

Short Note

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Two new bat species for Swaziland and a revised list for the country

Abstract: Bat distributions are still comparatively poorly known in Africa and updated national species lists do not exist for many countries. We present a revised checklist of the bats of Swaziland, which includes seven species not previously listed. Of these, two species are recent additions (*Mops midas* and *Myotis bocagii*) and these records marginally extend their known distributional range. A total of 26 species of bats are now known from the country, but additional surveys are predicted to add more taxa to the list. These new records predominantly come from human-modified landscapes, underscoring the importance of further surveys in such transformed habitats.

Keywords: Chiroptera; *Mops midas*; *Myotis bocagii*; Swaziland.

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Worldwide, there are over 1100 species of bat (Chiroptera), which constitutes the second largest order of mammals after the Rodentia (Wilson and Reeder 2005). Despite their diversity, bats remain poorly studied and there are large gaps in our knowledge of the ecology of many species, including distributional information, particularly in Africa (Monadjem et al. 2010a, Happold and Happold 2013). In fact, only a few countries in sub-Saharan Africa have updated and published bat species lists, such as

Mozambique (Monadjem et al. 2010b) and the Republic of Congo (Bates et al. 2013). The first checklist of the bats of Swaziland was published in 1998 and listed just 19 species (Monadjem 1998). Since then, five additional species have been recorded (Monadjem 2005, Monadjem and Reside 2008). However, predicted bat species richness is relatively high in Swaziland (Schoeman et al. 2013), suggesting that further taxa may be found in the country. Here we present an updated checklist of the bats of Swaziland, including the first record of *Mops midas* (Sundevall, 1843) and provide additional details on two recent records of *Myotis bocagii* (Peters, 1870).

This study was carried out in the Lowveld region of eastern Swaziland bordered by the Drakensberg Mountains in the west and the Lubombo Mountains in the east (Figure 1). The area is a part of the Maputaland-Pondoland-Albany biodiversity hotspot (Steenkamp et al. 2004). Elevation ranges from approximately 150–600 m above sea level. At lower elevations, land-use is dominated by commercial sugarcane plantations, subsistence maize fields, grazing lands for domestic livestock, rural villages, and several protected parks (Monadjem and Reside 2008). The dominant natural vegetation type is open savanna or woodland.

During bat surveys, mist-nets (EcoTone, Gdynia, Poland) measuring 12 m×3 m were placed around suspected roosts and areas of likely bat activity, such as water bodies or pathways. Mist-nets were set before sunset (before bat emergence) and closed after 4 h. Nets were checked at least every 10 min. Captured bats were placed in cloth holding bags. Forearm length was measured with calipers (Swiss Precision Instruments, Garden Grove, CA, USA) to the nearest 0.1 mm and mass taken with a spring balance (Pesola, Baar, Switzerland). Reproductive status and age (adult or juvenile), determined by ossification of the epiphyseal joints, as well as body mass and forearm length were noted. Bats were identified according to physical characteristics and measurements using Monadjem et al. (2010a). Voucher specimens are deposited in the Durban Natural Science Museum (DM).

Two individuals of *Mops midas* [field numbers: JS 161 (DM 14563) and JS 162] were captured on 7 May 2014 whilst

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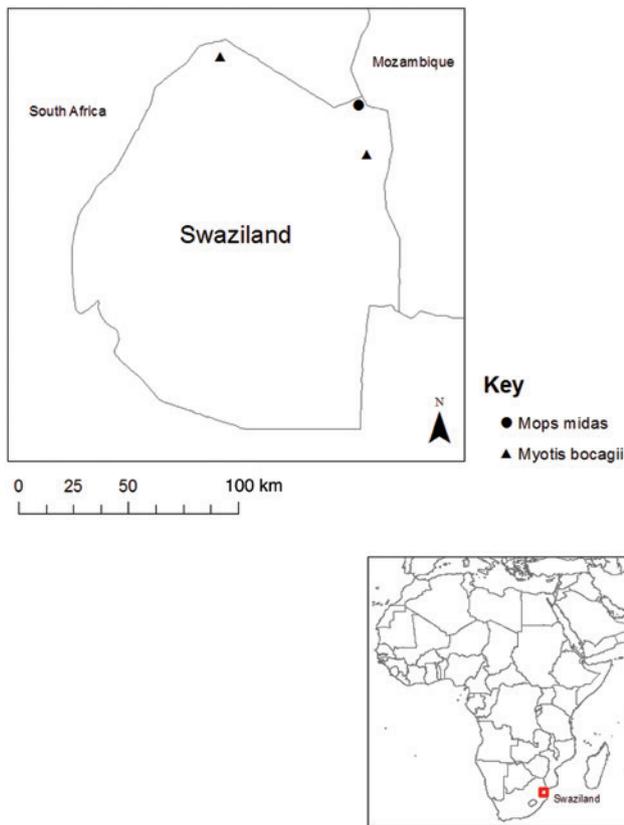


Figure 1: Map of Swaziland showing the locations of capture for *Mops midas* and *Myotis bocagii*.

exiting a roost in the Pentecostal Assemblies Church, Lomahasha, Swaziland at $25^{\circ}59'21.53''\text{S}$, $31^{\circ}58'6.36''\text{E}$, approximately 480 m above sea level (Figure 1). The bats were captured at 18:30 h and 19:15 h, roughly 45 min after sunset for the first individual. The species identification of these animals was confirmed by the large forearm size of each bat (61.4 mm and 62.3 mm) (Table 1), distinguishing them from other *Mops* spp. Further, the wrinkled upper lip separates *M. midas* from the similarly sized *Tadarida* spp. of the region (Monadjem et al. 2010a). Both bats were adult males and in reproductive condition (Figure 2A).

Two individuals of *Myotis bocagii* were captured at separate localities approximately 75 km apart. The first

individual was collected at Mlawula weir in Mlawula Nature Reserve at $26^{\circ}11'28.25''\text{S}$, $32^{\circ}0'18.40''\text{E}$ on 31 July 2007 (DM 9520) and has been previously reported (Monadjem et al. 2010a). The second individual (Figure 2B) was collected at the Ngonini Citrus Estate at $25^{\circ}47'17.38''\text{S}$, $31^{\circ}24'20.84''\text{E}$ on 19 December 2010 (DM 13644), along a small perennial stream with disturbed riparian forest (Figure 1). The Mlawula and Ngonini sites are approximately 140 m and 430 m above sea level, respectively. Measurements and mass for these specimens are presented in Table 1.

This is the southernmost known record of *Mops midas*, extending its range marginally by 160 km further south than previous records from Kruger National Park (Pienaar 1972, Rautenbach 1982, Cotterill and Happold 2013). The roost and surrounding habitat where we captured *M. midas* are different from previous observations. This species usually favors low-lying savanna and areas near water bodies or swamps (Smithers 1983, Jenkins et al. 2008, Monadjem et al. 2010a, Cotterill and Happold 2013). However, we captured these individuals in the Lubombo Mountains in an area surrounded by homesteads, small-holder agricultural fields, and grazing lands, with almost no natural vegetation in the vicinity and no open water; the nearest water body was over 2 km away and there are no significant rivers in the area. The preferred elevations of *M. midas* seem to vary: in Madagascar, the majority of *M. midas* records are at or below 150 m but with some records up to 1450 m (Jenkins et al. 2008, Goodman 2011), while in South Africa this species frequents areas 300 m above sea level in low-lying savannas (Pienaar 1972). We captured these two *M. midas* at 480 m above sea level on the plateau of the Lubombo Mountains.

Mops midas is known to roost in trees, rock crevices and anthropogenic structures such as buildings and bridges (Pienaar 1972, Dunlop 1999, Ratrimomanarivo et al. 2007, Jenkins et al. 2008, Goodman 2011, Cotterill and Happold 2013). These bats typically roost in monospecific colonies (Pienaar 1972, Cotterill and Happold 2013) but may occasionally share the roost with *Chaerephon pumilus* (Cretzschmar, 1826), *Mops condylurus* (A. Smith, 1833) (Dunlop 1999), or *Mops leucostigma* (G.M. Allen, 1918) (Andriafidison et al. 2006). Colonies may range from a few individuals to several hundred (Pienaar 1972, Smithers 1983). The two *M. midas* that we captured shared a roost with several hundred other bats, mostly *C. pumilus* and *M. condylurus*, and possibly *Scotophilus dinganii* (A. Smith, 1833) (which was captured flying around the same building as the molossid bats). We were unable to determine the total number of *M. midas* inhabiting the roost.

Table 1: Standard external measurements (mm) and mass (g) of the newly recorded bat specimens from Swaziland.

Species (museum number)	Total length	Tail length	Forearm length	Ear length	Mass
<i>Mops midas</i> (DM 14563)	161	59	62.3	25	46
<i>Myotis bocagii</i> (DM 9520)	–	–	37.5	–	8
<i>Myotis bocagii</i> (DM 13644)	97	38	41.2	–	10



Figure 2: Photographs of the specimens of the two species recorded from new localities in Swaziland: (A) *Mops midas* (DM 14563), (B) *Myotis bocagii* (DM 13644).

Myotis bocagii is widely but patchily distributed in sub-Saharan Africa, being mostly associated with riverine habitats in forest and savanna zones (Rosevear 1965, Monadjem and Fahr 2007, Happold 2013). In the forest zone, it is frequently associated with banana plants where it has been captured roosting during the day in furred banana leaves (Rosevear 1965, Monadjem and Fahr 2007), but may also roost in palms of the genus *Hyphaene*, as well as in hollow trees (Happold 2013). Its roosting sites in the savanna zone are not known, but it is closely tied to open water bodies where it trawls for insects (Happold 2013). The records from Swaziland are not surprising since the species has been recorded from Kruger National Park to the north and Mkhuzi Game Reserve and Krantzklouf Nature Reserve to the south (Monadjem et al. 2010a). However, the distribution and habitat preferences of this species are still poorly known south of the Limpopo River, and the species has yet to be recorded in southern Mozambique (Monadjem et al. 2010b) to the east of Swaziland.

In addition to extending their known geographic ranges, these records of *Mops midas* and *Myotis bocagii* also underlie the importance of continued surveys of Africa's bat fauna. Southern Africa is arguably the best researched region on the continent and yet the distributions of these two bat species have been extended

to include Swaziland only within the past 7 years. Throughout southern Africa, further research and surveying of bats is necessary. Use of mist nets that are higher up off the ground than traditional ground nets may also increase captures of high-flying bats such as molossidids (Kalko and Handley 2001) and lead to new species records in the region. It is impossible to properly conserve bats without accurate data on species' distribution and abundance. Although both bats are listed by the IUCN Red List as species of "Least Concern" due to their large distributions, population trends for *M. bocagii* are unknown, and known to be declining for *M. midas* (Jacobs 2008, Jenkins et al. 2008).

The total number of bat species confirmed for Swaziland is now 26 species (see Appendix 1). The new distributional records reported here emphasize the importance of protecting bats in a wide variety of habitats, including outside of protected areas. For many bats, rural, urban, and semi-urban zones provide valuable habitat (Taylor et al. 1999), even for rarely captured species such as *Mops midas*. Effective management and conservation plans for some bat species should include these habitats as well. Although bats are often considered a nuisance, especially when roosting in buildings where they may create noise and their faeces may accumulate, they form an integral part of ecosystems and provide a variety of ecosystem

services (Jones et al. 2009). Continued research and conservation of bats in Swaziland is necessary.

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Appendix

Appendix 1: Revised checklist of the bats of Swaziland.

Family	Genus	Species	References
Pteropodidae	<i>Epomophorus</i>	<i>crypturus</i> ^a	Monadjem (1998)
	<i>Epomophorus</i>	<i>wahlbergi</i>	Monadjem (1998)
Rhinolophidae	<i>Rhinolophus</i>	<i>blasii</i>	Monadjem (2005)
	<i>Rhinolophus</i>	<i>clivosus</i>	Monadjem (1998)
	<i>Rhinolophus</i>	<i>darlingii</i>	Monadjem (1998)
	<i>Rhinolophus</i>	<i>simulator</i>	Monadjem (1998)
Hipposideridae	<i>Cloeotis</i>	<i>percivali</i>	Monadjem (1998)
	<i>Hipposideros</i>	<i>caffer</i>	Monadjem (1998)
Emballonuridae	<i>Taphozous</i>	<i>mauritanus</i>	Monadjem (1998)
Nycteridae	<i>Nycteris</i>	<i>thebaica</i>	Monadjem (1998)
Molossidae	<i>Chaerephon</i>	<i>pumilus</i>	Monadjem (1998)
	<i>Mops</i>	<i>condylurus</i>	Monadjem (1998)
	<i>Mops</i>	<i>midas</i>	This study
Miniopteridae	<i>Miniopterus</i>	<i>fraterculus</i>	Monadjem (1998)
	<i>Miniopterus</i>	<i>natalensis</i> ^g	Monadjem (1998)
Vespertilionidae	<i>Hypsugo</i>	<i>anchietae</i>	Monadjem and Reside (2008)
	<i>Kerivoula</i>	<i>lanosa</i>	Monadjem and Reside (2008)
	<i>Myotis</i>	<i>bocagii</i>	Monadjem et al. (2010a)
	<i>Myotis</i>	<i>tricolor</i>	Monadjem and Reside (2008)
	<i>Neoromicia</i>	<i>nana</i> ^b	Monadjem (1998)
	<i>Neoromicia</i>	<i>capensis</i> ^c	Monadjem (1998)
	<i>Neoromicia</i>	<i>zuluensis</i> ^d	Monadjem (1998)
	<i>Nycticeinops</i>	<i>schlieffeni</i> ^e	Monadjem (1998)
	<i>Pipistrellus</i>	<i>hesperidus</i> ^f	Monadjem (1998)
<i>Scotophilus</i>	<i>dinganii</i>	Monadjem (1998)	
<i>Scotophilus</i>	<i>viridis</i>	Monadjem and Reside (2008)	

^aAs *Epomophorus gambianus*.

^bAs *Pipistrellus nanus*.

^cAs *Eptesicus capensis*.

^dAs *Eptesicus somalicus*.

^eAs *Nycticeius schlieffenii*.

^fAs *Pipistrellus kuhlii*.

^gAs *Miniopterus schreibersii*.

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