Myosorex longicaudatus – Long-tailed Forest Shrew


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Regional Red List status (2016)	**Endangered B1ab(ii,iii)**
Langeberg Mountains subpopulation	**Critically Endangered B1,2ab(ii,iii)**
National Red List status (2004)	Near Threatened
Reasons for change	Non-genuine: New information
Global Red List status (2008)	Vulnerable B1ab(iii)
TOPS listing (NEMBA)	None
CITES listing	None
Endemic	Yes

The unique feature of this forest-dwelling species is the long, thick, semi-prehensile tail (Skinner & Chimimba 2005).

Taxonomy

Myosorex longicaudatus (Meester & Dippenaar 1978)

ANIMALIA - CHORDATA - MAMMALIA - EULIPOTYPHLA - SORICIDAE - *Myosorex* - *longicaudatus*

Common names: Long-tailed Forest Shrew (English), Langstertbosskeerbek (Afrikaans)

Taxonomic status: Species and subpopulation

Taxonomic notes: A recent molecular study found this species to be genetically distinct from the other southern African species (Willows-Munro & Matthee 2009). In the phylogeny presented, *M. longicaudatus* is sister to a clade containing the Tanzanian species *M. geata* and *M. kihaulei,* while all the other southern African *Myosorex* species formed a well-supported monophyletic lineage.

This species will possibly be split into *M. l. longicaudatus*, the type specimen which originates from the Knysna Forest (Meester & Dippenaar 1978), and *M. l. boosmani.* The latter subpopulation, tentatively labelled a subspecies, is found in the Boosmansbos Forest (Langeberg Mountains), which differs in size and cranial configuration from subpopulations in the Knysna Forests (Dippenaar 1995). Molecular work should be undertaken to clarify the taxonomic status of the putative subspecies, as it is likely they represent two separate species.

Assessment Rationale

This is an endemic species restricted to a narrow range of forest within the Western and Eastern Cape provinces. It is restricted to pristine primary habitat that has not been degraded. Ongoing urban expansion (having increased by 8% and 6% for Western and Eastern Cape provinces between 2000 and 2013, respectively), especially along the coast, is inferred to have reduced and fragmented suitable habitat. Correspondingly, Southern Coastal and Swamp Forest have declined by at least 1–3% between 2000 and 2013. The current extent of occurrence is estimated to be 2,214 km^2, while the area of occupancy, based on remaining forest patches, is estimated to be 691 km^2 and 10.1 km^2 for *M. l. longicaudatus* and *M. l. boosmani* respectively. Furthermore, this species needs a moist microhabitat to survive, which makes it susceptible to extensive fragmentation and climate change. Climate models project that Afromontane forest suitable for this species will be heavily impacted in the coming decades (projected 18–61% decrease between 1975 and 2050).

Although well-protected in some areas, forests are becoming degraded through over-use, and continually encroached upon by residential and commercial development along the coast. Thus, due to restricted range, fragmented remaining habitat patches, and both current and projected (from climate change) loss of habitat and habitat quality, we list this species as Endangered B1ab(ii,iii). Similarly, the subpopulation in the Langeberg Mountains qualifies for Critically Endangered B1,2ab(ii,iii), as effective AOO may well be slightly less than the 10.1 km^2 estimated. The EOO is probably an underestimate due to lack of recent systematic surveys (last performed in early 1990s) and the southern aspect of the Southern Cape Fold Mountains is likely to contain suitable habitat for the species. Surveys are desperately needed to confirm its presence in these habitats. However, we take a precautionary approach as the current EOO value is well below the threshold for Endangered and it is not clear how much further the EOO could potentially be expanded. Further genetic work is also needed to determine the taxonomic status of *M. l. longicaudatus* and *M. l. boosmani*, and a re-assessment may be needed. Similarly, the ongoing habitat loss from urban expansion and climate change must be monitored.

Key interventions include the protection of forest habitats, and perhaps the creation of corridors between patches to facilitate gene flow and allow adaptation to climate change, as well as the enforcement of regulations restricting disturbance to protected forests.

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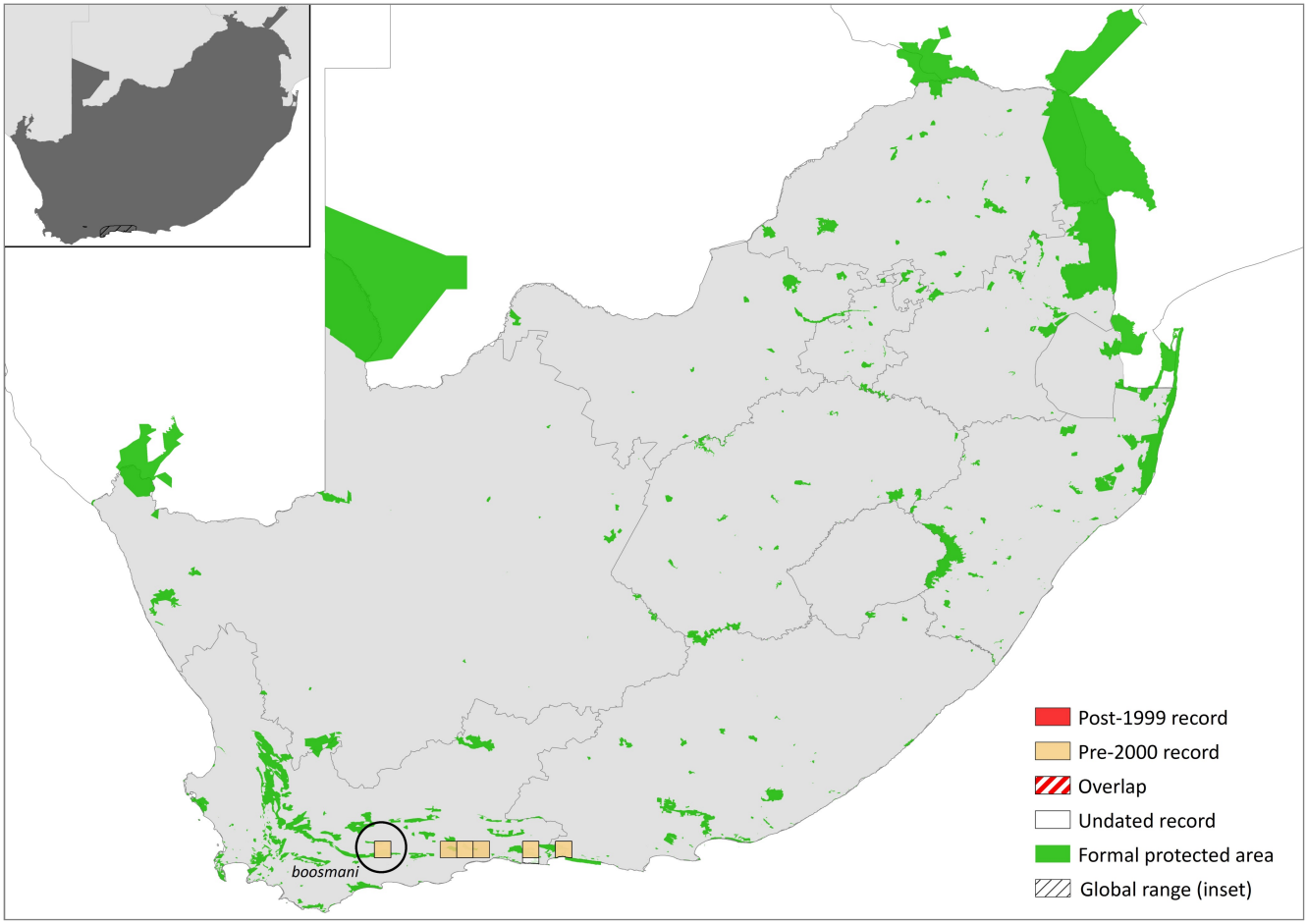

Figure 1. Distribution records for Long-tailed Forest Shrew (*Myosorex longicaudatus*) within the assessment region

Table 1. Countries of occurrence within southern Africa

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

Distribution

The Long-tailed Forest Shrew was only discovered in 1978 and is restricted to Afromontane evergreen forest, mostly preserved along the deep valleys and cooler south-facing slopes along the south coast of South Africa. It also occurs in fynbos in the Langeberg Mountains. It is a relic species from previous southward radiations, as reflected by its closest phylogenetic link being that of *M. geata* – a highly localized endemic of the Uluguru Mountains in Tanzania (Willows-Munro & Matthee 2009). The remaining three South African species cluster as a monophyletic entity with strong support for a sister taxon association between *M. cafer* and *M. sclateri* (Willows-Munro & Matthee 2009).

Specifically, the species is known from the southeastern parts of the Western Cape and southwestern parts of the Eastern Cape (Figure 1), occurring from the Langeberg Mountains, Western Cape to the Lottering Forest, Eastern Cape. Within the Knysna Forest, it occurs in Lottering State Forest, Diepwalle State Forest, Tonnelbos Forest and the Ruitersbos State Forest (Skinner & Chimimba 2005). It generally occurs at elevations up to 2,000 m asl. However, the subpopulation *Myosorex longicaudatus boosmani* from the Langeberg Mountains, occurs at much higher elevations (up to 3,600 m asl) than any other known subpopulations (Dippenaar 1995). The Langeberg subpopulation is separated from the Knysna subpopulations by the dry Gouritz River Valley, where *M. l. boosmani* is unlikely to occur (Dippenaar 1995). It is sympatric with *M. varius* but allopatric with *M. cafer* (Skinner & Chimimba 2005).

The extent of occurrence is estimated to be 2,214 km^2. Area of occupancy was estimated using current (2014) remaining forest patches, which corresponds to 691 km^2 (and 582 km^2 if we include only the forest area that intersects the EOO) and 10.1 km^2 for *M. l. longicaudatus* and *M. l. boosmani,* respectively. *Myosorex l. longicaudatus* is known from only five localities, *and M. l. bossmani* from just one locality. These localities are suspected to be isolated due to the species' presumed inability to disperse across unsuitable habitat. We note that the EOO may be an underestimate as most data collection in the region has been *ad hoc*, with the last semi -systematic surveys carried out in the 1970s and early 1990s by CapeNature (G. Palmer pers. comm. 2015). Correspondingly, the most recent records are from 1995 and 1996 (CapeNature) and previously all records are from 1975 to 1981 (N = 225 records in total). The Southern Cape Fold Mountains, particularly the southern aspect, may have suitable potential habitat and are

relatively well protected (G. Palmer pers. comm. 2015). Surveys are needed to confirm its presence there.

Population

This species is suspected to be relatively common in suitable habitat, with the highest numbers of individuals found at the forest edge (Dippenaar 1995). Subpopulation numbers may vary as one survey found no specimens after intensive trapping in an area where a previous survey had caught quite high numbers (R. Baxter unpubl. data). No density estimates are available.

Current population trend: Declining. Inferred from ongoing forest habitat loss.

Continuing decline in mature individuals: Unknown

Number of mature individuals in population: Unknown

Number of mature individuals in largest subpopulation: Unknown

Number of subpopulations: Unknown, but may be only five based on remaining forest patches and verified localities.

Severely fragmented: Yes. Forest habitat is fragmented by residential and industrial development along the coast.

Habitats and Ecology

Long-tailed Forest Shrews are found in montane and temperate forests, forests edges, fynbos and boggy grassland, and depend on moist microhabitats (typically above the 800 mm isohyet). It is restricted to pristine primary habitat that has not been degraded. It is nocturnal. They have longer tails than the other three species of forest shrew occurring in the assessment region (74% of the length of the head and body compared with 46–50% in the others), which suggests an arboreal lifestyle (Meester & Dippenaar 1978). There is little geographic variation in body colour (Skinner & Chimimba 2005). Stomach content analysis suggests it eats primarily insects and seeds (Skinner & Chimimba 2005).

Ecosystem and cultural services: Potential to become a flagship species of southern coastal forests and an ecotourism drawcard.

Use and Trade

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

Threats

The main threat to Long-tailed Forest Shrews is the loss of moist, productive areas such as wetlands and rank grasslands. Loss of these habitats due to water abstraction from agriculture, industry and urban sprawl is the major threat, while degradation of these habitats from overgrazing and imprudent fire regimes is the second most severe threat. A National Biodiversity Assessment in 2011 revealed that 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; Driver et al. 2012) because they are highly productive and hence become transformed for agriculture. Overall, 45% of our remaining wetland area exists in a heavily modified condition, due primarily to onsite modification from crop cultivation, coal mining, urban development, dam construction, overgrazing (and thus erosion), and off-site modifications from disruptions to flow regime and deterioration of water quality (Driver et al. 2012). Shrews have a high metabolic rate and thus rely on highly productive and stable environments.

Unfettered urban expansion, especially coastal development, is the major threat to this species. Loss of forest habitat, and fragmentation of remaining habitats, is likely to be causing significant population decline through lack of connection between patches, disruption of

Table 2. Threats to the Long-tailed Forest Shrew (*Myosorex longicaudatus*) 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	*1.1 Housing & Urban Areas*: forest habitat is being lost to residential and commercial development, especially along the coast.	GeoTerraImage 2015	Indirect (land cover change from remote sensing)	Regional	Continuing. Area of urban expansion has increased by 8% and 6% for Western and Eastern Cape provinces between 2000 and 2013 respectively.
2	*11.1 Habitat Shifting & Alteration*: most microhabitats lost from loss of Afromontane forest cover.	Taylor et al. 2016	Simulation	National	Increasing: a potential reduction in area of occupancy of 18–61% between 1975 and 2050.
3	*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	65% of wetland ecosystem types threatened.
4	*2.3 Livestock Farming & Ranching*: wetland and grassland degradation through overgrazing (removal of ground cover). Current stress *1.2 Ecosystem Degradation*: bush encroachment (including alien invasion) through climate change, fire suppression and overgrazing.	Driver et al. 2012	Indirect (land cover change from remote sensing)	National	45% of our remaining wetland area exists in a heavily modified condition.

ecological functioning, and increased exposure to human disturbances at forest edges. Fragmentation also increases its susceptibility to climate change. Climate change is considered to be the principal emerging threat to this species (Ogony 2014), both due to loss of habitat and because shrews cannot tolerate extremes of temperature for long and thus their foraging time will be reduced. Because of their high metabolism, low dispersal capacity and short life spans, climate change will reduce the amount of suitable habitat available. Habitat in neighbouring areas is arid and unsuitable for this species and thus it would not be able to disperse to other areas if the climate in its current range became unsuitable. It is thought that coastal subpopulations might be at less risk than non-coastal subpopulations.

Current habitat trend: The area of urban expansion has increased by 8% and 6% for Western and Eastern Cape provinces between 2000 and 2013, respectively (GeoTerraImage 2015). Furthermore, climate modelling indicated a potential reduction in area of occupancy of 18–61% between 1975 and 2050 (Taylor et al. 2016), which, assuming a linear rate of loss equates to a 2.4–8.1% loss of suitable habitat over a ten-year period.

Conservation

The main intervention for this species is the protection and restoration of wetlands and grasslands within and around forest patches. As habitat loss from climate change will be further compounded by habitat loss from land transformation (Driver et al. 2012), a critical intervention is to increase the extent of protected area networks that connect mountainous areas to lowland or coastal habitats, thus facilitating dispersal routes along elevational gradients. This species has confirmed presences in important formally protected areas such as the Diepwalle Forest Reserve and Garden Route National Park. Once further surveys have been conducted to identify additional subpopulations, biodiversity stewardship agreements with private landowners should be used to connect forest patches and conserve the integrity of associated wetlands and fynbos grasslands. Protecting such habitats may create dispersal corridors between forest patches that will enable adaptation to climate change.

All forests in South Africa are protected by law, although the degree to which this is enforced may vary. Increased enforcement of forest-related transgressions should be used to minimise disturbance to existing forest patches, as well as stricter zonation on development to decrease fragmentation of remaining forests. Assisted colonisation could become imperative if climate change continues to make existing habitat within the species' range unsuitable.

Recommendations for land managers and practitioners:

- More accurate estimates of forest patch occupancy through extensive live-trapping, in an attempt to recapture individuals, should be conducted through dedicated surveys by specialists and conservation authorities, thus informing spatial conservation planning.
- Enforce regulations on developments that potentially impact forests.
- *Myosorex. l. boosmani* potentially needs management imminently. Surveys should be conducted to assess population size, trends and distribution.

Research priorities:

- Systematic surveys in the Southern Cape Fold Mountains to determine whether the extent of occurrence extends further.

Data Sources and Quality

Table 4. Information and interpretation qualifiers for the Long-tailed Forest Shrew (*Myosorex longicaudatus*) assessment

Data sources	Museum records, indirect information (unpublished)
Data quality (max)	Inferred
Data quality (min)	Inferred
Uncertainty resolution	Best estimate
Risk tolerance	Evidentiary

Table 3. Conservation interventions for the Long-tailed Forest Shrew (*Myosorex longicaudatus*) 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	*1.1 Site/Area Protection*: protected area expansion to connect high-altitude and coastal habitats thus allowing adaptation to climate change range shifts.	-	Anecdotal	-	-	-
2	*1.2 Resource & Habitat Protection*: stewardship agreements with private landowners to buffer core forest patches and conserve habitat integrity of matrix.	-	Anecdotal	-	-	-
3	*3.3.2 Benign Introduction*: assisted colonisation may be necessary to help the species track climate change.	-	Anecdotal	-	-	-
4	*5.4 Compliance & Enforcement*: minimising disturbance to core forest patches by enforcing compliance with forest protection laws, and preventing illegal development.	-	Anecdotal	-	-	-

- Molecular studies to resolve the taxonomic resolution of the two putative subspecies.

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