



Discovery of a New Habitat of the Endangered Golden-Rumped Elephant Shrew at Nzovuni-Palakumi Forest Patches in Kilifi County, Kenya.

Charo Kaingu Charo ^a, Grace W. Ngaruiya ^{a*} and Jacinter A. Amadi ^a

^a School of Pure and Applied Sciences, Department of Plant Sciences, Kenyatta University, P.O Box 43844-00100, Nairobi, Kenya

DOI: <https://doi.org/10.55248/gengpi.5.0224.0623>

ABSTRACT

The endemic Golden-rumped elephant shrew (GRES) (*Rhynchocyon chrysopygus*) is listed as an endangered species because of the continued forest degradation and decline in mature individuals. Hence, identification of independent GRES populations outside the protected Arabuko Sokoke Forest (ASF) becomes a conservation priority. Local GRES sightings at the Nzovuni-Palakumi forest (NPF) fragment located about 36km from ASF instigated this study. The objective was to confirm presence of mature individuals in the nine forest patches within NPF. Random forest surveys were conducted to determine presence of GRES nests and then fifteen traps were set in areas where GRES foot trails were spotted. Information on GRES knowledge, forest usage, threats and associated conservation activities was obtained from randomly administered questionnaires, expert interviews, and group discussions. Actual capture of a mature individual and sighting of 81 GRES individuals authoritatively establish GRES in the Nzovuni-Palakumi Forest area. The NPF Giriama community has extensive cultural knowledge about GRES to differentiate it from the Four-toed elephant shrews and the Rufous elephant shrews also present in the area. Forest conversion to farms, indiscriminate charcoal burning, firewood collection and cutting of trees for poles have gradually reduced the local forest cover. Unfortunately, no forest conservation measures have been implemented in the area. The next step should be a detailed GRES population and distribution study that can support establishment of a community nature reserve towards livelihood diversification and biodiversity conservation at Nzovuni-Palakumi Forest.

Keywords: Golden-rumped elephant-shrew; forest patch, endangered; deforestation, conservation priority; livelihoods; Malindi,

1. Introduction

Elephant shrews belong to the mammalian super-cohort Afrotheria, along with elephants, sea cows, hyraxes, the aardvark, golden moles, and tenrecs (Rathbun, 1979). There are five species of Giant Elephant Shrews from the genus *Rhynchocyon* that occur in Eastern and Central African forests (Carlen *et al.*, 2017). In Kenya, three giant elephant shrew species have been documented but at different locations, namely the black and rufous elephant Shrew (*Rhynchocyon petersi*) in Shimba Hills Forest; the golden-rumped elephant shrew (*Rhynchocyon chrysopygus chrysopygus*) in Arabuko Sokoke Forest (ASF) and the recently described sub-species (*Rhynchocyon chrysopygus mandelai*) at the fragmented Boni-Dodori forest (Agwanda *et al.*, 2021; FitzGibbon & Rathbun, 2015; Hoffmann *et al.*, 2016).

The golden-rumped elephant-shrew (GRES) or sengi may weigh up to 600g; body length about 28cm and a tail length range of 19 - 26.3 cm (Rathbun, 1979). All Sengi have a long flexible snout with long limb bones adapted for cursorial locomotion (Evans, 1942). They are insectivorous and use their long flexible nose to overturn leaf-litter in search of invertebrates including earthworms, millipedes, insects and spiders (FitzGibbon, 1995; Rathbun, 1979). GRES is majorly differentiated by the presence of a distinctive golden rump patch (Rathbun, 1979). Another interesting fact is that GRES continually build distinctive 'nests' on the forest floor using leaf litter (FitzGibbon & Rathbun, 1994), highlighting the relation between sengi presence and litter quality. Thus, suitable GRES habitat may be characterized by consistent supply of fresh leaves from indigenous tree species at the coastal forest.

GRES is classified as Endangered by IUCN because of its decreasing population trend and continued decline of mature individuals (FitzGibbon & Rathbun, 2015). The decline in population has been well documented by Bauer (2001), FitzGibbon (1994) and Ngaruiya (2009) attributed to the clearance of woodland and scrub and subsequent forest fragmentation. The current most stable GRES population is found in the protected Arabuko Sokoke Forest (Amin *et al.*, 2016) but adjacent forest patches may possibly host stable GRES populations. However, these smaller sengi populations may be susceptible to any minor reduction in forest area and litter quality from deforestation and uncontrolled fires (FitzGibbon & Rathbun, 2015).

Successful endemic species conservation models involve the community who sustainably use non-timber forest products such as medicinal plants, honey, and ecotourism activities from protected forests. Hence, identification of independent GRES populations outside the protected Arabuko Sokoke Forest (ASF) should be a conservation priority. As a result, this study was instigated following several sightings of the GRES at the Nzovuni-Palakumi Forest (NPF) fragment in Kilifi County. Hence, the main objective is to confirm presence of mature GRES individuals in the nine forest patches that form NPF,

analyze threats to the habitat and document the community's knowledge and attitude towards this GRES. The expected study outcome is establishment of specific community conservation area (CCA); as a great opportunity that meets the twin objectives of ecological and human security in conservation (Kothari, 2006).

2. Materials and methods

2.1 Study area

Nzovuni-Palakumi Forest (NPF) bears high similarity with Arabuko Sokoke forest (ASF) which is located about 36km away (Figure 1). The semblance is highlighted by the tree species synonymous with the lowland Coastal forests of eastern Africa that previously stretched from Somalia to Tanzania (Burgess & Clarke, 2000). Unfortunately, the extent of the coastal forest has been reduced by nearly 80% due to human activities (Habel et al., 2017) and in turn severely fragmenting the original GRES habitat (FitzGibbon & Rathbun, 2015).

The study covered nine smaller forest patches that make up NSF, namely, Tangini, Kwaova, Kwapigi, Kwafande, Kwandhale, Kwanza, Kwakaraba, Safari Haweziro and Kwamziji (Figure 2) situated about 100km north of Mombasa and about 30km from Mariakani town. It is located in Palakumi Sub-Location, Ganze Sub County in Kilifi County.

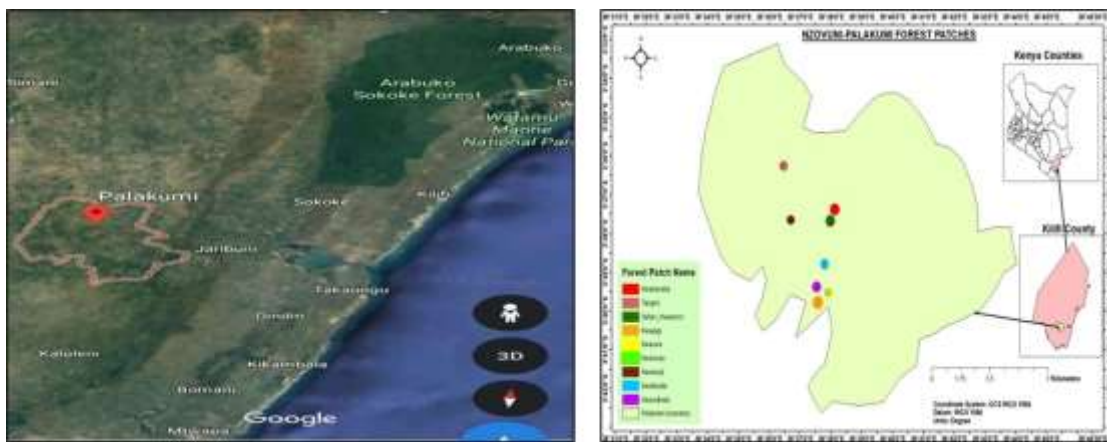


Figure 1: (a): The proximity of Palakumi area to Arabuko Sokoke Forest (Source: Google map). (b) A Map of Palakumi area showing the distribution of analysed forest patches (Source: Author)

The NSF is under the ownership of the Giriama local community found in Palakumi/Migumomiri sub-location that has a population of 6541 persons. The study based on the following villages with their respective population: Palakumi 664, Mutsangamali 1250, Baraka 700, Boyani 366 and Mwanganga 602 (Source: Palakumi/Migumomiri data from the Sub-Chief's Office, 2019).

The soil in NSF area is sandy clay loam and sandy loam with a pH range between extremely acid (4.22) to slightly alkaline (7.09) and is not suitable for typical maize growing level (KCID, 2018). Hence, the people mainly farm cashew nuts, mangoes, and coconuts. Increasing population exposes the forest patches to anthropogenic activities such as charcoal burning, crop cultivation and logging.

2.2 Study design

GRES presence

The study to establish GRES presence and the habitat status in the Palakumi area was done from December 2019 to January 2020. A field survey was done in all the forest patches where the GRES had been sighted and number of the GRES recorded in a data sheet. The survey was done using randomly placed transects in the forest patches and GPS software was used to take the coordinates of each forest patch. Arc GIS Software was used to develop a map showing the distribution of forest patches where the GRES was present. In addition, active nests were also identified during the forest surveys and used as an indicator of GRES presence. Traps were also set up in Safari Haweziro Forest patch which was stated to have higher numbers of GRES. Any captured GRES was to be photographed and then released to the wild.

Threat to the forest habitat and GRES perception by the community

Questionnaires to 27 persons identified using random sampling; seven expert interviews and three group discussions were done to identify threats to the forest habitat, any formal conservation activities and their understanding of the species. In addition, activities going on in the woodland were recorded and pictures taken for further inquiry from the community. The data was pooled, coded and entered into MS Excel for statistical analysis. Results were presented in form of bar graphs, pie charts and tables to bring a clear meaning of the collected data.

3. Results and discussion

3.1 GRES presence

The field survey confirmed that GRES was commonly found in Nzovulini-Palakumi Forest. Eighty-one individuals were sighted albeit unevenly in all nine forest patches enumerated (Table 1). Reassuringly, the four-toed sengi and rufous sengi were also encountered during the survey. Only one individual was successfully and safely trapped from the Safari Haweziro Forest patch and pictures taken to confirm existence (Figure 3).

Table 1: The GRES individuals sighted in the nine forest patches of NPF.

No.	Forest Patch	No. of Sighted GRES
1	Kwandhale	9
2	Kwafande	11
3	Kwakaraba	7
4	Kwamziji	8
5	Kwanzao	5
6	Kwaova	8
7	Kwapigi	13
8	Safari Haweziro	6
9	Tangini	14

Some forest patches such as Tangini, Kwapigi and Kwafande forest patches have more GRES individuals compared to Kwanzao and Safari Haweziro Forest patches. This variation in population is due to the size of the forest patch, the number of human activities and the magnitude of disturbances and damage to each individual forest patch. For instance, there was a small population of GRES in Kwanzao and Safari Haweziro Forest patches due to rampant charcoal burning, hunting, and trapping as well as clearance of forest cover for crop cultivation.



Figure 2: (a) The trap that was used to catch the species. (b) Picture of the golden-rumped elephant shrew at Safari Haweziro Forest patch. (c) The author holding the captured GRES indicating the mature size of the individual.

3.2 Threats to GRES habitat

The threats facing GRES habitat were recorded during the field survey in NSF as well as those provided by the local respondents on the questionnaires. All nine forest patches had evidence of various economic activities. Deforestation was done to provide land for agriculture, provide trees for charcoal burning, fuelwood, building poles and avail land for settlements. Consequently, most forest patches were highly degraded. A village elder stated that uncontrolled clearance of the trees for crop cultivation, charcoal burning and commercial firewood cutting posed a great threat to the animals that used to be common. These include GRES and other wild animals such as Dik-dik that are trapped for subsistence consumption. Kwapigi forest patch was least

degraded and the explanation given was that the inhabitants migrated about thirty years ago but are visited to monitor periodically. This scenario confirms the strength of traditional land tenure regulations conferred to a specific clan in a community that are obeyed by everyone.

Unfortunately, there was no knowledge about the endemic aspect of GRES in the community and subsequently no formal conservation measures employed to protect the GRES or its habitat.

3.3 Community perception and knowledge towards GRES

About 97% respondents confirmed that they had encountered GRES during their activities or walks in the forest and were familiar with GRES nests on the forest floor. Interestingly, only 19% had ever spotted a dead GRES or it remains in the forest. Mr. Mwanganga (village elder) stated that GRES was very common during their young age when the forest was still intact and thick but currently the GRES is now rare. Similar statements were made by a hunter and a resident in Mutsangamali village near Kwamziji forest patch.

Culturally, GRES was referred to by using two descriptive names: namely Fugu (Giriama) from its forgetful behavior or Jombwe (Giriama) from its long hind legs. Though mainly used as a food item. Tradition forbade pregnant women and young children from eating Fugu because it was thought they would become very forgetful. Similar case was cited by Ngaruiya (2009) in ASF as the main factor decreasing appeal of GRES to hunters. Other people said they do not eat GRES because it undergoes menstruation. There were some respondents who stated that GRES enabled one to be free from demons' possession.

4. Conclusion

The study has confirmed physical existence of GRES and GRES nests in Nzovuni-Palakumi Forest adding to the already established protected GRES areas of Arabuko Sokoke Forest, Gedi ruins forest and the various Mijikenda Kaya forests. The number of GRES sighted was 81 individuals from the nine forest patches. The highest documented GRES numbers were in Tangini and Kwapigi while the least in Kwanzao and Safiri Hawaziro forest patches. Deforestation was done to expand farms, provide trees for charcoal burning and firewood for commercial use. Unfortunately, there are no conservation measures that have been employed to protect the GRES or their forest habitat. If these activities continue without regulation, the remaining forest patches as vital GRES habitats are at high risk of gradually being degraded and consequently drive GRES to extinction outside protected forests. Therefore, implementation of a sustainable management strategy for the forest patches providing habitat to the GRES is a crucial factor to be considered.

Further comprehensive examination of the GRES population and distribution in Nzovuni-Palakumi forest should be a conservation priority. This initiative can be used to create awareness on the endemic value of GRES and its potentiality to facilitate ecotourism that can generate revenue for the community. Future comprehensive biodiversity surveys in the NPF should also be planned to establish a baseline database for future assessments.

Acknowledgements

The study appreciates Mr. Charles Safari and Kitsao Kazungu for their support in the field surveys, Mr. Julius Kitsao Kadavu and Mrs. Bahat Njoli for their good hospitality and Diana Bochere Mokaya for her financial support.

References

- Agwanda, B. R., Rovero, F., Lawson, L. P., Vernesi, Cristiano & Amin, R. (2021). A new subspecies of giant sengi (Macroscelidea: Rhynchocyon) from coastal Kenya. *Zootaxa*, 4948(2).
- Amin, R., Agwanda, B.R., Ogwoka, B., &Wacher, T. (2016). Status and behavioural ecology of sengis in the BoniDodori and Arabuko Sokoke forests, Kenya, determined by camera traps. *Journal East African Natural History*, 105, 223–235.
- Bauer, C.R. (1996). Impact of commercial and subsistence practices on the Arabuko-Sokoke Forest in coastal Kenya, using an endemic mammal as an indicator species. Eastern Kentucky University, Unpublished MA Thesis.
- Burgess, N. D., & Clarke, G. P. (2000). Coastal forests of eastern Africa. IUCN-The World Conservation Union, Publications Services Unit.
- Carlen, E.J., Rathbun, G.B., Olson, L.E., Sabuni, C.A., Stanley, W.T., &Dumbacher, J.P. (2017). Reconstructing the molecular phylogeny of giant sengis (Macroscelidea; Macroscelididae; Rhynchocyon). *Molecular Phylogenetics and Evolution*, 113, 150–160.
- Evans, F.G. 1942. The osteology and relationships of the elephant-shrews (Macroscelididae). *A Bulletin of the American Museum of Natural History* 80:85-125.
- FitzGibbon & Rathbun, (1994). Surveying Rhynchocyon elephant-shrews in tropical forest. *African Journal of Ecology*, 32(1), 50-57.
- FitzGibbon (1994). The distribution and abundance of the golden-rumped elephant shrew Rhynchocyon chrysopygus in Kenyan coastal forests. *Biological Conservation*, 67, 153–160.
- FitzGibbon, C. & Rathbun, G.B. 2015. Rhynchocyon chrysopygus. The IUCN Red List of Threatened Species 2015.
- FitzGibbon, C. D. (1995). Comparative ecology of two elephant-shrew species in a Kenyan coastal forest. *Mammal Review*, 25(1-2), 19-30.

- Habel, J.C., Casanova, I.C.C., Zamora, C., Teucher, M., Hornetz, B., Shauri, H., Mulwa, R.K., & Lens, L. (2017). East African coastal forest under pressure. *Biodiversity and Conservation*,
- Hoffmann, M., Rathbun, G. B., Rovero, F., Perkin, A., Owen, N., & Burgess, N. (2016). The distribution of the genus *Rhynchocyon* in the Eastern Arc Mountains, with an emphasis on the Black-and-rufous Sengi, *Rhynchocyon petersi*. *Afrotherian Conservation-Newsletter of the IUCN-SCC Afrotheria Specialist Group*, 12, 3-8.
- KCID (2018). Kilifi County Integrated Development Plan: Towards realizing people- focused transformation for wealth creation 2018-2022. County Government of Kilifi. Kenya.
- Kothari, A. (2006). Community conserved areas: towards ecological and livelihood security. *Parks*, 16(1), 3-13.
- Ngaruiya, G.W. (2009). Assessment of the Range and Population of Golden-rumped Elephant-shrew (*Rhynchocyon chrysopygus*) in North Coastal Forests of Kenya. M.Sc. Thesis, School of Biological Sciences, University of Nairobi, Kenya.
- Rathbun, G. B. (1979). *Rhynchocyon chrysopygus*. *Mammalian species*, (117), 1-4.
- Rathbun, G.B. (2015). The Amazing Afrotheria. In N. Scharff, F. Rovero, F.P. Jensen, & S. Brøgger-Jensen (Eds.), *Udzungwa: Tales of Discovery in an East African Rainforest* (pp. 16 - 17).