SMALL CARNIVORE CONSERVATION

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

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SPECIES SURVIVAL COMMISSION

Adult female Libyan striped weasel *(Poecilictis lybica)* - Photo: Marian Batkiewicz

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We are particularly grateful to Walter Rasmussen for reading the manuscripts and improving the English style.

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

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The distributions of small carnivores in the Nilgiri Biosphere Reserve, southern India: A preliminary report

T.R.K.YOGANAND & Ajith KUMAR

Introduction

This project on the distribution, ecology and conservation aspects of small carnivores in the Nilgiri Biosphere Reserve was introduced in an earlier issue of Small Carnivore Conservation (Kumar, 1994). The major goal of the project is to provide baseline data on the abundance and distribution of small carnivores in the different habitat types of the Reserve, and to make an assessment of the impact of human activities upon them. The second major objective of the project is to study ecological aspects of some of the small carnivore species by using radio-telemetry.

The study would cover 13 species: four species each of mongoose (common mongoose, *Herpestes edwardsi*, ruddy mongoose, *H.smithi*, brown mongoose, *H.fuscus*, and stripe-necked mongoose, *H.vitticollis*), civet (small Indian civet, *Viverricula indica*, common palm civet, *Paradoxurus hermaphroditus*, brown palm civet, *P.jerdoni and* Malabar civet *Viverra civettina*), lesser cats (leopard cat, *Felis bengalensis*, jungle cat, *F.chaus*, fishing cat, *F.viverrina*, and rusty spotted cat, *F.rubiginosa*) and one species of marten (Nilgiri marten, *Martes gwatkinsi*).

The three year project began in October 1994, with funding from the Ministry of Environment and Forests, Government of India. The project was scheduled into two phases, the first phase being the survey of the Reserve to study the distributions and abundances of small carnivores, a project which would be executed in the first year. The second phase would be the ecological study. This report contains the work done as part of the first phase of the project.

This article reports the work done during the first six months of the project (October 1994 to March 1995). During this period a habitat classification of the Reserve was made and survey sites were selected to represent the various habitat types and human impact patterns. Survey methods were developed, field tested and improved, and surveying in four of the selected sites was completed.

Survey sites

Nilgiri Biosphere Reserve encompasses the Nilgiri Mountains and the adjoining areas of the Western Ghats. The altitude ranges from 250 m to above 2,500m, and the annual rainfall varies from over 5,000mm, to less than 500mm. The Reserve includes a whole range of vegetation types: 1. tropical montane evergreen forest (Shola-grassland); 2. tropical wet evergreen forest; 3. tropical semi-evergreen forest; 4. tropical moist deciduous forest; 5. tropical dry deciduous forest; and 6. tropical dry thorn forest. The human influence pattern on the habitat also varies much among the various parts of the Reserve. Plantations of teak, eucalyptus, etc., after conversion of various forest types at a range of altitudes, adds to the diversity of the Reserve. A distributional study of the small carnivores, as proposed in this project, will involve surveying the various habitat types for their presence and relative abundance.

Of the 14 major areas in the Reserve, 12 were selected for this survey, covering all six major vegetation types and grades of human disturbance (Table 1).

Survey methods

The rich and diverse small carnivore community of the Reserve has remained under-recorded owing to the difficulties involved in sighting them. A survey could be made possible only by a combination of methods, including information from direct sightings and estimations from indirect evidence.

DIRECT SIGHTINGS

Most small carnivores occur at low densities, and are nocturnal and solitary. Therefore, direct sightings cannot be relied on to make an assessment of their distribution and abundance. However, during the survey, the various habitats in the selected areas were extensively walked to get direct sightings. Vehicular transects were done, mostly at night, wherever possible. At probable haunts of the various species, such as water holes, fruiting trees, etc., stationary observations were made for long periods of time. Automatic camera traps were set up in different habitats near probable sites such as water holes and scat-marking sites to get photographs of the animals. The traps were baited with dry fish, rodents, peanut butter, fruits, etc., to attract the animals.

Table 1: Major forest areas, their altitude, vegetation types and disturbance levels in the Nilgiri Biosphere Reserve.

SNo	Locality	Altitude (m)	Major vegetation types	Human disturbance
1 #	Nagarhole NP	700 - 1000	Moist & dry deciduous.	Moderate
2	Bandipur NP	700 - 1000	Moist & dry deciduous.	Moderate
3 #	Wyanad WS	700 - 1200	Moist & dry deciduous.	High
4 #	Mudumalai WS	700 - 1000	Moist & dry deciduous.	Moderate
5 #	Sigur RF	700 - 900	Dry deciduous & dry thorn.	Moderate
6 #	Talamalai RF, Minchikuli.	700 - 1000	Moist & dry deciduous.	Moderate
7 #	Moyar valley	250 - 350	Dry thorn.	High
8 #	Nilgiri SE slopes (Pillur)	250 1500	Moist & dry deciduous.	Moderate
9 #*	Siruvani hills	500 - 1800	Wet & semi-evergreen, moist deciduous.	Moderate
10 #*	Upper Nilgiri, Mukkurthi NP	2000- 2500	Montane evergreen (Shola-grassland)	Low
11	Attapadi plateau	600 - 1000	Moist, dry deciduous & dry thorn.	High
12 #*	Silent Valley NP	700 - 1700	Wet evergreen.	Low
13 #*	New Amarambalam RF	250 - 1800	Wet evergreen, semi-evergreen.	Moderate
14 #	Nilambur kovilakam RF	1000- 2400	Wet evergreen, semi-evergreen.	High

*# - proposed survey sites; * - survey completed;*
NP - National Park; WS - Wildlife Sanctuary; RF - Reserve Forest

INDIRECT EVIDENCES

Transects were laid in various habitats in the study area to quantify indirect signs of small carnivore presence. The main evidence of animal usage is the presence of scats, either excreted or marked for intra- and inter-specific communication. The animals mostly used bridle paths and less-used roads for scat marking. Therefore, most of the sampling was done along these roads and paths.

The scats found on the transects were collected for later identification by thin-layer chromatography, and for analysis of feeding ecology. Presently scats were assigned to various groups - cats, civets, mongooses, martens - depending on various characteristics such as size, shape, marking site, contents, time of deposition, etc. At each scat location a number of habitat parameters were recorded including vegetation types, proximity to streams and distance along the transect. Other signs, e.g. pug marks, were recorded and traced for later identification by comparison with known pugmark tracings. The sampling effort in different habitats, measured as the length of the transect, roughly reflects the proportion of the habitat type in that area.

Survey results and discussion

Of the 12 areas chosen for surveying, four areas were completed between October 1994 and March 1995. The Siruvani Forest area, which is highly diverse in habitat types and, by virtue of its proximity to Head Quarters (Coimbatore), was where most of our survey methods were field tested and improved upon. The other completed areas are: New Amarambalam Reserve Forest, mainly selected for its vast areas of semi-evergreen vegetation occurring due to the past influence of humans; Silent Valley National Park, with extensive wet evergreen forests, and where human disturbance has been minimal; Mukkurthi National Park in the Upper Nilgiris Plateau, at an altitude of above 2000 m, with the last remains of a unique vegetation type consisting of a stunted montane evergreen forest (sholas) and grassland community.

The survey results based on scats is constrained by the tentative identification of the scats. Personal observations show that there is a large possibility of misidentification of the scats of cats and mongooses. Another constraint is that the relative abundance of scats in an area is assumed to be indicative of the abundance of animals.

The defecation behaviours of the various groups of animals are largely unknown, and the rates of defecation, sites of scat-marking, communication systems, and other characters, may vary among these different groups. The results of this survey shall be viewed whilst bearing these constraints in mind. Such constraints might be partly resolved during ecological studies using radio-telemetry.

Table 2: The abundance of scats (n/km) of small carnivores (mongooses, civets, cats & Nilgiri marten) in eight vegetation types surveyed in the Nilgiri Biosphere Reserve.

Habitat type	Trans-dist (km)	Mongoose	Civet	Cat	Marten	Total
Scrub	4	0.25	0.25	0.25	0	0.75
Dry deciduous	23	1.52	0.39	0.87	0	2.78
Moist deciduous	15	0.07	0.27	0	0	0.34
Semi-evergreen	17	0.18	1.83	0.06	0	2.06
Wet evergreen	50.8	0.14	3.04	0.14	0	3.31
Shola-grassland	30.5	0.07	0	1.12	0.23	1.41
Grass land	7.5	0	2.93	0.67	0	3.6
Plantation	34	0.03	0	0.32	0	0.35
Mean		0.28	1.09	0.43	0.03	

A total of about 400 km. were walked, 182 km of which were for the estimation of scat abundance. We had only five sightings of four species (two of common palm civet, one of leopard cat, one of brown mongoose, and one of ruddy mongoose). A total of 357 scats were collected, of which those of civets constituted the majority (62%), followed by lesser cats (22%), mongooses (14%) and Nilgiri marten (2%). Overall, civet scats were found at rate of 1.09 scats/km, those of cats at 0.43 scats/km, of mongooses at 0.28 scats/km, and of Nilgiri marten at 0.03 scats/km.

Amongst the different vegetation types, the grasslands of Silent Valley had the greatest abundance of scats (3.6 scats/km), followed closely by wet evergreen forests (3.31). This is followed by dry deciduous (2.78), semi-evergreen (2.06), shola-grasslands (1.41), scrub (0.75), the plantation (0.35) and moist deciduous forests (0.34). Small carnivores seem to be very rare in plantations, with no scats being found in two of the three areas sampled.

There are differences amongst vegetation types in the abundances of the various species. In dry deciduous forests, mongooses were the most abundant species (1.52 scats/km.), whereas civets were the most common species in the wet evergreen forests (3.04 scats/km.), hill top grasslands (2.93 scats/km.) and semi-evergreen forests (1.83 scats/km.) Lesser cats, which were rare in all vegetation types, were the most common species (1.12 scats/km.) in the higher elevation shola-grasslands. The Nilgiri marten was found only in montane evergreen forests and in the associated grasslands of Mukkurthi, and also had a low abundance (0.23 scats/km.). The scrub forests of the plains had low small carnivore abundances, with no species being dominant.

The study so far shows some differences in the abundances of the four species groups in the various vegetation types, with civets being more common in wetter and closed forests, mongooses and lesser cats being more common in the open and drier forests, and the Nilgiri marten being confined to montane shola-grasslands. However, the tentative classification of scats into species groups, upon which the above conclusions are based, needs to be confirmed using TLC. A clearer picture of the species' abundance patterns would also be possible then.

Acknowledgements

The funds provided for this project by the Ministry of Environment and Forests of the Government of India are gratefully acknowledged. We would like to thank the Forest Departments of Tamil Nadu and Kerala for granting us the necessary permissions, and for assistance in conducting the field work. Our sincere thanks are also due to those people who assisted us in the field.

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A new location for the White-tailed mongoose, *Ichneumia albicauda* (Cuvier, 1829), Farasan Kabir Island, Red Sea, Saudi Arabia

David J. SIMMONS

Introduction

Ichneumia albicauda has been recovered from two main areas of Arabia: Oman (Gallagher, 1992) where it is uncommon (Harrison, pers. comm.) and the southwestern area of Saudi Arabia where Nader *et al.* (1975) described it as being common in the locality of Jizan. Harrison & Bates (1991) also mention it occurring in Yemen. It also occurs throughout much of Africa including N. E. Africa where there are a number of records from Somalia, Eritrea, Egypt, and the Sudan (Simmons, in prep.). Jennings (1984) visually identified *I. albicauda* on Farasan Kabir. The known distribution of this species in Arabia is still incomplete.

In 1991 Nader & Al-Safadi reported the first record of *Bdeogale crassicauda* in Arabia. The juvenile female specimen was recovered from Yemen. This species has a patchy distribution and until recently was known only from East Africa. Therefore it was important to separate *B. crassicauda* and *I. albicauda* on cranial evidence to avoid misclassification of the Farasan skull.

Material & method

On 13 July 1993 a disarticulated, clean skull (BMNH 1995.54), minus mandible was discovered by the author on the south east coast (16°42'S, 42°12'E) of Farasan Kabir Island. The skull was found approximately 1 m above the high tide strand line.

The skull was of an adult, which was shown by the fully erupted teeth and fused basioccipital/basisphenoid sutures. The teeth exhibited relatively light wear suggesting a fairly young adult. This suggestion is corroborated by the incomplete orbital rings which are only complete in older adults (Rosevear, 1974). The animal is a female, indicated by the limited development of the sagittal crest.

Dimensions in millimeters are: greatest total length 84.6; condylobasal length 83.1; greatest zygomatic breadth 44.2; width of braincase at posterior end of zygomatic arches 28.2; postorbital constriction 16.4; maxillary toothrow 31.6; ORB 17.2. The dimension ORB is the diameter of the orbit taken in a vertical line from the centre top of the orbital ring to the centrebottom of the orbital ring.

Reference material is given below:
Bdeogale crassicauda: BMNH 51.338, Liwale District, Tanganyika; BMNH 1.11.11.1, Mlanje, Nyasaland; BMNH 10.7.16.8 Mlanje, Nyasaland; BMNH 10.10.14.8, Kenya; BMNH 70.1021, Fort Jameson District, Zambia; BMNH 65.2618, Luvale Boma, Tanganyika; BMNH 6.6.5.8, Zanzibar Island; BMNH 73.878, Nairobi, Kenya.
Ichneumia albicauda (Arabia): BMNH 89.4.2.1, Muscat, Oman; BMNH 88.10.24.1, Muscat, Oman; BMNH 94.3.9.2, Khode, near Muscat, Oman; BMNH 88.10.24.2, Muscat, Oman.

An additional 32 *I. albicauda* skulls from N. E. Africa were studied for reference purposes. All were from the BMNH collections.

Diagnostic features

EXTERNAL CHARACTERISTICS

External characteristics may be a poor method of distinguishing *I. albicauda* from *B. crassicauda*. The white tail of *I. albicauda* may not be a reliable indicator. A small proportion of *I. albicauda* specimens in the BMNH collection have black tails (pers. obs.) although none of these specimens was from Arabia. Tail length may be a better indicator, with an upper limit of 300 mm for *B. crassicauda* being diagnostic (Taylor, 1987). In comparison, the author calculated a mean value of 365 mm for three Arabian *I. albicauda* specimens in the BMNH collection. Head and body length is similar, but *I. albicauda* is a little larger (mean 555 mm, Harrison & Bates, 1991) than *B. crassicauda* which should be less than 500 mm. Ear lengths have similar ranges.

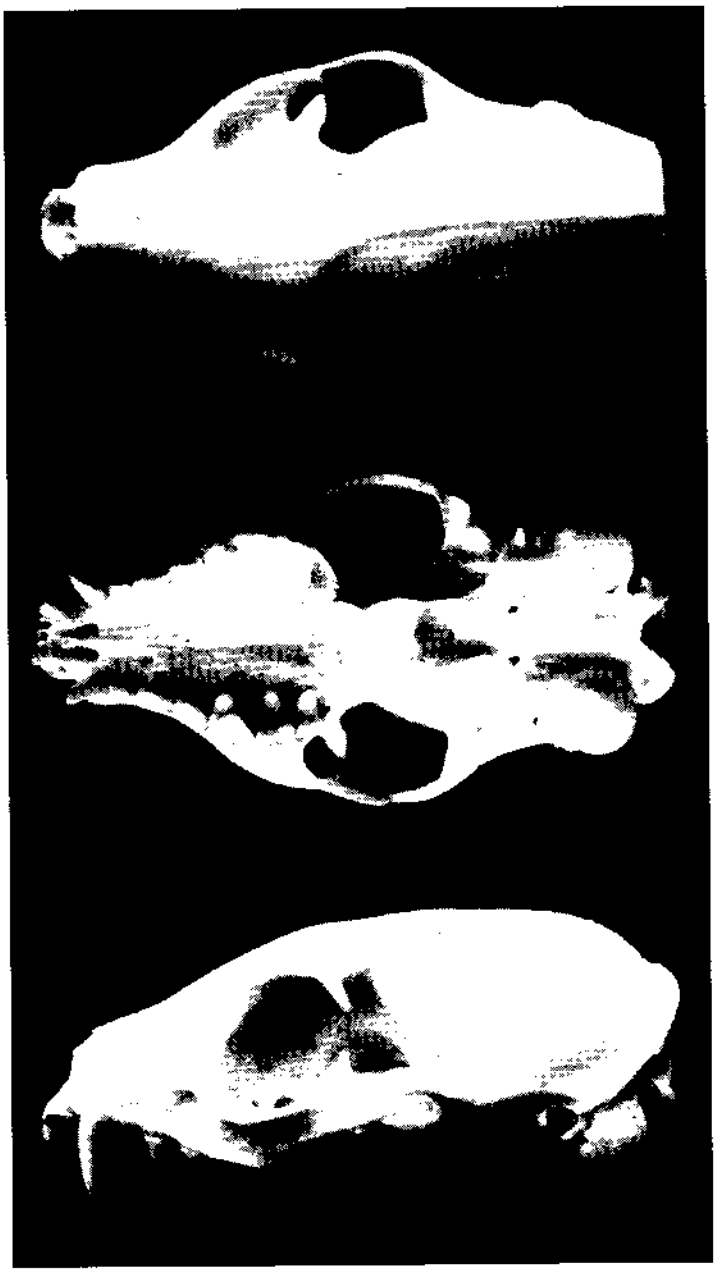

Fig. 1. Dorsal, ventral, and lateral view of the Farasan skull

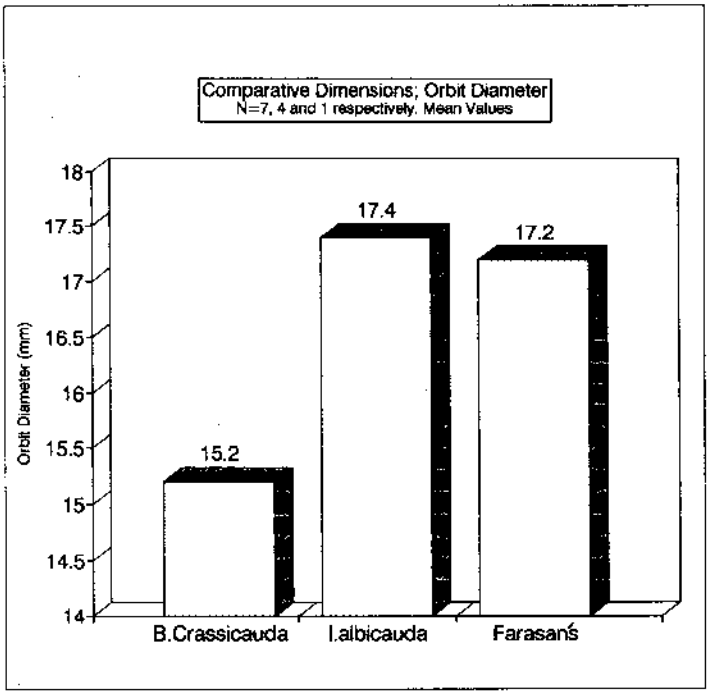

Fig. 2. Comparative dimensions of the orbit diameter

CRANIAL CHARACTERISTICS

Standard cranial measurements are very similar for the two species and do not give adequate grounds for easy differentiation. Below, specific cranial features that separate the two species are presented.

Tympanic bullae: The very strong inflation of the posterior chamber of the tympanic bullae of *I. albicauda* provides the clearest diagnostic feature (Fig. 1). The bullae of *B. crassicauda* are relatively flattened and show considerably less inflation of the rear chamber. The result of this feature is that the basioccipital of *I. albicauda* is much narrower than that of *B. crassicauda*. The Farasan skull has the diagnostic strong inflation of *I. albicauda*.

Zygomatic arches: The zygomatic arches of *B. crassicauda* are angulated at their posterior roots. This is not the case with *I. albicauda* where the zygoma curves inwards more evenly in a more gentle curve.

Orbits: Orbit diameter (Fig. 2) is larger in *I. albicauda* (17.4 mm) than in *B. crassicauda* (15.2). The orbit diameter of the Farasan skull (17.2 mm) is much closer to *I. albicauda* than to *B. crassicauda*.

Maxillary cheekteeth: Fig.3 shows the maxillary toothrow P^4, M^1, M^2 from BMNH specimens of *B. crassicauda*, *I. albicauda*, and the Farasan skull. It is clear that the teeth of the Farasan skull match those of *I. albicauda*. P^4 is diagnostic. The posterior edge is notably indented unlike *B. crassicauda*. Similarly, M^1 is distinctive.

Canines: Fig. 3 shows the upper C of the two specimen skulls and the Farasan skull. A consistent dental feature of *B. crassicauda* mentioned by Skinner & Smithers (1990) is the shape of the upper canine which is nearly straight and has clearly defined shearing edges on the anterior and posterior surfaces of the tooth. In contrast, the shape of the upper C in *I. albicauda* is slightly curved and pointed and lacks the distinctive shearing edges of *B. crassicauda*. The Farasan skull does not have such dagger-shaped canines, but again strongly resembles the slightly curved and pointed canines of *I. albicauda*.

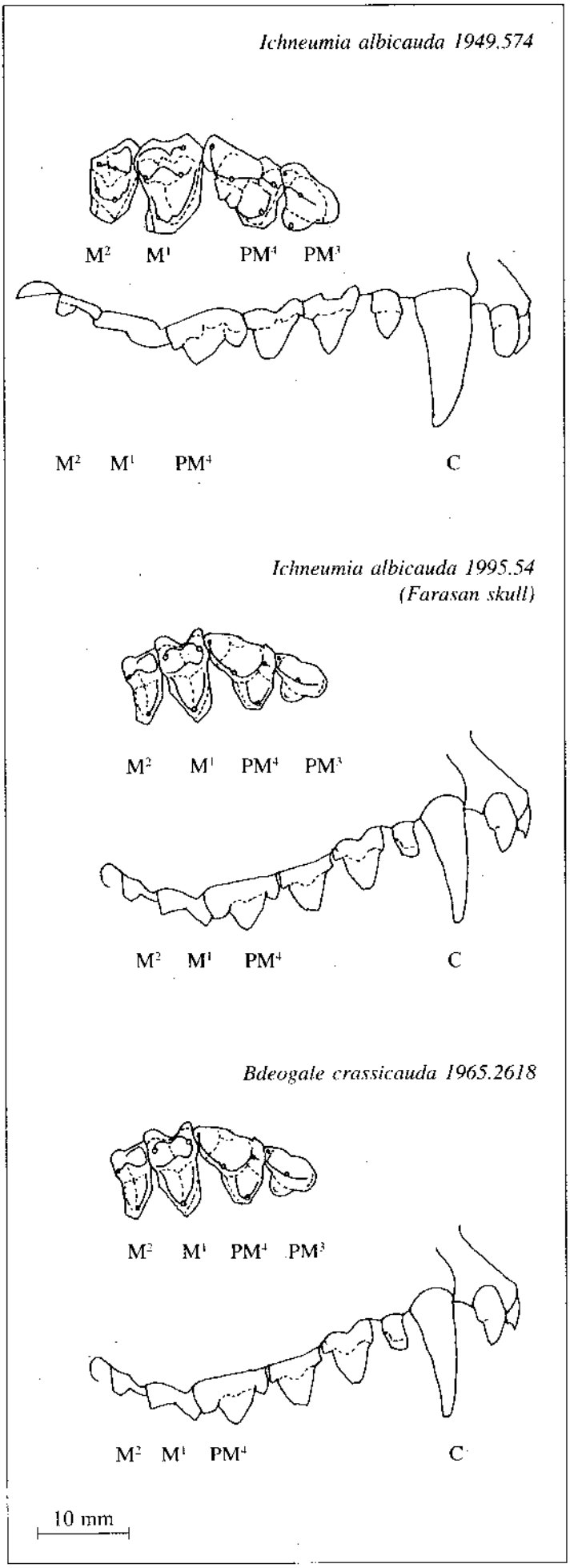

Fig. 3. Occlusal and lateral view of teeth of specimens of *Ichneumia albicauda*, *Bdeogale crassicauda*, and the Farasan skull

Remarks

On the dental and cranial evidence given above and based on observations by David Harrison (pers. comm.)I suggest that the Farasan skull is *I. albicauda*. Dental characteristics of *I. albicauda* and *B. crassicauda* are sufficiently different to allow identification. Cranial differences, particularly of the tympanic bullae are also diagnostic. However, due to the relatively small sample sizes this diagnosis cannot be unequivocal and some of the features used to differentiate the two species and identify the Farasan skull may prove to be inconsistent as more specimens are collected.

An interesting aspect of this skull is its small size compared to other Arabian *I. albicauda* specimens. Any comments on the taxonomic status of the Farasan skull must be tempered by the fact that all measurements are from a single specimen. There is obviously a large size range with this species. Generally speaking Arabian and N. E. African specimens are considerably smaller than East African specimens.

The Farasan skull is smaller than the minimum size range of Arabian skulls, but very few have been recovered. Further samples of Farasan and mainland Arabian individuals will reveal if subspecific status of the Farasan population is merited.

How Farasan Kabir was colonised remains a mystery. Either the animals were introduced, perhaps as a pest control measure, or they naturally colonised when the island was more accessible. However, on the evidence of this skull, the sighting by Jennings (1984) and another unrecovered skull found on the islands by the author it seems probable that there is a population of white-tailed mongooses on Farasan Kabir. It has been suggested that the skull was washed ashore or carried to the islands by a bird of prey (Van Rompaey, pers. comm.), but as Van Rompaey himself states, this seems unlikely.

The similarity of Arabian *I. albicauda* skulls to those of *B. crassicauda* is worthy of mention. The record by Nader & Al-Safadi (1991) of a juvenile female *B. crassicauda* needs confirmation based on cranial features. The tail length of this animal exceeds the range given by Taylor (1987).

In conclusion, the occurrence of a population of *I. albicauda* on the Farasan Islands can only serve to enhance the conservation standing of the Islands.

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Bovine TB in badgers

MAFF. 1995. *Bovine TB in badgers*. 11th report. Paperback.

The Ministry of Agriculture's latest glossy report notes a continuing dramatic increase in TB cattle herds but offers no explanations for this five-fold upswing since 1986 and expansion in blackspot areas. An equally unexplained drop in badger TB in the Glos. study area suggests the answer is not an increase in TB in badgers but one in cattle.

Previous issues of Small Carnivore Conservation pointed out that cattle are infectious at any stage of the disease (12:9), and that transfer from cattle to badgers is likely (10:19 and 11:25), and that Mad Cow replacements have simply stirred up the cattle TB reservoir since 1986. This is why cattle herd breakdowns are appearing in new areas, with no TB badgers initially, but badger TB re-established later on e. g. the Marlborough case.

The absolutely **pivotal** flaw in MAFF logic, in now claiming that only cows with gross lung lesions are infectious is simply because they are confusing two sorts of cattle which do not show lesions. Fully two in three TB herd breakdowns in fact produce no TB cows nor TB badgers because they **do not have TB**! (false positive reactors). But the small minority of early TB cases without lesions are producing herd breakdowns but being misunderstood by MAFF (Clifton-Hadley, 1995; Hancox, 1994). The cost-effective management of cattle TB urgently needs better, faster blood tests to derestrict movement of cattle and farm business quicker (7:14).

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Sighting of the Nilgiri marten (*Martes gwatkinsi*) at Eravikulam National Park, Kerala, India

M.D. MADHUSUDAN

The Nilgiri marten (*Martes gwatkinsi*) is a rare mustelid which is endemic to the forested tracts of the Western Ghat mountain range (which runs north-south along the western flank of the Indian Peninsula). Sightings of this species have been very few and, hitherto, there were no photographic records of the species, either in the wild, or in captivity. There is a remarkable paucity of reliable information on the distribution and status of this animal; it is listed under the 'indeterminate' category of threatened mammals by the IUCN (Groombridge, 1993). The exact taxonomic status of this animal is not clear either. For example it is regarded as a subspecies of *Martes flavigula* by Corbet & Hill (1992), whilst others (e.g. Prater, 1980) regard it as a separate species.

Prater (1980) notes that the species occurs in the well-wooded tracts of the southern Western Ghats. Interestingly, Wroughton (1919) records the possibility of a specimen in the collection of the Bombay Natural History Society as having come from Dharwad in north Karnataka. If true, this is very likely to represent the northern limit of its distribution. It is difficult to draw conclusions from the anecdotal accounts of the Nilgiri marten that are referred to in the following text, but if these are any indication, the animal presumably occurs at naturally low densities.

On 15 February 1995, at about 10 a.m., I sat in a shola forest (montane, stunted evergreen forest) at Rajamala in Eravikulam National park, Kerala (10°10'N, 77°00'E and 10°20'N, 77°10'E), photographing a Nilgiri langur *Presbytis johnii*. The monkey soon disappeared into the canopy. Around where the monkey disappeared, I noticed a dark shape in the crook of an *Isonandra candolleana* tree (about 10 m from the ground). I instantly identified the sleeping animal as a Nilgiri marten. The animal got up repeatedly to watch me, or to groom itself, but was not unduly perturbed by my presence. After I had watched it for nearly 90 minutes, the animal left, moving effortlessly through the canopy, and never descending to the ground.

I was taken aback by the large size of the animal. I had previously seen the Himalayan Yellow-throated marten (*Martes flavigula*) at Rajaji National park (near Dehra Dun in north India), and found that *M. gwatkinsi* is certainly larger. I estimate the total length of the animal to be close to four feet, with the tail being nearly as long as the body. The single available reference on the body morphometrics of the Nilgiri marten (Riley, 1913) gives a head-and-body length of 24 inches, a tail length of 16 inches, and a body weight of 4.5 pounds (the age and sex of the animal were not known).

I have no clue as to the food habits of this animal. However, given that the species (like other *Martes*), is as comfortable in trees as it is on the ground, it seems plausible that arboreal mammals and birds might constitute a significant part of its diet (Riley, 1913). Indeed, there are reports of the Nilgiri marten preying upon crows in the High Ranges of Kerala (Gouldsbury, 1949), and upon the Malabar giant squirrel (*Ratufa indica*) in the High Wavy Mountains of Kerala (Hutton, 1944). The patch of forest in which I sighted the animal was barely 5 ha in area, and surrounded by both tea and eucalyptus trees. *Martes gwatkinsi*, like many other small carnivores, might do well in the small patches of shola forests that dot the tea- or grassland-covered landscape around Eravikulam. Authentic local sources report an instance of the marten nesting in a solitary *Grevillea robusta* tree in the middle of an open tea plantation.

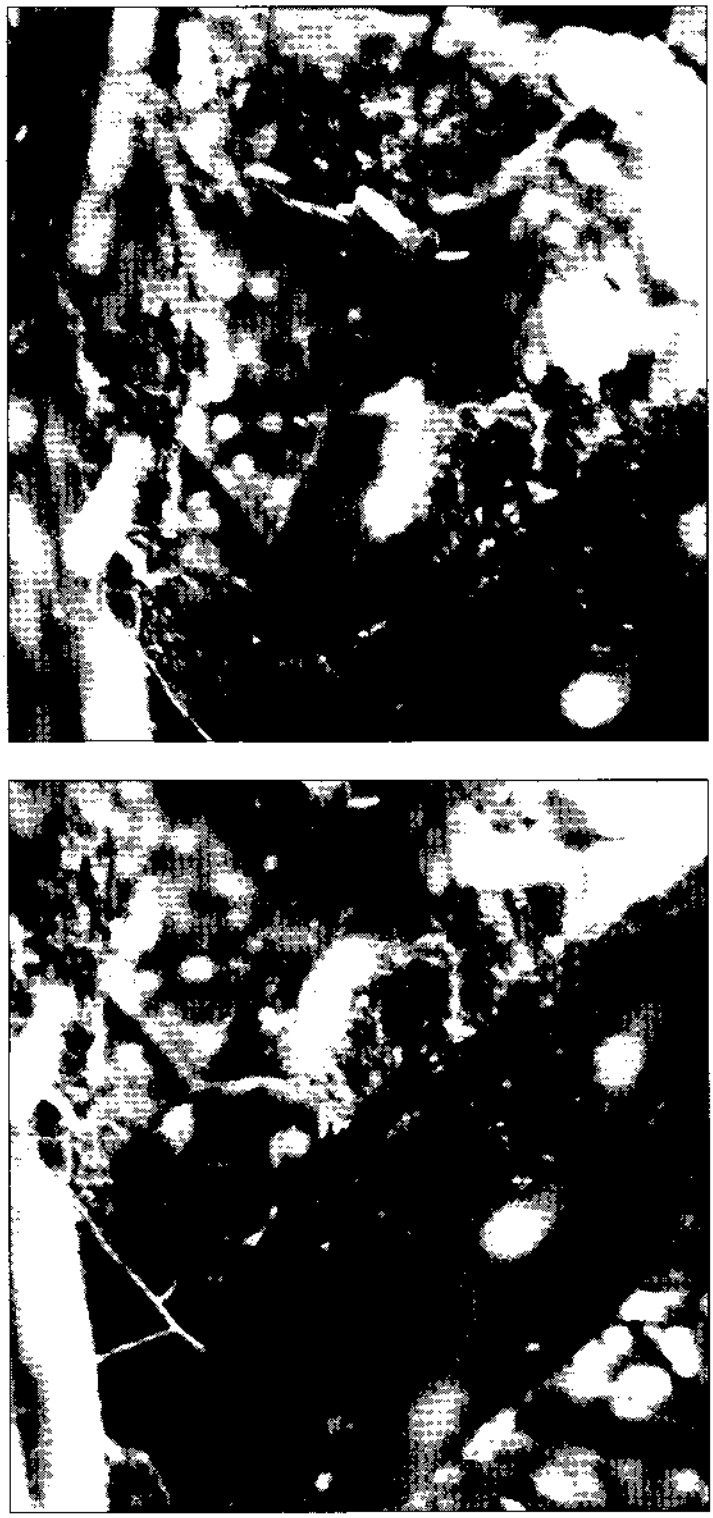

Fig. 1. Nilgiri marten (Martes gwatkinsi) *in Eravikulam NP, India. Photo: M. D. Madhusudan.*

Other small carnivores

Eravikulam, together with the estates that surround it, supports a diverse mustelid-viverrid community. In the course of my five-month study on the Nilgiri tahr at Eravikulam, I noted the presence of three species of mongoose: the ruddy mongoose *Herpestes smithii*, the stipe-necked mongoose *H. vitticollis*, and the endemic brown mongoose *H. fuscus*. There are also reliable accounts of a fourth species, the large grey mongoose, *H. edwardsii*, at elevations lower than 1,500 m ASL (J. Zacharias, *pers. comm.*). Amongst the civets, only the small Indian civet, *Viverricula indica*, has been seen in the area. However, the common palm civet, *Paradoxurus hermaphroditus*, which occurs sympatrically with *V. indica* over most of its range, might also occur here. Amongst the cats, there are confirmed sightings of leopard cat, *Felis bengalensis*, and jungle cat, *F. chaus*. Reports also note the occurrence of otters in this area. The common otter, *Lutra lutra*, and the clawless otter, *Aonyx cinerea*, could occur here, as has been reported for the High Wavy Mountains nearby (Hutton, 1949). No confirmation of the exact identity of the Eravikulam otters has been possible to date.

Even in the face of the poor information we have on the small carnivores of the Indian subcontinent, I would like to hazard that it is important not to neglect smaller, more disturbed, so-called 'marginal habitats' in any effort to conserve small carnivore species.

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A request for information and samples from nocturnal mammals

We are writing to inform you about our long-term research on nocturnal primates in Africa and to ask for your help. It has become apparent that many nocturnal species have been overlooked because of their cryptic habits and appearance. Similar looking populations often have different communication systems which suggest that they do not recognise one another as members of the same species. We are trying to sample the extent of speciation in noctural mammals, especially bushbabies (galagos) which are found over most of Africa south of the Sahara.

To this end we have built up an extensive library of tape recordings of the animals and we have identified 'vocal fingerprints' that can be used to identify each species. It is also possible to compare populations using newly developed studies of DNA from skin or hair samples (pet animals or road-kills, etc.). Guard hairs should be pulled to obtain the follicles at the base and stored in a dry place, wrapped in clean paper. For such studies to be successful it is essential that the precise locality of origin is known.

In order to sample a wide area we are asking volunteers who have tape recordings of bushbabies and **other vocal mammals** or who may be in a position to record their local species, or know someone who could make recordings. We have prepared a number of specimen tapes giving examples of typical calls, and explaining how to recognise and sample the calls which are of most interest.

We will be pleased to send a copy if it is of interest to you. At this stage the quality of recordings that we receive is not critical, since even relatively poor samples can still give a good impression of the extent of variation.

Bushbabies and **other mammals** can often be seen at night using a simple headband torch (4.5V. Petzl zoom or equivalent) which picks out the brilliant reflections from their eyes. Covering the torch with a red filter is sometimes effective if the animals are disturbed by white light and it allows the night vision of the observer to improve over time. Binoculars are also helpful at night by increasing the effective light -leading to useful and enjoyable sightings.

Naturally, we are in a position to refund any expenses you may incur on our behalf for tapes and postage, and your assistance will be duly acknowledged in papers and reports on our research. Without the help of naturalists in the fields we will be unable to sample many of the African forests, woodlands, and savannahs which we believe may harbour unusual representatives of the group, which may have evolved in isolation for long periods. Please bear us in mind should an opportunity present itself to (1) make tape recordings; (2) take hair samples from living animals or carcasses; (3) give descriptions of sightings, habitats, locations, etc. We will be very pleased to help on the technical side if possible.

We look forward hearing from you. With thanks.
Simon Bearder and Paul Honess.

Simon Bearder, School of Social Sciences, Oxford Brookes University, Oxford OX3 OBP, UK.

Breeding of the Libyan striped weasel *Poecilictis libyca* at Poznan Zoo, Poland

Hanna SITEK

The Libyan striped weasel is a little known carnivore from the arid areas of northern Africa whose biology and ecology have not been studied into any detail in the field. According to the available data, the species is nocturnal and spends its days in burrows and rock crevices. Its food consists of small mammals, birds, reptiles and invertebrates. The species appears to live singly in the wild. An Algerian female was found to have two fully developed foetuses when examined in May.

There are no records available about the keeping of *P. libyca* in captivity. In September 1993, a pair of this species was acquired by us from a private breeder in the Netherlands. According to the information available the animals were wild-caught in Libya. The age of our pair is unknown, but both appeared to be fully grown on arrival. For their maintenance we employed methods similar to those used in the maintenance of the Common zorilla, *Ictonyx striatus*.

The body length is about 25 cm, tail length 15-20 cm, weight 0.5 kg (female) and 0.6 kg (male). The back and sides are white with five parallel but irregular stripes. The belly and legs are black whilst the ears are black with whitish margins, and the tail is black, but grizzled with white. Striped weasels bear a definite resemblance to the common zorilla, both in their shape, and in their behaviour, although they are significantly smaller.

As the animals are getting-along very well, with no aggression having been observed, they are kept together permanently (apart from the breeding season). They use two kinds of enclosures. During the winter (when ambient temperatures fall below 5°C) they are kept in a cage of the following dimensions: 1 m x 1.5 m x 1 m high, with heating to about 15°C provided. The wooden floor is covered by gravel and sand. A simple den, 40 cm x 40 cm x 30 cm high, is provided for shelter. During the summer they are kept in an outdoor exhibition cage of 2.5 m x 1.5 m x 1.5 m high, with an adjoining wooden shelter 1 m x 0.7 m x 0.4 m high, which is further divided into smaller compartments with wooden partitions. The outside cage is furnished with a variety of plants, and with stones and branches located close to the ground. Inside the den there is a heating lamp which is switched on in rainy weather. The animals are moved outside when the ambient temperature exceeds 10°C.

Striped weasels are strictly nocturnal, and they spend the whole day in the den. They are very aggressive towards humans. During an attack they erect the fur along the back, raise the tail over it, and also rear the entire body, whilst uttering loud voices. During attack their movements are both very quick, and persistent, and they expel a fluid with a pungent odour. These animals also can 'play dead' when scared; after being recaptured from an escape, the male remained immobile with his eyes closed and his tongue extended for over two minutes.

The animals are basically ground-living, although able to climb on branches and the wire-netting of the cage. They do not destroy the plants in their cage, so the only signs of their nocturnal activity are the burrows and paths that remain visible in the cage.

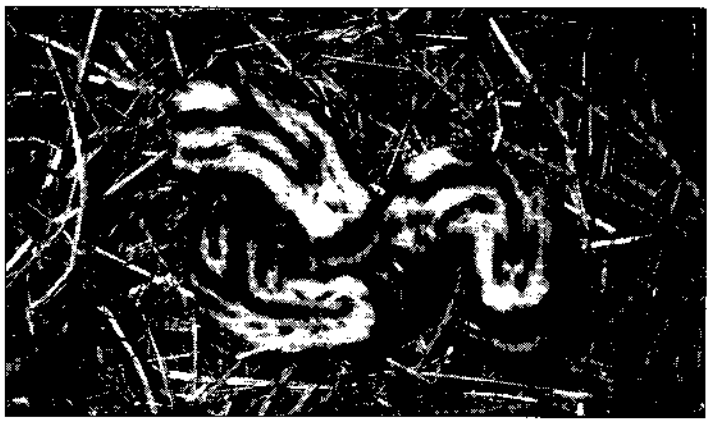

Fig. 1. Three-weeks old Libyan striped weasel cubs, *Poecilictis libyca*. Photo: M. Batkiewicz

If removed from the den during daylight, they try to bury themselves immediately.

Our weasels are fed once a day, six days a week. The food consists of finely-chopped horse-meat or beef, with grated vegetables, line seeds and boiled cereals, plus Japanese quail, day-old chicks, mice, small rats, raw eggs, crickets and locusts used in turn - fruit is not taken. As a prophylactic against vitamin deficiencies in spring and autumn 'Polmamix M' (a vitamin and mineral supplement for fur-bearing animals) is added. During suspected pregnancy bone meal and cod-liver oil are mixed with the female's regular food. Thus far, there have been no veterinary problems with our animals.

Most mustelids breed during the spring. Therefore, although neither mating, nor significant behavioral changes were noted in our female, she was separated from the male in April. She was moved to a cage similar to the one described above on 21.04.1994, and on 23.05.1994, two new-born cubs were found in the den. They were severely hypothermic, and weak. The younsters were removed from the den despite the female's attacking. However, she was probably primiparous, and unable to care for the cubs properly. The younsters, both male, were immediately placed in a human incubator. One died after one hour, the second died the same evening, although we had tried to feed the second cub every two hours with 'Humana 1'. The autopsy didn't reveal the cause of death, although we suspect that hypothermia had taken its toll. The new-born cubs had the following measurements: body weight 5 g, body length 63 mm, tail length 12.4 mm, head length 20.4 mm, hind foot length 7.5 mm. The body was covered with very short, whitish fur.

On 01.07.1994 the female was reintroduced to the male. As the shortest known pregnancy in a mustelid is around 35 days, she had been separated on 21.04.1994. On 11.07.1994 two cubs were spotted in the den, apparently tenderly cared-for by the female. It therefore appears that *P. libyca* can repeat the oestrus and pregnancy within 40 days. The female was very aggressive during the rearing of cubs. To prevent excessive disturbance the den was only opened once a day, and only to briefly check on the status of the cubs. After three weeks the female was separated for a few

minutes to perform de-worming, to check the status of the cubs, and to take measurements. There were three cubs, all male, with body weights of 55, 55, and 60 g, respectively. Their eyes were still closed. Their bodies were covered by short, blackish-white fur, and they were unable to walk. The canines and incisors were well-developed in both jaws. Cubs were de-wormed with 'Flubendazole'.

After another ten days the cubs and mother were briefly separated again. Their body weights were 80, 85, and 90 g. Two cubs had fully opened eyes but the smallest had only partly opened its eyes. They were already moving around quite skilfully. At an age of five weeks they probably started to take solid food on their own. At an age of two months their average body weight was 250 g, and they differed from the adults in size only. At this age the female moved them to an outside, self-made burrow. Even at this advanced age the female was still carrying her offspring by the neck. At an age of three months the offspring were separated from their mother, and she was reunited with the male.

When beginning with this virtually unknown species we had been anticipating some difficulties but on the contrary, this species appears to be easy to maintain, and successful breeding in the first year gives some promise for the future. In the meantime, youngsters have also been reared in the Netherlands, so there is a possibility to build up a viable population in captivity.

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Recent publications

Martens, sables, and fishers

Buskirk, S. W., Harestead, A. S., Raphael, M. G. & Powell, R.A. 1994. *Martens, sables, and fishers: Biology and conservation*. London: Cornell Univ. Press (Comstock Publ. Ass.). 484 pp. Price £53.95 or US$ 65.00.

Works providing detailed accounts of any particular group of small carnivores are uncommon, and this is no less the case for the martens (*Martes* sp.). Furthermore, what little we do have in the way of scientific writing on this small, but interesting mustelid genus, has often tended to emphasise the genus' significance as commercially important furbearers.

Despite the fact that *Martes* has only just over a handful of species (usually either seven or eight, depending upon your inclinations and viewpoint), it is of disproportionate importance to various human interest groups. At the basic level of natural history and aesthetics, these are shy, intriguing creatures, that move with beauty and grace through the remote landscapes of the northern forest belt. At another level, *Martes* are furbearers of considerable economic significance, so that fishers (*M. pennanti*), American martens (*M. americana*) and sable (*M. zibellina*) are trapped intensively in some places. Furthermore, in both North America and Europe, martens are sometimes viewed as indicators of undisturbed, native, natural coniferous forests and, to a certain extent, of environmental "health". At the other end of the spectrum, *M. foina* (the stone or beech marten) seems to have adapted to modern times by becoming increasingly synanthropic, sometimes becoming something of a "pest". Whilst the stone martens inhabiting the roofs of Prague's Charles University are much approved of for controlling the numbers of pigeons and rats, the hunting of poultry, and the bizarre habit of gnawing rubber automobile parts, have made them less popular elsewhere.

Until now, anyone wanting to read about the biology and ecology of the martens at a serious level has had little option other than to search through the primary research literature, sorting the wheat from the chaff as they go. Moreover, research articles dealing with *Martes* are often published in specialised journals, such as those dealing with fur production, game biology, or wildlife management, rather than in journals of general zoology or even mammalogy. What's more, those of us dealing with Eurasian species may face the additional problem of a multilingual literature. Not any more, however. This is because *Martens, sables, and fishers* does manage to provide a broad-based appreciation of most aspects of the biology and ecology of the martens, and so represents a very welcome compilation indeed.

According to the editor's preface, the idea of this book came from a series of discussions held at the Symposium on the Biology and Management of Fishers and Martens, with articles being solicited from the authors deemed most suitable by the editors, and contributions then being "refereed" as a quality-control exercise. The final volume contains 30 articles by 57 authors, these being divided between seven sections, each with a brief introduction by the appropriate editor. Although it is obviously impossible to detail all of these contributions here, the seven sections are as follows: (1) evolution and biogeography -five papers including two paleoecological studies and one on sexual dimorphism; (2) population ecology -three papers (one on *M. foiana*) on spacing, habitat use and vulnerability; (3) management of populations -seven papers dealing with various aspects of American marten and fisher population management, and including work on the effects of trapping, the success of translocations, age/sex determination, and population monitoring techniques; (4) status and conservation of Holarctic *Martes* -five papers, one on the Nearctic forms, the others on the former USSR (two papers), and Japan and China (these including an article on *M. melampus tsuensis*); (5) habitat ecology -four papers (one on European species) that deal with habitat selection and nutritional ecology; (6) managed habitats -four papers, one on *M. martes* in Boreal Scandinavia, the other dealing with the effects of different aspects of forestry practice; (7) physiology and reproduction -two papers, one on trade-offs between size and shape, the other being a review of reproduction in the genus. The entire volume is rounded off with a single set of references (over 50 pages in its entirety) and an index.

There are two ways to produce a book like *Martens, sables, and fishers*. The first is to provide the standard set of tired chapter headings that we are so used to seeing in zoological books (reproduction, feeding, habitat selection, relationships with man, etc.), each encompassing blow-by-blow accounts of how these differ in the various species. The alternative is to contact a range of folk active in research upon the beasties in question, and to then select topics for them in such a way that they write using their current and past experiences and pass these on to their colleagues. The danger in the first method is that the end-product is usually boring and list-like. The danger in the second is that, as you tend to be on best terms with people interested in similar things to yourself, the scope of the eventual coverage can be a little narrow, and some subjects may slip through entirely.

My personal view is that a volume of the first type would not have been successful here and that, despite the risks of strategy two, Buskirk *et al.* have done a good job on the martens. Having said that, there are gaps, as you might expect. Should you wish to know about marten diseases or parasites, you'll not get far with this volume, neither will you be able to find out much about their anatomy or physiology (with the exception of reproductive physiology). What you do get, however, is a clear picture of how different congeneric species interact with their environments, and how they respond to changes in those environments. This is much more useful from the point of view of the successful management of populations that are trapped for their pelts, or the conservation of those whose habitat is harvested for timber.

Again, if looking for criticisms, one could gripe about the slant towards Nearctic *Martes*, with comparatively little being said about the well-known European species, whilst the rarer species of marten are barely discussed at all. In all fairness, however, there has been more consolidated study of *M. americana* and *M. pennanti* within the last decade than there has upon any other *Martes* sp. and, as regards the poorly-known species, well, these really are very poorly known so there isn't really a great deal to say about them! Moreover, much of what has recently been learned about *M. americana* and *M. pennanti* can be extrapolated to the other species, and in this sense the book works well. The research discussed here is right up-to-date, and the bibliography (which is very comprehensive) can provide a pathway into any aspect of the biology of these animals that one might wish to pursue. Furthermore, the contributions by the three Russian authors provide a noteworthy insight into the work undertaken in the former USSR to date, and of which western scientists are usually completely ignorant.

This volume is very much a child of its time, and the content is clearly appropriate to the martens of the late 20th century. After all, this is the century that we all live in, and these are the martens that we wish to conserve. I am favourably impressed with this book and, if you have a serious interest in the biology of *Martes* (or in the general conservation biology of small carnivores) this book is well-worth acquiring. Perhaps the only real problem is the price, although I'm now reconciled to the fact that I sometimes (but increasingly often) must pay £50 to get an academic book that I really want. It is clear that *Martens, sables, and fishers* is not intended for students, but £50 still represents a substantial cost to many private purchasers. Despite this, I believe that *Martens, sables, and fishers* will represent an excellent investment for many people working in a variety of fields in wildlife conservation and management. Overall, I believe that Buskirk *et al.* have done well, and a contribution such as this is long-overdue, and very welcome.

(review by H. I. Griffiths)

THE SPOTTED LINSANG, *Prionodon pardicolor*

Harry VAN ROMPAEY

The genus *Prionodon* Horsfield, 1824 comprises two species, *P. linsang* (Hardwicke, 1820) and *P. pardicolor* Hodgson, 1841, the latter first mentioned in 1841. Both belong to the family Viverridae and subfamily Viverrinae, but Thomas (1925) places *pardicolor* in the genus *Pardictis*. Aside from differences in coat pattern, Thomas also remarks on cranial differences; *P. pardicolor* has a shorter, more parallel-sided palatal tube, non-expanded ecto-pterygoids, and bullae with an annular, swollen anterior with a large meatus, but a comparatively small, less inflated posterior part. Ellerman & Morrison-Scott (1966) place *P. linsang* in the subgenus *Prionodon*, and *P. pardicolor* in the subgenus *Pardictis*.

Fig. 1. Spotted linsang (*Prionodon pardicolor*) from Vietnam. Photo by K. Baranauskas.

LOCAL NAMES

Linsang pyauk (Burmese; U Tun Yin, 1967); **Namlaniao** (Kachin, used for all civets; U Tun Yin, 1967); **Suliyu** or **Silu** (Lepcha) and **Zik-chum** (Bhutan)(Blanford, 1888-1891)

DISTRIBUTION AND STATUS

The spotted linsang (Fig. 1.) (also sometimes known as the spotted tiger civet), is widespread over much of south-east Asia but uncommon to rare throughout. Its range includes: eastern Nepal, India (Sikkim, Assam, and Bengal), Bhutan, north-eastern Myanmar (Burma), northern Thailand, Laos, northern Vietnam, and southern China (western Sichuan, Yunnan, Guizhou and southwestern Guangxi)(Fig. 2.).
CITES status: Appendix I

Nepal

Hodgson (1841), in his description of the species, states that it is 'sufficiently common in the mountains of Nepal, though not until the last three years known to me as a denizen of them'. In 1847 he finds 'the species very numerous in the eastern half of the sub-Himalayas, or Nepal and Sikkim'. In the 1970s four observations were made in Chitawan National Park (Sunquist, 1982).

Museum specimens: Both the BMNH and SMF hold specimens from Nepal, but none have any specification of locality.

India

SIKKIM

Museum specimens: The FMNH holds specimens from Phadamchen, Lingtam, and Jeluk (Lunglung); the MNHU from Lachen and Gangtok; the BMNH from Mandili; and the FMNH from Phadamchen, Lingtam, and Jeluk [while Sanborn (1932) also mentions a specimen from Sedonchen]. Sclater (1891) mentions a specimen from Gumpah held in the Indian Museum, Calcutta.

The Mammal Survey of India, Burma, and Ceylon (1914-15) collected specimens from Chuntang (=Tsunthang), Dikchu, and Singhik (5 km north of Dikchu) (Wroughton, 1916a).

In the 1880s it was not considered rare in Sikkim (Blanford, 1888-1891). In the 1980s a specimen was caught in Lachung (Schreiber *et al*, 1989; Anon., 1989).

ASSAM

Museum specimens: The BMNH holds a specimen from Dening (Mishmi Hills) (Hinton & Lindsay, 1926) and the FMNH has one from Karong.

BENGAL

Jerdon (1874) collected a specimen from Darjeeling and Sclater (1891) mentions two specimens from this area held in the Indian Museum, Calcutta.

MANIPUR

Ramakantha (1994) reports the sighting of specimens in the forests of Jiribam-Tamenglong, and a possible sighting in the Shiroy-Karom Hill ranges of Ukhrul District.

Myanmar (Burma)

Museum specimens: Thomas in 1891 mentions a specimen from Meteleo and in 1921 two specimens from Kachin Province in the collection of the Bombay Natural History Society. Sclater (1891), cites a specimen from the Kakhyen Hills in the Indian Museum, Calcutta. The AMNH holds specimens from Magwe and Hpawshi, near Gangfang (Anthony, 1941).

The Mammal Survey of India, Burma and Ceylon (1914-15) collected a specimen in the Chin Hills, 80 km west of Kindat (Wroughton, 1916b). U Tun Yin (1967) mentions five skins, collected in 1939 by R. Kaulback, from Nam Tamai Valley, Taron Valley, and Ratnampti in Myitkyina District (in BMNH). A skin, collected by Lord Cranbrook in 1931 in Jite, Tibet, is thought to have originated in Burma.

Thailand

Museum specimens: The NMNH has a specimen from Lory Province.

The species is near its southern distributional limit in Thailand, and is considered to be very rare and localised (Lekagul & McNeely, 1977). The occurrence of the spotted linsang has not