Volume 18

October 2008

African Bat Conservation News

ISSN 1812-1268

Inside this issue:

Above: An adult, male Rüppell's bat (*Pipistrellus rueppellii*) caught at Lufupa camp, Kafue River, Kafue-NP, Zambia (S14.61430 E26.18840, alt. 1091m). Tissues were taken before being released (ECJS-06/2008).

NOTICE BOARD

Talks

6th Austin Roberts Commemorative Lecture

"The hunt for the reservoir hosts of Marburg and Ebola viruses"

by Prof. Robert Swanepoel

(Special Pathogens Unit, National Institute for Communicable Diseases)

To be held at: Transvaal Museum Auditorium, Paul Kruger Street, Pretoria (opposite the City Hall), South Africa
On: Thursday, 13th November at 17h30 for 18h00
For further information contact: Tersia Perregil (perregil@nfi.museum) or +27 12 3227632

Conferences

5th International Conference on Environmental, Cultural, Economic and Social Sustainability

University of Technology, Mauritius, 5-7 January 2009 http://www.SustainabilityConference.com/

International Workshop of Experts on Global Environmental Change (including Climate Change and Adaptation) in sub-Saharan Africa

Pretoria, South Africa, 9-11 February 2009

10th International Mammalogical Congress

Mendoza, Argentina, 9-14 August 2009 http://www.cricyt.edu.ar/imc10

12th European Bat Research Symposium - Lithuania, August 2011.

Download and subscribe to African Bat Conservation News at:

www.Africanbats.org

ISSN 1812-1268

SCIENTIFIC CONTRIBUTIONS

BATS RECORDED FROM KOEGELBEEN CAVE AND SELECTED OTHER SITES IN THE NORTHERN CAPE, SOUTH AFRICA

By: Ara Monadjem[1], Niall Higgins[2], Tina Smith[3] and Eric Herrmann[4]
[1]*All Out Africa Research Unit, Department of Biological Sciences, University of Swaziland, Private Bag 4, Kwaluseni, Swaziland. E-mail: ara@uniswacc.uniswa.sz*
[2]*Department of Botany, Martin Ryan Institute, National University of Ireland, Galway, Republic of Ireland*
[3]*All Out Africa Research Unit, P.O. Box 153, Lobamba, Swaziland*
[4]*Department of Tourism, Environment & Conservation, Private Bag X6102, Kimberley 8300, Northern Cape, South Africa*

Cave-dependent species are generally tied to cave ecosystems for roosting and breeding, and hence conservation of such sites is vital for the long-term persistence of their populations. South Africa has a number of important bat cave sites, such as Guano Cave in de Hoop Nature Reserve, Western Cape (MCDONALD *et al.*, 1990) and Sudwala Cave, Mpumalanga Province (JACOBS, 2000). Koegelbeen Cave, a South African Natural Heritage Site, is an important refuge for several bat species in the Northern Cape but has received only a little attention in the published (HERSELMAN and NORTON, 1985) and grey (IRISH *et al*., 1997) literature. In the 1980's, Koegelbeen was known as the second most important bat cave in the former Cape Province, second only to Guano Cave (IRISH *et al*., 1997). The aim of this paper is to report on a brief bat survey of Koegelbeen and a number of other caves in the north-eastern Northern Cape conducted in late March 2008.

A total of five caves or abandoned mines were visited between 28 March and 1 April 2008. In chronological order these were: Koegelbeen Cave (28°39.188´S 23°20.918´E); Hopefield Mine (28°36.930´S 23°19.433´E); Soetfontein Cave (28°23.095´S 23°03.041´E); Blinkklip Grot (28°17.995´S 23°07.040´E); and the Eye of Kuruman (27°27.883´S 23°26.176´E). A sixth cave, the Wonderwerk Cave (27°50.863´S 23°33.232´E) was also visited, but no bats were observed anywhere within the cave.

Each cave or mine was visited once (twice in the case of Soetfontein) during the day when bats were roosting, and all chambers containing visible bats were explored. Due to its fairly large size (total length of 788 m), only the Main Chamber and the Bat Corridor of Koegelbeen Cave, as delineated by J. Irish and E. Marais in 1991 (IRISH *et al.*, 1997), could be surveyed. Bats were captured within the caves and mine by hand or with a mistnet, and identified using a recently developed matrix (MONADJEM *et al.*, *in press*). In addition, several mistnets and two harp traps, set before sunset, were used to trap emerging bats up to one hour after sunset. At Koegelbeen (two nights) two harp traps and one mist net (10 m in length) were placed just outside the fenced perimeter on the eastern side of the sinkhole. At Hopefield (one night) two mist nests were placed at the western and eastern side of the main farm house (28°37.191´S 23°19.768´E). Voucher specimens were collected from each species and deposited in the Durban Natural Science Museum. Echolocation calls were recorded using a Time Expansion bat detector (Tranquility III; supplied by Courtpan Design Ltd, UK) connected to a laptop computer.

At Koegelbeen an attempt was made to obtain a population estimate by conducting a replicated count (O'SHEA and BOGAN, 2003) of the bats emerging from the cave at sunset. However, due to our unfamiliarity with the emergence pattern of the bats, and being limited to two nights at the cave, only one emergence count was obtained. The count was made by an observer and a recorder positioned on boulders overlooking the site where a small gulley enters the eastern side of the sinkhole. An emergence count could not be made at Soetfontein Cave due to the prevailing cold and wet weather, while Hopefield Mine was considered too difficult to count reliably due to the large number of exits. An emergence count was also made at the Eye of Kuruman, but no bats were recorded leaving the gated cave entrance.

A total of 194 individuals of five species were captured during this survey (Table 1). This represents 36% of the 14 species of bats that have been collected from the Northern

Table 1: Species and numbers of bats captured at five caves in the Northern Cape, March 2008. Numbers in brackets represent estimates of the numbers present in the cave at the time of the survey.

Species	Koegelbeen (cave)	Hopefield (mine)	Soetfontein (cave)	Blinkklip Grot (cave)	Eye of Kuruman (cave)
Rhinolophidae					
Rhinolophus clivosus	-	2 (80)	2 (20-50)	1 (15-20)	1
Rhinolophus darlingi	-	3	-	-	-
Rhinolophus denti	6	-	1	-	-
Vespertilionidae					
Neoromicia capensis	2	5	-	-	-
Miniopteridae					
Miniopterus natalensis	162 (2000)	4 (100-150)	5 (1200)	-	-
Total individuals caught (or collected)	170	14	8	1	1
Total species	3	4	3	1	1

Cape (A. Monadjem, unpublished data). Hopefield Mine had the highest species richness (four species), but the largest congregations of bats by far were at Koegelbeen. We counted a total of 2010 bats emerging at sunset on the 29th of March 2008, which may represent an underestimate as the light was very poor by the end of the count. The bats emerged from the cave, with some bats circling inside the sinkhole, before leaving the sinkhole in an easterly direction via the small gulley. Judging by the numbers hanging in the cave during the day, the vast majority of the emerging bats would have been *Miniopterus natalensis*. A total of 162 *M. natalensis* were trapped with harp traps over two nights at Koegelbeen, of which 98 were sexed with 87 males and 11 females, giving a sex ratio of approximately 8:1 (males:females).

The only *Rhinolophus* species recorded in Koegelbeen Cave during our suvey was *R. denti* but it is possible that we overlooked other species of this genus at this site, as well as *Nycteris thebaica*, due to the inaccessible nature of some parts of the cave. A previous survey in July 2004, based on counting hanging bats in the cave, recorded c. 200 *R. denti*, 50-100 *R. clivosus* and 20-30 *R. darlingi* (D. Jacobs, *pers. com.*). Voucher specimens of all three species from this location exist in the Transvaal Museum (Table 2). During this July 2004 visit no *M. natalensis* were recorded, while during an earlier visit in December 2003 only *M. natalensis* was present and all three rhinolophid species were absent (D. Jacobs, *pers. com.*).

Table 2: Species list for Koegelbeen Cave based on voucher specimens. DM = Durban Natural Science Museum, Durban; NMB = National Museum, Bloemfontein; MMK = McGregor Museum, Kimberley; TM = Transvaal Museum, Pretoria.

Species	Vouchers
Rhinolophidae	
Rhinolophus denti	DM 10132, DM 10134
*Rhinolophus clivosus**	TM 36060, NMB 7502, MMK 2777
*Rhinolophus darlingi**	MMK 2926
Nycteridae	
*Nycteris thebaica**	MMK 2755
Molossidae	
*Tadarida aegyptiaca**	NMB 7509
Vespertilionidae	
Neoromicia capensis	DM 10133
Miniopteridae	
Miniopterus natalensis	DM 10137, DM 10140

*Indicates species collected during previous surveys

Hand-held echolocation calls for *R. denti* caught in harp traps placed near the entrance to Koegelbeen were retained for analysis using Batsound v3.30 (Petersson Elektronik AB, Uppsala, Sweden); 16-bit resolution; time expansion factor 10 (Figure 1).

These calls compare well with that of SCHOEMAN (2006) who recorded a peak frequency of 111.2 kHz and 23.4 ms, and JACOBS *et al.* (2007), who recorded a peak frequency of 110.9 kHz. The harmonics in Figure 1 are probably false and as a result of the gain on the bat detector being too high.

Our population estimate for *Miniopterus natalensis* at Koegelbeen Cave is considerably lower than previous

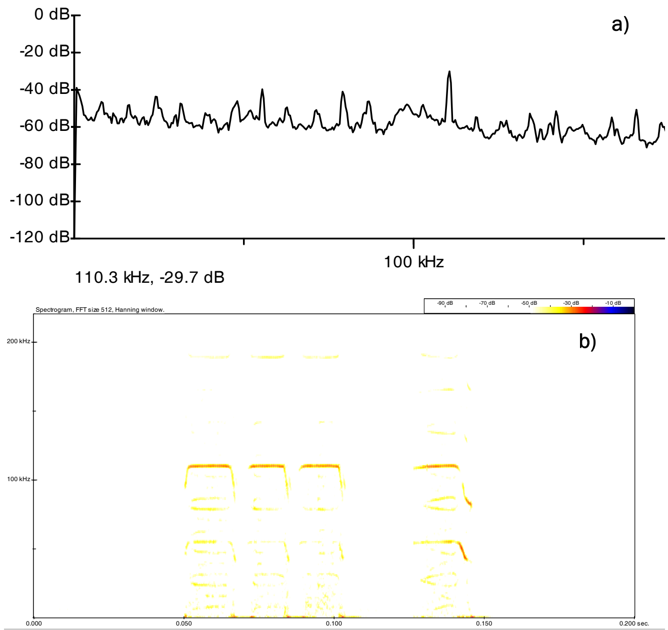


Figure 1: Echolocation call structure for *R. denti* from Koegelbeen Cave. a) Power spectrum: peak frequency at 110.3 kHz taken from the CF component of the call; b) Spectrogram: characteristic FM-CF-FM call structure of fairly long duration (18ms) with FM components sweeping down to 82 kHz. Multi-harmonics show a complex array of related frequencies (24, 55, 110 kHz) with most energy displayed in the third harmonic at 110 kHz.

reports. HERSELMAN and NORTON (1985) estimated a maximum number of 60,000 *Miniopterus* and 5,000 rhinolophids, but noted that the numbers may be lower seasonally due to migration; no mention is made of the months in which they sampled Koegelbeen, except to say that it was an important nursery colony (suggesting that their visit was during the austral summer i.e. November to February). IRISH *et al.* (1997) considered the estimate of 60,000 for *Miniopterus* realistic during their visit to Koegelbeen in late February 1997, but only recorded 1,000 to 2,000 rhinolophids (*R. clivosus* and *R. darlingi*). *Rhinolophus darlingi* and *R. clivosus* were both recorded at Koegelbeen by HERSELMAN and NORTON (1985). Although IRISH *et al*. (1997) reported that *R. denti* had previously been collected at Koegelbeen, it was not recorded by HERSELMAN and NORTON (1985), who considered the species extremely rare and possibly even extinct in the former Cape Province. The considerable variation in the number of *Miniopterus* at Koegelbeen suggests that the cave needs to be monitored on a more regular basis, within acceptable limits of disturbance, to ascertain whether there has indeed been a decline in the population. The importance of the Koegelbeen roost is further underscored by the fact that the population of *Miniopterus natalensis* here is genetically distinct from other southern African populations (MILLER-BUTTERWORTH *et al.,* 2003). The low number recorded during our survey may, however, be attributed to the time of year when bats may be migrating. There is evidence that some of these bats may hibernate at Steenkampskraal, 560 km to the south-west (MILLER-BUTTERWORTH *et al*., 2003). From a conservation perspective, only Koegelbeen and Soetfontein Caves appeared to support viable numbers of bats. However, although fewer numbers of bats were recorded at Hopefield Mine, the cumulative importance of abandoned asbestos mines is still to be investigated, especially in summer months when *Miniopterus* may exclude (by numerical dominance) rhinolophids from the regions main caves such as Koegelbeen.

Rhinolophus denti (Figure 2) is currently listed as Near Threatened in the most recent Red Data Book of South African mammals (FRIEDMANN and DALY, 2004).

ISSN 1812-1268

Figure 2: *Rhinolophus denti* captured at Koegelbeen, 28 March 2008. The specimen was deposited in the Durban Natural Science Museum, DM10134.

Figure 3: View of Koegelbeen Cave. The entrance is indicated by the red arrow .

However, this species was known from just five localities in South Africa prior to this survey. Our record of this species from Soetfontein represents a new locality. Combined with the fact that it occurs in small numbers and is entirely dependent on caves (none of which are in protected areas), suggests that it may warrant a higher listing of Vulnerable. The Koegelbeen Cave (Figure 3) may represent the most important roost site for this species in South Africa. It was not easy to estimate its numbers here as the cave system is relatively extensive. However, we only observed this species from a single, low (the ceiling being about 1 m high) side chamber in which there were approximately 20 individuals. Previous work (see above) suggests that the species may use Koegelbeen seasonally, with largest numbers (c. 200 individuals) present in winter months (D. Jacobs, *pers. com.*). By way of comparison, in Namibia, *R. denti* was recorded roosting on the ceiling between 1.5 – 5 m above the ground (CHURCHILL *et al.*, 1997). The colonies in Namibia were also generally larger, with two caves (Arnhem and Ludwig) both containing over 450 bats. Fortunately, the current owner of the property where Koegelbeen Cave is situated is aware of its conservation importance and expressed interest in continuing to protect the site.

Acknowledgements

Peter Taylor is thanked for verifying the identification of the specimens. We thank the following landowners for their hospitality and for allowing us to work on their properties: Koning Scholtz (Snr & Jnr), Johan Cornelissen, Jimmy van der Linde and Albertus Viljoen. We also thank Eric Gaborone and Susan Joubert of Ga-Segonyana Municipality for access to the Eye of Kuruman. The Northern Cape Department of Tourism, Environment and Conservation provided financial and logistical support. Prof. David Jacobs and an anonymous referee provided valuable comments on an earlier draft.

References

CHURCHILL, S., DRAPER, R. and MARAIS, E., 1997. Cave utilization by Namibian bats: population, microclimate and roost selection. *S. Afr. J. Wildl. Res.* 27 (2): 44 - 50.

FRIEDMANN, Y. and DALY, B., 2004. Red Data Book of the Mammals of South Africa: A conservation assessment. CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa.

HERSELMAN, J.C. and NORTON, P.M., 1985. The distribution and status of bats (Mammalia: Chiroptera) in the Cape Province. *Annals of the Cape Provincial Museums (Natural History)* 16 (4):1-126.

IRISH, J., AVENANT, N.L. and LOTZ, L., 1997. Kogelbeengrot: verslag m.b.t. potensiële toerisme-ontwikkeling. Pp. 19. Unpublished report to the Griekwastad Publicity Organisation.

JACOBS, D. S., 2000. Community level support for the allotonic frequency hypothesis. *Acta Chiropterologica* 2: 197 - 207.

JACOBS, D.S., BARCLAY, R.M.R. and WALKER, M.H., 2007. The allometery of echolocation call frequencies of insectivorous bats: Why do some species deviate from the pattern? *Oecologia*, **152**: 583 - 594.

MCDONALD, J. T., RAUTENBACH, I. L. and NEL, J. A. J., 1990. Roosting requirements and behaviour of five bat species at De Hoop Guano Cave, southern Cape Province of South Africa. *S. Afr. J. Wildl. Res.* 20 (4): 157 - 161.

MILLER-BUTTERWORTH, C.M., JACOBS, D.S. and HARLEY, E.H. 2003. Strong population substructure is correlated with morphology and ecology in a migratory bat. *Nature*, **424**: 187-191.

MONADJEM, A., TAYLOR, P., COTTERILL, F.P.D. and SCHOEMAN, M.C. In press. Bats of Southern Africa: A Biogeographic and Taxonomic Synthesis.

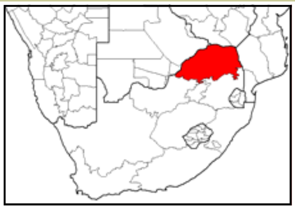
O'SHEA, T.J. and BOGAN, M.A. (eds). 2003. Monitoring trends in bat population of the United States and Territories: Problems and prospects. U.S. Geological Survey, Biological Resource Discipline, Information and Technology Report, USGS/BRD/ITR-2003-003. 274 pp.

SCHOEMAN, M.C. (2006) The relative influence of competition and coevolution on the community structure of insectivorous bats in southern Africa. PhD thesis, University of Cape Town, Cape Town.

Submitted: 31 July 2008
Accepted: 18 August 2008

ISSN 1812-1268

Bats of Messina Nature Reserve, Limpopo Province, South Africa



By: Ernest C.J. Seamark and Teresa Kearney
Vertebrate Department, Transvaal Museum, P.O. Box 413, Pretoria, 0001, Republic of South Africa. tehome@vodamail.co.za or Kearney@nfi.museum

Voucher specimens in the collection of the Transvaal Museum (TM) that were collected from Messina Nature Reserve, Limpopo Province, South Africa indicated that six species of bats had previously been recorded from the reserve. These were *Taphozous mauritianus* (TM 44201), *Nycteris thebaica* (TM 44200), *Neoromicia capensis* (TM 44203), *Nycticeinops schlieffeni* (TM 44206), *Scotophilus dinganii* (TM 44205) and *Chaerophon pumilus* (TM 44199). During fieldwork which we undertook in the reserve from 21-23 November 1996 a further three species (*Neoromicia zuluensis*, *Pipistrellus rusticus* and *Rhinolophus hildebrantii*) were added. The intention of the field work in 1996 was to catch species of *Eptesicus*, *Pipistrellus* and *Neoromica* for chromosome GTG-band analysis (KEARNEY *et al.*, 2002). Unfortunately, our permit only allowed us to take voucher specimens of *Eptesicus*, *Pipistrellus* and *Neoromicia* species, hence our record for *Rhinolophus hildebrandtii*, and the recaptures of *Nycticeinops schlieffeni* , *Scotophilus dinganii* and *Chaerophon pumilus* do not have vouchered support.

The vegetation in Messina Nature Reserve is Musina Mopane Bushveld (MUCINA and RUTHERFORD, 2006), and the topography is a mixture of rocky outcrops and ridges interspersed with flat areas. In November 1996 a single site (22°24'36''S, 30°03'00''E), on the Farm Prinzenhage 47 MT, was sampled for two nights with mist nets, and three nights with a harp trap. The mist nets and harp trap (Figure 1) were set over and around a small (2 m x 3 m x 0.03 m), man-made water hole. Five 12 m mist nets were set in a V shape over the water hole, with three nets stacked on top of one another on one side, and two nets stacked on top of one another on the other side of the V shape. When opened the lowest strand of the mist nets were just above the water and the top strands reached approximately seven meters high on the one side, and five meters high on the other side of the V shape. A single six meter net was set along vegetation at the side of the water hole, with the lowest strand touching the ground. A two-bank harp trap (dimensions of trapping area - 1.6 m width x 1.4 m height) was set slightly away from the water hole between two trees. On the third night several plastic sheets were attached between the trap and the trees to create a funnel into the trap, and only then did the trap catch any bats. The mist nets were opened after the first bat was sighted at dusk (approximately 18h30), and were checked regularly until they were closed when bat activity dropped (approximately 20h00). Bats caught in the nets were transferred to cloth bags that were hung on the mist net poles, as the calls emitted by the bats in the bags appeared to attract other bats to the nets.

Figure 1: Small, man-made dam in the Musina Mopane bushveld at Messina Nature Reserve, showing the bat trap (without plastic sheeting attached to the sides) and one of the mist net poles used in November 1996.

Table 1 gives field measurements of 61 individuals caught between the 21st to the 23rd of November 1996 that were identified to seven species, from three families. In the absence in 1996 of any field keys for the identification of South Africa bat species, field identifications were made using MEESTER *et al*. (1986). Identification of voucher specimens of *N. capensis*, *N. zuluensis* and *P. rusticus* was confirmed by GTG-band karyotypes, and skull and bacula morphology (KEARNEY *et al.*, 2002). Voucher specimens were lodged in the Durban Natural Science Museum (DNSM), all other bats were released at the site they were caught (Figure 2). Given the difficulty of accurate field identification of some of the vesper species field measurements are presented separately for individuals that were released and those that were taken as vouchers (Table 1).

Vespertilionidae
***Scotophilus dinganii* (A. Smith, 1833)**

Five individuals were caught (1♂; 4 ♀). Of the females, three were lactating, and one was pregnant. On the first night a male and a pregnant female were caught side by side in a net at 19h17. Two lactating females were mist netted on the second evening, one of which was caught in

Figure 2: Teresa Kearney releasing bats caught at Messina Nature Reserve in November 1996.

ISSN 1812-1268

Table 1. Mean ± SD and range of field measurements for the different sexes of seven species of bats caught at Messina Nature Reserve, Limpopo Province, South Africa, between 21st and 23rd of November 1996. Separating species and sexes based on whether the individuals were kept as vouchers or released. Sample sizes are given in parentheses. Fa - forearm length, HL - head length (from junction of neck to nose tip - see CHURCHILL, 1998), and Tib - tibia length, or for *Rhinolophus hildebrantii* NW - noseleaf width.

Species		Fa (mm)	HL (mm)	Tib/NW (mm)	Mass (g)
Scotophilus dinganii (released)	♂	52.2 (1)	23.4 (1)	-	26.2 (1)
	♀	55.2 ± 1.93 (4) 54.0-58.0	24.4 ± 0.70 (3) 23.8-25.2	23.7 (1)	31.6 ± 2.08 (3) 30.0-34.0
Neoromicia capensis (vouchers: DNSM 5396 & 5398)	♀	32.0 ± 2.44 (2) 30.3-33.7	16.8 ± 0.21 (2) 16.6-16.9	12.0 (1)	7.0 ± 0.56 (2) 6.6-7.4
Neoromicia zuluensis (released)	♂	30.3 ± 0.21 (2) 30.2-30.5	14.5 ± 0.14 (2) 14.4-14.6	12.3 (1)	3.4 ± 0.35 (2) 3.2-3.7
Neoromicia zuluensis (vouchers: DNSM 5359 & 5375)	♀	29.3 ± 0.35 (2) 29.0-29.5	14.4 ± 0.35 (2) 14.1-14.6	-	6.6 ± 1.3 (2) 5.65-7.5
Neoromicia zuluensis (released)	♀	30.0 ± 0.46 (3) 29.5-30.3	14.5 ± 0.05 (3) 14.4-14.5	12.7 ± 0.29 (3) 12.35-12.9	5.5 ± 0.47 (3) 4.6-5.55
Pipistrellus rusticus (vouchers: DNSM 5318, 5379, 5389, 5390 & 5391)	♂	28.5 ± 0.51 (5) 28.0-29.2	14.2 ± 0.49 (5) 13.7-14.8	11.1 ± 0.17 (3) 11.0-11.3	4.3 ± 0.57 (5) 3.6-5.0
Pipistrellus rusticus (vouchers: DNSM 5394, 5395, 5399, 5407 & 5865)	♀	28.6 ± 0.53 (5) 27.9-29.4	13.9 ± 0.27 (5) 13.6-14.3	10.6 ± 0.59 (5) 9.6-11.2	4.9 ± 0.33 (5) 4.5-5.3
Pipistrellus rusticus (released)	♂	28.0 ± 1.62 (2) 26.8-29.1	13.8 ± 0.35 (2) 13.5-14.0	10.8 (1)	4.3 ± 0.14 (2) 4.2-4.4
Pipistrellus rusticus (released)	♀	28.2 ± 1.97 (2) 26.8-29.6	13.9 ± 0.77 (2) 13.3-14.4	11.0 (1)	4.4 ± 0.63 (2) 3.9-4.8
Nycticeinops schlieffeni (released)	♂	29.2 ± 0.41 (8) 28.8-30.0	14.4 ± 0.71 (8) 13.2-15.6	12.1 ± 0.24 (8) 11.9-12.6	4.9 ± 0.43 (8) 4.3-5.5
	♀	30.3 ± 0.80 (22) 28.7-32.3	14.7 ± 0.42 (22) 14.1-15.4	12.4 ± 0.39 (17) 11.8-13.0	6.3 ± 0.55 (22) 5.7-7.7
Rhinolophus hildebrandtii (released)	♂	64.0 (1)	29.5 (1)	12.4 (1)	26.0 (1)
Molossidae (released)	♂	39.3 ± 0.71(2) 38.8-39.8	22.3 ± 0.28 (2) 22.1-22.5	-	11.5 ± 0.00 (2) 11.5

the lowest pocket of the net just above the water. The third lactating female was caught on the last night in the harp trap, following the addition of the plastic sheeting to the sides of the trap. Dorsal and ventral pelage of the male was paler than that of the females. Pelage colour of all individuals was noticeably paler than that of individuals of this species caught during previous field work in KwaZulu-Natal (Seamark and Kearney *pers. comm*.). Individuals were identified as *Scotophilus* on the basis of having only one upper incisor on each side, and their forearm length was longer than 46 mm (MEESTER *et al*., 1986). The identification to species was also based on forearm length (MEESTER *et al*., 1986). Relative to the another similar sized vespertilionid species, *Eptesicus hottentotus*, which has two upper incisors on each side, *Scotophilus dinganii* has a yellow ventral pelage, and both dorsal and ventral hairs do not have a black base (Seamark *pers. comm*.).

Neoromicia capensis **(A. Smith, 1829)**

Two lactating females (DNSM 5396, DNSM 5398) were mist netted, one on each night. In the field this species was differentiated from similar sized *Nyc. schlieffeni* on the basis of having two upper incisors on each side (Meester *et al*. 1986), and black bases to the hair of both dorsal and ventral pelage (Seamark *pers. comm*.). The colour of the tips of the hairs of the dorsal pelage of these individuals was different to *P. rusticus*, but a similar buffy-brown to grey-brown colour as in *N. zuluensis*. However, unlike the *N. zuluensis* individuals, these individuals were observed to have a lighter pelage around the eyes and mouth, and a longer head length (Table 1).

Neoromicia zuluensis **(Roberts, 1924)**

Seven individuals were caught. Six were mist netted (2 ♂, 4 ♀), five on the first night, and one on the second night. Of the females, one was pregnant and three were lactating. A single female was caught in the harp trap on the third night; unfortunately no record was kept of the reproductive condition. In the field this species was differentiated from similar sized *Nyc. schlieffeni* on the basis of having two upper incisors on each side (MEESTER *et al*., 1986), and black bases to the hair of both dorsal and ventral pelage (Seamark *pers. comm*.). The colour of the tips of the hairs of the dorsal pelage of these individuals was different to *P. rusticus*, but a similar buffy-brown to grey-brown colour as in *N. capensis*. These individuals were also observed to lack the lighter pelage found around the eyes and mouth of *N. capensis* and *P. rusticus*, and had smaller head lengths than individuals assigned to *N. capensis* (Table 1). Two voucher specimens were taken (DNSM 5359, DNSM 5375).

Pipistrellus rusticus **(Tomes, 1861)**

Fourteen individuals were caught (7 ♂, 7 ♀), ten in mist nets (nine on the first night and one on the second night), and four in the harp trap. Of the females, three were pregnant, three were lactating, while the seventh individual was not pregnant nor lactating. In the field this species was differentiated from similar sized *Nyc. schlieffeni* on the basis of having two upper incisors on each side (MEESTER *et al*., 1986), and black bases to the hair of both dorsal and ventral pelage (Seamark *pers. comm*.). The reddish-orange colour of the tips of the hairs of the dorsal pelage of these individuals was observed to be different to that in *N. capensis* and *N. zuluensis*. The dorsal pelage of twins born in captivity to DNSM 5865 was a dull, grey colour in contrast to the reddish-orange tipped and brownish-black based pelage of the adults. Ten voucher specimens were taken (DNSM 5318, 5379, 5389-5391, 5394, 5395, 5399, 5407, and 5865).

Nycticeinops schlieffeni **(Peters, 1859)**

Thirty individuals were caught (8 ♂; 22 ♀), 29 in mist nets (22 on the first night, seven on the second night), and one in the harp trap. The captured specimens had a sex ratio of males to females of 1:2.5. Of the females, six were pregnant and 14 were lactating. Most lactating females were missing hair on the lower back just above the tail. Individuals were identified as *Nyc. schlieffeni* on the basis of having only one

Table 2. Capture effort (meter-squared-hours) and rate for mist nets and harp traps. KH – Kliphuis, see (SEAMARK and KEARNEY, 2007) and LWA – Limpopo Wilderness Area, see (KEARNEY *et al*., 2008).

	Mist nets			**Harp trap***	
	This study	KH	LWA	This study	LWA
Capture effort (m^2hrs)	478.8	577.2	1730.67	67.2	120.98
# individual caught	54	32	3	7	4
Capture rate (%)	11.27	5.54	0.17	10.41	3.3

*10 hrs effort is assumed per night (dusk to dawn period) if left out all night.

upper incisor on each side, forearm lengths smaller than 46 mm, and sickle shaped tragi (MEESTER *et al*., 1986). Also, unlike *P. rusticus*, *N. capensis* and *N. zuluensis* that have black bases to the hair of both dorsal and ventral pelage, *Nyc. schlieffeni* has a single colour along the length of the hair that gradually darkens near the base of the hair (Seamark *pers. comm*.).

Rhinolophidae
***Rhinolophus hildebrandtii* Peters, 1878**

A single male was caught in a 6 m net along vegetation next to the dam. This individual was identified as *R. hildebrandtii* (Table 1) as it had a noseleaf width greater than 9 mm, and a forearm length greater than 62 mm (MEESTER *et al*., 1986).

Mollosidae

Two, scrotal males were caught; both had bald patches on the top of their heads. Identification is uncertain as there are no vouchers, however, based on forearm length (Table 2) and the previous record of *Chaerophon pumilus* (TM 44199) from the reserve, these individuals were possibly also *C. pumilus*. But, other possible species identifications include – *Sauromys petrophilus* and *Chaerophon chapini*.

Species richness

The new species recorded in November 1996 increased the bat species richness for Messina Nature Reserve to nine species (with one unverifiable species), or eight species (all verifiable). This is lower than the 51 species estimated by GELDERBLOM *et al.* (1995) for the Savanna biome, but may be explained by species richness being correlated with area surveyed (FINDLEY 1993). Sampling of additional localities within Messina Nature Reserve may increase the number of species found within the Reserve. In comparison with published figures for other areas, all of which are in KwaZulu-Natal, this species richness is similar to the nine species previously recorded for Ndumu (DIXON, 1966), which is higher than that recorded for Oribi Gorge (BOURQUIN and MATHIAS, 1984) and Tembe Elephant Park (MONADJEM *et al.*, 2007) with six each, but lower than the 13 each recorded for Hluhluwe-Umfolozi Park (BOURQUIN and MATHIAS, 1984) and Ithala (SEAMARK and KEARNEY, 2004), and 19 recorded for the uMkhuze section of the Greater St. Lucia Wetland Park (D'CRUZE *et al.*, 2008).

Capture rate

Capture effort and capture rate for the mist nets and harp trap are presented in Table 2. Capture effort was calculated by multiplying the area of the net or trap (length x height) by the amount of time deployed, hence meter-squared-hours. Capture rate (presented as a percentage) is the number of bats caught divided by the capture effort. The results of captures by different methods (i.e. harp trap or mist nets) are presented separately. In comparison with two other areas (Kliphuis in the Western Cape and Lapalala Wilderness Area in Limpopo province) in South Africa, Messina had a capture rate with mist nets 2.03 times that of Kliphuis and 66.29 times that of Lapalala Wilderness Area, and with the harp trap 3.15 times more than at Lapalala Wilderness Area (Table 2). Although this measure gives a relative indication of the number of individuals in an area, it does not take into account any possible effect of variation in the time of year the fieldwork was done at each of the sites.

Acknowledgements

We thank Limpopo Province Department of Nature Conservation for permit number N 08, and allowing this field work on one of its nature reserves. We also thank David Jacobs and Peter Taylor for their constructive reviews of the manuscript.

References

BOURQUIN, O., MATHIAS, I., 1984. The vertebrates of Oribi Gorge Nature Reserve: 1. *The Lammergeyer* **33**: 35-44.

CHURCHILL, S., 1998. *Australian bats*. Reed New Holland (Australia), Sidney. x + 230pp.

D'CRUZE, N. C., MCDONELL, Z. J., LANGEVELD, T., BROOKS, P. D., COMBRINK, X., SEAMARK, E. C. J., and KEARNEY, T. C., 2008. Bat survey in the uMkhuze section of the Greater St. Lucia Wetland Park, KwaZulu-Natal, South Africa. *African Bat Conservation News* **17**: 4-9.

DIXON, J. E. W., 1966. Notes on the mammals of Ndumu Game Reserve. *Lammergeyer* **6**: 24-40.

FINDLEY, J. S., 1993. *Bats: A community perspective*. Cambridge University Press, Cambridge.

GELDERBLOM, C. M., BRONNER, G. N., LOMBARD, G. N., and TAYLOR, P. J., 1995. Patterns of distribution and current protection status of the Carnivora, Chiroptera and Insectivora in South Africa. *South African Journal of Zoology* **30**(3): 103-114.

KEARNEY, T. C., SEAMARK, E. C. J., BOGDANOWICZ, W., ROBERTS, A., and ROBERTS, E., 2008. Chiroptera of Lapalala Wilderness Area, South Africa. *African Bat Conservation News* **18**: 8-12.

KEARNEY, T. C., VOLLETH, M., CONTRAFATTO, G., and TAYLOR, P. J., 2002. Systematic implications of chromosome GTG-band and bacula morphology for Southern African *Eptesicus* and *Pipistrellus* and several other species of Vespertilioninae (Chiroptera: Vespertilionidae). *Acta Chiropterologica* **4**(1): 55-76.

MEESTER, J. A. J., RAUTENBACH, I. L., DIPPENAAR, N. J., and BAKER, C. M., 1986. *Classification of Southern African Mammals*. Volume 5. Transvaal Museum Monograph, Pretoria.

MONADJEM, A., RESIDE, A., and TAYLOR, P. J., 2007. Bats recorded from Tembe Elephant Park, KwaZulu-Natal, South Africa. *African Bat Conservation News* **13**: 2-3.

MUCINA, L., RUTHERFORD, M. C., 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* **19**: i - viii + 1-807.

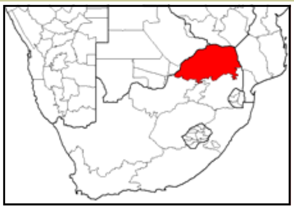
SEAMARK, E. C. J., and KEARNEY, T. C., 2004. Bats (Chiroptera) of Ithala Game Reserve, northern KwaZulu-Natal, South Africa. *Durban Museum Novitates* **29**: 1-4.

SEAMARK, E. C. J., and KEARNEY, T. C., 2007. Field Notes (February 2005): Kliphuis camp site, Cederberg, Western Cape Province South Africa. *African Bat Conservation News* **13**: 4-5.

Submitted: 31 July 2008
Accepted: 06 October 2008

ISSN 1812-1268

Chiroptera of Lapalala Wilderness Area, Limpopo Province, South Africa



By: Teresa Kearney[1], Ernest C.J. Seamark[1], Wieslaw Bogdanowicz[2], Erin Roberts[3], and Anthony Roberts[3]

[1]*Vertebrate Department, Transvaal Museum, P.O. Box 413, Pretoria, 0001, Republic of South Africa. tehome@vodamail.co.za or Kearney@nfi.museum.*
[2]*Museum and Institute of Zoology, Polish Academy of Science, Wilcza 64, 00-679 Warszawa, Poland.*
[3]*Lapalala Widerness School, P.O. Box 348, Vaalwater, 0530, South Africa.*

Background

Lapalala Wilderness Area in the Limpopo Province of South Africa has been a private game reserve since 1981, and grew with the consolidation of different farms from 1981 to 1999. It currently encompasses 16 farms, or parts thereof (Alem 544LR; Lith 541LR; Haajesveldt 576LR; Gorcum 577LR; Dordrecht 578LR; New Belgium 608LR; Ongegund 598LR; Landmans Lust 595LR; Moerdyk 593LR; Blinkwater 604LR; Byuitzoek 600LR; Wildeboschdrift 599LR; Doornleegte 594LR; Frishgewaagd 590LR; Kliphoek 636LR and Welgelegen 647LR), and is 36,000 hectares in extent (Figure 1). The area also falls within the Waterberg Biosphere Reserve proclaimed by UNESCO in March 2001.

Lapalala is located within the savanna biome of the central bushveld bioregion, and falls within the Waterberg mountain bushveld vegetation type (MUCINA and RUTHERFORD, 2006). The area is characterised by Waterberg sandstone kopjes, although an area of dolerite derived soils has influenced the associated vegetation. In addition to numerous seasonal streams Lapalala is bisected by two perennial rivers, the Palala and the Blocklands, the confluence of which occurs on the reserve. The region experiences "long, hot summers and short, very cold winters" (HERHOLDT, 1989: 87).

Fieldwork was undertaken at Lapalala in April 2007, the aim of which was to catch *Laephotis botswanae* for a project on the genus by two of the authors (see KEARNEY and BOGDANOWICZ, 2007). Hence revisiting the site where this species had previously been caught in 1988 (see HERHOLDT, 1989).

Historical Records

Specimen records indicate five species of bats had previously been recorded from close to, or within, what is currently the Lapalala Wilderness Area. The following information was recorded from catalogue book, index card and label information.

***Nycteris thebaica* E. Geoffroy St.-Hilaire, 1818**

Two females (TM 24722, TM 24723), both pregnant (each with one embryo), were collected on 13 October 1974 by I.L. Rautenbach from the farm Dordrecht 578LR, 20 km South of Marken (23°50'S 28°23'E; 2328Cd). These individuals were shot around 21h00 in a pump house that

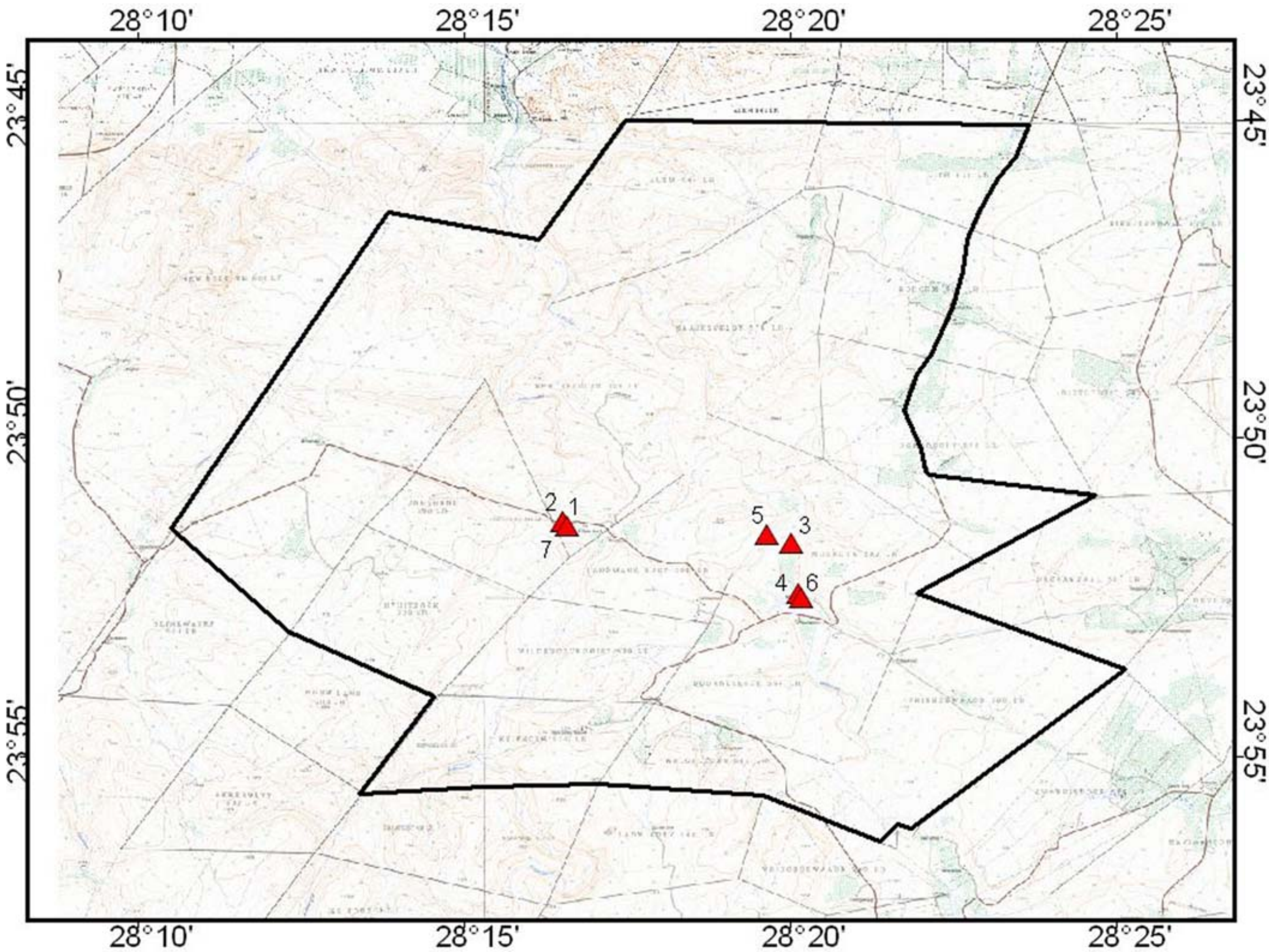


Figure 1. Map indicating the boundary of Lapalala Wilderness Area and seven different sites where mist nets, and, or harp traps were set in April 2007.

ISSN 1812-1268

they were probably utilizing as a night roost.

Pipistrellus rusticus **(Tomes, 1861)**

A female (TM 39791) was collected on 26 February 1988, by E.M Jones and J. Pallett, from an open mud area on the side of a dam wall, near the office (referred to as the reception complex by HERHOLDT, 1989), in mixed Acacia woodland on sandstone (23°52'S 28°08'E). The office / reception complex referred to in locality information for specimens collected in 1988 has since been demolished, and the entrance to the reserve has been moved. However, this building was ca 270 m to the east of the reservoir (Figure 1, point 7 – 23.85622S 28.27153E) that was revisited during the fieldwork in 2007.

Neoromicia capensis **(A. Smith, 1829)**

A male (TM 39793) was collected at the same locality and date as the *P. rusticus* (see above). Another male (TM 39899) was collected on 28 March 1988, by G. Bronner & R. Gerrans, at the side of the road to Weltevreden Research Station (23°52'S 28°09'E).

Neoromicia zuluensis **(Roberts, 1924)**

Two females (TM 39792, TM 39795) and a male (TM 39794) were collected at the same locality and date as the *P. rusticus* (see above).

Laephotis botswanae **Setzer, 1971**

A male (TM 39796) was caught between 19h00 and 20h00 (see HERHOLDT, 1989) at the same locality and date as the *P. rusticus* (see above).

2007 survey

Six species of Chiroptera were caught during fieldwork from 4 to 7 April 2007 (Table 1). Specimens were identified using the keys in MEESTER *et al.* (1986) and KEARNEY (2005). Voucher specimens were lodged in the Transvaal Museum (TM), *Hipposideros caffer* (Sundevall, 1846), *Myotis welwitschii* (Gray, 1866), and *Scotophilus dinganii* (A. Smith, 1833) were recorded for the first time in the Lapalala Wilderness Area.

Hipposideros caffer **(Sundevall, 1846)**

An adult male (TM 48100, see Figure 2), was captured on 6 April 2007, at around 20h10, in a harp trap set in vegetation along the road, above the causeway over the Blocklands River (Figure 1, point 1 - 23.85494S 28.27064E). Based on voucher records in the AFRICAN CHIROPTERA REPORT (2008), this record falls within a gap between previous easterly and westerly locality records (Figure 3).

Figure 2: Adult, male *Hipposideros caffer* (TM 48100).

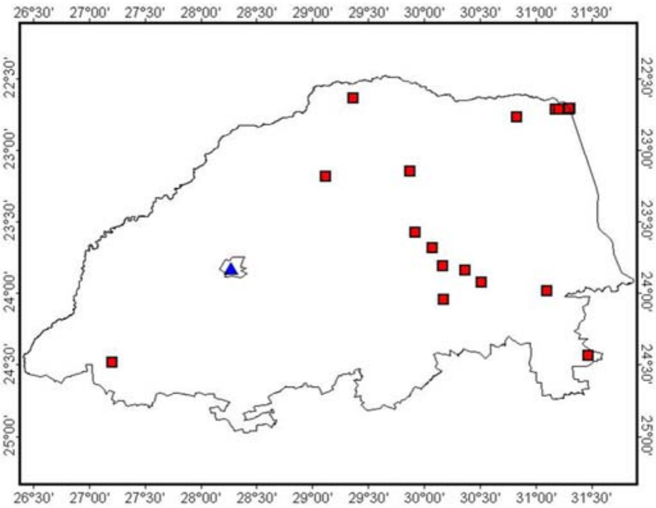


Figure 3. Distribution of *Hipposideros caffer* within Limpopo Province based on voucher specimens. Squares denote previous records; triangle denotes the new record plotted within the boundary of Lapalala Wilderness Area.

Myotis welwitschii **(Gray, 1866)**

A scrotal male (TM 47968, see Figure 4), was caught on 5 April 2007, around 19h20, near the top of a macro mist net set along the causeway over the Blocklands River (Figure 1, point 2 - 23.85511S 28.27064E). Throughout its distribution *M. welwitschii* is considered a rare, solitary species (TAYLOR, 2000; FAHR and EBIGBO, 2003; SEDLÁCEK *et al.*, 2006). This record is the fourth for Limpopo Province (based on voucher records in the AFRICAN CHIROPTERA REPORT (2008), and is 35 km NE from the closest previous record at Klipfontein 54JS (Figure 5).

Pipistrellus rusticus **(Tomes, 1861)**

A scrotal male (TM 48096, see Figure 6), was caught on 5 April 2007, around 18h30, near the top of a macro mist net set along the causeway over the Blocklands River (Figure 1, point 2 - 23.85511S 28.27064E).

Table 1. Field measurements and sexual condition for six species of bats (in each case n = 1) caught at Lapalala Wilderness Area in April 2007. Measurements (in millimetres, unless otherwise stated) of forearm length (Fa), head length (HL) [from junction with neck to nose tip - see CHURCHILL (1998)], tibia (Tib), body mass (Mass, in grams), and testes length (Testes), as well as the number of embryos. TM — Transvaal Museum accession number of vouchers.

Species	TM	Sex	Mass	Fa	HL	Tib	Testes	Embryos
Hipposideros caffer	48100	♂	6.5	47.7	-	-	-	-
Myotis welwitschii	47968	♂	13	54.6	22.5	23.4	11	-
Pipistrellus rusticus	48096	♂	4.4	29.3	14.3	10.5	13	-
Neoromicia capensis	48095	♀	6.3	34.9	17.8	13.9	-	-
Neoromicia zuluensis	48098	♂	3.5	30	13.7	12.3	7	-
	48097	♀	3.6	30.2	14.6	12.7	-	2 – left & right
Scotophilus dinganii	48099	♂	27	52.2	25.3	23.7	11	-

ISSN 1812-1268

Table 2. Capture effort (meter-squared-hours) and rate for mist nets (Macro – single net area of 6 m x 30 m, and Traditional – nets ca 2.4 m height x a variety of lengths 6 m to 18 m long) and harp traps. KH – Kliphuis, see SEAMARK and KEARNEY (2007) and MNR – Messina Nature Reserve, see SEAMARK and KEARNEY (2008).

Variable	**Mist nets**					**Harp trap***	
	This study			KH	MNR	This study	MNR
	Macro	Traditional	Combined				
Capture effort (m^2hrs)	982.08	748.59	1730.67	577.2	478.8	120.98	67.2
# individuals caught	3	0	3	32	54	4	7
Capture rate (%)	0.31	0	0.17	5.54	11.28	3.3	10.41

*10 hrs effort is assumed per night (dusk to dawn period) if left out all night.

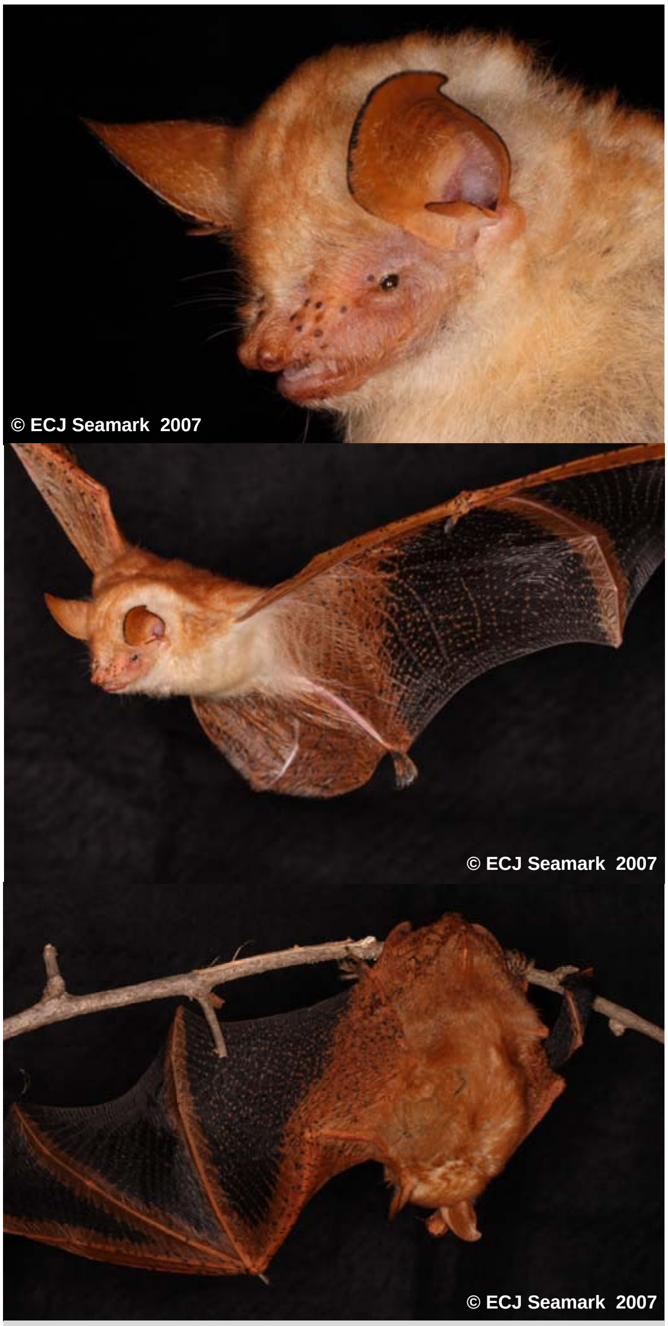


Figure 4: Adult, male *Myotis welwitschii* (TM 47968).

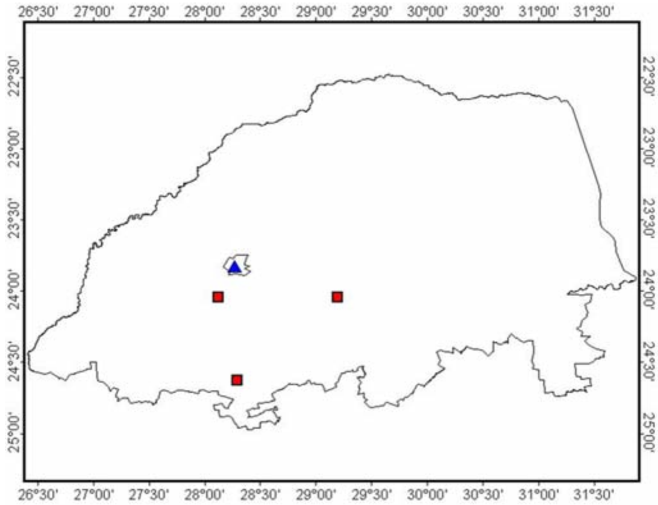


Figure 5. Distribution of *Myotis welwitschii* within Limpopo Province based on voucher specimens. Squares denote previous records; triangle denotes the new record plotted within the boundary of Lapalala Wilderness Area.

Figure 6: Scrotal, male *Pipistrellus rusticus* (TM 48096)

Neoromicia capensis **(A. Smith, 1829)**

An adult female (TM 48095) was caught on 4 April 2007, in a harp trap set across a road within the fenced area of the Wilderness School (Figure 1, point 3 - 23.86057S 28.33057E). It was found when the trap was checked around 20h00.

Neoromicia zuluensis **(Roberts, 1924)**

Two individuals; a pregnant female (TM 48097, see Figure 7), and a scrotal male (TM 48098) were caught on 5 April 2007, in different harp traps, one set within the Wilderness School buildings (Figure 1, point 4 - 23.87378S 28.33236E), the other across a road within the fenced area of the Wilderness School complex (see Figure 1, point 3 - 23.86057S 28.33057E). Both were found when the traps were checked around 20h30.

Figure 7: Adult, female *Neoromicia zuluensis* (TM 48097).

Scotophilus dinganii **(A. Smith, 1833)**

A scrotal male (TM 48099, see Figure 8) was caught on 6 April 2007, around 18h35, in a macro mist net set along a road next to vegetation, above the causeway over the Blocklands River (Figure 1, point 1 - 23.85494S 28.27064E).

Figure 8: Adult, male *Scotophilus dinganii (*TM 48099).

No bats were caught in mist nets and a harp trap set at three other sites (Figure 1, points 5-7). At the site where mist nets were set along and across the Palala River within the fenced area of the Wilderness School complex at the base of tall cliffs (Figure 1, point 5 – 23.85823S 28.32405E), bats were seen emerging from high up the cliff face at 18h12, but they did not descend to the height of the mist nets. No bats where caught at the site where *Laephotis* had previously been captured (Figure 1, point 7 – 23.85622S 28.27153E), possibly because the mist nets were only open for an hour (18h00-19h00) before they were closed to avoid damage when a large storm passed through the area, however, bats were observed flying in the area from 18h00.

Discussion

There are several possible reasons why we did not catch any *Laephotis botswanae* even though we mist netted at the same site (Figure 1, point 7), and two other sites (Figure 1, points 1 and 2) close to where HERHOLDT (1989) had previously caught *L. botswanae*. *Laephotis* is not locally abundant (KEARNEY and SEAMARK, 2005) and would appear to have specific flight paths, as indicated by the capture of specimens with mist nets set in exactly the same place at Hella-Hella in KwaZulu-Natal but at different times in May 1996 (KEARNEY and TAYLOR, 1997) and June 1998 (SEAMARK and KEARNEY *pers. comm*.). JACOBS *et al*. (2005) also noted similar foraging patterns in *L. wintoni* over different nights of radio tracking individuals, so although we were in the same area at Lapalala we may not have had the mist nets across the exact flight paths or foraging areas the bats were using when previously caught. The possibility that this species is seasonally common (David Jacobs pers. comm.), may explain why HERHOLDT (1989) caught the *Laephotis* on 26 February yet we failed to catch this species during our visit from 4-7 April. Another difference was that in 1988 there was water behind the dam wall while in 2007 the reservoir was dry. HERHOLDT (1989) suggested *Laephotis* is a hardy species given several individuals were caught in the Waterberg area on cold, rainy, or frosty nights, when few or no other bats were caught. In 2007 it did not rain while the mist nets at, or close to, the site where *Laephotis* had previously been caught were open. The temperature, however, which was recorded at half hourly intervals from 18h00 until 20h00 on two of the nights and from 18h00 until 19h00 on the third night, ranged from 19.2 ^{O}C to 16.1^{O}C.

Voucher specimens indicate a species richness for the Lapalala Wilderness Area of eight Chiroptera species. An observation (photographic record) was subsequently recorded (10 December 2007) for a ninth species in the area, *Taphozous mauritianus*, which was observed at the Wilderness School building complex (ROBERTS, 2008a). In the case of *Nycteris thebaica*, even though several pump houses were searched during the day, no nycterids were recorded during the 2007 fieldwork. However, the continued presence of this genus in the area was confirmed by a photographic record of a *Nycteris* taken in 13 March 2008 at the Lapalala Wilderness School building complex (ROBERTS, 2008b). In comparison with published figures for other protected areas in Limpopo province, it is higher than that of Messina Nature Reserve with eight species [SEAMARK and KEARNEY, 2008]. Comparison with other protected areas, all of which are in KwaZulu-Natal, indicates that the species richness in Lapalala is the same as that previously recorded for Ndumu (DIXON, 1966), higher than that recorded for Oribi Gorge (BOURQUIN and MATHIAS, 1984) and Tembe Elephant Park (MONADJEM *et al.*, 2007) with six each, but lower than the 13 each recorded for Hluhluwe-Umfolozi Park and Ithala (SEAMARK and KEARNEY, 2004), and 19 recorded for the uMkhuze section of the Greater St. Lucia Wetland Park (D'CRUZE *et al.*, 2008).

Capture effort (Table 2) was calculated by multiplying the area of the net or trap (length x height) by the amount of time deployed, hence meter-squared-hours. Capture rate (presented as a percentage) is the number of bats caught divided by the capture effort. In comparison with two other areas (Kliphuis in the Western Cape and Messina Nature Reserve in Limpopo province) in South Africa, Kliphuis had a mist net capture rate 32.59 times more than that of Lapalala Wilderness Area, and Messina Nature Reserve had a mist net capture rate 66.35 times more, and a harp trap capture rate of 3.15 times more, than that of Lapalala Wilderness Area (Table 2). Although this measure gives a relative indication of the number of individuals in area, it does not take into account any possible effect of variation in the time of year the fieldwork was done at each of the sites.

Acknowledgments

We thank Limpopo Environmental Affairs for permit number CPM-005-00010 to collect vouchers. For assistance in the field we thank Sello Thomas Litshani (Lapalala Wilderness). We also thank David Jacobs and Victor Van Cakenberghe for constructive reviews of the manuscript.

References

AFRICAN CHIROPTERA REPORT, 2008. African Chiroptera Project, Pretoria, 1868 pp.

BOURQUIN, O., and MATHIAS, I., 1984. The vertebrates of Oribi Gorge Nature Reserve: 1. *The Lammergeyer* **33**: 35-44.

CHURCHILL, S., 1998. *Australian bats*. Reed New Holland (Australia),Sydney. x + 230 pp.

D'CRUZE, N. C., MCDONELL, Z. J., LANGEVELD, T., BROOKS, P. D., COMBRINK, X., SEAMARK, E. C. J., and KEARNEY, T. C., 2008. Bat survey in the uMkhuze section of the Greater St. Lucia Wetland Park, KwaZulu-Natal, South Africa. *African Bat Conservation News* **17**: 4-9.

DIXON, J. E. W., 1966. Notes on the mammals of Ndumu Game Reserve. *Lammergeyer* **6**: 24-40.

FAHR, J., and EBIGBO, N. M., 2003. A conservation assessment of the bats of the Simandou Range, Guinea, with the first record of *Myotis welwitschii* (Gray, 1866) from West Africa. *Acta Chiropterologica* **5**(1): 125-141.

HERHOLDT, E. M., 1989. A new distribution record for the Botswana long-eared bat in South Africa. *South African Journal of Wildlife Research* **19**(2): 86-87.

JACOBS, D. S., BARCLAY, R. M. R., and SCHOEMAN, M. C., 2005. Foraging and roosting ecology of a rare insectivorous bat species, *Laephotis wintoni* (Thomas, 1901), Vespertilionidae. *Acta Chiropterologica* **7**(1): 101-109.

KEARNEY, T.C. and TAYLOR, P.J., 1997. New distribution records of bats in KwaZulu-Natal. *Durban Museum Novitates* **22**: 53-56.

KEARNEY, T.C., 2005. Systematic revision of southern African species in the genera E*ptesicus*, *Hypsugo*, *Neoromicia* and *Pipistrellus* (Chiroptera: Vespertilionidae). Ph.D. thesis. University of Kwa-Zulu-Natal, Durban, South Africa.

KEARNEY, T. C., and BOGDANOWICZ, W., 2007. Resolving relationships between species of Long-eared bats from the genus *Laephotis* using DNA sequence data and 3D geometric morphometrics. *African Bat Conservation News* **11**: 2.

KEARNEY, T. C., and SEAMARK, E. C. J., 2005. Morphometric analysis of cranial and external characters of *Laephotis* Thomas, 1901 (Mammalia: Chiroptera: Vespertilionidae) from southern Africa. *Annals of the Transvaal Museum* **42**: 71-87.

MEESTER, J. A. J., RAUTENBACH, I. L., DIPPENAAR, N. J., and BAKER, C. M., 1986. *Classification of Southern African Mammals*. Volume 5. Transvaal Museum Monograph, Pretoria: 1-359.

MONADJEM, A., RESIDE, A., and TAYLOR, P. [J.], 2007. Bats recorded from Tembe Elephant Park, KwaZulu-Natal, South Africa. *African Bat Conservation News* **13**: 2-3.

MUCINA, L., and RUTHERFORD, M. C., 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* **19**: i - viii + 1-807.

ROBERTS, A. 2008a. Tomb bat at Lapalala Wilderness School, South Africa. *African Bat Conservation News* **16**: 2.

ROBERTS, A., 2008b. Slit-faced bat found at Lapalala Wilderness School, South Africa. *African Bat Conservation News* **16**: 3.

SEAMARK, E. C. J., and KEARNEY, T. C., 2004. Bats (Chiroptera) of Ithala Game Reserve, northern KwaZulu-Natal, South Africa. *Durban Museum Novitates* **29**: 1-4.

SEAMARK, E. C. J., and KEARNEY, T. C., 2007. Field Notes (Febuary 2005): Kliphuis camp site, Cederberg, Western Cape Province South Africa. *African Bat Conservation News* **13**: 4-5.

SEAMARK, E.C.J. and KEARNEY, T., 2008. Bats of Messina Nature Reserve, Limpopo Province, South Africa. *African Bat Conservation News* **18**: 5-7.

SEDLÁČEK, O., HOŘÁK, D., RIEGERT, J., REIF, J., and HORÁČEK, I., 2006. Comments on Welwitsch's mouse-eared bat (*Myotis welwitschii*) with the first record from Cameroon. *Mammalian Biology* **71**(2): 120-123.

TAYLOR, P. J., 2000. *Bats of Southern Africa: Guide to biology, identification, and conservation.* University of Natal Press, Pietermaritzburg, i - vii; 1-206.

Submitted: 09 September 2008
Accepted: 21 September 2008

RECENT LITERATURE

PUBLISHED PAPERS

BENDA, P., DIETZ, C., ANDREAS, M., HOTOVÝ, J., LUCAN, R. K., MALTBY, A., MEAKIN, K., TRUSCOTT, J., and VALLO, P., 2008. Bats (Mammalia: Chiroptera) of the Eastern Mediterranean and Middle East. Part 6. Bats of Sinai (Egypt) with some taxonomic, ecological and echolocation data on that fauna. *Acta Soc. Zool. Bohem.* 72: 1-103.

Abstract: A complete list of bat records from Sinai was compiled, composed mostly of new findings from the field (85%). From the territory of Sinaitic peninsula, 106-111 records of up to 15 bat species are reported; viz. *Rousettus aegyptiacus* (Geoffroy, 1810) (10 records), *Rhinopoma cystops* Thomas, 1903 (1), *Taphozous perforatus* Geoffroy, 1818 (1), *Nycteris thebaica* Geoffroy, 1813 (2), *Rhinolophus clivosus* Cretzschmar, 1830 (9), *R. hipposideros* (Borkhausen, 1797) (8), *R. mehelyi* Matschie, 1901 (1 [uncertain]), *Asellia tridens* (Geoffroy, 1813) (4-5), *Eptesicus bottae* (Peters, 1869) (6), *Hypsugo ariel* (Thomas, 1904) (24), *Pipistrellus kuhlii* (Kuhl, 1817) (3-5), *Otonycteris hemprichii* Peters, 1859 (5), *Barbastella leucomelas* (Cretzschmar, 1830) (6), *Plecotus christii* Gray, 1838 (19-20), and *Tadarida teniotis* (Rafinesque,1814)(8). Six species (*R. aegyptiacus*, *R. cystops*, *T. perforatus* , *R. mehelyi*, *E. bottae*, and *T. teniotis*) are here reported from Sinai for the first time. The taxonomic status of *Rousettus aegyptiacus* and *Tadarida teniotis* from Sinai is discussed. According to a profound taxonomic revision, *Hypsugo bodenheimeri* (Harrison, 1960) has been found to be a junior synonym of *Hypsugo ariel* (Thomas, 1904). The species status of *Barbastella leucomelas* from Sinai and southern Israel has been confirmed and hence, a separate species position for Central Asian *Barbastella* populations suggested. Representatives of *Plecotus christii* from the Sinaitic and southern Holy Land populations have been found to be significantly larger than the nominotypical ones from Upper Egypt and therefore described as a separate subspecies, *P. christii petraeus* subsp. nov. Basic descriptive echolocation parameters for 12 Sinaitic bat species are given and discussed. Echolocation calls of Rhinolophus clivosus, Hypsugo ariel, Otonycteris hemprichii, Barbastella leucomelas, and Plecotus christii are described in detail for the first time. Diet composition of six bat species(*Rhinolophus clivosus*, *Hypsugo ariel*, *Otonycteris hemprichii*, *Barbastella leucomelas*, *Plecotus christii*, and *Tadarida teniotis*) from Sinai was studied and their feeding ecology discussed.

DELMAS, O., HOLMES, E. C., TALBI, C., LARROUS, F., DACHEUX, L., BOUCHIER, C., and BOURHY, H., 2008. Genomic diversity and evolution of the lyssaviruses. *PLos ONE* 3(4): e2057.

Abstract: Lyssaviruses are RNA viruses with single-strand, negative-sense genomes responsible for rabies-like diseases in mammals. To date, genomic and evolutionary studies have most often utilized partial genome sequences, particularly of the nucleoprotein and glycoprotein genes, with little consideration of genome-scale evolution. Herein, we report the first genomic and evolutionary analysis using complete genome sequences of all recognised lyssavirus genotypes, including 14 new complete genomes of field isolates from 6 genotypes and one genotype that is completely sequenced for the first time. In doing so we significantly increase the extent of genome sequence data available for these important viruses. Our analysis of these genome sequence data reveals that all lyssaviruses have the same genomic organization. A phylogenetic analysis reveals strong geographical structuring, with the greatest genetic diversity in Africa, and an independent origin for the two known genotypes that infect European bats. We also suggest that multiple genotypes may exist within the diversity of viruses currently classified as 'Lagos Bat'. In sum, we show that rigorous phylogenetic techniques based on full length genome sequence provide the best discriminatory power for genotype classification within the lyssaviruses.

DJOSSA, B. A., FAHR, J., KALKO, E. K. V., and SINSIN, B., 2008. Fruit selection and effects of seed handling by flying foxes on germination rates of shea trees, a key resource in northern Benin, West Africa. *Ecotropica* 14(1): 37-48.

Abstract: Many tropical plants depend on seed dispersal by animals for their natural regeneration. Our results reveal that in the Pendjari Region, Benin (West Africa), fruits of shea trees (*Vitellaria paradoxa*) constitute a key resource for flying foxes (Chiroptera: Pteropodidae). Furthermore, handling of *Vitellaria* seeds by flying foxes can lead to an increase in germination success. We propose that seed dispersal by flying foxes is crucial for the long-term maintenance of this socio-economically important tree, which is not yet cultivated by local populations in traditional agroforestry systems.

HASHIM, I. M., and MAHGOUB, K. S., 2008. Abundance, habitat preference and distribution of small mammals in Dinder National Park, Sudan. *African Journal of Ecology* 46(3): 452-455.

HAYMAN, D. T. S., SUU-IRE, R., BREED, A. C., MCEACHERN, J. A., WANG, L., WOOD, J. L. N., and CUNNINGHAM, A. A., 2008. Evidence of henipavirus infection in West African fruit bats. *PLos ONE* 3(7): e2739.

Abstract: Henipaviruses are emerging RNA viruses of fruit bat origin that can cause fatal encephalitis in man. Ghanaian fruit bats (megachiroptera) were tested for antibodies to henipaviruses. Using a Luminex multiplexed microsphere assay, antibodies were detected in sera of *Eidolon helvum* to both Nipah (39%, 95% confidence interval: 27-51%) and Hendra (22%, 95% CI: 11-33%) viruses. Virus neutralization tests further confirmed seropositivity for 30% (7/23) of Luminex positive serum samples. Our results indicate that henipavirus is present within West Africa.

KUZMIN, I. V., NIEZGODA, M., FRANKA, R., AGWANDA, B., MARKOTTER, W., BEAGLEY, J. C., URAZOVA, O. Y., BREIMAN, R. F., and RUPPRECHT, C. E., 2008. Lagos bat virus in Kenya. *Journal of Clinical Microbiology* 46(4): 1451-1461.

Abstract: During lyssavirus surveillance, 1,221 bats of at least 30 species were collected from 25 locations in Kenya. One isolate of Lagos bat virus (LBV) was obtained from a dead *Eidolon helvum* fruit bat. The virus was most similar phylogenetically to LBV isolates from Senegal (1985) and from France (imported from Togo or Egypt; 1999), sharing with these viruses 100% nucleoprotein identity and 99.8 to 100% glycoprotein identity. This genome conservancy across space and time suggests that LBV is well adapted to its natural host species and that populations of reservoir hosts in eastern and western Africa have sufficient interactions to share pathogens. High virus concentrations, in addition to being detected in the brain, were detected in the salivary glands and tongue and in an oral swab, suggesting that LBV is transmitted in the saliva. In other extraneural organs, the virus was generally associated with innervations and ganglia. The presence of infectious virus in the reproductive tract and in a vaginal swab implies an alternative opportunity for transmission. The isolate was pathogenic for

ISSN 1812-1268

laboratory mice by the intracerebral and intramuscular routes. Serologic screening demonstrated the presence of LBV-neutralizing antibodies in *E. helvum* and *Rousettus aegyptiacus* fruit bats. In different colonies the seroprevalence ranged from 40 to 67% and 29 to 46% for *E. helvum* and *R. aegyptiacus*, respectively. Nested reverse transcription-PCR did not reveal the presence of viral RNA in oral swabs of bats in the absence of brain infection. Several large bat roosts were identified in areas of dense human populations, raising public health concerns for the potential of lyssavirus infection.

REINHARDT, K., NAYLOR, R. A., and SIVA-JOTHY, M. T., 2008. Temperature and humidity differences between roosts of the fruit bat, *Rousettus aegyptiacus* (Geoffroy, 1810), and the refugia of its ectoparasite, *Afrocimex constrictus*. *Acta Chiropterologica* 10(1): 173-176.

SCHMIDT, D. F., LUDWIG, C. A., and CARLETON, M. D., 2008. The Smithsonian Institution African Mammal Project (1961-1972): An Annotated Gazetteer of Collecting Localities and Summary of Its Taxonomic and Geographic Scope. *Smithsonian Contributions to Zoology*(628): viii + 320 pp.

Abstract: Conceived and directed by Henry W. Setzer, the African Mammal Project (1961-1972) covered portions of 20 countries concentrated in the northern, western, and southern regions of Africa and generated over 63,000 specimens of mammals. The geographic foundation of this ambitious field program is documented as an annotated gazetteer that provides coordinate data for 785 cardinal collecting localities, collectors' names and dates of collection, general ecological descriptions, and mammalian genera obtained at each site. In georeferencing localities, emphasis was given to primary archival sources - original specimen labels, collectors' field journals, and contemporaneous field maps. Most localities surveyed fell within the Northern Savanna and Southern Savanna biotic zones. The Mediterranean, Sahara Desert, Guinea High Forest, and Southwest Arid zones were moderately sampled; the Southwest Cape and Afromontane zones were minimally represented. The principal inventory method applied by field teams involved multiple transect lines of snap traps, supplemented by hunting, roost searching, mist-netting, and specimen purchasing. Total collecting effort varied immensely among countries, from 13 days (Chad) to 770 days (South Africa), and the number of specimens obtained was strongly correlated; length of dedicated site inventory mostly ranged from 3 to 8 days of collecting effort per cardinal locality. The resulting 63,213 vouchers include examples of 15 orders, 47 families, and 208 genera of African mammals; Rodentia (70%) and Chiroptera (20%) are most abundantly represented. The historical genesis of the African Mammal Project and its scientific goals as developed by H. W. Setzer are reviewed in the introduction to the gazetteer.

STANLEY, W. T., and FOLEY, C. A. H., 2008. A survey of the small mammals of Minziro Forest, Tanzania, with several additions to the known fauna of the country. *Mammalia* 72(2): 116.

Abstract: Complete faunal lists are vital for understanding the natural history of countries and unique habitats within them, as well as the design of effective conservation strategies. Although many mammal species of Tanzania are familiar, the fauna of some areas of the country has not been properly documented. We surveyed the small mammals (shrews, bats and rodents) of Minziro Forest in northwestern Tanzania. Six species are documented here for the first time for Tanzania. Other records include Tanzanian species poorly represented as vouchers in collections. Minziro is a unique forest worthy of conservation priority and further study.

TURNI, H., and KOCK, D., 2008. Type specimens of bats (Chiroptera: Mammalia) in the collections of the Museum für Naturkunde, Berlin. *Zootaxa* 1869: 1-82.

Abstract: The present catalogue documents all the chiropteran type specimens found in the collections of the Zoological Museum of the Humboldt-University, Museum für Naturkunde, Berlin (ZMB). Due to insufficient labeling at the time of receipt and description, many types have until now remained unrecognized, labelled with synonymous or incorrect names. From more than 13,000 specimens examined, we identified 540 types (86 holotypes, 249 syntypes, 22 lectotypes, 168 paratypes or paralectotypes, 5 of ambiguous status, 10 missing). These types belong to 218 described bat species, of which 116 are currently accepted (valid) species names. Lectotypes were designated for the original descriptions of *Chilonycteris Boothi*, *Chiroderma villosum*, *Molossus ferox*, *Phyllorhina bicornis*, *Phyllostomus spiculatus*, *Rhinolophus capensis*, *Vespertilio Bocagii*, *Vespertilio Schreibersii* and *Vesperus cubanus*.

Call for contributions

African Bat Conservation News 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 including roost counts and echolocation and sonograms 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.

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).

General contributions should be sent to the editor: EditorABCN@Africanbats.org

Scientific Contributions should be sent to: ScientificEditorABCN@Africanbats.org