SMALL CARNIVORE CONSERVATION

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Stripe-necked Mongoose Herpestes vitticollis - *Photo: M. N. Jayakumar, IFS, ARPS, AFIAP*

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Brown-tailed Mongoose *Salanoia concolor* in the Betampona Reserve, eastern Madagascar: Photographs and an ecological comparison with Ring-tailed Mongoose *Galidia elegans*

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Abstract

Photographs of the little known Brown-tailed Mongoose *Salanoia concolor* in the Betampona Reserve, eastern Madagascar are presented. These are probably the first images of this species taken in the wild. Morphological features of *S. concolor* are described. Comparison of the behavioural ecology of this species with the sympatric Ring-tailed Mongoose *Galidia elegans*, indicates that while the two species share the same habitat and activity cycle, they have dietary differences. Evidence suggests that *S. concolor* is mainly insectivorous, while *G. elegans* is more carnivorous. Both species exhibit activity peaks in the early morning and late afternoon and show a preference for relatively intact rain forest. Observations suggest that *G. elegans* is more arboreal than *S. concolor*. Both species often forage solitarily, but live as monogamous pairs with dependent offspring.

Introduction

The Brown-tailed Mongoose *Salanoia concolor* (I. Geoffroy Saint-Hilaire, 1839) of the monotypic genus *Salanoia* (Gray, 1865) is one of the least known Malagasy mongooses (Herpestidae, Galidiinae). Albignac (1984) devotes only two short sentences to this species in his overview of Malagasy carnivores. It is reported as occurring in the eastern coastal zone of Madagascar (Albignac, 1984). The pelage is uniformly dark brown. The species is known to be diurnal and is suspected to have a diet mainly consisting of insect larvae (Albignac, 1984). *S. concolor* was recently classified as Vulnerable by IUCN red list criteria (IUCN/CBSG, 2001).

The Ring-tailed Mongoose *Galidia elegans* (I. Geoffroy Saint-Hilaire, 1837) is common and widespread in the east, north and west of Madagascar. It is represented in the east by the form *G. e. elegans*, with reddish-brown pelage and five or six darker brown rings on the tail (Albignac, 1984). The species is diurnal and eats a varied diet including rodents, small lemurs, reptiles, frogs, fish, snails, insects, worms and eggs (Albignac, 1984).

Both species are morphologically similar and exist sympatrically in the rain forest of the eastern coastal zone (Albignac, 1984; Britt, 1999).

Study Site and methods

The Betampona Reserve was first created in 1927 and became the first of the strict nature reserves (Réserve Naturelle Intégrale) established in 1966 (Andriampianina & Peyrieras, 1972). The reserve is situated between 17°15' - 17°55' S and 49°12' - 49°15' E, about 40 km north-west of the city of Toamasina on the east coast of Madagascar. Betampona covers an area of 2,228 ha with altitudes ranging from 275 - 650 m above sea level (Razokiny, 1985). Current estimates (Britt *et al.*, in press) indicate that only 50% of the reserve area remains as relatively intact forest. The climate is humid tropical. Mean annual temperature is 24°C and annual rainfall is greater than 2,500 mm. The forest at Betampona is dominated by trees of the families Lauraceae, Moraceae, Euphorbiaceae, Clusiaceae, Sapotaceae, Myrtaceae, Arecaceae, Liliaceae and Burseraceae; lianas of the families Dillenidae and Apocyanaceae; and numerous epiphytes of the families Aspleniaceae and Orchidaceae (Andrianarisata, 1995; B. R. Iambana, *pers. comm.*). The canopy height averages 20 - 25 m and is very broken, with occasional large emergents of > 30 m. The terrain is steep with numerous ridges.

Fig.1. Brown-tailed Mongoose Salanoia concolor. *Photo: V. Virkaitis.*

The sympatric occurrence of *Salanoia concolor* and *Galidia elegans* at Betampona was previously reported by Britt (1999). Observations of *S. concolor* and *G. elegans* were collected opportunistically from November 1998 to December 2001. *S. concolor* was first noted at Betampona by Ingrid Porton (St. Louis Zoo, U.S.A.) in 1998. Limited data are presented on the behaviour of both species at Betampona based upon observations by personnel of the Madagascar Fauna Group's (MFG) Project Betampona. MFG personnel were in the forest daily between 07:00 and 16:00 hrs, and on average 3 times a week an hour before dawn and an hour after dusk. Additionally occasional night walks were taken. The following variables were recorded when the species were sighted: location; time; number of individuals; age of individuals (adult or immature); activity; substrate. Locations were recorded making use of fixed markers positioned every 50 m on the trail system.

A total of 75 observations of *Salanoia concolor* were recorded. Times of observations (indicative of activity pattern), variation in group size, and comments on diet and habitat use are presented. These are compared with data from 70 observations of the sympatric *Galidia elegans*.

Results

Description

The photographs show that *Salanoia concolor* has fairly short, dark brown pelage. This is flecked with longer, light coloured guard hairs along the back and flanks. The back cover illustrates the slightly lighter collar of reddish-brown fur running from just below the ears around the throat. The fur on the ventrum is also reddish brown. The ears are relatively large and more rounded than

in *Galidia elegans*. Fig. 1 illustrates clearly the sharply pointed muzzle of *S. concolor*. The snout protrudes somewhat over the lower jaw. The muzzle is very thinly furred with short whiskers. Fur under the chin and around the mouth is whitish/grey. The tail is uniformly dark brown. The fur on the tail is much longer than on the rest of the body and can be erected when the animal is alarmed. The claws are about 1cm long and relatively straight.

In the field *Salanoia concolor* is noticeably smaller and more gracile than *Galidia elegans*. The tail of the latter is also considerably longer. Individual variation in pelage colour has been noted, such that some individuals of *S. concolor* appear the same shade of reddish-brown as *G. elegans* (although this may result from varying light conditions in the forest).

Salanoia concolor emit a variety of soft, throaty squeaks and growls while foraging, but are generally fairly silent. On sighting humans, individuals often exhibit "head-bobbing" behaviour. If alarmed they produce loud growls and move with a stiff-legged gait, erecting the tail hair. In contrast, *Galidia elegans* is very vocal, with a wide range of calls, and are often first detected by their characteristic high-pitched whistling contact calls.

Prior to this publication the only known photograph of *Salanoia concolor* in existence was of a stuffed specimen at the Field Museum of Natural History in Chicago, published in Garbutt (1999). Photographs presented were taken by Vicki Virkaitis in May 2001 at Betampona.

Activity pattern

All observations were recorded during daylight. Neither species were observed to be active at night during nocturnal fauna surveys undertaken on 20 nights between October 2001 and January 2002 nor during occasional night walks in the Reserve from 1997 to 2002.

Data presented in Fig. 2 suggest that both species exhibit peaks of activity in the early morning and late afternoon, with lower levels of activity throughout the day.

Group size and composition

Salanoia concolor is most frequently observed singly or in pairs (see Fig. 3). Groups of three were also observed - usually one animal was clearly smaller than the other two and was assumed to be an offspring of the pair. In March 1999 three adult-sized and one immature individual were observed travelling together. In November 2001 two adults, one juvenile and one infant were observed together. The same group was observed again in December 2001. On both occasions the infant was concealed in a hollow under tree roots, and not observed until the mother returned to lead it away. In July 2000 five adult sized animals were observed foraging as a group. Infants were observed from November to March. As trios were observed throughout the year it is hypothesised that offspring remain with the parents for at least a year.

Galidia elegans is also most frequently observed singly or in pairs (see Fig. 3). No more than three individuals were ever recorded together, and these were invariably a pair of adults and an offspring. Infants were observed from November to May. As groups of three individuals were noted throughout the year it is proposed that young remain with their parents for at least a year.

Habitat use

Salanoia concolor is observed most frequently in relatively intact rain forest (92.5% of observations), but is also recorded in areas of secondary vegetation and cultivated land (7.5% of observations). On three occasions individuals were observed in trees, once at 2 m foraging in a dead trunk and twice descending vertical trunks between 5 - 10 m above the ground. All other observations were on the ground. This species appears to have a preference for ridge tops, as 88.1% of observations were recorded in this habitat.

Galidia elegans was also observed most frequently in relatively intact rain forest (94.3 % of observations), but were also recorded in areas of secondary vegetation (5.7% of observations). *G. elegans* appears to be markedly more arboreal than *S. concolor*, being noted in trees during 12.8% of observations. Most detections of *G. elegans* off the ground were below 5 m, although one individual was observed moving through the canopy at around 12 m above the ground. *G. elegans* was observed to climb vertical trunks, clamber through dense masses of fine branches and lianas, and to leap between horizontal and vertical supports. This species was recorded on ridge tops during 60% of the observations.

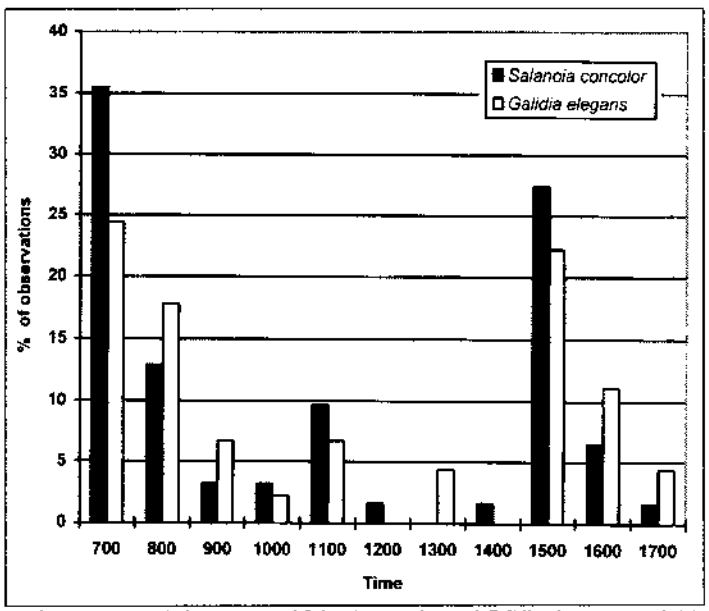

Fig.2. Percentage of observations of Salanoia concolor *and* Galidia elegans *recorded in each hour from 07.00 to 18.00 hours at Betampona.*

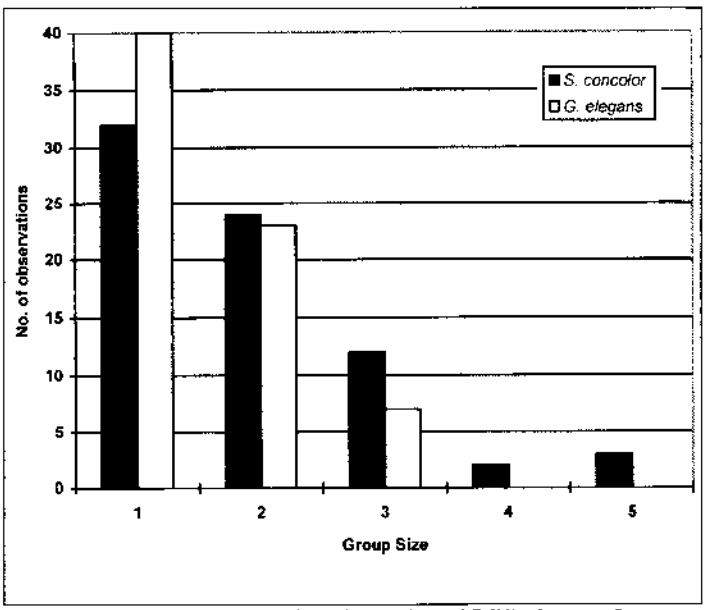

Fig.3. Observations of group sizes in Salanoia concolor *and* Galidia elegans *at Betampona.*

Diet

Salanoia concolor at Betampona have been observed feeding only on coleopteran larvae extracted from rotting wood (n = 8). Foraging in leaf litter has also been observed (n = 6), thus it seems likely that other insects are also taken.

Galidia elegans at Betampona have been observed consuming or hunting a wide variety of prey, including Woolly Lemur (*Avahi laniger*) (n = 1), a native forest rodent (*Nesomys rufus*) (n = 2), *Mantidactylus* frogs (n = 2), crabs (n = 1), and coleopteran larvae (n = 5). It is unclear whether *G. elegans* actually captured and killed the *Avahi*. A Henst's Goshawk (*Accipiter henstii*) was observed in the area, and it is suspected that the *G. elegans* stole its meal. This carnivore has also been observed attempting to capture the following bird species: *Canirallus kioloides*, *Coua caerulea*, *C. reynaudii*, and *Brachypteracias squamiger*. Arboreal activity suggests that *G. elegans* will raid birds nests for eggs or nestlings. As with *S. concolor* individuals of *G. elegans* have been observed foraging in leaf litter (n = 3), suggesting that other insects are also consumed. Both of these carnivores are reported by local villagers to take domestic poultry.

Discussion

The limited data presented suggest that while both *Salanoia concolor* and *Galidia elegans* share the same habitat and activity cycle they have dietary differences. It seems likely that *S. concolor* is mainly insectivorous, specialising in extracting insect larvae from decaying wood, while *G. elegans* is far more carnivorous and omnivorous. Certain external morphological features of *S. concolor* suggest that it is adapted for the extraction of insect larvae: the relatively long, straight claws for breaking up decaying wood and the long, narrow, protruding snout for locating larvae by scent. The evidence supports the assertion by Albignac (1984) that *S. concolor* has a similar diet to the Narrow-striped Mongoose *Mungotictis decemlineata* (A. Grandidier,1867), from the dry forests of south-west Madagascar.

The two species do also appear to differ in use of the rain forest habitat, with *Galidia elegans* being more active in the canopy, while *Salanoia concolor* is more terrestrial in its activities. *S. concolor* was predominantly observed along ridge tops, while *G. elegans*, although most commonly sighted along ridge tops, was also often sighted on mid-slopes and in valley bottoms.

Both species appear to prefer to forage alone, but likely live in pairs with dependent offspring. Albignac (1984) reports *Galidia elegans* living in family groups of 3, 4 or more. At Betampona no more than 3 individuals were observed together, although on three occasions larger groups of *Salanoia concolor* was recorded. *S. concolor* infants are born between November and January, as has been recorded for *G. elegans* (Albignac, 1984). If *S. concolor* shares a similar gestation period with *G. elegans* (74 - 90 days, Albignac, 1984), mating would be expected to occur from August to October.

Both species are estimated to exist in reasonable numbers at Betampona, and it is likely that populations can be self-sustaining. Subjectively it appears that *Salanoia concolor* is the commoner of the two species at Betampona. Certainly both species are adapted to live in largely intact rain forest. Betampona, as the last sizeable remnant of lowland forest in the area, thus provides an important refuge for both these species.

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Current and historical distribution of European Mink *Mustela lutreola* in Biscay. Evolution and comments on the results

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Abstract

First records of European Mink in Biscay date back to 1963, since then its distribution had no important changes. Recently, a European Mink survey has been carried out in the Basque Country using line-triggered camera systems. Results suggest a reduction of the distribution in Biscay; however, this seems to be an artefact due to different performances of European Mink detection techniques. We give a more accurate distribution for the species and we stress the need for a systematised methodology for European mink surveys.

Introduction

The European Mink *Mustela lutreola* is a riparian mustelid native to the continent. Its distribution experienced a severe regression during the second half of the 20th century and disappeared from most countries (Youngman, 1982; Maran & Henttonen, 1985; Maran *et al.*, 1998a). As a result of this decline, nowadays there are two major populational nuclei: one in the East, (Maran & Henttonen, 1985; Tumanov, 1992), and another in the West. The eastern population is still in regression (Maran & Henttonen, 1985; Maran *et al.*, 1998b); mink has disappeared from some countries in recent decades, and it continues declining in areas where it is still present (Maran & Henttonen, 1985; Maran *et al.* 1998b; Romanowski, 1990).

With the western population, the situation is different. In the north, the French population has disappeared from Brittany and Pays de Loire in 20 years, between 1977 and 1997 (Lodé *et al.*, 2001). On the other hand, in the Iberian Peninsula the situation is intriguing since the species seems to be expanding southwards (Maran & Henttonen, 1985; Palazón & Ruiz-Olmo, 1992; Torres & Zuberogoitia, 1997). Recently, a survey was carried out in the whole Iberian area occupied by the European Mink, including Biscay. In this paper we discuss the results of this survey for Biscay, we add some other locations, present past data on the distribution of European Mink in the area and we discuss the current distribution and its historical evolution.

Study area

Biscay, in the north of the Iberian Peninsula (Fig.1), has an area of 2,236 km^2 and a population of near 1,200,000 people. Altitudes range from 0 (by the sea shore) to 1,475 m (Gorbea peak). The climate is oceanic, annual rainfall ranges between 1,200 and 2,200 mm, and annual average temperatures range from 13.8ºC to 22ºC. (Flores, 1989). Winters are mild and there is no summer drought. Streams are short, small and fast flowing, running into the Bay of Biscay. All the major rivers, with the sole exception of the Butroe River (Fig 1), are polluted, specially the Nerbioi and Ibaizabal Rivers (Department of Environment and Land Ordination, 2001). Springs, tributaries and small coastal streams show in general acceptable water conditions, however some of them are also polluted, especially those of Nerbioi and Ibaizabal Rivers near the main population nuclei (Department of Environment and Land Ordination, 2001). Best water conditions are in small Rivers in the Artibai-Oka area and westwards of the Kadagua river (Department of Environment and Land Ordination, 2001).

Results

European Mink was first reported in Biscay in 1963 (Rodiguez de Ondarra, 1963), a few years after the first record of the species in the Iberian Peninsula (Rodriguez de Ondarra, 1955). Afterwards, persistence of mink in the Biscay area has been confirmed in several works (Castién & Mendiola, 1985; Palazón & Ruiz-Olmo, 1997; Aihartza *et al.*, 1999; Zuberogoitia *et al.*, 2001) including the last survey carried out from February 1999 to December 2000 (Gonzalez-Esteban *et al.*, 2001; Palazón *et al.*, 2002). The species reached Biscay from Gipuzkoa in the East, and by the time of its first report it had arrived in the northwest of the region, east of the Nerbioi river (Rodiguez de Ondarra, 1963). Castién & Mendiola (1985) reported European Mink to be present in five 10 x 10 km UTM squares, including the two already reported by Rodriguez de Ondarra (1963). In 1997 after an extensive study, Palazón & Ruiz-Olmo (1997) cited European Mink in 13 10 x 10 km UTM squares, two of them based on bibliographic data before 1980 and another one reported before 1980 and confirmed afterwards (Palazón & Ruiz-Olmo, 1997). Locations recorded spread over

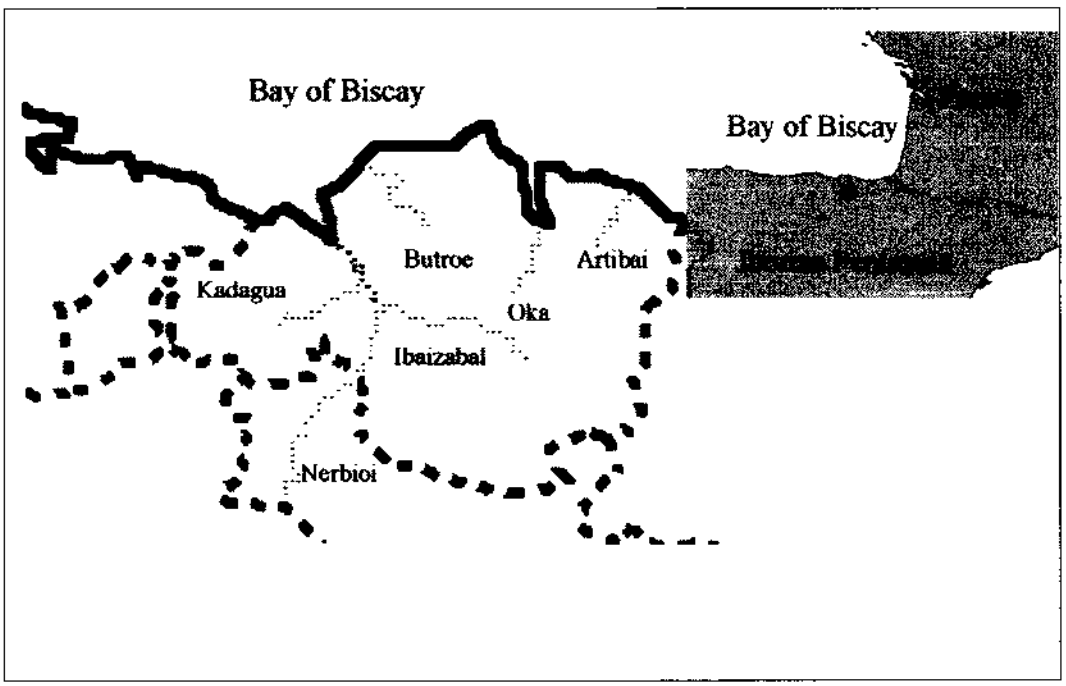

Fig. 1. Map of the study area. Biscay and major rivers in the region.

the catchments of the Rivers Ibaizabal, Oka, Artibai and Butroe, and also some other minor rivers (Palazón & Ruiz-Olmo, 1997). In addition, they reported two bibliographical (before 1980) locations in a tributary of the Nerbioi and another one in the Nerbioi (after 1980), but none westwards of this river. Aihartza *et al.* (1999), as the result of field surveys carried out between 1990 and 1996, reported European Mink in ten 10 x 10 km squares, including two new squares and the first location westwards of the Nerbioi River. Zuberogoitia *et al.* (2001) cited the species as present in most of the region, but more common in the oriental area. They also include new data westwards of the Nerbioi near the western edge of the region. Finally in the last survey carried out from February 1999 to December 2000, Gonzalez-Esteban *et al.* (2001) located a total of eight European Mink in five different 10 x 10 km UTM squares. Four of these locations are in the Artibai catchment, one in the Lea (a smaller river between Artibai and Oka), two in the Oka catchment and the last one in the Ibaizabal catchment (Gonzalez-Esteban *et al.*, 2001; Palazón *et al.*, 2002). The authors concluded that the European Mink maintains populations in the area of the Artibai and Oka rivers, and they also remarked the fact that European Mink is absent from western Biscay, where the rivers are best preserved (Gonzalez-Esteban *et al.*, 2001).

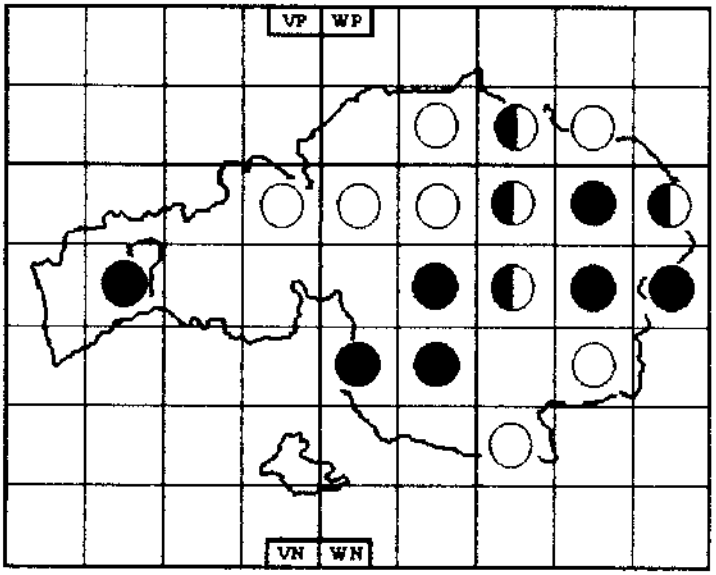

Fig. 2. Distribution of European Mink in Biscay. Empty circles indicate bibliographic data, full circles indicate presence detected in the last three years, and divided circles indicate both bibliographic data and presence detected in the last three years.

Discussion

At first sight, it seems that the European Mink spread rapidly over eastern and central Biscay after its arrival and maintained this distribution for a long period of time, without colonising the area westwards of the Nerbioi River. By the late 1990s there are two records of European Mink westwards of the Nerbioi (Aihartza *et al.*, 1999; Zuberogoitia *et al.*, 2001), but permanent colonisation of the area has not been confirmed. The last survey, carried out by Gonzalez-Esteban *et al.* (2001), suggests a reduction of the distribution of European Mink, with the species confined to the north-east area. However, as stated by Gonzalez-Esteban *et al.* (2001), there are some methodological differences that prevent unconditional comparison among works.

Firstly, works of Castién & Mendiola (1985) and Palazón & Ruíz-Olmo (1997) are partially based on bibliographic data, dating back as far as 1963 (22 and 34 years respectively). By including information from many years, they risk artificially enlarging the actual distribution of the species.

Secondly, data for Biscay given by Palazón & Ruíz-Olmo (1997) and Aihartza *et al.* (1999) are not the result of a survey for European Mink with a specific methodology, but based on different sources such as: live-trapping data, track searches, torching, enquiries and road casualties and casual observations. Thus, they are liable to fail to detect mink in remote areas and areas of low human density.

Thirdly, the last survey carried out by Gonzalez-Esteban *et al.* (2001), was conducted using photographic bait stations, more concretely the Line-Triggered Camera System described by Zielinski & Kucera (1995). There are some remarks that one should bear in mind about this method: Firstly, that some studies found that this method has a lower performance than other methods when detecting carnivores (Zielinski & Kucera, 1995). Indeed, Gonzalez-Esteban *et al.* (2001) failed to detect European Mink in areas where there were data of road kills, the species had been sighted and in a stream where European Mink was being studied at that time (Zuberogoitia *et al.*, 2001; Garin *et al.*, 2002a,b). Moreover, Gonzalez-Esteban *et al.*, (2001) used the same method in order to detect European Mink in Araba, a region adjacent to Biscay where simultaneously a live-trapping study was being carried out. They failed to detect the species in 14 squares where the live trapping method did (Gonzalez-Esteban *et al.*, 2001; Palazón *et al.*, 2002). On the other hand, they detected mink in a square where live trapping did not (Gonzalez-Esteban *et al.*, 2001; Palazón *et al.*, 2002). However, despite its lower performance, the method used by Gonzalez-Esteban *et al.* (2001) has several advantages like being cheaper and non-intrusive with the species. Moreover, it lacks some deleterious effects that live-trapping may have (Zabala *et al.*, 2001)

Finally, most studies have been conducted over long periods of time (a whole year or more), whilst small carnivores, including mink, have different degrees of activity and displacements throughout the year. They are likely to be more attracted to bait in some seasons and their trappability also changes markedly throughout the year (Brzezinski *et al.*, 1992; Zielinski & Kucera, 1995; Zabala *et al.*, 2001). Moreover, overall trapping success is related to trapping effort (McDonald & Harris, 1999); therefore, some distributional studies, specially those based on trapping that do not include data from other sources, and/or have low trapping efforts are not reliable and probably only will reliably detect target species in areas with high densities.

In our opinion, the results of the last European Mink survey in Biscay underrepresented the distribution of the species. Based on the results of the recent surveys, scientific research publications, road kills and sightings of the species, we give a more accurate distribution for the species in Biscay (Fig. 2).

As observed in Fig. 2, European Mink in Biscay occupies almost the entire province, including several areas were it was not detected in the surveys. The current distribution is quite close to that reported in older works (Castién & Mendiola, 1985; Palazón & Ruiz-Olmo, 1997; Aihartza *et al.*, 1999). A possible difference might be the colonisation of the area westwards of the Nerbioi River, where mink has been absent for many years. Indeed, besides data on two road kills (Zuberogoitia *et al.*, 2001), there are data on mink in streams south of the area (Palazón *et al.*, 2002). Small distributional changes observed in previous works are more likely to be due to different sampling efforts than to a changing distribution pattern with continuous colonisation and extinctions in some areas.

The main conclusion is the need of a reliable and common (for all the regions) methodology to detect European Mink. Indeed, using different methods results in incomparable data and inefficient effort. In our opinion, a deep study is needed in order to develop a standardized technique, which should fulfil some basic requirements. An easy, cheap and, most important, harmless and reliable technique is needed.

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REQUEST FOR INFORMATION ON MUSTELIDS: FOLKLORE, MYTHOLOGY AND BELIEFS.

For a work on ethnobiology, I would greatly appreciate any information on local beliefs and uses related to mustelids, such as the use of badger fat as medicine or the belief that weasels can kill people as a revenge if disturbed.

Any type of reference from all around the world is welcome, but published data and especially from Europe are preferred. Please send data to:

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Thank you very much.

Do European Mink use only rivers or do they also use other habitats?

Iñigo ZUBEROGOITIA and Javier ZABALA

European Mink *Mustela lutreola* has been defined as a semi-aquatic mustelid linked to aquatic ecosystems (Youngman, 1982). Afterwards, several works on its ecology involving radio-telemetric studies bore out this statement (Palazón & Ruiz-Olmo, 1997; Maizeret *et al.*, 1998; Sidorovich *et al.*, 2000; Garin *et al.*, 2002a,b; Zabala & Zuberogoitia, 2003; Zabala *et al.*, 2003). Indeed, radio-tracking studies have shown a very close relation between European Mink and aquatic habitats (Palazón & Ruiz-Olmo, 1998; Garin *et al.*, 2002a; Zabala & Zuberogoitia, 2003; Zabala *et al.*, 2003).

However, it is possible to find indirect data about the use of non-aquatic habitats. Road kills are claimed to be the main mortality factor in the Spanish Mediterranean area (Palazon & Ruiz-Olmo, 1997) as well as it is in the neighbouring French area (Maizeret *et al.*, 1998). In this way, Palazón *et al.* (1997) report dead minks on roads far away from rivers. Moreover, during a study on distribution of carnivores in Biscay Aihartza *et al.* (1999) found three out of fourteen European Mink records (21,1%) to be a long way away from the nearest river (more than 1 km). Both arguments suggest that European Mink may leave river basins but do not show how often this event occurs. Similar behaviour has been already reported for other semi-aquatic species, which do so in order to increase their hunting territories, to establish their dens or to seek new areas (i.e. otter *Lutra* see Kruuk, 1995; American Mink *Mustela vison* see Dunstone, 1993; Lodé, 1993; Niemimaa, 1995; Ferreras & MacDonald, 1999). The high number of road kills and casual sightings of European Mink far from rivers suggest that this takes place very often, whilst radio-tracking data contradict this hypothesis.

During a radio-tracking study of eight European Mink we gathered 1,092 locations, 406 of them belonging to active points and 686 to inactive points (nocturnal and diurnal resting sites). Five mink were never found out of streams or marshes. The other three (all of them males), were located at least once out of aquatic habitats, but always within 100 metres of the river. Altogether, minks were found out of aquatic habitats 10 times (2.46%) during activity and five times resting (0.84%). Out of the 10 times that minks were found out of streams, once is supposed to have been a short cut from a stream to the main river; and the other nine times, the mink presumably went out to forage (two locations were found in a chicken farm 30 m from a river). The conclusion that can be drawn from these results is that territorial minks use almost exclusively aquatic habitats, according with data reported by Palazón & Ruiz-Olmo (1997). However, the high number of road kills remains surprising. Therefore, either mink use non-aquatic habitats more often than reported, or studied mink are not representative of the whole population.

In our study area mink home ranges were almost exclusive with low overlap, and though intensively trapped (see Zabala *et al.*, 2001) no other mink but tracked individuals were found inside the home ranges (Garin *et al.*, 2002a). Besides, after the disappearance of a male, it was replaced by another one (a mature male) that came to occupy almost the same home range (Garin *et al.*, 2002a). This rapid substitution suggests the existence of a floating population somewhere. Moreover, several studies have, hitherto, reported exclusivity of home ranges within sexes (Sidorovich, 2000; Garin *et al.*, 2002a) and in some cases there are clues of territoriality (Garin *et al.*, 2002a, Zabala & Zuberogoitia, 2003). On the other hand, Sidorovich *et al.* (2000) reported that when European Mink was attacked by American Mink, the former usually left the stream area and sheltered for up to 22 hours in habitats unusual for this species, such as forest or fields. In addition, behavioural experiments conducted in captivity showed that while the most common interaction between European Minks was an approach (40 % of the cases), there were also aggressive behaviours, defensive threats, escapes and chases between them (in total 60 % of the cases) (Maran *et al.*, 1998; Macdonald *et al.*, 2002). In the same way, it is very likely that outcast minks (young, weak or old individuals) are pushed by dominant European Minks out of main streams, to marginal streams or springs, and probably even out of aquatic habitats. Probably outcast minks move continuously seeking for new territories, waiting for a chance to occupy a vacant one, or to escape from territorial conflicts with conspecifics or American Minks. This would explain the rapid substitution of an adult male by another one after the disappearance of the former, our fail to detect more mink inside the home ranges (territories) of studied mink (Garin *et al.*, 2002a) and also the high number of road kills and observations of European Mink far from aquatic habitats. This would also imply the existence of a floating population of European Mink, that has not yet been studied. Further study on this topic is needed.

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Is the European Mink *Mustela lutreola* a longstanding member of the Iberian fauna or a mid-twentieth-century arrival?

Jabi ZABALA[1] and Iñigo ZUBEROGOITIA[2]

Since the first report, in 1951 (Rodríguez de Ondarra, 1955), of European mink *Mustela lutreola* in the Iberian Peninsula there have been two hypotheses in order to explain the lack of data before 1951. The first suggested that European Mink had just recently reached Iberia, whilst the second proposed that it is an ancient, but overlooked, member of the Iberian fauna. Most authors supported the first hypothesis (Rodríguez de Ondarra, 1955; Youngman, 1982; Senosiain & Donazar, 1983; Illana, 1994: Aihartza *et al*,.1999). However, recently, in relation with a paper dealing with the distribution of European mink in the Iberian Peninsula, both referees observed that there is still no answer for the question in the title of this paper. Therefore, we would like to make here some comments on this point, and try to clarify it.

As is widely known, the first data of European Mink in the peninsula date back to Rodríguez de Ondarra (1955), who describes mink (*Putorius lutreola* in his work) captured in 1951 (one animal) and 1952 (two) in Gipuzkoa. Two were caught in Tolosa, and the third in Villabona (Rodríguez de Ondarra, 1955). Both villages lie in eastern Gipuzkoa. Before this there are no data on the species in the Iberian Peninsula: no data in (the scarce) scientific literature; no animals in taxidermists' collections; no knowledge among trappers; no road kills; and no observations of river-dwelling mustelids (Rodríguez de Ondarra, 1955; Castién & Mendiola, 1985; Aihartza *et al*., 1999). Since then, there have been numerous records of European Mink in Iberia: one in 1951, three in 1952, three in 1954, two in 1956, one in 1958, one in 1959, one in 1962, and three more mink captured at an unknown date (Rodríguez de Ondarra, 1963), and so on. Most of these mink were captured (presumably by farmers) and several of them stuffed. Afterwards, road kills and sightings have both become important data sources (Arambarri *et al*., 1997), especially in densely populated areas (like Biscay or Gipuzkoa) where these methods have detected the species in areas where photographic devices and live trapping failed to do so (Zabala & Zuberogoitia, 2003). Finally, our personal field experience showed us that in areas where European Mink is present locals (at least some of them) notice them; we also met some European mink watchers, especially in medium populated villages.

It can be argued that the lack of data before 1951 does not prove the absence of mink, as, indeed, negative or absence data can never be considered sure. However, as stated by Youngman (1982), commercially valuable furbearers are among the first species to be recognised by local hunters, trappers and naturalists. In Iberia, both naturalists and taxidermists were surprised with the first European Mink individual,because they had not seen the animal before. They did not know what species it was, even though they knew all the other mustelids of the region (Rodríguez de Ondarra, 1955; Elosegi, *pers. comm.*). Twenty years latter, Senosiain & Donazar (1983) reported that trappers from Navarra also claimed not to know the species when they first captured European Mink. Because trapping (without scientific purpose) was more common in the past, we should expect European Mink to be known, if they were present. The prior lack of road kills also suggests an earlier absence, although this could be due to the lower degree of road traffic in the past. In the same way the lack of stuffed animals, or cranial samples in museums and particular collections (well documented now) strongly bears out the hypothesis of mink absent from the area before 1951 (Rodríguez de Ondarra, 1955; Belamendia, 2001). There is little old material from the area available for study nowadays, and some collections date only back to the 1990s (Belamendia, 2001). However, the distribution of data in both time and space is really suggestive, because the first Iberian data are from near the French border, just after a period of high mink population density in France judging from the large amount of specimens from France deposited in museums during the 1940s

(Youngman, 1982). In the next year, 1952, mink is found in an area near Araba, and by 1958 in the border area between Gipuzkoa and Biscay. Unfortunately, Rodríguez de Ondarra (1963) gave no date for the mink found little more westwards in Biscay. However, overall this pattern suggests colonisation from the border south and westwards.

Rodríguez de Ondarra (1963) described as "captured" every mink found until 1963. But for the first three he gave more detail in Rodríguez de Ondarra (1955): two were killed (one by a hunter and another one by children when they saw it swimming), and the third one was captured, probably because it was causing damage to household poultry. Therefore, these first records, obtained almost simultaneously, were not a result of scientific investigation. Indeed, the same is probably true of all data obtained until the late 1980s. Therefore, even if heightened scientific interest has yielded a considerable amount of data in the area during the last decade, it cannot have been the reason underlying records of European Mink between 1951 and the late 1980s.

In conclusion, the hypothesis that the European Mink has always been part of the Iberian fauna, but was only discovered last century through increased research, is not supported by any data. Indeed, every circumstantial line of reasoning suggests colonisation of the Peninsula shortly before 1951, as stated by most authors (Rodríguez de Ondarra, 1955; Youngman, 1982; Senosiain & Donazar, 1983; Illana, 1994; Aihartza *et al.*, 1999).

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Records of small carnivores from Mount Kinabalu, Sabah, Borneo

Vladimir DINETS

In October 2002, during 36 hours of spotlighting in the vicinity of Gunung Kinabalu National Park headquarters, two species of carnivores were observed.

On October 15, at approximately 03:00, a Hose's Civet *Diplogale hosei* was sighted along Mempening Trail at about 1,700 m elevation, in hilltop montane broadleaf forest, during a dark rainy night. It was first located by its eye-shine with a small flashlight, and then was seen better with a larger one. The animal was apparently curious about the light and approached the observer closely (to as little as 5 m). It walked parallel to the trail but did not use it. Its movements and reaction to light closely resembled Banded Civet *Hemigalus derbyanus*, a related lowland species, which the author had a chance to observe a few days later in a riparian forest along Kinabatangan River, Sabah. Unfortunately, although Banded Civet could be videotaped at night at the same distance, the dark overall coloration of Hose's Civet made it impossible to obtain any video footage of useable quality. Both species have mostly white eye-shine, brighter than all other non-aquatic civet species of Borneo, except for Banded Linsang *Prionodon linsang*.

On October 16, the author discovered that a small roadside garbage dump along the Power Station Road (just below the power station, located at 1,950 m elevation in montane broadleaf forest) was attracting various species of squirrels, treeshrews, and birds. The dump was revisited at approximately 01:00 on October 17. The weather that night was mostly clear with bright moonshine, but the dump was in the shadow. It was attended by nocturnal Pen-tailed Treeshrews *Ptilocercus lowii* and one Kinabalu Ferret Badger *Melogale everetti*. The ferret badger was very shy; it was not seen during the initial approach, and appeared only half an hour later. It was briefly seen through the video camera from across the road, at a distance of about 15 m, and ran away as soon as the small flashlight was turned on to make videotaping possible. The animal had weak reddish eye-shine; it resembled a very large short-tailed treeshrew in overall shape, movements and agility, but could be easily identified by its facial markings.

Elevations provided as in Wheatley, N. 1996. *Where to watch birds in Asia*. Princeton University Press, Princeton, USA.

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Feeding ecology of the Common Palm Civet *Paradoxurus hermaphroditus* (Pallas) in semi-urban habitats in Trivandrum, India

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Introduction

The Common Palm Civet, *Paradoxurus hermaphroditus* (Pallas) or Toddy Cat as it is commonly called is strictly nocturnal; resting by day on trees or in thick underbrush. They live in a wide variety of habitats ranging from wilderness to the vicinity of human settlements. They also seek refuge in man-made structures such as pipes, wooden ceilings, dry drains and outhouses.

Scat analysis is used as a tool to study the feeding ecology of animals (Livet & Roeder, 1987; Virgos *et al.*, 1996; Virgos & Casanovas, 1997) so as to make out carnivore habitat selection (Rice, 1986; Kendall *et al.*, 1992; Clevenger, 1994).The palm civets are commonly known to eat fruit (Wemmer & Watling, 1986; Rabinowitz, 1991). They are pests of fruit crops, cocoa pods and coffee pods (Veenakumari *et al.*, 1996; Lee, 1996) and are good seed-dispersal agents (Joshi *et al.*, 1995; Corlett, 1996; Ganesh *et al.*, 1998). Palm civets also feed on small animals such as insects, grubs, centipedes, millipedes, lizards, mice, rats, shrews, and gerbils (Prater, 1971; Wemmer & Watling, 1986; Rabinowitz, 1991; Joshi *et al.*, 1995). They are also fond of palm juice or 'toddy' and hence the name 'toddy cat'. The present investigation was designed to analyze the feeding ecology of the Common Palm Civet in some semi-urban areas in Trivandrum.

Methods

Scats of *Paradoxurus hermaphroditus* were collected from two semi-urban habitats of Trivandrum (08°29'N, 76°59'E), India *viz.*, Kaudiar and Kariavattom for the period October 2000 to September 2001.

Laboratory analyses of the scats were carried out following the procedures of Corbett (1989) and Reynolds & Aebischer (1991). The remains were identified using diagnostic features like colour and smell of the scat. Keys and other reference collections were used to identify the undigested remains such as seeds, hair, bones, feathers and teeth.

The following criteria were used to identify scats: they were regularly found at the same location and always contained undigested plant or animal matter. Scats were elongate, measuring 5-8 cm in length. The contents when composed of fruits could be identified by its smell alone as the faeces had a fruity smell. The colour was similar to that of the pulp and the skin of the fruits consumed. Undigested, intact seeds were also obtained from the scats. Only the fleshy exocarp and/or the mesocarp were sloughed off, loosened or completely macerated. Usually, the scats contained parts of only one type of fruit. When animal matter had been consumed, bits of bones and hair of the prey were seen in the scat. Fresh faeces usually smelt of blood. Consumed insects were indicated by the chitinous exoskeleton in the scats.

The results are presented as the percentage frequency of occurrence (number of scats with the particular item/total number of scats x 100) (Table 1). A χ^2 test was done to indicate the preference of fruits over animal matter.

The food acceptability by palm civets was noted by presenting different types of food (fruits and animal matter) to seven palm civets captured from the wild using large wooden traps (size 1.5 m x 1.5 m x 1.5 m). They were maintained in an open area enclosure of 3.5 m x 3 m x 2 m with a fence made of galvanized pipes and 25 mm x 25 mm link mesh.

Results

Of the total 75 scats collected, 39 were obtained from the study area at Kaudiar and 36 from the study area at Kariavattom. They were obtained from specific spots *viz.*, on wooden logs, near water bodies and on terraces of buildings and wooden ceilings of a tiled house.

Fruit matter was found in 82% of the scats collected from Kaudiar (Table 1). Of these, the highest frequency of occurrence was the fruit of papaya, *Carica papaya* (23%). Animal matter was present in 18% of the scats. Scats containing bone pieces, blood and hair constituted 10% (rats, *Rattus rattus* – 8% and mice, *Mus musculus* –3%). The rest contained insects likes cockroaches (3%) and beetles (5%).

Eighty-three percent of the scat samples collected from Kariavattom contained fruit matter (Table 1). Here also, the highest frequency of occurrence was of *Carica papaya* (22%). Animal matter was present in 17% of the scats. The remains of Gerbil, *Tatera indica* was found in 3%, Rat, *Rattus rattus* in 6%, and insects in 8%. In one of the scats, the crushed shell of a hen's egg was found along with the pulp and seeds of Custard Apple, *Anona squamosa* and in another scat a tuft of grass along with the pulp and seeds of Guava, *Psidium guajava*.

Though fruits from Rose Apple Tree, *Jambosa vulgaris* and Lemon, *Citrus aurantifolia* were abundant at the location where

Fruiting tree	Common name	Family	Season of fruiting	Percentage of occurrence of the fruit parts in scat	
				Kaudiar	Kariavattom
Ananas comosus	Pineapple	Bromeliaceae	June-August	5.13	–
Anona squamosa	Custard apple	Anonaceae	April-July	10.26	16.67
Areca catechu	Arecanut	Arecaceae	October-February	2.56	–
Artocarpus heterophyllus	Jackfruit	Moraceae	January-December	7.69	5.56
Artocarpus hirsutus	Jungle jackfruit	Moraceae	May-June	10.26	–
Carica papaya	Papaya	Caricaceae	January-December	23.08	22.22
Hydnocarpus laurifolia	Marothi	Flacourtiaceae	October-December	–	5.56
Mangifera indica	Mango	Anacardiacea	May-June	7.69	5.56
Musa paradisiaca	Banana	Scitaminaeae	January-December	–	13.89
Psidium guajava	Guava	Myrtaceae	May-July	15.38	13.89

Table 1. Percentage of occurrence of each fruit in the scats obtained from two study areas.

the scats were collected at Kaudiar, no scats containing these fruits were obtained. Similarly, at Kariavattom the fruits of the Cashew tree, *Anacardium occidentale* were seen in abundance but no scat containing this fruit was obtained. The scat samples collected from both sites had a higher percentage of fruits over animal matter (in Kaudiar, $\chi^2 = 22.26$, $df = 1$, $P < 0.001$ and in Kariavattom, $\chi^2 = 21.42$, $df = 1$, $P < 0.001$).

Captive palm civets showed clear differences in food acceptability (Table 2). They ate fruits only when fully ripe. On days when the animals were presented with unripened fruits, they were left untouched in the enclosure until fully ripened. They also ate chicken, rats, mice, fish, worms, cockroaches, beetles, and various other insects. They preferred sweet fruits to other food items and rejected anything sour.

Table 2. Foods presented to captive palm civets (+, item eaten; ≠, item sometimes or partially eaten; -, item rejected)

Food	Whether eaten or not	Comments
Apple	≠	Discarded skin appears as if peeled with a peeler
Arecanut	≠	Only the ripe outer hull was consumed
Banana	-	Banana skin was discarded
Cashew fruit	-	-
Coffee berries	-	-
Custard apple	≠	Outer green skin discarded
Grapes	≠	Only when extremely ripe and sweet
Guava	-	-
Jackfruit	+	Only when ripe; the sweet fruit alone consumed, rest
Jungle jackfruit	+	discarded for both types of jackfruits
Lemon	-	-
Mango	+	When very ripe; skin & seed discarded
Marothi fruit	+	Skin discarded
Orange	-	-
Papaya	+	Discarded skin appears as if peeled with a peeler
Black pepper corns	≠	-
Pineapple	!	Discarded skin appears as if peeled with a peeler
Rose apple	-	-
Tomato	-	-
Dead chicken	+	The head was crushed but not consumed
Hen's egg	!	Consumed only when shell was broken
Dead rats	-	-
Live rats	+	The head was crushed but not consumed
Fish	+	Entire fish consumed and if stinking rubbed on the body
Worms	+	-
Insects	+	-

Discussion

Common Palm Civets are known to be omnivorous. They feed on a variety of plant and animal matter indicating to a certain degree of opportunism. Although fruits are eaten whenever available, fruit availability is spatially and temporarily variable (Rabinowitz, 1991). Fruit-loving palm civets may increase the proportion of non-fruit foods or aseasonal fruits in their diet during periods of low fruit availability (Leighton & Leighton, 1983). However, they also feed on a variety of animal species throughout the year. The presence of grass in a scat sample indicates that palm civets like many carnivores use grass as an intestinal scourer.

Uniform compositions of scats containing fruits indicate that the palm civet has the habit of eating in bulk the fruits of a single species at one particular feeding time. Palm civets are known to raid coffee plantations, eat the hull of the coffee beans and expel the undigested kernels in their faeces. Plantation owners maintain that it is from these seeds that the tastiest coffee is made (Prater, 1971). Since palm civets are ardent tree climbers and are highly mobile, they may play an important role in seed dispersal (Gruèzo & Soligam, 1990), and thus in the maintenance and structuring of tropical forest communities.

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The first record of Small-toothed Palm Civet *Arctogalidia trivirgata* from Cambodia, with notes on surveying the species

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Until the end of the 1990s, only limited information was available on mammals of Cambodia. Historically, few collecting expeditions visited the country (e.g. Thomas, 1929; Osgood, 1932; Delacour, 1933, 1940; reviewed in Walston, 2001). Political turbulence and the resulting insecurity of many parts of the country in the second half of the 20th century limited fieldwork, with the few activities tending to concentrate on species of outstanding international interest, such as Kouprey *Bos sauveli* (e.g. Wharton, 1957; Pfeffer & Ou Kim San, 1967). In the late 1990s, stability returned to the country. Extensive mammal surveys were an obvious conservation priority: Cambodia could be the last refuge of Kouprey, and populations of other very large mammals such as Asian Elephant *Elephas maximus*, Tiger *Panthera tigris*, and Banteng *Bos javanicus* were widely speculated to be high and of commensurate international significance (Santiapillai & Jackson, 1990; Byers *et al.*, 1995, Nowell & Jackson, 1996; Lair, 1997; Duckworth & Hedges, 1998; Nowell *et al.*, 1999; Rabinowitz, 1999). Moreover, a number of records of little-known and/or threatened smaller species (e.g. Mainland Slender-tailed Treeshrew *Dendrogale murina*, Timmins *et al.*, in press; Wroughton's Free-tailed Bat *Otomops wroughtoni*, Walston & Bates, 2001; Hairy-nosed Otter *Lutra sumatrana*, Long, 2000; Poole *in prep.*) suggest a rich mammal fauna.

Collation of historical records of mammals in Cambodia by Walston (2001) found that many species common and widespread in neighbouring countries (Thailand, Lekagul & McNeely, 1977; Laos, Duckworth *et al.*, 1999; Vietnam, Dang Huy Huynh, 1994) were not represented historically from Cambodia by specimens or other specific records. Although many such species, and indeed others more localised in Indochina (e.g. Greater Oriental Chevrotain *Tragulus napu*, Sunda Colugo *Cynocephalus variegatus*) are mapped for Cambodia in the generalised distribution maps of Lekagul & McNeely (1977) and Corbet & Hill (1992), this is assumed to result from extrapolation of records in neighbouring countries. Ongoing surveys have found many of these predicted species, but a clearer understanding of mammalian biogeography in Indochina (e.g. Timmins & Trinh Viet Cuong, 2001: Annex 10) suggests that this practice could be imprudent.

After some reconnaissance surveys from 1994 onwards (e.g. Olivier & Woodford, 1994; Desai & Lic Vuthy, 1996; Timmins & Men Soriyun, 1998), field surveys for large mammals (i.e. those identifiable without capture) began in earnest in 1999. These used a variety of methods, mostly camera-trapping, sign surveys, examination of captured animals or their remains (with hunters, in villages, in menageries, etc.), interviews with local people, and direct observation by day (usually during bird surveys). In the intervening four years, most of the expected species of large mammal have now been confirmed from Cambodia (Walston, 2001), although these records are mostly not yet formally published. Among the small carnivores, one species which remained unrecorded was Small-toothed Palm Civet *Arctogalidia trivirgata*.

On 9 February 2003 we observed a single male Small-toothed Palm Civet at 12°15'48.09" N, 106°55'16.59" E and 150 m asl in the Keo Seima Biodiversity Conservation Area, Mondulkiri Province, Cambodia. The animal was in a small area of semi-evergreen forest amid an extensive area (over 1,500 km^2) of largely natural habitats, consisting predominantly of a patchwork of semi-evergreen forest within a predominantly deciduous dipterocarp forested landscape. Although the area is within a logging concession, operations have ceased since 2000 and the vegetation around the site of observation retains essentially a mature forest structure. As with almost all natural habitats in Cambodia, the Keo Seima area is widely used by local people for collection of animal and plant forest products for subsistence and commercial use. Many such people subsist during overnight trips on food they catch in the forest; snaring and other forms of hunting remain heavy enough to depress some populations, although gun use has dropped markedly since 1998 as a result of a government gun confiscation programme.

The civet was avidly feeding on ripe fruit in a cauliflorous fig tree, ranging from 6 to 10 m above the ground, and was present on both passes of the tree (at 00h10 and 02h15). It was found during a spotlight search for nocturnal mammals along a largely dry stream bed, and viewed with a 500,000 cp spotlight from within 6 m of the tree. It showed little obvious reaction to such intense illumination, both times for several minutes, even continuing to feed. This lack of shyness was especially notable given the dense layer of dry bamboo debris in the stream bed, which rendered our approach noisy.

The distinctive features of the northern (*leucotis*) group of races of Small-toothed Palm Civet were readily visible: large ears with extensive pinkish-white areas (these reflecting very prominently in the torchlight); warm dark-brown dorsum with three readily visible longitudinal dark stripes; rather paler venter; long 'soft'-looking dark tail with some obscure darker ringing basally; head greyer brown than dorsum; rather uniform head (compared with local Common Palm Civet *Paradoxurus hermaphroditus*), the most notable features being a darker muzzle with a prominent well-defined white stripe running between the eyes towards the nose, and slightly darker spectacles; rich red-brown irides.

Keo Seima is the site of a long-term biodiversity conservation project of the Government of the Kingdom of Cambodia (specifically, the Department of Forest and Wildlife of the Ministry of Agriculture, Forestry and Fisheries) with support from an international NGO, the Wildlife Conservation Society. Background to the site is given in Walston *et al.* (2001). Since 2001, it has become one of the best surveyed areas for mammals in the country, with, to date, about 7000 camera-trap nights; eighty-eight 4-km mammal sign transects spaced randomly across the entire area; 30 days of bird survey by a team also competent to identify most large mammals to species; frequent, ongoing, discussion with local people at all levels about wildlife and conservation; pro-active patrolling involving confiscation of all hunted mammals; and numerous opportunistic records gathered in the course of project activities. So far, however, Small-toothed Palm Civet evaded detection at Keo Seima. This is almost certainly because of the lack of spotlight surveys at the site. Extensive spotlighting in southern and central Laos during 1992-1996 showed that Small-toothed Palm Civet is widespread in (semi-) evergreen forest over a wide range of altitudes, and tolerant of even quite considerable

degradation through logging (Duckworth, 1997). It is, however, almost entirely nocturnal, so cannot reliably be directed by diurnal direct observation. It is strictly arboreal, and so is unlikely to be directed by camera traps. Moreover, most hunting techniques (e.g. snares and other traps, dogs) are not effective against arboreal species, which can only really be taken in significant numbers by shooting. While the species leaves many signs in the form of spat-out chewed and/or compressed fruits, there is no information as to how to tell these from potentially similar feeding signs of other frugivorous mammals. Footprints and other signs would also be challenging to identify to species, because several other civet species overlap in distribution with Small-toothed Palm Civet. Local information would be similarly difficult to assign to species. Spotlighting (direct observation by night) is the only method with a realistic chance of assessing the species' status in an area. Hence, Duckworth (1997) assembled from southern and central Laos 34 records from spotlighting, three by diurnal direct observation (one of which was in the morning half-light), and only 'small numbers' in trade (including in the possession of hunters). As in Keo Seima, the recent mammal surveys across Cambodia have included little spotlighting. This methodological imbalance quite plausibly explains the lack of records of what may turn out to be a species widespread and numerous in the country's remaining (semi-) evergreen forests.

These same features that make the species difficult to survey by most methods also mean that it may be one of the mammals in its size-class least affected by the very heavy hunting across Indochina. It thus is probably not a conservation priority, but clarification of status across its global range is desirable. This will require extensive spotlighting, which at least in Indochina should probably be undertaken during March—May; Duckworth (1997) suspected a depression of activity during the cold months of December and January. Moreover, animals are readily detected by loud calls (as well as by eyeshine, and sounds of crashing vegetation and falling fruit), which may be primarily given during mid-February to June.

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The Stripe-necked Mongoose, *Herpestes vitticollis*

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The Stripe-necked Mongoose, *Herpestes vitticollis*, Bennett, 1835, is unquestionably the most splendid as well as the largest of all Asian mongooses. The first specimens were sent to England by Philip Poole in 1835, then Assistant-Surgeon of the Madras Medical Establishment, with an accompanying note stating that they were obtained in the forests about 20 miles inland from Kolun (now Quilon), in the Travancore Country (Fraser, 1849). The type specimen was caught in the thickest part of the Ghat Forest, by accident, in 1829 (Elliot, 1839).

Local names

Quoki-balu and Kaṭi-kera (in Coorg, Ryley, 1913); Galmugatiya or Loco-mugatiya (Sinhalese; Phillips, 1922); Malamkiri, Kiri Pullie, Sewapu Keeri or Sare Keeree (Tamil; Phillips, 1929; Hutton, 1949; Prater, 1971); Chen Keeree (Malayalam; Prater, 1971); Kemp Kerree (Kanarese; Prater, 1971). Also known as the Ceylon Badger (Kelaart, 1852) or Badger Mongoose (Pocock, 1941; Phillips, 1984).

Distribution

India: The hills near the west coast of India, from Dharwar (Jerdon, 1874) or near Bombay (Blanford, 1888-1891) to Cape Comorin. In the Nilgiris and in the hills of Coorg (now Kodagu) and Dharwar (Phillips, 1929). Although recorded from North Kanara, probably a rare straggler as far north as that district (Shortridge in Ryley, 1913). Pocock (1941:49) notes about a specimen labelled "Bombay": "Probably shipped from Bombay, but killed farther south on the western side of India".

Anaikatti, Nilgiri Hills (AMNH-163180, 163182); Anamalai Hills (Mudappa, 2001); Bandipur Tiger Reserve (Johnsingh, 1983; Karanth, 1986; Karanth *et al.*, 2001; R. Arumugam, *in lit.*); Bhadra Wildlife Sanctuary (Karanth, 1982; Karanth *et al.*, 2001); Chipgeri, N. Kanara (Pocock, 1937); Coorg (Wroughton, 1918); Eravikulam National Park, Kerala (Madhusudan, 1995); Haleri, N. Coorg (Ryley, 1913/BMNH-13.8.22.20); Horselykonda, Eastern Ghats (Allen, 1911) (doubtful record as the largely arid/scrub habitat is unlikely to support this species, D. Mudappa, *pers. comm.*); Kalakad-Mundanthurai Tiger Reserve (Mudappa, 1998); Kotagiri (Pocock, 1941); Kudremukh National Park (Karanth *et al.*, 2001); Kundahs, Nilgiri Hills (Adams, 1931/AMNH-163180 and 163182); Mudumalai Wildlife Sanctuary, Madras State (Spillett, 1968; W. Duckworth, *in lit.*; R. Arumugam, *in lit.*); Nagarahole, S. Coorg (Ryley, 1913; Karanth & Nichols, 2000; Karanth *et al.*, 2001; R. Arumugam, *in lit.*); Nilgiri Hills (Pocock, 1937/BMNH-88.2.5.19); Nilgiri Plateau (BMNH-1937.1.10.20); Nilgiri North (R. Arumugam, *in lit.*); Shambagamur, Nelliampathy Plateau, Palni Hills (Kinloch, 1923); Srimangala, S. Coorg (Pocock, 1937); Travancore (RMNH-22928; BMNH-86.9.6.1, 46.5.13.5 & 55.12.24.224); Wottekolli, S. Coorg (Pocock, 1937/ BMNH-13.8.22.19).

Sri Lanka: Both in the high hills and in the lowlands, in both the Wet Zone and the Dry Zone but only locally (Phillips, 1984). Gal Oya National Park (Bibile, 1994); Galge, Uva Prov., Yala River (AMNH-240922); Gamaduwa, Central Province (Pocock, 1937/BMNH-30.6.8.2, 34.4.17.3 and 27.11.28.3);

Fig. 1. Stripe-necked Mongoose Herpestes vitticollis *feeding on Black-naped Hare* Lepus nigricollis. *Photo: Mrs. Asha Jayakumar, ARPS.*

Haputale Estate (Phillips, 1933); Horton Plains (Phillips, 1984); Kandelay or Kandehy, 25 miles from Trincomalee (Kelaart, 1852); Kalutara District (Phillips, 1984); Kirindi Oya, near Lunuganwehera (Fernando, 1913); Kumbukkan Oya (IRSNB-3612); Kumbulgamuwa (Phillips, 1984); Menik Ganga (River) region, 10 miles N. of Kataragama (Phillips, 1984/BMNH-57.51); Mousakanda (Pocock, 1937); Nuwara Eliya (Kelaart, 1852); Nikawewa, near Kantalai (Phillips, 1984); Ruhuna National Park (Phillips, 1930; Santiapillai *et al.*, 2000); Sinharaja MAB Reserve (Kotagama & Karunaratne, 1983).

Habitat and status

Evergreen forest up to the tops of the mountains (2,133 m asl) (Webb-Peploe, 1947); commoner in the hills than in the lowlands (Hill, 1939). In deciduous forests usually in swampy clearings, along watercourses, and in open scrub (Krishnan, 1972) and in rice fields (Anonymous, 1935). Out of 11 sightings seven were in dry deciduous forest, three in moist deciduous forest, and one in a teak plantation (R. Arumugam, *in lit.*). In Valprai in the Anamalai Hills in about a dozen sightings between April and December 2002 they have been observed foraging along streams in riverine forests and swamps, and also in tea plantations that are criss-crossed with streams and swamps (D. Mudappa, *pers. comm.*).

India: Rare in the northern parts of its range, and most abundant in Travancore (Jerdon, 1874). Common all over the Nilghiri and Palni Plateaux (Anonymous, 1935), in the High Wavy Mountains (Hutton, 1949), and on the Valparai Plateau in the Anamalai Hills (D. Mudappa, *pers. comm.*). In Coorg not uncommon, although less plentiful and more local than the Indian Grey Mongoose, *Herpestes edwardsii* (Shortridge in Ryley, 1913). In the Western Ghats it is more common between 400 and 1400 m asl.

Character	Holotype	N	X	Min	Max
GSL	99.5	14	102.6	98.8	107.4
CBL		10	99.3	96.9	103.5
ROL	33.0	15	34.0	31.1	36.5
PAL	53.3	14	56.0	52.2	59.6
MAX	37.7	15	37.9	35.2	39.5
TYM		13	18.2	16.9	18.8
CAN	17.7	15	19.7	17.5	21.6
ROB		15	24.5	22.0	26.9
IOB		15	20.7	18.7	23.0
PAB	29.9	15	30.7	29.0	32.4
ZYG	49.5	13	54.9	50.7	57.7
BRB	36.3	15	37.6	36.0	39.4
MAS	36.3	14	38.7	37.1	40.8
BRH		15	30.7	28.6	32.0
MAL	66.5	14	70.3	66.5	74.9
MAN	43.3	14	44.1	41.6	45.9
CMB	26.2	14	28.6	25.9	31.2

Table 1. Cranial measurements (in mm) for Herpestes vitticollis. *Holotype: young male, BMNH-1855.12.24.224. N, number of specimens: X, mean; Min, minimum; Max, maximum; GSL, etc., see: List of skull characters and acronyms in Small Carnivore Conservation 23:12.*

Sri Lanka: Used to be fairly common in the higher hills of the Central Provinces; but seems to be rather dying out. Not uncommon in the interior (Blyth, 1851). Moderately plentiful in the Horton Plains area and around Gamaduwa; in the low-country Dry Zone not uncommon along the banks of the Menik Ganga; in the Wet Zone present in the Kalutara District but not common (Phillips, 1984).

Description

Head iron-grey to purplish-brown, finely speckled with yellow, darkest on the forehead, paler on the sides. Front part of body reddish-yellow, grizzled with brown; rear part orange-red, obscurely grizzled. A black band runs from behind the ears along the sides of the neck to the shoulders. Chin and throat are the same colour as the cheeks but less grizzled. Under-surface of the neck and chest brown-yellow. Belly orange-yellow but not abruptly defined from the colour of the chest. Underfur sparse, pale yellow-brown. Hairs on the sides >6 cm long, banded with black and grey and ending in long, orange-red tips. Mean length of tail: 64% of the length of head & body (n=12). General colour of the tail orange-red except for the 9 cm long black tip. Hairs at the base of the tail are ca. 8 cm long but decrease in length towards the tip. Ears rounded, covered with short, fine, reddish-brown hairs. Forelegs and front of hindlegs and tarsus dark purplish-brown. Centre line of tarsus nude. There is a gradual increase in reddish tones towards the south (Pocock, 1941; Corbet & Hill, 1992). Toes 5/5. The snout has a slight upward curve and there is a large and conspicuous sack-like depression beneath the tail (Shortridge in Ryley, 1913). Small intestines: 200 cm; large intestines: 25 cm; caecum: 5 cm; stomach with distinct pylorus: 12.7 cm; and spleen: 10 cm (Kelaart, 1852). The skull is recognised by its large size and by its flattened and expanded frontal region, also by its projected, rather narrow and long muzzle, and powerful teeth (Anderson, 1878), as well as by the pronounced inferior projection of the posterior chamber of the auditory bulla (Pocock, 1941). Skull measurements: see Table 1.

Dental formula: I 3/3, C 1/1, PM 4/4/, M 2/2 = 40. An additional molar is present in the type specimen. The teeth were studied by Ogilby (1835) and Gray (1864). The spermatozoa were studied by Pattabiraman *et al.* (1981).

Measurements for Sri Lanka males (n=4): mean length of head & body is 48.9 cm; mean length of tail is 32.5 cm; weight up to 3.1 kg. Females (n=2): mean length of head & body is 46.4 cm; mean length of tail is 30.4 cm; weight up to 1.7 kg (Phillips, 1935). In Sri Lanka males were found to be larger, heavier, and more numerous than females (Phillips, 1984).

Measurements for Indian males (n=4): mean length of head & body is 52.9 cm; mean length of tail is 31.5 cm; weight up to 3.4 kg. Females (n=3): mean length of head & body is 47.4 cm; mean length of tail is 29.7 cm; weight 2.7 kg (n=1) (Pocock, 1941).

Habits

Diurnal. Crossing a jungle track at midday (Shortridge in Ryley, 1913); shot in the afternoon (Phillips, 1933); observed feeding at 14:00 hrs (Ramachandran, 1985); often seen during the day in the open on rocks (Hutton, 1949). More often encountered in the early mornings and evenings (Phillips, 1984); most active between 07:00-09:00 hrs (Santiapillai *et al.*, 2000). One crossing a track about 16:00 hrs and two crossing a sandy stream bed at 18:15 and probably the same pair next day working their way along a sandy stream bed amid open deciduous forest at about 07:00 hrs (W. Duckworth, *in litt.*). Out of 11 sightings in Mudumalai Wildlife Sanctuary, seven were between 07:25 and 09:45 and four between 13:20 and 17:20 (R. Arumugam, *in lit.*).

Usually solitary but also seen in pairs (Blanford, 1888-91; Kinloch, 1923). The only stable social unit consists of the mother and her offspring (Santiapillai *et al.*, 2000). Out of 11 sightings eight were of a single animal and three of a pair (R. Arumugam, *in lit.*). In Valprai in the Anamalai Hills about a dozen sightings were all of solitary animals (D. Mudappa, *pers. comm.*). Very often seen early in the morning as well as late in the evening on grassy patches close to water holes in Bandipur and Nagarhole National Parks, mostly single but occasionally in pairs.

Appears to spend much time grubbing about in soft, damp soil and swamps (Phillips, 1984). Less plentiful in the neighbourhood of habitations than the Indian Grey Mongoose *Herpestes edwardsii* (Shortridge in Ryley, 1913) but a specimen was shot when it was chasing chickens (Phillips, 1933). Seems to have a favourite rock as a latrine; a pair was seen nesting among the roots of a large tree near the water's edge (Hutton, 1949).

Food

Small game such as small mammals, birds, birds' eggs, and reptiles form its main diet but fresh-water crabs, frogs, and probably fish as well as insects, grubs, and roots of certain plants are also taken. It also preys on animals as large as itself or larger such as Black-naped Hare, *Lepus nigricollis*. A Stripe-necked Mongoose was seen chasing a young Chital *Axis axis* fawn (Krishnan, 1972). Capable of killing even Indian Spotted Chevrotain *Moschiola meminna* (Johnsingh, 1983). In Periyar Tiger Reserve two *H. vitticollis* were observed feeding on a two-days-old Tiger's kill of a Sambar *Cervus unicolour* stag (Ramachandran, 1985). A Stripe-necked Mongoose was found scavenging on a Black-naped hare found dead in a small down by the side of a forest road in Bandipur National Park at 07:00 hours in the morning during a rainy day (Fig. 1). In captivity, fond of bananas (Krishnan, 1972).

Reproduction

The usual litter appears to number two or three. A female gave birth to three young in May on bare dry earth under an over-hanging rock, amongst a jumble of rocks. The young remain and hunt with their parents until they are well grown (Pocock, 1941).

Parasites

Felicola zeylonicus from a specimen from Gamaduwa, Mousakande (Werneck,1948) and *Ctenocephalides paradoxuri* from the banks of the Menik Ganga (Phillips, 1984).

In 1987 a new nematode parasite *(Spirocerca skrajabini)* was described from cysts and nodules of abdominal muscles of a *Herpestes vitticollis* specimen from Udaipur, Rajasthan (Trivedi & Gupta, 1987). Either the host species was misidentified or the locality was wrong as *Herpestes vitticollis* does not occur in Rajasthan.

Predators

Nothing is known about the predators; probably larger carnivores and birds of prey. All mongoose species are in demand for the wildlife trade. The meat is eaten by several tribes and the hair is used for making shaving brushes, paint brushes, and good-luck charms (Hanfee & Ahmed, 1999) but not as frequently as that of the Indian Grey Mongoose *H. edwardsii* and the Small Indian Mongoose *H. auropunctatus* (D. Mudappa, *pers. comm.*). Although they are supposed to have extraordinarily though skins (Anonymous, 1935) they are regularly killed by dogs (Adams, 1931; Webb-Peploe, 1947).

Longevity

A male Stripe-necked Mongoose lived for 12 years 10 months and 18 days in Trivandrum Zoo (Flower, 1931).

Taxonomy

Herpestes vitticollis Bennett, 1835 *Proc. Zool. Soc. London* 1835:67. Holotype: BNMN No. 1855.12.24.224. Collected by P. Poole in the Ghat forests about 20 miles inland from Kolun (Quilon) in 1829. Type locality: Travancore.

Mungos vitticollis Ogilby, 1835 *Proc. Zool. Soc. London* 1835:103.

Mangusta vitticollis Elliot, 1839 *Madras J. Lit. & Sci.* 10:103.

Crossarchus rubiginosus Wagner, 1841 *Schreber Säugeth. Suppl.* 2: 329.

Taeniogale vitticollis Gray, 1864 *Proc. Zool. Soc. London* 1864:569.

Bechthold (1939) categorised *H. vitticollis* together with the Asian mongooses *H. urva, H. semitorquatus,* and *H. brachyurus* in the subgeneric group of *Urva*, and *H. javanicus* and *H. edwardsii* in the subgeneric group of *Herpestes*. Hinton & Dunn (1967) added the Asian *H. auropunctatus, H. fuscus* and *H. smithii*, and the African *H. ichneumon* and *H. naso* to the subgeneric group of *Herpestes*. Wozencraft (1989) included *H. urva, H. semitorquatus, H. vitticollis, H. brachyurus* as well as *H. hosei* and *H. fuscus* in subgenus *Urva*; his subgenus *Herpestes* included *H. auropunctatus, H. edwardsii, H. javanicus* and *H. smithii*. A craniometric analysis by Taylor & Matheson (1999) indicates that if the *Urva* subgenus were to be maintained, it should include the African species *H. naso*, because this bears marked similarities, especially to *H. vitticollis*. They conclude, however, that none of the differences between species are sufficiently distinct to warrant maintaining subgeneric distinctions.

Two subspecies have been described:

Herpestes vitticollis vitticollis Bennett, 1835

Range: Western Ghats, Coorg, Travancore (India) and Sri Lanka. Dominance of chestnut red on its coat.

Herpestes vitticollis inornatus Pocock, 1941 *Fauna Brit. India, Mamm.* 2:49.

BMNH No. 1909.3.13.1. Young male collected by A. G. Edie, 23 December 1908 at Chipgeri, North Kanara, India. Range: Kanara. This subspecies is distinguished from the typical race by the general absence of red almost all over the upper side of the body. The two subspecies completely intergrade in intermediate localities, both red and dark grey specimens occurring in the Nilghiri Hills and Coorg. There appears to be a gradual increase in the development of the red pigment from north to south, which may be associated with increase in the average annual rainfall (Pocock, 1941).

Conservation status

The Stripe-necked Mongoose is listed in Schedule IV of the Indian Wildlife (Protection) Act (1972), Appendix III (India) of CITES (UNEP-WCMC, 2001), and, nationally for India, LR nt (Lower Risk – near threatened) during the CAMP Workshop (BCPP Camp Report, 1999). Chief threat is loss of habitat. Recommended for captive breeding for education as it is not known to people (BCPP Camp Report, 1999).

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Gazetteer

Abbreviations: **I:** India; **SL**: Sri Lanka.
Bandipur NP, I: 11°37'-11°57'N, 76°12'-76°46'E; Bhadra Wildlife Sanctuary, I: 11°22'-13°47'N, 75°29'-75°47'E; Bombay, I: 18°56'N, 72°51'E; Comorin, Cape, I: 08°04'N, 77°35'E; Dharwar, I: 15°30'N, 75°04'E; Eravikulam NP, I: 10°10'-10°20'N, 77°00'-77°10'E; Galge, SL: 06°32'N, 81°18'E; Haputale, SL: 06°46'N, 80°58'E; Kalutara, SL: 06°35'N, 79°59'E; Kantalai, SL: 08°22'N, 81°00'E; Kataragama, SL: 06°26'N, 81°20'E; Kotagiri, I: 11°21'N, 76°44'E; Kudremukh NP, I: 13°01'-13°29'N, 75°00'-75°25'E; Rajiv Ghandi NP, Nagarahole, I: 11°15'-12°15'N, 76°00-76°15'E; Mudumalai, I: 11°34.6'N, 76°32.8'E; Nilgiri North, I: 11°32.1'N, 76°40.8'E; Nuwara Eliya, SL: 06°58'N, 80°46'E; Quilon, I: 08°53'N, 76°38'E; Sinharaja MAB Reserve, SL: 06°21'-06°27'N, 80°21'-80°34'E; Trincomalee, SL: 08°34'N, 81°13'E.

Museum abbreviations

AMNH: American Museum of Natural History, New York, NY, USA; **BMNH**: The Natural History Museum, London, UK; **IRSNB**: Institut Royal des Sciences Naturelles, Brussels, Belgium; **RMNH**: Naturalis, Leiden, The Netherlands.

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Pests in France

A legal act of 1988 put 12 species of mammals and 6 of birds on a national list of "potential pests species". The same legislation organized in every "département", the 96 administrative divisions -like counties or parishes- over the country, an advisory hunting and wildlife committee (Comité Départemental pour la Chasse et la Faune Sauvage) in charge, among other duties, of deciding, each year, which from the national list would be locally classified as pest (i.e. hunting authorized during the hunting closed season, even with traps, snares,....). Three reasons are officially put forward: public health protection, prevention of heavy damage to economic interests or private properties and biodiversity protection. However, the annual decisions are usually more on "habits" than on facts, some "départements" putting every species on the list, even those never found there.

For instance, it is significant that the carnivore species present in France, native or introduced, are either protected (Brown bear *Ursus arctos*, Grey Wolf *Canis lupus*, Eurasian Otter *Lutra lutra*, European mink *Mustela lutreola*, Stoat *Mustela erminea*, Wild cat *Felis silvestris*, Eurasian lynx *Lynx lynx*, Common Genet *Genetta genetta*), or are potential pests (Red Fox *Vulpes vulpes*, Racoon Dog *Nyctereutes procyonoides*, American mink *Mustela vison*, Stone Marten *Martes foina*, Pine Marten *Martes martes*, Western Polecat *Mustela putorius*, Least Weasel *Mustela nivalis*, Raccoon *Procyon lotor*), none being in the middle, classified as just game species, i.e. species that could be regulated during the hunting season by hunting. It looks as if this classification was aimed mainly at keeping open the possibility of practicing hunting, including species other than classical game species, during the hunting closed season.

To be honest, there is one exception, the Eurasian Badger *Meles meles*, which is indeed classified as a game species. However, in this case, under-ground hunting is still legally practised and is increasing, out of the hunting season, even in spring when sows have cubs. Officially, this is to protect wheat or maize fields. In this case, as with many other pests, it is easier to know how much costs the hunting of badger than to know the amount of the damages that are claimed to have been prevented. Last but not least, this legislation has not prevented poaching of individuals within all the protected species.

After many years of discussions between different partners and lobbies, the weasel, the polecat, and the pine marten have been taken out of the list (act of 21 March 2002, published on the 04 April 2002). The weasel (a 50-100g specialist vole hunter), the polecat, whose status is certainly not at its healthiest from the best we know (many confusions with feral American mink, and with the rare and endangered European Mink in south-west France) and the pine marten, a species where the pelt trade has been banned for more than 20 years, certainly deserve, all three, better than a "potential" pest status.

However, soon after this good news, the government changed through general elections (spring 2002) and the hunters' lobby came back with their vision of wildlife (i.e. game species) management. The new government, who changed the Ministry of Environment into the Ministry of Ecology and Sustainable Use, decided to put back the three species on the national pest list, without arguing. All of our questions stayed without answer.

- Had you a single documented case of heavy damages linked to weasels since 1988?
- Why is the stoat out of the list when weasel and polecat are in?
- Why are you putting back the polecat which has been decreasing all over the country since 1950?
- Why do so few trappers give the results of their trapping bags to the administration, even though they should do so?

On November the 6th 2002, at a meeting of the national advisory hunting and wildlife committee (CNCFS), where this proposal had to be submitted but which is just giving advice, I commented that nothing new in the biology of these species had been published since April 2002. The answer was, from one of the participants: "right, but in the mean time there were elections !".

Three points should be mentioned:

- Trapping is allowed when hunting season is closed for Fox, Stone Marten, American Mink, Raccoon, Raccoon Dog, Nutria *Myocaster coypus*, and Muskrat *Ondatra zibethicus*, all the last 5 species being introduced. The other two "potential pest" mammals are the European Rabbit *Oryctolagus cuniculus* and the Eurasian Wild Pig *Sus scrofa*, two very popular game species in the same time. The control and monitoring of catches will be important. This has been in the law since 1988, but experience has proven it is difficult to obtain. It has yet not been possible to analyse any trapping bag properly.
- In the same time, surveys for a better approach of these mammals' populations, dynamics and status should be developed, which has not been the case up to now. Trapping the way it is practiced, for pest control, is certainly not like a scientific survey.
- The status of the Stoat, a species which is apparently seen as positive (it is an officially protected species), is difficult to understand on biological grounds, when the Weasel and the Polecat are on the list of potential pests. In the same time, trapping these two species really put Stoats at risk, when some of the allowed traps are both non-selective and lethal. It has to be mentioned that in France, the Stoat is the symbol of Brittany and of lawyers. Could this be an explanation?

The act putting back the three species on the national list was indeed signed on November the 6th and published on November the 27th. It seems that really, French national pest legislation motivations are outside of biology, at least in its everyday application, when the real status of these carnivores is really of concern.

François Moutou, DVM
Member of the CNCFS
French Mammal Society

IUCN/SSC Mustelid, Viverrid and Procyonid Specialist Group: Vietnam working group

Northern Vietnam and adjacent areas in China and Laos are highlighted in the IUCN/SSC Action Plan for Mustelids, Viverrids and Procyonids (Schreiber et al., 1989) as core areas for mustelid and viverrid conservation. The Back-striped Weasel *Mustela strigidorsa*, Spotted Linsang *Prionodon pardicolor*, Large-spotted Civet *Viverra megaspila* are listed as priority species for conservation efforts. Owston's Palm Civet *Chrotogale owstoni* and Lowe's Otter Civet *Cynogale lowei* are listed as species of highest concern within the Indomalayan region.

Although some progress has been made in fulfilling the specific actions recommended for these species there is currently little co-ordination or reporting of work to improve conservation action planning and species status assessments.

Vietnam's forest cover has reduced from 44% in 1950 to 27.5% in 1995 a reduction of 1.6 million hectares. At the current rate of deforestation by 2090 all forest in Vietnam will be lost. Vietnam needs major improvements in protecting its remaining forest biodiversity, better understanding of species distribution, habitat requirements and minimum viable areas for species persistence and requires understanding on how *ex situ* conservation strategies can apply to the current loss of biodiversity facing the country.

Mustelid & Viverrid Conservation Programs in Vietnam

The Owston's Palm Civet Conservation Program based in Cuc Phuong National Park has made progress in captive breeding and research of this species, in addition to forest protection ranger training and awareness raising amongst rangers and communities, yet the latter are restricted to Cuc Phuong National Park and its surrounding provinces.

Field surveys carried out by International NGO's , national organisations and institutions in Vietnam have increased knowledge on the status and distribution of certain species, local uses and threats. This information is currently not being compiled so conservation planning and status assessments for small carnivore species is greatly hampered.

This working group has been developed as it is felt that it offers a solution to co-ordinating this much needed work in the country. The IUCN/SSC is a largely apolitical organisation that has an established network of persons involved in the conservation of mustelids and viverrids from many different organisations that will hopefully help prevent the counterproductive competition. Furthermore, it will allow expertise and resources to be shared and a more powerful message to be conveyed as several voices combine in one.

Working group objective

Improve the conservation of mustelids and viverrids in Vietnam by developing a co-ordinated program of activities carried out by a number of international and national specialist organisations and institutions following common management strategies and methods. All work will be carried out in such a way that directs training and responsibility to Vietnamese scientists and conservationists. Specific areas of work are as follows:

- Raise the awareness of mustelids and viverrids in Protected area communities by developing training and resources with already established environmental education activities.
- Improve protection of mustelids and viverrids by Forestry Protection officials.
- Improve our understanding of the level of use both locally and wider through the wildlife trade.
- Improve understanding on the status and distribution of mustelids and viverrids throughout Vietnam.
- Improve *ex situ* conservation strategies for species of mustelids and viverrids where conservation breeding is thought necessary.
- Update conservation recommendations and action plans for members of mustelids and viverrids families native to Vietnam.

Working Group organisation

The working group will be co-ordinated by Scott Roberton (OCP), Nguyen Cong Minh (IUCN) and Dr Nguyen Xuan Dang (IEBR) under the supervision of the IUCN/SSC Mustelid, Viverrid and Procyonid Specialist Group steering committee. These three people will be the point of contact for other individuals and organisations within the group and will be responsible for organising meetings, distributing information and maintaining communication between group members.

At the heart of all the work described in this concept is the strong involvement of Vietnamese conservationists and scientists in all projects who will ultimately make the difference in small carnivore conservation in Vietnam.

The co-ordinators of the group will assist organisations to raise funds, design and implement projects. At present there are no funds for administration of the group so for now these will be covered by the IUCN, IEBR and the OCP but will be kept to a minimum until such funds are located.

The group is currently developing and seeking funds to hold a two-day symposium to be held in July 2003. Through a participatory process of group discussions led by national leaders in small carnivore conservation and research and facilitated by international experts from the IUCN/SSC specialist groups this symposium will identify national conservation priorities. Priorities will not just focus on academic questions, but will be developed into ranked activities. Detailed project proposals based on the top ten ranked priority activities will then be produced. The IUCN/SSC representatives will then administer funding to the best projects and assist in applying for funding for the projects not funding on the day.

The symposium will:

- Motivate national conservationists and scientists.
- Identify priority needs to be done and,
- Identify the best conservation and research methods to be employed.
- Assist Vietnamese scientists and conservationists to develop and carry out a number of well designed projects.
- Create a clear workplan for the Vietnam Working group to follow over the following year.

If you would like more information on the group please contact:

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The status of stoats and weasels in Britain

Robbie A. McDONALD

Even in Western Europe, where the status of most small carnivore species is relatively well known, the inconspicuous nature of the smallest carnivores, Stoats *Mustela erminea* and Weasels *M. nivalis*, causes numerous conservation and management problems. While both species are afforded limited protection under the Bern Convention, they are often in conflict with economic and conservation concerns because of their predatory habits. Monitoring the status of stoat and weasel populations is especially problematic, because they leave few field signs and direct sightings are scarce and sporadic (King, 1989). This means that large-scale direct surveys of the kind that have been conducted for Otters *Lutra lutra*, Badgers *Meles meles*, Pine Martens *Martes martes* and other larger mustelids are impractical. Ecologists interested in the status of Stoats and Weasels, have, however found allies in an unusual place.

In Great Britain, Stoats and Weasels are the targets of legal predator control undertaken by gamekeepers to enhance populations of game birds, notably Grey Partridge *Perdix perdix* and Red Grouse *Lagopus lagopus scoticus*. The meticulous records kept by gamekeepers are collated by The Game Conservancy Trust as part of the National Gamebag Census (Tapper, 1992). This long-running scheme has indicated a decline in the number of Weasels being trapped per 1,000 ha since the start of the scheme. In contrast, Stoat trapping records increased between the early 1960s until the mid-1970s and have remained static or shown a slight decline since. These trends have lead to concern that actual populations of these species may be in decline themselves.

A series of investigations into the changing status of Stoats and Weasels have been conducted over the last five years, and all are now published in the scientific literature. In most situations populations of Stoats and Weasels are extremely sensitive to the availability of their prey, hence an important area of investigation was of changes in prey availability and how this affected the diet of the two species (McDonald *et al.*, 2000). Analysis of the gut contents of 792 Stoats and 458 Weasels found that both species appeared to have benefited from the recovery of Rabbits *Oryctolagus cuniculus* from myxomatosis which was rife in the late 1950s and early 1960s. Both species diets were more specialised and both species took more mammalian prey, rather than avian prey which is their fall-back when preferred prey items are scarce.

More sinister was the possibility that Stoats and Weasels were secondarily exposed to anticoagulant rodenticides that are widely used for controlling rodent pests on farmland in Britain. A screening exercise of 40 Stoats and 10 Weasels collected on game estates found that 9 Stoats (23%) and 3 Weasels (30%) had been exposed to rodenticides (McDonald *et al.*, 1998). While these numbers are small (analyses cost approximately US$/€500 each), there was a significant difference in the prevalence of rodenticide exposure between male and female Stoats, reflecting differences in their diet. Smaller female Stoats eat more rodents than larger males, which eat more rabbits. A risk analysis project using small mustelids and other carnivores and raptors is currently in progress in Britain to assess the gravity of the rodenticide problem for native predators.

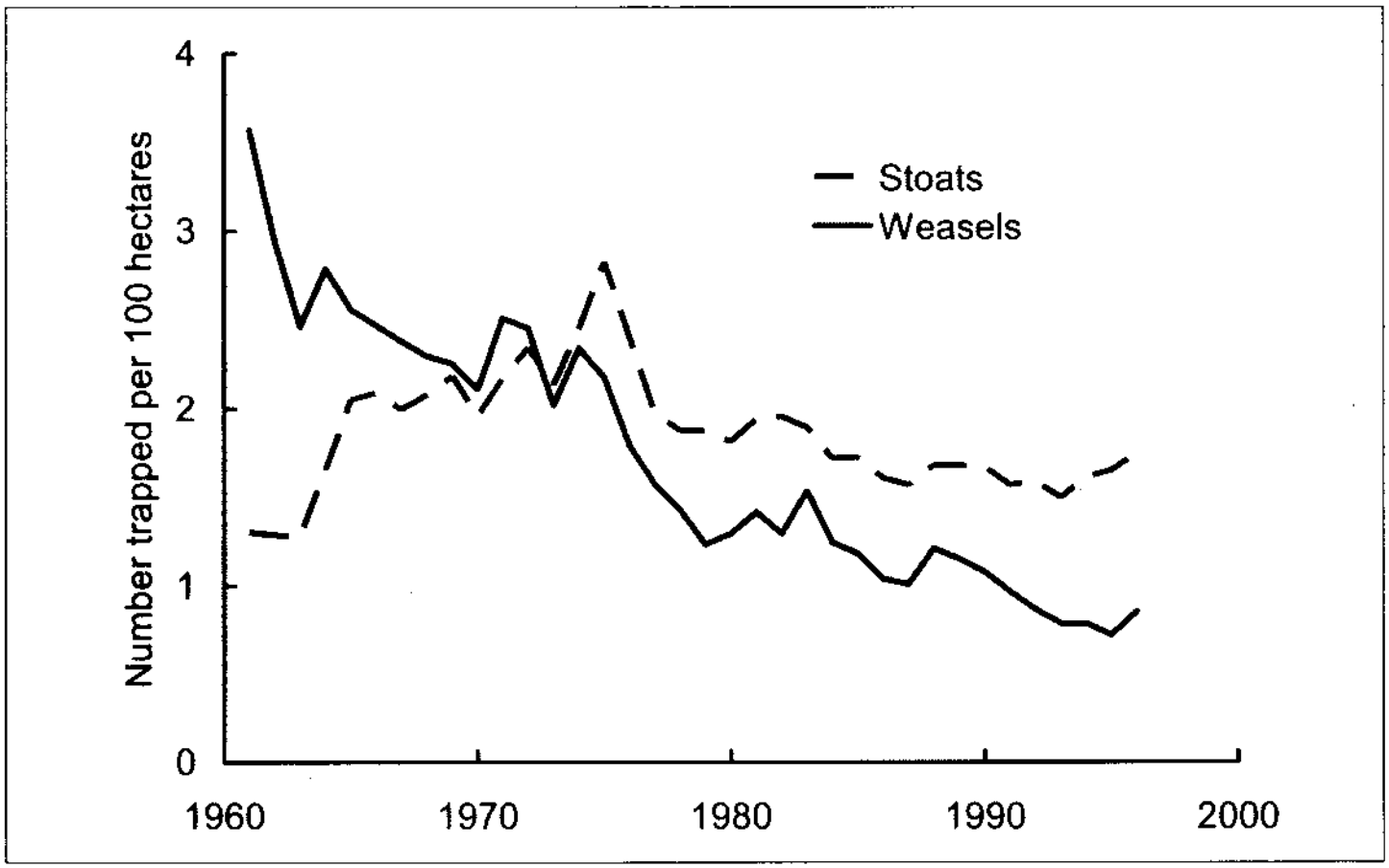

Fig. 1. The decline in numbers of Weasels and Stoats trapped on game estates in Great Britain. Data from the National Gamebag Census, Game Conservancy Trust.

Of course, trapping by gamekeepers themselves, may be to blame. By examining the population biology of trapped Stoats and Weasels and constructing a simple prospective population model, it was possible to examine the effect of trapping on population growth rates (McDonald & Harris, 2002). Despite intensive trapping, the pattern of mortality that gamekeepers cause in Weasels is not sufficient to incur long-term population decline. In effect, Weasels can breed sufficiently quickly, so long as there is enough food, to keep ahead of the gamekeepers efforts. Trapped stoat populations, on the other hand, exhibited a growth rate of not significantly different from 1.0, suggesting that populations were stable in the long-term. These models, however, did not include immigration, which is the key to long-term population growth and future modelling studies will incorporate a spatial element to investigating how trapping affects Stoat and Weasel status locally and nationally.

So, if food does not appear to be a problem and neither does trapping, secondary poisoning presents a possible solution to the apparent decline of Weasels and Stoats. However, further investigation of the recording scheme itself, threw up an additional possibility (McDonald & Harris, 1999). Since the 1960s the job of gamekeepers in Britain has changed dramatically. Most keepers now rely on rearing and releasing Pheasants *Phasianus colchicus* rather than encouraging wild game birds like partridge and grouse. This means that they have less time available for trapping small predators. As the importance of rearing game has increased, trapping effort has decreased. Since the numbers of Weasels and Stoats trapped is directly related to effort, the number of Weasels and Stoats trapped and recorded in the census could have declined solely because of changes in the trapping practice of gamekeepers. This highlights again the importance of accuracy in mammal monitoring schemes, and in the case of trapping record schemes, the importance of recording trapping effort.

In summary, Weasels and Stoats are probably not doing as badly in Britain as their records at first suggested. In some parts of Britain, they are scarcer than can be explained by variation in effort, and secondary exposure to rodenticides appears to be a general problem. Thus future monitoring of their populations using improved gamekeeper-based schemes will be very valuable. In particular a study of their spatial ecology and interactions with each other and other predators will make a valuable contribution to understanding the conservation and status of these widespread, but challenging, species.

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9th African Small Mammal Symposium

The 9th African Small Mammal Symposium will take place in Morogoro, Tanzania, from 14 to 18 July 2003.

The website for this conference can be accessed at www.dpil.dk/asms It provides general information and online registration and abstract submission forms. We have made it a simple website without fancy pictures, etc. so that it can easily be consulted also over slow e-mail connections.

The European Union and the Flemish Interuniversity Council have provided financial assistance to cover the participation of a number of African scientists and young European scientists who otherwise could not attend this symposium. Applications for these grants can be submitted through the website.

If you have any problems in accessing this website contact us at asms@ruca.ua.ac.be

Recent publication

Pine Marten

Noblet, J.-F. 2002. *La Martre*. Saint-Yrieix-sur Charente: Eveil Nature. 72 pp.

This beautifully illustrated book relates the little that is known about the biology and ecology of this persecuted carnivore. It is also the story of the fight for its right to exist.

As is explained in more detail on page 18, the Pine Marten, together with the Weasel and Polecat had finally been removed from the 'list of harmful animals' in France, and this after a long and difficult campaign by French conservationists. Seven months later all three small carnivores were put back on the 'harmful list' again by Mad. Roselyne Bachelot, Minister of Ecology. Trapping is allowed all year long and one can imagine a trapped female slowly dying with her offspring. Is there no limit to what some politicians will do in order to obtain votes, in this case from the massive hunting lobby?

A recently discovered specimen of Indonesian Mountain Weasel (*Mustela lutreolina* Robinson & Thomas 1917) from Sumatra

Darrin P. LUNDE and Guy G. MUSSER

Restricted to the high altitude forests of Java and southern Sumatra, the Indonesian Mountain Weasel *Mustela lutreolina* ranks among the least known of all mustelid species. The most recent review placed the total number of specimens at a meager eleven: nine from Java and only two from Sumatra (van Bree & Boeadi, 1978). Van Bree & Boeadi inquired of the curators of several major natural history collections about additional material but at that time the response from the American Museum of Natural History was that there were none (van Bree & Boeadi, 1978). However, this was before the systematic curation of our carnivore collection and we have since discovered that a specimen previously identified as '*Mustela* sp.' actually represents a third known example of *M. lutreolina* from Sumatra. The species name is penciled on the specimen's tag in the distinctive hand of Dr. Karl F. Koopman, and we have verified this determination against the original species description (Robinson & Thomas, 1917) and the descriptions in van Bree & Boeadi (1978).

The specimen (AMNH-106670) was collected by J. J. Mendon on July 12, 1936 at an altitude of 1,800 m on Mt. Dempo, Sumatra and consists of a study skin, skull and partial skeleton. The skull is badly damaged but the following measurements (in mm) could be taken with digital calipers: Breadth of rostrum across canines 11.8; interorbital constriction 11.7; postorbital constriction 13.3; length of palate 25.3; crown length from upper canine to last upper molar16.5; greatest length auditory bulla 17.8.

Brongersma (1940) examined the mounted skin and skull of the one Sumatra specimen available to him, noted cranial and pelage differences between it and a Java specimen, and questioned whether the Sumatran morph might represent a separate taxon. In comparing our third Sumatra specimen to the illustration of the Java specimen in Brongersma (1940, figs 2a-d), one of Brongersma's cranial characters still holds true: the bullae diverge slightly posteriorly among Sumatran examples but are parallel sided in the Java specimen. A further possible distinction is seen in the baculum, which differs from the illustration of a Java specimen (Brongersma, 1940, fig 2e) in having a blunter head. The significance of these morphological traits is difficult to interpret with so few specimens and they may represent nothing more than individual or age-related variation yet the possibility of a species-level distinction between Javan and Sumatran populations is worth investigating.

The last land connection between Sumatra and Java disappeared sometime within the past 11,000 years (Voris, 2000) but the *M. lutreolina* population on Sumatra may have been isolated much earlier in light of its montane distribution, which currently ranges between 1,000-2,200 m (van Bree & Boeadi, 1978). If *M. lutreolina* were to be separated into Sumatran and Javan taxa each would represent an island endemic. Such a pattern of endemic species pairs would have a precedent among rodents from the same areas: *Mus crociduroides* is restricted to the upper montane forests of western Sumatra while *Mus vulcani* is endemic to similar habitats in western Java. Similarly *Maxomys inflatus* and *M. hylomyoides* are endemic to the montane forests of western Sumatra while *M. bartelsii* is known only from montane west and central Java (Musser, 1986).

Additional specimens would help resolve the question of the status of Sumatran *M. lutreolina* but the species is currently listed as IUCN Endangered (IUCN, 2002) so we cannot advocate the active collection of this species. Alternatively, the analysis of sequence data extracted from the DNA of existing museum specimens may shed some light upon the status of the Sumatran population.

The locality where the AMNH *M. lutreolina* was collected, Sumatra's Mt. Dempo, is part of a protected area system (MacKinnon, 1997) yet there have been no reports of the species since W.C. Verboom collected the second known specimen in 1941 (van Bree & Boeadi, 1978). Surveys of this region using camera traps might be the best way to confirm the survival of the species in Sumatra. Virtually nothing is known of the natural history of the Indonesian Mountain Weasel, the only tidbit is that the holotype was collected "... while it was engaged in killing a *Lariscus insignis javana*." (Robinson & Thomas, 1917: 262).

Acknowledgements

The late Dr. Karl F. Koopman, Curator of Mammalogy at the American Museum of Natural History, deserves recognition for having dedicated so much of his time to ensuring that the specimens in the American Museum's mammal collections were identified correctly. We also acknowledge Dr. Esteban Sarmiento as the person who actually curated the bulk of the AMNH Mustelidae collection while working as a curatorial intern in the mid-1980s.

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