Crocidura maquassiensis – Maquassie Musk Shrew

Photograph wanted

Regional Red List status (2016)	**Vulnerable B2ab(ii,iii,iv)***
National Red List status (2004)	Vulnerable B2ac(ii,iv)
Reasons for change	No change
Global Red List status (2016)	Least Concern
TOPS listing (NEMBA)	None
CITES listing	None
Endemic	No

*Watch-list Data

This species is named after the locality where it was originally described: Makwassie, Wolmaransstad district, North West Province (Skinner & Chimimba 2005).

Taxonomy

Crocidura maquassiensis (Roberts 1946)

ANIMALIA - CHORDATA - EULIPOTYPHLA - SORICIDAE - *Crocidura* - *maquassiensis*

Common names: Maquassie Musk Shrew, Makwassie Musk Shrew (English), Maquassie-skeerbek (Afrikaans)

Taxonomic status: Species

Taxonomic notes: Meester et al. (1986) raise doubts about the validity of the species, which has been described as a variant of the Reddish-grey Musk Shrew (*C. cyanea*) or a form of the Lesser White-toothed Musk Shrew (*C. suaveolens*). We similarly caution that this may represent a species complex based on ecological divergence between the lower-land sand forests of Maputaland and the grassland escarpment subpopulations (P. Taylor unpubl. data), and will need revision if taxonomic work confirms this. However, until new research proves its relatedness to other musk shrews, we retain the species status.

Assessment Rationale

This is a rare species endemic to South Africa, Swaziland and Zimbabwe, existing in moist grassland habitats in the Savannah and Grassland biomes. Although it has a wide inferred extent of occurrence (284,735 km^2), it appears to be patchily distributed. We use wetlands as a proxy for suitable habitat and calculate the amount of natural habitat remaining within buffer strips around wetlands as the inferred area of occupancy (AOO), which yields a range of 1,790–2,089 km^2 (32 m buffer strip). We suspect that these habitat patches are severely fragmented as shrews have a poor dispersal ability, and continuing rates of urban and rural expansion (highest rates are 15% and 9%, respectively, in Limpopo Province) may have increased overgrazing and water abstraction, which may reduce the suitability of patches and the corridors between them. Similarly, we infer a continuing population decline based on high rates of habitat loss in all provinces, especially KwaZulu-Natal and North West (1.2% per year from 1994–2011 and 0.5% per annum from 2006–2010, respectively). Thus we list this species, under a precautionary purview, as Vulnerable B2ab(ii,iii,iv) because, although the AOO estimate varies widely, not all suitable habitat will be occupied (for example, not a single individual was sampled during a recent survey in North West Province). We recommend more field studies be undertaken to understand the distribution and density of the species. If new data indicate a wider AOO and confirm its broad habitat tolerance, a reassessment will be necessary and it may be downlisted to Near Threatened or Least Concern.

Key interventions include protected area expansion of moist grassland and riverine woodland habitats, as well as providing incentives for landowners to sustain natural vegetation around wetlands and keep livestock or wildlife at ecological carrying capacity.

Regional population effects: This species is suspected to have a low dispersal capacity and exists in fragmented habitat. Thus, we assume no rescue effects are possible.

Distribution

This is a rare species, recorded only from disparate localities in Zimbabwe, Mantenga Falls in the middleveld region of Swaziland (Monadjem 1998), Limpopo (Motlateng and Blouberg, and more recently in the Soutpansberg Mountains; P. Taylor unpubl. data), North West (Makwassie), Gauteng (Krugersdorp, Roodeplaat Dam and Heuningklip), KwaZulu-Natal (Kosi Lake, Lake Sibaya, Gaint's Castle, Royal Natal and Chase Valley Heights) and Mpumalanga (Loskop Dam) (Skinner & Chimimba 2005). The species may be considered near-endemic or endemic if molecular work reveals a species complex existing across regions and biomes. Additionally, the Highveld grassland population may turn out to be taxonomically distinct from the subtropical grassland population (P. Taylor unpubl. data).

Although the type locality of the species is the town of Maquassie, North West Province (discovered in 1928 in a

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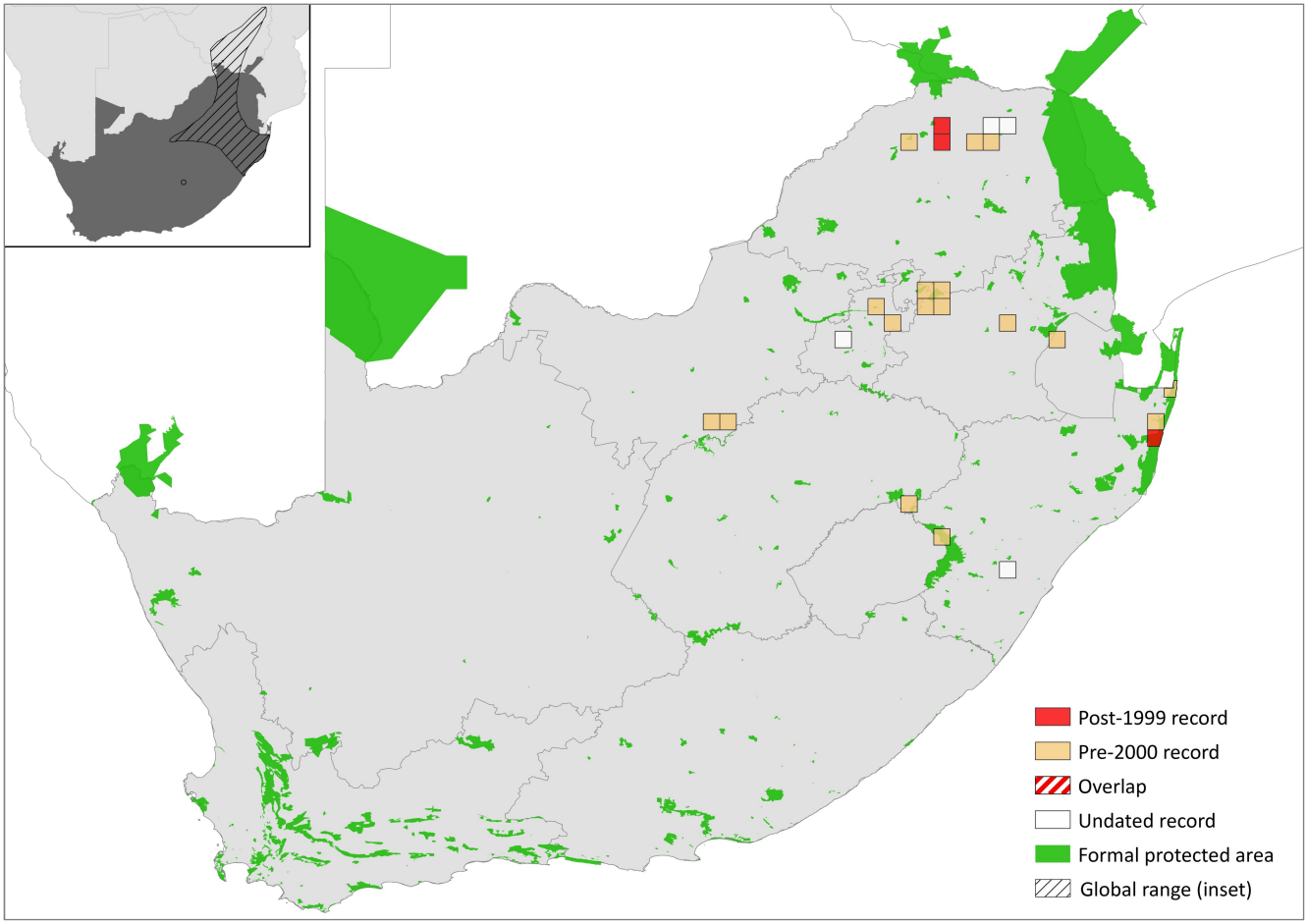

Figure 1. Distribution records for Maquassie Musk Shrew (*Crocidura maquassiensis*) within the assessment region

Table 1. Countries of occurrence within southern Africa

Country	Presence	Origin
Botswana	Absent	-
Lesotho	Absent	-
Mozambique	Absent	-
Namibia	Absent	-
South Africa	Extant	Native
Swaziland	Extant	Native
Zimbabwe	Extant	Native

house), it has been infrequently recorded in the province and there have been no post-1999 records (Figure 1) despite a recent survey that sampled the Klipspruit region around Maquassie that may form part of a dispersal corridor for the species (Power 2014). Countrywide, post-1999 records for the species pertain only to the Soutpansberg Mountains (Taylor et al. 2015) and northern KwaZulu-Natal (P. Taylor unpubl. data). Similarly, both Friedmann and Daly (2004) and Baxter (2008) indicate a possible occurrence for the species in southern Free State Province on the Orange River, but this revision does not have a record for this area and its presence has not been detected in the Free State in recent surveys (N. Avenant pers. comm. 2016).

Based on the scattered records available, we infer the extent of occurrence to be 284,735 km^2. However, we suspect the species to be patchily distributed within this wide area. As the species depends on moist habitats, we use wetlands as a proxy for suitable habitat and calculate the amount of natural habitat remaining within buffer strips around wetlands as the inferred area of occupancy (AOO), which yields a range of 40,496–47,246 km^2 (using a 500 m buffer strip) to 1,790–2,089 km^2 (using a 32 m buffer strip). Although this is still a huge area, we suspect the lower estimates are more plausible as not all suitable patches will be occupied due to the natural rarity of the species, its poor dispersal capacity and ongoing habitat degradation of patches and corridors between them.

Population

This species is small, relatively rare and seldom caught in traps during sampling. Research from Luvhondo Nature Reserve in the Soutpansberg Mountains, indicates a low-density population, where only two individuals were captured over a year-long period (2010–2011) in half-hectare plots (Taylor et al. 2015). This equates to a trap success of 0.005 captures / trap night and an inferred density of around 1 individual / 0.01 km^2 (P. Taylor unpubl. data). If we extrapolate this density across the lowest estimate of AOO, it yields a population size of at least 179,000 individuals.

Its rarity is also corroborated through recent field studies in Mkhuze and Phinda Game Reserves, KwaZulu-Natal where, despite being within the range of the species, it was not sampled whilst other *Crocidura* species were (Delcros et al. 2014; Rautenbach et al. 2014). Thus, this may be a naturally rare species that is difficult to identify and has been overlooked. Although more information and sampling is needed, this species is likely to persist in areas with moist conditions.

Current population trend: Declining. Inferred from natural habitat loss in core provinces.

Continuing decline in mature individuals: Unknown

Number of mature individuals in population: 179,000 – based on extrapolation across AOO of density in the Soutpansberg Mountains.

Number of mature individuals in largest subpopulation: Unknown

Number of subpopulations: Unknown

Severely fragmented: Yes, considering the poor dispersal ability of the species and the fragmented nature of moist grasslands within its EOO.

Habitats and Ecology

Little is known about the habitats and ecology of this species. The type specimen was collected in a house and the Motlateng specimen from a grassy mountainside beneath a rock at 1,580 m asl (Skinner & Chimimba 2005). Other specimens have also been found on rocky or montane grassland, such as recently in the Soutpansberg Mountains (Taylor et al. 2015). The Chase Valley Heights specimen was brought in by a cat from the garden (P. Taylor pers. comm. 2016), which demonstrates the importance of cataloguing what the cat brings in. The Royal Natal specimen was collected in mixed bracken and grasslands along the Tugela River and a single specimen has been collected from coastal forest (Taylor 1998). Thus, it may tolerate a wide range of habitats, including urban and rural landscapes.

Ecosystem and cultural services: Candidate for flagship species in grassland biodiversity stewardship schemes.

Use and Trade

There is no known subsistence or commercial use of this species.

Threats

The main threats to shrews are the loss or degradation of moist, productive areas such as wetlands and rank grasslands within suitable habitat. The two main drivers behind this are abstraction of surface water and draining of wetlands through industrial and residential expansion, and overgrazing of moist grasslands, which leads to the loss of ground cover and decreases small mammal diversity and abundance (Bowland & Perrin 1989, 1993). Suppression of natural ecosystem processes, such as fire, can also lead to habitat degradation through bush encroachment or loss of plant diversity through alien invasive infestation, and is suspected to be increasing with human settlement expansion. There are also clear overlaps and synergistic effects between these threats. We infer a continuing population decline based on loss of natural habitat.

Wetlands are the country's most threatened ecosystem, with 65% of wetland ecosystem types threatened (48% of all wetland types Critically Endangered, 12% Endangered and 5% Vulnerable) because they are highly productive and hence become transformed for agriculture (Driver et al. 2012). Overall, 45% of our remaining wetland areas exist in a heavily modified condition, due primarily to onsite modification from crop cultivation, coal mining, urban development, dam construction, and overgrazing (and thus erosion) and off-site modifications from disruptions to flow regime and deterioration of water quality (Driver et al. 2012).

Table 2. Threats to the Maquassie Musk Shrew (*Crocidura maquassiensis*) ranked in order of severity with corresponding evidence (based on IUCN threat categories, with regional context)

Rank	Threat description	Evidence in the scientific literature	Data quality	Scale of study	Current trend
1	*7.2 Dams & Water Management/Use*: wetland loss through drainage/water abstraction during agricultural, industrial and urban expansion.	Driver et al. 2012	Indirect (land cover change from remote sensing)	National	Increasing with settlement expansion and 65% of wetland ecosystem types threatened already.
2	*2.3.2 Small-holder Grazing, Ranching or Farming*: wetland and grassland degradation through overgrazing (removal of ground cover).	Bowland & Perrin 1989	Empirical	Local	Possibly increasing with human settlement expansion and intensification of wildlife farming.
		Driver et al. 2012	Indirect	National	45% of remaining wetland area exists in a heavily modified condition.
3	*7.1.2 Suppression in Fire Frequency/ Intensity*: human expansion around forests has decreased natural fire frequency. Current stress *1.2 Ecosystem Degradation*: altered fire regime leading to bush encroachment (including alien vegetation invasion) and thus loss of moist grasslands.	-	Anecdotal	-	-
4	*1.1 Housing & Urban Areas*: forest habitat lost to residential and commercial development. Current stress *1.3 Indirect Ecosystem Effects*: fragmentation and isolation of remaining habitat patches with limited dispersal between.	GeoTerraImage 2015	Indirect (land cover change from remote sensing)	Regional	Continuing. Area of urban expansion has increased between 2000 and 2013.

Table 3. Conservation interventions for the Maquassie Musk Shrew (*Crocidura maquassiensis*) ranked in order of effectiveness with corresponding evidence (based on IUCN action categories, with regional context)

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	*1.2 Resource & Habitat Protection*: stewardship agreements with private landowners to conserve wetlands and grasslands.	-	Anecdotal	-	-	Multiple organisations
2	*2.2 Invasive/Problematic Species Control*: Maintain stocking rates of livestock and wildlife at ecological carrying capacity.	Bowland & Perrin 1989	Empirical	Local	Small mammal diversity and abundance significantly higher after decrease in grazing pressure.	-
3	*2.1 Site/Area Management*: maintain/restore natural vegetation around wetlands.	-	Anecdotal	-	-	-
4	*2.2 Invasive/Problematic Species Control*: clear alien vegetation from watersheds and wetlands to restore habitat quality.	-	Anecdotal	-	-	Working for Water, Department of Environmental Affairs
5	*4.3 Awareness & Communications*: educating landowners in the importance of wetlands and grasslands.	-	Anecdotal	-	-	-

Current habitat trend: Habitat loss and degradation across the range of the species are caused primarily by agricultural expansion, urban and rural settlement expansion, plantations and mining. Overall, there was a 19.7% loss of natural habitat in KwaZulu-Natal from 1994 to 2008, with an average loss of 1.2% per year (Jewitt et al. 2015). If this rate of loss continues into the future, there will be an estimated 12% loss of habitat over 10 years. In Gauteng, 13% of natural habitat was lost between 1995 and 2009 (Driver et al. 2012). In North West Province, 2% of natural habitat was lost just between 2006 and 2010 (Desmet & Schaller 2015). Similarly, although not formally quantified, there is ongoing habitat loss in both Mpumalanga and Limpopo provinces, especially from settlement expansion and mining. New land cover data from 2000 and 2013 show that Gauteng, Limpopo, Mpumalanga and North West provinces experienced rural expansion of 39%, 9%, 7% and 6.5%, respectively (GeoTerraImage 2015), while urban expansion proceeded at 8%, 15%, 11% and 14% for the same provinces (GeoTerraImage 2015). Such settlement expansion indicates both a loss of habitat and an increase in human encroachment on grassland and wetland resources, which we infer as increasing habitat degradation. The effects of climate change on this species are currently unknown.

Conservation

This species occurs in Maloti-Drakensberg Transfrontier Park and presumably several other protected areas. The main intervention for this species is the protection and restoration of wetlands and grasslands. Biodiversity stewardship schemes should be promoted if landowners possess wetlands or grasslands close to core protected areas or remaining habitat patches, and the effects on small mammal subpopulations should be monitored. Protecting such habitats may create dispersal corridors between grassland patches that will enable adaptation to climate change. At the local scale, landowners and managers should be sensitised, encouraged and incentivised to conserve the habitats on which shrews and other small mammals depend. Retaining ground cover is the most important management tool to increase small mammal diversity and abundance. This can be achieved through lowering grazing pressure (Bowland & Perrin 1989), or by maintaining a buffer strip of natural vegetation around wetlands (Driver et al. 2012). Small mammal diversity and abundance is also higher in more complex or heterogeneous landscapes, where periodic burning is an important tool to achieve this (Bowland & Perrin 1993). Removing alien vegetation from watersheds, watercourses and wetlands is also an important intervention to improve flow and water quality, and thus habitat quality, for shrews. Education and awareness campaigns should be employed to teach landowners and local communities about the importance of conserving wetlands and moist grasslands.

Recommendations for land managers and practitioners:

- Landowners and communities should be incentivised to stock livestock or wildlife at ecological carrying capacity and to maintain a buffer of natural vegetation around wetlands.
- Enforce regulations on developments that potentially impact on the habitat integrity of grasslands and wetlands.

Research priorities:

- Additional field surveys are needed to clarify and confirm the distribution of this species.
- Further molecular research may be needed to disentangle a possible species complex.

Encouraged citizen actions:

- Citizens are requested to submit any shrews killed by cats or drowned in pools to a museum or a provincial conservation authority for identification, thereby enhancing our knowledge of shrew

distribution (carcasses can be placed in a ziplock bag and frozen with the locality recorded).

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Data Sources and Quality

Table 4. Information and interpretation qualifiers for the Maquassie Musk Shrew (*Crocidura maquassiensis*) assessment

Data sources	Museum records, field study (unpublished), indirect information (literature, expert experience)
Data quality (max)	Inferred
Data quality (min)	Inferred
Uncertainty resolution	Maximum/minimum values
Risk tolerance	Precautionary

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Details of the methods used to make this assessment can be found in *Mammal Red List 2016: Introduction and Methodology.*