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Above: A Yellow House Bat (*Scotophilus dinganii*) caught at Rocktail Bay, KwaZulu Natal, South Africa.

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Observations, Discussions and Updates

Position Statement on Bats and Ebola
BAT CONSERVATION AFRICA (BCA)
www.batconafrica.net

Summary: Bats and the current Ebola outbreak

The Ebola epidemic raging in parts of West Africa has now claimed almost 5,000[#] lives. The great concern about this crisis has led to speculations about the outbreak's origin based on limited scientific information. Consequently, there is a great deal of public misconception about the virus, its source and its transmission. One such misconception is that fruit bats have played a role in the current outbreak. In fact, there is currently no scientific evidence linking bats to the current outbreak of *Zaïre ebolavirus* that originated in southeastern Guinea. While some bat species have been implicated as reservoirs of Ebola virus, scientists have been thus far unable to isolate live virus particles from bats, and the role of bats as reservoirs of Ebola virus in equatorial Africa has yet to be confirmed. The wildlife source of the current Ebola outbreak in West Africa is as yet unknown.

While bats are linked to other zoonotic diseases, and remain a potential reservoir for Ebola, efforts to control their populations are likely to exacerbate the problem. Here we endeavor to correct some misconceptions about Ebola and bats:

- Despite claims in the media to the contrary, there is currently no scientific evidence that bats were the source of the current Ebola epidemic. "Patient Zero", or the patient in whom the outbreak began, has been identified as a two-year-old boy from southeastern Guinea. All cases since then appear to have stemmed from human-to-human-contact. It is not known how the Patient Zero contracted the disease; media claims of a link to bats are speculative. More research is needed.
- The Ebola virus is not airborne and, if bats are confirmed as a reservoir, the mere presence of bats could not lead to an outbreak of Ebola. However, handling bats should be strictly avoided. We advise that only bat experts should handle bats with appropriate personal protective equipment.
- Habitat destruction and hunting increases human contact with wildlife. Direct contact with wildlife in general may increase the risk of contracting zoonotic diseases. Humans may be exposed to hitherto unknown viruses and diseases via habitat destruction and human encroachment on wildlife habitats, including forests; harvesting and consumption of bushmeat; and unlicensed trade in wild animals such as primates.
- Attempts to relocate or exterminate bats lead to dispersal of bat colonies and will raise the risk of human contact. Culling (killing) bats has, in the past, counter-intuitively resulted in increased rates of infection among bat populations. This, in turn, can increase the likelihood of human zoonotic infection. Bats therefore should not be culled or their roosts disturbed.

Key facts about bats

Bats are flying mammals that occur on all continents except Antarctica. There are nearly 300 bat species in Africa, making up 20% of African mammalian diversity. Bats provide many ecosystem services that support human livelihoods: they contribute to forestry by pollinating flowers of trees, and aid reforestation by dispersing seeds. By consuming agricultural pests, insectivorous bats contribute enormously to agricultural productivity by reducing crop damage and pesticide use. This natural subsidy to agricultural productivity depends critically on healthy populations of bats.

Bats and Diseases

Although the ecological effects of bats on people are overwhelmingly positive, bats can carry diseases transmissible to humans. As social mammals, many bats live in dense aggregations that are conducive to infections by pathogens and transmission of parasites. Globally, some common bat pathogens include rabies (a virus that is transmitted via saliva or blood of infected mammals and can cause fatal encephalitis in humans) and histoplasmosis (a respiratory disease caused by a spore-producing fungus that grows in accumulated bat and bird droppings). Although bats are known to carry rabies, more than 99% of human deaths from rabies occurring in Africa and Asia are caused by infections from carnivores, including domestic dogs. African bats have also been associated with viruses such as Marburg virus, Duvenhage virus, and Shimoni virus, but whether the bats harbor the viruses long-term, as reservoir species, remains poorly understood.

Ebola: General information

Ebola virus is part of the filovirus family, which is comprised

Table: Basic ecological and geographical information about bats implicated as Ebola virus reservoirs

Species	Distribution	Habitat	Day roosts	Migratory?
Franquet's Epauletted Fruit Bat (*Epomops franqueti*)	West to Central Africa, marginally East Africa	Common in rainforests, woodlands, and farmbush	Densely foliated large trees	Non-migratory
Hammer-headed Fruit Bat (*Hypsignathus monstrosus*)	West to Central Africa, marginally in East Africa	Common in rainforests	Densely foliated trees, often near water	Non-migratory
Little Collared Fruit Bat (*Myonycteris torquata*)	Central Africa	Common in rainforests	In bushes and trees in the forest	Possibly migratory

[#]Editors note: When the this "Position Statement" was issued by Bat Conservation Africa this figure was 'about 5,000', but that it is currently (15 February 2015) 9,365 (see: http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/case-counts.html).

of four African species within the genus Ebolavirus: *Bundibugyo ebolavirus* (BDBV), *Zaïre ebolavirus* (EBOV), *Sudan ebolavirus* (SUDV), and *Taï Forest ebolavirus* (TAFV; formerly *Côte d'Ivoire ebolavirus*). These species cause periodic disease outbreaks in humans and non-human primates, usually with very high mortality rates.

The virus is transmitted to people by close contact with wild animals (often carcasses) of primates, and potentially, bats, and spreads among people through human-to-human contact. Infection results from direct contact with blood, saliva, urine, feces or other bodily fluids of infected (sick) people or animals, or through indirect contact with environments or objects contaminated with such fluids.

Bats as potential reservoirs of Ebola virus

As with humans, primates such as gorillas and chimpanzees are susceptible hosts and succumb to Ebola. Human disease has been linked to contact with those Ebolavirus-infected primates, which are hunted or scavenged and consumed as bushmeat. Before 2005, the history of Ebola outbreaks included potential exposure to bats, but it was not until 2005 that the first scientific evidence implicated bats as a reservoir of Ebola virus. Bats that seemed healthy tested positive for Ebola antibodies, and carried fragments of the virus. However, live virus could not be isolated from the bats, making them a likely, but not proven, reservoir. It is only in three fruit bat species (see Table), including the Hammer-headed Fruit Bat (*Hypsignathus monstrosus*), Franquet's Epauletted Fruit Bat (*Epomops franqueti*) and the Little Collared Fruit Bat (*Myonycteris torquata*) that substantial evidence was found. The Straw-coloured Fruit Bat (*Eidolon helvum*), a migratory bat widely distributed through sub-Saharan Africa, had very low levels of antibodies in one study in Ghana and no viral fragments, making it an unlikely Ebola virus reservoir. Very few studies have focused on Ebola virus ecology, and the links between bats, non-human primates, humans and Ebola viruses are not clear. For a comprehensive review, see Olival, K.J. & Hayman, D.T.S., 2014. Filoviruses in bats: Current knowledge and future directions. *Viruses* 6, 1759-1788.

The dangers of disturbing bat roosts

Disturbance of bat roosts and culling (killing) of bat colonies has proven an ineffective method for controlling zoonotic diseases when present in bat populations. In Uganda, Egyptian fruit bats (*Rousettus aegyptiacus*) were culled in the aftermath of a 2007 Marburg virus outbreak among humans. Soon thereafter, a new population of bats colonized the roost. The immigrant population had a higher rate of Marburg virus infection, which led to a second outbreak among humans. Likewise, long-term culling of vampire bats (*Desmodus rotundus*) in Peru has had a similar effect: colonies that were subjected to culling had higher rates of rabies infection. Consequently, where bats are harboring diseases that are potentially dangerous to humans, disturbing roosts or killing bats will likely increase rather than decrease the risk of people getting infected by such diseases.

The wisest way forward is to simply leave bats alone. Don't disturb, touch or hunt them. Do not try to evict or cull/exterminate bat colonies. Wildlife hunting and "bushmeat" consumption is currently considered the most likely route for the Ebola virus to enter the human population.

For details about signs and symptoms of Ebola refer to these links:

World Health Organization (WHO): www.who.int/mediacentre/factsheets/fs103/en

Centre for Disease Control (CDC): www.cdc.gov/vhf/ebola

A position statement by Bat Conservation Africa (BCA)

BCA is a network of bat researchers and conservationists working with African bats. Our mission is to facilitate research on, and conservation actions for, bats in Africa, through providing a network open to all bat conservation workers in the continent. Find more information on our website.

Scientific contributions

Commercial Hunting of Foraging Fruit Bats in Western Madagascar

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Madagascar's three endemic species of fruit bat are all at risk of population declines by hunting to supply the commercial and subsistence demand for bushmeat (RACEY *et al.*, 2010). Malagasy law only permits hunting of these species for subsistence between 1 May and 1 September through their classification as game in national wildlife legislation (RACEY *et al.*, 2010). Hunting, however, occurs throughout the year and sales are made without the required additional authorization for commercial transactions (JENKINS and RACEY, 2008; RAKOTOARIVELO *et al.* 2011). In the Menabe region of western Madagascar, hunters target *Pteropus rufus* (Tiedemann, 1808) and *Eidolon dupreanum* (Schlegel, 1887) fruit bats when they feed on the nectar of flowering kapok (*Ceiba pentandra*) trees in the austral winter (RACEY *et al.*, 2010; RANDRIANANDRIANINA *et al.,* 2010). This hunting occurs within the legal hunting season for game species, but information on the numbers of bats hunted, and the use of the meat, is lacking.

Quantitative information on bushmeat hunting in Madagascar is difficult to obtain because consumers and hunters are reluctant to divulge information that may reveal sensitive or even illegal activities. Recent studies on the use of wild animal meat in Madagascar have successfully used self-reporting by local observers to obtain information (HUMBER *et al.*, 2010, JENKINS *et al.*, 2011). In this short note, we report on a pilot project that enabled fruit bat hunters to anonymously record information.

We provided seven hunters with notebooks and pencils to record basic information about their hunting activities between 28 June and 10 August 2009. Hunting localities were generally in settlements along roads in the Menabe Region of western Madagascar, between the towns of Mahabo and Belo-Tsiribihina (i.e. Mahabo, Bemanonga, Ankilimida, and Beroboka). Each hunter who agreed to participate was paid 10,000 Ariary (5 USD) per month and provided the following information: (i) name of

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the tree where bat hunting took place, (ii) number of hunters, (iii) the numbers of nets used, (iv) number of male and female bats of each species hunted, (v) intended destination of hunted bats, (vi) price per bat and (vii) duration of the hunt.

All hunting occurred at night and with nets and records from 105 logbook entries revealed that most targeted trees were 'kapok' *Ceiba pentandra* (84.9%), followed by 'adabo' *Ficus* sp. (5.4%) 'taretra' *Agave sisalana* (4.3%) and 'fihamy' *Ficus* sp. (2.2%). Information on the number of hunters was only available for 80 data entries and usually comprised single hunters (78.8%) or teams of two hunters (16.3%), with a maximum of four. In some cases more than five hunters worked together but each operated a net and these were included as independent data points in the analysis. The mean hunting operation lasted 5.2 hours (SE 0.23) and usually began before 20h00.

There were 105 log book entries in our data set, covering 382 *P. rufus* (n=188 male, n=194 female) and 61 *E. dupreanum* (n=29 male, n=27 female, n=5 unsexed). Mean bat capture per night, per hunter was 3.6 (SE 0.37) for *P. rufus* and 0.6 (SE 0.13) for *E. dupreanum*. Assuming a single night of hunting, the number of *P. rufus* caught increased for hunts lasting up to seven hours but then notably decreased (Fig. 1A). There was a similar pattern for *E. dupreanum*, with no captures noted after seven hours (Fig. 1B).

Commercial transactions were reported for the majority of *P. rufus* (81%) and *E. dupreanum* (84%) entries. Some hunters informed us that they kept a few bats for their own consumption. From the commercial transactions, *Pteropus rufus* was sold directly to the public (38%), in markets (25%) or in combinations of to the public and sales to hotels/restaurants (37%). In comparison, proportionally more *E. dupreanum* were sold to the public (48%) with fewer sales in markets (24%) or the combined public/hotel restaurant (28%). Prices for *P. rufus* ranged from 2,000 to 3,000 Ariary (1.0-1.5USD) per bat, and *E. dupreanum* between 1,500 and 2,000 Ariary (0.8-1.0 USD) per bat.

Informal discussions with people during this study revealed that six hunters from Mahabo visit a *P. rufus* roost at Andranomena (24.2 km from Mahabo) when they are not engaged in agricultural activity. The hunters camped for three nights a week for approximately eight months of the year, netting bats as they leave and return to the roost. Approximately 20 bats are caught each night and the bats have apparently not abandoned the roost.

The fruit bats in our study were primarily hunted for commercial purposes by local village residents. By hunting at night, near their homes, and selling the bats locally they kept the opportunity costs low. It appeared that the commercial demand for fruit bat bushmeat came from both households and restaurants. RACEY *et al.* (2010) highlighted the role that small restaurants can play in maintaining a high demand for *P. rufus* in western Madagascar. It is possible that in our study area, this demand is maintained by a steady supply of minibus passengers travelling between Antananarivo and Morondava on Route National 34/35. (RANDRIANANDRIANINA *et al.* 2010). It therefore appears that both residents and transit passengers create the demand for fruit bat meat and the occurrence of foraging bats in close proximity to houses during the austral winter facilitates part-time hunting.

Observations in this study were made during the legal season for hunting these game species but there was no evidence that the hunters obtained authorization for their sales, so although the act of hunting was legal, selling the bats was illegal (RAKOTOARIVELO *et al.*, 2011). It is likely that few people are aware of the intricacies of the wildlife law; a study elsewhere in Madagascar showed that people have a poor knowledge of wildlife law, especially for non-protected species like bats (KEANE *et al.*, 2011). Part-time hunters also reported catching foraging fruit bats near their homes in April-May and November-December, in *Ficus* spp. and mango *Mangifera indica* trees respectively. Hunting therefore occurs for between six and seven months of the year, both inside and outside of the legal season for game species.

On a nightly basis, village hunters mainly operated for five hours from just after dusk, and there were diminishing returns for both species during hunting periods of more than seven hours. This is consistent with observations of *P. rufus* feeding in kapok trees, which recorded peak activity between 19h00 and 23h00 (ANDRIAFIDISON *et al.*, 2006). Thus, the reduction in fruit bat captures after midnight is more associated with normal activity patterns than a behavioral response to the nets and hunters.

Both *P. rufus* and *E. dupreanum* are widespread in western Madagascar (MACKINNON *et al.*, 2003) across landscapes that have a low human population density. Part-time hunters, whilst foraging in villages for at least six months a year, target these bats. There is also evidence that professional hunters operate in the same area and target roosting colonies of *P. rufus*. Roost sites are threatened by fire and agricultural expansion, as well as hunting, and should be the focus of conservation efforts, whilst additional investigations into the off-take by part-time hunters in urban areas are also needed.

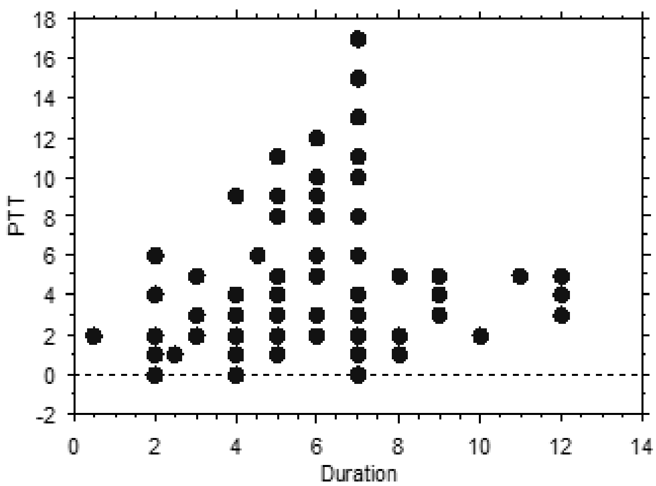

FIGURE 1A. Captures in hours of *Pteropus rufus* fruit bats in villages by part-time hunters.

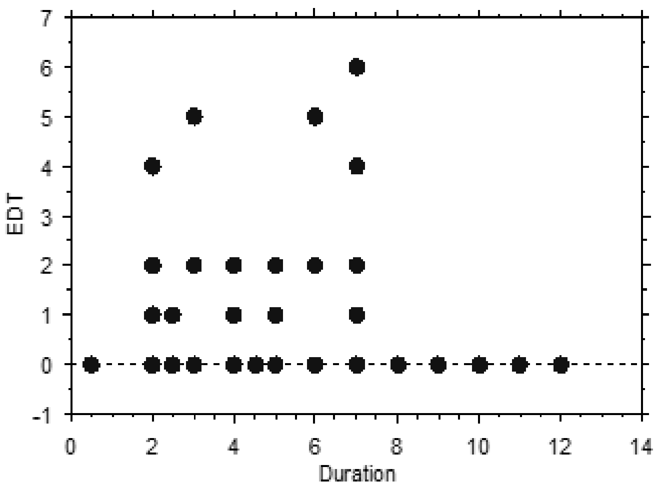

FIGURE 1B. Captures in hours of *Eidolon dupreanum* fruit bats in villages by part-time hunters.

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Possible first record and echolocation call of *Scotophilus* cf. *nux* Thomas, 1904 from Gabon

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Key words: Chiroptera, *Scotophilus nux*, Loango National Park, conservation, Gabon, echolocation.

Introduction

The insectivorous bat fauna of Gabon is poorly known, despite some detailed studies of Brosset in the Makokou and Bélinga regions (BROSSET, 1966, 1969). Many sub-Saharan species are only known from some scattered observations across their distribution. Their actual distribution remains unclear. Their conservational status is dependent on the area of distribution, their ecological preferences and threats. Thus, information on distribution, habitat and behaviour is vital to the conservation of species.

From January to February 2012, we carried out a bat study in a coastal rainforest with mangroves and lagoons south of the Loango National Park in the Gamba Complex of Protected Areas in southern Gabon (Figure 1). Little bat research has been conducted in this area in the past, although the Smithsonian Institution did carry out a small inventory of bats around the Rabi oil fields (RODRIGUEZ *et al.*, 2006).

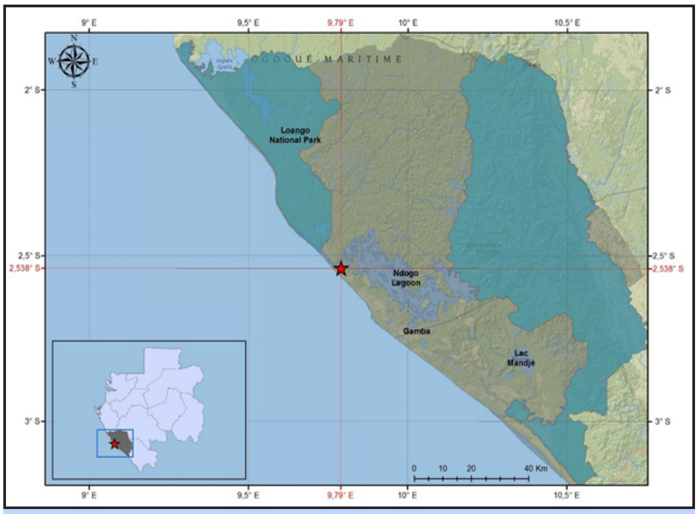

FIGURE 1. Map of Gabon with location of the Gamba complex of protected areas (left) and detailed map of the Gamba complex (right). Blue areas denote national parks, grey areas protected areas within the complex. The red star indicates the location of the mist nets placed on February 8th 2012.

The purpose of our study was to describe the calls of insectivorous bat species occurring in the Central African forest zone, thereby serving as a basis for acoustic bat surveys in this biome and to contribute to the species list and distribution of bats in Gabon. Acoustic surveys can improve our knowledge of the distribution and ecology of insectivorous bats. Here we present a description of the echolocation calls of *Scotophilus* cf. *nux* Thomas, 1904 and the first record of this species for Gabon.

Materials and methods

The study was carried out in the Gamba Complex of Protected Areas, near the village Setté Cama in southern Gabon. The complex of protected areas comprises the Loango National Park, the Moukalaba-Doudou National Park and the Rabi-Ndogo protected area, which is situated between them. The complex is characterized by a diversity of habitat types, including coastal forests, mangroves, swamps and lagoons to semi-montane forests and savannahs. The study area consists of coastal forests with mangroves and lagoons around the Ndogo lagoon, south of Loango NP.

Bats were caught during 12 trapping sessions in January and February 2012. On the 8th February 2012, two ground level mist-nets with dimensions of 6 x 4 meters and 12 x 4 meters were placed on a peninsula surrounded by mangroves and open water. The nets were set up across a hippopotamus trail a few meters from the bank of the lagoon and under closed canopy with coordinates 2.53458° S, 9.78911° E.

The mistnets were opened from 18.00 - 22.00 hours. Captured bats were removed from the nets and transported back to the camp site near the local village Setté Cama by boat. The bats were stored in holding bags for a maximum of 4 hours before examination and release. The following measurements were taken: forearm length, from the elbow to the carpals with the wings folded; 3rd metacarpal: length of the metacarpal of the third digit; 1st and 2nd phalanx of 3rd digit: length of the first and second phalanges of the third digit, respectively; tail length: from

Table 1. Measurements of *S.* cf. *nux* with field number 34 in comparison with published data from *S. nux* and *S. nucella*. Lengths are given in mm, mass in grams.

Measurement	*S.* cf. *nux*	ROBBINS *et al.* (1985)	GOODMAN *et al.* (2005)	VAN CAKENBERGHE and HAPPOLD (2013)	*S. nucella* - DECHER and FAHR (2007)
Forearm	56.9	55.4 - 60.4	53.0 - 58.0	53.0 - 61.0	49.5 - 52.4
3rd Metacarpal	51.3	-	48.0 - 49.0	-	-
1st Phalanx of 3rd digit	18.1	-	17.0 - 19.0	-	-
2nd Phalanx of 3rd digit	17.5	-	14.0	-	-
Tail	45.0	47.0 - 60.0	45.0 - 53.0	44.0 - 54.0	41.0 - 47.0
Head length	23.8	-	-	-	-
Tragus	6.9	-	-	-	-
Ear length	12.9	16.0 - 17.0	15.0 - 16.0	15.0 - 19.0	15.0 - 16.0
Ear width	6.5	-	-	-	-
Tibia	23.0	-	-	19.0 - 25.0	19.8
Mass	24.5	26.0 - 38.0	21.0 - 27.0	24.7 - 37.0	15.0 - 27.0

Figure 2. *Scotophilus* cf. *nux* from Gabon with unidentified parasite on the outer edge of the ear.

Figure 4. Hind leg of *S.* cf. *nux* from Gabon with a cluster of unidentified parasites.

Figure 3. Ventral side and wing of *S.* cf. *nux*, showing the chestnut brown coloration of the ventral fur.

the tip of the tail to its base adjacent to the anus; head length: maximum length of the head from tip of the nose to the back of the head; tragus length: length from the base of the tragus to the tip; ear length: from the lower border of the external auditory meatus to the tip of the pinna; ear width: maximum width of the ear; tibia length: from the knee joint to the ankle; mass: body weight of the animal in grams.

Table 2. Echolocation parameters for the captured individual of *Scotophilus* cf. *nux*. These calls were recorded during the first seconds after release. The following call parameters are given: minimum frequency (F_{min}), maximum frequency (F_{max}), dominant frequency (F_{dom}), pulse duration (DUR), and interpulse interval (IPI). Pulses: number of pulses included in this section (low quality pulses were omitted from the sample).

	Pulses (N)	Mean	SD	Min	Max
F_{min} (kHz)	22	38.49	0.83	37.82	40.04
F_{max} (kHz)	13	59.45	7.23	52.54	75.79
F_{dom} (kHz)	24	44.54	1.91	41.11	47.37
DUR (ms)	13	1.87	0.30	1.60	2.50
IPI (ms)	11	57.08	33.44	16.20	108.60

Echolocation calls were recorded using a Pettersson D240X bat detector with an Edirol R09 recorder during the few seconds after their release, at or close to their capture site. The recordings were made in a semi-open habitat on a coastal savannah at approximately 30 meters from a forest edge. The echolocation calls were analysed by using Batsound v.3.3 software from Pettersson Electronics AB. The sampling rate was set at 44.1 kHz with a 16 bit resolution.

Results

On 8 February 2012 an adult female possible Nut-coloured house bat (*Scotophilus nux*) (field number 34) was captured exiting the forest towards the lagoon. The bat was identified as

S. cf. *nux* based on external measurements (Table 1) and the orange-brown coloring of ventral and dorsal pelage (Figure 2 and 3). The fur is short and fine, the length of the hairs is around 5 mm. The head of the animal is large and robust. The wing and tail membranes are black. The tragus is long, narrow and with a strongly concave anterior margin (Figure 2). The bat was not lactating nor did it show any signs of recent reproduction.

On the tail membrane and on the edge of the ear clusters of larger brown parasites were present (Figure 2 & 4). On the underside of the wings several mites and flies were present. The bat however showed no signs of decreased health.

Comparisons

Several species of *Scotophilus* occur in Africa. The taxonomy of *Scotophilus* remains confusing (ROBBINS *et al*., 1985; SIMMONS, 2005). *Scotophilus nux* is sometimes mentioned as subspecies of *S. dinganii* (Smith, 1833) or *S. leucogaster* (Cretzschmar, 1826). We follow ROBBINS *et al.* (1985) who recognise *S. nux* as a separate species.

The combination of the overall chestnut brown colour, the forearm (FA) of 56.9 mm and the robust head distinguish this individual from *S. leucogaster, S. viridis* (Peters, 1852), *S. nigrita* (Schreber, 1774) and *S. dinganii* (ROBBINS *et al*., 1985; HAPPOLD, 1987; MONADJEM *et al*., 2010). The FA of 56.9 mm corresponds with both *S. nux* and *S. dinganii* but *S. dinganii* has bright or orange-yellow underparts. *S. viridis* and *S. leucogaster* are smaller in FA and have yellow or whitish coloured underparts and *S. nigrita* is much larger (FA > 70 mm) (MONADJEM *et al*., 2010). *Scotophilus nucella* is very similar to *S. nux* in colouration but is distinguished from *S. nux* by its smaller skull, wing, and body dimensions (ROBBINS, 1984). *S. nucella* has a forearm between 49 and 53 mm (ROBBINS, 1984). Our specimen was released after capture, therefore no skull or dental measurements were taken. The forearm of 56.9 mm is the only characteristic that could distinguish this individual from *S. nucella*. At this moment, this individual can only be identified as *Scotophilus* cf. *nux*.

Echolocation calls

The echolocation calls of this individual were frequency-modulated with a short quasi-constant frequency component (Figure 5). This type of call is often produced by vespertilionid bats that forage in semi-cluttered habitat close to trees, above clearings, or forest edges and trails (ALDRIDGE and RAUTENBACH, 1987). Our individual of *S*. cf. *nux* emitted echolocation calls with a dominant frequency between 41.11 and 47.37 kHz (Table 2). The end frequency of the pulses (lowest frequency) ranges from 37.82 kHz to 40.04 kHz. The highest frequencies range from 52.54 kHz to 75.79 kHz.

The FM component of the pulse is usually dominant. A single harmonic pulse is sometimes visible between 76 – 100 kHz.

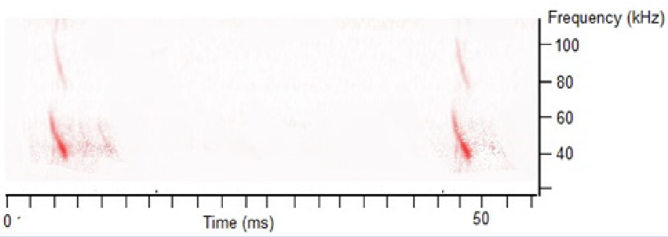

Figure 5. Spectrogram of *S*. cf. *nux*. The spectrogram was produced using Hanning window, FFT size 256. A single harmonic pulse is visible in louder calls.

Discussion

We assign this individual to *S*. cf. *nux*, which was not previously known for Gabon, based on external measurements and colour. Most observations of *S. nux* are made in central and west African forests around and north of the equator (ROBBINS *et al*., 1985; FAHR, 2008). POUSARGUES (1896) describes one specimen of *Scotophilus borbonicus* (Geoffroy, 1803) from Brazzaville with uniform redish brown coloration, which might represent *S. nux*. ROBBINS *et al.* (1985) mention two specimens from the Republic of Congo but without specific locality. BATES *et al*. (2013) however, consider these two specimens to represent *S. dinganii*.

This is the first description of the echolocation call of this species. The echolocation call parameters of this individual may not be representative for the species. More calls of different individuals, recorded in different habitats and regions within its distribution range, need to be analysed for a comprehensive assessment of the echolocation calls of this species and may be used for further identification of this individual. Our recordings of the echolocation call can also differ from normal foraging echolocation calls caused by stress in the animal from trapping and handling. Description of echolocation calls of *S. nucella* may give additional characteristics to distinguish *S. nux* from *S. nucella*. The given range of forearm in *S. nucella* is based on 9 individuals and may not be representative for the species. Additional measurements of forearm of *S. nucella* can clarify its actual range in forearm length.

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Recent literature

Papers

BAIZE, S., D. PANNETIER, L. OESTEREICH, T. RIEGER, L. KOIVOGUI, N. MAGASSOUBA, B. SOROPOGUI, M. S. SOW, S. KEÏTA, H. DE CLERCK, A. TIFFANY, G. DOMINGUEZ, M. LOUA, A. TRAORÉ, M. KOLIÉ, E. R. MALANO, E. HELEZE, A. BOCQUIN, S. MÉLY, H. RAOUL, V. CARO, D. CADAR, M. GABRIEL, M. PAHLMANN, D. TAPPE, J. SCHMIDT-CHANASIT, B. IMPOUMA, A. K. DIALLO, P. FORMENTY, M. VAN HERP and S. GÜNTHER. 2014. Emergence of Zaire Ebola virus disease in Guinea. *The New England Journal of Medicine* 371: 1418–25. doi: 10.1056/NEJMoa1404505.

In March 2014, the World Health Organization was notified of an outbreak of a communicable disease characterized by fever, severe diarrhea, vomiting, and a high fatality rate in Guinea. Virologic investigation identified *Zaire ebolavirus* (EBOV) as the causative agent. Full-length genome sequencing and phylogenetic analysis showed that EBOV from Guinea forms a separate clade in relationship to the known EBOV strains from the Democratic Republic of Congo and Gabon. Epidemiologic investigation linked the laboratory-confirmed cases with the presumed first fatality of the outbreak in December 2013. This study demonstrates the emergence of a new EBOV strain in Guinea.

BARATAUD, M., G. BEUNEUX, J.-F. DESMET, P. FAVRE, S. GIOSA and S. ROUÉ. 2014. Découverte de signaux sonar d'un chiroptère inconnu sur l'île de La Réunion. *Vespère* 3: 231 – 240.

During bat detector monitoring on la Réunion island, two bat echolocation call sequences have been collected in the same site (Ravine Bernica, Saint-Paul) in April 2009 and December 2012. The calls have been analyzed and described with their auditory and spectrogram features; they display unknown structure and rhythm features, which can't be linked to any other studied species at this time. They probably belong to a new taxa.

CHIPPAUX, J.-P. 2014. Outbreaks of Ebola virus disease in Africa: the beginnings of a tragic saga. *Journal of Venomous Animals and Toxins including Tropical Diseases* 20: 44. doi: 10.1186/1678-9199-20-44.

The tremendous outbreak of Ebola virus disease occurring in West Africa since the end of 2013 surprises by its remoteness from previous epidemics and dramatic extent. This review aims to describe the 27 manifestations of Ebola virus that arose after its discovery in 1976. It provides an update on research on the ecology of Ebola viruses, modes of contamination and human transmission of the disease that are mainly linked to close contact with an infected animal or a patient suffering from the disease. The recommendations to contain the epidemic and challenges to achieve it are reminded.

DISCA, T., B. ALLEGRINI and V. PRIÉ. 2014. Caractéristiques acoustiques des cris d'écholocation de 16 espèces de chiroptères (Mammalia, Chiroptera) du Maroc. *Vespère* 3: 209 – 229.

While bats echolocation is well studied in Europe nowadays, allowing making reliable surveys with ultrasound detectors, North African data remain incomplete and even species shared by Europe and North Africa may have different sonar characteristics from either side of the Mediterranean Sea. We here present the results obtained for Moroccan bats during the 2008 Win-Timdouine expedition in Morocco. Sixteen species are presented: *Hipposideros tephrus*, *Rhinolophus blasii*, *Rhinolophus ferrumequinum*, *Rhinolophus hipposideros*, *Otonycteris hemprichii*, *Tadarida teniotis*, *Miniopterus schreibersii*, *Eptesicus isabellinus*, *Pipistrellus* cf. *pipistrellus*, *Pipistrellus rueppellii*, *Hypsugo* cf. *savii*, *Myotis punicus* and *Myotis* gr. *escalerai* have been studied based on specimens caught and reliably identified, then released most often equipped with chemiluminescent capsules allowing noticing flight conditions and recording specimens in normal flight conditions. *Myotis capaccinii*, *Nycteris thebaïca* and *Plecotus gaisleri* were determined from sequences recorded in the field only, without any morphological identification. Results were consistent with the available literature for *Rhinolophus blasii*, *Rhinolophus ferrumequinum*, *Plecotus gaisleri*, *Otonycteris hemprichii*, *Hypsugo savii*, *Eptesicus isabellinus*, *Tadarida teniotis*, *Myotis capaccinii* and *Myotis punicus*.

Our results diverged for *Hipposideros tephrus*: mean maximum energy was 10 kHz over what is mentionned by Dietz *et al.* 2009 for North Africa; *Nycteris thebaïca*: maximum energy was lower than the values recorded in Zimbabwe; *Rhinolophus hipposideros*: frequencies were largely over what is known from Europe, but similar to those measured in Tunisia; *Pipistrellus* cf. *pipistrellus*: two frequency modes were observed; *Pipistrellus rueppellii*: new sonar types are described for hunting behavior and our results were strongly divergent from kenyan and Zimbabwean data; *Miniopterus schreibersii*: a new acoustic type which has never been observed in Europe, is described; *Myotis* cf. *escalerai*: a new sonar type is described.

FUNK, S AND P. PIOT. 2014. Mapping the zoonotic niche of Ebola virus disease in Africa. *eLife* 3: e04565. doi: 10.7554/eLife.04565

Identifying the regions where wild animal populations could transmit the Ebola virus should help with efforts to prepare at-risk areas for future outbreaks.

HACKETT, T. D., C. KORINE and M. W. HOLDERIED. 2014. A whispering bat that screams: bimodal switch of foraging guild from gleaning to aerial hawking in the desert long-eared bat. *The Journal of Experimental Biology* 217(17): 3028–3032. doi: 10.1242/jeb.100362.

Echolocating bats have historically been classified as either loud aerial hawkers or whispering gleaners. Some bat species can forage in multiple ways and others have demonstrated limited flexibility in the amplitude of their echolocation calls. The desert long-eared bat, *Otonycteris hemprichii*, has been said to be a passive gleaning whispering bat preying on terrestrial arthropods such as scorpions. Using an acoustic tracking system, we recorded individuals flying at foraging and drinking sites and compared their flight height, flight speed, call duration, pulse interval and source levels with those of gleaning individuals previously recorded using the same setup. We found differences in all variables with the strongest difference in source levels, where bats called at a mean of 119 dB peSPL (compared with 75 dB peSPL when gleaning). Bat faecal analysis indicated that their diet differed from previous studies and that prey species were capable of flight. We conclude that the bats switched from passive gleaning to capturing airborne insects (aerial hawking). Although whispering bats have been known to opportunistically catch insects on the wing, in the present study we show a full bimodal switch between foraging guilds with the respective changes in source level to those typical of a true aerial hawker.

JOHNE, R., P. DREMSEK, J. REETZ, G. HECKEL, M. HESS and R. G. ULRICH. 2014. Hepeviridae: An expanding family of vertebrate viruses. *Infection, Genetics and Evolution* 27: 212–229. doi: 10.1016/j.meegid.2014.06.024.

The hepatitis E virus (HEV) was first identified in 1990, although hepatitis E-like diseases in humans have been recorded for a long time dating back to the 18th century. The HEV genotypes 1–4 have been subsequently detected in human hepatitis E cases with different geographical distribution and different modes of transmission. Genotypes 3 and 4 have been identified in parallel in pigs, wild boars and other animal species and their zoonotic potential has been confirmed. Until 2010, these genotypes along with avian HEV strains infecting chicken were the only known representatives of the family Hepeviridae. Thereafter, additional HEV-related viruses have been detected in wild boars, distinct HEV-like viruses were identified in rats, rabbit, ferret, mink, fox, bats and moose, and a distantly related agent was described from closely related salmonid fish. This review summarizes the characteristics of the so far known HEV-like viruses, their phylogenetic relationship, host association and proposed involvement in diseases. Based on the reviewed knowledge, a suggestion for a new taxonomic grouping scheme of the viruses within the family Hepeviridae is presented.

KAMANI, J., G. BANETH, M. MITCHELL, K. Y. MUMCUOGLU, R. GUTIÉRREZ and S. HARRUS. 2014. *Bartonella* species in bats (Chiroptera) and bat flies (Nycteribiidae) from Nigeria, West Africa. *Vector Borne and Zoonotic Diseases* 14(9): 625–632. doi: 10.1089/vbz.2013.1541.

Previous and ongoing studies have incriminated bats as reservoirs of several emerging and re-emerging zoonoses. Most of these studies, however, have focused on viral agents and neglected important bacterial pathogens. To date, there has been no report investigating the prevalence of *Bartonella* spp. in bats and bat flies from Nigeria, despite the fact that bats are used as food and for cultural ritual purposes by some ethnic groups in Nigeria. To elucidate the role of bats as reservoirs of bartonellae, we screened by molecular methods 148 bats and 34 bat flies, Diptera: Hippoboscoidea: Nycteribiidae (*Cyclopodia greeffi*) from Nigeria for *Bartonella* spp. Overall, *Bartonella* spp. DNA was detected in 76 out of 148 (51.4%) bat blood samples tested and 10 out of 24 (41.7%) bat flies tested by qPCR targeting the 16S-23S internal transcribed spacer (ITS) locus. *Bartonella* was isolated from 23 of 148 (15.5%) bat blood samples, and the isolates were genetically characterized. Prevalence of *Bartonella* spp. culture-positive samples ranged from 0% to 45.5% among five bat species. *Micropterus* spp. bats had a significantly higher relative risk of 3.45 for being culture positive compared to *Eidolon helvum*, *Epomophorus* spp., *Rhinolophus* spp., and *Chaerephon nigeriae*. *Bartonella* spp. detected in this study fall into three distinct clusters along with other *Bartonella* spp. isolated from bats and bat flies from Kenya and Ghana, respectively. The isolation of *Bartonella* spp. in 10.0-45.5% of four out of five bat species screened in this study indicates a widespread infection in bat population in Nigeria. Further investigation is warranted to determine the role of these bacteria as a cause of human and animal diseases in Nigeria.

KOH, H. S., J. E. JO, J. G. OH, G. H. KWEON, N. H. AHN, W. H. SIN and D. S. SIN. 2014. Little genetic divergence of the greater horseshoe bat *Rhinolophus ferrumequinum* from far-eastern Asia, with a preliminary report on genetic differentiation of *R. ferrumequinum* from Eurasia and northern Africa examined from cytochrome *b* sequences. *Russian Journal of Theriology* 13(2): 97–103.

We obtained cytochrome *b* complete sequences (1140 bp) of the greater horseshoe bat *Rhinolophus ferrumequinum* from Korea (Jeju Island and mainland Korea), and these sequences were compared to corresponding sequences of *R. ferrumequinum*, obtained from GenBank, in order to examine genetic divergence among populations within *R. ferrumequinum* from far-eastern Asia and other parts of the range. Specimens from four populations in far-eastern Asia (Jeju, mainland Korea, northeastern China, and Japan) formed a far-eastern clade and were little differentiated, indicating that our results support a former subspecies classification, recognized *R. f. korai* and *R. f. quelpartis* as synonyms of *R. f. nippon*. In addition, we found that the eastern China clade from Henan is genetically distinct from the far-eastern clade, although individuals from Japan, northeastern China, and eastern China are known as *R. f. nippon*, and we propose further analyses with additional specimens from China to examine whether or not the eastern China clade is a subpopulation within *R. f. nippon*. On the other hand, *R. ferrumequinum* from Eurasia and northern Africa was found to be composed of four clades (far-eastern Asia, eastern China, central China, and western Asia – Europe – northern Africa), and average nucleotide distances between the first and other three clades were 2.15%, 4.10%, and 5.37% respectively. Thus, we found that genetic distances between these clades are correlated with geographic distances between them, and we concluded that further analysis of cytochrome *b* and other markers from additional specimens of *R. ferrumequinum* across distributional range is necessary to reexamine its population structure and subspecies classification.

KRÜGER, N., M. HOFFMANN, J. F. DREXLER, M. A. MÜLLER, V. M. CORMAN, C. DROSTEN and G. HERRLER. 2014. Attachment protein G of an African bat henipavirus is differentially restricted in chiropteran and nonchiropteran cells. *Journal of Virology* 88(20): 11973–11980. doi: 10.1128/JVI.01561-14. url: http://jvi.asm.org/content/88/20/11973.

Henipaviruses are associated with pteropodid reservoir hosts. The glycoproteins G and F of an African henipavirus (strain M74) have been reported to induce syncytium formation in kidney cells derived from a *Hypsignathus monstrosus* bat (HypNi/1.1) but not in nonchiropteran BHK-21 and Vero76 cells. Here, we show that syncytia are also induced in two other pteropodid cell lines from *Hypsignathus monstrosus* and *Eidolon helvum* bats upon coexpression of the M74 glycoproteins. The G protein was transported to the surface of transfected chiropteran cells, whereas surface expression in the nonchiropteran cells was detectable only in a fraction of cells. In contrast, the G protein of Nipah virus is transported efficiently to the surface of both chiropteran and nonchiropteran cells. Even in chiropteran cells, M74-G was predominantly expressed in the endoplasmic reticulum (ER), as indicated by colocalization with marker proteins. This result is consistent with the finding that all N-glycans of the M74-G proteins are of the mannose-rich type, as indicated by sensitivity to endo H treatment. These data indicate that the surface transport of M74-G is impaired in available cell culture systems, with larger amounts of viral glycoprotein present on chiropteran cells than on nonchiropteran cells. The restricted surface expression of M74-G explains the reduced fusion activity of the glycoproteins of the African henipavirus. Our results suggest strategies for the isolation of infectious viruses, which is necessary to assess the risk of zoonotic virus transmission. Importance: Henipaviruses are highly pathogenic zoonotic viruses associated with pteropodid bat hosts. Whether the recently described African bat henipaviruses have a zoonotic potential as high as that of their Asian and Australian relatives is unknown. We show that surface expression of the attachment protein G of an African henipavirus, M74, is restricted in comparison to the G protein expression of the highly pathogenic Nipah virus. Transport to the cell surface is more restricted in nonchiropteran cells than it is in chiropteran cells, explaining the differential fusion activity of the M74 surface proteins in these cells. Our results imply that surface expression of viral glycoproteins may serve as a major marker to assess the zoonotic risk of emerging henipaviruses.

LUČAN, R. K., T. BARTONIČKA, P. BENDA, R. BILGIN, P. JEDLIČKA, H. NICOLAOU, A. REITER, W. M. SHOHDI, M. ŠÁLEK, Š. ŘEŘUCHA, M. UHRIN, M. ABI-SAID and I. HORÁČEK. 2014. Reproductive seasonality of the Egyptian fruit bat (*Rousettus aegyptiacus*) at the northern limits of its distribution. *Journal of Mammalogy* 95(5): 1036–1042. doi: 10.1644/14-MAMM-A-035.

We collected and analyzed data on the annual course of reproduction of the Egyptian fruit bat (*Rousettus aegyptiacus*) in 2 climatically distinct areas, the Mediterranean and the Egyptian desert, located at the northern limits of the species' distribution. In both regions, reproductive seasonality was characterized by distinct bimodality in birth timing regardless of climatic differences. A low incidence of simultaneous pregnancy and lactation indicated that both seasonal bimodal polyestry with and without postpartum estrus may occur in both regions, with a possibly lower incidence of postpartum estrus in females from the Mediterranean population. Observed shifts in birth timing between the Mediterranean and the desert study area corresponded to regional differences in fruiting phenology of major dietary plants. The male reproductive cycle was synchronized with that of females. The period of testicular recrudescence occurred during the peak pregnancy period. Because testis size was related to body mass irrespective of body size, we hypothesize that food abundance is an important trigger of male sexual activity. *R. aegyptiacus* is the sole species with seasonal bimodal polyestry among Palearctic bats.

NAIDOO, S., D. VOSLOO and M. C. SCHOEMAN. 2014. Haematological and genotoxic responses in an urban adapter, the banana bat, foraging at wastewater treatment works. *Ecotoxicology and Environmental Safety*. doi: 10.1016/j.ecoenv.2014.04.043.

Wastewater Treatment Works (WWTWs) are a ubiquitous feature of the urban landscape. The Banana Bat, *Neoromicia nana* specifically exploits the high abundance of chironomid midge prey available at WWTWs but these populations also have higher levels of non-essential metals (Cd, Cr and Ni) in their tissues than bats foraging at unpolluted sites. Pollutant exposure may elicit primary physiological responses such as DNA damage and haematological changes. We investigated whether pollutant exposure from foraging at WWTWs impacts haematological and genotoxic parameters in *N. nana*. We compared four measures of haematological/genotoxic damage between *N. nana* foraging at three WWTWs and two unpolluted sites located in KwaZulu-Natal, South Africa: DNA damage measured by the Comet assay, total antioxidant capacity as indicated by the FRAP assay, chromosomal aberration indicated by micronuclei formation and blood oxygen capacity based on haematocrits. There was significantly higher DNA damage in *N. nana* at WWTWs than in bats from unpolluted sites, suggesting inadequate repair to double stranded DNA breaks. In addition, WWTW bats had a significantly lower antioxidant capacity than bats from unpolluted sites. This suggests that bats at WWTWs may have a diminished capacity to cope with the excess reactive oxidative species (ROS) produced from pollutants such as metals. There was no increase in micronucleus frequency in WWTW bats, indicating that cellular functioning has not yet been disrupted by chemical exposure. Haematocrits, however, were significantly higher in WWTW bats, possibly due to erythrocyte production in response to certain pollutants. Thus, effects of pollutant exposure in bats foraging at WWTWs elicit sub-lethal haematological and genotoxic responses which may pose serious long-term risks. This provides evidence that WWTWs, that are aimed to remove pollutants from the environment, can themselves act as a source of contamination and pose a threat to animals exploiting these habitats.

NINA, J. 2014. Ebolavirosis: a 2014 Review for Clinicians. *Acta Medica Portuguesa*, 27(5): 625–633.

Ebolavirosis, like Marburgvirosis, are African zoonosis, and for both the primary animal reservoir are bats. It is a typical acute haemorrhagic fever, characterized by a high lethality rate. In an outbreak, the human index case became infected after contact with an infected animal or its blood, in most cases during hunting. Secondary human cases became infected after close contact with another human case, with infected human fluids or with a recent dead corps of a human case. These viruses are easily transmitted by direct contact or by contact with patient body fluids, mainly blood. As such, health professionals working under suboptimal conditions usually constitute a large share of Ebola victims. At the moment, the treatment is only supportive, but several drugs are almost ready to be tried in human trials. There is no vaccine approved, but again there are several very promising in the pipeline.

ORR, T. J. and M. ZUK. 2014. Reproductive delays in mammals: an unexplored avenue for post-copulatory sexual selection. *Biological reviews of the Cambridge Philosophical Society* 89(4): 889–912. doi: 10.1111/brv.12085.

Numerous mammalian taxa exhibit reproductive delays, pauses in reproduction that occur between mating and fertilization, between fertilization and implantation of the embryo, or after an embryo has implanted. Of the 27 mammalian orders, 9 are known to exhibit reproductive delays, including Diptrotodontia, Dasyuromorphia, Eulipotyphyta, Cingulata, Carnivora, Rodentia, Chiroptera, Lagomorpha and Cetartiodactyla. Most researchers interested in delays have focused on their evolutionary origins. However, the consequences of these delays have not been considered fully. Given the lengthening of the period over which reproduction occurs, it is possible that this unique aspect of reproduction facilitates post-copulatory sexual selection. When considered in the context of sexual selection, delays may allow sperm competition and female manipulation of fertilization (cryptic female choice) as well as other post-copulatory processes. We investigate the potential for reproductive delays to facilitate post-copulatory sexual selection and suggest avenues for research that may further our knowledge of sexual selection. We also provide a general review of reproductive delays in mammals.

RAKOTONDRAMANANA, C. F., S.M. GOODMAN, B. RAMASINDRAZANA and M. C. SCHOEMAN. 2014. Vocalisations de *Pipistrellus* spp. sensus lato de Madagascar: Expérience sur l'effet de confinement. *Malagasy Nature*, 8, 80–88.

Different aspects associated with the echolocation calls of bats are important for a range of studies associated with these organisms, including census work using vocalization dictionaries, taxonomic research, and different ecological studies. In many cases, the peak frequency range in bats is species specific. However, the manner echolocation calls are recorded, particularly with respect to the size of flight cages, may have important implications for some of the standard parameters used in the analysis and characterization of different bioacoustic variables. Herein, we conduct an experiment to test potential differences in a group of Malagasy bats using two different size flight cages. The study organisms are members of the Family Vespertilionidae, specifically those classically placed in the genus *Pipistrellus*, which are today placed in different genera, and form cryptic species complexes. On Madagascar, there are currently three recognized genera of vesper bats: *Pipistrellus*, *Neoromicia*, and *Hypsugo*. One species was formerly considered a member of the genus *Eptesicus*, *E. matroka*, but now placed in *Neoromicia*. As considerable work still remains to characterize species of vespers occurring on Madagascar and the purpose of this paper is to understand the importance of flight cage size in recorded echolocation parameters of individual bats and without their specific identification being critical, we use the collective term *Pipistrellus* sensu lato for the animals studied herein. Vespers were captured with mist nets at different sites: central west – Kirindy CNFEREF, Isalo region (near Ranohira) and Zazafotsy, and central east - Anjozorobe and Andasibe between October 2012 and March 2013. Recordings were made at night and generally soon after individual bats were netted. Two different flight cages were employed: large (12 x 3 x 3 m, referred to as cage A) and small (5.4 x 1.4 x 1.5 m, referred to as cage B). Each individual bat was released at one end of the cage and its vocalizations recorded in time expansion (x10) using a D-240X Pettersson bat detector. Associated wave files were stored directly on a netbook computer. To eliminate the effect of fatigue, after an individual was first recorded in one of the two flight cages, it was placed in a cloth bag to rest for about 10 minutes, before it was released and recorded in the second type of flight cage (alternating between A and B). Recorded echolocation calls were analyzed using BatSound version 4.1.4 set at 44.1 kHz. To avoid pseudo-replication, a single pulse at the beginning of the search phase per individual per flight cage was selected based on the signal to noise ratio. The following parameters were measured from the power spectrum: frequency of maximum energy or peak frequency (FmaxE, in kHz), maximum frequency (Fmax, in kHz) to +18 dB, and minimum frequency (Fmin, in kHz) to -18 dB. Further, the duration of a pulse (Dur, in ms) and the interval between two successive pulses (IPI, in ms) were measured from the composite spectrogram and oscillogram In total, 75 individual *Pipistrellus* s.l. bats were recorded in the two types of cage. Most of the recorded echolocation calls in flight cage type A showed a frequency-modulated signal followed by a short quasi-constant frequency (FM/QCF) component, while those from flight cage type B typically displayed a frequency modulated (FM) signal that lacked a QCF component. Comparison of the effects of confinement between the two types of cage showed no significant variation in FmaxE ($t = -2.36$, $df = 74$, $P = 0.210$) and Fmax ($t = -2.42$, $df = 74$, $P = 0.180$) parameters, while significant differences were found in Fmin ($t = 2.93$, $df = 74$, $P < 0.05$), Dur ($t = 11.42$, $df = 74$, $P < 0.001$), and IPI ($t = 9.04$, $df = 74$, $P < 0.001$). These results show that the different taxa involved have considerable plasticity in echolocation call structure associated with confinement (cluttered and non-cluttered environments). This information should be considered when interpreting the echolocation parameters of individuals recorded in flight cages and extrapolating the utility of this information for taxonomical and ecological research.

ROLLINSON, D. P., J.C. COLEMAN and C. T. DOWNS. 2014. Roost temperature and fidelity of Wahlberg's epauletted fruit bat, *Epomophorus wahlbergi*, in an urban environment. *African Zoology* 49(2): 173–180. doi: 10.3377/004.049.0218.

Generally, Wahlberg's epauletted fruit bat (*Epomophorus wahlbergi*) roost in trees or under the eaves of buildings. This study investigated the roosting dynamics of *E. wahlbergi* in the urban environment of Pietermaritzburg, South Africa. To determine roost fidelity bats were radio-tracked to daytime roosts. Bats were found to change their daytime roosts regularly, and would change more frequently during winter than spring. Roost temperatures were measured by placing i-Button® temperature loggers at known roosts, either in man-made structures or vegetation. Temperatures varied across different roosts, but roost temperatures were generally higher than ambient temperatures. Roosts in man-made structures had higher temperatures than those in natural vegetation. This study showed the importance of temperature in *E. wahlbergi* daytime roosts, although other factors such as reproduction and social interactions, predator avoidance and proximity to food resources are likely to also affect selection of daytime roosts.

RUSSO, D., M. DI FEBBRARO, H. REBELO, M. MUCEDDA, L. CISTRONE, P. AGNELLI, P. P. DE PASQUALE, A. MARTINOLI, D. SCARAVELLI, C. SPILINGA and L. BOSSO. 2014. What Story Does Geographic Separation of Insular Bats Tell? A Case Study on Sardinian Rhinolophids. *PloS One* 9(10): e110894. doi: 10.1371/journal.pone.0110894.

Competition may lead to changes in a species' environmental niche in areas of sympatry and shifts in the niche of weaker competitors to occupy areas where stronger ones are rarer. Although mainland Mediterranean (*Rhinolophus euryale*) and Mehely's (*R. mehelyi*) horseshoe bats mitigate competition by habitat partitioning, this may not be true on resource-limited systems such as islands. We hypothesize that Sardinian *R. euryale* (SAR) have a distinct ecological niche suited to persist in the south of Sardinia where *R. mehelyi* is rarer. Assuming that SAR originated from other Italian populations (PES) - mostly allopatric with *R. mehelyi* - once on Sardinia the former may have undergone niche displacement driven by *R. mehelyi*. Alternatively, its niche could have been inherited from a Maghrebian source population. We: a) generated Maxent Species Distribution Models (SDM) for Sardinian populations; b) calibrated a model with PES occurrences and projected it to Sardinia to see whether PES niche would increase *R. euryale*'s sympatry with *R. mehelyi*; and c) tested for niche similarity between *R. mehelyi* and PES, PES and SAR, and *R. mehelyi* and SAR. Finally we predicted *R. euryale*'s range in Northern Africa both in the present and during the Last Glacial Maximum (LGM) by calibrating SDMs respectively with SAR and PES occurrences and projecting them to the Maghreb. *R. mehelyi* and PES showed niche similarity potentially leading to competition. According to PES' niche, *R. euryale* would show a larger sympatry with *R. mehelyi* on Sardinia than according to SAR niche. Such niches have null similarity. The current and LGM Maghrebian ranges of *R. euryale* were predicted to be wide according to SAR's niche, negligible according to PES' niche. SAR's niche allows *R. euryale* to persist where *R. mehelyi* is rarer and competition probably mild. Possible explanations may be competition-driven niche displacement or Maghrebian origin.

SCHOEMAN, M. C., S. M. GOODMAN, B. RAMASINDRAZANA and D. KOUBÍNOVÁ. 2014. Species interactions during diversification and community assembly in Malagasy *Miniopterus* bats. *Evolutionary Ecology* 29(1): 17–47. doi: 10.1007/s10682-014-9745-4.

The habitat first rule (HFR) proposes that radiating species initially diversify into habitat specialists and later into dietary specialists within a given habitat, whereas the general vertebrate model (GVM) adds divergence of sexually selected traits as a possible third axis of specialization subsequent to habitat and dietary divergence. In this study, using 12 *Miniopterus* spp. from Madagascar we test predictions of the HFR and GVM from ecological and evolutionary perspectives on Grinnellian and Eltonian niche structures. We used environmental niche models (ENMs) to quantify the Grinnellian niche, both for current and last inter-glacial climates. We used null models to examine Eltonian niche patterns of sympatric species in terms of their phylogenetic relatedness and phenotypic and sensory characters associated with the trophic niche—body size, skull morphology and echolocation. As predicted by the HFR, we found evidence for labile Grinnellian niches: there was no similarity in ENMs between sister species; overlap in ENMs was significantly low in >65 % of all possible species pairs; there was no relationship between ENM niche overlap and phylogenetic distances between species; and there was no phylogenetic signal in suitable bioclimatic zones among species. Conversely, we found equivocal support for the HFR regarding Eltonian niche patterns. Closely related species tended to be distributed among ensembles rather than within ensembles, although there was no evidence for overdispersion in phylogenetic patterns in ensembles. In <50 % of the observed combinations of sympatric *Miniopterus* spp., we found significant signal for overdispersion of phenotypic and sensory characters. We hypothesize that selective processes associated with the adaptive radiation of *Miniopterus* spp. on Madagascar may have favoured bats to diversify first into broad scale habitat specialists, but argue that understanding the relative influence of bionomic processes at a local spatial scale will require more reciprocal comparisons of Eltonian niches.

SRINIVASULU, B., C. SRINIVASULU, H. KAUR, T. A. SHAH, G. DEVENDER and A. SRINIVASULU. 2014. The reassessment of the threatened status of the Indian endemic Kolar Leaf-nosed Bat *Hipposideros hypophyllus* Kock & Bhat, 1994 (Mammalia: Chiroptera: Hipposideridae). *Journal of Threatened Taxa* 6(12): 6493–6501. doi: 10.11609/JoTT.o4117.6493-501.

The Kolar leaf-nosed bat *Hipposideros hypophyllus* Kock & Bhat, 1994, endemic to Kolar District, Karnataka, India was listed as 'Endangered' in the IUCN Red List of Threatened Species due to its restricted distribution and continuing decline in the quality of its habitat. The species has not been sighted or collected since its initial collection in the years 1983 and 1985 wherein eight individuals were collected from Therahalli and 41 individuals were collected from Hanamanhalli, respectively. Based on recent observations and collections from the type locality, we provide information about its distribution, threats, phylogenetic position and conservation status. We also provide an updates conservation assessment of this species following the IUCN Red List categories.

TANSHI, I. 2014. Bat Conservation Africa: a voice for African bats. *IUCN Bat Specialist Group Newsletter* (1).

YU, W., Y. WU and G. YANG. 2014. Early diversification trend and Asian origin for extent bat lineages. *Journal of Evolutionary Biology* 27(10): 2204–2218. doi: 10.1111/jeb.12477.

Bats are a unique mammalian group, which belong to one of the largest and most diverse mammalian radiations, but their early diversification is still poorly understood, and conflicting hypotheses have emerged regarding their biogeographic history. Understanding their diversification is crucial for untangling the enigmatic evolutionary history of bats. In this study, we elucidated the rate of diversification and the biogeographic history of extant bat lineages using genus-level chronograms. The results suggest that a rapid adaptive radiation persisted from the emergence of crown bats until the Early Eocene Climatic Optimum, whereas there was a major deceleration in diversification around 35–49 Ma. There was a positive association between changes in the palaeotemperature and the net diversification rate until 35 Ma, which suggests that the palaeotemperature may have played an important role in the regulation of ecological opportunities. By contrast, there were unexpectedly higher diversification rates around 25–35 Ma during a period characterized by intense and long-lasting global cooling, which implies that intrinsic innovations or adaptations may have released some lineages from the intense selective pressures associated with these severe conditions. Our reconstruction of the ancestral distribution suggests an Asian origin for bats, thereby indicating that the current panglobal but disjunct distribution pattern of extant bats may be related to events involving seriate cross-continental dispersal and local extinction, as well as the influence of geological events and the expansion and contraction of megathermal rainforests during the Tertiary.

ZHU, Q., M. KOSOY, K. J. OLIVAL and K. DITTMAR. 2014. Horizontal transfers and gene losses in the phospholipid pathway of *Bartonella* reveal clues about early ecological niches. *Genome Biology and Evolution* 6(8): 2156–2169. doi: 10.1093/gbe/evu169.

Bartonellae are mammalian pathogens vectored by blood-feeding arthropods. Although of increasing medical importance, little is known about their ecological past, and host associations are underexplored. Previous studies suggest an influence of horizontal gene transfers in ecological niche colonization by acquisition of host pathogenicity genes. We here expand these analyses to metabolic pathways of 28 *Bartonella* genomes, and experimentally explore the distribution of bartonellae in 21 species of blood-feeding arthropods. Across genomes, repeated gene losses and horizontal gains in the phospholipid pathway were found. The evolutionary timing of these patterns suggests functional consequences likely leading to an early intracellular lifestyle for stem bartonellae. Comparative phylogenomic analyses discover three independent lineage-specific reacquisitions of a core metabolic gene-NAD(P)H-dependent glycerol-3-phosphate dehydrogenase (gpsA)-from Gammaproteobacteria and Epsilonproteobacteria. Transferred genes are significantly closely related to invertebrate Arsenophonus-, and Serratia-like endosymbionts, and mammalian Helicobacter-like pathogens, supporting a cellular association with arthropods and mammals at the base of extant *Bartonella* spp. Our studies suggest that the horizontal reacquisitions had a key impact on bartonellae lineage specific ecological and functional evolution.

Notice Board

Conferences

12TH African Small Mammal Symposium

To be held in: Antananarivo, Madagascar, 12-18 April 2015

The 12th African Small Mammals Symposium will take place at Mantasoa, Madagascar, about a 2.5 hour drive from Antananarivo. This international symposium, organized by Association Vahatra and the Department of Animal Biology of The University of Antananarivo, will be an occasion for students, researchers, and experts on African and Malagasy small mammals to present their work and exchange ideas and experiences.

Further information can be found at - http://www.vahatra.mg/asms/asmseng.html

All aspects of queries and information should be sent to: Steve Goodman: sgoodman@vahatra.mg or Voahangy Soarimalala: vsoarimalala@vahatra.mg

Zoological Society of Southern Africa 37th ZSSA Congress

To be held at: Rhodes University, Grahamstown, South Africa, 12 to 17 July 2015.
Further information: http://www,essa-zssa2015.co.za/programme.html

17th International Bat Research Conference

To be held in: Durban, South Africa, 2016

Opportunities

American Society of Mammalogists – African Graduate Research Fund

The American Society of Mammalogists has recently established a program to fund African nationals in studying mammals in their countries of origin. The intent is to help promote the science of mammalogy in Africa, a continent with exceptional mammalian diversity but lacking in adequate resources for training and educating young professionals. This program, the African Graduate Research Fund, supports African graduate students who show promise of becoming leaders of the next generation of mammalogists.

Further information can be found at: http://www.mammalogy.org/committees/african-graduate-student-research-fund

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American Society of Mammalogists – Sponsored Membership

The American Society of Mammalogists (ASM) has developed a program to provide the opportunity for young individuals who show promise in the field of mammalogy, in this case African nationals but they can be from any developing country, and may be eligible for a sponsored membership in the American Society of Mammalogists.

If you know of a young promising individual who you believe would benefit from membership in the ASM, send the name and contact information to Dr. Ricardo Ojeda (rojeda@mendoza-conicet.gob.ar) or Duane A. Schlitter (happygd@suddenlink.net). They will contact the person and ascertain if sponsored membership is suitable.

Scholarships & Grassroots Grants for Bat-Centric Projects Foucused on Critical Conservation Needs

Bat Conservation International (BCI) requests proposals through its online application system (http://www.batcon.org/our-work/initiatives/award-grants-scholarships or http://www.batcon.org/our-work/initiatives) from university students, conservation organizations, and individual researchers/conservationists interested in seeking financial support for their projects. The application system will begin accepting new submissions on **March 1, 2015**.

Please address all questions to: grants@batcon.org

Call for contributions

African Bat Conservation News is divided into two main parts: peer reviewed and non peer reviewed articles.

The non peer reviewed part is further subdivided into a two sections:

Research and Conservation - which aims to promote projects, organizations and individuals working on bat related research, conservation and/or education within Africa and its surrounding islands. Updates on projects and activities are also encouraged.

Observations, Discussions and Updates - This section is used to inform and allow readers to comment on various issues of a thematic nature. It is also used to capture information (e.g. Observations) which may not have enough information to make the scientific contribution section (these observations will be moderated by the editorial board).

The scientific contribution part of African Bat Conservation News is peer reviewed and publishes brief notes concerning the biology of bats, new geographical distributions (preferably at least 100 km from the nearest previously published record), sparsely annotated species lists resulting from local surveys, roost counts, and echolocation of bat species occurring on the African continent and adjacent regions, including the Arabian peninsula, Madagascar, and other surrounding islands in the Indian and Atlantic oceans and those islands just off Africa within the Mediterranean and Red Seas.

Two additional sections are also included in the newsletter - Recent literature - this includes abstracts from recent conferences and recently published works. If you are involved in a conference or have published a paper and wish to have it included in this section please send a copy of the PDF of the paper to the Editor or Scientific Editor.

Notice Board - includes information on future planned conferences, workshops or training opportunities. If you are an organizer of such an event and wish it to be promoted in ABCN then please send the information to the Editor.

African Bat Conservation News Project Cycle

Issues will be published Quarterly (January, April, July, October).

Deadlines for scientific contributions (1 November, 1 February, 1 May, 1 August).

Deadlines for non-scientific contributions (1 December, 1 March, 1 June, 1 September).

Non scientific contributions should be sent to the Editor while scientific contributions should be sent to the Scientific Editor.

Notes to authors are available at www.africanbats.org or download PDF.

Editorial Team