





Reassessment of the conservation status of *Crocidura fingu*, a shrew endemic to Príncipe Island, Gulf of Guinea

JOÃO C.T. ALVES^{*1} , YODINEY DOS SANTOS¹ 
PATRÍCIA GUEDES^{2,3}  and RICARDO ROCHA^{2,3,4} 

Abstract The Fingu white-toothed shrew *Crocidura fingu*, categorized as Data Deficient on the IUCN Red List, is endemic to Príncipe Island, Central Africa. It is currently known from < 10 sites and its ecology and any threats are largely unknown. We review its distribution and ecology, and any potential threats, based on camera-trap data, field observations and previously published and unpublished sightings. *Crocidura fingu* appears to have an island-wide distribution and to use a range of ecosystems, from native forests to urban areas. It is largely nocturnal and exhibits considerable spatiotemporal overlap with introduced mammals such as the African civet *Civettictis civetta*, domestic cat *Felis catus* and rats *Rattus* spp. The species has an area of occupancy < 500 km² and is known from fewer than five locations, and its population is inferred to be affected by several introduced mammals. We recommend that it is reclassified as Endangered on the IUCN Red List.

Keywords Camera trap, *Crocidura fingu*, introduced mammal, IUCN Red List, Príncipe Natural Park, São Tomé and Príncipe, shrew

Non-volant terrestrial mammals are commonly absent from Oceanic islands. Yet each of the two islands of São Tomé and Príncipe, in the Gulf of Guinea off the coast of Central Africa, hosts an endemic shrew (Rainho et al., 2022): the São Tomé shrew *Crocidura thomensis* on the 857 km² São Tomé Island and the Fingu white-toothed shrew *Crocidura fingu* on the 142 km² Príncipe Island.

The shrew occurring on Príncipe, first considered conspecific with *C. thomensis* (Bocage, 1903) and later reclassified as *Crocidura poensis*, a species native to mainland Africa (Heim de Balsac & Hutterer, 1982), was recently described as *C. fingu* based on molecular and morphological evidence (Ceríaco et al., 2015; Nicolas et al., 2019). It is

the only native non-volant mammal on Príncipe, where it has been described as common and widespread (Ceríaco et al., 2015) despite being known from only four sites, all in the north of the island (Rainho et al., 2022). Little is known regarding the ecology of and any threats to this endemic insular species, which is categorized as Data Deficient on the IUCN Red List (Ceríaco et al., 2019). Here we reassess this categorization based on > 90 new records of the species and new information regarding potential threats.

During March 2019–August 2022 we deployed camera traps (Bushnell Essential E3, Bushnell, USA, and Browning PATRIOT, Browning, USA) across various land-cover classes, including native forest in Príncipe Natural Park in the mountainous south of the island where *C. fingu* had not been previously recorded (Fig. 1). We deployed the cameras at 26 sites for 2–188 days, attached to trees at c. 30 cm above ground and oriented towards structures that could be frequented by animals. The cameras operated continuously, with high sensitivity and a sequence of three captures per activation. Photographs containing animals were considered to be distinct records if captures occurred > 30 min apart. We collected the data in the context of a wider study on introduced mammals and thus we selected this camera-trap method instead of methods more conventionally used for micromammals. We further collated previously published records, four new observations and three records previously misidentified as *C. thomensis* (CAS Mammalogy, 2022a,b; UMMZ Mammals Data Group, 2022).

During 2,433 camera-trap days we obtained 96 records of shrews across four sites (Fig. 1). Shrews were photographed between 17.32 and 4.55, suggesting a largely nocturnal activity pattern. Rats *Rattus* spp. were observed at these four sites (55 records), closely matching the circadian rhythm of the shrew, whereas similarly nocturnal African civets *Civettictis civetta* (three records) and a domestic cat *Felis catus* (one record) co-occurred with the shrew at only one site each (Plate 1). Mona monkeys *Cercopithecus mona* (18 records) were detected at three sites, but only during the daytime. These findings extend the previously known maximum altitude of *C. fingu* by c. 500 m, to 852 m, with > 80% of records above 300 m. Collating the camera-trap data, field observations and previously misclassified records resulted in 103 new records of *C. fingu* from nine sites across all land-cover classes (Table 1; Fig. 1).

*Corresponding author, jctalves@gmail.com

¹Fundação Príncipe, Santo António, São Tomé and Príncipe

²CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto, Vairão, Portugal

³BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Campus de Vairão, Vairão, Portugal

⁴Department of Biology, University of Oxford, Oxford, UK

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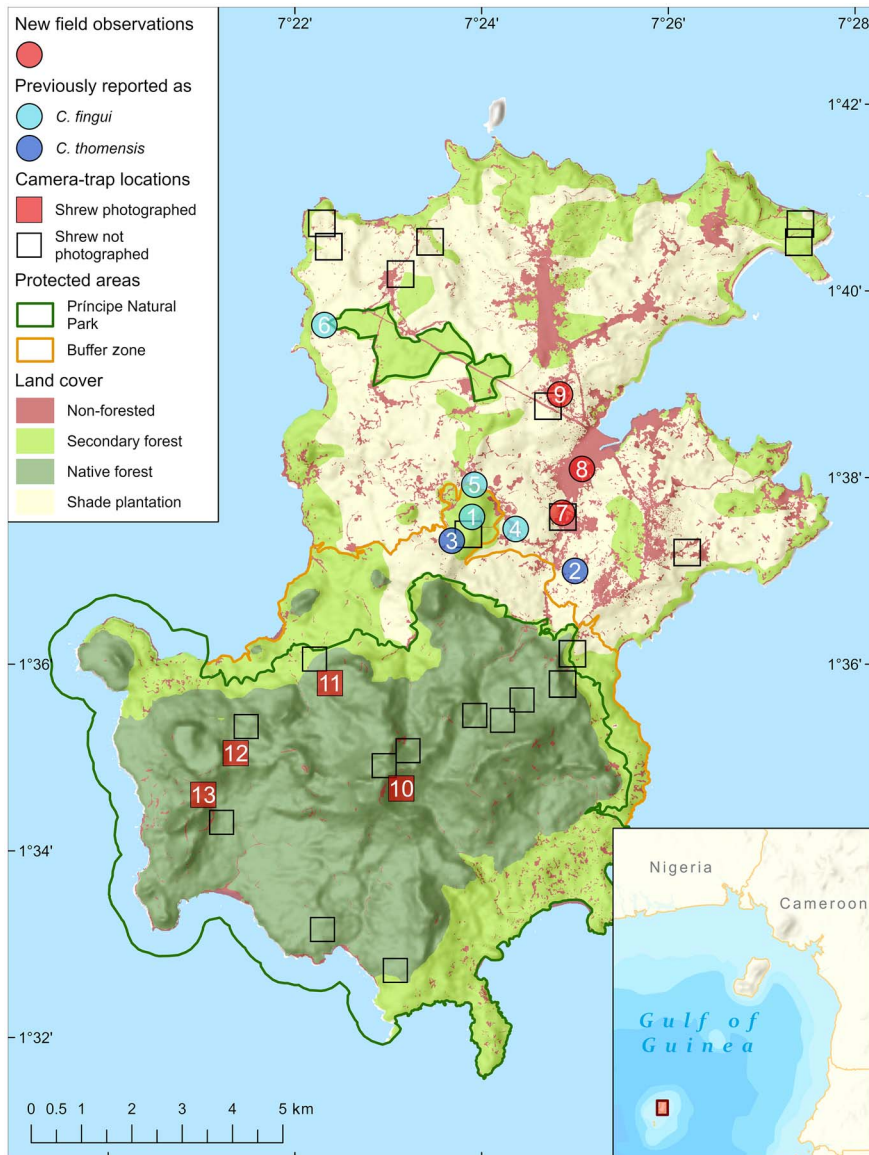


FIG. 1 Previous and new records of the endemic Fingui white-toothed shrew *Crocidura finguí* across the various land-cover classes of Príncipe Island (Freitas, 2019; Soares, 2019) in the Gulf of Guinea off the coast of Central Africa. For details of the numbered records, see Table 1. (Readers of the printed journal are referred to the online article for a colour version of this figure.)

These records extend the known distribution of *C. finguí* and support claims that the species is able to use both human-impacted and native habitats (Ceríaco et al., 2015). This habitat flexibility and the extensive forest cover of Príncipe (Fig. 1) suggest that land-use change alone does not pose an immediate threat to the species. Nevertheless, on small islands even widespread taxa can undergo rapid range contractions. The black rat *Rattus rattus* has been linked to the possible extinction of the Christmas Island shrew *Crocidura trichura* (Meek, 2000) either as a vector for *Trypanosoma* or because of predation, competition or other indirect effects (Eldridge et al., 2014). *Crocidura trichura* was abundant and widespread in 1900 but virtually disappeared following the introduction of black rats (Meek, 2000). Similarly, the spatiotemporal coexistence of *C. finguí* with introduced mammals raises concerns about the potential threats that predation or competition from these introduced

species might pose (Dutton, 1994; Rainho et al., 2022), similar to the situation regarding *C. thomensis* on São Tomé (Dutton & Haft, 1996; de Lima et al., 2016). One of our records was of a shrew captured by a free-ranging cat, and anecdotal evidence suggests that such captures are frequent.

We recommend that the conservation status of *C. finguí* should be recategorized to Endangered based on criteria B2ab(v); i.e. area of occupancy < 500 km² (B2), known to occur in five or fewer locations (a), and evidence, estimation, inference or projection of a continuous decline in the number of mature individuals (b(v)). A 'location' is any geographically or ecologically distinct area where a single threatening event could swiftly impact all individuals of the taxon inhabiting it (IUCN, 2022), and in this context we consider Príncipe to be a single location. To support its conservation, we also recommend that further research is conducted on the ecology of this insular endemic species.



PLATE 1 Camera-trap photographs of the Fingu white-toothed shrew *Crocidura fingu* (a), and the co-occurring rat *Rattus* sp. (b), domestic cat *Felis catus* (c) and African civet *Civettictis civetta* (d). The top two photographs are from Pico Mesa (site 12 in Fig. 1), the bottom two from Barriga Branca (site 13 in Fig. 1).

TABLE 1 Records of the endemic Fingu white-toothed shrew *Crocidura fingu* on Príncipe Island, with date of observation, number of observations, site, altitude, habitat and source. The numbering of the records corresponds to those in Fig. 1.

No.	Date	No. of observations	Site	Altitude (m)	Habitat	Source
1	1894	1	Oquê Nazaré	311	Secondary forest	Bocage (1903)
2	26 June 1988	1	Bela Vista	111	Shade plantation	UMMZ Mammals Data Group (2022)
3	13 May 2006	2	Santa Trindade	240	Secondary forest	CAS Mammalogy (2022a,b)
4	Mar. 2013	1	Porto Real	130	Non-forested	Ceriaco et al. (2015)
	Mar. 2013	1	Porto Real	133	Non-forested	Ceriaco et al. (2015)
	Mar. 2013	1	Porto Real	135	Non-forested	Ceriaco et al. (2015)
5	Mar. 2013	1	Pincaté	193	Secondary forest	Ceriaco et al. (2015)
6	Unknown	1	Oquê Daniel	145	Shade plantation	Ceriaco et al. (2015)
7	12 Feb. 2022	1	Reta de Porto Real ¹	14	Non-forested	L. Matos (pers. comm., 2022)
	25 Sep. 2022	1	Reta de Porto Real ¹	14	Non-forested	Authors (pers. obs., 2022)
8	21 Feb. 2022	1	Santo António ¹	5	Non-forested	L. Matos (pers. comm., 2022)
9	31 July 2022	1	Gaspar ¹	162	Shade plantation	Y. Alberto (pers. comm., 2022)
10	Apr.–June 2019	23	Pico Príncipe ^{1,2}	852	Native forest	This study
11	Apr. 2019–Aug. 2022	2	Pico Príncipe Base ^{1,2}	258	Native forest	This study
12	Dec. 2019–Feb. 2020	64	Pico Mesa ^{1,2}	356	Native forest	This study
13	Oct.–Nov. 2020	7	Barriga Branca ^{1,2}	226	Native forest	This study

¹New field record.
²Camera-trap record.

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Conflicts of interest None.

Ethical standards This research abided by the *Oryx* guidelines on ethical standards. All fieldwork was conducted with the approval and support of local authorities.

Data availability Data misreported as *Crocidura thomensis* supporting this study are available from GBIF.org at doi.org/10.15468/dhbozg and at doi.org/10.15468/dx3rcj. Camera-trap data are available from the corresponding author upon request.

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