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FIRST VIDEOS OF ENDEMIC ZANZIBAR SERVALINE GENET *GENETTA SERVALINA* ARCHERI, AFRICAN PALM CIVET *NANDINIA BINOTATA* (MAMMALIA: CARNIVORA: VIVERRIDAE) AND OTHER SMALL CARNIVORES ON UNGUJA ISLAND, TANZANIA

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FIRST VIDEOS OF ENDEMIC ZANZIBAR SERVALINE GENET *GENETTA SERVALINA ARCHERI*, AFRICAN PALM CIVET *NANDINIA BINOTATA* (MAMMALIA: CARNIVORA: VIVERRIDAE) AND OTHER SMALL CARNIVORES ON UNGUJA ISLAND, TANZANIA

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Abstract: The faunal diversity of the densely populated island of Unguja, Zanzibar archipelago, Tanzania, includes several endemic mammals. Camera-trapping in Jozani-Chwaka Bay National Park and Kiwengwa–Pongwe Forest Reserve in September 2017 captured the first video footage of the Zanzibar Servaline Genet *Genetta servalina archeri*, an endemic subspecies first formally described in 1998. Other native small carnivores were also recorded on video for the first time during this survey, including the African Palm Civet *Nandinia binotata*, which was first documented in print as present in Unguja in 2004. Also camera-trapped in 2017 were the Zanzibar Slender Mongoose *Herpestes sanguineus rufescens* and the Zanzibar Bushy-tailed Mongoose *Bdeogale crassicauda tenuis*. Follow-up camera-trapping in Jozani-Chwaka Bay National Park in August 2018 captured additional video of the Zanzibar Servaline Genet and the African Palm Civet. No images were obtained of the African Civet *Civettictis civetta*, or of the two introduced species—the Banded Mongoose *Mungos mungo* and the Small Indian Civet *Viverricula indica*—in either year. As the remaining natural habitat in Zanzibar shrinks in size and becomes fragmented, it is increasingly urgent to document the archipelago's carnivores and other fauna, so that sound conservation measures can be implemented.

Keywords: *Bdeogale crassicauda*, Bushy-tailed Mongoose, *Herpestes sanguineus*, Slender Mongoose, Tanzania, Zanzibar.

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Author contribution: Both authors took part in the fieldwork in 2017. HVG carried out the fieldwork in 2018. Both authors analyzed the data and interpreted the results. MTW conceived the idea for the paper, HVG wrote the initial draft, MTW gave critical input, and the authors revised it together prior to submission and also following its review. Both HVG and MTW approve the published version of the article.

For **Swahili abstract** see end of this article.

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INTRODUCTION

The island of Unguja, in the Zanzibar archipelago, hosts several native carnivore species (Kingdon 1977; Pakenham 1984; Kingdon & Howell 1993; Van Rompaey & Colyn 1998; Perkin 2004). Three of these are considered endemic subspecies, namely, the Zanzibar Slender Mongoose *Herpestes sanguineus rufescens*, the Zanzibar Bushy-tailed Mongoose *Bdeogale crassicauda tenuis*, and the Zanzibar Servaline Genet *Genetta servalina archeri*, which was first formally described in 1998 (Van Rompaey & Colyn 1998). The remaining two native carnivores on Unguja are the African Civet *Civettictis civetta*, which is the island's largest extant wild carnivore, and the African Palm Civet *Nandinia binotata*. The latter was first observed by a biologist during a survey in 1998–99 and noted as a possible endemic subspecies (Perkin 2004).

The density of the human population of Zanzibar is about 400 per km² and as the number of people expands by about 3% per year, 1.2% of the archipelago's forests is lost annually to cultivation and wood extraction for firewood, charcoal production, and building materials (Siex 2011). This lends urgency to investigating the islands' fauna, particularly species at higher trophic levels. Mammalian carnivores, including small-bodied carnivores, may be particularly vulnerable to habitat fragmentation and loss (Di Minin et al. 2016). Though Unguja's natural habitat is diminishing, two elusive species previously not documented on the island were found there in the fairly recent past, as noted above.

The camera-trapping work reported here was undertaken opportunistically, alongside other research and with limited time and equipment, with the objective of obtaining further photographic documentation of Unguja's carnivores 14 years after camera-trapping in some of the same areas by one of the authors (Goldman & Winther-Hansen 2003a, b) and six years after a much larger scale camera-trapping survey carried out by other researchers (Siex 2011).

STUDY AREAS

Zanzibar forms part of Conservation International's Coastal Forests of Eastern Africa Hotspot (Critical Ecosystem Partnership Fund 2016). We set camera-traps in two of Unguja's protected areas: Jozani-Chwaka Bay National Park (JCBNP) and Kiwengwa–Pongwe Forest Reserve (KPFR) (Fig. 1).

JCBNP (ca. 6.183–6.291 °S, 39.375–39.443 °E)

encompasses the island's only remaining natural, old-growth forest (Robins 1976; Williams et al. 1998; Box 5.5.4 in Rodgers & Burgess 2000) as well as a mosaic of other habitats, including scrub forest, bracken fields, saltmarsh grassland, and mangrove forests. Most of the park's 50km² is covered by high and low scrub forest (also known as coral rag forest (Siex 2011)) on ground characterized by numerous outcroppings of fossilized coral (Image 1a). The scrub forest comprises such species as *Euclea racemosa*, *Polysphaeria parvifolia*, *Pachystela brevipes*, *Maytenus mossambicensis*, *Searsia natalensis*, *Macphersonia gracilis*, *Annona senegalensis*, and *Flueggea virosa* (Leskinen et al. 1997). This vegetation cover is classified as Eastern African Coastal Scrub Forest, in Clarke's scheme (Clarke 2000). Some 4km² of the park is groundwater forest that floods during the annual heavy rains and is dominated by *Eugenia* sp. and *Calophyllum inophyllum*, with *Pandanus rabaiensis*, *Vitex doniana*, and *Elaeis guineensis* as subdominants (Robins 1976; Beentje 1990; Burgess et al. 1992; Nahonyo et al. 2002). This part of the park can be classed as coastal riverine/swamp/groundwater forest in Clarke's classification scheme (Clarke 2000). Contiguous with the natural old-growth forest is a former *Calophyllum inophyllum* plantation (Image 1b).

KPFR (ca. 5.924–6.041 °S, 39.33–39.403 °E) is about 31km² in size and is covered by high and low scrub forest, as described above. Camera-traps were placed in the low scrub forest near the Mchekeni caves.

In September 2017, temperatures on Unguja were between 20°C and 32°C. In August 2018, temperatures ranged from 21°C to 30°C. Humidity varies between 75% and 83%. The island receives about 1,575mm of rain annually. Most precipitation falls during rainy seasons in November–December and March–May. During our survey, there were occasional showers. In August, the sun rises at about 06.30h and sets at about 18.24h EAT. In September, the sun rises at about 06.16h and sets at about 18.20h EAT.

METHODS

Between 3 and 15 September 2017, 10 Bushnell Trophy Cam camera-traps were set in JCBNP and KPFR together with bait to attract the island's native carnivore species: the Zanzibar Servaline Genet, the African Palm Civet, the African Civet, the Slender Mongoose, and the Bushy-tailed Mongoose. Most of these species had previously been camera-trapped near JCBNP forestry headquarters and in the scrub forest several kilometres

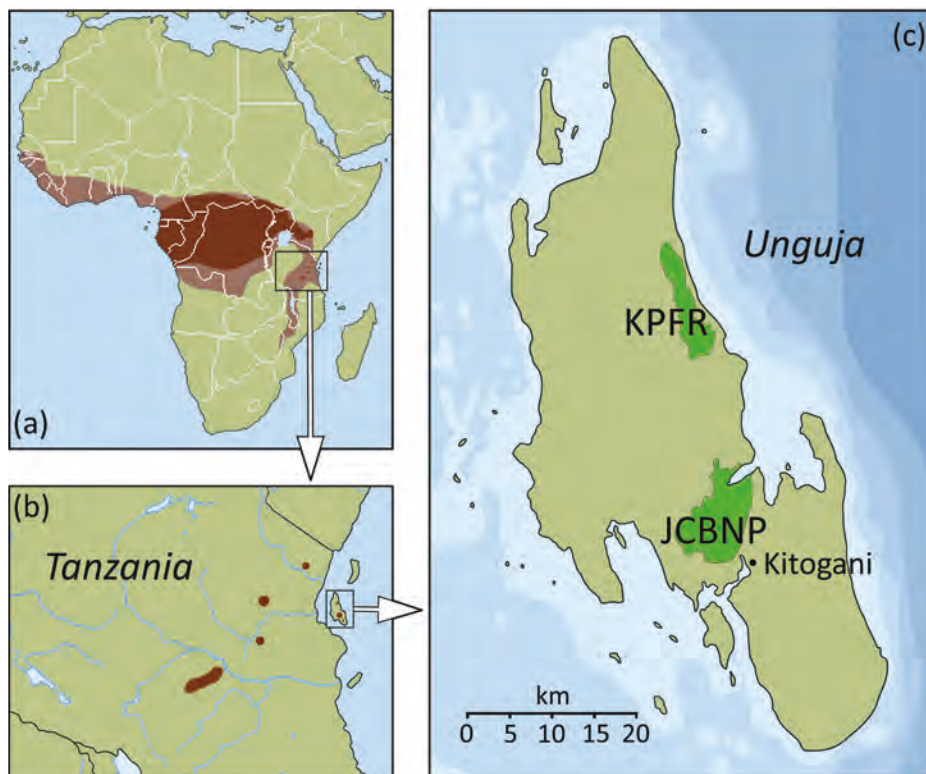


Figure 1. Jozani-Chwaka Bay National Park (JCBNP) and Kiwengwa–Pongwe Forest Reserve (KPFR) on the island of Unguja, in the archipelago of Zanzibar, Tanzania: (a)—The distribution of the Servaline Genet (*Genetta servalina*; dark brown) and, overlapping it, that of the African Palm Civet (*Nandinia binotata*; light brown) | (b)—The distribution of the Servaline Genet in Tanzania (dark brown); African Palm Civet distribution not shown. Maps modified from IUCN Red List of Threatened Species (species assessors and the authors of the spatial data, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=12252776> and <https://commons.wikimedia.org/w/index.php?curid=12252756>).

to the north, so we set up the traps in those areas. We did not set the traps at pre-set points on a grid or along transects because we were not attempting to estimate population density and did not have the time and resources to do so.

Not all cameras were active for the entire survey period in 2017. Multiple traps were set up at most stations. Counting multiple traps at a single station as a single trap, the number of trap nights in 2017 at JCBNP was 30 and at KPFR nine.

Between 04 and 12 August 2018, a single Bushnell Trophy Cam camera-trap was set in JCBNP (at different locations) for seven trap nights.

RESULTS

In 2017, the Zanzibar Servaline Genet was camera-trapped at four plantation forest stations and three scrub forest stations in JCBNP and at one scrub forest station in KPFR (Image 2; Video 1). The proximity of the plantation forest stations makes it possible for the same individual

Servaline Genet to be camera-trapped at several of these stations. It is likely that the patterns of dark markings on the pelage of Servaline Genets permit individual identification, as has been done in capture–recapture studies of such species as Tiger (*Panthera tigris*; e.g., Karanth 1995) and Jaguar (*Panthera onca*; e.g., Silver et al. 2004). Although this would have allowed us to determine how many individual Servaline Genets visited the plantation forest trap stations, it proved difficult to reliably compare images of pelage patterns on account of the different body positions of the animals vis-à-vis the cameras.

Servaline Genets were mostly camera-trapped during the dark hours of the night in 2017, although one individual was camera-trapped in scrub forest habitat in JCBNP in daylight at 08.45h and at 17.48h.

Camera-trap videos of Servaline Genets in 2017 show individuals engaged in behaviours such as ascending and descending a tree, auto-grooming, and rolling on the ground. In one video, a Servaline Genet is chased by a Northern Giant Pouched Rat *Cricetomys gambianus cosensi* (Image 3). The alarm calls of Zanzibar Sykes's



Image 1. a—groundwater forest | b—plantation forest | c—scrub forest, JCBNP.

Monkey *Cercopithecus mitis albogularis* and Red Bush Squirrel *Paraxerus palliatus frerei* were also captured on video in connection with the presence of a male Servaline Genet at one scrub forest station in JCBNP.

In 2017, the African Palm Civet was camera-trapped in the JCBNP at two scrub forest stations. Palm Civets were camera-trapped exclusively at night, in trees and on the ground. In 2018, the Zanzibar Servaline Genet was camera-trapped at one scrub forest station and one

plantation forest station and the Palm Civet was camera-trapped at one plantation forest station (Image 4).

Camera-trapping revealed as many as three species of carnivores—Servaline Genet, Palm Civet, and Bushy-tailed Mongoose—visiting a single scrub forest or plantation forest station during the course of a night. They did not overlap on film, suggesting that they avoid one another. The only exception was when a Bushy-tailed Mongoose *Bdeogale crassicauda tenuis* and a Palm Civet visited a station at the same time (Image 5). At two sites, adult Bushy-tailed Mongooses were camera-trapped in pairs.

The Zanzibar Slender Mongoose (*Herpestes sanguineus rufescens*) was camera-trapped—on both the ground and a tree branch, exclusively during daylight—in 2018 but was not camera-trapped in 2017. A Slender Mongoose was observed (by MTW) crossing a dirt road in a cultivated area on the western periphery of Zanzibar Town during the survey in 2017.

The African Civet was the only native species of extant carnivore that was not camera-trapped during either of the surveys. It is the largest of the island's surviving wild carnivores.

In addition to the carnivores that were camera-trapped, the following mammals appeared in the images: Zanzibar Sykes's Monkey *Cercopithecus mitis albogularis*, Zanzibar Four-toed Sengi *Petrodromus tetradactylus zanzibaricus*, Black and Rufous Sengi *Rhynchocyon petersi*, Red Bush Squirrel *Paraxerus palliatus frerei* and, as already mentioned, Northern Giant Pouched Rat *Cricetomys gambianus cosensi*. Unidentified bats and a pair of unidentified small arboreal rodents also made appearances. Outside of the protected areas, near the settlement of Kitogani, Greater Galago *Otolemur garnettii garnettii* and the Zanzibar subspecies of the Tanzania Dwarf Coast Galago *Galagoides zanzibaricus zanzibaricus* were camera-trapped in the same tree at different times.

DISCUSSION

The Zanzibar Servaline Genet was first described in a 1998 publication on the basis of a single skull and damaged skin that came to the attention of a naturalist in 1995 (Van Rompaey & Colyn 1998). No documented scientific observations of the Servaline Genet were made until the animal was camera-trapped in 2003 (Goldman & Winther-Hansen 2003a,b, 2007; Goldman et al. 2004). Servaline Genets were also camera-trapped on Unguja during a survey that lasted from 2008 to

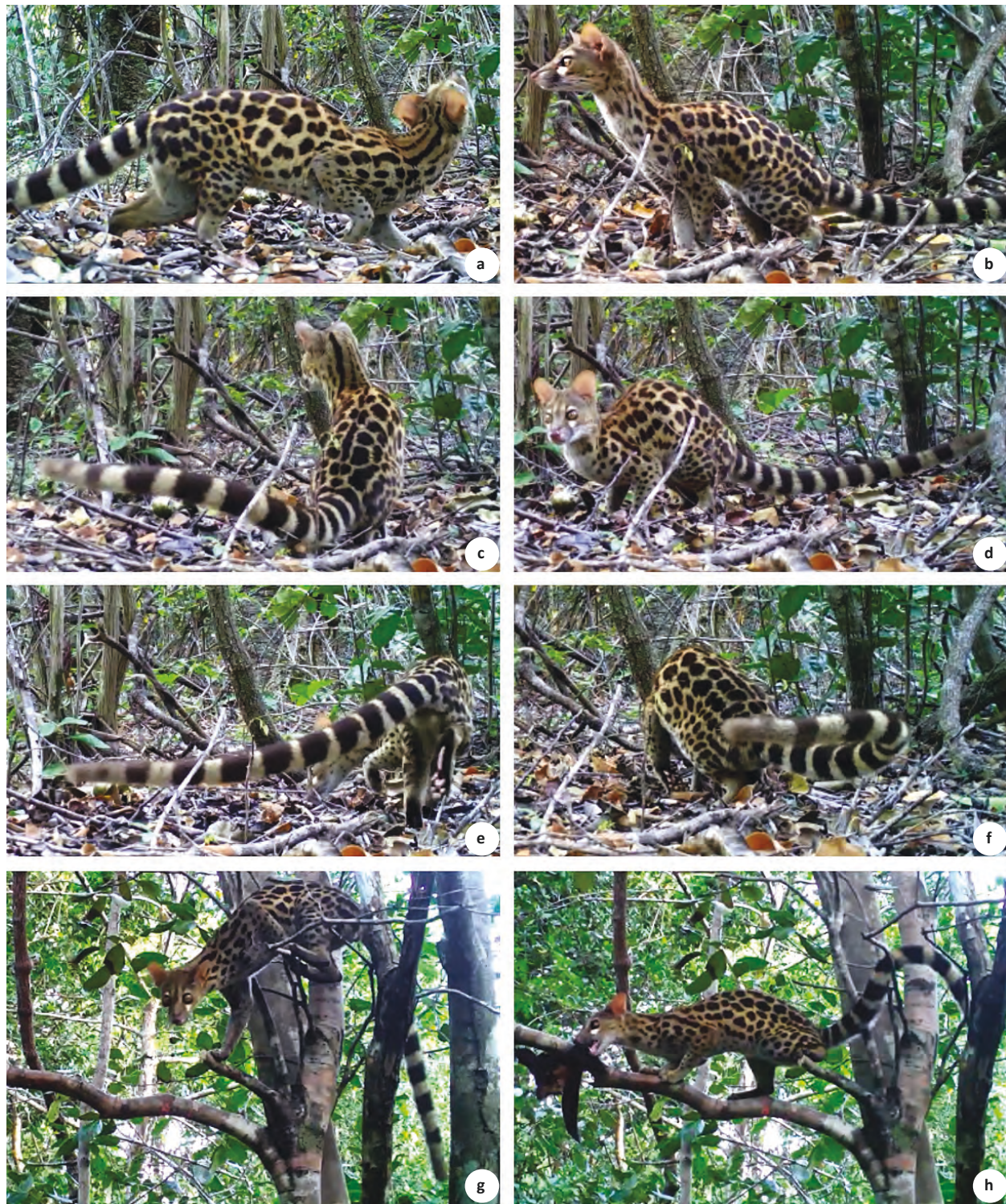


Image 2. Camera-trap video stills of a male Zanzibar Servaline Genet *Genetta servalina archeri* in the scrub forest, JCBNP: a–f - 07.11–08.40 h EAT, 06 September 2017 | g - 17.48h EAT, 08 September 2017 | h - 18.04h EAT, 08 September 2017. The markings on the pelage of the Zanzibar Servaline Genet is described thus: “Nuchal line poorly developed. Spots may tend to fuse near the spine, suggesting a dark mid-dorsal line. Numerous closely groups brownish-black spots on the back and flanks, rarely forming longitudinal lines, weaker and more scattered on the ventral side ... Forelegs may have small spots down to the feet; hindlegs down to the ankle ... [Tail] with 9 – 12 dark rings” (Van Rompaey & Colyn 2013, p. 243). Note the rosette configuration of spots on the dorsal pelage, most clearly seen in (a) and (b). Note also the very long tail (with 12 rings), which is characteristic of the arboreal and semi-arboreal viverrids; in a study comparing nine genet species, Servaline Genets had the longest tails relative to body length (Veron 1999). The long metatarsal pad typical of the arboreal and semi-arboreal species of viverrids (Veron 1999) can be seen on the right hindfoot in (e). The palmar surface of the left forefoot can be seen in (f). In Servaline Genets, “[m]etatarsal and metacarpal pads [are] not connected to interdigital pads” (Van Rompaey & Colyn 2013: 243).



Image 3. Camera-trap video stills showing a Zanzibar Servaline Genet *Genetta servalina archeri* being chased by a Northern Giant Pouched Rat *Cricetomys gambianus cosensi*, scrub forest, JCBNP, 21.09h EAT, 13 September 2017.



Image 4. Camera-trap video stills of the African Palm Civet *Nandinia binotata* in the plantation forest (top photos, both at 20.41h EAT, 10 August 2018) and the scrub forest (bottom left at 22.39h EAT; bottom right at 21.46h EAT, both on 15 September 2017), JCBNP.



Image 5. Camera-trap video still of a Zanzibar Bushy-tailed Mongoose *Bdeogale crassicauda tenuis*, lower left, and an African Palm Civet *Nandinia binotata*, centre, approaching the bait in the plantation forest, JCBNP, 19.47h EAT, 10 August 2018. The mongoose left the scene a moment after this image was captured.

2011 and comprised 316 trap stations and 4,335 trap days (Siex 2011). That study extended the documented range of this species—described as “geographically isolated in Jozani forest” (Van Rompaey & Colyn 2013)—to the corridor between KPFR and JCBNP in the north and, in the south, to the southernmost part of Unguja (Siex 2011). Our own camera-trapping has pushed the Zanzibar Servaline Genet’s known range further north, into KPFR.

Servaline Genets are widely distributed in central Africa, from the coasts of Cameroon, Equatorial Guinea, Gabon, and Congo, eastward through Uganda, Rwanda, and Burundi and the wet forests of western Kenya (Van Rompaey & Colyn 2013) (Image 1a). East of this they are confined to small areas of forest in Tanzania’s Eastern Arc Mountains and the forests of Unguja (Cordeiro & Seltzer 2012; Van Rompaey & Colyn 2013 and references therein) (Image 1b). The isolation of these pockets hints that the former range of the Servaline Genet in the easternmost part of the continent has undergone severe constriction with climatic and vegetation changes. The extent to which the Zanzibar Servaline Genet may be specially adapted to drier coastal forest is yet to be investigated.

The presence of the African Palm Civet on Unguja first came to light when the species was observed, and subsequently live-trapped, during a survey of nocturnal mammals (primarily galagos) in 1998–99 (Perkin 2004). It was not camera-trapped during the large-scale survey of 2008–2011 (Siex 2011).

In mainland Africa, the distribution of the African Palm Civet largely overlaps that of the Servaline Genet, extending from the Senegambian coast in the west to the coast of Tanzania in the east (Gaubert et al. 2015) (Image 1a). Regarding the African Palm Civet on Unguja, Perkin

observed that “more research may show this population of *N. binotata* to be a distinct subspecies because of the effects of isolation of Unguja Island from the mainland” (Perkin 2004). The separation occurred some eight or nine thousand years ago (Prendergast et al. 2016).

The recent scientific discovery of the Servaline Genet and the African Palm Civet in Unguja is notable given the high density of the human population (400 individuals/km²) and the small size of the island (1,650km²). When the camera-trapped images of the Servaline Genet and the Palm Civet were shown to Zanzibaris in and around JCBNP, they were familiar with the former, a nocturnal predator with a reputation for killing large numbers of chickens in henhouses and leaving the majority of them unconsumed. In contrast, almost all Zanzibaris who examined our African Palm Civet images professed never to have seen it before, in life or in photographs. This attests to the elusiveness of this species on Unguja.

Pairs of apparently full-grown Bushy-tailed Mongooses were camera-trapped at two locations. According to Taylor (2013), this mongoose is “primarily solitary”, although females accompanied by young may be expected. On Unguja, Bushy-Tailed Mongooses are known for carrying Giant African Land Snails *Achatina* spp. to rocks against which the shells are cracked. Broken snail shells accumulate around favoured rocks.

It is noteworthy that images of the African Civet, the island’s largest extant carnivore, were obtained during camera-trapping in 2003 (Goldman & Winther-Hansen 2003a,b, 2007) and in 2008–2011 (Siex 2011) but not in 2017 or 2018. Zanzibaris residing in the vicinity of JCBNP believe that the African Civet population has been much reduced in recent years. Hunting for sport and, in some cases, human consumption is said to be the cause. According to local informants, this is a new phenomenon on the island as African Civets are not part of the traditional diet.

Our camera-trapping produced no evidence of the two introduced species of small carnivore included by Pakenham (1984) in his work based primarily on his own observations in Zanzibar in the 1930s and ‘40s. These species were the Banded Mongoose *Mungos mungo*, which Pakenham noted was “seldom seen now”, and the Small Indian Civet *Viverricula indica*, which was “common” and “frequently observed in early morning or late evening in semi-open grassy areas or woodland” (Pakenham 1984). Neither of these species was camera-trapped in 2003 (Goldman & Winther-Hansen 2003a) nor in 2008–2011 (Siex 2011). We were told that both are still present in cultivated areas on the western side of the island, but not in Jozani or on the east coast.

CONCLUSION

Although very little is known about the distribution and population status of Zanzibar's carnivores and other mammal species across the islands of Unguja and Pemba, deforestation can be considered a major threat to the wildlife of the archipelago. Within JCBNP, we saw ample evidence of wood-cutting, poaching, and cattle-grazing in spite of the dedicated efforts of the forestry staff, who work with very limited resources. We have donated camera-trapping equipment to the Department of Forestry and Non-renewable Natural Resources and have trained staff in its use. We have also facilitated the department's procurement of two unmanned aerial vehicles for the purposes of forest monitoring. Government resources should be allocated to support the vigorous protection of Zanzibar's forest reserves and singular national park, and patches of community forest should be carefully managed to preserve habitat for wildlife and to keep hunting to sustainable levels.

The mammalian fauna of Unguja includes endemic taxa that may have been shaped by the founder effect, genetic drift, and adaptation to the local environment as a result of climatic change and isolation from the mainland following the end of the last ice age.

Palaeozoological research has demonstrated the extinction of several species of mammals on the island (Prendergast et al. 2016). Though many Zanzibaris believe that the island's former apex predator, the Zanzibar Leopard *Panthera pardus adersi*, may still be present (Goldman & Walsh 2002; Walsh & Goldman 2012, 2017), there is no recent physical evidence for its persistence. To our knowledge there are no verified still or moving images of the Zanzibar Leopard in the wild, and we concur with the international authorities (e.g., Hunter et al. 2013) who consider it to have been extirpated. Unique island animals are particularly vulnerable to extinction and every effort should be made to ensure the survival in the wild of mammal populations in Zanzibar.

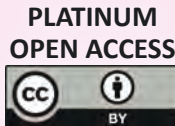
REFERENCES

- Beentje, H.J. (1990). *A Reconnaissance Survey of Zanzibar Forests and Coastal Thicket*. FINNIDA, Dept. of Environment, Commission of Lands and Environment, Zanzibar, 34pp.
- Burgess, N.D., L.B. Mwasumbi, W.J. Hawthorne, A. Dickinson & R.A. Doggett (1992). Preliminary assessment of the distribution, status and biological importance of coastal forests in Tanzania. *Biological Conservation* 62: 205–218. [https://doi.org/10.1016/0006-3207\(92\)91048-W](https://doi.org/10.1016/0006-3207(92)91048-W)
- Clarke, G.P. (2000). Defining the eastern African coastal forests, pp9–26. In: Burgess, N.D. & G.P. Clarke (eds.). *Coastal Forests of Eastern Africa*. IUCN, Cambridge, 42pp.
- Cordeiro, N.J. & C.E. Seltzer (2012). First record of the Servaline Genet (*Genetta servalina*) in the East Usambara Mountains, Tanzania. *Journal of East African Natural History* 101(1): 17–27. <https://doi.org/10.2982/028.101.0101>
- Critical Ecosystem Partnership Fund (2016). Coastal forests of Eastern Africa. <http://www.cepf.net/resources/hotspots/africa/Pages/Coastal-Forests-of-Eastern-Africa.aspx>. Electronic version accessed on 09 November 2017.
- Di Minin, E., R. Slotow, L.T.B. Hunter, F.M. Pouzels, T. Toivonen, P.H. Verburg, N. Leader-Williams, L. Petracca & A. Moilanen (2016). Global priorities for national carnivore conservation under land use change. *Scientific Reports* 6: article no. 23814. <https://doi.org/10.1038/srep23814>
- Gaubert, P., L. Bahaa-el-din, J. Ray & E. Do Linh San (2015). *Nandinia binotata*. The IUCN Red List of Threatened Species 2015: e.T41589A45204645. Electronic version accessed on 09 November 2017. <https://doi.org/10.2305/IUCN.UK.2015-4.RLTS.T41589A45204645.en>
- Goldman, H.V. & M.T. Walsh (2002). Is the Zanzibar Leopard (*Panthera pardus adersi*) extinct? *Journal of East African Natural History* 91(1/2): 15–25. [https://doi.org/10.2982/0012-8317\(2002\)91\[15:ITZLPP\]2.0.CO;2](https://doi.org/10.2982/0012-8317(2002)91[15:ITZLPP]2.0.CO;2)
- Goldman, H.V. & J. Winther-Hansen (2003a). *The Small Carnivores of Unguja: Results of a Photo-trapping Survey in Jozani Forest Reserve, Zanzibar, Tanzania*. Report printed privately, Tromsø, Norway, 32pp.
- Goldman, H.V. & J. Winther-Hansen (2003b). First photographs of the Zanzibar Servaline Genet *Genetta servalina archeri* and other endemic subspecies on the island of Unguja, Tanzania. *Small Carnivore Conservation* 29: 1–4.
- Goldman, H.V. & J. Winther-Hansen (2007). Lights, camera, action. *Africa Geographic* 15: 24–25.
- Goldman, H.V., J. Winther-Hansen & M.T. Walsh (2004). Zanzibar's recently discovered Servaline Genet. *Nature East Africa* 34: 5–7.
- Hunter, L., P. Henschel & J.C. Ray (2013). *Panthera pardus* Leopard, pp. 159–168. In: Kingdon, J. & M. Hoffmann (eds.). *The Mammals of Africa. Vol. V. Carnivores, Pangolins, Equids and Rhinoceroses*. Bloomsbury, London, 560pp.
- Karanth, K.U. (1995). Estimating Tiger *Panthera tigris* populations from camera-trap data using capture-recapture models. *Biological Conservation* 71(3): 333–338.
- Kingdon, J. (1977). *East African Mammals: An Atlas of Evolution in Africa. Vol. III. Part A (Carnivores)*. University of Chicago Press, Chicago, 491pp.
- Kingdon, J. & K.M. Howell 1993. Mammals in the forest of eastern Africa, pp. 229–241. In: Lovett, J.C. & S.K. Wasser (eds.). *Biogeography and Ecology of the Rain Forests of Eastern Africa*. Cambridge University Press, Cambridge, 341pp.
- Leskinen, J., V.M. Pohjonen & M.S. Ali (1997). *Woody Biomass Inventory of Zanzibar Islands*. Zanzibar Forestry Technical Paper Series 40. Dept. of Commercial Crops, Fruits and Forestry, Zanzibar, 103pp.
- Nahonyo, C.L., L.B. Mwasumbi, S. Eliapenda, C. Msuya, C. Mwansasu, T.M. Suya, B.O. Mponda & P. Kihaule (2002). *Jozani–Chwaka Bay Proposed National Park Biodiversity Inventory Report*. Department of Commercial Crops, Fruits and Forestry, CARE-Tanzania, Zanzibar, 200pp.
- Pakenham, R.H.W. (1984). *The Mammals of Zanzibar and Pemba Islands*. Printed privately, Harpenden, UK, 81pp.
- Perkin, A. (2004). A new range record for the African Palm Civet *Nandinia binotata* (Carnivora, Viverridae) from Unguja Island, Zanzibar. *African Journal of Ecology* 42: 232–234. <https://doi.org/10.1111/j.1365-2028.2004.00499.x>
- Prendergast, M.E., H. Rouby, P. Punnwong, R. Marchant, A. Crowther, N. Kourampas, C. Shipton, M. Walsh, K. Lambeck & N.L. Boivin (2016). Continental island formation and the archaeology of defaunation on Zanzibar, eastern Africa. *PLoS One* 11(2): e0149565. <https://doi.org/10.1371/journal.pone.0149565>
- Robins, R.J. (1976). The composition of the Josani Forest, Zanzibar.

- Botanical Journal of the Linnean Society* 72: 233–234. <https://doi.org/10.1111/j.1095-8339.1976.tb01362.x>
- Rodgers, W.A. & N.D. Burgess (2000).** Taking conservation action, pp. 317–334. In: Burgess, N.D. & G.P. Clarke (eds.). *Coastal Forests of Eastern Africa*. IUCN, Cambridge, 456pp.
- Siex, K.S. (2011).** *Protected Area Spatial Planning for Unguja and Pemba Islands, Zanzibar. Final Consultancy Report*. Wildlife Conservation Society, New York, 42pp.
- Silver, S.C., L.E.T. Ostro, L.K. Marsh, L. Maffei, A.J. Noss, M.J. Kelly, R.B. Wallace, H. Gomez & G. Ayala (2004).** The use of camera traps for estimating Jaguar *Panthera onca* abundance and density using capture/recapture analysis. *Oryx* 38(2): 148–154. <https://doi.org/10.1017/S0030605304000286>
- Taylor, M.E. (2013).** *Bdeogale crassicauda* Bushy-tailed Mongoose, pp. 320–323. In: Kingdon, J. & M. Hoffmann (eds.). *The Mammals of Africa. Vol. V. Carnivores, Pangolins, Equids and Rhinoceroses*. Bloomsbury, London, 560pp.
- van Rompaey, H. & M. Colyn (1998).** A new Servaline Genet (Carnivora, Viverridae) from Zanzibar Island. *South African Journal of Zoology* 33: 42–46. <https://doi.org/10.1080/02541858.1998.11448452>
- van Rompaey, H. & M. Colyn (2013).** *Genetta servalina* Servaline Genet, pp. 242–245. In: Kingdon, J. & M. Hoffmann (eds.). *The Mammals of Africa. Vol. V. Carnivores, Pangolins, Equids and Rhinoceroses*. Bloomsbury, London, 560pp.
- Veron, G. (1999).** Pads morphology in the Viverridae (Carnivora). *Acta Theriologica* 44: 363–376. <https://doi.org/10.4098/AT.arch.99-36>
- Walsh, M.T. & H.V. Goldman (2012).** Chasing imaginary leopards: science, witchcraft and the politics of conservation in Zanzibar. *Journal of Eastern African Studies* 6(4): 727–746. <https://doi.org/10.1080/17531055.2012.729778>
- Walsh, M.T. & H.V. Goldman (2017).** Cryptids and credulity: the Zanzibar Leopard and other imaginary beings, pp. 54–90. In: Hurn, S. (ed.). *Anthropology and Cryptozoology: Exploring Encounters with Mysterious Creatures*. Routledge, Abingdon, 246pp.
- Williams, A., T.S. Masoud & W. Othman (1998).** *Community-based Conservation: Experiences from Zanzibar. Gatekeeper Series 80*. International Institute for Environment and Development, London, 20pp.

Swahili abstract: Mfumo bioanuwai wa Kisiwa cha Unguja, kilichopo katika funguvisiwa vya Zanzibar, Tanzania, una idadi kubwa ya watu na baadhi ya aina za wanyama ambao hawapatikani mahali pengine popote. Kamera zilizotegwa mwezi wa tisa 2017 katika Hifadhi ya Taifa Jozani-Chwaka Bay na Msitu wa Hifadhi Kiwengwa-Pongwe zimepnasa ushundwi (aina ya kanu) *Genetta servalina archeri* kwa mara ya kwanza katika video. Ushundwi ni spishi ndogo anayepatikana Unguja pekee; alitangazwa kisayansi kwa mara ya kwanza mwaka wa 1998. Wanyama mbua wengine wadogo waliorekodiwa pia kwa mara ya kwanza katika uchunguzi wa 2017 walikuwa ni fungo-miti *Nandinia binotata*, mnyama ambaye upatikanaji wake Unguja umeelezwa kwa mara ya kwanza 2004, kicheche aina ya *Herpestes sanguineus rufescens* na kitu (kwa jina la kisiwani) *Bdeogale crassicauda tenuis*. Video nyingine za ushundwi na fungo-miti zimechukuliwa ndani ya Hifadhi ya Jozani mwezi wa nane 2018. Picha za ngawa (kwa jina la kisiwani) *Civettictis civetta*, na spishi mbili za kigeni – nguchiro *Mungos mungo* na fungo (kwa jina la kisiwani) *Viverricula indica* – hazikupatikana katika unasaji wa video wa mwaka 2017 na pia 2018. Kwa kuwa misitu ya asili ya Zanzibar inazidi kupungua na kubaki visehemu sehemu chache, ni muhimu zaidi kutafiti na kuandika habari za wanyama mbua na wanyama wengine visiwani, ili hatua madhubuti za uhifadhi wanyama hao kutoweka kabisa ziweze kuchukuliwa.





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