dental formulae for vespertilionids with vestigial teeth.

Some members of the genus *Scotoecus* Thomas, 1901 have an inconspicuous vestigial tooth which occurs on both sides of the upper jaw between the canine and following premolar. This tooth is regarded as permanent premolar pi in vestigial form.

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van der Merwe, M. and I. L. Rautenbach (1986). Multiple births in Schlieffen's bat, *Nycticeius schlieffenii* (Peters, 1859) (Chiroptera: Vespertilionidae) from the southern African subregion.

Nycticeius schlieffenii is a monestrous species that breeds during the spring months in the northern parts of the Kruger National Park. During spring 1983 the average number of corpora lutea in 11 *Nycticeius schlieffenii* females was 3.1 (range 1 - 4), with the average number of fetuses recorded 2.8. In the present study this bat has been found to be a polyovular seasonal breeder, giving birth to as many as three young per estrous cycle.

Nycticeius schlieffenii is 'n monestrus spesie wat gedurende die lente in die noordelike gebied van die Nasionale Kruger Wildtuin teel. Gedurende die lente van 1983 was die gemiddelde aantal corpus luteums wat deur 11 *Nycticeius schlieffenii*-wyfies afgeskei is 3.1 (bestek 1 - 4), met die gemiddelde aantal fetusse waargeneem 2.8. In die huidige studie is bevind dat hierdie vlermuisspesie 'n poliovulêre seisoenale voortplanter is wat aan so veel as drie kleintjies per estrussiklus geboorte gegee het.

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van der Merwe, M. and I. L. Rautenbach (1987). Reproduction in Schlieffen's bat, *Nycticeius schlieffenii*, in the eastern Transvaal lowveld, South Africa.

The present study is based on 153 Schlieffen's bats collected over a 2-year period from September 1983 to September 1985. Spermatogenesis extends over a 10-month period with the first signs of spermatozoa in the epididymides by the end of April. Spermatozoa were present in the epididymides from the end of April until the beginning of September. Copulation begins during June (early winter) and the females have spermatozoa in the uterine horns from then until the end of August (late winter) when ovulation occurs. These bats are seasonally monoestrous with the great majority of births occurring during November. The number of conceptuses varied; a maximum of 5 pre-implanted embryos was recorded, but the maximum number of fetuses observed was 3.

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van der Merwe, M. and I. L. Rautenbach (1990). Reproduction in the rusty bat, *Pipistrellus rusticus*, in the northern Transvaal bushveld, South Africa.

Rusty bats are seasonally monoestrous and give birth to twins during November. Spermatozoa are present in the epididymides from March to August but absent from the testes from April until September. Males thus store spermatozoa in the epididymis for 5 months of the year (April-August). Mating is initiated during April with uterine horns exhibiting a 3-fold increase in sperm volume between April and July samples. It is concluded that ovulation and fertilization occur during the second half of August. Up to 5 conceptuses per female were recorded, but a maximum of only 2 implantations was observed.

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van der Merwe, M., I. L. Rautenbach and W. J. van der Col (1986). Reproduction in females of the little free-tailed bat, *Tadarida (Chaerephon) pumila*, in the eastern Transvaal, South Africa.

Little free-tailed bats (2 - 9/month) were collected over 15 months in the eastern Transvaal lowveld (latitude 24°59'S). There was an extended but distinct breeding season of 8 months per year. Females appeared to be polyoestrous and able to bear 3 pregnancies per breeding season. There was a progressive decrease in the magnitude of the three birth peaks during the breeding season, with a concomitant slight loss in birth synchronization. Gestation period was ~ 60 days and one young per female was the rule, with implantation occurring only in the right uterine horn of the bicornuate uterus. It is suggested that offspring are weaned before the age of 21 days, and that females become sexually mature in the following breeding season at the age of 5 - 12 months.

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van der Merwe, M. and R. J. van Aarde (1989a). Plasma progesterone concentrations in the female Natal Clinging Bat (*Miniopterus schreibersii natalensis*). Abstract. Eigth International Bat Research Conference, Sydney, Australia, 9 - 15 July 1989.

Plasma progesterone concentrations measured by radioimmunoassay in the Natal clinging bat remained below 2.01 ng/ml during lactational anoestrus but increased significantly during the period of delayed implantation. Values peaked at implantation but were followed by a significant decrease thereafter. Concentrations remained low (< 7.0 ng/ml) during the initial period of foetal development (153 - 201days *post coitum*) and attained peak values (85.6 - 181.3 ng/ml) 216 - 222 days after fertilization. The sharp postlrnplantatlon increase in progesterone levels coincided with a significant increase in placental weight.

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van der Merwe, M. and R. J. van Aarde (1989b). Plasma progesterone concentrations in the female Natal Clinging Bat (*Miniopterus schreibersii natalensis*).

Plasma progesterone concentrations measured by radioimmunoassay in the Natal clinging bat remained below 2.01 ng/ml during lactational anoestrus but increased significantly during the period of delayed implantation. Values peaked at implantation but were followed by a significant decrease thereafter. Concentrations remained low (< 6.0 ng/ml) during the initial period of fetal development (153 - 180 days *post coitum*) and attained peak values (85.6 - 181.3 ng/ml) 216 - 222 days after fertilization. The marked post-implantation increase in progesterone concentrations coincided with a significant increase in placental weight.

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van der Merwe, N. J. and I. L. Rautenbach (1988). The placenta and foetal membranes of the lesser yellow house bat, *Scotophilus borbonicus* (E. Geoffroy, 1803) (Chiroptera: Vespertilionidae).

A discoidal hemodichorial placenta is present in *Scotophilus borbonicus*. Evidence is presented which suggests that histotrophic nutrition, in addition to hemotrophic nutrition, occurs. The foetal trophospongium phagocytoses cell debris and glandular secretions derived from the maternal endometrium (decidua basalis). This cell debris forms a detritus zone between the decidua basalis and trophospongium. The existing concept of the basal lamina (intrasyncytial membrane) of the hemodichorial placenta is described in a modified form.

'n Diskoidale hemodikoriale plasenta is teenwoordig in *Scotophilus borbonicus*. Bevindinge word voorgele wat aandui dat histotrofe voeding, bykomstig tot hemotrofe voeding, plaasvind. Die fetale trophospongium fagositeer seldebris en klierafskeidings afkomstig van die endometrium (decidua basalis). Die seldebris vorm 'n detritussone tussen die trophospongium en die decidua basalis. Die bestaande konsep van die basale lamina (intrasinsitiale membraan) van die hemodikoriale plasenta word in 'n gewysigde vorm beskryf.

van der Merwe, N. J. and I. L. Rautenbach (1989). The male reproductive pattern and histology of the testes of the lesser yellow house bat, *Scotophilus borbonicus* (E Geoffroy, 1803) (Chiroptera: Vespertilionidae).

Monthly samples of the testes of the vespertilionid bat, *Scotophilus borbonicus* were collected, sectioned and examined by light microscopy. Spermatogenesis was prolonged and extended over 8 months, coinciding with spring, summer and autumn. During any particular month only certain spermatogenic cells are present in the seminiferous tubules. The mediastinum is, unlike that of most other mammals, situated towards the caudal border of the testis. This species is eminently suited for the study of the process of spermatocytogenesis.

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van der Merwe, N. J., I. L. Rautenbach and B. L. Penzhorn (1988). A new pattern of early embryonic development in the seasonally breeding non-hibernating lesser yellow house bat, *Scotophilus borbonicus* (E. Geoffroy, 1803) (Chiroptera: Vespertilionidae).

Monthly collections of *Scotophilus borbonicus* females and examination of serially sectioned female genital tracts showed that it is a monoestrous species. Insemination, ovulation and fertilization take place in autumn. Early embryonic growth is retarded, but not arrested. The conceptus remains in the morula stage for 6 to 8 weeks, followed by a blastocyst stage of c. two months. With the onset of warmer weather, a higher rate of embryogenesis is observed.

Van der Westhuyzen, J., R. C. Cantrill, F. Fernandes-Costa and J. Metz (1983). Effect of a vitamin B-12-deficient diet on lipid and fatty acid composition of spinal cord myelin in the fruit bat.

The effects of vitamin B-12 deficiency on lipids and fatty acids of spinal cord myelin were studied in control and vitamin B-12-deficient fruit bats. Very low plasma and brain vitamin B-12 concentrations were present in animals fed the vitamin B-12-free, all fruit diet. Myelin was isolated from the spinal cord of control and vitamin B-12-deficient animals (n = 3 pools) by means of a flotation method in a discontinuous sucrose gradient. The molar concentration of cholineglycerophosphatide was significantly lower in the deficient bats than in the controls. The molar cholesterol:phospholipid ratio in the deficient bats was also significantly lower. The odd-chain fatty acid 15:1 was not detected in cholineglycerophosphatide from the controls, but comprised 1.4 % of the total fatty acids in the deficient group. The odd-chain fatty acids 15:0, 17:1 and 19:0 were present in slightly higher amounts in cholineglycerophosphatide of deficient bats. Lipid and fatty acid differences were related to the vitamin B-12-requiring methionine synthetase and methylmalonyl CoA mutase reactions.

Van Neer, W. (1990). Les faunes de vertébrés quaternaires en Afrique centrale.

Les ensembles fauniques de vertébrés quaternaires de l'Afrique Centrale sont actuellement au nombre d'une vingtaine et représentent, à une exception près, des restes archéozoologiques. Ce matériel paléontologique, dont le principal agent taphonomique* est l'homme, est jusqu'à présent très dispersé dans le temps et l'espace, mais il permet néanmoins une évaluation paléoécologique et paléoéconomique. Trois sites, Ntadi Yomba, Matupi et Ishango témoignent par leurs faunes de la période aride fin Pléistocène. Sur plusieurs sites datant des deux derniers millénaires (Ngovo, Dimba, Akameru, Cyinkomane, couches supérieures de Shum Laka) les vertébrés préservés démontrent un milieu plus boisé que l'actuel, ce qui indique qu'une déforestation probablement surtout anthropique s'est effectuée entre temps. En ce qui concerne l'introduction des animaux domestiques en Afrique centrale, il semble que celle-ci s'est effectuée dans le premier millénaire de notre ère. Le nombre restreint de sites avec préservation faunique de cette période empêche pourtant de dater ces événements plus précisément

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Van Orshoven, J. and P. J. H. Van Bree (1968). Quelques données sur six espèces de Megachiroptères de la République de Guinée.

A collection of Megachiroptera captured in mistnets at Kankasili (10° 11' N,12° 29' W), Republic of Guinea, Africa, during 1966-1967, is described. The following species were represented: *Rousettus aegyptiacus* (10 specimens), *Lissonycteris angolensis* (2 specimens), *Epomophorus gambianus* (1 specimen), *Epomops buettikoferi* (13 specimens), *Micropteropus pusillus* (104 specimens) and *Nanonycteris veldkampi* (4 specimens). Measurements, as well as descriptions of the colours and of the palatal ridges of the bats are given.

Varty, N. and J. E. Hill (1988). Notes on a collection of bats from the riverine forests of the Jubba Valley, southern Somalia, including two species new to Somalia.

Fifty-eight bats of eight species were collected from the riverine forests of the Middle Jubba Valley, Somalia during August and September 1986. *Epomophorus wahlbergi* was the most commonly-caught species. Two species *Pipistrellus eisentrauti* and *Scotoecus albigula* had not been previously recorded for Somalia and two other species, *Nycteris parisii* and *Hipposideros commersoni*, are rare within Somalia. Seven of the eight species showed evidence of breeding during this period (dry season). The forests are rapidly being destroyed and there is an urgent need to conserve the remainning stretches of riverine forest to protect the rare species.

Vattier, G. and J. P. Adam (1966). Capture de Cératopogonidae (Diptera) dans des grottes de la république gabonaise.

Au cours d'une brève mission au Gabon, en janvier 1966, l'un de nous (J.P.A.) a eu l'occasion de prospecter deux grottes situées aux environs de Belinga sur le cours supérieur de l'Ivindo, et une troisième à quelques kms au Nord du village de Batouala.

Dans deux d'entre elles il a été possible de capturer une importante série de Cératopogonidés appartenant à trois espèces distinctes dont deux inédites.

Nous donnons ici, un bref aperçu du biotope et des conditions de capture. La description des nouvelles espèces.

Vattier-Bernard, G. (1970). Contribution à l'étude systématique et biologique des Phlébotomes cavernicoles en Afrique intertropicale. 1re partie.

Ce travail comprend:

- une étude systématique et morphologique des Phlébotomes cavernicoles vivant au Congo-Brazzaville. Adultes et stades préimaginaux de *Spelaephlehotomus gigas* et de *Phlehotomus mirabilis* sont décrits;

- une mise au point de la répartition géographique des huit espèces de Phlébotomes cavernicoles africains.

Diverses techniques (capture, élevage...) sont décrites.

This work includes:

- a systematical and morphological study of the cavernicolous sandflies from the Congo. The adults and the immature stages of *Spelaephlebotomus gigas* and *Phlebotomus mirabilis* are described;

- the geographical distribution of the cavernicolous African sandflies (eight species).

Different methods (capture, rearing...) are given

Vaughan, N. and J. E. Hill (1996). Bat (Chiroptera) diversity and abundance in banana plantations and rain forest, and three records for St. Vincent, Lesser Antilles.

Mist netting in banana plantations and rain forest showed that rain forest had higher numerical bat species richness, but fewer bats, than banana plantations. The conservation of the few remaining tracts of rain forest on St. Vincent may be important for the survival of several species of bat and for the maintenance of bat diversity. Three bat species previously unrecorded from St. Vincent were caught there, namely; *Pteronotus parnellii, Micronycteris megalotis* and *Tadarida brasiliensis antillularum*.

Les captures au filet ont montré que si la richesse spécifique du peuplement de chiroptères de la forêt pluvieuse est plus élevée que celle des plantations de bananes, la situation inverse prévaut en ce qui conceme l'abondance des individus. La conservation des dernières portions de forêt pluvieuse de St. Vincent est probablement très importante pour le maintien de plusieurs espèces de chiroptères et de la diversité des communautés présentes. Trois nouvelles espèces de microchiroptères ont été récemrnent découvertes à St. Vincent: *Pteronotus parnellii, Micronycteris megalotis* et *Tadarida brasiliensis antillularum*.

Vaughan, N., G. Jones and S. Harris (1996). Effects of sewage effluent on the activity of bats (Chiroptera: Vespertilionidae) foraging along rivers.

In order to investigate how a decline in river water quality might affect the foraging behaviour of bats in riparian habitats, bat activity and feeding rates were measured at sites upstream and downstream from 19 sewage outputs. Paired sampling was used to control for variation in bat activity due to environmental parameters. Bat activity (bat passes) and attempted prey captures (terminal buzzes) recorded from broad band bat detectors were counted at each site, and bat species groups could be distinguished. Overall bat activity and foraging activity were reduced downstream from sewage outputs, by 11 % (total reduction in passes) and 28 % (total reduction in buzzes). Both phonic types of *Pipistrellus pipistrellus* were less active at downstream sites than at upstream sites (total reduction in activity was 55 % for the 45 kHz phonic type and 51 % for the 55 kHz phonic type). The 45 kHz phonic type of *P. pipistrellus* concentrated its foraging effort at upstream sites (total reduction in counts of buzzes was 87 %), while *Myotis* spp. Foraged at higher rates downstream from outputs than upstream (total increase in foraging rate was 112 %). For the conservation of *P. pipistrellus*, the maintenance of high standards of water quality may be important. *Myotis daubentonii* may be able to benefit from eutrophication.

Vaughan, N., G. Jones and S. Harris (1997a). Habitat use by bats (Chiroptera) assessed by means of a broad-band acoustic method.

1. Bats foraging activity was quantified by using a broad-band acoustic method on transects in 10 land use types in south-west England. From multivariate analyses of parameters of bat echolocation calls, 83 % of bat passes could be identified to species level with quantified degrees of certainty. The remaining 17 % could be identified to species group.

2. Total bat activity was positively correlated with air temperature, and once adjusted for temperature, was significantly higher over rivers and lakes than over other land use types.

3. Bats that use frequency-modulated echolocation calls (mainly *Myotis* spp., but some *Plecotus auritus* were recorded in nine of 10 land use types, but never in villages. Rivers and lakes supported

high levels of activity of these species. Bats classified as 45 kHz and 55 kHz phonic types of *Pipistrellus pipistrellus* had different habitat requirements; 45 kHz *P. pipistrellus* fed in many habitats, while 55 kHz *P. pipistrellus* fed mainly over rivers and lakes. Bats classified as *Nyctalus noctula, Nyctalus leisleri* and *Eptesicus serotinus* were most active in open habitats and over rivers and lakes.

4. Total bat activity was equally high in woodland interiors and along woodland edges, but bats were relatively more active in sheltered sections of transects than in exposed sections.

5. Plans for land management should take into account the habitat needs of bats. For most species in Britain, rivers and lakes are of primary importance. Management plans should aim to maintain physical diversity and features used by insects in freshwater habitats, woodlands and pasture.

Vaughan, N., G. Jones and S. Harris (1997b). Identification of British bat species by multivariate analysis of echolocation call parameters.

1. A method for the identification of bat species from time-expanded broad-band recordings of their echolocation calls is presented. The method may be used for the assessment of habitat use by bats.

2. Recording were made of echolocation calls produced by 536 bats of known species identity, belonging to 15 species found in Great Britain. One call was analysed per individual, and sonograms and descriptive statistics of six time and frequency variables of calls are presented. British bats can be placed in three groups according to the structure of their calls: high duty cycle FM/CF/FM bats (*Rhinolophus* spp.), low duty cycle FM bats (*Myotis* spp, and *Plecotus* spp.) and intermediate duty cycle FM/CF bats (*Pipistrellus* and *Nyctalus* spp. And *Eptesicus serotinus*).

3. FM/CF/FM bats could be identified from the peak frequency of their calls. Two separate quadratic multivariate discriminant analyses were carried out on the time and frequency parameters of calls produced by FM bats and FM/CF bats. For FM bats 67 %, and for FM/CF bats 89 %, of unknown calls were classified to species.

Vaughan, T. A. (1966). Morphology and flight characteristics of Molossid bats.

Selected aspects of the morphology of bats of the family Molossidae are described and the functional significance of these features are discussed. The structure and proportions of the ears and the wings are considered to reflect primarily ther rapid enduring flight typical of molossids. Comparisons of characteristics of the wings of three rnolossids and of four bats of the family Vespertilionidae were made, and several aerodynamic relationships were applied to a consideration of the styles and speeds of flight of these bats. Molossid bats in genera seem adapted to fast flight in open areas, whereas the vespertilionids studied are apparently suited to slower flight fairly low to the ground, near vegetation and other obstacles.

Vaughan, T. A. and R. P. Vaughan (1986). Seasonality and the behavior of the African yellow-winged bat.

The African yellow-winged bat (*Lavia frons*) was observed in Kenya, East Africa, through one wet and one dry season (December 1982 to July 1983). This opportunistic, sit-and-wait predator typically forages from the crowns of *Acacia tortilis* and captures insects through a broad range of elevations by brief, precise interceptions. *Lavia* is monogamous. Members of a pair roost together in a territory defended by the male, forage either separately or together, and share the territory for some 3 months with the single young. *Acacia tortilis* responds to erratic dry-season rains by flowering and growing new leaves; attending brief bursts of insect abundance may be of crucial importance to *Lavia* during dry-season energy bottlenecks. Many of the most distinctive aspects of the life history of *Lavia* - monogamy, territoriality, the division of labor, opportunistic foraging, a long mother-young association,

and a close association between *Lavia* and *A. tortilis* - probably are adaptations to recurring periods of energy stress.

Vaughan, T. A. and R. P. Vaughan (1987). Parental behavior in the African yellow-winged bat (*Lavia frons*).

The parental behavior of five monogamous pairs of African yellow-winged bats (*Lavia frons*) was observed in Kenya. Each females bore a single young, which clung to its mother continuously until about one week before it first flew and foraged. Newly Volant young foraged with their parents and soon developed foraging performance that closely resembled that of their parents. Young were weaned about 20 days after becoming Volant. Until at least 50 days after its first flight, each young shared its parent's territory, synchronized its grooming and foraging periods with those of its parents, and periodically huddles against its mother when roosting. Recurring but unpredictable periods of low insect density have seemingly selected for an extended period of parent-young association, during which the young become skilled opportunistic foragers.

Vaughan, T. C., E. L. Cockrum and P. J. Vaughan (1977). Four Vespertilionid bats new to the fauna of Tunisia.

Quatre espèces de chauves-souris dont la répartition connue est européenne ont été trouvées dans le nord de la Tunisie: *Myotis emarginatus, M. capaccinii, Pipistrellus pipistrellus* et *P. savii*.

Four bats: *Myotis emarginatus, M. capaccinii, Pipistrellus pipistrellus*, and *P. savii*, essentially European in distribution, and previously unknown from Tunisia are reported from the northern part of that country.

Veiga-Ferreira, M. C. (1948). Notas acêrca dos Megaquiropteros da Guiné Portuguesa.

A colecção de Quirópteros obtida pela Missão Zoológica da Guiné, chefiada pelo Prof. F. Frade, em 1945 e 1946, nas várias localidades do seu itinerário, eleva-se a 276 exemplares, dos quais 37, correspondentes a três espécies, pertencem à subordem *Megachiroptera* e constituem o material, conservado em álcool, em que se baseia o presente estudo. Embora na sua maioria tenham sido capturados a tiro, o estado de conservação dos referidos exemplares é muito satisfatório, mesmo para as observações craniológicas.

Uma das espécies, *Rousettus angolensis*, é, segundo cremos, registada pela primeira. vez como elemento da fauna da Guiné Portuguesa. Muito deslocada da área geográfica que lhe foi atribuída, o encontrá-la na Guiné Portuguesa parece indicar que futuras explorações revelarão a sua existência nas outras regiões entre esta colónia e Angola.

Eidolon helvum e *Epomophorus gambianus* estão, desde há muito, registados como existentes na nossa Guiné, mercê das antigas colheitas do português Francisco Newton, que forneceram o material ao Prof. Bocage, e das mais recentes do Dr. Monard.

Um fado importante se nos afigura oportuno pôr em relevo, que é o de não haver entre os exemplares coligidos pela Missão, nem pelo Dr. Monard, nenhum que se identifique com *Epomophorus guineensis* Bocage, binome geralmente incluído na sinonímia de *Epomophorus gambianus*, o que leva a admitir que se trata de aberração ou de forma muito rara, apenas uma vez encontrada.

Os Megaquirópteros são conhecidos vulgarmente, na Guiné Portuguesa, pela designação imprópria de "Vampiros", embora ali se saiba perfeitamente que estes animais são frugívoros, pelos estragos por eles produzidos. Dos seus hábitos e prejuízos que causam dá-nos ideia o Prof. Frade no relatório da Missão, de onde extraímos os seguintes passos, a pág. 286~287: "J á em Farim, durante a noite,

maçam-nos os ouvidos com o seu monótono cantar, lembrando o bater do martelo na bigorna, os "Vampiros", grandes morcegos que invadem os mangueiros na época da maturação dos seus saborosos frutos. O foco da lâmpada eléctrica descobrelhes os elhitos brillhantes e incomoda-os a tal ponto que mudam de lugar, provocando querelas entre eles. No dia seguinte, lá continuam suspensos, cabeça pendente, dormindo. O chão, junto às árvores, está juncado de frutos roídos, pois estragam mais do que comem". Mais adiante, a pág. 300: "Cai a tarde. Do continente aflui à iiha de Bolama, atravessando o mar de alto, legião inumerável de morcegos de enorme envergadura, em esquadrilhas desordenadas, sem disciplina das formações ordeiras de patos. Vão tomar de assalto os mangueiras da antiga capital".

Veiga-Ferreira, M. C. (1949). Notas acêrca dos Microquiropteros da Guiné Portuguesa.

O presente trabalho regista 11 espécies de Microquirópteros da Guiné Portuguesa, provenientes das explorações (1945 - 1946) da Missão Zoológica da Guiné, chefiada pelo Prof. F. Frade. Essas espécies, representadas por mais de 200 exemplares, distribuem-se por 5 famílias (*Nycteridae, Hipposideridae, Molossidae, Vespertilionidae*, e *Embalonuridae*) e 6 géneros (*Nycteris, Hipposideros, Chaerephron, Scotophilus, Eptesicus* e *Tazophous*). Duas espécies são pela primeira vez registadas como elementos da fauna da Guiné Portuguesa: *Hi'pposideros abae* Allen e *H. cyclops* Temm.; outras registadas pela segunda vez, como *H. gigas viegasi* Monard, *H. braima* Monard e *Mops osborni occidentalis* Monard.

Verboom, B., A. M. Boonman and H. J. G. A. Limpens (1999). Acoustic perception of landscape elements by the pond bat (*Myotis dasycneme*).

We tested the hypothesis that echolocating bats use landscape elements as acoustic landmarks. We predicted that bats should be able to perceive distant landscape elements using echolocation and hence change their echolocation behaviour in relation to these elements. Echolocation parameters of commuting pond bats *Myotis dasycneme* (Boie, 1825) were related to the bats' distance from banks of different sized canals. Pulse durations emitted while bats flew over canals of 13, 19, and 25 m wide increased successively. Interpulse intervals were equally long at 13, 19, and 25 m wide canals, but significantly longer at a 30 m wide canal. The mean interpulse interval used by bats flying along the midline of the 30 m wide canal was just sufficiently long to prevent overlap of an echo from the canal bank and a new outgoing pulse. The results indicate that pond bats perceive the canal banks by gradually adapting their pulse emissions to the distance to the banks. This suggests a role for the banks as acoustic landmarks.

Vermeil, C. (1960). Contribution à l'étude des Nycteribiidae et des Streblidae (Diptera, Pupipara) de Tunisie.

Nous avons trouvé, dans la collection de MM. Deleuil et Labbe, cinq espèces sur les sept déjà signalées de Nycteribiidæ et de Streblidæ, parasites de Chiroptères en Tunisie, c'est-à-dire: *Penicillidia conspicua, Nycteribia vexata vexata, Nycteribia latreillii, Nycteribia schmidlii, Nycteribosca kollari*. *Nycteribia biarticulata* paraît bien être une nouvelle espèce pour ce pays. Nous avons indiqué les variations, principalement chætotaxiques, observées sur ce matériel. Confirmant Theodor et Moscona, il ne nous semble pas qu'il faille retenir la sous-espèce *africana* de *N. latreillii* proposée par Karaman.

Verschuren, J. (1965b). Contribution à l'étude des cheiroptères du Parc National du Serengeti (Tanzanie).

Au cours d'une mission en 1962-1963, pour la F.A.O./O.N.U., au Parc National du Serengeti, nous avons récolté un certain nombre de Cheiroptères. Cette réserve naturelle est située en Tanzanie, un peu au Sud de l'Equateur, à des altitudes variant entre 1.200 et 2.100 mètres. Deux biotopes

principaux sont représentés: la savane et la steppe, d'une part et de vastes étendues de bush, d'autre part. Les captures de Cheiroptères ont été effectuées principalement dans les affleurements granitiques, très nombreux dans la réserve naturelle et dans des arbres creux des étroites galeries forestières. Toutes les localités indiquées ci-après sont situées dans le Parc National.

Verschuren, J. (1967). Exploration du Parc National Albert. Mission F. Bourlière et J. Verschuren (1957 - 1961). Fasc. 2. Introduction a l'écologie et la biologie des cheiroptères.

Une prospection mammalogioue détaillée, axée principalement sur l'Écologie, a été entreprise, au Parc. National Albert, République du Congo, de juillet1957 à décembre 1961. Elle a été complétée par des courtes visites dans la réserve. Naturelte en 1962 et 1963; une prospection préliminaire, avec le Prof[r] H. HEDIGER, avait eu lieu en 1948.

Plusieurs centaines de Cheiroptères ont été récoltés dans différents milieux du Parc National; une quantité assez importante de données écologiques ont été obtenues sur ces Mammifères. L'ensemble de cette documentation fait l'objet de la présente publication. On notera que les travaux sur les Cheiroptères n'ont pas été effectués en profondeur comme au Parc National de la Gararnba, au cours de la Mission H. DE SAEGER, où une monographie assez complète des Cheiroptères avait été préparée (VERSCHUREN, 1957). Par ailleurs, nous avons estimé superflu de reprendre ici une série de problèmes examinés dans ce travail.

En ce qui concerne les Cheiroptères, il est évident que des lacunes restent à combler au Parc National Albert. Deux auteurs seulement, avant nous, s'étaient occupés de ce groupe de Mamrnifères: FRECHKOP (1938 et 1943) et CURRY-LINDAHL (1961).

Verschuren, J. (1977). Les cheiroptères du Mont Nimba (Liberia).

273 Cheiroptères, répartis en 18 espèces, ont été récoltés dans la région du Mont Nimba Liberia, Afrique occidentale, vers la limite nord de la forêt, à des altitudes de 500 à 1 350 m. La majorité (90 %) des captures étaient représentées par des *Pteropidae*, par suite de l'usage intensif de filets de nylon. *Myonycteris torquata leptodon* est, de loin, l'espèce la plus abondante. Une liste de récoltes et d'observations écologiques est suivie d'une tentative de synthèse de certains problèmes généraux: répartition des espèces, biotopes, reproduction, associations, migrations, facteurs anthropiques. 5 espèces nouvelles sont signalées pour le Liberia.

273 Bats (order: Chiroptera), includlng 18 difîerent species, have been collected in the Mount Nimba area (Liberia, West Africa), near the northern lirnit of the forest (altitudes between 500 and 1 350 m). The rnajortty of the animals (90 %) are represented by *Pteropidae*, due to the intensive use of nylon nets. *Myonycteris torquata leptodon* seems the most common bat. Lists of recolts and ecological observations are followed by more general indications concerning some problems: distributions of species, biotopes, reproduction, associations, rnigrations, anthropical factors. 5 species are new for Liberia

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Verschuren, J. (1980). Notes sur les cheiroptères du Burundi.

La faune mammalogique du Burundi est nettement moins bien connue que celle du Zaire et du Rwanda, pays limitrophes, études de façon intensive. Un seul auteur, P.L. NIORT (1970), s'est occupé de façon spécifique des Cheiroptères de ce pays. Des élements intéressants peuvent être trouvés égamement chez des auteurs ayant effectué une étude globale des pays anciennement belges (Zaïre, Rwanda et Burundi): H. SCHOUTEDEN (1946) et R.W. HAYMAN, W. MISONNE et W. VERHEYEN (1966). Le Rwanda a fait l'objet de travaux approfondis par M. ANCIAUX DE FAVEAUX. Cet auteur s'est récemment livré à de remarquables travaux d'envergure sur la répartition biogéographique et les cycles annuels de reproduction des Cheiroptères d'Afrique centrale, en ajoutant une bibliographie approfondie,

incluant pratiquement tout ce qui a été publié antérieurement sur le sujet (1972, 1976, 1977, 1978). L'auteur de la présente note a examiné aussi la faune des Cheiroptères du Zaïre - Garamba et Virunga -, du Rwanda, de Tanzanie, de même que du Liberia et du Sénégal (VERSCHUREN, 1955, 1965, 1966, 1976 et sous presse).

Pendant la période juin-août 1976, nous avons effectué des recherches sur les Cheiroptères du Burundi, à l'occcasion d'une mission pour l'Adrninistration générale de la Coopération pour le Développement (Belgique), ayant pour objet essentiel le pré-lancement de Parcs Nationaux au Burundi. Ces recherches ne constituaient pas le but de base des travaux. Les récoltes, en utilisant principalement des filets, ont été réalisées près de Bujumbura, capitale du pays (alt. 600 m) et dans la vallée de la Ruvubu et ses environs (alt. 1400 - 1650 m), à l'Est du Burundi. Les collections sont conservées à l'Institut royal des Sciences naturelles de Belgique. Nous ne détaillerons pas les caractéristiques générales géographiques et biologiques du Burundi, celles-ci étant largement examinées dans plusieurs travaux récents.

Verschuren, J. (1982). XXII. Note sur les cheiroptères du Sénégal, principalement dans les pars nationaux du Niokolo-Koba et du Delta du Saloum.

Relativement peu d'auteurs se sont occupés spécifiquement des Cheiroptères du Sénégal, quoique la situation soit remarquablement en train de se modifier avec les travaux de ADAM & HUBERT (1972, 1976).

DORST (1959) signale dans la région de Richard Toll: *Scotophilus gigas, Pipistrellus ruppelli senegalensis, Tadarida limbata, Tadarida condylura, Tadarida Midas*.

AELLEN (1956) relève au Parc national du Niokolo-Koba: *Epomophorus gambianus, Micropteropus pusillus, Nycteris hispida hispida, Nycteris thebaica gambiensis, Rhinolophus alcyone, Hipposideros commersoni gambiensis, Hipposideros caffer guineensis, Hipposideros caffer tephrus, Eptesicus guineensis, Eptesicus minutus, Eptesicus rendalli, Scotophilus leucogaster leucogaster, Scotophilus nigrita nigrita, Tadarida condylura wonderi* et *Tadarida limbata websteri*.

Dans la région du Ferla, POULET (1972) indique *Rousettus aegyptiacus, Taphozous perforatus, Aselia tridens, Nycteris thebaica* et *Tadarida major*.

En basse Casamance, DUPUY (1973) signale *Eidolon helvum, Epomophorus gambianus* et *Nycteris gambiensis*.

Dans la région de Bandia, près de Dakar, ADAM & HUBERT (1972) indiquent six espèces nouvelles pour le pays: *Epomophorus anurus, Lissonycteris angolensis smithi, Rhinopoma microphyllum, Eptesicus tenuipinnis, Glauconycteris poensis,Glauconycteris variegata*, de même que *Pipistrellus rueppelli senegalensis, Hipposideros caffer guineensis* et *Hipposideros tephrus*. Les mêmes auteurs (1976) indiquent la répartition géographique de 5 *Nycteridae* au Sénégal, y compris *Nycteris grandis*.

Enfin, dans une récente publication, BOHME & HUTTERER (1978) signalent 11 espèces dans les diverses régions du Sénégal, principalement à l'ouest: *Epomophorus gambianus, Micropteropus pusillus, Nycteris macrotis, Nycteris gambiensis, Lavia frons, Rhinolophus guineensis, Hipposideros cyclops, Asellia tridens, Tadarida (Mops) condylura* et *Tadarida (Chaerephon) pumila*.

Plusieurs études ont été effectuées en Guinée; pour l'Afrique occidentale, le travail de ROSEVEAR (1965) reste l'outil de base. Pour l'Afrique centrale, l'étude ANCIAUX DE FAVEAUX (1975) est capitale.

En mai-juin 1975 et avril-mai 1 nous avons séjourné dans les Parcs nationaux du Niokolo-Koba et du delta du Saloum, les travaux étant axés sur des problèmes d'écologie et de conservation. Des récoltes et observations ont été effectuées en points de ces réserves naturelle, de même qu'à Dakar; ces observations pourront être utilisées lors de la mise au point d'une "faune" des Cheiroptères des Parcs. Quelques observations ont été effectuées aussi à Bamako, Mali, en mai 1977. Rappelons que le Parc national du Niokolo-Koba est situé en zone soudanienne dans l'est du et celui du delta du Saloum à la

limite des zones soudaniennes et sahéliennes dans l'ouest du pays, mais sous climat subcanarien. Les récoltes sont conservées à l'Institut royal des Sciences naturelles de Belgique, Bruxelles.

Verschuren, J. (1986a). Notes d'écologie, principalement des mammifères, du Mont Nimba (Liberia).

Peu de régions de l'Afrique tropico-équatoriale ont été étudiées de façon aussi intensive par les naturalistes que le Mont Nimba. Jusqu'il y a deux décennies, ces travaux concernaient essentiellement le Nimba Guinéen, et dans une moindre mesure, Ivoirien. Les recherches étaient orientées principalement vers la Botanique, les Vertébrés inférieurs et les Invertébrés. Les études de LAMOTTE et de SCHNELL, de même que celles de plusieurs auteurs non cités ici, resteront longtemps des modèles du genre.

Cependant, depuis une quinzaine d'années, à l'initiative du "Nimba Research Committee", grâce à l'enthousiaste dynamisme de K. CURRY-LINDAHL, le Nimba Liberien a fait, lui aussi, l'objet d'études approfondies. Les publications sortent à un rythme accéléré. Pour le flore, il convient de citer les monumentaux travaux de J.G. ADAM. Une étude de base complète des Oiseaux est actuellement préparée par K. CURRY-LINDAHL. Concernant les Mammifères, on disposait d'excellentes informations sur la Guinée et la Côte d'Ivoire contigües. La liste globale de KUHN reste l'ouvrage de base pour les Mammifères de l'ensemble du Liberia. Notre collègue au Nimba Research Laboratory, le Dr. M. COE, a publié une remarquable étude exhaustive des Mammifères, orientée surtout au point de vue écologique.

L'auteur de cette note a séjourné au Nimba Liberien de novembre 1965 à mars 1966. Il a revu cette région en 1978-1979, dans le cadre d'une mission globale de promotion de la conservation au Liberia. Tout récemment, plusieurs auteurs, en particulier, ROBINSON, se sont occupés avec dynamisme des Mammifères du Liberia, mais pas spécifiquement du Nimba, à l'exception de l'équipe de HILL, qui s'est consacrée aux Cheiroptères. Les informations de K. CURRY-LINDAHL (comm. pers.) restent une mine de données précieuses.

Nos publications antérieures concernaient essentiellement les Insectivores (VERSCHUREN et MEESTER, 1977), les Rongeurs (MISONNE et VERSCHUREN, 1976) et lès Cheiroptères (VERSCHUREN, 1976. Il restait à examiner les autres groupes de Mammifères et à publier une synthèse des éléments de climatologie et d'écologie générale. Des remarques relatives à la Conservation trouvent également leur place ici. Par ailleurs, beaucoup d'éléments relatifs aux Mammifères "in globo" du Liberia sont examinés dans une étude actuellement sous presse. Elle fait suite au rapport général de mission (1983), axé sur la Conservation. Les limites d'études de la zone reprise ici concernent essentiellement la partie Liberienne du Nimba (avec quelques pointes d'exploration en Guinée) et une région d'environ une dizaine de kms de large, sur le piedmont.

La base de travail était située au Nimba Research Laboratory, à Grassfield, dont les coordonnées sont les suivantes: Lat. N. 7°30', Long. W. 8°32'. Les explorations ont été effectuées à pied ou en véhicule tous terrains. Les moyens nécessaires logistiques et autres ont été mis à notre disposition par le Nimba Research Committee et la Société minière, LAMCO. Des régions forestières du Liberia, situées loin du Nimba, et qui ont été prospectées intensivement en 1978-1979, avaient déjà été visitées par l'auteur en 1965-1966 (Nord-Ouest et Centre-Est du pays).

Les données chronologiques de l'exploration 1965-1966 sont les suivantes:
11-16 novembre 1965: Monrovia.
16 novembre 1965 à fin mars 1966: exploration de la région du Mont Nimba, y compris, du 15 au 21 février 1966, avec K. CURRY-LINDAHL.
6 au 10 décembre 1965: exploration de la région de Mputu-Chien.
4 au 7 janvier: exploration des hauts sommets Guinéens.
26 au 27 février: exploration de la région de Zorzor-Voinjama.
15 au 17 mars: exploration de la région de Chien-Mputu.

Les recherches ont été poursurvies, après notre départ, par plusieurs naturalistes. Actuellement (1983), le laboratoire situé au pied de la montagne reste toujours fonctionnel, sous la supervision du

technicien E. YALLAH. Celui-ci, accompagné de plusieurs collaborateurs, nous a accompagné durant tous nos déplacements.

Le laboratoire de Grassfield est situé dans une clairière herbeuse, d'origine édapho-anthropique, sur dalle latéritique. Il domine une petite galerie forestière intacte, sous-affluent de la rivière Yah (Bassin du St. John's river). Ce laboratoire avait constitué une des bases initiales de l'exploitation minière du mont Nimba.

Les collections de Mammifères, y compris quelques Primates et Pholidota, de même que la documentation iconographique, sont actuellement localisées à l'Institut royal des Sciences Naturelles de Belgique. Les peaux des grands Mammifères ont été conservées au Liberia. Les Batraciens récoltés ont été étudiés par M. LAMOTTE, à Paris.

Verschuren, J. (1988). Notes d'écologie, principalement des mammifères, du parc national de la Pendjari, Bénin.

Le Parc National de la Pendjari, entouré de plusieurs zones cynégétiques, s'étend sur 275.000 hectares dans le Nord du Bénin. Plus aux Nord encore, se trouve le Parc du W, d'environ 500.000 hectares. Ces unités protégées se continuent dans les pays voisins (Niger, Burkina Faso). L'auteur a séjourné pendant près de six mois au Bénin. en 1985, comme responsable du lancement d'un grand projet de conservation au Bénin, avec l'appui financier de la C.E.E. Il s'agissait d'une importante action pionnière de la C.E.E., suivie, depuis lors, par plusieurs autres interventions en Afrique. Sur base de ses observations et également de documents non publiés de divers spécialistes (GREEN et SAYER),l'auteur décrit le Parc de la Pendjari et examine les divers problèmes qui se posent, concernant le climat, l'eau et le feu, les milieux végétaux, la faune, en particulier celle des grands mammifères, les recensements, certaines actions anthropiques. Les grands mammifères ont été longtemps très braconnés mais les noyaux subsistant suffisent pour permettre une recolonisation de la plupart des habitats où domine la savane soudanienne, avec une très longue saison sèche et des pluies abondantes mais très localisées dans le temps. Le problème des eaux résiduelles en saison sèche est capital. Le Parc de la Pendjari constitue un des ultimes refuges pour l'éléphant de savane de l'Ouest de l'Afrique; il constitue également une des meilleures zones d'Afrique pour l'Antilope rouanne, *Hippotragus equinus*.

The Pendjari National Park, situated in N. Benin, is 275,000 hectares large and is surrounded by several cynegetic zones. The W-Park, still further north, has a surface of 500,000 hectares. Both protected areas are extending into the neighbouring countries (Niger, Burkina Fasso).

In 1985 the author spent six months in Benin, starting a large conservation project with the financial support of the E.E.C. It was an important pioneer action of the E.E.C., which was later followed by several other interventions in Africa.

On the basis of observations and of unpublished documents by different specialists (GREEN and SAYER), the author describes the Pendjari Park and considers sorne problems with relation to climate, water, fire, plant environments, fauna (especially large mammals), surveys and influence of man. Large marnmals have been severely affected by poachers, but viable groups still exist, allowing recolonisation of most of the habitats with soudanese savanna, characterized by a long dry season and by periodical heavy rainfall. The problem of residual water during the dry season remains a major one. The Pendjari Park is one of the last refuges for elephants of the W. African savanna, and one of the oost places in Africa for the roan antelope *Hippotragus equinus*.

Vielliard, J. (1974). Les chiroptères du Tchad.

Une petite collection de chauves-souris a été faite dans le bassin du Tchad entre novembre 1969 et janvier 1971 et a été déterminée avec l'aide de M. V. AELLEN. Les espèces suivantes sont signalées pour la première fois de la République du Tchad: *Micropteropus pusillus, Eptesicus rendalli, Eptesicus*

somalicus, Chalinolobus variegatus, Scotoecus hirundo, Tadarida nigeriae et *Tadarida midas*. Une liste complète des Chiroptères du Tchad a été dressée en tenant compte des informations de la littérature et des collections du Muséum de Paris. Un total de 21 espèces seulement est reconnu. Les données disponibles sur chaque espèce sont discutées et des problèmes de systématique sont évoqués en particulier pour *Epomophorus anurus, Nycteris hispida. Eptesicus* spp., *Scotophilus* spp. et *Tadarida pumila*.

Eine kleine Fledermaus-Ausbeute aus Tschad würde in Zusarnmenarbeit mit V. AELLEN bearbeitet; folgende Arten werden erstmals aus der Republik Tschad gemeldet: *Micropteropus pusillus, Eptesicus rendalli, E. somalicus, Chalinolobus variegatus, Scotoecus hirundo, Tadarida nigeriae* und *T. midas*. Unter Berücksichtigung der Literatur und der Sammlung des Museums Paris wird rine vollständige Liste der Fledermäuse von Tschad zusamrnengestellt; die insgesamt nur 21 Arten urnfasst. Die erhältlichen Daten über jede Art werden diskutiert, auf systematische Probleme wird besonders bei *Epomophorus anurus, Nycteris hispida, Eptesicus* spp., *Scotophilus* spp. und *Tadarida pumila* hingcwiesen.

In collaboration with V. AELLEN, the author identified a small rnaterial of bats, collected in Tchad between novernber 1969 and january 1971. The following species are recorded for the first time from this area: *Micropteropus pusillus, Eptesicus rendalli, E. somalicus, Chalinolobus variegatus, Scotoecus hilrundo, Tadarida nigeriae*, and *T. midas*. A complete list of bats, known from the Republic of Tchad is given, comprising only 21 species. The available informations of each species are discusscd, systematic problems are pointed out particularly for *Epomophorus anurus, Nycteris hispida, Eptesicus* spp., *Scotophilus* spp., and *Tadarida pumila*.

Vivier, L. and M. Van der Merwe (1996). Reproductive pattern in the male Angolan free-tailed bat, *Tadarida (Mops) condylura* (Microchiroptera: Molossidae) in the Eastern Transvaal, South Africa.

The reproductive pattern in male Angolan free-tailed bats *Tadarida (Mops) condylura* was studied at two localities in the Eastern Transvaal during the period 1989 - 1991. Males displayed a nine-month breeding season extending from June to February. Following testicular recrudescences in early June, spermatogenic activity displayed two periods of peak activit in August/early September and November/early December. Although testes became involuted in March, baseline spermatogenic activity was maintained and testes never regressed to preputertal conditions. Leydig cell morphology closely followed spermatogenic activity, with the diameter of Leydig cell nuclei displaying a concomitant seasonal pattern.

Vogel, P. (1977). Neue Nachweise der *Rhinopoma hardwickei* (Chiroptera) aus Westafrika.

Neue Funde der Fledermaus *Rhinopoma hardwickei* aus dem Niger aktualisieren das Problem der subspezisehen Zuordnung des bereits bekannten Nigermaterials. Ferner wird die Art erstmals für die Republik Mali nachgewiesen.

From Mali, the first record of the bat *Rhinopoma hardwickei* is communicated. From Niger, new data of the same bat actualise the problern of subspecific rank of older material from this country.

Volleth, M. and K.-G. Heller (1994). Phylogenetic relationships of vespertilionid genera (Mammalia: Chiroptera) as revealed by karyological analysis.

Banded karyotypes of 50 species belonging to 23 genera were analyzed. The diploid chromosome numbers ranged from 26 to 50. For karyotypic comparison we used a 44 chromosomes karyotype,

consisting of 4 metacentric and 17 acrocentric autosomes, as "basic karyotype". Almost all of its 25 autosomal arms could be identified in each individual karyotype. In 8 chromosomes, i. e. 1/2, 7, 11, 12, 13, 15, 23 and X, small inversions were detected. As a result, each of the chromosomes mentioned occurs in two states which differ slightly in their banding patterns. These were used as character states in the cladistic analysis together with other chromosomal rearrangements.

The implications drawn from the cladogram obtained are: The Miniopterinae clearly belong to the Vespertilionidae but are the first to branch off from the common stem. The tribe Myotini should be raised to the rank of a subfamily. Within the largest subfamily Vespertilioninae, one autapomorphic chromosomal character was found for each of the tribes Vespertilionini and Pipistrellini. In addition, both tribes are distinguished from the other Vespertilioninae tribes by two svnapomorphic features. These results allow for the first time an unequivocal classification of the systematically difficult "pipistrelloid" species. The species of the genus *Pipistrellus* (sensu HILL and HARRISON 1987) are spread over the Pipistrellini and Vespertilionini. We therefore suggest the splitting of this heterogenous genus into at least four genera. Only the members of the previous subgenus *Pipistrellus* constitute the genus *Pipistrellus* and belong to the Pipistrellini. The previous subgenera *Hypsugo, Vespadelus* and *Falsistrellus*, given generic rank in some recent studies, belong to the tribe Vespertilionini and are not closely related to *Pipistrellus*. For the genera *Eptesicus* and *Hesperoptenus*, which belong neither to the Vespertilionini nor to the Pipistrellini, the tribe Eptesicini was established. The phylogenetic relations of this tribe and the status of the presumably polyphyletic tribe "Nycticeiini" could not be solved.

Wallin, L. (1969). The Japanese bat fauna. A comparative study of chorology, species diversity and ecological differentiation.

The aim and arrangement of the study are presented in section I, the introductory section. A summary description is given of the areas investigated during the author's field studies in Japan.

In section II, the taxonomical section, a description, with data on distribution and bionomy, is given of each of the 29 forms (25 species) occurring in Japan.

Hypsugo Kolenati is re-established as a subgenus for *Pipistrellus savii*. The genus *Vespertilio* is divided into a *murinus* group and a *superans* group. Two new forms are described: *Vespertilio orientalis* and *Vespertilio rnurinus ussuriensis* (the latter is extra-limital to Japan). *Vespertilio namiyei* is considered to be a synonym of *V. superans*. The taxonomy and nomenclature of other forms are discussed (of especially *Rhinolophus ferrumequinum nippon, R. cornutus pumilus, Myotis formosus, M. capaccinii macrodactylus, Eptesicus nilssoni japonensis*, and *Tadarida teniotis*).

In section III, the general section, comparative analyses of species diversity (subsection 0) and ecological differentiation (subsection D) are given. Background information for this main item will be found in the subsections on regional climate (subsection A) and chorology (subsection B).

A comparison is made of the climate of Japan and that of the western part of the Palaearctic region. The range in temperature between the northern and southern parts of Japan corresponds to that in western Europe between Scandinavia and the Mediterranean. There is thus a southerly depression and concentration of the isotherms over Japan, compared with the western part of the Eurasian continent. The amplitude of the annual variation of temperature is similar in Japan and Scandinavia.

The steep gradient in the temperature conditions in Japan is reflected in the occurrence of both tropical (Megachiroptera) and boreal (*Plecotus auritus, Eptesicus nilssoni*) elements.

The precipitation is ampler in Japan than in western Europe. Large areas of dry-ground vegetation are lacking in Japan. Bat groups (for example, Rhinolophidae) frequently occurring in such habitats are poorly represented in Japan, as compared with Europe as a whole.

Other consequences of the relatively moist climate in Japan are presumably the exposed roosting habtts of several Japanese bat species (for example, *Vespertilio orientalis, Murina aurata* and *M. leucogaster*).

Four groups of faunal elements are recognized: endemic forms (9), northerly Palaearctic forms (8), southerly Palaearctic forms (10), and Oriental forms (2).

The relation between the Japanese bat fauna and that of the western Palaearctic region is analyzed in a survey of the chorology of the Palaearctic bat species. A numerical method is applied, giving a quantitative expression for the faunistic congruence of regions (index of faunistic congruence).

The "relative endemism" gives a numerical expression of a hypothesis about the dispersal centre (India and Indo-China) for the bat forms on the Eurasian continent.

Within each of three phytogeographical zones (subtropical, temperate and boreal) the following habitat zones are recognized: original forests, secondary forests, the cultivated landscape, transitions between open fields and forests, urban habitats, lentic habitats and lotic habitats. Short descriptions of the different habitat zones are given, together with a list of the bat forms occurring in them.

A general feature of species diversity is illustrated by the regression for the logarithm of the number of species and the logarithm of the area of the compared regions. An increasing species diversity towards the south is superimposed on this regression.

Japan is found to be comparable with central and southern European countries with respect to species diversity when the area-dependent species diversity is taken into account.

A regression for the number of endemic species and the total number of species within different regions on the Eurasian continent is demonstrated.

The distributions of the bat species in different hunting habitats in Japan and Europe are compared.

A comparison of the differentiations within the bat faunas of Japan, Europe, Scandinavia and Garamba (Africa) is made with the aid of a classification of types of roosts and behaviour at the roost.

The strongly anthropophile tendency of bats in northern Europe is not found in Japan. Only one species (*Pipistrellus abramus*) is predominantly house-dwelling there. The increasing synanthropism towards the north in Europe seems to have no counterpart in Japan. The differences in the climates, the milieu structure in the cultivated landscapes, and the architectures of the two regions are suggested as some of the reasons for this difference in habitat selection by the bats

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Warner, J. W., J. L. Patton, A. L. Gardner and R. J. Baker (1974). Karyotypic analyses of 21 species of molossid bats.

Examination of 135 specimens representing 21 species from seven genera of the family Molossidae revealed diploid numbers ranging from 34 to 48. Seventeen species from six genera have diploid numbers of 48. Geographic variation and polymorphism were found only in *Eumops glaucinus*. Chromosomal variation within the family is presumed to be primarily due to changes in diploid number resulting from Robertsonian translocations.

Wassif, K. and G. Madkour (1963). Studies on the osteology of the rat-tailed bats of the genus *Rhinopoma* found in Egypt.

The genus *Rhinopoma* is represented in Egypt by the species *hardwickei* and *microphyllum*. Of the two species *hardwickei* is the more common and has, therefore, been used to show the type of organisation found in an insectivorous bat. The Skeletal differences between the two species have also been studied.

Careful review of the literature reveals that the amount of work dealing with the osteology of insectivorous bats and of *Rhnlopoma* in particular is very fragmentary. Thus, Anderson (1902) very

briefly described the skull of *Rhinopoma microphyllum*. Thomas (1903) referred to cranial differences bewteen the two species. Miller (1907) wrote on the cranial and dental characters of the genus *Rhinopoma*. Wassif (1946 & 1948) described the tympanic region of *Rhinopoma microphyllum* and Garg (1955) described the orbito-temporal region in the skulls of *Rhinopoma h. hardwickei*, and *Rhinopoma kinneri* from Ajmer.

Wassif, K. and G. Madkour (1970). The structure of the hyoid bone, larynx and upper part of trachea in some Egyptian bats.

The structure of the hyobranchral skeleton of vertebrates has received considerable atlention frorn anatomists since the early work of Meckel (1829), Rathke (1832), Richer (1832), Saint-Hilaire (1832) and Owen (1866). Blainville (1841) described and figured the hyod apparatus of a large number of mammals including ..res species of *Pteropus*. Max Weber (1927) described … the hyoid region of *Rhinolophus hipposideros*. Soragues (1943) studied the hyoid apparatus and the muscles connected to it in placental mammals with special reference to bats. He described twenty three species of the Megachiroptera and twenty two species of the Microchiroptera. The species of Microchiroptera described by Sprague (1943) included *Rhinopoma micrcohyllum, Taphozous nudiventris, Nycteris aethiopica, Rhinolophus euryotis*. Romankowowa (1963) made a cornparative studv of the skeleton of the hyoid apparatus in Polish species of bats including *Rhinolophus hipposideros, Myotis myotis, Myotis mystacinus, Myotis dasycneme, Myotis daubentoni, Eptesicus serotinus, Nyctalus noctula, Pipistrellus pipistrellus* and *Plecotus auritus*.

Wassif, K. and G. Madkour (1971). The wing skeleton in Egyptian bats (Microchiroptera).

Brief descriptions of the fore-limb bones of bats appeared in the works of Dobson (1878) and Miller (1907). Greene (1931) studied the development of the carpal bones of *Tadarida* and Romankowowa (1961) described the sesamoid bones of the limbs of bats belonging to the genera *Rhinolophus, Plecotus, Barbastella* and *Myotis*. Wassif and Madkour (1970) described the wing phalanges of Egyptian bats belonging to the genera *Rhinopoma, Taphozous, Nycteris, Rhinolophus, Asel ia, Pipistreltus, Otonycteris, Plecotus* and *Tadarida*. Vaughan (1970) spoke of the characteristics of the skeleton in bats and Walton and Walton (1970) wrote on the post-cranial osteology of bats. Felten *et al* (1973) carefully described the distal part of the humerus in European bats and used it in the identification of the different genera and species.

Bat skeletons may be found in caves and ancient tombs and it is hoped that this illustrated account of the wing skeleton in Egyptian bats can be used as an aid in the identification of such fragments.

Wassif, K. and G. Madkour (1972). The structure of the os penis in Egyptian bats (Microchiroptera).

The os penis has been studies in 13 species of bats belonging to seven families of the suborder Microchiroptera. The bone was found to be variously developed in the different species. It is very small in both species of *Taphozous* (Emballonuridae) and of *Tadarida* (Molossidae). The os penis in the four species is a minute spicule in which there is no differentiation between a basal plate and a style. In *Rhinopoma* the two species studied show a moderately developed baculum in which the basal plate is sharply demarked from the style. In all cases the differences between different species of the same genus are, in general, size differences. Larger species possess larger bacula.

The Vespertilionidae show a variety of structure. The least developed baculum is that of *Plecotus austriacus* and the largest is that of *Otonycteris hemprichi*. *Pipistrellus (Scotozous) rüppelli*, which is of the size of *P. kuhli*, has a baculum more than twice as large as that of *kuhli*. They are both built on the same general plan.

In *Rhinolophus clivosus* (Rhinolophidae) the os penis is very large and tongue-shaped. In *Asellia tridens* (Hipposideridae) it is anchor- shaped, while in *Nycteris thebaica* (Nycteridae), it is racket-shaped, with a long style.

Wassif, K., G. Madkour and S. Soliman (1984). Fauna and Flora of Egypt. 1. On a collection of bats from Egypt.

The present collection includes some 1097 specimens of bats of which 693 specimens are in the form of skins and skulls (S+S') and 404 specimens are preserved in 70 % alcohol (Alc.), besides skeletons of dissected bats. The specimens were collected from the following localities:
Cairo-Giza area
Western Desert
Oases of Siwa, Kharga, Dakhla, Bahariya and Farafra
Wadi Natroun and Faiyum
El Arish in North Sinai
Feiran and St. Katherine in South Sinai
Luxor and Aswan in Upper Egypt.

The specimens were identified to the species level, because of the lack of collections from other localities to compare with the present specimens. The collection includes the following species:

Fam. Pteropodidae
1. *Rousettus aegyptiacus* E. Geoffroy, 1810
Fam. Rhinopomatidae
2. *Rhinopoma microphyllum* Brunnich, 1782
3. *Rhinopoma hardwickei* Gray. 1831
Fam. Emballonuridae
4. *Taphozous perforatus* E. Geoffroy, 1818
5. *Taphozous nudiventris* Cretzschmar, 1831
Fam. Nycteridae
6. *Nycteris thebaica* E. Geoffroy, 1818
Fam. Rhinolophidae T. Bell. 1836
7. *Rhinolophus clivosus* Cretzschmar. 1828
8. *Rhinolophus hipposideros* Heuglin. 1861
Fam. Hipposideridae G. S. 1-1ille r, 1907
9. *Asellia tridens* E. Geoffroy, 1813
Fam. Vespertilionidae
10. *Pipistrellus kuhli* Kuhl, 1819
11. *Pipistrellus rüppelli* Fischer, 1821
12. *Eptesicus innesi* Lataste, 1887
13. *Otonycteris hemprichi* Peters, 1859
14. *Plecotus austriacus* Gray, 1838
Fam. Molossidae
15. *Tadarida aegyptiaca* E. Geoffroy, 1818
16. *Tadarida teniotis* Temminck, 1826

The single specimen of *Eptesicus innesi* collected from Abu Rawash in August 1948 is the third known specimen of this rare bat. According to Flower (I932) Dr. Walter Innes, formerly curator of the Zoological Museum at the School of Medicine in Cairo, about the year 1885 obtained two specimens, a male and a female, in a house in Cairo. These were described by Lataste (1885) as *Vesperugo innesi*. One of the specimens is now, preserved in spirits, in the British Museum, the other is said to be in the Genoa Museum.

According to Sanborn and Hoogstraal, the bats they collected from Egypt belong to the following species and subspecies:

Rousettus aegyptiacus aegyptiacus,
Rhinopoma hardwickei cystops,

Rhinopoma microphyllum,
Taphozous perforatus perforatus,
Taphozous (Liponycteris) nudiventris,
Nycteris thebaica thebaica,
Rhinolophus clivosus clivosus,
Rhlnolophus clivosus brachygnathus,
Rhinolophus mehelyi,
Rhinolophus hipposideros minimus,
Asellia tridens tridens,
Plecetus auritus christiei,
Otonycteris hemprichi hemprichi,
Pipistrellus kuhli kuhli,
Tadarida teniotis rüppelli,
Tadarida aegyptiaca aegyptiaca

Gaisler, Madkour and Pelican (1972) reported on 236 specimens of bats which they collected from Egypt during April-May 1969. *Pipistrellus deserti* collected from Luxor in April 1969 is a new addition to the bat fauna of Egypt. Since it was not previously reported from that country. The authors distinguished two subspecies of *harwickei* namely, *Rhinopoma hardwickei sennaariense*, and *Rhinopoma hardwickei cystops*. *Plecotus auritus* of previous authors was referred to as *Plecotus austriacus christiei*. The subspecies of *Pipistrellus kuhii* was found to be *marginatus*. From the Zoogeographical point of view they found that most ol the bat species found in Egypt (76.2 %) are Palaearctic forms. The remaining (23.8 %) are Ethiopian species.

Watson, J. P. (1998). New distributional records for three microchiropteran bats (Vespertilionidae, Rhinolophidae) from the Free State Province, South Africa.

Distributional data on three microchiropteran species (*Myotis lesueuri* (Roberts, 1919), *Eptesicus hottentotus* (A. Smith, 1833) and *Rhinolophus denti* Thomas, 1904), recorded in the Free State Province for first time, are presented. In all three cases these comprise range extensions for the species.

Wickler, W. and U. Seibt (1976). Field studies on the African fruit bat *Epomophorus wahlbergi* (Sundevall), with special reference to male calling.

Social interactions, site attachment and group cohesion were studied in a free-living colony of *Epomophorus* fruit bats. Daily activities in an undisturbed colony were recorded. Special attention was paid to the peculiar calling behaviour of courting ?? during the night. Structure and repetition rate of their sounds were analyzed in the laboratory. A special mode of acoustic interaction was found and related to the observed spacing out of calling ?? By following feeding animals in the field and by analysis of their faeces we found that besides fruits they eat special leaves which afford steroidal sapogenins

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Widmaier, E. P. and T. H. Kunz (1993). Basal, diurnal, and stress-induced levels of glucose and glucocorticoids in captive bats.

Plasma levels of glucocorticoids and glucose were measured in three species of fruit bats (Chiroptera) sampled from captive populations. Three species of Old World bats (*Pteropus vampyrus, P. Hypomelanus*, and *Rousettus aegyptiacus*) had plasma levels of glucose that were within the normal mammalian range (80-100 mg/dl), with no difference between males and females. All animals had detectable levels of one or both of the major glucocorticoids (cortisol and corticosterone) found in mammals. Steroid levels were highest in *P. hypomelanus* (cortisol: 1,269 ± 207 ng/ml; corticosterone; 590 ± 154 ng/ml) and lowest in *R. aegyptiacus* (corticosterone: 36 ± 4 ng/ml; cortisol not determined). Diurnal changes in these steroids and the effects of handling and restraint stress were further

investigated in *P. hypomelanus*. Experimental animals were captured in their roost quarters, bled once by venupuncture within 3 min, placed singly into a small holding chamber for 50 - 60 min, and bled again. This procedure was performed at four different times over the course of 24 h with different groups of animals. Glucose was at a minimum just before and a maximum just after the period of food presentation. Cortisol levels remained relatively constant throughout the day-roosting period and significantly declined to their lowest level in the period following food presentation. As expected, the effects of handling and isolation caused a significant increase in both plasma cortisol and glucose levels. When individual *P. hypomelanus* were subjected to 3 h restraint stress in small plastic wire-mesh restraining devices, cortisol levels rose approximately 800 % by 2h, with the first significant increase at 20 min. Thus, effects of sampling time (time of day) on plasma levels of cortisol and glucose should be considered when designing field and laboratory studies in which hormones and other blood borne parameters are being measured. Handling and bleeding times that exceeded 3 min were associated with elevated plasma levels of cortisol and glucose above resting (unstressed) levels, suggesting that field and laboratory protocols should be designed to reduce or eliminate this problem. Finally, the exceptionally high levels of plasma corticoids in *P. hypomelanus*, and to a lesser extent in *P. vampyrus*, place these bats among the highest known circulating adrenal steroid levels of all mammals.

Wilson, V. J. (1975). Mammals of the Wankie National Park, Rhodesia.

The object of this Survey was to produce a check list of the mammals occurring in the Wankie National Park, Rhodesia, to show their distribution within the Park, to present information on the habitat in which they were found to occur, their habits, the time of the year at which the young are born, predation, food and feeding habirs and such other information as might contribute to their better understanding.

As far as is practical the data presented are based on material handled during the Survey and now in the collection of the National Museums & Monuments of Rhodesia, including fringing records made during the Botswana Mammal Survey (Smithers, 1971) along the western border of the Park or gleaned from a number of smaller collections made by staff members of the Museums from about 1950 onwards.

The first systematic collecting of small mammals in the Park was undertaken by Mr. P. Wright during 1967 and 1968. The writer has incorporated the data accompanying Wright's collection, amounting to 130 specimens, in the present work.

In addition a number of specimens have been collected within recent years by the Research Staff of the Department of National Parks and Wildlife Management which are now in the National Museum collection.

While the larger mammals occurring are well known, some having been studied in detail by members of the Department of National Parks, very little is known about the wide range of smaller species which constitute by far the larger proportion of the mammals which occur. Special emphasis was, therefore, placed on the collection of these smaller species, the information presented on the larger being based, in the main, on visual observations obtained during the course of the survey; from unpublished records in the files of the Department of National Parks; or from members of the Department stationed in the Park. Where culling operations had to be undertaken by the Departrnent , the opportunity was taken to recover material and data, otherwise no larger species were collected during the survey.

The field work continued over a two-year period from August 1969 to June 1971. During this time, in addition to the daily routine, 141 nights were spent in observation and collecting of small nocturnal species which cannot normally be contacted during daylight hours.

Throughout the text reference to "record" or "recorded" indicates that material is available to support the statement. Where visual records are used, owing to the doubts which so often arise with this type of record, they are clearly designated.

The Wankie National Park is the premier wildlife conservation area in Rhodesia. It is important, therefore, that we have a knowledge of the presence of species other than those which the visitor may

see, for it is the whole spectrum of wildlife that is being conserved not just the species that are large and conspicuous.

It is hoped that this paper will draw attention to the wide range of smaller, yet none the less interesting, mammalian species which occur.

The survey was undertaken by the National Museums and Monuments of Rhodesia at the request of the Department of National Parks and Wildlife Management and I should like to acknowledge the co-operation and assistance I have had from the Department, in particular its research branch and the many field officers, who have assisted me to whom due acknowledgement is made in the appropriate section of this report.

Wingate, L. R. (1978). The life history and population dynamics of six species of bats inhibiting a deserted mine tunnel in Natal, South Africa.

The life history and of six of Microchiroptera (*Nycteris thebaica, Rhinolophus clivosus, R. simulator, Hipposideros caffer, Myotis tricolour* and *Miniopterus schreibersi* roosting in Doornhoek mine tunnel, 16 km east of Pietermaritzburg, was investigated for two years. Doornhoek is a maternity colony for *R. clivosus* and *M. tricolour*; a winter roost for *M. thebaica* and *R. simulator* females; while *R. simulator* males are present throughout the year. Up to 30 *H. caffer* are present sporadically, while a few *M. schreibersi* males are sometimes seen during mid-summer. The tunnel was also used as a transitory roost by *M. schreibersi* during late spring migratory movements.

Wolton, R. J., P. A. Arak, H. C. J. Godfray and R. P. Wilson (1982). Ecological and behavioural studies of the Megachiroptera at Mount Nimba, Liberia, with notes on Microchiroptera.

Au cours d'une étude des Mégachiroptères de la partie libérienne du Mont Nimba faite entre juillet et septembre 1978, on a capturé 1007 individus annartenant à neuf espéces, presque exclusivement à l'aide de filets japonais. On a échantillonné dans une grande variété d'habitats et d'altitudes différentes.

Des informations sur les Mégachiroptères sont maintenant à notre disposition pendant presque toute l'année au Mont Nimba; beaucoup de celles-ci sont présentées et analysées ici. Les donnees sur la reproduction et l'habitat ont été regroupées et discutées pour chaque espèce. Une attention particulière a été accordée aux mouvements des chauves-souris; *Nanonycteris veldkampi* migre au Nimba. Beaucoup de chauves-souris ont été marquées et relâchées, mais pour de nornbreuses stations le taux des recaptures est resté très bas. Les méthodes par lesquelles les ressources peuvent être réparties entre Ies espèces sont discutées.

Six espèces ont été gardées au laboratoire pour perrnettre des observations sur: (a) le comportement de préhension de la nourriture, (b) la consomrnation nocturne de nourriture et (c) les types d'activité. Pour plusieurs espèces la concordance entre les activités au laboratoire et dans la nature est bonne. Un intérêt particulier a été accordé au comportement du rare *Scotonycteris ophiodon*.

En supplément, 280 Microchiroptères appartenant à 10 espèces ont été capturés, 6 d'entre elles sont nouvelles pour le Liberia. De courtes notes sont données sur chacune.

Les notes taxonomiques pour les espèces qui présentent un intérêt particulier sont dues à Hill (1982).

A study of the Megachiroptera of Liberian Mount Nimba was made between July and September 1978. 1,007 fruit bats of nine were captured, almost exclusively with mist nets. A wide range of habitats and altitudes was sampled. Inforrnation on Megachiroptera is now available for nearly the whole year at Mount Nimba: much of this information is presented and analysed here. Breeding and habitat information has been assembled for each species. Attention has been given to bat movements; *Nanonycteris veldkampi* is a migrant to Nimba. Many bats were marked and released, but for a variety

of reasons the recapture rate was very low. Methods by which resources may be partitioned amongst species are discussed.

Six species were kept in the laboratory to allow observations on (a) food handling and settling behaviour, (b) nightly food consurnption and through-put times, and © temporal patterns of activity to be made. Agreement between laboratory and field investigations of activity patterns is good for several species. Particular attention was paid to the behaviour of the rare *Scotonycteris ophiodon*.

In addition, 280 Microchiroptera of 16 species were caught. 6 of these are new to Liberia. Short notes have made for each.

Taxonomic notes for species of particular interest are provided by Hill (1982).

Woodman, N. (1993). The correct gender of mammalian generic names ending on *-otis*.

Mammalian generic names ending in *-otis* include *Cloetis, Cryptotis, Dolichotis, Laephotis, Macrotis, Myotis, Pharotis*, and *Phyllotis*. In the literature many of these names currently are associated with a combination of feminine, masculine, and neuter adjectival species names, in violation of the Code of Zoological Nomenclature. These generic names are feminine in gender, and the species names with which they are combined must be corrected appropriately.

Wroughton, R. C. (1906). On some mammals collected by Mr. Robin Kemp in S. Nigeria.

The Natural History Museum has recently received a small collection of mammals made by Mr. Robin Kemp in S. Nigeria. As the geographical region is an interesting one and the collection contains several forms sufficiently distinct to merit separate names, a short account of it may be acceptable.

Yalden, D. W. and M. J. Largen (1992). The endemic mammals of Ethiopia.

Species which are endemic to just one country add a particular interest to its fauna, and represent a special conservation requirement and concern.

Often, endemicity is associated with particular faunal regions or habitat types which, in continental areas at least, rarely coincide with our rather arbitrary political divisions, so that the countries which we recognize are rarely characterized by endemic species. Of the 247 mammals listed for Nigeria (Happold, 1987), probably none are endemic; even the most localized species occur also in Cameroon, and the majority are distributed throughout West Africa because their habitats are extensive east-west belts of vegetation [*Crocidura longipes* is at present only known from Nigeria]. Similarly, the Somali-arid zone, which is rich in endemics, covers much of Somalia, but extends into eastern Ethiopia and northern Kenya, while the Ruwenzori mountain area also contains numerous endemics (e.g. Hutterer, Van der Straeten & Verheyen, 1987), but includes parts of Zaire, Burundi, Uganda and Rwanda.

Ethiopia is one country where a major habitat block, having a high degree of endemicity in both fauna and flora, is contained within political boundaries. This account reviews the status and distribution of the 30 mammals which are currently believed to be endemic to Ethiopia

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Yalden, D. W., M. J. Largen, D. Kock and J. C. Hillman (1996). Catalogue of the mammals of Ethiopia and Eritrea. 7. Revised checklist, zoogeography and conservation.

This review of the Ethiopian and Eritrean mammal fauna recognises provisional totals of 277 terrestrial and 11 marine species. The terrestrial fauna is dominated by savanna forms (47.2 % of the total), most of which are widespread but with significant numbers being derived from either the East African

savannas or the sub-Saharan savanna belt. Deserticolous species (16.2 %) include many which are clearly associated with the Somali-arid zone. The 29 endemics are almost exclusively confined to the central plateaux at altitudes in excess of 1800 m and most are denizens of grassland or moorland habitats; few are forest species. Sylvicolous mammals are equally poorly represented amongst non-endemic forms (6.5 %) and it is concluded that Ethiopian forests have an impoverished fauna compared with those of Uganda and Zaire.

Conservation of wildlife, perennially starved of resources, has suffered greatly from neglect, poaching and destruction of property during the political crises of recent years. This situation is not irredeemable, given the return of peace and some measure of prosperity. If the region's actual and proposed national parks were to be fully established and effectively administrated, the have the potential to provide sanctuary for 210 (76 %) of the terrestrial mammals, including all but five of the endemic species (one shrew and four rodents). Amongst largers mammals which are unprotected, the apparently precarious situation of the Dibatag (*Ammodorcas clarkei*) gives particular cause for concern.

Yom-Tov, Y., M. Cohen and Z. Wollberg (1990). On the possible function of the anterior cornu in the Microchiroptera.

We measured the size of the ossified anterior cornu (the hyoid arch) of 10 species of microchiropteran bats belonging to 5 familes. We found that it is long and articulated in nasal emitters (Rhinolophidae, Hipposideridae and Nycteridae) and short and unarticulated in mouth emitters (Vespertilionidae and Molossidae). There is, apparently, also a positive relationship between the relative size of the "free" hyoid (the part not attached to the bulla) and the frequency of the bats' calls during searching (CF calls). We suggest that the function of the attachment of the hyoid bones to the bulla is to trigger the acoustic reflex. In addition, its function in nasal emitters is to raise the pharynx towards the nasopharynx during sound production.

La tail le de la corne antérieure ossifiée (l'arc hyoide) de 10 espèces de Microchiroptères appartenant à 5 familles a été mesurée. Ces mesures montrent qu'elle est longue et articulée chez les chauves-souris dont les émissions sont nasales (Rhinolophidae, Hipposideridae, Nycteridae), courte et non articulée chez celles dont les émissions sont buccales (Vespertilionidae, Molossidae). Il semble aussi exister une relation positive entre la taille relative de la partie libre de l'hyoïde (la partie non attachee a la bulle) et la frequence des cris ernis par les chauves-souris au cours de leur chasse.

La fixation des os hyoïdes à la bulle pourrait avoir pour fonction de provoquer le réflexe acoustique. En plus, chez les chauves-souris qui ont une émission nasale, son role est d'elever le pharynx vers le nasopharynx au cours de la production de sons.

Yoon, M. H. and T. A. Uchida (1983a). Identification of recent bats belonging to the Vespertilionidae by the humeral characters.

With the finding of many humeri of fossil bats on the Akiyoshi-dai Plateau in recent years, the investigation was carried out to determine whether bats can be classified to the species level by the humeral characters alone. Using the humeri of 23 recent species and 4 subspecies belonging to 9 genera of the Vespertilionidae including 3 subfamilies, keys based on humeral characters to various taxa from subfamily to species enabled us to identify to the species level. Furthermore, not only the functional significance of the humeral morphology but also the adaptation of bats for flight within each taxon were discussed the higher the bat was in the degree of adaptation for flight, the lower th e DW/˙W ratio (the ratio of the distal epiphysis width to the proximal one) was. Consequently, it became clear that the ratio is one of the most important criteria exhibiting directly the degree of adaptation. Taking also the wing-type ratio (the third finger to the fifth one); into consideration the adaptabiliyv for flight in bats can be estimated more exactly.

Yoon, M. H. and T. A. Uchida (1983b). Identification of recent bats belonging to the Rhinolophidae by the humeral characters.

Humeral characters of eleven recent species and one subspecies belonging to three genera of the Rhinolophidae including two subfamilies were described. A key provides for their identification as well as the identification of the fossil bats found on the Akiyoshi-dai Plateau. Further, we discussed differences in the adaptability for flight of the bats not only within each taxon of the family but also between the phylogenetically less advanced Rhinolophiae and the more advanced Vespertilionidae, taking the value of DW /PW (the ratio of the distal epiphysis width to the proximal one) and the wing-type ratio (the third finger to the fifth one) into consideration. In consequense, as a rule, the more the bat was in a phylogenetically high position, the more the adaptability for flight was high.

Yoshiyuki, M. (1995). Two rare species of the bats *Trienopus rufus* and *Mormopterus jugularis* (Mammalia, Chiroptera) from Madagascar.

Madagascan red trident bat, *Triaenops rufus* of the Hipposideridae and Peter's wrinkled-lipped bat, *Mormopterus jugularis* of the Molossidae are the endemic species in Madagascar. The material of these species have been few until present time. The present paper describes the external, cranial and dental characters of these imperfectly known species.

Young, R. A. (1975). Aging criteria, pelage colour polymorphism and moulting in *Rhinolophus megaphyllus* (Chiroptera) from south-eastern Queensland, Australia.

Plusieurs colonies de *Rhinolophus megaphyllus* ont été étudiées et marquées dans le sud-est du Queensland de 1970 à 1974. Les classes d'âge ont stabilés d'après des critères de reproduction, de morphologie et d'usure des dents. Les males atteignent la maturité sexuelle au début de leur deuxième année d'âge et les femelles dans la deuxième ou troisième année. Dans le Queensland, *R. megaphyllus* est polytypique et présente un dimorphisme sexuel en rapport avec la teinte de son pelage. Plusieurs hypothèses sont envisages pour expliquer ce polytypisme de couleur et le dimorphisme sexuel chez cette espèce.

Several colonies of *Rhinolophus megaphyllus* in south-eastern Queensland were studied by means of a mark-recapture method during the years 1970 to 1974. Age classes were established using reproductive, morphological, and molar tooth wear criteria. Males become sexually mature early in their second year and females in their second or third year. In Queensland, *R. megaphyllus* is polymorphic and sexually dimorphic with respect to pelage colour. In Queensland, rufous, grey and intermediate pelage colour phases occur in many populations, but only the grey phase has been recorded in New South Wales and Victoria. The rufous and grey colour phases appear to be the result of two different genetically controlled pigmentary systems, with intermediate pelage colours attributable to moulting and aging of the new fur. Bats with grey pelage always remain grey, but the rufous morph undergoes colour changes that vary according to age and sex. An incomplete juvenile moult occurs in many individuals. Several hypotheses are suggested to explain pelage colour polymorphism and sexual dimorphism in *R. megaphyllus*.

Zeller, U. (1984). Zur Kenntniss der Stimmapparates des Epauletten-Flughunde (Epomophorini, Pteropodidae, Megachiroptera).

Courting males of *Epomopborus, Epomops* and *Hypsignathus* emitt loud calls attracting estrous females. Studied were the organs of vocalization of a male *Epomophorus labiatus* and of a female *Epomophorus anurus* as well as male and female *Epomops buettikoferi* and *Hypsignathus monstrosus* with special emphasis on the topography of the neck and of the thoracic cavity. Compared to other Megachiroptera the larynx of the three genera is enlarged, however, to a quite different degree. *Epomophorus* is close to the supposed ancestral condition. The larynx is situated in the caudal half of the neck. There is no sexual dimorphism in the size of the larynx. The males of *Hypsignathus*

monstrosus possess a huge larynx reaching caudally to the diaphragm and nearly filling up the upper and middle mediastinum. The larynx of the females is much smaller reaching only behind the manubrium sterni. *Epomops* is intermediate between *Epomophorus* and *Hypsignathus*. The male's larynx is larger than that of *Epomophorus* and partially situated in the thoracic caviry. In *Hypsignathus* the larynx enters the thoracic cavity ventrally, but in *Epomops* dorsally of the heart. To reach the bifurcation the trachea is curved cranio-dorsally in *Hypsignathus*, but cranio-ventrally in *Epomops*. The different topography of the thoracic organs dernonstrates, that the enlargement of the larynx took place independently in the phylogeny of both genera. The extreme enlargement of the larynx in the male *Hypsignathus monstrosus* can be regarded as a result of intraspecific selection in correlation with the highly specialized lek mating behaviour of this species.

Zima, J. (1982). Chromosomal homology in the complements of bats of the family Vespertilionidae. II. G-band karyotypes of some *Myotis*, *Eptesicus* and *Pipistrellus* species.

G-bands observed in the chromosomes of *Myotis myotis, M. brandti, M. mystacinus, Eptesicus nilssoni, Pipistrellus savii, P. pipistrellus* and *P. kuhli* are described. The G-band patterns found in the karyotypes of the examined species of the genera. *Myotis* and *Eptesicus* are identical with those found in the congeneric North American species. The G-band pattern found in the chromosomal arms of *Pipistrellus* spp. Is identical with that in *Myotis* spp. In the karyotypes of the species of these two genera; the biarmed autosomes consist of arms showing an identical G-band pattern.

Zima, J. and I. Horácek (1985). Synopsis of karyotypes of Vespertilionid bats (Mammalia: Chiroptera).

In this paper, a brief synopsis of karyotypes of vespertilionid bats is presented according to literary data available to the authors. The variation in the karyotype on populational, specific and generic levels and karyotypic differences among genera, tribes and subfamilies are discussed. It is striking that chromosomal differentiation on the populational, specific and generic levels is almost entirely limited to tropical and subtropical forms. On the contrary, the karyotypes of forms inhabiting the Temperate Zone are very stable on the mentioned levels. The authors suppose that this phenomenon is connected with differences in ecological and social structures of populations and with different evolutionary potential of vespertilionid bats inhabiting the tropics and the Temperate Zone.

Zima, J., M. Volleth, I. Horácek, J. Cerveny and M. Macholán (1992b). Karyotypes of two species of bats, *Otonycteris hemprichi* and *Pipistrellus tramatus* (Chiroptera, Vespertilionidae).

The karyotype of *Otonycteris hemprichi* from Central Asia is described, and the arm composition is determined by G-banding (2n = 30, NFa = 48; 1/2,3/4, 5/6, 19/7, 21/8, 12/9, 15/10, 14/11, 18/13, '16/17', 20, 22, 23, 24?, X, Y). The metacentric fusion autosomes are identical to those of European and certain American *Plecotus* and *Barbastella* species. Robertsonian polymorphism is ascertained in a small sample of specimens of *Pipistrellus tramatus* (2n = 35, 36; NFa = 48). The karyotype of *P.tramatus* from Vietnam is different from that of *P. coromandra* from India described previously.

Zimara, R. (1935). Säugetiere Westafrikas (gesammelt von Alfred Weidholz).

Die von Herrn Altred Weidholz auf drei Expeditionen in Westafrika gesammelten Säugetiere umfassen 53 Arten und Unterarten in 123 Exemplaren.

Für die Wissenschaft sind die gesammelten Dama-Gazellen von besonderem Interesse, die uns mit ihren Fundorten über ihre Verbreitung Aufschluß geben, so daß wir einerseits von einer von Heller neuaufgestellten Rasse, den bisher unbekannten Fundort, anderseits eine neue Rasse im Nigerdreieck feststellen konnten.

Auch liegen uns von einigen Arten, wie *Felis ocreata* Gmel., *Canis pallidus* Rüpp. sowie *Canis variegatus* Kretzschm., Serien vor, die uns zeigen, wie groß die Farbenvariabilität innerhalb ein und derselben Art bei gleichen Fundorten sein kann. Bei der Bearbeitung der drei Expeditionen habe ich die einschlägige Literatur sowie die bereits erschienenen Separatas, soweit sie mir bisher zugänglich waren, verwendet. Von der bei der Darnu-Cazellen-Arbeit
verwendeten habe ich am Schlusse dieser ein genaues Verzeichnis angeschlossen.

Nachfolgend behandle ich jede Expedition für sich und lasse am Schlusse der dritten Expedition eine Übersicht über die zoogeographische Verbreitung der Dama-Gazellen sowie einen aus dieser sich ergebenden Bestimmungsschlüssel folgen.

Die erste hier bearbeitete Expedition wurde im Jahre 1927 unternommen und beschränkte sich auf Französisch-Nigerien.

Die mitgebrachten Säugetiere umfassen 13 Arten und Unterarten in 42 Exemplaren. Es befindet sich für die Wissenschaft zwar keine neue Art darunter, doch wurde durch den mitgebrachten Dama-Gazellenbock der Fundort der von Neu mann beschriebenen *Gazella dama reducta* bekannt. Diese Subspezies wurde von Heller nach einem Menagerieexemplar mit unbekanntem Fundort aufgestellt. Ferner befinden sich auch die im allgemeinen Teil erwähnten Serien darunter.

Der Zustand der mitgebrachten Präparate ist bei dieser Expedition im allgemeinen zufriedenstellend. Besonders die hier in Betracht kommenden sind sehr gut erhalten.

Die in dieser Arbeit vorkommenden nachstehenden Fundorte befinden sich alle in Französisch-Nigerien, mehr oder weniger weit von Timbuku,
Archarnbault, Fort.
Bourem.
Gourma-Bahrus.
Macina.
Nia-Funke, am Niger.

Die zweite Expedition wurde im Jahre 1928 unternommen und auf das Tschadseegebiet ausgedehnt. Die gesammelten Säugetiere umfassen 23 Arten und Unterarten in 30 Exemplaren. Der Zustand der mitgebrachten Präparate ist weit besser als bei der vorjährigen Expedition.

Nachstehend folgt ein Verzeichnis von den in dieser Arbeit vorkommenden Fundorten.
Archambault (Fort), am oberen Scharifluß, südlich vom Tschadsee.
Bagirmiland am Schari, südöstlich von Tschadsee.
Bahr-Sara, Nebenfluß des Schari, südöstlich vom Tschadsee.
Bali, Nebenfluß des Ubangi.
Bossanoa, Steppengegend, nördliches Ubangiland.
Lai, am Logone, Ubangi-Schari-Territorium.
Logone, südöstlich des Tschadsees.
Impfondo, am rechten Ibangiufer (gewissermaßen das Zentrum des Schlafkrankheits-Seuchenherdes).
Marrot, zirka 150 km südlich von Fort Archambault.
Melfi, Bagirmi, rechtes Schariufer.
Moissala, am Buhr-Sara.
Scharifluß.
Ubangitluß.

Die dritte Expedition wurde 1930 unternommen und erstreckte sich vom Senegal im Westen bis Timbuktu im Osten lind Hombori im Süden. Die mitgebrachten Säugetiere umfassen 20 Arten und Unterarten in 51 Exemplaren.

Sehr interessant sind die vier mitgebrachten Dama-Gazellenweibchen, die mit dem 1927 mitgebrachten Bock zusammen zu einer Revision der Arten und Unterarten Anlaß gegeben haben und zu einer neuen Abfassurig des Bestimmungsschlüssels fuhrten.

Auch bei dieser Expedition waren wie bei der 1928 unternommenen nur wenige Präparate schadhaft.

Nachstehend das Verzeichnis der in dieser Arbeit vorkommenden Fundorte.
Bonrem bei Timbuktu.
Dialokoto, Französisch-Garnbien.
Gourma-Rahrus, zwischen Kabara und Bourem.
Hombori, südlich von Timbuktu.
Kabara, Tirnbuktus Nigerhaten.
Kayes, am Senegal.
Nampala, südwestlich von Timbuktu .
Nia-Funke am Niger.
Niokolo-Koba, Nebenfluß des Gambia.
Nioro, nordöstlich von Kayes.
Tabadienke, Sumpfgebiet unweit des Niokolo-Koba.