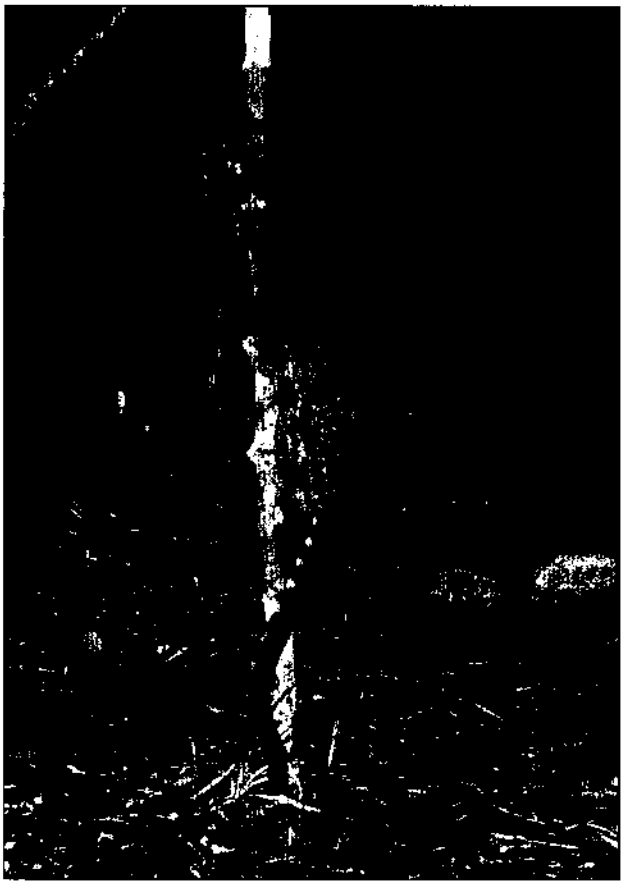
SMALL CARNIVORE CONSERVATION

The Newsletter and Journal of the IUCN/SSC Mustelid, Viverrid & Procyonid Specialist Group

Number 29 October 2003

SPECIES SURVIVAL COMMISSION



Zanzibar Servaline Genet Genetta servalina archeri

Zanzibar Bushy-tailed Mongoose Bdeogale crassicauda tenuis

Photos: Helle V. Goldman & Jon Winther-Hansen

The production and distribution of this issue has been sponsored by
"Marwell Preservation Trust Ltd", Colden Common, UK
"Royal Zoological Society of Antwerp", Antwerp, Belgium
"Columbus Zoo", Powell, Ohio, USA and
"Wildlife Conservation Society/Central Park Wildlife Center",
New York, NY, USA

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The aim of this publication is to offer the members of the IUCN/SSC MV&PSG, and those who are concerned with mustelids, viverrids, and procyonids, brief papers, news items, abstracts, and titles of recent literature. All readers are invited to send material to:

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Printed on recycled paper **ISSN 1019-5041**

First photographs of the Zanzibar Servaline Genet *Genetta servalina archeri* and other endemic subspecies on the island of Unguja, Tanzania

Helle V. GOLDMAN[1] and Jon WINTHER-HANSEN[2]

In January 2003, a camera trapping survey in Jozani–Chwaka Bay National Park, Zanzibar, resulted in the first photographs of the Zanzibar Servaline Genet *Genetta servalina archeri*. This subspecies is endemic to the island of Unguja and has only recently been described. The three other documented indigenous small carnivores of the island were also photo-trapped: Zanzibar Bushy-tailed Mongoose *Bdeogale crassicauda tenuis*, Zanzibar Slender Mongoose *Herpestes sanguineus rufescens* and African Civet *Civettictis civetta schwarzi*. Both mongooses are endemic subspecies, while the population of African Civets on Unguja belongs to a subspecies also found on the adjacent coast of the mainland (Packenham, 1984; see also Ray, 1995). To our knowledge, no living specimens of these animals have been photographed in Zanzibar before.

With the limited resources of Zanzibar's environmental authorities focused on a small number of highly salient species, particularly Aders' Duiker *Cephalophus adersi* and the Zanzibar Red Colobus Monkey *Procolobus kirkii*—considered the two most important indicator species, the rest of Zanzibar's fauna has received comparatively little attention. Most international research and conservation efforts have been similarly oriented. Among Unguja's fauna is a largely overlooked guild which includes four indigenous small carnivores. The aim of our camera trapping survey was to document the small carnivore species present in Jozani–Chwaka Bay National Park. The larger objectives were to augment our very scanty knowledge of these animals and to contribute to their preservation in Zanzibar.

Study area

Unguja, the main island in the Zanzibar archipelago, lies about 6° south of the equator and 40 km from mainland Tanzania and has an area of approximately 1,600 km^2. The deeper soil zone of the western part of the island formerly supported moist forest, while in the east and much of the south thicket and dry forest covered the drier and less fertile "coral rag" zone–fossil coral incompletely overlain by a thin layer of poor soil. The island has been separated from mainland Africa for ca. 10,000-15,000 years, permitting the evolution of several endemic mammal subspecies (Moreau & Pakenham, 1941; Pakenham, 1984; Kingdon, 1989).

With about 524,000 inhabitants, Unguja has a rural population density of some 170 persons per km^2 (figures based on United Republic of Tanzania, 1991; Zanzibar Revolutionary Government, 1992). Rural Zanzibaris make their living from various combinations of cash crop and subsistence cultivation, livestock husbandry, charcoal and lime production, harvesting and selling fuelwood and building poles, hunting and fishing. Increasing in scale as the human population grows (by over 3% per year), many of these activities have seriously degraded the natural environment in parts of the island. Habitat destruction and hunting are two of the main threats to the island's wild fauna.

Zanzibar lies within the Eastern Arc and Coastal Forests "biodiversity hotspot", one of 25 "areas featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat" (Myers *et al.*, 2000, p. 853). Jozani–Chwaka Bay National Park, upgraded from a forest reserve at the beginning of 2003 and enlarged to 50 km^2, encompasses Unguja's only remaining natural, older-growth forest (Robins, 1976; Williams *et al.*, 1998; Box 5.5.4 in Rodgers & Burgess, 2000). It comprises a mosaic of other habitats as well, including coral rag thicket, bracken fields, saltmarsh grassland and mangrove forests. While people do illegally poach and cut wood within the boundaries of the park, Jozani's flora and fauna are probably under less human pressure than surrounding areas, which are afforded no legal protection or are under the control of local communities.

Methods

Two baited TrailMaster camera traps, using infrared sensors, were deployed in the park for a total of 55 trap-nights during January 2003. To sample different habitats in a large portion of the park, the sets were moved often; by the end of the study the traps had been set up at 10 locations.

Survey effort was concentrated in the coral rag thicket because of the importance in documenting the wildlife in the more threatened habitat. The park's thicketed areas—proportionally much more extensive than the groundwater forest—appear to be under heavier human pressure in the form of illegal hunting and wood harvesting.

Results

The resulting 73 photographs of wild animals included representatives of seven species: one primate (*Cercopithecus mitis*), one rodent (*Paraxerus palliatus*), one insectivore (shrew sp.) and four carnivores: African Civet *Civettictis civetta schwarzi*, Zanzibar Servaline Genet *Genetta servalina archeri*, Zanzibar Bushy-tailed Mongoose *Bdeogale crassicauda tenuis* and Zanzibar Slender Mongoose *Herpestes sanguineus rufescens*. All seven species were photo-trapped in the coral rag thicket; three species were also photo-trapped in the groundwater forest. Of the viverrids

Zanzibar Servaline Genet Genetta servalina archeri *photo-trapped in Jozani–Chwaka Bay National Park. See Goldman & Winther-Hansen 2003 for this photograph in colour. Photo: Jon Winther-Hansen & Helle V. Goldman*

and herpestids, all but the African Civet were photo-trapped in both the thicket and the groundwater forest.

Each carnivore species was photo-trapped at two or more locations. The Zanzibar Servaline Genet was photo-trapped at four sites, the African Civet at two, the Zanzibar Slender Mongoose at two, and the Bushy-tailed Mongoose at three. Three camera trap locations produced photographs of multiple carnivore species. One site yielded photographs of the Zanzibar Bushy-tailed Mongoose and Zanzibar Slender Mongoose; another the African Civet and Zanzibar Servaline Genet. Another location yielded photographs representing all four carnivore species. In fact, three species came within a few hours of one another during a single night/early morning at this trap site. The two shortest intervals between recorded visits by different carnivore species were 38 minutes separating visits by the two mongoose species and 44 minutes dividing visits by a Zanzibar Servaline Genet and a Zanzibar Bushy-tailed Mongoose.

Three of these species were photo-trapped exclusively at night. Zanzibar Servaline Genets were photo-trapped between 19:56 and 03:24. Similarly, African Civets triggered the cameras starting at 20:09 and ending at 03:42. The third nocturnal small carnivore, Zanzibar Bushy-tailed Mongooses were photo-trapped throughout the night, starting at 19:31, about 30 minutes after darkness fell, and ending at 05:41, roughly half an hour before sunrise. (In January, the sun rises at about 06:15 and sets at about 18:45; it becomes light about 20 minutes before sunrise and it remains light for about 20 minutes after sunset. We defined night-time as the hours of darkness from 19:00 to 06:00 and day-time as 06:01–18:59.)

In contrast, Zanzibar Slender Mongooses set off the cameras only during daylight hours, from 06:26 to 18:53. A closer look at the timing of Slender Mongoose photographs reveals that of 31 pictures, only 5 were taken after 07:29 and before 17:00. This suggests a preference for early mornings and late afternoons. (For details of when animals were photo-trapped, see Goldman & Winther-Hansen, 2003.) In contrast to all other small carnivores, which were photo-trapped singly, a pair of apparently adult Zanzibar Slender Mongooses triggered the camera repeatedly one morning.

Discussion

These results compare favourably with the only other camera trapping work to have been undertaken in Jozani–Chwaka Bay National Park (then Jozani Forest Reserve) (Stuart & Stuart, 1997), in which two camera traps, set off by trigger pads, were left in the same positions during the duration of the three week effort. Scent lures rather than bait were used to attract animals to the trap. That effort produced photographs of only one small carnivore (the African Civet). A more recent biodiversity survey of the park, which did not employ camera trapping, recorded two (perhaps three: compare p. 48 and Appendix VII in Nahonyo *et al.*, 2002) of the island's indigenous small carnivores. This highlights the utility of camera trapping using infrared sensors, combined with a strategy of baiting the traps and shifting them to different locations in order to sample a large area and different habitats.

It is noteworthy that our survey did not produce any photographs of the two introduced wild carnivore species said to be present on Unguja (Moreau & Pakenham, 1941; Kingdon, 1977; Pakenham, 1984; Stuart & Stuart, 1998; Nahonyo *et al.*, 2002): the Banded Mongoose *Mungos mungo*, which is a mainland African species, and the Small Indian Civet *Viverricula indica*, of Asian origin. Weighing this against the quantity of photographs of the native small carnivores, the lack of Banded Mongoose and Small Indian Civet pictures suggests that these introduced species are less common than has been assumed, at least in the Jozani area.

Among the survey's most rewarding results were photographs of Zanzibar Bushy-tailed Mongooses *Bdeogale crassicauda tenuis*. Patchily distributed across south-eastern Africa, Bushy-tailed Mongooses exist at low densities in habitats ranging from open acacia woodland to lowland forest (Kingdon, 1977; Taylor, 1986, 1987; Schreiber *et al.*, 1989). Little is known about the biology and ecology of this elusive nocturnal mongoose and the causes of its rarity are not understood (Taylor, 1986, 1987; Stuart in Mills & Hes, 1997). Of the four recognized subspecies, one has endangered status in the IUCN Red List of Threatened Species: *B. c. omnivora*, which is probably confined to the diminishing Arabuko-Sokoke Forest in coastal Kenya (Schreiber *et al.*, 1989). Kingdon describes *B. c. tenuis* as "smaller and darker" than *B. c. crassicauda*, the nominate race (1977, p. 246). Based on molar dentition, he suggests that the isolated Zanzibar Bushy-tailed Mongoose "may be the most primitive form" of *B. crassicauda* (1977, p. 246). The diet of Bushy-tailed Mongooses is believed to consist mainly of invertebrates (Kingdon, 1977; Taylor, 1987; Stuart in Mills & Hes, 1997). On Unguja, *B. c. tenuis* is known for preying on large land snails, which it smashes against coral outcroppings, stones or tree trunks, where debris accumulates with repeated visits (Williams, 1951, p. 305). This feeding behaviour has been described as characteristic of some herpestids (Taylor, 1975).

Perhaps the most significant results of our study are the images of the Zanzibar Servaline Genet *Genetta servalina archeri*, a subspecies formally described in 1998 based on a specimen taken at Kitogani, 2.5 km SSE of the park (Van Rompaey & Colyn, 1998). Six photographs were produced from four locations, demonstrating the Genet's distribution in both the groundwater forest and the thicket within Jozani–Chwaka Bay National Park. These photographs constitute the first documentation of live Zanzibar Servaline Genets since a set of Servaline Genet tracks were observed at one location during a survey of the Jozani area in 1997 (Stuart & Stuart, 1998). More camera trapping is needed to determine the wider distribution of Servaline Genets on Unguja.

The pictures add not only to our knowledge of the Zanzibar Servaline Genet's distribution but also to what we know of its habitus. For example, the badly damaged skin upon which the formal description of the subspecies was based (Van Rompaey & Colyn, 1998) – a dry specimen, including a damaged skull, of unknown age acquired by Anthony Archer in 1995 – has a neutral, greyish background colour. As Gaubert *et al.* (2002a) note, coat colour can be influenced by how specimens have been prepared, among other factors. A forthcoming description of the subspecies (Van Rompaey & Colyn, in press) has been updated on the basis of the new photographs of the Zanzibar Servaline Genet, which show that the base colour of the pelt on the upper part of the body is ochreous (see front cover of this issue and Goldman & Winther-Hansen, 2003).

Five subspecies of Servaline Genets are recognized (Van Rompaey & Colyn, 1998, in press). Lowe's Servaline Genet *G. s. lowei*, 400 km south-west of Unguja in the Udzungwa Mountains on mainland Tanzania, is the Zanzibar Servaline Genet's geographically nearest relative (Kingdon, 1977; Van Rompaey & Colyn,

1998, in press). We speculate that *G. s. lowei,* with its similar appearance and colouration, may also be the Zanzibar Servaline Genet's closest phylogenetic kin. Servaline Genets are widely distributed west of Lake Victoria and across Central Africa's Congo Basin, but they exist in small, isolated pockets in East Africa outside of Uganda (Kingdon, 1977, 1997; Van Rompaey & Colyn, 1998). These enclaves occur at moist, forested mountains – and on Unguja. This suggests that East African Servaline Genets may be relicts of a once continuous population that inhabited a formerly wetter and more thickly forested East Africa. Kingdon has commented on the "peculiarities of [coastal East Africa] in harbouring forest species that have affinities with populations in equatorial regions far to the west" (1977, p. 247), suggesting colonization from the central and western regions of Africa (see also Kingdon & Howell, 1993). The presence of Servaline Genets – characterized as "a true forest form" (Kingdon 1977, p. 155) – in Unguja's drier thicket, as well as in acacia woodland south of the Ruwenzori Mountains (Van Rompaey & Colyn, in press) indicates that the species is not strictly confined to moist high forest, as Gaubert *et al.* (2002b) have recently determined for the congeneric *G. johnstoni* in West Africa.

The very recent scientific discovery of the Zanzibar Servaline Genet is puzzling. It is not a very small animal. Kingdon (1997) gives the weight of Servaline Genets as 1-2 kg, head and body length as 41-50 cm and tail length as 35-44 cm. And though Servaline Genets are shy and nocturnal, the notoriety on Unguja of a chicken-killing animal fitting the Servaline Genet's description indicates that it does make forays into settlements. Although earlier observers referred to the presence of a "genet" on Unguja (Burton, 1967 [1872], p. 198; Mansfield-Aders, 1967 [1920], p. 329; Ingrams, 1967 [1931], pp. 295 and 427), it seems that they actually had the Small Indian Civet in mind. Pakenham & Moreau (1941) and Pakenham (1984) compounded the confusion by assuming that the referent was the African Civet.

That an animal of the Servaline Genet's dimensions and striking appearance remained undocumented up to eight years ago on a flat, relatively small and densely inhabited island is challenging to explain. The 68-year gap between the collection of the Lowe's Servaline Genet type specimen in the Udzungwa Mountains and its recent re-discovery in 2000 (Brink *et al.*, 2002; see also De Luca & Mpunga, 2002) is more comprehensible in light of the more difficult access to the location and the ruggedness of the terrain. Schreiber *et al.* (1989, p.3) point out that most viverrids, "particularly the tropical forms, are among the least known carnivores…it is not surprising that new subspecies and even species continue to be described". There is a clear need for more and better research on Zanzibar's less highly profiled fauna. There may well be other species that have yet to come to light on one or both of the main islands of the archipelago.

Referring to the richness and diversity of Africa's 67 species of carnivores, Taylor (1986) observes that at any one location there are usually three or four viverrid and herpestid species, in addition to other carnivores. Taxonomic assemblages of sympatric small carnivores with overlapping, catholic diets and generally similar trophic roles raise questions concerning the degree of each species' ecological specialization and the extent to which sympatric species compete or partition resources among themselves (Schoener, 1986; Taylor, 1986; Terborgh & Robinson, 1986). Fecal analysis of sympatric African small carnivores has yielded a wealth of information about dietary differences, including how these may change seasonally (e.g. MacDonald & Nel, 1986; Hutterer & Ray, 1997; Ray, 1998; Ray & Sunquist, 2001) Tracking radio-tagged individuals has revealed habitat preferences, ranging behaviour, and diel activity patterns (Ikeda *et al.*, 1982; Maddock & Perrin, 1993; Ray, 1997). These methods have complemented studies relying on direct observation, including those aided by night-viewing scopes (Rood & Waser, 1978; Waser, 1980) and feeding stations (Ikeda *et al.*, 1982). We propose that photo-trapping may help elucidate the spatial and temporal niche dimensions of ecological separation, as illustrated by our brief study.

The Zanzibar Slender Mongoose and the Zanzibar Bushy-tailed Mongoose have been placed on Appendix 1 of The Forest Resources Management and Conservation Act no. 10 of 1966, a list of species which are illegal to hunt (Zanzibar Revolutionary Government, 1997). African Civets, listed on Appendix 2, are accorded a lower level of legal protection, presumably on account of their non-endemic status. We have urged the environmental authorities to place the Zanzibar Servaline Genet on Appendix 1, which was published before *G. s. archeri*'s presence on Unguja had been fully documented. At least as important for the survival of this species and other wildlife is the conservation of the natural habitats which they require. This is the greatest challenge facing conservation authorities in Zanzibar.

Acknowledgements

At the Department of Commercial Crops, Fruits and Forestry, Sheha Idrissa Hamdan, Thabit S. Masoud, Mtumwa Khamis Ame, Shaabani Imani Ali, Habib Abdulmajid Shaaban and Khamis Juma Salum facilitated our fieldwork. Martin Walsh improved the original report on which this paper is based and brought the early references to "genets" on Unguja to our attention. The manuscript benefited from Harry Van Rompaey's careful reading.

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More badger TB politics

A previous update (Hancox, 2002) suggested that sadly this 30-year old saga would have to continue for some time yet. And the conclusion of the recent Inquiry in Parliament corroborated that view and even though the impact of foot-and-mouth disease has postponed a verdict until 2007. With the backlog of cattle testing and no movement control of untested cattle TB has spread far and wide so that bovine TB is out of control. Amazingly some farmers and vets are still questioning whether cattle-to-cattle transmission is important or not.

In evidence given to the Committee, Prof. Bourne said an analysis of past culls showed that they do not work. Minister Elliot Morley said culls seem to be based largely on folklore and he saw not a shred of evidence for culls outside trial areas, and mass culls have been ruled out as politically unacceptable.

So, taking these two aspects together, yet another Inquiry chaired by Prof. C. Godfray of Imperial College is to look into whether the Krebs/Bourne cull is so compromised that it should be scrapped. The £6.7 million saved per year would release some £30-35 million infinitely better spent on tried and tested cattle measures (Hancox, 2003).

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Committee Report HC 432 Appendices 6 & 7.

www.publications.parliament.uk/pa/cm200203/cmselect/cmenvfru/432/4320

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The head colour pattern of the Eurasian badgers (Mustelidae, *Meles*)

Alexei V. ABRAMOV

Introduction

The Eurasian badger (*Meles*) is one of the most widespread Eurasian mustelids. Its range covers Europe, except for the northernmost regions, the Middle East (as south as Palestine and Mesopotamia), Central Asia, South Siberia, Mongolia, Tibet, Eastern Asia (from the Amur Region to Yunnan) and the Japanese Islands (except for Hokkaido).

Geographic variation of craniological and exterior characters of the Eurasian badger is significant. A great number of forms of different taxonomic rank, *viz.* species, subspecies, natio, aberratio, *etc.* has been described (for a review see Abramov, 2001). There are contradicting opinions regarding species composition of the genus *Meles*; different authors accept 1 to 3 species. I am of the latter opinion and distinguish the European Badger *Meles meles* (Linnaeus, 1758), the Asian Badger *M. leucurus* (Hodgson, 1847) and the Japanese Badger *M. anakuma* Temminck, 1844. This point of view is well supported by the clear differences between European, Asian and Japanese Badgers in proportions and size of the skull (Lynch, 1994; Abramov, 2001), dental characters (Baryshnikov & Potapova, 1990; Baryshnikov *et al.*, 2003), shape of the *os malleus* (Abramov & Baryshnikov, 1995), shape of the baculum (Baryshnikov & Abramov, 1997; Abramov, 2002), level of sexual size dimorphism in the skull (Abramov & Puzachenko, in press), parasitologic data (Abramov & Medvedev, 2003) and molecular data (Kurose *et al.*, 2001; Sato *et al.*, 2003). The European Badger *M. meles* is distributed throughout Europe (including Scandinavia) to the west of the Volga River (Russia), Caucasus, Iranian Plateau, Pamir-Alai Mtns, South and West Tien Shan Mtns; south to Israel; Iraq; Iran; and on Ireland, Britain, Crete, and Rhodes (Heptner *et al.*, 1967; Long & Killingley, 1983). The Asian Badger *M. leucurus* is distributed from the east of Volga River through south Siberia, Kazakhstan, and Middle Asia to China and Korea; reaching Tibet in the south. The Japanese Badger *M. anakuma* is restricted to the Japanese Islands of Honshu, Kyushu, and Shikoku. The distribution ranges of these species is shown in Fig. 1.

In most taxonomic works, the peculiarities of coat colour (especially features of the facial mask) were used for characterizing the geographic variation of the Palaearctic badgers and for describing new forms. The present work reviews the head coloration and pattern of *Meles* and discusses its taxonomic significance.

Materials and methods

This study is based on 266 skins (including stuffed specimens) of badgers from a wide geographic area. The studied specimens are kept in the collections of following museums (see Table).

Also I have studied many photo files from the "Badgers on the Web" (http://www.badgers.org.uk) and numerous links therein (especially for Japanese and Korean websites).

Head colour pattern

The overall body coloration of western and northern European Badgers *Meles meles* is rather light, light grey or silvery, sides clearly lighter than the middle part of back. A wide black or black-brown longitudinal stripe on either side runs from the snout's tip over eye and ear (both covered from above and below). A pure white facial stripe is in between the two black bands, covering the back of the head and partly the neck (Fig. 2A). The snout, cheeks and tips of the ears are white.

Badgers from the Middle East are lighter (brownish) than European ones. A lighter coloration is also typical for the badgers from the Mediterranean. Such pale colour was the reason for describing several subspecies of the badger from Crete (*arcalus*), Rhodes (*rhodius*) and Spain (*marianensis*, *mediterraneus*). Nevertheless, the pattern of the snout's white and black stripes of the Middle East and Mediterranean badgers is the same as in other European ones. The European Badgers occurring in Asia Minor and the Caucasus (*canescens*, *minor*, *ponticus*), as well as those from Central Asia (Hissar-Alai, West Tien Shan and Pamir-Alai) (*severzovi*), are characterized by silver-grey body coloration and bright, contrasting facial stripes. Different colour variations of European badgers, *viz.* melanistic, albino and erythristic, have

Museums	*M. meles*	*M. leucurus*	*M. anakuma*
Zoological Institute, Saint-Petersburg, Russia (ZIN)	67	83	1
Zoological Museum, Moscow State University, Moscow, Russia (ZMMU)	22	27	
Institute of Animal Systematics and Ecology, Novosibirsk, Russia		10	
Russian Research Institute of Game Management and Fur Farming, Kirov, Russia	3	3	
Institute of Zoology and Genofunds of Animals, Almaty, Kazakhstan		4	
Kazakh Antiplague Research Institute, Almaty, Kazakhstan		5	
Institute of Zoology, Tashkent, Uzbekistan	13	15	
Institute of Zoology and Soil, Bishkek, Kirgizstan	2	4	
National Science Museum, Tokyo, Japan			5
The Kitakyushu Museum and the Institute of Natural History, Kitakyushu, Japan			2

been described. Extremely dark badgers have been seen, but the white facial stripes are normal in such animals (Neal & Cheeseman, 1996).

The Asian Badgers *Meles leucurus* have the light grey upperparts of the body tinged with sandy/straw-coloration, the sides slightly lighter, and the underside and legs black. A narrow blackish brown (sometimes brown) facial stripe runs over the eye (Fig. 2B), then gets narrower and runs above the ear. This stripe hardly reaches the hind side of ear, sometimes reaching only its anterior side. The light yellowish white median stripe is narrow and short; usually it does not reach the back of head and blends into the colour of neck and back already on the back of head. Such colour is typical for all studied skins of the Asian Badger from Siberia (*raddei*, *altaicus*, *sibiricus*, *aberrans*) and Middle Asia (*arenarius*, *tianshanensis*, *talassicus*). The badgers from North Mongolia have the same coloration. According to literature data (Allen, 1938; Pocock, 1941), the same coloration is characteristic for the badgers from different regions of China. Numerous Chinese forms (*leptorhynchus*, *chinensis*, *hanensis*, *sininensis*, *tsingtauensis*, *blanfordi*), of which many were described on the basis of only single specimens, differ only slightly in the intensity of body coloration.

A peculiar coloration is known for the badgers from Russian Far East (Primorie and Ussuri Territory), which were described as *amurensis* (syn. *schrenkii*, *melanogenys*). The overall pelage coloration is very dark, with brown predominating. The snout also is dark brown, and in some specimens facial stripes are almost not distinguishable (Fig. 2C), but when visible, the pattern of the facial mask is similar to that of the Siberian and Middle Asian badgers. The dark coloration, as well as a small size, are considered the main specific character of the badgers from Primorie. The badgers from North Korea are coloured in the same manner (ZIN C.25682, ZMMU S-59104).

The coat coloration of Asian Badgers (its intensity, but not the facial mask's pattern) varies widely. In the collection of ZIN, there is a specimen No C.54691 from Ussuri Territory (Suchan River) being very brightly coloured, similar to a European Badger. Nonetheless, the shape and pattern of facial stripes correspond to the Asian type. Dark coloured badgers (similar to those from Far East) are known from Transbaikalia, for instance, from the valley of Barguzin River (ZIN C.18209).

There was an opinion that two ecological forms of *Meles leucurus* occur in the Asian part of the range (Transbaikalia, Mongolia, Kazakhstan), *viz.* the "steppe badger" (large and light-coloured) and the "mountain-forest badger", which is smaller and dark-coloured (Radde, 1862; Bannikov, 1954). The present study does not support this opinion. It seems that any population of any subspecies of the Asian Badger may show dimorphic coloration, with both light- and dark-coloured animals, but these colour morphs are not segregated biotopically and occur together in the same habitats (Ognev, 1931; Stroganov, 1962; Heptner *et al.*, 1967).

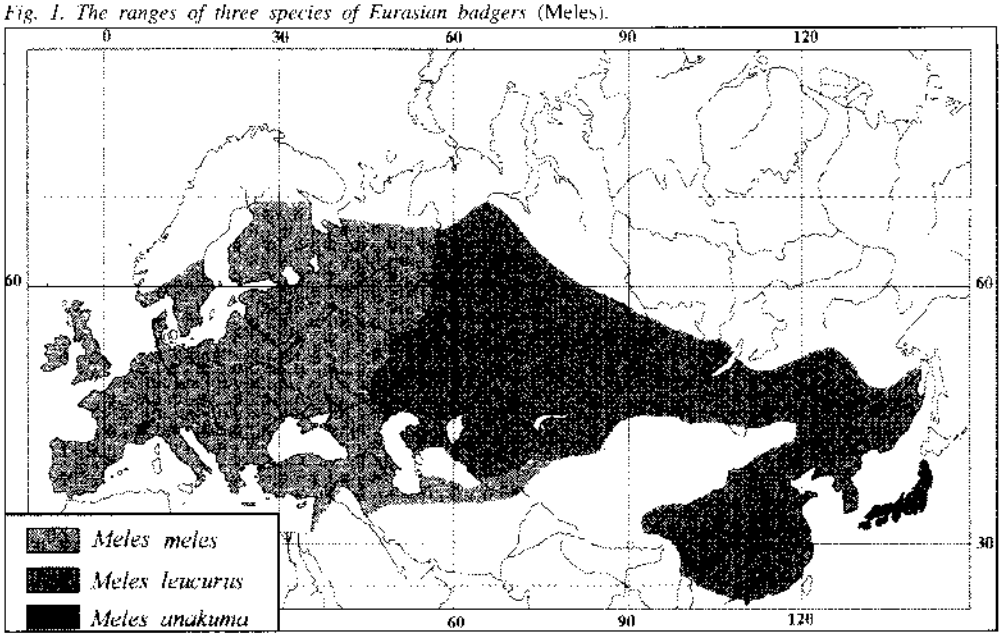
Some researches (*e.g.* Petrov, 1953; Heptner *et al.*, 1967; Baryshnikov & Potapova, 1990) have recorded that the body pelage coloration of the Japanese Badgers is also dark, being similar to that of badgers from the Far East. On this basis these badgers' forms were lumped into the group "*amurensis-anakuma*" (Heptner *et al.*, 1967; Heptner, 1968). Based on the coloration, Baryshnikov & Potapova (1990) assigned Japanese Badgers to the Asian Badger (*Meles anakuma*: *sensu* Baryshnikov & Potapova, 1990). However, the Japanese Badger is characterised by the light, yellowish upperparts and stout. Although brown facial stripes are well marked on the snout, usually they are short, not reaching the ear, and form dark "spectacles" around the eyes (Fig. 2D). The median facial stripe is yellow-straw coloured, short and ends up between the ears. All the specimens from Japan (Honshu, Kyushu) studied by me were coloured in the same manner, and also a similar pattern was described for Japanese badgers by Long & Killingley (1983).

These differences in facial pattern between the three badger species, as a rule, are easily seen and allow one reliably to assign any specimen to a particular form.

Differences in the facial pattern in *M. meles* and *M. leucurus* can be used for refining the limits of their distribution in sympatric zones. Such zones exist in West Tien Shan and in the European part of Russia (Kirov Province, Udmurtia, Tatarstan). Badgers occurring in the mountains of West Tien Shan (Karzhantau, Ugam, Pskem, Chatkal, Kuraminskii and Turkestan Mt. Ranges) have the facial mask typical for *Meles meles*, with black and white stripes, and the brightly silvery body coloration. The northern, central and eastern ridges of Tien Shan (Talass-Alatau, Kirgizskii, Ferganskii, Zailiiskii, Kungei-Alatau and Terskei-Alatau Mt. Ranges) are inhabited by the badgers having the head colour pattern of Asian type. Furthermore, they are characterised by the dark, brown-black body coloration, and their colour was used as a reason to describe a separate form from this region (*tianshanensis*, *talassicus*).

The colour pattern of specimens from Zhiguli Nature Reserve allows confirmation of the occurrence of the Asian Badger on the right riverbank of Volga River (Snegirevskaya, cited from Belyanin, 1981); the latter record was subsequently confirmed by craniological data (Baryshnikov *et al.*, 2003, Vekhnik & Abramov, in press).

Fig. 1. The ranges of three species of Eurasian badgers (Meles).



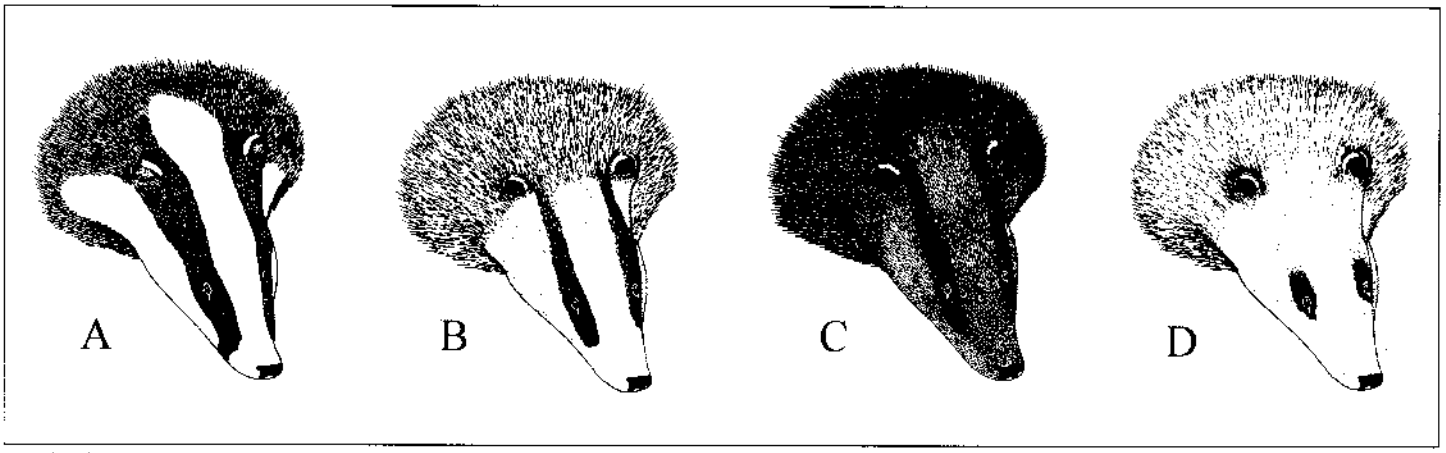


Fig. 2. The head colour pattern of the Eurasian badgers: A – the European Badger Meles meles. *B – the typical Asian Badger* Meles leucurus. *C – the Far-Eastern form of Asian Badger* Meles leucurus amurensis. *D – the Japanese Badger* Meles anakuma.

Acknowledgements

I would like to thank all curators of collections for their assistance during the course of this study. I am thankful to Dr. D. V. Logunov for commenting on the first draft and improving the English. A. E. Bobal kindly prepared the drawings. This work was supported in part by the grants Nos 02-04-48607 and 03-04-63139 from the Russian Foundation for Basic Research.

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The diversity and conservation of mustelids, viverrids, and herpestids in a disturbed forest in Peninsular Malaysia

Mohd. AZLAN J.

Introduction

Little is known on the distribution of mustelids, viverrids, and herpestids in Peninsular Malaysia because species conservation is concentrated much on charismatic and flagship species, especially on large mammals. A total of 21 species have been recorded from all three families in Peninsular Malaysia (Medway, 1983). All the species from the family Mustelidae, Viverridae, and Herpestidae except Malay Civet *Viverra tangalunga* and Common Palm Civet *Paradoxurus hermaphroditus* receive a total protection status in the Wildlife Protection Act, 1972 (WPA 1972). Anyone found killing these animals will be liable to a fine not exceeding five thousand ringgit (Aprox.USD 1,300) or to a term of imprisonment not exceeding three years or both. *V. tangalunga* and *P. hermaphroditus* receive a protection status where upon conviction of killing these animals a fine not exceeding three thousand ringgit (USD 790) or to a term of imprisonment not exceeding three years or to both will be imposed. However, in many rural areas of Peninsular Malaysia civets are considered a pest because they prey on small livestock and raid fruit orchards. Section 55 of the WPA 1972 allows farmers to shoot any wild animal that causes damage to their property, providing reasonable efforts have been to frighten the animal away.

Despite the threats from local farmers, it is believed that habitat destruction would cause both a severe decline in mammalian species throughout their range (Stevens, 1968; Seidensticker, 1986), and a loss of genetic diversity (Soule, 1987; Terborgh, 1992). It is therefore important to understand the diversity of small carnivores in disturbed habitat in order to provide baseline data for monitoring long-term changes, and for comparison with other forested areas elsewhere in Malaysia.

Materials and Methods

Study site

The study was conducted in Jerangau Forest Reserve (20-538 meters a.s.l.), a secondary forest, that was logged in the 1970s, and which surrounds an oil palm estate, in the State of Terengganu (04° 55.5' N, 103° 05.7' E). We have covered an approximate area of 170 km^2, which includes the oil palm estate with an area of approximately 2,000 ha. Past logging history has resulted in disturbed forest with dense undergrowth, with dense stands of the invasive ferns *Dicranopteris* sp. and *Gleichenia* sp. in abandoned log yards and along old logging roads This study area receives an average annual rainfall of 2,000mm, and consists mainly of selectively logged hill dipterocarp and lowland dipterocarp forest.

Direct observations and commercially made Cam Trakker brand camera trap units (manufactured by Camtrak South, 1050 Industrial Drive, Watkinville, GA 30677, USA) were undertaken. Cam Trakker combines a fully automatic 35mm camera with a passive infrared heat-in-motion detector. The heat-in-motion sensor operates on a horizontal plane, thus it is important that it is aimed parallel to the ground. When animals move along the trail, a silent switch engages the camera, which takes a photograph. The time delay between photographs was set to a minimum of three minutes.

The cameras were deployed in 24 different locations. All camera units were mounted on trees, at least 2.5m to 3.5m from the path or trail, with the infrared beam set approximately 50cm from the ground. Most of the trails and paths were old logging roads with thick undergrowth of secondary trees and shrubs.

All the cameras were checked every month to reload new film rolls. However there were several instances where the films had been fully consumed before checking, so there were gaps in the record. The same camera locations were retained throughout the duration of the study, from February 2000 till October 2001.

Results

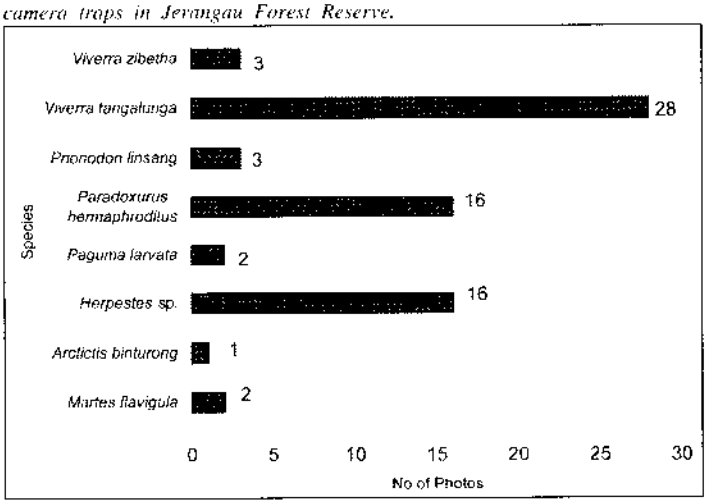
All the photographic results are targeted on terrestrial animals, as no cameras were deployed near streams to prevent camera malfunction due to flooding. Therefore, animals that are either arboreal or are associated to aquatic habitat will be underrepresented in the results. The most frequently encountered species during the night walks was the Common Palm Civet, *P. hermaphroditus*, which was observed on telephone cable lines and oil palm trees (Palmaceae : *Elaeis guineensis*).

All the photographs were identified to the species level except for *Herpestes* spp. because they were too small to be distinguished to species in the photographs. A total of 3,314 exposures were recorded, of which only 2,226 were of wildlife. A total of 71 photographs were recorded for both mustelids and viverrids (approximately 3.2% of the total animals photographed). These families have the highest diversity of species recorded throughout the study period. I have also collected a road kill of the Eurasian Otter *Lutra lutra*, which brings the total species recorded, to nine. The diversity of mustelids, viverrids, and herpestids in this study area represents approximately 42% of the total species recorded for Malaysia by Medway (1983). *Viverra tangalunga* was the most frequently captured viverrid, while mustelids were only represented by *Martes flavigula*. (Fig. 1).

Discussion

The major limitation to this study was the inability to sample the arboreal and aquatic mustelids and viverrids comprehensively. Moreover, the fact that four of the eight species

Fig.1. Relative encounter rates of mustelids, viverrids, and herpestids from camera traps in Jerangau Forest Reserve.



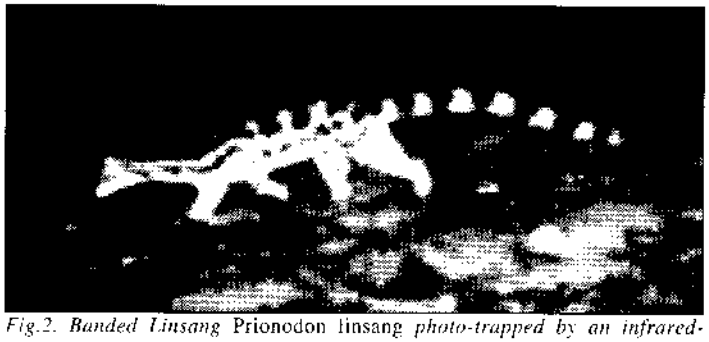


Fig.2. Banded Linsang Prionodon linsang *photo-trapped by an infrared-sensored camera in Jerangau Forest Reserve, Peninsular Malaysia.*

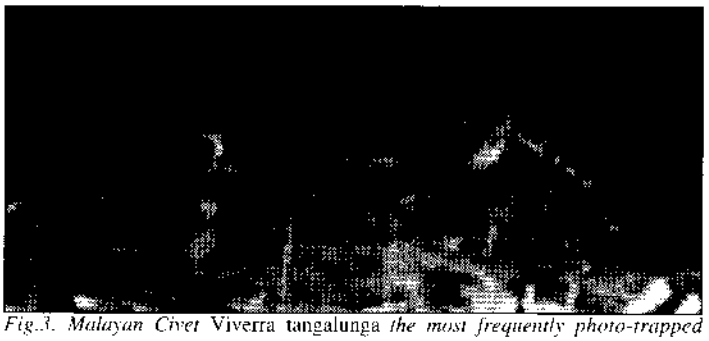


Fig.3. Malayan Civet Viverra tangalunga *the most frequently photo-trapped viverrid in Jerangau Forest Reserve, Peninsular Malaysia.*

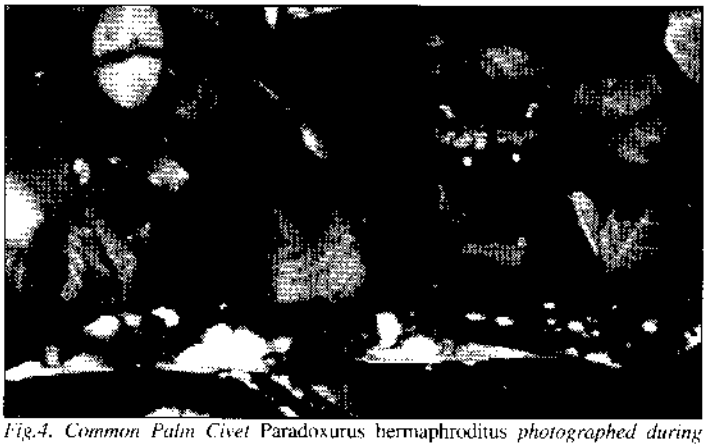


Fig.4. Common Palm Civet Paradoxurus hermaphroditus *photographed during the night surveys around Jerangau Forest Reserve, Peninsular Malaysia.*

were recorded only 1-3 times each suggests that there could well be further ground-dwelling species present. However, it provides baseline data on the diversity and relative abundance of these families in a disturbed habitat. Using camera trapping to study these secretive and nocturnal animals, suggests that it could be an ideal tool for further study to determine their behavior patterns. For example, from the result we could confirm that *P. hermaphroditus* spends a substantial amount of time on the ground, even though activities have been recorded as arboreal (Medway, 1983; Payne, *et al.*, 1985). It would also be possible to look into their activity patterns by analyzing the time and date recorded at each photograph, if adequate data representing each species were available.

The family Viverridae was represented by five genera (*Arctictis, Paguma, Paradoxurus, Prionodon,* and *Viverra*) in the study area. A study conducted by Ratnam *et al.* (1995) in Temengor Forest Reserve, a disturbed habitat revealed the presence of five species: *Prionodon linsang, Paguma larvata, Hemigalus derbyanus, Paradoxurus hermaphroditus* and *Arctogalidia trivirgata*. The difference in the viverrid diversity may be due to various factors including variation in sampling methods, duration of study and the suitability of this mixed habitat forest to support a great diversity of viverrids. Of the eight small carnivores recorded only *M. flavigula* and *Viverra zibetha* are not considered common (Medway, 1983).

Even though forest conversion to oil palm estate may have provided abundance of oil palm fruit, small vertebrates and invertebrates as a major food source for some of these species, its threat to wildlife could be devastating if precautions are not taken seriously. Forest fragmentation and isolation creates easy access for illegal hunters, who may shoot any wildlife that moves. There have even been cases where domesticated animals have been killed using shotguns for no reason by some of these frustrated hunters. In addition to this, I have also observed many road-kills around the study area, particularly *P. hermaphroditus*.

Mustelids, viverrrids, and herpestids that occur in Peninsular Malaysia receive protection both internationally and locally. Nonetheless, it is important to educate and create awareness among the local communities, especially on issues involving conflict. Farmers need to be educated in intensive poultry farming, where proper fencing and guarding may be necessary to prevent civets from preying.

A comprehensive study will be required to understand the population dynamics, minimum viable population in disturbed habitat, and ecological function of small carnivores in tropical rainforest, especially their role as seed dispersers. Such information will provide input to the conservation strategies for these species in this region.

Acknowledgements

I would like to thank the Department of Wildlife and National Parks, Peninsular Malaysia, Department of Forestry and the Federal Land Development Authority (FELDA), Jerangau Barat Management and settlers for their support for this project. In addition to this we are also are grateful to all the stakeholders who have participated in this project. We are thankful to En. Mat Salleh, Raleigh International (Malaysian Chapter) and volunteers for their help in the fieldwork. I am grateful to all WWFM staffs especially Dr. Dionysius S.K. Sharma who helped and guided throughout the fieldwork. This project (MY0086) was funded by WWF-UK and WWF Japan.

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A review of the taxonomic and conservation statuses of the island raccoons

Samuel I. ZEVELOFF

The Procyonidae is a rather small family, consisting only of some 7 genera and 20 species. It includes raccoons (*Procyon*), coatis (*Nasua* and *Nasuella*), ringtails (*Bassariscus*), olingos (*Bassaricyon*), the Kinkajou (*Potos flavus*), and possibly the Red Panda (*Ailurus fulgens*). The precise numbers of its genera and species vary depending upon whether certain forms are regarded as distinct and if the Red Panda is included in this family (see Pecon Slattery & O'Brien, 1995; Flynn *et al.*, 2000; and Zeveloff, 2002 for discussion on the latter issue). Procyonids occur throughout much of North, Central, and South America. The Red Panda of Asia, if it indeed belongs in this family, would be its sole "Old World" representative.

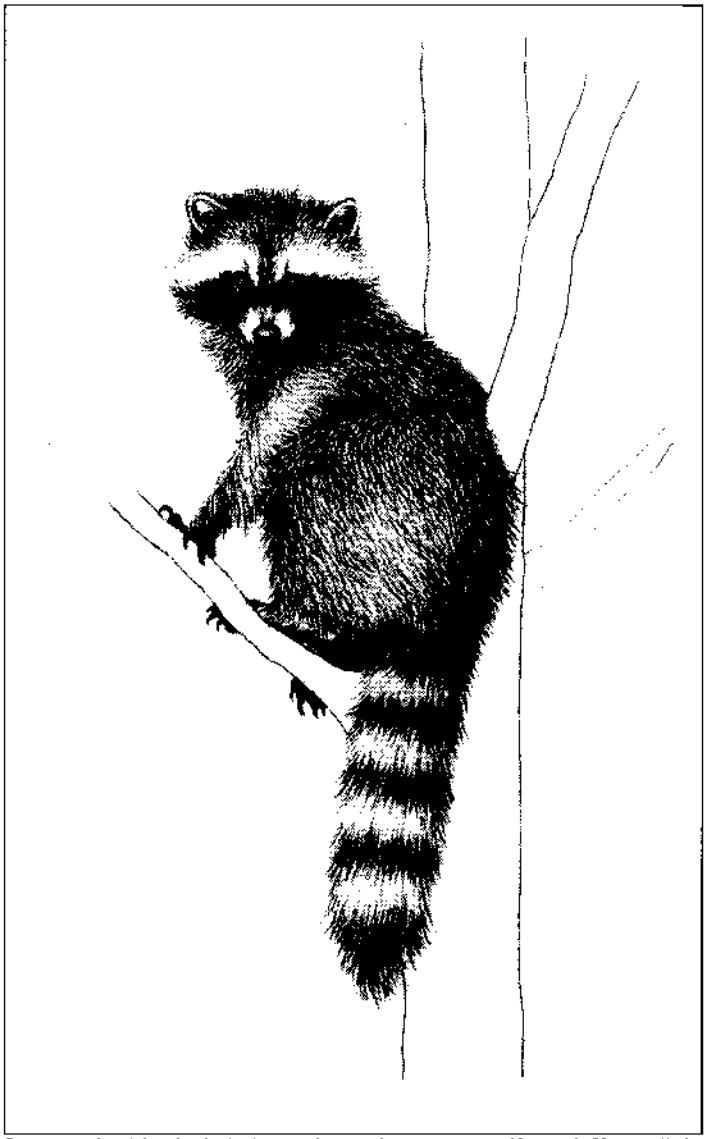
Having the greatest range of any of the genera in their family, the raccoons extend from Canada to Argentina. Seven different species have been recognized. The genus *Procyon* includes two subgenera. The Raccoon or Common Raccoon, *Procyon lotor* Linnaeus 1758, and the five island forms belong to the subgenus *Procyon*. (The Common Raccoon also occurs on various islands.) The Crab-eating Raccoon, *Procyon cancrivorus* Cuvier 1798, is the sole member of the subgenus *Euprocyon* (e.g., Goldman, 1950).

Of these seven potential species, only the common and crab-eating raccoons are widely distributed. Each of the others has a very restricted range on particular islands. The Common Raccoon is widespread in much of North and Central America. The Crab-eating Raccoon ranges from southern Costa Rica and the Isthmian region of western Panama to northern Argentina. It has been released on the islands of Trinidad and Tobago, and possibly several others in the Carribean (Goldman, 1950; Glatston, 1994).

Procyonids thrive in a great variety of habitats and climatic conditions; this broad adaptability is especially true of raccoons. Nevertheless, there are several island raccoons, mostly in the Carribean, each of which is facing threats to its survival. This situation is at least partially due to the intense development of their islands, several of which have become inviting resort locales. The conservation of these raccoons is also confounded by questions about whether each is a genuine species rather than a subspecies of the Common Raccoon.

The International Union for the Conservation of Nature (IUCN) initially assessed the conservation status of the island raccoons in 1996 (www.redlist.org, 2003). In this paper, I review both their taxonomic and conservation statuses, anticipating that such a discussion may be useful for protection efforts. These topics have previously been considered by Goldman (1950), Hall (1981), Sanderson (1987), Glatston (1994), Stone (1995), and Zeveloff (2002). Most recently, Helgen & Wilson (2003) provided an authoritative taxonomic assessment of the three raccoons of the West Indies: the Guadeloupe, Bahama, and Barbados raccoons. The following material relies heavily on these references.

The Guadeloupe or Guadeloupean Raccoon, *Procyon minor* Miller 1911, occurs only on Guadeloupe Island which is administered by France. It is in the Lesser Antilles, a "string" of islands located to the east of Puerto Rico, which extends southward



Raccoon by Elizabeth DeWitte from "Raccoons. A Natural History" by Samuel I. Zeveloff (Smithsonian Institution Press. 2002).

toward the coast of Venezuela. Small and rather dark, it is generally grayish with an "ochraceous" (an earthy or orange yellow) buff color on the neck and shoulders. It is heavily overlaid with black on its back producing a "grizzled" effect. Its underparts are so thinly overlaid with a grayish hue that the light brown underfur shows through. Although they are widely separated geographically, the Guadeloupe Raccoon may be most closely related to the Bahama Raccoon, the next one to be discussed. They differ in certain details but their delicate skulls are similar.

Helgen & Wilson (2003) examined four museum specimens of the Guadeloupe Raccoon and determined that it could not be regarded as a species which is distinct from the Common Raccoon. A recent genetic analysis by Pons *et al.* (1999) had previously suggested this as well. As will be discussed below, the Bahama Raccoon, the aforementioned seemingly closest relative of the Guadeloupe Raccoon, is probably also a subspecies of the Common Raccoon. Helgen & Wilson reviewed that there are no palaconto-

logical or archaeological records for raccoons either in the Lesser Antilles islands or on the Bahamas. They believe that the small sizes of each of the three West Indies raccoons could be a relatively recent occurrence, pointing out that such a size decrease has been observed in various species introduced onto small islands including the Green Monkey *Cercopithecus* sp. (Ashton & Zuckerman, 1951) and several rodents (Yom-Tov *et al.*, 1999).

Land use changes on Guadeloupe have resulted in a considerable loss of this raccoon's native habitat and it is now confined to the island's mangroves and remaining rainforest stands. It ostensibly still occurs in the Parc National de Guadeloupe, where it has been selected as the park's "emblematic" species. It is still hunted for food. Another possible threat to its survival is an introduction of Crab-eating Raccoons to Guadeloupe, though this has not been confirmed (Glatston, 1994). As of 2003, the Guadeloupe Raccoon remained classified as Endangered by the IUCN due to the continuing decline of the fewer than 2,500 mature individuals in its sole population (www.redlist.org 2003).

The Bahama, Bahamas, or Bahamian Raccoon, *Procyon maynardi* Bangs 1898, is only known to occur on New Providence Island (Nassau) in the Bahamas. It is a small, medium dark form, somewhat paler than the Guadeloupe raccoon. Its upper body is largely grayish, becoming an ochraceous buff color on the nape of its neck and shoulders. It is moderately overlaid with black fur that thins out along the sides. Its underparts are lightly covered with grayish fur. The top of its head is a grizzled mix of gray and black, and its black mask is interrupted between the eyes. The skull and the dentition are both slender and delicate.

As mentioned, the Bahama Raccoon seems to be closely related to the Guadeloupe Raccoon. It may also be closely connected to the Common Raccoons of the Florida Keys. For many years, serious doubts have also been raised about this raccoon being a separate species (e.g., Allen, 1911; Koopman *et al.*, 1957; McKinley, 1959) and it has alternately been classified as *Procyon lotor maynardi*, a subspecies of the Common Raccoon. Helgen & Wilson (2003) examined 10 museum specimens from New Providence. They found that the characters used to classify *Procyon maynardi* as a unique species could be attributable to individual variation within the Common Raccoon, and thus concluded that it seemed most appropriate to classify it as a subspecies of *P. lotor*.

Land development in the Bahamas has undoubtedly had an impact on this animal. It is not legally protected nor are there protected areas known to contain it. As of 2003, it was classified as Endangered by the IUCN due to the ongoing decline of its severely fragmented (i.e., no subpopulation is estimated to have more than 250 individuals) population of fewer than 2,500 individuals (www.redlist.org 2003).

If any individuals of the Barbados Raccoon, *Procyon gloveralleni* Nelson & Goldman 1930, still exist, they only occur on Barbados, another island in the Lesser Antilles. Although probably once abundant, especially on the island's rugged south side, this raccoon was last sighted in 1964 and is extinct according to the IUCN. Its upper pelage was usually a light ochraceous buff coloration which was most evident on the nape of its neck and shoulders. This was heavily overlaid with black and its underparts were thinly covered with a buffy grayish hue. Atop the head, it was a buffy gray mixed with black. The mask was continuous across its face. Small and dark, it was similar in color to the Guadeloupe Raccoon. Its skull was rather short and seemed to be delicate.

Helgen & Wilson (2003) offer compelling evidence that Barbados Raccoons are introduced Common Raccoons which probably originated from the Florida/Georgia area. Given the extensive distance of Barbados from the island and mainland locations inhabited by the Common Raccoon, they are skeptical about it having dispersed there naturally. Moreover, they establish that the distinctive features of the holotype specimen described by Nelson & Goldman (1930): an absence of first premolars, and the long upper carnassial teeth, are not evident in other *Procyon gloveralleni* specimens. Indeed, MacPhee & Fleming (1999) contend that the Barbados Raccoon is actually extant on the island today, but as *Procyon lotor*.

The last two raccoons to be considered are those likeliest to be distinct species, and should thus be the focus of island raccoon conservation efforts. The Trés Marías Islands Raccoon, *Procyon insularis* Merriam 1898, historically occurred off of the west coast of Nayarit, Mexico on two of the Trés Marías Islands (Las Islas Marías): María Madre Island and María Magdalena Island. Its habitat preferences are probably similar to those of the Common Raccoon. This relatively large, pale species has a short, coarse, bristly pelage. Its upper parts are normally a light creamy buff color, not the iron grayish hue of the nearby mainland Common Raccoon subspecies: the Mexican Raccoon *Procyon lotor mexicanus* and the Mexican Plateau Raccoon *Procyon lotor hernandezii*. Furthermore, its imposing skull is considerably more angular than that of the Common Raccoon. On its back, it is thinly overlaid with black. Its underparts are lightly covered with a pale creamy buff color, permitting the light brown underfur to show through.

The Trés Marías Islands Raccoon is not common and may never have been. The major threats to its survival are its limited distribution, hunting, and its capture for pets. It is not protected nor are there protected areas that could enhance its survival. The Mexican government considered this raccoon to be threatened in 1994 (Norma Oficial Mexicana, 1994). In 2003, though, it was classified as Endangered by the IUCN because there are probably fewer than 250 mature individuals (www.redlist.org 2003). The subspecies on María Magdalena Island, *Procyon insularis vicinus*, is considered to be extinct. The other subspecies, *Procyon insularis insularis*, occurs on María Madre Island.

The fifth and last island raccoon to be considered is the Cozumel Island or Pygmy Raccoon, *Procyon pygmaeus* Merriam 1901, which occurs only on this island off of Mexico's Yucatán Peninsula. It seems to prefer the mangrove stands and sandy soils along the island's coastal wetlands (Navarro & Suárez, 1989). As its scientific name implies, it is the smallest raccoon species, often weighing just 3 to 4 kg (6.6 to 8.8 pounds). It has a short, bristly, light buffy grayish pelage which is thinly overlaid with black. Its underparts are finely covered with light buffy hairs, allowing the light brownish underfur to show through. On its head, it is a grizzled gray and black. Its black facial mask tends to become brownish mixed with gray along the middle.

The Cozumel Island Raccoon has a relatively flat skull, similar to that of the Campeche Raccoon *Procyon lotor shufeldti*, the Common Raccoon subspecies on the nearby mainland. Its fur is reportedly similar in color and texture to that of this subspecies, though Merriam (1901 cited in Cuáron *et al.*, 2003) stated that it was easy to distinguish this Raccoon from the Common Raccoon due to its "Broad black throat band and golden yellow tail ...." The Cozumel Island Raccoon is noticeably smaller than the mainland form, has a shorter and narrower rostrum, a much smaller cranium,

A note on the diet of the Water Mongoose *Atilax paludinosus* in the central Great Karoo, South Africa

Chris STUART and Tilde STUART

Although the diet of the Water Mongoose *Atilax paludinosus* has been studied at several locations in South Africa (Rowe-Rowe, 1977; Du Toit, 1980; Whitfield & Blaber, 1980; Stuart, 1981; Louw & Nel, 1986; Baker, 1989), it has to date not been looked at in the arid interior.

Previous authors have found this to be an opportunistic feeder and this has been substantiated by this study in an extreme environment. The study was undertaken on the farm '*Slypfontein*' (31° 33.41' S / 022° 39.60' E; 3122 CB) that lies between the villages of Loxton and Victoria West. The landscape is a mix of flat plains and broken hill country with several stream courses, dry for much of the year, although springfed pools were present in one river bed throughout the year. Evidence from tracks indicated that the mongooses were ranging widely along and away from the water courses although dung middens were only located along the stream with permanent pools. The three located middens were on flat rocky areas some three metres above the stream bed. The vegetation of the area is predominantly low karroid scrub, with mainly exotic trees and grass thickets along the main water course.

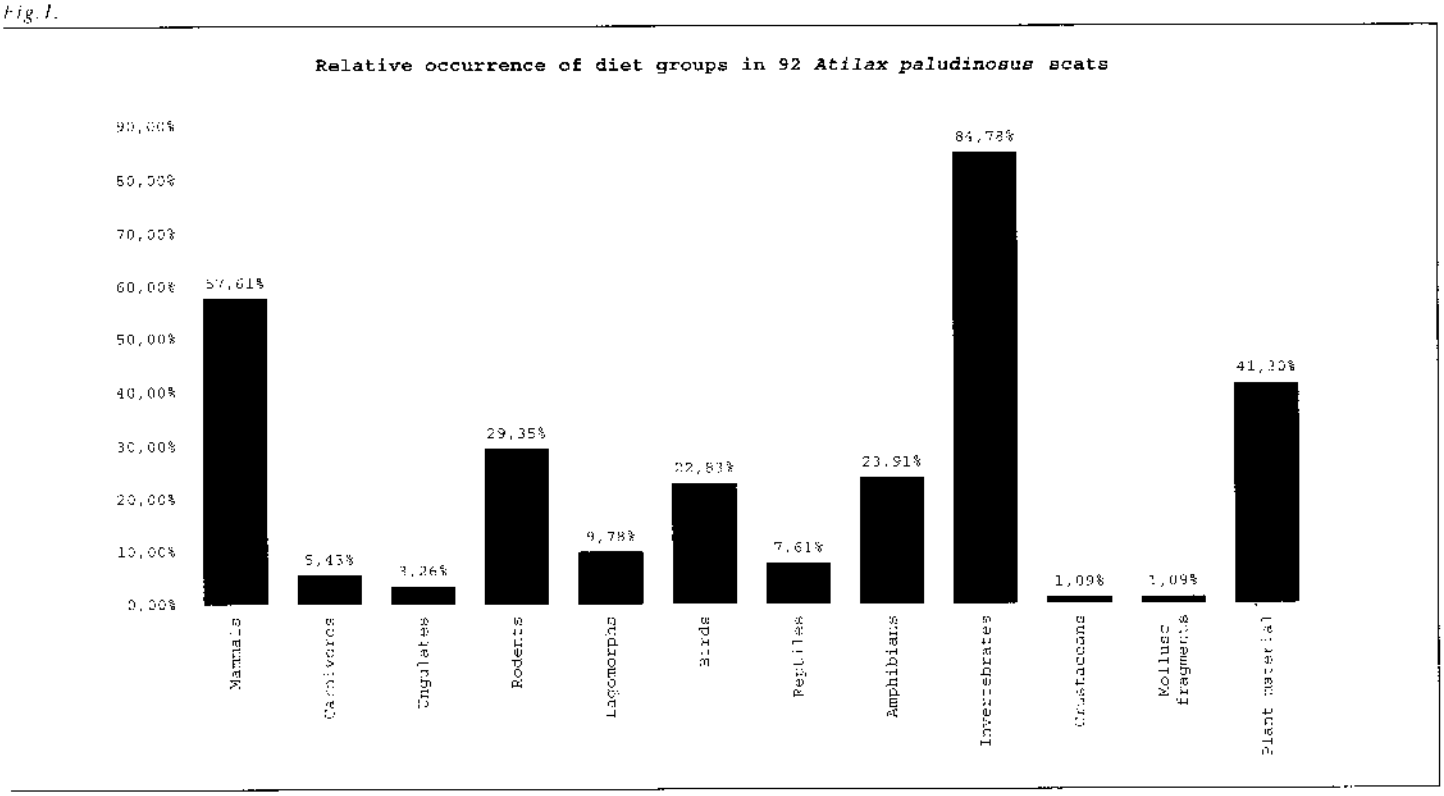
In the present study scat analysis was used to investigate the diet of the Water Mongoose in the central Great Karoo. Water Mongoose scats were collected regularly at three midden sites. A total of 92 scats were collected and processed over a total of nine months from April 2001 to April 2002. A summary of the scat contents is given in Table 1, with relative occurrence of the different diet groups in the 92 Water Mongoose scats also being presented in Fig. 1. Invertebrate remains occurred in 78 of the 92 scats. Beetle adult and larvae (Coleoptera) remains were of consistently high occurrence in all samples and ranged from a low of 52% in July and 100% in April, May and September. Termites (Isoptera), predominantly *Hodotermes*, occurred in all samples except November and ranged from a 24% to a 69% occurrence. Grasshoppers and crickets (Orthoptera) were absent in samples from four months but with a surprisingly high 80% occurrence in June. Other invertebrate remains were not of great importance.

Mammal remains, especially rodents, were second in occurrence. The most important identified rodent prey consisted of Bush Karoo Rat *Otomys unisulcatus* and the Namaqua Rock Rat *Aethomys namaquensis*. Scrub Hare *Lepus saxatilis* (Lagomorph) remains occurred in scats collected in April (24 %) and July (20%) but were absent in all other months. One scat from May contained the remains of a Smith's Red Rock Rabbit *Pronolagus rupestris*. The presence of sheep hair in scats from May and August probably represents scavenging. The carnivore material identified was dominated by Water Mongoose hair and was almost certainly a product of self-grooming. Small Grey Mongoose *Herpestes pulverulentus* hair and bones in a single scat during April was the only confirmed carnivore. It is not clear whether this was actively predated, hunted or scavenged.

Frog and toad (Amphibian) bones were present in scats from all months except July (the coldest month). The highest levels of occurrence were from September to April, when most rain falls in this region. The most abundant species in the area are *Bufo gariepensis*, *Afrana fuscigula* and *Xenopus laevis*, but bones were not identified to species level.

Reptile remains identified included hatchling Leopard Tortoises *Geochelone pardalis* in two scats, newly hatched Tent

Fig. 1.



	Absolute occurence	Relative occurrence
Mammals	53	57,61%
Carnivores	5	5,43%
Ungulates	3	3,26%
Rodents	27	29,35%
Lagomorphs	9	9,78%
Birds	21	22,83%
Reptiles	7	7,61%
Amphibians	22	23,91%
Invertebrates	78	84,78%
Crustaceans	1	1,09%
Mollusc fragments	1	1,09%
Plant material	38	41,30%

Table 1. Summary of all 92 scats - Atilax paludinosus

Tortoise *Psammobates tentorius* fragments in one sample and those of a single Helmeted Terrapin *Pelomedusa subrufa* from August. A single snake and lizard were not identified.

Plant remains occurred in a surprisingly high number of the scats (>40%), with the most important being the fruit skins and seed of the indigenous Blue Bush *Diospyros lycioides*. When fully ripe many fruits fall to the ground and become available to terrestrial foragers. The greatest presence was recorded in July (72%). Other plant remains were identified from *Lycium hirsutum*, *Tamarix ramosissima* and the seeds of the exotic Sweet Prickly Pear *Opuntia ficus-indica*. Grass was present in four of the months sampled but it is unlikely it was eaten as a food source.

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Observation of a Striped Skunk (*Mephitis mephitis*) in Yonne department, France

On Friday 10 May 2002, a naturalist walking in Cerisiers forest, Yonne, France, between La Longueraie and Les Marquets, observed and took photographs of an animal, which, after some research, proved to be a Striped Skunk *Mephitis mephitis*, a North American mustelid species.

The observation was made during the afternoon, and lasted about two hours. The animal apparently had been discovered when resting under cover. It then walked out to the observer, sniffing his stick. The skunk never seemed frightened and was followed a few meters away. It had not been seen again by the autumn of 2002.

The identification was made possible through two pictures, sent to the French mammal society (SFEPM). Phone calls with the observer's family added some precision to this unique and single observation.

There is no reason to doubt what had been reported, even though it is not possible to use the pictures to locate the site or to conform the time of observation.

The familiar behaviour of the animal is in favour of an escape from captivity. Striped Skunks are on sale in France as pets.

In 1996, a person was discovered with a small breeding group (a pair ?) of Striped Skunks and a group (a pair ?) of Northern Raccoons *Procyon lotor* in North department, in the cellar of his house and was then apparently allowed to keep them (Fournier, 2000 and Fournier *in litt.*, 2002). Despite a telephone investigation with the local veterinary services in autumn 2002, it was not possible to know if these animals were or are still there.

Striped Skunk is one of the main rabies reservoirs in North America, more important than foxes *Vulpes* in some States (Godin, 1982). Conclusions are easy to draw.

Acknowledgements

I thank Mr and Mrs Martin who sent this observation, Claire Ménissier (*La Hulotte*) who forwarded it and André Fournier who helped in finding this North department case.

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A short note on the analysis of the scats of Water Mongoose *Atilax paludinosus* and Rusty-spotted Genet *Genetta maculata* from Kasanka National Park, north-east Zambia

Chris STUART and Tilde STUART

Small samples of scats of a viverrid and an herpestid were collected from the Kasanka National Park (Central Province, Zambia). Little has been recorded on the diet of carnivores from this area. The area is dominated by rivers, lakes, swamp and seasonally inundated floodplains.

Water Mongoose *Atilax paludinosus*

Forty scats (Fig. 1) were collected at four locations within Kasanka: Wasa Camp, Luwombwa Camp, Mulembo Waterfall, and the confluence of the Musola and Kasanka Rivers. The Water Mongoose is a common species in the park.

Rodents were the only mammals identified in the scats and although many could not be identified to species level, Cane Rat *Thryonomys swinderianus* remains were present in four scats, as were multimammate mice (*Mastomys*). Amphibians in the form of frog bones were found in 24 of the scats and reptiles in eight samples. Fish scales and bones were present in three scats. At the time of collection, towards the end of the dry season, oxbow lakes and floodplain pools were rapidly drying up, and presumably allowed easier access to fish for this mongoose. Insects featured in 33 scats of which Orthoptera (28) and Coleoptera (22) were by far the most important. Freshwater gastropod (snail) shell fragments were present in nine scats.

Total number of scats = 40

CONTENTS	Absolute occurrence	Relative occurrence
Mammals	**29**	**72,50%**
Unidentified mammal hair	7	17,50%
Atilax hair	2	5,00%
Rodents	**21**	**52,50%**
Unidentified hair + bones	13	32,50%
Thryonomys hair + bones	4	10,00%
Otomys sp.hair, tooth	1	2,50%
Praomys sp.hair + bones	4	10,00%
Mus minutoides teeth	1	2,50%
Birds	**1**	**2,50%**
Feathers - weaver size	1	2,50%
Reptiles	**8**	**20,00%**
Mabuya scales + bones	4	10,00%
Snake scales	5	12,00%
Amphibians	**24**	**60,00%**
Frog bones	24	60,00%
Fish	**3**	**7,50%**
Small fish scales + bones	3	7,50%
Invertebrates	**33**	**82,50%**
Insects	**33**	**82,50%**
Beetle fragments	22	55,00%
Grasshopper + Cricket fragments	28	70,00%
Termites	2	5,00%
Molluscs	**9**	**22,50%**
Freshwater snails	9	22,50%
Plant material	**11**	**27,50%**
Grass	11	27,50%

Fig.1. Atilax paludinosus *scat analysis - Kasanka National Park - Zambia.*

Total number of scats = 18

CONTENTS	Absolute occurrence	Relative occurrence
Mammals	**18**	**100,0%**
Rodents	**18**	**100,0%**
Unidentified hair + bones	8	44,4%
Praomys (Mastomys) sp. hair, bones, teeth	6	33,3%
Praomys (Mastomys) denniae, incl. teeth	2	11,1%
Grammomys dolichurus hair, bones, teeth	1	5,6%
Otomys sp. hair	1	5,6%
Mus minutoides teeth	1	5,6%
Insectivores	**2**	**11,1%**
Crocidura sp. hair + jaw	1	5,6%
Unidentified shrew	1	5,6%
Reptiles	**1**	**5,6%**
Mabuya scales	1	5,6%
Amphibians	**6**	**33,3%**
Frog bones	6	33,3%
Invertebrates	**12**	**66,7%**
Insects	**12**	**66,7%**
Beetle fragments	2	11,1%
Grasshopper + Cricket fragments	9	50,0%
Termites	1	5,6%
Unidentified insect fragments	3	16,7%
Plant material	**7**	**38,9%**
Grass	7	38,9%

Fig.2. Genetta maculata *scat analysis - Kasanka National Park - Zambia.*

Rusty-spotted Genet *Genetta maculata*

A single sample of 18 scats (Fig. 2) was collected from a hollow in a fallen tree at one location on the bank of the Musola River. For scat identification see Stuart & Stuart (1994).

Rodent remains were present in all scats, of which four species were identified and *Mastomys* was most important. Two scats contained remains of musk shrews (*Crocidura*). Amongst the droppings at the midden site was a well chewed but complete carcass of a crociduran shrew. Amphibian bones were present in six scats. Insects wee present in 12 of the scats, of which Orthoptera (grasshoppers and crickets) with an occurrence in nine scats are the most important.

Localities of scat collection (all UTM coord., gridzone 36 L, Mapdatum ARC50):

- Wasa Camp: 2 06 110 E / 86 10 872 N
- Luwombwa Camp area: 1 86-88 E / 86 14-16 N
- Mulembo Waterfall: 2 13 722 E / 86 12 916 N
- Confluence Musola & Kasanka Rivers: 1 99 650 E / 86 07 500 N
- Fibwe Bat Forest at the bank of Musola River: 2 00 892 E / 86 07 134 N

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Patterns of activity and home range of Mountain Coati *Nasuella olivacea*

A. RODRÍGUEZ-BOLAÑOS, P. SÁNCHEZ and A. CADENA

Introduction

Animals in individuals or groups carry out their routine activities within activity ranges or territories. The nature of these areas varies greatly between species depending particularly upon the distribution of resources. Such resources may include: sleeping and/or breeding refuges, sites for foraging and migration, finding the opposite sex in the mating season, and water and food. Energy requirements may be particularly important in determining the size of the activity range (Mace *et al*, 1984).

In accordance with Pike (1984), resource requirements may vary with the time and between individuals of the same species, determining with other factors the activity range size. Information about activity range distribution is clearly important, in understanding the animals' ecology.

The relationship of an animal population within its ecosystem depends strongly upon its diet and foraging behaviour. Understanding ecological role and its influence in the animal spatial dynamics is essential for management planning with the species and its habitats. Nevertheless, for some mammals, studies in trophic ecology and of movements are hitherto nonexistent. This is the case with Mountain Coati *Nasuella olivacea*, among several other animals of high mountain areas.

Coaties are the only gregarious members of carnivorous Procyonidae (Russell, 1982). *Nasuella olivacea* is the only coati that inhabits the altitudinal range of 2,000 meters (Wilson & Reeder, 1993) and above into moorland. Their adaptations and strategies to live in habitats of such extreme conditions are not yet known.

The present study was designed to determine the characteristics of the activity range, using methods of radio telemetry, of *Nasuella olivacea* in cloud-forest in the Carpanta Biological Reservation, Colombia.

Little published information about Mountain Coati is based upon field observations. More information, based upon specimens, concerns morphology and its interpretation in an evolutionary and systematic framework (Decker, 1991). In other cases, the species is briefly characterised within general accounts of mammals of high mountains and moors. Recently, the diet has been studied, confirming that is a specialist consumer of invertebrates, with appropriate morphological adaptations (Rodríguez-Bolaños *et al*., 2000). *Nasuella olivacea* seems to present a social organization similar to coaties of the genus *Nasua* (Rodríguez-Bolaños, 1995), but this has not yet been confirmed by more detailed studies of aspects like the degree of reproductive synchronization, intra-group relationships and those with solitary males, and other aspects of sociality.

Knowledge of general natural history of coaties reflects studies in ecology (Kaufmann, 1962), reproduction (Russell, 1981, 1982) and behaviour (Gommper & Krinsley, 1992), with both the coaties of the genus *Nasua*: *N. nasua* and *N. narica*.

Fig.1. Mountain Coati Nasuella olivacea *during the radio-collaring process (under anaesthesia).*

Coati social organization is based upon groups constituted by mature females and young of both sexes. Mature males are solitary, except during the time of mating, when they may enter temporarily into groups of males and females in temporary aggregations. Outside mating seasons, males may depredate juveniles (Russell, 1981, 1982), meaning that they are driven away aggressively by the females. This is presumably a mechanism of protection of juveniles (Russell, 1981; Janzen, 1970; Newcomer & De Farcy, 1985). Alternatively, according to Smythe (1970), it may be a strategy to maximise solitary males' hunting success, while the groups forage competitively, and so partitioning resources between the sexes.

Groups of 4-25 members have been reported (Kaufmann, 1962; Gompper & Krinsley, 1992), with group size apparently varying with stage of the reproductive cycle (Russell, 1982). Groups of 200 or more members (Alvarez del Toro, 1952; mentioned by Kaufmann, 1962) are probably exceptional, perhaps reflecting superabundant food. In *Nasuella olivacea* groups vary from 6-8 individuals to more than 50.

Group activity range size of *Nasua narica* was measured as 520 hectares in Arizona, USA (Lanning, 1976) and between 34 and 45 ha in Barro Colorado Island, Panama. The mature males seem to have less fixed activity ranges reflecting proximity to currently available sources of food. With these relatively big activity ranges, coaties in North America have been described as semi-nomadic (Kaufmann *et al*., 1976).

Area of study

Location

The study area covers 1,200 ha within the Carpanta Biological Reservation, Colombia. Three-quarters of this area are covered by Andean high forest. The area is located in the department of

Cundinamarca, municipality of Junín at approximately 4°34' N, 73°41' W, in the eastern-mountain range of Colombia. Altitude ranges from 2,340 to 3,340 meters (Repizzo, 1993). Other biophysical characteristics of the study area are detailed in Rodríguez-Bolaños *et al.* (2000).

Methodology

Capture

During the first month, the study area was surveyed extensively to locate sectors with relatively higher frequencies of indirect evidences (e.g. dead remains, faeces, prints) and/or direct observations of the Mountain Coati. In such places were set seven Tomahawk traps (large and medium sizes). No prior information on appropriate baits for this species was available, so several were tested: sardines, dry fish, flour and worms, banana and proprietary cat food. These reflect the species' insectivorous diets (Rodríguez-Bolaños, 1995; Rodríguez-Bolaños *et al.*, 2000).

The traps were run every day during the field phase in January to September. They were visited once per day, and the bait was replenished every second day or when devoured by other animals. The sole capture of *Nasuella olivacea* was of a male in a trap baited with a barley-cat-food mix. The animal was taken in the trap to the cabin 'Sietecuerales' (within the Carpanta Reservation) for processing.

The animal was weighed in a canvas bag, and the dose of ketamine hydrochloride necessary to induce dissociative anesthesia was calculated and applied (Clifford, 1984; Day *et al.*, 1980; Fuentes, 1987). The coati stayed in this state during three hours, by means of successive minimum doses of 0.02 mg/kg, every 20-25 minutes. Standard measurements were taken, the sex and reproductive condition verified, and ectoparasites were gathered. A Biotrack radio transmitter (model 218 and frequency 896: Biotrack, Wareham, Dorset, England), weighing 50 grams, was harnessed round the neck (Fig. 1).

The animal was observed for one day in captivity to examine the recovery of the drug and adaptation to the collar. Then it was liberated at point of capture.

Monitoring

To capture the signal of the transmitter, fixed points reception stations) were marked every 50 meters along the roads or paths around and crossing the study area. In those favourable points, such as peaks and areas with little vegetation, reception was good (see Mech, 1983).

The UTM reference was determined for each reception station using manual field methods. These were based upon easily identifiable start points in aerial photographs and consecutively at all stations registering direction, slope and distance.

To detect signals, a receiving Wildlife model Materials TRX 1 OOOS was used with range of frequency 218999, and an antenna Yagi of three elements (Wildlife Materials Inc., Carbondale, IL 62901, USA).

The location of the transmitter was deduced from compass bearings from 3-4 directions every hour, in periods of 12 hours every day during one month.

UTM references of the reception stations were digitized via AUTOCAD. Together with data of the directions to signals, they were entered to the computer program LOCATE II (Nams. 1990) to calculate each localization of the coati. The generated file was processed in the software of Telem 88 (Koeln & Coleman, 1989).

Activity range

Activity range size and form were calculated by the minimum convex polygon method (Hayne, 1949) and with the harmonic media method (Dixon & Chapman, 1980; White & Garrott, 1990). The core area was defined as the most uniform distribution of use corresponding with the contour of 50% of the activity range (Ackerman *et al.*, 1990) based on the data of the harmonic media generated by Telem 88.

The most used areas inside the activity range were determined by calculation of the harmonic activity centre (minimum value of the distribution of the harmonic media), obtained with Telem 88. This point of maximum use is called "activity centre" (Fig.2). (Ackerman *et al.*, 1990; Dixon & Chapman, 1980).

Test of independence

Many analyses of animal movements assume that the localization of an animal at time T1 is independent of its localization at time T2. Using critical values derived empirically for the square half distance among successive observations, Schoener (see Swihart & Slade, 1985) proposed a test that evaluates the independence of

Table 1. Sizes of activity range (in ha) of a male Nasuella olivacea *in The Carpanta Biological Reservation, according to the methods of the convex polygon, Harmonic Media and Not Circular 95% (for different intervals of time).*

Months	Time Intervals	Convex Polygon	Harmonic Media	Not Circular 95%	No. of Localizations
June*	1 Hour	3.79	7.30	9.17	18
June*	1 Hour	11.29	8.89	11.47	216
August*	1 Hour	0.33	0.56	1.66	10
June**	2 Hour	3.77	7.51	10.82	12
	4 Hours	2.87	4.61	14.23	7
	24 Hours	2.44	0.68	26.44	4
July**	2 Hours	11.84	10.08	13.05	69
	4 Hours	11.72	11.33	14.44	50
	12 Hours	11.62	12.30	16.88	36
	24 Hours	4.64	6.52	11.36	17
August**	4 Hours	0.32	0.45	2.27	6
	12 Hours	0.06	-	-	4

* Original data taken in field, without modifying
** Modified data, to different intervals of time

the observations. The Schoener's ratio is used here to propose an efficient schedule of sampling that avoids pseudoreplication.

The statistical independence of the animal localizations was evaluated by means of the computer program HOME RANGE (Ackerman *et al*, 1990). Equally were obtained here, the distances stockings among localizations, the distances stockings to the arithmetic activity centre, and the graph of the characteristics of movements carried out between localizations.

Localizations separated by one hour were found to be auto-correlated. To calculate the minimum time interval between pairs of independent localizations, values of T2 / R2 were calculated for different sample sizes increasing the time interval (2, 4, 12 and 24 hours) and discarding intermediate localizations (Swihart & Slade, 1985).

Movements

To identify the pattern of the movements, the distances moved between radio-located localizations were graphed in a plotter Hewlett Packard Design Jet 650C with files generated by HOME RANGE program. The graphs showed the distances moved with time, allowing determination of times of greater or lesser activity during the period of the monitoring.

Results

Area of vital domain

A total of 244 localizations of the radio-collared animal was obtained, separated in three periods: late June, July (Fig. 2) and early August. July had the most recorded localizations, because there were only short tracking periods in June and August. Subsequent discussions are generally based upon results in July.

Sizes of the activity range, for different time intervals and number of localizations, are shown in Table 1. To compare the sizes of the activity range by means of different methods, the calculations are shown according to three different methods (minimum convex polygon, harmonic media and not circular). The method selected to report the final data is the Harmonic Media Method.

The activity range during July covered 8.89 ha with localizations related to intervals of one hour and of 11.33 ha with intervals exceeding 4 hours. The area centre (the 50% of most used activity range) covered 1.17 ha in June, 2.48 ha in July and 0.19 ha in August.

The harmonic centre of activity, defined as the place of most importance, from the point of view of the space use intensity, is shown in Fig. 2, next to the movements deployed by the coati during July.

Independence among localizations:

The Schoener's index (T2/R2) marked autocorrelation among the localizations carried out to intervals of one hour. Using time intervals of 2, 4, 12 and 24 hours respectively (Table 2), changes were observed in the Schoener's value. This showed that independence of localizations is achieved at intervals of 4 hours (at 4 hours T2/R2 = 1.57). The apparent activity range size is increased when the number of localizations is reduced (see above).

Movements

Movements inside the activity range in July are shown in Fig.2, based on all the distances travelled between localizations, every hour during the day. The medial distance travelled between localizations separated by one hour, was respectively 68 m, 67 m and 26 m in June, July and August. Fig.2 shows the pattern of the movements.

The averages of the travelled distances every hour (Fig.2) show a period of main movement between 07h00 and 10h00. In the hour preceding 08h00, the average movement was of 138 m, up to 09h00, 70 m, and up to 10h00 the average movement was 81 m. Other activity peaks were found in the hour up to noon (average 80 m travelled) and that up to the 4 pm (average 93 m travelled).

Discussion

During the study period, the radio-collared coati movements were relatively short and there seemed to be no significant exploration of new places.

The Mountain Coati in a specialist consumer of edaphic insects (Rodríguez *et al*., 2000). This resource is abundant in the floor of the Andean forests, which contains much decomposing organic matter (Salamanca & Chamorro, 1994; García & Chamorro, 1994). The great quantity of suitable insect food in these forests may mean that the animal does not need to travel big distances to find food. It is probable that the quantity of available food decreases in the dry seasons of each end of year. Because these seasonal cycles are not so marked in the tropics, as in temperate areas, it can be assumed that the resources that depend on these fluctuations may be relatively more stable. That the radio-tracking took place during the rainy season (July) doubtless partially explains the small activity range.

Reproductive rhythms might also affect the size of the activity range (Russell, 1982). Mountain Coati may primarily reproduce during the dry season (December-February), and during this period, males will need to roam to find females. In the season of the present study, the radio-collared coati did not need to mate, thereby at least partially explaining the small activity range.

Independence was achieved among the localizations, with modifications of the initial data, when eliminating intermediate data and proving intervals of more time (Swihart & Slade, 1986).

Table 2. Schoener's Index Value for different time intervals and media of the distances travelled between localizations.

Months	Time Interval	T2/R2	Medial Distance among localizations
June [1]	1 Hour	0.34	68.21
July [1]	1 Hour	0.89	66.83
August [1]	1 Hour	0.40	26.96
June [2]	2 Hours	0.47	97.52
	4 Hours	0.82	153.00
	24 Hours	2.12	289.92
July [2]	2 Hours	1.23	97.77
	4 Hours	1.57	123.10
	12 Hours	1.74	141.04
	24 Hours	1.88	145.93
August [2]	4 Hours	0.66	44.04
	24 Hours	0.94	47.25

[1] Original data without modifying (to intervals of 1 hour).
[2] Schoener's Index using adjusted data.

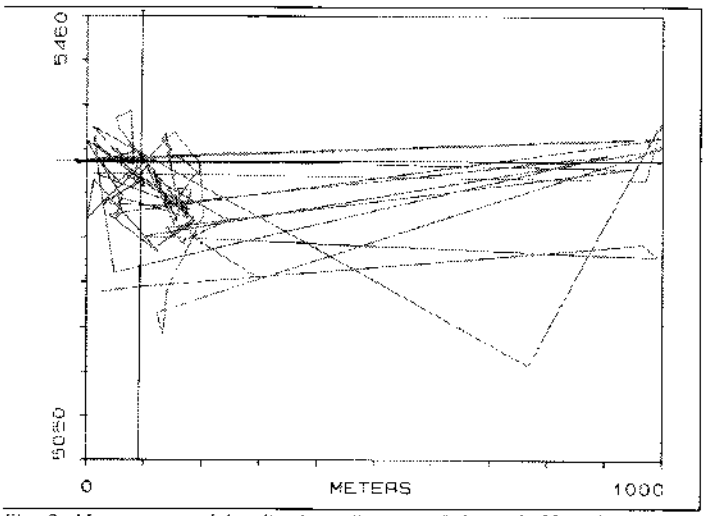

Fig. 2. Movements and localizations diagram of the male Nasuella olivacea *during July. The point marks the activity centre. The activity centre is calculated by Telem88 and is shown at the intersection of the two bold lines.*

The obtained medial distance, to intervals of four hours (123 m) is related with the intensity of use of the space of the animal. This indicates a time period of four hours as the base to design study movement patterns of male coatics in the rainy season. During the dry season, the interval can probably be shortened, because of the predicted increase in the medial distances travelled.

Observed movements define a constant and repetitive space's use pattern, an activity centre of approximately 2.48 hectares, and regular displacements of almost a kilometer toward another place that was used less frequently. This was visited especially toward the middle morning and in the afternoons. Other characteristics, like nomadism, a lack of established paths, and erratic displacements, were described for *Nasua narica*. Although such behaviour was not observed in the solitary male *Nasuella olivacea*, it may occur in groups, which seem to show different foraging strategies.

The relatively small total area of the activity range (11.33 hectares), contrasts with ranges reported for *Nasua narica* of 520 ha in Arizona (Lanning, 1976) and 34-45 ha in Barro Colorado (Kaufmann, 1976). Such great differences may also reflect differences between open habitats, like deserts and prairies of North America, and the broken forests, rugged and exuberant of vegetation of the high Colombian mountain.

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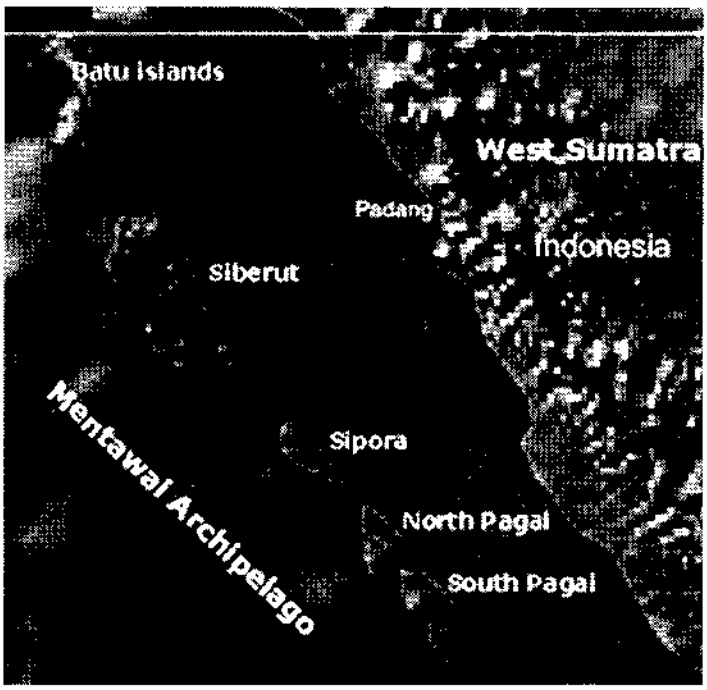
Encounter with a Siberut Palm Civet, Mentawai Islands, West Sumatra, Indonesia

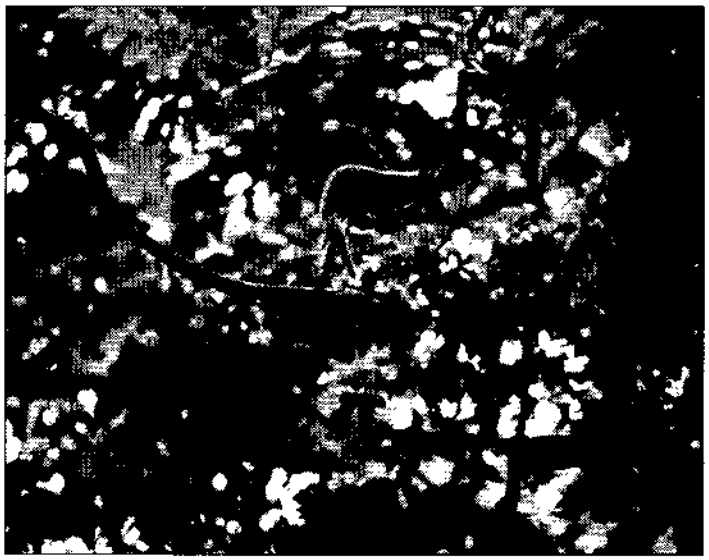
Christophe ABEGG

The Siberut Conservation Project (SCP) is composed of an international team of researchers (German Primate Centre, University of Strasbourg, Bogor Agricultural University) that was set up in 2002 with the initial financial support of the ZGAP (Zoologische Gesellschaft für Arten- und Populationsschutz).

Near the village of Pulipsoman, North Siberut, as principal investigator, I identified a field site and successfully negotiated with the local villagers (as well as with the local and central Indonesian government officials) the establishment of a permanent field station for research and conservation (see map). The objective is to study the endemic primate fauna found in the Mentawai Archipelago while helping the local economy of the villagers in a sustainable way, i.e. community-based conservation. It is hoped that villagers' traditionally owing the lands since generations, by giving their support to the research project, can successfully prevent logging companies from destroying the mammal and primate-rich Peleonan Forest of North Siberut where the SCP is based. Indeed, unlike in former times in Indonesia and especially in the Mentawai Islands, the logging companies now have to get the approval of local communities before being allowed to exploit their traditional grounds. The locals that possess the land now fully support the research and conservation project and have themselves built the field station.

In December 2002, during a stay in the lowland primary forest in the vicinity of the SCP field station, a civet was spotted at about 4 m height on a liana. Pak Tarianus, a local associate, first detected the civet and then brought me to see it, at 10.00 am. It was vocalizing like a cat before we arrived and kept doing so while looking at us. It did not run away but instead, as can be seen in the pictures, it went slowly upward first, then away at greater height. The encounter lasted about 5 minutes.

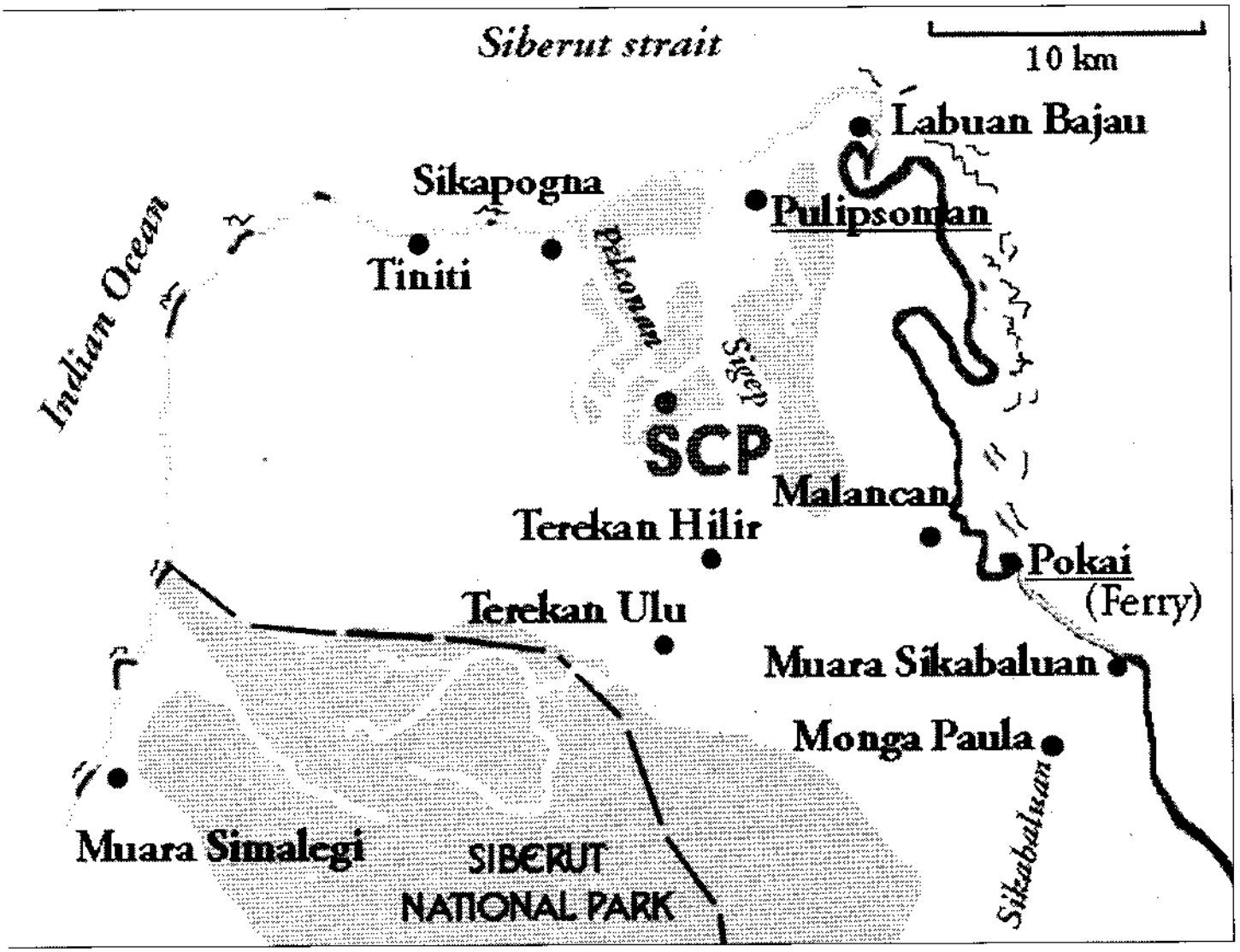




Siberut Palm Civet Paradoxurus lignicolor. *Photo: C. Abegg*

Local people say that it is not uncommon to see this animal and that it often preys on chickens around villages. The Siberut Conservation Project will try in the future to collect fecal samples. The pictures of the Siberut Palm Civet indicate a uniform reddish brown pelage coloration, thus distinct from the generally well patterned pelage of its mainland congener, the Common Palm Civet *Paradoxurus hermaphroditus*. The latter is distributed over a large area on the continental islands of Indonesia. Genetic analyses comparing samples from the Mentawai and other civet populations should help to confirm its valid species status (*Paradoxurus lignicolor*) as accepted in Schreiber *et al.* (1989) and Corbet & Hill (1992).

The future confirmation of new species among the mammalian fauna of the Mentawai Islands would not be surprising as they already contain a high number of endemic species (more than 60%). Recently, our team found that Mentawai Island macaques are paraphyletic with two full species, one on Siberut (*Macaca siberu*) and the other in Sipora and Pagai islands (*M. pagensis*). It would be of particular importance from a conservation perspective to determine to what extent other members of Mentawai mammalian fauna are well differentiated following the geographical distribution of the macaques within the archipelago. The study of the civet along with the three non-macaque primates can help to understand the complex biogeography of this region of particular interest, as its relative geographic isolation probably acted through the last million years as a refuge for many plants and animals that disappeared elsewhere due to intensified impact of glaciations in Southeast Asia (Brandon-Jones, 1996; Abegg & Thierry, 2002). Against this background, the conservation of a forested area of 4,000 hectares on Siberut Island, an area still rich with its original fauna unlike many other places that are highly used by hunters, is a priority as a part of Mentawai Islands' biodiversity hotspot. Efforts to elucidate some of the questions posed by this natural wealth are now underway in northern Siberut, led by the SCP team.



PRIMARY FOREST

SECONDARY FOREST

AGRICULTURE FIELDS

MANGROVE

CORALS

●SCP FIELD STATION

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The status of mongooses in central India

K. S. SHEKHAR

Introduction

In the last two years as part of a project to understand the status of small wild cats (Shekhar, 2002) I was travelling and working in central India and during this study I recorded the presence and absence of many species of animals which include the mongoose family.

Three species of mongoose were sighted during my study period and I tried to document every sighting (see Table). In central India people consider the mongoose sacred. Sighting a mongoose is considered to bring good luck and thought to be auspicious, so most people do not kill them.

Indian Grey Mongoose *Herpestes edwardsii*

This species was sighted throughout central India and majority of sightings occurred near human settlements. The Indian Grey Mongoose was sighted near garbage bins, garbage dumps outside human settlements, scavenging on carrion, on approach roads close to villages and towns, etc. Its sightings in dense jungle were rare and as one progressed from the human settlements towards undisturbed jungles the occurrence of the species greatly decreased.

Litters were seen during June and July. This species was most active in the early mornings and just before sunset (diurnal periods) but can apparently be sighted at any time during the day or the night. These animals are often captured and sold as pets, but evidently not at high enough levels to threaten the species.

Small Indian Mongoose *Herpestes auropunctatus*

This species was recorded in forested areas, in scrub and open habitats. Though not as common as the Indian Grey Mongoose in its range the Small Indian Mongoose is found in a variety of habitats. The sightings were more in the northern regions of central India. The species is shy and often hurried into a bush on being sighted, in contrast to the other two species. Animals of this species are also caught to be kept as pets.

Ruddy Mongoose *Herpestes smithii*

This species was found exclusively in the jungle and was never sighted near human settlements. The species is very curious

Accurate geographic coordinates could not be provided for most areas because of loss of data logbooks.

AREA	LOCATION	INDIAN GREY MONGOOSE	SMALL INDIAN MONGOOSE	RUDDY MONGOOSE
PANNA, SATNA, CHATTERPUR	Panna Tiger Reserve, Vindhya Mountains (Satna Territorial Div.) and Chatterpur Territorial Division.	Very common and often sighted close to human habitations	Common and sighted in the forests and close to human habitations	Sightings only in the forested areas. Seen solitary and in pairs. Hunts frequently in trees too.
CHAMBAL	Chambal Sanctuary, Bhind and Morena Districts.	Common	No sightings	No sightings
GUNA	24° 48' N 78° 04' E	Common	4 sightings in 3 months (Jan-March)	4 sightings in forested areas. A pair was seen scavenging on a dead cow.
SHIVPURI	Kuno Sanctuary	Common	No sighting during the study	Common in forested areas
GANDHI SAGAR SANCTUARY	In the sanctuary	Common	2 sightings in 1.5 months. One road killed specimen identified.	No sightings during the study
KANHA TIGER RESERVE	22°07' to 22°27' N 80°26' to 81°03' E	Common	No sighting recorded	Common in the forested areas
PENCH TIGER RESERVE	21°38' to 21°51'N 79°09' to 79°22'E	Common	No sighting	Frequent sightings during the study (March-April). One animal was found with a dead dove on a tree.

Ruddy Mongoose Herpestes smithii

Ruddy Mongoose Herpestes smithii

nd inevitably turned up at most of the scent stations created for ild cats (see Shektar, 2002). The Ruddy Mongoose is an excellent ree climber. It hunts in trees and carries prey into trees for feeding. It was seen resting in trees. This mongoose is an opportunistic eeder and was frequently sighted on road kills. At one site a Ruddy Mongoose and White-backed Vultures *Gyps bengalensis* were eeding together and I observed them feed on a putrefied road kill or three consecutive days. The Ruddy Mongoose is not as shy as the Small Indian Mongoose and does not flee a cautious observer. Ruddy Mongooses were seen over dead birds (doves, partridges, quails, young of many species of birds, etc.), they were seen with eptiles (rat snake), and with Long-tailed Climbing Mouse *Vandeleuria oleracea*. They are common in forests of central India.

Status

Factors that favour mongooses:

A) Fragmentation of forests in central India has proved disastrous for many wide-ranging animals like wild cats and canid species but may have benefited mongooses and other burrowing animals. Most of the jungle in the territorial areas in central India s unprotected and heavily disturbed by humans and their cattle. These areas are also fragmented and lack habitat corridors. Over the ears many species of animals which could not adapt to such shrinking forests must have dispersed or died out. The mongoose amily is one of the survivors.

B) The mongoose is considered a sacred animal by many people and is not killed, but instead tolerated, even if it kills poultry.

Factors that do not favour mongooses:

A) The Indian Grey and Small Indian Mongoose are two species that are caught and sold as pets to keep a check on unwanted rats, insects, snakes etc. There are certain nomadic hunting tribes in central India (Kanjar, Parthi) who frequently catch these species of mongoose along with their litter and tame them and sell them to villagers at a price approximately equal to 1 US$. During the process of catching the animals some of them succumb to injuries and some get torn open by the dogs that hunt along with the tribes.

B) Road kills are another main threatening factor for the species. In a period of two years I counted over 40 mongoose kills on roads of central India.

At the moment, mongooses in central India are not endangered but threats from people might rise in the future. These beautiful animals play a very important role in the food chain and their survival has to be ensured. A live mongoose is filled with activity and is a delight to watch.

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4TH INTERNATIONAL MARTES SYMPOSIUM

Introduction

The Fourth International *Martes* Symposium will take place in the historic city of Lisbon, capital of Portugal, from 20-24th July 2004. Organised by The *Martes* Working Group, sessions will be held in the Science Faculty of the University of Lisbon. The purpose of this leaflet is to advertise the Symposium and invite pre-registration and offers of papers. Further details and instructions for formal registration will be supplied in a second mailing later in 2003.

Symposium Theme

The Symposium will cover aspects of the biology, management and conservation of members of the genus *Martes*. Presentations should concentrate on the results of research on *Martes* species or can focus on interactions with other carnivore species in a community context (e.g. habitat and prey requirements). We are keen to include contributions on *Martes* species from throughout the global range of the genus, including both original and comprehensive reviews.

Language and General Format

The working language of the Symposium will be English. As in the case of previous *Martes* Symposia, proceedings will be published in a prestigious, peer-reviewed volume.

Preliminary offers of papers or posters

Individuals interested in presenting at the Symposium are invited to submit titles only at this stage. Please mail, email or fax titles of papers or posters to the local contact. Offers of abstracts will be invited in the next mailing later in 2003.

Accommodation

Bed & Breakfast accommodation will be arranged in hotels and guesthouses in Lisbon. We aim to provide options to suit a range of budgets.

Field Trips and other entertainments

A one-day field excursion will be arranged to a *Martes foina* study site in Cork Oak Woodland 100km south of Lisbon and other options will be available. We also plan to arrange opportunities to sample Portuguese culture and cuisine, including traditional Fado singing, Equestrianism and Port production.

4TH INTERNATIONAL MARTES SYMPOSIUM

1st Announcement

MARTES IN CARNIVORE COMMUNITIES

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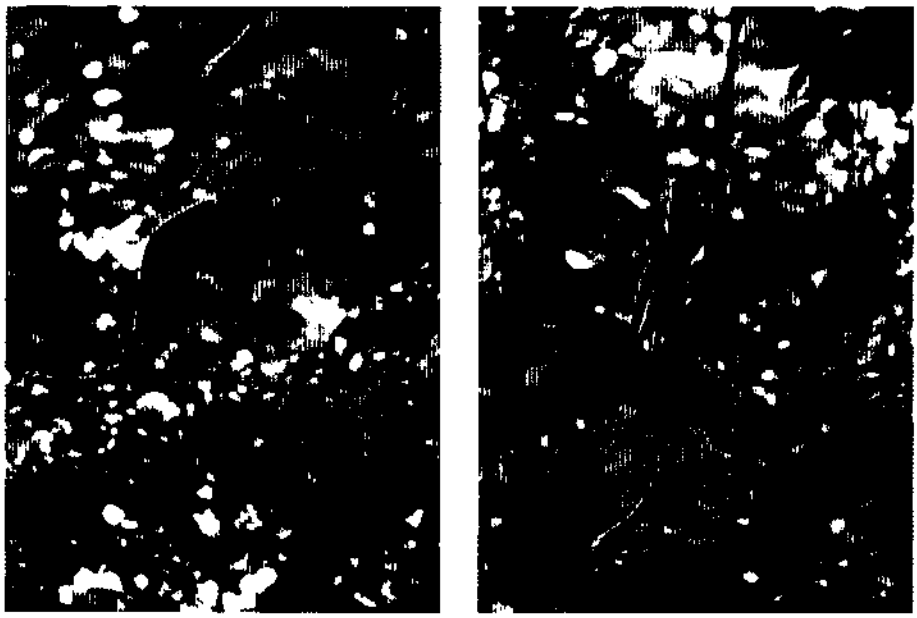

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The aim of the Newsletter is to promote communication between all interested in mustelid, viverrid and procyonid conservation and to stimulate conservation related activities for the species involved.

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