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Pygmy spotted skunk *(Spilogale pygmaea)* from Chamela, Jalisco, Mexico - Photo: Lisette Cantú

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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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Ecology of the Pygmy spotted skunk (*Spilogale pygmaea*) in the Chamela Cuixmala Biosphere Reserve, Mexico: Preliminary findings

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Introduction

The Pygmy skunk (*Spilogale pygmaea*, Thomas 1898) is a small carnivore endemic to Mexico, distributed throughout the Pacific coast, from the state of Sinaloa to the Istmo de Tehuantepec (Van Gelder, 1959; Baker & Sánchez, 1973). The first specimen of pygmy skunk captured came from Rosario, Sinaloa, on the Pacific coast in 1897. They were collected occasionally and, besides Sinaloa, a few specimens were captured in Guerrero, Oaxaca, Colima, Nayarit, Jalisco, and Michoacan (Baker & Sánchez, 1973; Genoways & Jones, 1968; Greer & Greer, 1970; Hall 1981; Martínez & Vargas, 1996). Although it is an endemic species protected by Mexican laws (SEDESOL, 1994) little is known about the pygmy skunk's natural history and ecology. The most detailed information about movement patterns, home range size, and temporal and spatial resource utilization relates to the other two species included in this genus, *Spilogale putorius* and *S. gracilis* (Crooks & Van Vuren, 1995; Kinlaw, 1995). Until today most information reported about the pygmy skunk is based on data obtained for other skunk species (Ceballos & Miranda, 1986; Medellín *et al.*, 1998). Because of that, our research team started to generate basic information about this species as a part of the project «Ecology and conservation of the mesocarnivore community from western Mexico».

This progress article reports the work carried out from 1996 to January 1999, where important information about some ecological issues of this small carnivore in Chamela, Jalisco, has been obtained.

Study area

The study was carried out at the Chamela IBUNAM Biology Station, part of the Chamela-Cuixmala Biosphere Reserve. This is the only protected area where, until now, the presence of the pygmy skunk is known. The annual mean precipitation in the area is 750 mm, and it presents as the most outstanding characteristic a marked seasonality, with a rainy season from July to October, and a long dry season that extends to May. Therefore, water availability for wildlife is very limited at the end of the dry season. Tropical dry forest is the most abundant type of vegetation and covers almost the complete study area. The second important type of vegetation is semi-deciduous tropical forest, restricted to the riverbeds in Chamela, and with a very limited extension. Other types of vegetation present in the area are mangroves, xerophilous bushes, riparian vegetation and palm groves. Next to these vegetation groups, it is also possible to find some deforested areas, covered by secondary vegetation and several crops. The most important problem at a regional level is the rate of deforestation due to the expansion of agriculture and cattle ranching, as well as tourist development in the Pacific Coast area.

Methods

Animals were obtained with live traps baited with spicy meat and live chicks. Once captured, animals were anaesthetised

with a xilacine hydrochloride and ketamine hydrochloride mixture (López-González *et al.*, 1998). Conventional somatic measurements were taken; physical and reproductive conditions were evaluated, as well as approximate age (based on tooth-wear characteristics). Some animals were equipped with collar or harness radiotransmitters. Once completely recovered from anaesthesia, skunks were released at the capture site. Animals equipped with radiotransmitters are directly located at their dens by homing, and radiotracking was carried out. The information obtained will allow us to describe the species' home range size during different seasons, its denning ecology and its habitat use. The droppings of captured skunks were gathered, and through the analysis we obtained information about the food habits of the species in Chamela.

Results

It has not been possible to observe any pygmy skunk during its normal activities, due to its nocturnal habits. All individuals captured for the first time were aggressive,and only some of those re-captured tolerated our presence more or less. However, no physical contact was allowed without showing agression, an attitude different to that reported by López-Forment & Urbano (1979), who stated that they are «daring and unsuspicious animals».

A total of 50 different individuals have been captured, 13 females and 37 males, all of them inside the undisturbed dry forest. Up to date, no trace of this species has been found in agricultural areas and pastures adjacent to the Chamela Biological Station (Cantú-Salazar *et al.*, 1998). Table 1 summarizes morphometric data obtained for these individuals. The maximum weight obtained was 230 g (a large and healthy male), compared to 320 g as reported by Ceballos & Miranda (1986) in the same area. Therefore, we believe that the data supplied by these authors are somewhat exaggerated.

A male with semi-descended testes was captured in March 1997. During April and May 1997, and May and June 1998, 16 males with descended testes were captured. Two pregnant fe-

	Females (n=13)		Males (n=27)	
	mean	range	mean	range
Total length	250.1	204-298	271	247-300
Tail length	67	50-80	69.5	55-87
Hind foot length	30.8	26-35	33.6	30-37
Ear length	20.3	15-25	21	17-25
Weight	156	130-173	185.7	145-230

Table1. Somatic measurements (in mm and g) of 40 adult pygmy skunks captured in Chamela, Jalisco

males were captured in May and June 1998. Other studies indicate that pregnant females were captured from May to August, which suggests that this species may produce two litters per year (Baker & Sánchez, 1973; Genoways & Jones, 1968; Teska *et al.*, 1981).

López-Forment & Urbano (1979) make observations regarding this species' diet, reporting insects, large arachnids, crayfish, scorpions, bats, and wild figs (*Ficus* sp.). This is the only study on this particular species' diet, although it has been inferred that feeding habits may be similar to those of other species included in the genus which feed upon insects, spiders, birds, eggs, small mammals, fruits and seeds (Ceballos & Miranda, 1986: Medellín *et al.*, 1998). In this project, we have collected 48 scats, corresponding to individuals captured in traps, and their analysis is being carried out.

During the dry season of 1997 and 1998, mainly, the home range size of nine animals was obtained (Cantú-Salazar, 1998). The mean home range was 20.4 ha (Kernel adapted method). Male home ranges were larger than those of females. A wide overlap of male and female home ranges was observed, but both males and females monitored presented exclusivity in their core areas, with the exception of a sympatric male and female where a wide overlap was found. Nine other individuals were monitored during 1998 (including in the rainy season),and these data are currently being analyzed.

Most of the biological information collected about pygmy skunks up to our findings is anecdotical and therefore has almost a mythological and folkloric touch. We believe our information should be helpful in understanding the real ecological needs for the conservation of this «endangered» species, which, in our belief, should be regarded as a «vulnerable» species.

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Badgers (*Meles meles* L., 1758) in a mountain area north of Varese (Lombardy – Italy)

C. M. BIANCARDI and L. RINETTI

Introduction

The ecology of badgers (*Meles meles*) in alpine and pre-alpine environments, where food availability is scarce and subject to seasonal fluctuations, is poorly known. Our research began in 1989 in a mountain area of Italian Pre-Alps and this work presents our results in several aspects of badger ecology: food, sett distribution and use, interactions with humans and historical data.

Study area

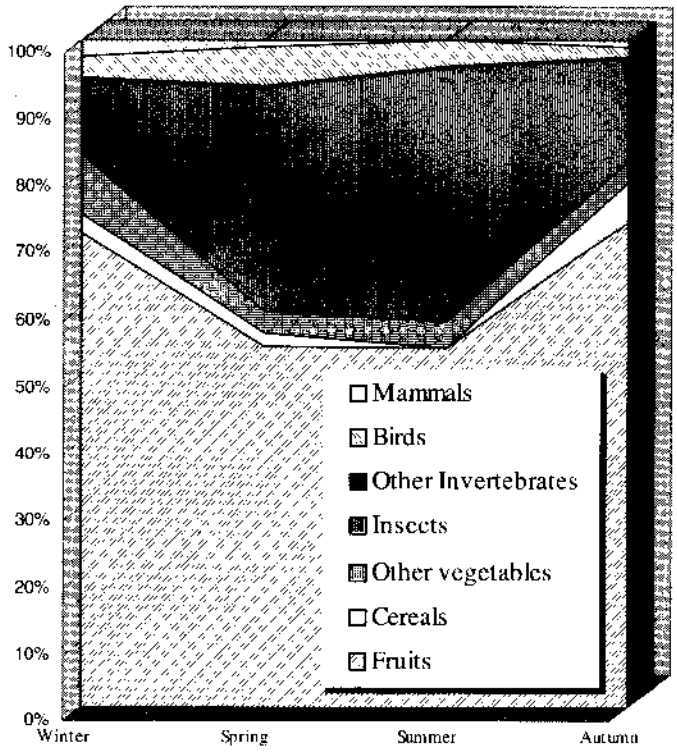
The study area consists of 180 km^2 between the eastern coast of Lake Maggiore and the Swiss border; the main town is Luino (46°00'N; 08°77'E) in the county of Varese. The altitude ranges between 200 – 1,600 m ASL. The climate is temperate sub-maritime (Mennella, 1967), with high rainfall (average 1,469 mm/y) mainly in spring and late summer but with a high number of annual hours of sunshine (average = 2,309 h/y). The mean temperatures range from +2.8°C in January to +20.9°C in July (Spinedi, 1992).

Large chestnut (*Castanea sativa*) woods grow in the vegetational belt between the lake shore and 700-900 m. Chestnut trees, whose dispersal is favoured by man, replaced the original oak woods in almost the whole area; only on arid and warmer slopes does the *Quercus pubescens* remain. Cherry trees (*Prunus avium*), hazel (*Corylus avellana*) and ash (*Fraxinus excelsior*) are other species in these woods. Beech (*Fagus sylvatica*) woods lie in the central vegetation belt, mainly on cold and humid slopes. This coniferous presence is due to reforestation activity in small patches in the area. Poor grassland and abandoned pasture (*Nardetum*) characterise the higher vegetation belt.

Methods

218 badger faeces were collected between October 1989 and December 1991 and analysed as described by Kruuk & Parish (1981); see further details in Biancardi, Pavesi & Rinetti (1995). During that period we began a periodic survey of all setts, a survey that is still going on. We have collected information about the kind of sett and its use, its altitude, its orientation on the slope, the vegetation, the percentage of coverage and of soil (Biancardi & Rinetti, 1998).

Although radio-tracking could improve our knowledge on badgers' movements, territory size and social behaviour, it is very difficult to adapt that technique to mountain environments except to diurnal mammals: e.g. large ungulates such as chamois and ibex, or rodents like squirrels. Therefore, we are now attempting to define badger territories through Dirichlet tessellation (Doncaster & Woodroffe, 1993).



Graph. 1: Seasonal variation in badger's diet

Information on the historical presence of badgers and their interactions with humans was collected in interviews with eldery people, former hunters or poachers. The Local Volunteers Ecological Guards (GEV) help us to collect more information, e.g. about road kills.

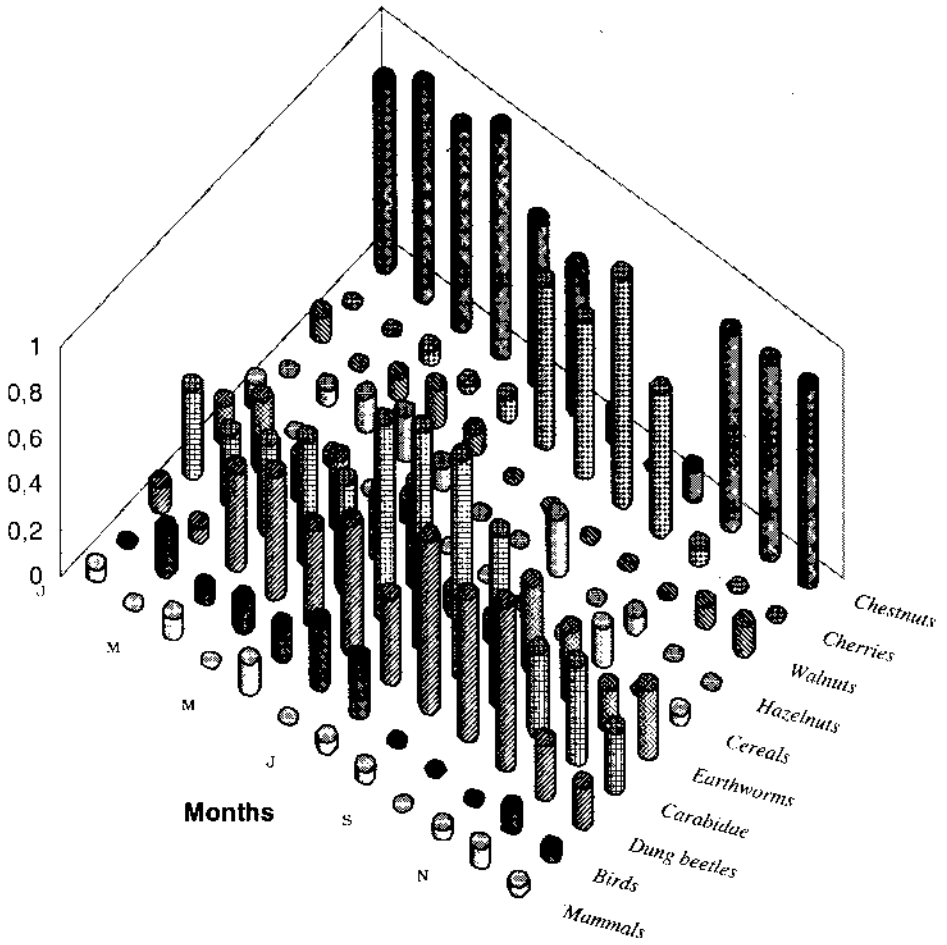
Results

Food

Fruits and insects, mainly Coleoptera, represent over 85% of the volume of badger diet in our study area. Seasonal variations are shown in Graph. 1; the importance of fruits decreases in spring and summer, when many more insects are available.

				Glucids			
Fruits	Water	Proteins	Lipids	Soluble	Starch	Fibre	Energy Kcal
Chestnut (*Castanea sativa*)	41,0	3,5	1,8	8,1	34,3	8,4	189
Hazelnuts (*Corylus avellana*)	5,7	13,0	62,9	1,8	0,0	6,7	625
Walnuts (*Juglans regia*)	19,2	10,5	57,7	3,4	2,1	0,0	582
Cherries (*Prunus avium*)	86,2	0,8	0,1	9,0	0,0	1,3	38
Cereals							
Maize (*Zea mais*)	12,5	9,2	3,8	2,5	66,0	0,0	355

Table 1: Composition of some foods items (% of edible fraction). From: Carnovale E. & Miuccio F., 1989



Graph. 2: Frequency of occurrence of some food items

The frequency of occurrence of some specific items (Graph. 2) shows that chestnuts (*Castanea sativa*) represent the staple food in autumn and winter; in summer they are replaced by cherries; figs and grapes, not shown in the graph, are eaten in September – October when they are ripe. Chestnuts contain, in a great part, glucides such as starch and a little water (Table 1); their resistance in litter, their abundance in the cold season and their contents in protein and lipids, could account for the high percentage in frequency of occurrence and volume, although many undigested parts were found in faeces.

Cereals are frequently eaten in the southern part of the study area, where small maize fields are present. Frequency of occurrence and percentage in volume of insects increase in spring and summer thanks to their greater availability in the warmer seasons. The most eaten insects are dung-beetles *Geotrupes stercorosus* and Carabidae, *Abax* spp. and *Carabus* spp. In two specimens collected in October we obtained evidence of the destruction of wasp nests: a great number of adults of *Vespula germanica* had been eaten.

The acid soils of the study area do not support a high density of populations of earthworms. In addition, abandoned high pastures are now decaying and their substrata acidifying. Very few earthworm chetae were found in almost a quarter of the samples.

Among birds a jay (*Garrulus glandarius*) and a blackbird (*Turdus merula*) (probably dying individuals), were found in winter, and some young passerines, probably fallen from the nest, were found in spring. In samples coming from a sett near a small farm we detected some feathers of chicken (*Gallus gallus*) and guinea-fowl (*Numida meleagris*).

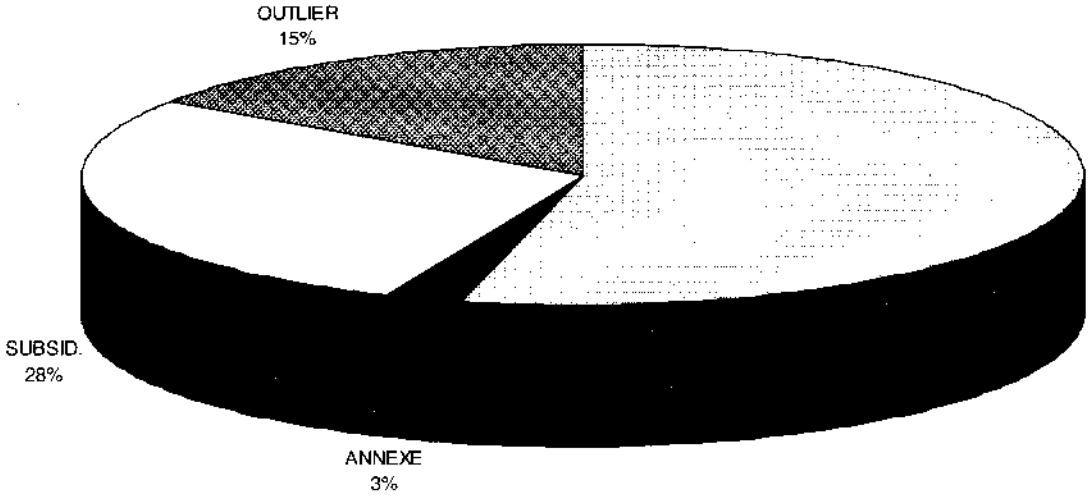
Among mammals we found moles (*Talpa caeca*), a shrew (*Crocidura leucodon*), voles (*Microtus* spp.), rabbits (*Oryctolagus cuniculus*) and one red squirrel (*Sciurus vulgaris*).

In short, in the Luino area there is a great availability of chestnuts almost throughout the year, and they represent the easiest way to obtain some proteins, lipids and energy; more or less the same situation was found on Monte Baldo with olives (Kruuk & De Kock, 1981). When other more appetizing food is available (maize, for example) badgers seem to prefer it.

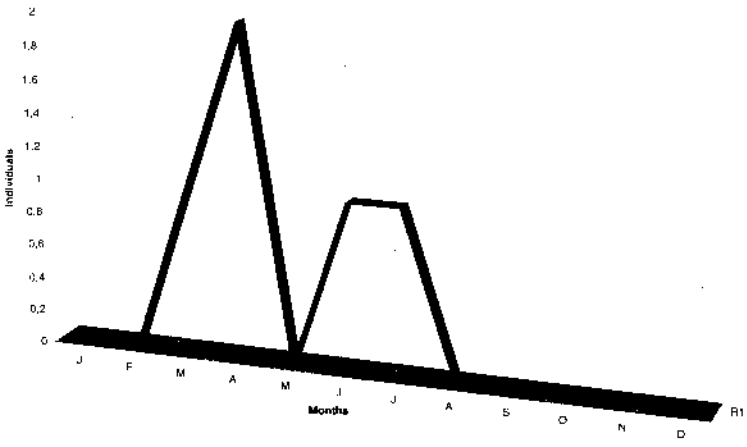
Badgers seem to take advantage of human activities: the presence of farms and cultivated patches in the southern part of the study area affects badgers' food; also former cultivated, now abandoned fields, are frequently visited.

Setts and territory

Territory size and social structure of populations of badgers in alpine environments are very poorly known. We collected data from 39 setts in our study area, 38 are described in Biancardi & Rinetti (1998), but one sett is new. As shown in Graph. 3, more than half of the setts are main setts; but there is only one annexe sett, which means that one clan has two "great" setts. In other cases badger clans have one main sett and perhaps a subsidiary or an outlier. We think this is evidence of low population density and of poorly-defined territory sizes, which could account for the scarcity of marking activities: we found few real "boundary latrines" and many more Temporary Defecation Sites (TDS).



Graph. 3: Badger setts



Graph. 4: Road kills (1991-92)

As shown, methods as bait marking here are unpracticable for defining the territory boundaries. Moreover, the geomorphology of the study area, with steep slopes and thick vegetation, does not easily allow night-time radio-tracking. Other methods "on paper" as Dirichlet tessellation give results showing enormous territory size, probably due to two factors: (i) the lack of information (not all setts are known) and (ii) the large areas deserted by badgers (some northern slopes, the poor alpine beech woods). We are now thinking of mapping all known badger paths with a GPS device.

The distribution of setts appears to be related to food availability and is relatively independent from different geological aspects of the study area (Biancardi & Rinetti, 1998). These results are partial and many more studies are needed before an accurate account of badger behaviour in alpine and pre-alpine environments can be produced.

Badgers and humans

Several former hunters and poachers said that they could find a difference between two "varieties" of badgers: "tass canin" (dog badger), with long hairs, weighing around 8 kg, not edible and "tass purscell" (pig badger), with short hair, weighing around 15 kg, edible. This distinction has no systematic meaning, but frequently occurs in Italy (Gandolfi, 1996; Griffiths & Thomas, 1997) and also in Croatia (Griffiths, pers. comm.); these differences may be due to seasonal variation in weight and hairs (Griffiths, pers. comm.) or, perhaps, to animals of a different age class. The fattest badgers hunted in the Luino area weigh 18 kg.

Badgers were hunted because they were considered to be an agricultural pest: farmers said that badgers would eat potatoes and tomato roots, knock down maize plants to eat their cobs, and rummage in the dunghills to find larvas and dung-beetles. Badgers were hunted also as an economic and a gastronomic resource: in the period between the two world wars catching a badger meant enough money on which to live for 2 – 3 weeks and meat at dinner for the family; badger furs were sold on the Luino market, badger fat was sold to chemists to make unguents and badger meat was cooked in different ways. We also collected some old recipes as evidence of old local traditions (Biancardi & Rinetti, 1995). Hunting was carried out with traps or dogs (terriers or dachshunds), usually in October-November; sometimes dogs were seriously injuried or killed by badgers, and dogs were sometimes "trapped" in the badger sett. We recorded one case of a man who had a tame badger in the 1950s. The two of them were not well-liked when they went in the local "osteria" (bar) because of the badger's smell.

Nowadays badgers are protected by law but, occasionally, somebody still attempts to catch them: in July 1991 a gamekeeper from Dumenza, a village near Luino, found and set free an adult male which had been trapped (probably in order to have a badger at dinner). Road-kills have become a serious cause of death. Our preliminary data, that refer to the years 1991-92 report four adult females and one male killed in road-accidents (Graph. 4). Our data are few and incomplete, but the seasonal course of road mortality seems to agree with the observations of Davies, Roper & Shepherdson (1987).

Acknowledgements

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Observations of the Red panda (*Ailurus fulgens*) in the Singhalila Parc, Darjeeling, India

Sunita PRADHAN

Introduction

By being a bamboo eater, the Red panda is an unusual carnivore. Apart from this, the panda has a high mortality rate, very low reproductive or protracted growth rate and very small litter sizes, features in contrast with other carnivores (Glatston, 1989; Gittleman, 1994). Carnivores which have high mortality rates produce more litters in less time (Harvey *et al.*, 1989; Charnov, 1991; Gittleman, 1994). The high mortality rate of the panda has been attributed to various factors such as inefficient maternal care of vulnerable young, and high susceptibility of the pandas to canine distemper virus and other bacteria and ectoparasites (Roberts & Gittleman, 1984; Gittleman, 1994). The problem of mortality due to diseases also could be due to the deleterious effects of inbreeding (O'Brien & Knight, 1987). Therefore, in addition to the threats of habitat loss and fragmentation, poaching, death of bamboo after its mass flowering, sustenance on the low nutritive bamboo diet, the red panda is faced with biological sources of mortality as well (Glatston, 1989; Gittleman, 1994). Red panda are distributed from Nepal in the west to a few provinces of China in the east. In India, red panda are found in the state of Sikkim, the Darjeeling hills of North Bengal and the north-eastern state of Arunachal Pradesh. Red pandas have been subjected to more studies in captivity than in the wild, hence very little is known about the species in its natural habitat. An ecological study of red panda in the Singhalila National Park, Darjeeling was conducted from 1993-1996.

Singhalila National Park (26°31'N, 87°59'E) is located on the north-western border of Darjeeling District (Fig. 1) and ranges between 2,400 to 3,636 m ASL. Observations of red panda during the course of field work were done when and where sighted and for as long as an animal was in sight. For each sighting, a note on the habitat, the number of animals, sex, age, and activity was noted. There is no apparent sexual dimorphism in red panda which makes it difficult to identify the sex of animals when sighted. Whenever possible, I assigned sex and age to a red panda as cub, female(adult panda seen with cub), subadult and adult or unsexed.

	GB		KT		SD	
	SGT	IND	SGT	IND	SGT	IND
Jan	2	2	1	1	0	0
Feb	0	0	2	2	0	0
Mar	0	0	1	1	3	3
Apr	0	0	3	3	1	1
May	0	0	1	1	1	1
Jun	1	1	0	0	1	1
Jul	2	2	1	1	0	0
Aug	2	2	0	0	1	1
Sep	0	0	0	0	0	0
Oct	1	1	2	4	3	4
Nov	0	0	1	1	0	0
Dec	1	1	1	3	0	0
Total	9	10	13	17	10	11

Table 1: Details of red panda sightings in the study sites at Singhalila NP, Darjeeling (SGT=Sighting; IND=Individuals; GB= Gairibans;KT=Kaiyakatta-Kalipokhari; SD=Sandakphu)

Observations and discussion

A total of 32 sightings of the red panda was made during the course of the two year study. These included 18 sightings made during actual monitoring and 14 sightings made during other field work. The maximum number of sightings during the study period were in October. Details of sightings in the study area are presented in Table 1.

With the exception of sudden chance encounters, the red panda did not immediately flee when encountered. When it was resting in a tree, it would continue to rest after some initial inspection of the intruder by sniffing the air or remaining alert for some time. However, the few who moved off were seen to do so sluggishly, by climbing down the tree or walking on to other trees via connecting branches.

The longest sighting observation of a red panda in the study area was for 180 minutes (10.00 - 13.00 hrs) when three adult red pandas were seen together on 26th December (winter). They were seen on a huge *Rhododendron arboreum* tree at Kayakatta (2,900 m ASL) at a height of 5.5 m from the ground, and were resting on several branches of the tree. Along with other tree species such as *Magnolia cambelli, Ilex* sp., *Osmanthus sauvis, Sorbus cuspidata* and *Daphepyllum himalyensis*, the area where this sighting was made is dominated by an association of Rhododendron-bamboo. Although the three red pandas interacted very little, they stayed together in the same tree throughout the three hours of observation. Finally one of the animals got up, climbed up to a higher branch, defecated and left the tree. While climbing up the tree, it brushed past its mate, but no aggression or offence was shown by the animals during this short period of direct interaction. In red pandas mating occurs during winter, usually between early January and mid-March (Dittoe, 1944; Zucherman, 1953; Mottershead, 1958, 1963; Erken & Jacobi, 1972; Roberts & Kessler, 1979; Keller, 1980; Roberts, 1980, 1981; Pradhan & Saha, 1994). In the wild they are solitary outside the mating period (Yonzon & Hunter, 1989). Johnson *et al.* (1988) also report red pandas to remain oblivious of other red pandas in the near vicinity during their study in the Wolong Natural Reserve, China. A discrete distance is also maintained when the animals are housed together in captivity (Keller, 1977). During the present study the group of three red pandas was seen at the end of December, i.e. approximately during their mating period, and the pandas could have been adults in a premating aggregation.

Two adult red pandas were seen together on 28th October at Gairibans Research Base (2,000 m ASL) at 14.30 hrs. As October is not known to fall within the breeding period of the species, it is difficult to say anything about the association of these animals.

Apart from these sightings, cubs and adult pandas were seen together in the Singhalila National Park during the month of October. Female red pandas give birth mainly in June (Hodgson, 1847; Wall, 1908; Pocock, 1941). The litter consists of an average of two young (range = 1-4)(Glatston, 1989). The young ones are

small and helpless at birth. Wild pandas use tree cavities as maternity dens. Yonzon & Hunter (1989) report that red panda use hollows of *Abies* sp., and Reid *et al.* (1991) report that the hollows in *Abies lasiocarpa* trees could have been used as maternity dens in the Wolong Nature Reserve. During the present study, a local cattle herder showed me the hollow base of a huge *Vitex* sp. tree which had been used by a red panda as its nest. On inspection, I found red panda hair, testifying to the presence of the animal in the tree base. In captivity, red panda cubs do not attain independence from maternal care before they are 6 months old, but nothing is known about the dispersal patterns in the wild (Roberts, 1981). The cub seen in October 1994 in Sandakphu (Singhalila National Park) at 3,450 m ASL was a suckling. The mother seemed to be lazing, but the cub was exremely active and playful. It climbed and descended efficiently but did not venture too far away from its mother. This mother and cub pair was seen on a huge Silver fir (*Abies densa*) tree, approximately 7.5 m above ground level on the north-west aspect at 14.30-15.15 hrs in Silver fir-birch-bamboo forest. Two cubs and a female were seen at 2,820 m ASL on the south-east aspect on Quercus-rhododendron-bamboo forest at Kaiyakatta in October 1995. They were on a huge *Quercus pachyphylla* tree, approximately 6.5 m above the ground. The trio was also seen on the same tree on the consecutive day during which one of the cubs was suckling. In captivity, even the male (father) has been observed to play with the young ones (Muller, 1989; Stevenson *et al.*, 1989) but presence of an adult other than the mother was not seen on the three ocassions when a cub and female were seen during this study in the Singhalila National Park. Both the *Abies densa* tree and the *Quercus pachyphylla* tree used by the adult female panda and the cubs were mature evergreen trees that provided good cover, whilst the broad branches provided a larger surface area for the mother and the cubs to sit, play and rest.

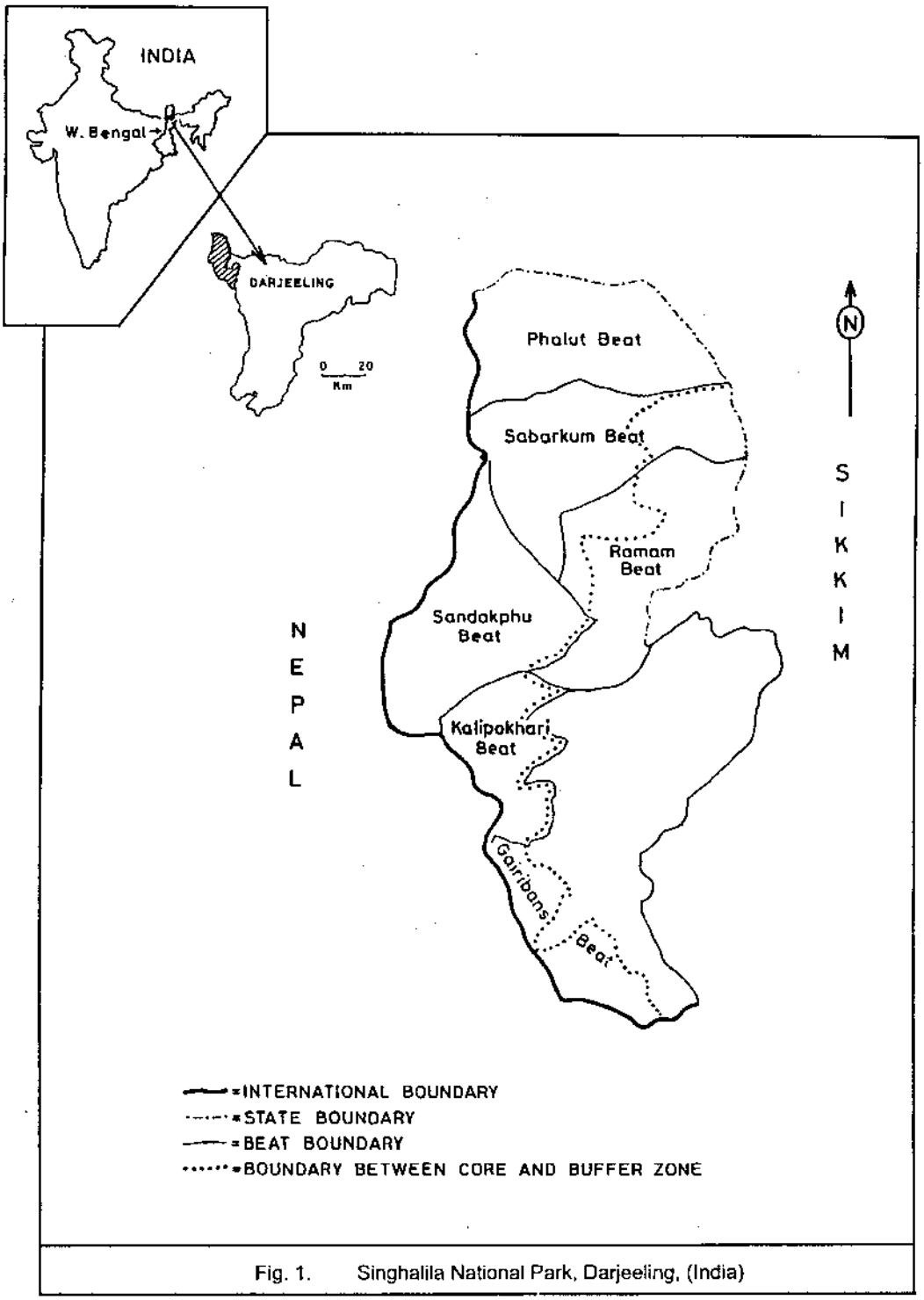

Fig. 1. Singhalila National Park, Darjeeling, (India)

All the other animals seen were alone. Out of all these animals sighted and observed, only one exhibited a kind of aggression. This was sighted in August 1995, in Sandakphu at 3,450 m ASL in Silver fir-birch-bamboo forest on the northern aspect at 10.00 hrs, and was observed for 30 minutes. It was on the base of the slope when it was first seen while my field assistant and I were on the ridge. This animal, instead of walking or running away, walked up the hill towards us. Whilst doing this, it scent marked by rubbing its anal portion on three occasions, twice on a fallen log and once on the base of a tree. In red panda scent marking is effected by depositing a secretion from anal and circumanal glands on various substrata in the enclosure or habitat; these are used either for marking territories and home ranges or as cues for mates during breeding season (Roberts & Gittleman, 1984). We did not move from our place of observation, but the panda positioned itself at about 7 m from us. It stayed there for a few minutes sniffing the air around, then descended out of sight. We packed up and, when we were just about to move, realised that the panda had stealthily climbed the birch (*Betula utilis*) tree behind us and was looking at us. This was unusual behaviour for the red panda which is known to be shy. On one only occasion was a red panda observed when feeding. This animal was sighted in a rhododendron-bamboo forest 2,890 m ASL at Kalipokhari on a *Rhododendron* tree feeding on leaves of *A. aristata* bamboo which was tall enough to reach the height of the branch where the

panda was resting. On January 1995, a subadult red panda was seen walking on the soft snow on the ground at 2,800 m ASL in Kaiyakatta.

Eighty seven % of the sightings of red panda in the Singhalila National park were on trees and the rest on the ground. Some of the trees used, and which form important components of red panda habitat were *Abies densa, Quercus pachyphylla, Sorbus cuspidata,* and *Magnolia campbellii.*

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Recent publication

Carnivores of South East Asia

Kanchanasakha, B., Simcharoen, S. & U Tin Than. 1998. *Carnivores of mainland South East Asia.* Bangkok: WWF-Thailand Project Office. 236 pp.

This handy pocket-sized field guide is concerned with the 49 wild carnivores (including the recently discovered *Viverra tainguensis*) distributed over eastern India, eastern Bangladesh, Bhutan, northern Sumatra, Singapore, south-west China, Hainan, and particularly Myanmar (Burma), Thailand, Laos, Cambodia, Vietnam, and Malaysia. For each species there are notes on size, weight, shape & colour, distribution, variation (possible subspecies), and ecology & behaviour, as well as a schematic map and a fine line drawing of the animal. A table shows the conservation status of all species, including both IUCN categories and CITES Appendix listings. For 34 of the species drawings of the tracks are given and for a few the form of the scats.

The modern state of European mink (*Mustela lutreola* L.) populations

I. L. TUMANOV

The protection of rare and disappearing animals represents the most complicated problem within the general task of conserving natural richness. To resolve these problems it is necessary to have data on distribution boundaries, species number, and status. Among the rare smaller mammals of Europe it is necessary to distinguish the European mink, *Mustela lutreola* which on the threshold of the 21st century has almost completely disappeared from the majority of European countries and its numbers are dramatically decreasing within the former USSR. We have carried out monitoring of the European mink during the last 30 years, allowing us to follow population changes in the species' range boundaries and also, periodically, to evaluate the state of its population (Tumanov & Ternovskij, 1972; Tumanov & Zverev, 1984, 1986; Tumanov, 1992, 1996).

The results of my own field investigations carried out in different regions of Russia, of literature researches, of inquiries and questionaire data obtained from colleagues, hunters and records of local hunting organizations, were used in the present work.

As early as in the beginning of the 19th century the aboriginal mink was widely distributed in Europe. It inhabited a vast territory from the eastern boundaries of Spain up to the tributaries of Irtysh in western Siberia. The species was absent only from Sweden, Norway, Great Britain, Ireland, Denmark, Belgium, Portugal, Italy and, apparently, Bulgaria (Novikov, 1939). However, already by the middle of the last century it had disappeared from the fauna of the major part of Austria, Germany, Switzerland, the Czech and Slovak Republics, and earlier from the Netherlands. At the end of the 19th century the European mink was not recorded in these countries any more. In the first half of the 20th century its range continued to shrink. In Poland the last specimen was captured in 1915, in Yugoslavia in 1941, and in Hungary in 1952 (Youngman, 1982). Then the aboriginal mink disappeared from Finland (Henttonen, 1992) and many French departments (Saint-Girons, 1991). At the present time in the western part of its range small populations remain only in the south-west of France, in northern Spain (where it apparently penetrated from France), and in Rumania on the mouth of Danube (Ruiz-Olmo & Palazon, 1990; Palazon & Ruiz-Olmo, 1993; Moutou, 1994). According to Maran (1994) the general size of these populations does not exceed 3,000 individuals.

At the east of the European mink's range the decrease in numbers became noticeable at the end of the 1950s-1960s. Here the reduction of the species' distribution area has a clear direction from west to east, and from the periphery to the center of its range.

On the water bodies of Bessarabia at the beginning of the 20th century the European mink was still considered to be a common representative of the local fauna. Then, in the 1930s its numbers in Moldavia suddenly began to drop and in the 1940s only single skins were coming in to the state organization for pelt purchases. At the beginning of the 1960s in the basins of Dnestr and Prut it was possible to find marks of the activity of aboriginal mink, which, at the end of this decade finally disappeared (Korchmar', 1968).

In Ukraine in the 1930s-1940s the European mink was widely distributed along the whole area of suitable habitat; it was absent only from Crimea. The catastrophic decrease in its numbers was distinctly observed at the border of the 1950s-1960s (Abelentzev, 1968). Thus, according to data available from the Chernigovsky region, the last time it was recorded was in 1951; in Poltavsky in 1955; in Sumsky in 1968; and in L'vovsky in 1981-1983. At present, in the water bodies of Ukraine it remains, apparently solitarily, mainly in the south-western part of the country.

A similar picture is typical for the republic of Belarus. If in the 1930s-1940s the European mink here occurred in the whole territory, on the border of the 1950s-1960s it disappeared in the western and then in the central part of the Republic (Serzhanin, 1970). In recent times a small population of the species (numbering 120-150 individuals) remained only in the north-east of Belarus along the border with Russia (Sidorovich, 1991) and in the south-west of the Byelorussia Republic in the Polesye Region (pers. comm. L. S. Tzvirko, 1999).

In the Kaliningrad region and the Baltic countries the aboriginal mink is practically absent. According to the official census data of game animals in Latvia and Lithuania mink has not appeared in the local fauna from the beginning of the 1960s. However, in recent years signs of its occurrence in Lithuania were again discovered. In Estonia the European mink is also sometimes trapped in the north-eastern part of the country (Maran, 1994).

In Russia aboriginal mink markedly began to disappear along the boundary of its range at the end of the 1950s and in the 1970s its numbers had already drastically decreased along the whole of the species' distribution range. According to our expert estimation, at the beginning of the 1980s on the entire territory of the former USSR its number did not exceed 40-50 thousand individuals, and its main population was concentrated in a number of central and north-western regions of Russia (Tumanov & Zverev, 1984, 1986). An intense worsening of the European mink's numbers and shrinkage of its range continues to be observed until the present time. Hence, only decisive means directed at its restoration can save the species from totally disappearing from nature within several decades.

What is the number of the European mink in Russia? The results of analysis of the corrected evidence in the main economic regions of the country, i.e. within the whole eastern range of the species, are given below.

North-western and Northern regions

The north-western border of the European mink's distribution in general always coincided with the administrative border between the Murmansky region and Karelia (Danilov & Tumanov, 1976). However, at the present time in Karelia and adjacent regions of the Leningrad area it has already disappeared. The water bodies of the Leningrad area are mainly inhabited by American mink which appeared here due to escapes from farms and the dispersion of animals from Karelia (where the species was introduced in 1962-1965).

The range of the European mink in the Leningrad area is constantly decreasing. If at the end of the 1970s it here inhabited an area of 4.5 Mha already by the beginning of the 1990s this had diminished to 2.0 Mha, and numbers decreased from 3.0-3.5 to 1.0-1.5 thousand individuals.

In the adjacent Pskov and Novgorod areas, in the basins of the rivers Velikaya, Shelon', Lovat, Polist, and Msta, considerable populations of European mink are still remaining. According to data from a 1995 census of some water bodies in this territory, species population densities achieved 2.5-4.2 individuals per 10 km of the river and general numbers comprise 5.0-5.5 thousands. Unfortunately, according to the information available, American mink have also dispersed into practically all regions of Pskov and Novgorod in the last few years.

In the Arkhangelsk area and the Komi Republic the European mink mainly inhabits the basins of the rivers Onega, Pechera, Mezen', and Vychegda. In the Komi Republic the density of the species population comprises 0.5-0.7 individuals per 10 km of river, and its number is about 4.0 thousand individuals. Although the population density of European mink is everywhere small, taking into account the length of the rivers, we evaluate the species' numbers in this territory at approximately 7-8 thousand individuals.

In the Vologda area the aboriginal mink occupies the rivers of Volga and the North-Dvinsk water basins, where its density sometimes achieves 3-5 individuals per 10 km of river. American mink here only started to penetrate into the western regions of the area where during the last 10 years, it occupied a fourth part. Nevertheless, the analysis of census data for 1982, 1987, and 1995 has shown that in this region the number of European mink is at a comparatively stable level and its fluctuations correspond to the natural course of population dynamics. In the last years the numbers of aboriginal mink in the area have fluctuated between 6-8 thousand. Thus, its general abundance within the north-western and northern boundaries of its range at the moment comprises not less than 19-23 thousand individuals.

Ural region

The major part of this territory is inhabited by American mink. In the Bashkiriya, Udmurtiya, and Sverdlovskaya areas the marks of occurrence of the aboriginal species are no longer counted. In the Chelyabinsk, Orenburg, and Perm' areas it could be met as a single animal (Kiseleva, 1999; Rudi, 1999). In the Omskaya area attempts to find *Mustela lutreola* were unsuccessful. The last reliable case of its non-intentional capture here refers to 1984 (Mal'kova & Sidorov, 1999; Sidorov, 1999).

Volga territory

Practically all water bodies in the Volga region suitable for habitation by the mink are occupied by the American species. In the Tatarstan, Chuvashiya, and Volgograd areas the aboriginal mink apparently does not remain, and in the Kuibyshev, Saratov, and Ul'yanovsk areas it could be met only as a solitary animal.

North-Caucasian region

The southern boundary of the eastern part of the European mink's range is along the territory of 'Fore Caucasus'. Here lives the large but everywhere increasingly rare subspecies *M. lutreola turovi*. In the 1920s-1930s Caucasian mink was widely distributed within this region; already by the beginning of the 1970s it was considered to be under threat of extinction. Particularly noticeable decreases in its numbers are taking place in the floating and steppe biotopes and, less intensively, in the forest-steppe, and mountain-forest biotopes. The center of the range of the aboriginal mink is contracting towards the western part of the North Caucasus and also decreasing in the east.

In the territory of the republics of Fore Caucasus the European mink is still met solitarily along the tributaries of the River Terek. In the Rostov area, Krasnodar and Stavropol' regions, along the basins of the rivers Kuban', Don, Severnyi

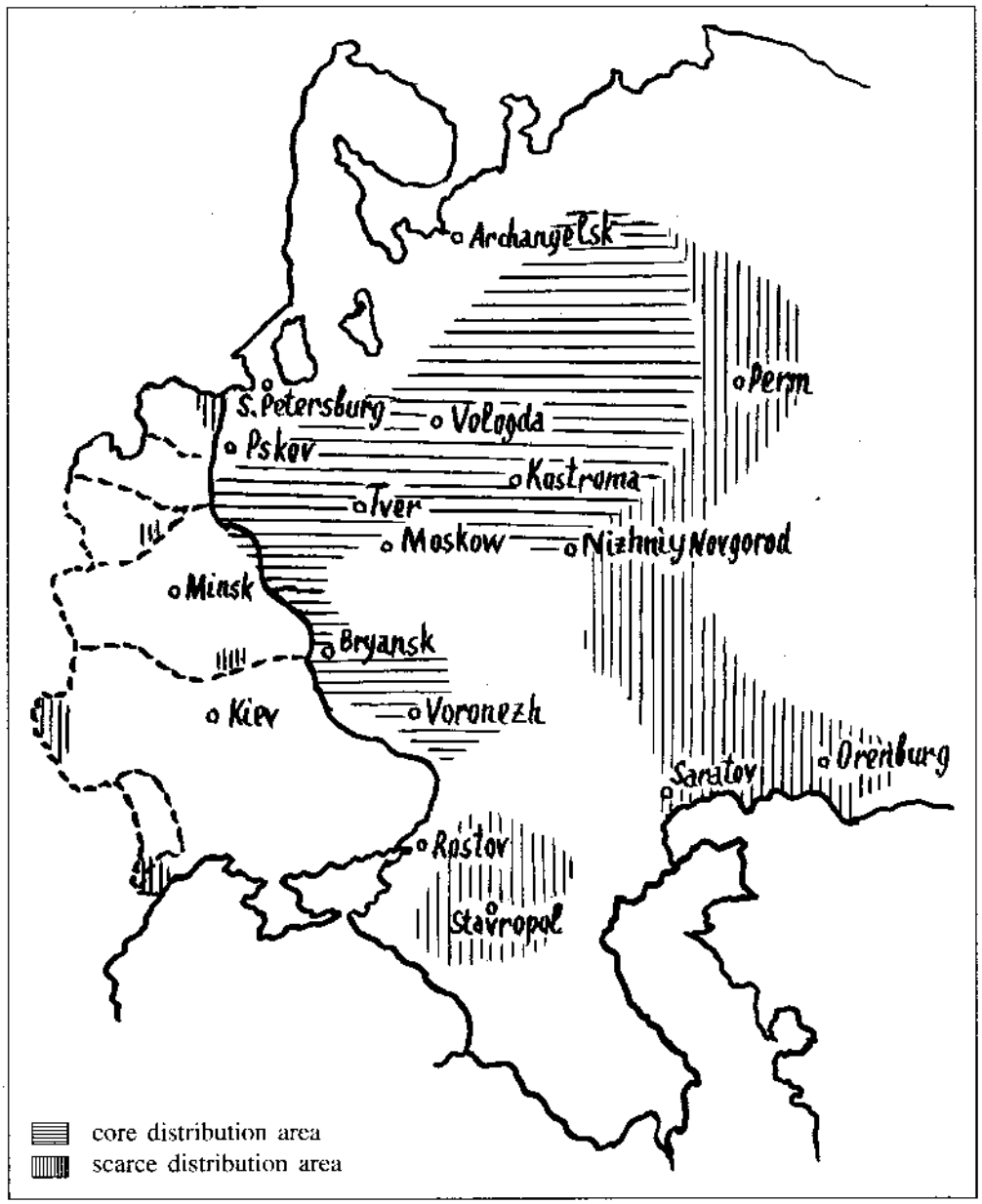

Fig. 1. Distribution of European mink in former USSR

Donetz, Kuma and others it also remains in small numbers (pers. comm. A. M. Gineeva and A. M. Kudaktina). The total number of the species in the region, apparently does not exceed 1.0 thousand individuals. Unfortunately, American mink lives practically everywhere in these places.

The central part of Russia

The territory of Central Russia and Volga-Byatka region still has small numbers of European mink. First of all this refers to the rivers Volga, Don and West-Dvina basins. However, in many of these the representatives of the American species are markedly prevailing. For example, according to Kochanovsky (1999) in the Tver' area the computed number of American mink comprises 7,200, and the European mink only 1,200 individuals. American mink also intensively settled the territories of Moscow, Tula, Kursk, Lipetzk, and Orlov areas. Here the individuals of the aboriginal species are met either solitarily or in small groups. At the same time in the Smolensk, Yaroslavl', Ivanov, Kosteoma, and Bryansk areas, the European mink is rather common, though not numerous. Thus, according to the results of our census (1995 and 1996) in the Yaroslav area live no less than 0.8-1.0 thousand, in the Ivanovo area 1.2-1.4, and in the Kostroma and Smolensk areas 2.5-2.7 thousand individuals. The number of this species is markedly lower (0.5-0.6 thousand individuals) in Voronezh (Ryabov *et. al.*, 1991) and the Bryansk areas (0.3-0.4 thousand individuals).

In the Volgo-Vyatsk region the European mink is on the threshold of disappearing. In the Kirov area small groups live mainly on some of the water bodies (Cheptza, Muravlevka, and others), of the basin of the River Vyatka (pers. comm. A. P. Savel'ev, 1995). In the Nizhniy Novgorod area and Republic Mari-El it is practically absent and main water bodies suitable for it are occupied by the American species. According to our expert estimation the number of European mink in the central part of Russia does not at present exceed 11-12 thousand, and in general within the territory of the former USSR is 30-50 thousand individuals.

Thus, the number of the European mink in the regions examined is constantly decreasing and the tendency towards range reduction that started to show in the 1950s-1960s is very clearly displayed nowdays. As in previous years the main reservoirs of the species are in the northern and north-western part of European Russia and in some of its central regions (Fig. 1). The comparative analysis of our data with the data published earlier (Tumanov & Zverev, 1984) have shown that during the period of the last two decades the range of the species has decreased very markedly and its numbers have fallen to an average of 10 thousand individuals, or by more than 20%. All this gives rise to serious anxiety for the safety of the European mink in its natural habitats.

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A comment on the nomenclature of the Rusty-spotted genet

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The taxonomy of the genus *Genetta* is still very unsettled and nomenclature has not been stabilized for either species or subspecies.

For instance, the scientific name *Genetta rubiginosa* Pucheran, 1855 has been used by some authors for the Rusty-spotted genet, instead of *Genetta tigrina* (Schreber, 1776), *Genetta maculata* (Gray, 1776) or *Genetta pardina* I. Geoffroy, 1832.

Indeed, although the several forms of the Rusty-spotted genet were classically regarded as subspecies of *G. tigrina* (Schwarz, 1930; Wenzel & Haltenorth, 1972; Coetzee, 1977; Meester *et al.* 1986), and, more recently, included in *G. maculata* (Schlawe, 1981; Wozencraft, 1993), *G. rubiginosa* has often been considered as a separate species (Roberts, 1951; Ansell, 1978; Crawford-Cabral, 1980-81; Ansell & Dowsett, 1988), with several subspecies spread out through a broad range at the African continent, east of the Dahomey Gap (e.g. *fieldiana* from Cameroon, *letabae* from Transvaal, and *schraderi* from Eritrea).

However, although that we agree with the last point of view, we consider that a problem does exist in using the scientific name *Genetta rubiginosa* to designate the Rusty-spotted genets, since the specimen that became the type after the description by Pucheran did not come from Cape of Good Hope nor even from the North of the Cape Province [a posterior correction of Roberts (1935)], but instead it was sent by Verreaux from Senegal to the Paris Museum.

The cause of the mistake committed by Pucheran, and later by Roberts, when considering the Cape in South Africa as the type locality is simply the fact that the original tag attached to the type specimen only stated the indication "Cap" (the French word for Cape) for the place where the animal was collected.

This pertinent inconsistency was first referred to by Schlawe (1981), who suggested that such specimen does not represent the Rusty-spotted genet, but the Hausa genet - *Genetta thierryi* Matschie, 1902. In fact, one of us (J. Crawford-Cabral) had examined a photo of the specimen kindly offered by Schlawe and verified that the palmar pads agree with what is given for the Hausa genet in the description of *Pseudogenetta villiersi* by Dekeyser (1949), a synonym of *G. thierryi*.

So, the specific name *rubiginosa* should not be used for any of the Rusty-spotted genets, and it must be substituted by one of the names later given to these forms. The oldest available ones are *fieldiana* Du Chaillu, 1860 and *aequatorialis* Heuglin, 1866. However, the choice of a valid specific name depends on research that we are developing now on a craniometrical basis, but which we intend to start also with a molecular approach this year, -investigating the conspecificity or not of those forms. Moreover, it seems important also to look to the numerous forms described by Matschie (1902), Neumann (1902) and Roberts (1951) within the Rusty-spotted genet complex.

It is hence possible that the Rusty-spotted genets represent more than one species; there is also good reason, furthermore, to investigate if they and the Pardine genet itself do not constitute a superspecies (see Mayr & Ashlock, 1991).

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Observations of viverrid, mustelid and herpestid species in Khao Yai NP, Thailand

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Introduction

As part of a telemetry study focusing on the sympatric wild felids in Khao Yai National Park (KYNP), we observed the presence, distribution and behavior of several viverrid, mustelid and herpestid species from October 1997 through November 1999.

KYNP (2,168 km^2) is located in central Thailand, about 200 km northeast of Bangkok. Elevation in the study area (site of all observations), is about 750 m with occasional peaks rising to 850 m. Study area vegetation is predominantly a combination of mixed deciduous and moist semi-evergreen forest. Significant portions of the area also consist of grassland and open gravel-shrub habitat. KYNP is characterized by three distinct seasons: hot (Mar.-May), cool (Nov.-Feb.), and wet (June-Oct.), with mean temperatures ranging from 28° C during the hot season to 17° C during the cool season (Hansel & Srikosamatara, 1996).

For the viverrid family, observations were made on Small Indian civets (*Viverricula indica*), Large Indian civets (*Viverra zibetha*), Common palm civets (*Paradoxurus hermaphroditus*), and Binturongs (*Arctictis binturong*). For mustelids, only Yellow-throated martens (*Martes flavigula*) were observed. The Javan mongoose (*Herpestes javanicus*) was the only herpestid observed.

This study is conducted by the Feline Research Center of the Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville. Financial support is also provided by the Feline Research Center. Sean Austin is participating within the Joint Ph.D. Program of Texas A&M University-Kingsville and Texas A&M University-College Station with Drs. Michael Tewes and Nova Silvy serving as project supervisors.

Methods

Information was gathered from incidental observations, camera-trapping or live captures. For incidental observations, information noted was season, habitat, time of day, weather and any unusual behavior. For camera-trap photos, information included season, habitat and time of day. Three types of live traps were used; a steel mesh box trap (150 x 44 x 44 cm), a larger "Tomahawk-type" trap (152 x 44 x 56 cm), and a wooden (200 x 100 x 100 cm) trap. All were baited with a live chicken (kept in a separate compartment) and triggered by a foot treadle. Traps were occasionally also baited with raw chicken or fish. Information recorded at live captures consisted of season, bait used, trap type, previous night's weather, nearness to full moon, habitat, behavior, approximate weight and approximate total body length. Except for binturongs, all animals were released immediately after data were recorded. Two binturongs were sedated, processed, radio-collared and later released.

Live-captures resulted during the course of 5,848 trap nights from February 1998 to September 1999. The following is the more notable information gathered on the viverrid, herpestid, and mustelid species in Khao Yai National Park, Thailand.

Results

Yellow-throated marten *Martes flavigula*

The yellow-throated marten is geographically very widespread occurring as far west as Pakistan and eastern Afghanistan, east to Taiwan, north to Siberia, and south to Indonesia, including Borneo (Corbet & Hill, 1992). Very little information regarding wild individuals exists in literature. To date, most information is anecdotal (Lekagul & McNeely, 1977; Corbet & Hill, 1992; Duengkae, 1998; Kanchanasakha *et al.*, 1998). Information on only two individuals, both live captures, was gathered during this study. Many similarities existed between both captures; they were captured in smaller steel-mesh traps, they had only live chickens as bait, they were captured on clear nights within a week of a full moon, and both were captured in dense semi-evergreen forest within 10 m of a road. According to literature, yellow-throated martens are primarily diurnal but hunt at night as well (Lekagul & McNeely, 1977; Duengkae, 1998; Kanchanasakha *et al.*, 1998). This pattern may explain why both captures were on clear bright nights. L. Grassman (pers. comm., 1999) has found, using radio-telemetry, that yellow-throated marten diurnal activity is greater than nocturnal activity, however, during and near full moon, nocturnal activity increases significantly.

There is some disagreement regarding whether yellow-throated martens frequently or always hunt in pairs or do so only during the breeding season. Duengkae (1998) states that yellow-throated martens "always" hunt in pairs. Lekagul & McNeely (1977) state they "often" hunt in pairs whereas Kanchanasakha *et al.* (1998) state yellow-throated martens "hunt alone but during the breeding season, they are seen hunting in pairs". From my observations (SA), at the first capture, there was a single individual in the cage with no evidence of others nearby. At the second, one individual was in the cage and another outside. Upon approach, the marten outside gave the distinctive bark (earning them the name "tree dog" in Thai) and fled. This observation occurred during February and whether it was during the breeding season (if one exists in lower latitudes such as Thailand) is unknown.

Javan mongoose *Herpestes javanicus*

The Javan mongoose too is geographically very widespread. It occurs from Pakistan east to the island of Hainan and south to Java (Corbet & Hill, 1992). Mongooses have often been included in the family Viverridae, (Lekagul & McNeely, 1977) but Wozencraft (1989) treated them as a separate family.

Observations include three live-captures, one incidental observation of a pair of Javan mongooses running through a field and one camera-trap photo. One live-trap capture was recorded during each season: cool (Nov.), hot (Mar.), and wet (May). Traps were baited with live chickens much larger than the mongoose, which concurs with literature that states that the Javan mongoose is an opportunistic hunter taking most any prey it encounters (Lekagul & McNeely, 1977). All three captured mongooses were extremely aggressive when approached. Complete attention was on the field biologist and several mock charges were made. This

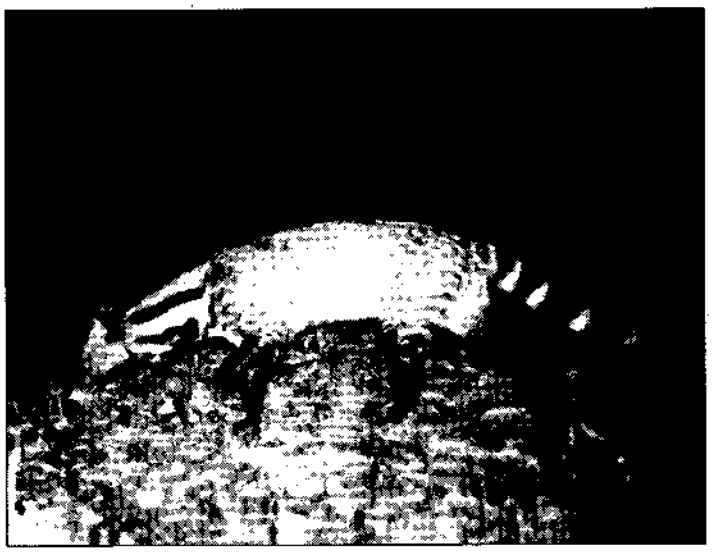

Fig. 1. Large Indian Civet (Viverra zibetha) *on animal trail in semi-evergreen forest*

behavior is in contrast to nearly all other captured species which were more concerned with escape unless approached very closely. Habitat for all captures was open grassland. Existing evidence suggests that Javan mongooses are nocturnal and diurnal, yet all captures occurred on clear nights with a bright moon. As with yellow-throated martens, it is likely that their nocturnal activity is greater on bright nights when there is a maximum amount of visibility.

The only incidental observation occurred in open grassland habitat during mid-afternoon. Though literature indicates that this species forages alone, my observation (SA) was of two Javan mongooses running together across a small path. Other mongooses, such as the white-tailed mongoose (*Ichneumia albicauda*), are known to forage together regularly (Ikeda, *et al.*, 1982) though this species is more strictly nocturnal (Waser, 1980) and pairing may be a defensive strategy.

The single camera-trap photo came from open grassland habitat during the cool season (Nov.-Feb.). It shows a single Javan mongoose during the day.

Large Indian civet *Viverra zibetha*

This large civet is mapped by Lekagul and McNeely as occurring as far east as central India. Corbet & Hill (1992) however, revised this to limit the range from eastern Nepal south through the Malay peninsula. Lekagul & McNeely (1977) and Duengkae (1998) indicate large Indian civets prefer secondary scrub forest. However, Rabinowitz (1990), Kanchanasakha (1998), and results from this study show they are more likely to use a combination of semi-evergreen and mixed deciduous forest.

Observations from this study included 3 live captures, numerous incidental observations, and 16 camera-trap photos (Fig.1). Live-trapping captures all occurred in semi-evergreen/mixed deciduous forest. There were no large Indian civet captures during the wet season. Captures occurred on clear and cloudy nights and there seemed to be a preference for dark nights rather than bright nights with captures ranging from 9 to 12 days from full moon.

All incidental observations were at night and also in semi-evergreen/mixed deciduous forest. Of the 16 photos produced, 14 were in this same habitat combination. One was in bamboo forest and one was in open gravel-shrub habitat. Camera-trapping effort was significantly greater (87% of trap nights) in semi-evergreen/mixed deciduous forest which explains a disproportionate number of photos found in this habitat. All 16 photos were at night which support statements that they are almost exclusively nocturnal.

Many latrines thought to belong to large Indian civets were observed in open grassland habitat. Latrines were attributed to large Indian civets by scat size and the presence of three or more scats (Wemmer & Watling, 1986). Therefore, although other data indicate a strong preference for semi-evergreen/mixed deciduous forest, the presence of latrines in open habitat indicates at least a consistent temporary use of these areas.

Small Indian civet *Viverricula indica*

This small civet is also wide ranging, being found from eastern Pakistan west to Taiwan, through southern China and as far south as Bali and Lombok. Literature suggests that they are nocturnal, terrestrial, and prefer open habitat such as grassland, shrub forest or dipterocarp forest (Lekagul & McNeely, 1977; Rabinowitz, 1990; Corbet & Hill, 1992; Duengkae, 1998; Kanchanasakha, 1998).

Of all animals captured in live traps, small Indian civets were by far the most prevalent. Twenty-nine individuals were captured in chicken-baited traps. Of these captures, 16 were in open shrub habitat, 4 were in grassland and 10 were in the semi-evergreen/mixed deciduous forest combination. It is noteworthy that during the wettest months (May to Oct.), only 3 of the 29 captures took place even though trap effort at this time did not change. Rabinowitz (1990) found small Indian civet home range decreased as rain increased. This may explain why trap encounters and captures during these months were less frequent.

Moon phase did not seem to be related to capture success. Three were captured on full moon whereas 4 were captured on or near new moon. Weather appeared to have a greater influence on small Indian civets with 20 of 29 captures on clear nights whereas only 9 captures were on cloudy or rainy nights.

All incidental observations of small Indian civets were in open habitat. All were of single individuals crossing roads or foraging near the road edge. Kanchanasakha (1998) states that they can sometimes live in groups though this was never observed in the study area.

Camera-trapping produced 14 photos of this species, with 13 photos from semi-evergreen/mixed deciduous forest and 1 from open shrub habitat. As with large Indian civets, the preponderance of photos from this habitat is likely more a reflection of increased sampling effort in this habitat type rather than a disproportionate amount of use. All photos were at night supporting the view that this species is strictly nocturnal.

Common palm civet *Paradoxurus hermaphroditus*

This species is perhaps the most geographically widespread civet. It ranges in the west from northern Pakistan through India, southern China and to the Philippines. Its range also extends south through Indonesia including islands such as Sulawesi, Borneo and Madagascar (Kanchanasakha, 1998). As many as 30 subspecies have been proposed supporting considerable intraspecific variation (Kanchanasakha, 1998). Others however, while conceding many subspecies, mention that geographical variation is not great (Corbet & Hill, 1992). Regardless, this civet is far ranging and ubiquitous as observations from this study support.

All information from this study supports the fact that the common palm civet is a habitat generalist. The 15 live-captures were distributed approximately proportionate to the habitat types within the study area. Three captures occurred in grassland, 4 in open shrub habitat, 2 in bamboo forest and 6 in semi-evergreen/mixed deciduous forest. Four captures were from the hot season, 5 from the cool season, and 6 from the wet season. Eight captures were on clear nights and 7 from cloudy or rainy nights. It is possible moon light had an influence on common palm civet behavior as 10 of 15 captures occurred within 1 week of full moon.

Camera-trapping produced 7 photos of common palm civets, all in semi-evergreen/mixed deciduous forest. All photos were at night which concurs with studies by Rabinowitz (1990) and Grassman (1996) that show common palm civet activity is exclusively nocturnal. Incidental sightings of common palm civets occurred in all habitat types and only at night. Scats identified as belonging to common palm civets, [i.e., filled with whole seeds, strung lengthwise and in open areas (Bartels, 1964)] were seen nearly daily along trails through grassland habitat.

Common palm civets seemed to be more tolerant of human disturbance than other civets in this study area. This species was often seen near buildings and on one occasion entered a restaurant area when people were present. We were never aware of other civet species behaving similarly during this study.

Binturong *Arctictis binturong*

The binturong is the largest of the civets with long shaggy black and gray fur making it appear even larger. It is predominantly arboreal with a stout, long, partly-prehensile tail. The binturong ranges from Sikkim to Burma, through to Malaysia and including Sumatra, Java, Borneo and Palawan (Corbet & Hill, 1992). Binturongs live primarily in dense evergreen forest.

It is still reported that binturongs are mostly nocturnal Lekagul &McNeely, 1977; Rozhnov, 1994; Kanchanasakha, 1998; Duengkae, 1998). However, this study and other literature indicate that binturongs in the wild are also diurnal with increased crepuscular activity (Kleiman, 1974; Nettelbeck, 1997, 1998).

During the course of trapping for felids, 5 binturongs were captured in live-traps. Three were juveniles and 2 were adults. Both adults (1 male, 1 female) were sedated, processed and radio-collared for subsequent radio-tracking. All individuals were captured in semi-evergreen/mixed deciduous forest. The first binturong that was sedated was captured in a trap that was baited with a week-old dead chicken. All other traps were baited with live chickens which suggests that binturongs, as well as feeding on much fruit, will scavenge carrion and opportunistically hunt live prey such as birds.

A scat left in the trap by the first capture contained only seeds of fig (*Ficus* spp.) trees which is the same as the stomach contents of a binturong mentioned in Rozhnov (1974). Trapping success for binturongs did not seem tied to weather or moon cycle, as they were captured on clear and rainy nights and from 2 to 12 days from full moon. It is interesting that all 5 captures were during April. The first in 1998, the other 4 within 2 weeks in April 1999. In April 1998, the weather was hot and dry, although April 1999 was unseasonably wet.

Preliminary results from radio-tracking show a significant difference in the amount of area used by the adult male and female binturong. The female uses a range of approximately 6 km^2 with a core area (85% of locations) of only ~1.5 km^2. The male uses an area of approximately 9.5 km^2 with two distinct core areas, each approximately 4 km^2. The male spends its time equally between the two areas. For both binturongs, 100% of their home ranges are in semi-evergreen/mixed deciduous forest. The two radio-collared binturongs were captured at different locations within the study area and therefore do not have any home range area overlap.

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The current Status of *Vormela peregusna* throughout its historical range

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The marbled polecat was first described by Güldenstädt in 1770 as *Mustela peregusna*. In 1886 it was elevated to generic status by Blasius, who considered this species to have characteristics that were distinct from other species in genus *Mustela* and, though not great in magnitude, had no intermediates. Research since then has further subdivided the species into several subspecies; some Soviet authors recognise up to twelve, although it is sure that the taxonomic position of many of these is unclear, with most of them really representing localised geographical variants.

According to Ognev (1962) the various subspecies are easiest distinguished by variation in the pelage. The occipital stripes that traverse from the back of the head and down the neck are present as three white bands in western forms, but alter across the species' range, becoming a single "collar" in the Eastern Asiatic *Vormela*. Secondly, the haunch patches (which are obliquely elongated) are well defined in the west but become small isolated spots in eastern forms. Shoulder bands differ in width and degree of yellow hue, and the anal stripes at the base of the tail also vary in width. Furthermore, the proportions of dark and light colouring change, so that the saddle is either seen as brown with yellow patches or alternatively as yellow with brown patches. The belly (generally described as uniform in colour) is totally black in the west of the species' distribution but has "belly spots" which join the sides of the saddle underneath in the east.

The distinction between subspecific forms is often vague, with those defined by different authors overlapping geographically. Moreover, most forms are known only from their type localities, with little appreciation of the gradual transition between forms – a position that is further exacerbated by a lack of first hand field data from much of the species' overall range. A single subspecies is believed to exist within Europe, *V. p. peregusna*, which extends across the European part of the former USSR, the Balkans, Turkey and the Black Sea coast. Ognev (1962) also lists a second subspecies, *V. p. intermedia* from the west coast of the Caspian Sea and the north-eastern Caucasus. Between this subspecies and *V. p. alpherakii*, which is found further east along the east shore of the Aral Sea and south-west of the Caspian into northern Iran, exists a transitional zone in the former Ural'sk Region, north of the Caspian Sea.

Vormela peregusna pallidior is listed in the Russian Red Data Book and possesses a split distribution. It is present east of the Karatao Mnts in the southern Altai Steppes, although Schreiber *et al.* (1989) believe that it continues into Mongolia. It thus also overlaps here with *V.p. negans* of which Ognev (1962) states that it inhabits Kazakhstan and northern China – these two taxa may or may not be identical; both names have been used by other authors, although none seem to have referred to both. Lastly, the probably best documented form is *V.p. syriaca* which inhabits the Arabian Peninsula. Most of these forms are, however, listed as synonyms of *V.p. peregusna* by Wilson & Reeder (1993).

Distribution

A recent European distribution map (Mitchell-Jones *et al.*, 1999) shows *Vormela* to be confined to the SE tip of Europe. Furthermore, a vast retreat by *V. peregusna*'s north-westernmost European boundaries has been remarked on by Spassov & Spiridonov (1993), who claim that the species' distribution has receded by between 350-600 km to the south and 700-1,000 km to the east over the last 200 years. Their map shows a division of the European population into two, the species being absent from Moldavia and much of Ukraine. The eastern population's range covers the northern Black Sea Coast and Ukraine, where it is fragmented around Odessa (Wilderness Fund, 1997). However, it should be noted that the map given by Spassov & Spiridonov (1993) may artificially expand the species' former range: it includes a record from the border of Poland and Belarus (Bielowieza) which is certainly erroneous (V. Sidorovich, pers. comm.), as is a further record from Marburg (now Maribor) in Slovenia by Koller (1929) (B. Kryštufek, pers. comm). Albania contains only a single historical record (located close to the Serbian border) and *V. peregusna* was always considered rare in Former FSR Yugoslavia (Miric *et al.*, 1983) but more records are now available for Federal Yugoslavia (see Milenkovic *et al.*.. in press). Here most records are from southern Serbia, although there are a small number of records from other parts of Serbia and Montenegro. Romanian records cluster in the North Dobrudja region, and include a protected area bordering Bulgaria. The Tsacea, North Tukea and Tekirghiol hunting organisations all reported *Vormela* as being present in response to questionnaires circulated by the Wilderness Fund between 1985-87 (Wilderness Fund, 1997). Bulgarian records derive from throughout the country, but are primarily from South Dobrudja and west Bulgaria, although few are on voucher specimens (see Wilderness Fund 1997). *Vormela* is present also in two protected areas: Ropotamo River National Park (847 ha) and Srebama Pelican Reserve (600 ha). *Vormela* was historically found in Macedonia, Greek Macedonia and western Thrace, but Greek records in Mitchell-Jones *et al.* (1999) are all pre-1970, with no recent validation.

Turan (1984) describes regions within Turkey where the species should be present, however, there is a poor representation of recorded sightings that barely coincides with this: Thrace, East Marmara, Inner Agean, Central Anatolia, eastern Black Sea, Kalramanmoras, Adiyaman, Malatya, Eastern Van, Hakkari, Siirt, Bitlis, North Samsun, North-east Erzurumas and the Kars region (Turan 1984).

There are two separate regions of distribution in the south-west and south-east of the Former USSR (Spassov & Spiridonov, 1993). However, their boundaries are uncertain and many records are extralimital, including Atamanskii on the River Don. There is no specified northern limit, although pelts have been sold in Kundravy village (at 55°N). *Vormela*'s distribution spreads through south-east Ukraine near Kirovo and Krasnograd (Ognev, 1962), but it was considered rare in the former Kharkov Province. Marbled polecats are likely in the Crimean Steppes and foothills and have been sighted near Balaklava. There are no data from the former Kursk Province and they are considered extremely rare in the former Orel Province where the northern boundary seems to lie in Maloarkhangel'sk County. Moving eastward, there is no

information for the former Bobrov County, Voronah Province and Saratov Province up to Syrzan County (Ognev, 1962).

In Ciscaucasus and the other Caucasian territories, *Vormela* is often seen in Stavropol Province, considered common in the former Kuban region and the Terek region also, and continued north to the Caspian Sea. It has been reported to reach a height of 5,000 feet in these mountainous areas, though is only present on the southern and eastern steppes of Transcaucasus (Vereshchagin, 1959). There are few data for the southern Ural slopes, considered to contain the species' northern limit in west Siberia, and it possibly reaches the Turgai and Akmolinsk steppes, though not where *Mustela eversmanni* is present (Heptner *et al.*, 1967). *Vormela* has been known from the Altai steppes and foothills, spreading further south around the Ural River and Aral Sea. Presumed to be widespread but rare throughout Uzbekistan, *Vormela* is also found around the Ili River and in both Turkmenistan and Tajikistan along the Tedzhen and Murghab Rivers. Unfortunately, many of these records are very old and require confirmation.

Russian locations are largely confined to the border with Ukraine and the south of the country between the Black and Caspian seas. Georgia and Armenia both lack records, though Azerbaijan has fuller representation and the species is distributed evenly throughout the country. Kazakhstan's records are confined to its borders, limited probably by the mountainous landscape, and Uzbekistan also has few records stretched along the southern border. By contrast, Turkmenistan displays many records across the country, taken from a variety of sources. Tajikistan and Kyrgystan are both poorly represented (and mountainous) but *Vormela* has been sighted on their western borders.

In Mongolia, *Vormela* is suspected to stretch across much of the country and these are reviewed by Chotolchu *et al.* (1989). A few records exist outside of this area which is more associated with *M. sibiricus*' range, possibly explained by poor identification or an overlapping of distributions. China has until recently lacked information (only two records - one in Shansi Province, the other at Khorgos, bordering Kazakhstan). However, a recent atlas (Zhang Yongzu *et al.*, 1997) shows a number of records from the north-central deserts of China (especially in the area of the Huang He River), although the dates of these are not given. Few data are available for Pakistan, but Roberts (1977) gives a distribution map. In Afghanistan the species is considered to be abundant around Kandahar though rare near Kabul, and a provisional limit with the central mountainous area forming a physical barrier has been suggested (Hassinger, 1973). Iranian records are concentrated in the north (Etemad, undated), but the species has also been sighted bordering Afghanistan and near the Persian Gulf (Lay, 1967).

Reviews of records of *Vormela* in Asia Minor are given by Harrison & Bates (1991), whilst Qumsiyeh (1996) covers the "Holy Land". Locations of *Vormela* in Iraq are known in the north close to those areas bordering Turkey, however, it would appear that the desert zone further south provides another physical barrier to this species as is the case in Israel, Jordan and Saudi Arabia. It was assumed until recently that Vormela did not reach Saudi Arabia, but in April 1990, the first live specimen was caught near Turayf. There is also an unconfirmed record from the Shaumari Reserve 170 km away (Nader, 1991). In Jordan it is frequent in the north-west and it is considered common in Israel throughout the Mediterranean zone, including the southern limit of the species' range. Although sighted close to Egypt, it's presence there was discounted by Harrison & Bates (1991). Records are scarce from Syria, one is cited from near Turkey and another from near the border with Lebanon (which itself only has records in Bekaa and Sidon in central Lebanon). *Vormela* seems to be not uncommon in Israel, where it has sometimes been seen in synanthropogenic contexts. Israeli records are reviewed by Ben-David (1998), and here the species even seems to have fairly extensive fossil record (Dayan, 1993); this is one of the few areas in which the species is said to be increasing.

Density

The numbers of marbled polecats in any country or across a specific area have never been published, except for Ukraine where 150 individuals nation-wide have been estimated by Dudkin (cited by IUCN/SSC, 1998). Other countries use terms of relative abundances, for example Afghanistan indicates regions of abundance and rarity (e.g. Hassinger, 1973), while the species is believed common in Israel but threatened in Europe.

Threats and Conservation

Potential and actual threats to this species are little researched and little known. However it is assumed by many that the greatest threat is from the intensification of agriculture - particularly in steppe areas where *Vormela* is typically found, as this creates both loss of habitat and prey species. The extent of this is unclear as, although this process has dramatically altered world landscapes this century, it should be recognised that marbled polecats are opportunistic animals and have often been seen in human and agricultural environments (e.g. farm areas and gardens). *Vormela* will feed on lizards, snakes, beetles, snails, small birds and their eggs (Turan, 1984) and has been known to prey on poultry (many reports cite chicken stealing). *Vormela* seems to be an opportunistic predator, and faecal analyses (Ben-David, 1988) showed that food type varied with season, with mole crickets (Gryllotalpidae) constituting 60% of the summer diet. Nevertheless, Bulgarian reports cite preferences for small rodents such as souslik, *Spermophilus citellus*, common hamster, *Critecus critecus*, and Romanian hamster, *Mesocritecus newtoni* (Wilderness Fund, 1997) and, in Eurasia, predation upon jirds, jumping mice and spiny mice has been reported. It is often stated that the decline in *V. peregusna* is related to declining densities of steppic rodent prey. In reality, there is little real evidence for this, and this may perhaps be related to recent ideas about close ecological linkages between mustelids and their prey as, for example, in the case of the black-footed ferret, *Mustela nigripes* and prairie dogs.

The Wilderness Fund (1997) list hunting, killing for damage, the use of poisonous chemicals against rodents and car accidents as having significant impact on *Vormela* in Bulgaria even though illegal: a similar viewpoint is taken by Milenkovic *et al.* (in press) for Yugoslavia. The issue of competition has also been considered by some workers: steppe polecat (*Mustela eversmanni*), European polecat (*M. putorius*), stoat (*M. erminea*) and stone marten (*Martes foina*) have been identified as possible competitors, however, this is largely unstudied.

In 1994, the IUCN accorded European populations of *V. peregusna* with Red Data Book status under the category of vulnerable (V). Furthermore, it has been named as a priority species for conservation by Schreiber *et al.* (1989), and a *Vormela* Project was later initiated to aid regional co-ordination of a

conservation plan and examine status and threats within Europe (SSC/IUCN, 1998). In September 1979, *Vormela* was added to Appendix II of the Berne Convention, although this listing only became valid on March 5th 1998. Little is being done for the species locally, however, the efforts of the Wilderness Fund's Project in Dobrudja (Bulgaria) aim to create a comparative study in Dobrudja (west Bulgaria) and Romania leading to a management plan.

Conclusions

This investigation highlights the lack of accurate, up-to-date information in all areas of knowledge on *Vormela*. Research is still needed into basic ecology and biology, alongside the collection of data on both distributions and densities. The data that are available vary with age (many are over a century old) and, in many cases, are certainly outdated due to vast changes in landuse in this period. The quality and abundance of the records available vary throughout the species' range, indicating either a great reduction in distributional area or very poor recording in many cases: both factors are likely to be the case, but the proportion contributed by each is unknown. It is therefore necessary to co-ordinate a management plan across the political boundaries, creating constant results of the species' status across its entire range.

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Appeal for the protection of mustelids in France

The Pine marten, the Weasel, and the Polecat are still on the National Pest List in France. A national campaign is launched to withdraw these species from this list. Any foreign reader writing to both our Prime Minister and Minister of Environment will be a great help:

Monsieur Lionel Jospin, Premier Ministre, Hotel Matignon, 57 Rue de Varennes, 75007 Paris

Madame Dominique Voynet, Ministre de l'Environnement, 20 Avenue de Ségur, 75032 Paris

Carnivores of the Niger Delta, Nigeria

H. VAN ROMPAEY and C. B. POWELL†

Introduction

For an introduction to the Niger Delta and its fauna, and a map, we refer to Powell & Van Rompaey (1998). In this paper the genets of the Niger Delta are treated in detail. Data on the other carnivores of this area were assembled by going through Bruce Powell's correspondence from the last five years.

Mongoose as well as genet are bushmeat in most of the Niger Delta area. In much of the Ogbia area, mongoose (excl. crusimanses) are totem species and so are not killed. Sometimes, here and there, it is mentioned that the anal glands could be used medicinally.

Family Viverridae Gray, 1821

Subfamily Nandiniinae Pocock, 1929

***Nandinia binotata* (Gray, 1830) Two-spotted palm civet**

Few specimens from Nigeria are to be found in museum collections, and no localities could be added to Happold's (1987) list by museum research.

Besides specimens from **Okoroba** (HVR-P.2) and **Kaiama** (RMCA-98.049.M22), five undeposited specimens were collected: **Azuzuama**, 1; **Gbarantoru**, 1; **Ikibiri**, 1; **Kamabugo**, 1; and **Swali**, 1. A specimen from **Tombia** was not kept.

Nandinia was expected to occur in the Niger Delta, although not so by Rosevear (1953, map 183a). It is common throughout the freshwater forest including beach-ridge forests (Powell, 1995).

N. binotata is known as a 'palm civet' as is the Asian *Paradoxurus hermaphroditus* or Common palm civet. The latter is also called 'toddy cat' due to its fondness for "palm wine" (from *Phoenix silvestris*). Rosevear (1974:234) states that 'though *Nandinia* does climb palm trees, and has been shot in them, there is at present no significant evidence that, despite its common English name, its habits are in any exclusive or predominant way connected with them, and particularly in so far as thieving palm wine is concerned. In an area such as West Africa where wine-tapping is so abundantly practised, such a habit if it existed would be a matter of common everyday knowledge. This is not so'. On the other hand, according to Kingdon (1977:171) 'captive *Nandinia* are also reported to show a weakness for alcohol which may originate in their eating fermenting fallen fruit and tree exudates'. J. Brewer (in lit., 1984) also writes: "The palm civets here (The Gambia) would also seem to have a liking for palm wine. The local belief is that the cries that they sometimes make during the night are because they have taken too much palm wine and either have a headache or are feeling very happy. However, as there is no palm wine tapping in the Abuko Nature Reserve, I can only presume that they may nip the end of an inflorescence and lap up the exuding sap".

† Bruce Powell died the 24th June 1998

Despite neither Booth (1960) nor Rosevear (1974) mention this habit, throughout the Delta *Nandinia* is widely reputed for drinking palm wine.

In one area people regard it as being hermaphroditic (cfr. the Asian palm civet, *Paradoxurus hermaphroditus*), because of the position of the scent glands which, in the male, are situated anterior to the penis, and in the female in front of the vulva.

Subfamily Viverrinae Gray, 1821

***Civettictis civetta* (Schreber, 1776) African civet**

In addition to the localities listed by Happold (1987), Howell (1968) mentions its occurrence in the Borgu Game Reserve, Agbelusi (1994) in Ondo State, and Braband & Volkmer (1975) in the lowland forest zone NE of Port Harcourt.

Braband & Volkmer (1975) state that in the region NE of Port Harcourt the African civet has taken over the role of the hyaena and is called 'hyaena' by the Ibo. In this region *Civettictis* is a natural definitive host of *Paragonimus utero-bilateralis*.

Neither Rosevear (1953) nor Happold (1987) mention specimens from the Niger Delta.

Undeposited skins were purchased respectively at the **Yenagoa** and **Mbiama** markets. A skin from **Otuaka** was not kept.

The melanistic skin of a specimen collected on the east side of the Orashi River showed only three light lateral patches near the base of the tail resembling those of normal individuals; it also had smoother fur.

The species is common in the Niger Delta throughout the freshwater forest including beach-ridge forests (Powell, 1995), although this was not expected by Rosevear (1953, map 178).

Genetta cristata* and *Genetta rubiginosa: see Powell & Van Rompaey (1998).

Family Herpestidae Bonaparte, 1845

Subfamily Herpestinae Bonaparte, 1845

***Atilax paludinosus* (G. Cuvier, 1829) Marsh mongoose**

Rosevear (1947) mentions its presence on the edges of the mangrove swamps.

Relatively few specimens were collected from the Delta, possibly due to its reputed bad taste which makes it one of the lowest priced species in the bushmeat market. In the Gbanraun area it is called *okosi* ('with open anus') and is often killed because it feeds on crabs (it is common in the mangrove zone). Besides specimens from **Otuokpoti** (BMNH-1994.523) and **Ede-Epie**

(HVR-P.5) undeposited specimens were collected from **Azama/ Kassama**, **Igovia**, and **Tungbo**.

***Crossarchus obscurus platycephalus* Goldman, 1984 Cusimanse**

Crossarchus specimens from Benin, Nigeria, and Cameroon were described as *Crossarchus platycephalus* by Goldman in 1984. The species is not recognised as valid by Wozencraft (1993) or by Colyn *et al.* (in press).

Neither Goldman (1984) nor Happold (1987) mention *Crossarchus* from the Niger Delta. Oates (1989) mentions a dead specimen in a trap in the floodplain between the Niger and Orashi Rivers (SW of Oguta) and the sighting of a small pack downstream of Kreigani on the east bank of the Orashi River.

Specimens were collected from **Ebubu**, 2 (BMNH-1996.581, 1996-582); **Igovia**, 6 (BMNH-1997.310, 1997.311, 1997.312, 1997.315; RMCA-96.052.M7; SBP-654.251); **Kaiama**, 1 (HVR-P.11); **Obiofu**, 1 (HVR-P.1); **Opu-Ogbogolo**, 2 (BMNH-1995.250; RMCA-94.054.M1); **Ozochi**, 1 (BMNH-1994.184); **Taabaa**, 3 (BMNH-1996.583, 1997.313, 1997.314); **Udoda**, 1 (RMCA-95.038.1); **Umuanwo**, 1 (RMCA-98.017.M6); and **Uzere**, 1 (RMCA-98.017.M7). Nine undeposited specimens were collected from **Akpede camp**, **Aseingbene**, **Igovia**, **Kala-Ogbogolo**, **Okolobiri**, **Onuebum**, **Opu-Ogbogolo**, and **Tombia** (2).

The species seems to be quite common through the Orashi/ Yenagoa sector to upstream of the bifurcation of the Niger. It is unknown to hunters in the marsh forest or tidal-freshwater zone (Powell, 1995).

***Herpestes ichneumon* (Linnaeus, 1758) Large grey mongoose**

Besides two deposited specimens: **Ahoada-Port Harcourt Road** (HVR-P.3) and **Port Harcourt-Elele Road** (RMCA-XXXX), five undeposited specimens were collected in **Agudama**, **Okogbe**, **Okolobiri**, **Swali**, and **Tombia**.

The species is reported to be common in open fields at Tombia; there is a sight record (Kay Williamson) from between Elele-Alimini and Ndelle. Happold (1987) did not list it as a forest species but cited Cozens & Marchant's (1952) sight record of it at Okrika. Using a skin for reference, it was established as being present at several sites east of the Nun River (Biseni, Okordia, and Yenagoa) but was not known to hunters at Kaiama on the river's west bank (Powell, 1995).

The species is common in farmed areas within the high forest zone and seems to be actively expanding its range in line with deforestation. It is absent from undisturbed high forest (Powell, 1995).

Several ethnic groups have stories of it using its anus to catch fowl (cfr. *Atilax paludinosus* in Kingdon, 1977); Rosevear (1974) stated he had no West African records of this otherwise widespread belief.

***Mungos mungo* (Gmelin, 1788) Banded mongoose**

Hunters reported mongooses with bands across the back from Kpakiama on the west bank of the Forcados River opposite Bomadi. No specimens were collected. This could be *Mungos mungo*.

***Xenogale naso* (De Winton, 1901) Long-nosed mongoose**

Besides three deposited specimens: **Igovia**, 2 (BMNH-1996.315; RMCA-96.052.M7) and **Otuokpoti**, 1 (HVR-P.7) two specimens were seen (but either not kept or lost) from: **Azikoro** and **Okoroba**. There is also a reliable sight record of a dead specimen near the coast at **Ogbotobo** between the mouths of Raos and Dodo rivers.

Up till 1994 (Colyn & Van Rompaey) no record of *Xenogale naso* existed from west of the Cross River, thus being believed to be a barrier to several species e.g. *Bdeogale nigripes*, *Genetta cristata*, and *Xenogale naso*. In the mean time specimens of *Genetta cristata* were collected from the Niger Delta, approximately 200 km west of the Cross River (Powell & Van Rompaey, 1998).

A juvenile female *Xenogale* (ca. 2-3 months old) was purchased 18 March 1994 in Otuokpoti village on Ekole Creek, 8 km south of Yenagoa. This was the first recorded specimen from west of the Cross River (Colyn & Van Rompaey, 1994). She was kept as a free-ranging domestic pet until killed on 20 March 1995.

Adult canine teeth erupted mid-October, lower milk canines fell out between 7-15 November and the upper left ca. 28 November. On 11 December she had double upper right canines; the last milk canine was lost on 28 December when the first premolar became visible. She had reached her near full-grown size in early October (tip of snout to tip of tail 82 cm). Measurements taken on the unskinned carcass: head and body: 51 cm, tail: 35 cm.

When the tail fur was erected the pale colour of the underfur was vey conspicuous and made the animal look quite different; this happened when she was nervous or afraid, or when moving across unfamiliar territory.

She disliked entering water and used the front feet to scoop food from the water; she actively climbed up unto chairs and shelves and tried to climb up table legs by wrapping limbs around them and "shimmying up". She was mainly diurnal but had sleeping spells during the day.

She chased, caught, and ate lizards (*Agama*, *Mabuya*, *Hemidactylus*), toads (*Bufo*), snakes, centipedes, worms, most insects of all sizes (including domestic cockroaches and large wasps), as well as rats and mice. She also ate mashed banana, plantain fried in oil (but not fresh), fish, soft bread, roasted groundnuts and sugar cubes. Favourites were honey, cheese, fried egg, lizard eggs, milk and some soft drinks. Ignored or rejected were oniscoid isopods, millipedes, mushrooms, rotting tilapia, ants, furry caterpillars, tomatoes, and a particular species of beetle (vomiting after eating it once).

Xenogale, as several other mongoose species (*Mungos mungo*, *Ichneumia albicauda*, and *Atilax paludinosus*) has the habit of carrying snails to a favourite spot where it breaks them by throwing them with the forefeet backwards against a tree or a rock. In 'Norgbene' and 'Lalabene' its vernacular name translates as 'snail breaker' (*osi-pa-owei* or *osi-pe-owei*).

The long-nosed mongoose is not well known locally and is possibly rare and/or local.

Family Mustelidae Fischer, 1817

Subfamily Lutrinae Bonaparte, 1838

Aonyx capensis (Schinz, 1821) Cape clawless otter

Happold (1987) had no specimens nor records of *Aonyx capensis* from any part of the forest zone, other than east of the Cross River (Powell, 1993). Although otters are missing from mammal lists for Ondo State (Agbelusi, 1994), Bendel State (Anadu & Oates, 1982), and Owerri Province (Cozens & Marchant, 1951), Heslop (1935) was almost certainly aware of the existence of otters in the eastern Niger Delta, but he evidently assumed that they were otter-shrews (*Potamogale velox*). Foster-Turley *et al.* (1990) consider it to be very rare in Nigeria.

Aonyx is well known and, by all accounts, common in the mangrove zone. Fishermen consider them as daily pests which remove fish from traps, but they are difficult to catch which partly accounts for the lack of records (Powell, 1995).

Specimens have been collected from **Okolobiri** Creek (BMNH-1995.318) and from **Sampou-Apoi** (BMNH-1998.148), whilst a skin was bought at **Kamabogu** market (BMNH-1998.149). Some natives believe that the female does not pass faeces but vomits out undigested food.

Lutra maculicollis Lichtenstein, 1835 Spotted-necked otter

The spotted-necked otter is rarely seen and is probably less common than the Cape clawless otter (Happold, 1987); according to the Otter Action Plan it is very rare in Nigeria (Foster-Turley *et al.*, 1990). Rosevear (1947:28) states that the 'speckle-throated otter often occurs in mangrove swamps' but in 1974 he found the Cape clawless otter 'frequent in mangrove swamps', not mentioning *L. maculicollis* from this habitat.

Some hunters say that there are two types of clawed otter: a white-throated brown one and an all-black one.

In contrast to the all-black **Gbanraun** specimen (BMNH-1994.524) the **Igovia** (BMNH-1998.150) specimen's throat is white with dark spots (larger and rounder than shown in Rosevear's figure). A skull was collected from **Tungbo/Sagbama** (BMNH-1998.151).

L. maculicollis seems to be completely unknown in the mangrove zone and on the coastal barrier islands of the Niger Delta.

Family Felidae G. Fischer, 1817

Subfamily Pantherinae Pocock, 1917

Panthera pardus (Linnaeus, 1758) Leopard

Some fairly reliable reports of occurrences come from remote road-less areas of Rivers State (Powell, 1993, 1995). These include sightings from Agge-dodo Barrier Island, Bolou-Orua's Kada-Ogba Forest, and Oyeregbene, south of Peremabiri (Powell, 1995).

The species is probably widespread but rare through the southern tidal-freshwater zone and on some barrier islands, but most likely extinct in more inland areas. Anadu & Oates (1982) also conclude there was no evidence for the survival of leopards in their survey sites, including the Kwale area between the rivers Ase and Niger, and the Taylor Creek and Nun River Reserve Areas (Powell, 1995).

Throughout the riverine area generally, the killing of a leopard gives prestige to the hunter and is often accompanied by ritual ceremonies, however, no reports of any recent killings have been received. The killing of leopards is taboo in Otuaka, north of Ogbia, but the species is nevertheless extinct locally. A leopard-like animal (*Seri*), also taboo to kill, is reported in Kula (Santa Barbara/San Bartholemew Barrier Island) but its existence and identity remain un confirmed (Powell, 1995).

No convincing evidence was found for the presence of *Mellivora capensis* (Mustelidae), *Poiana richardsonii* (Viverridae), or other small felines.

Abbreviations

BMNH	The Natural History Museum, London, UK
HVR	H. Van Rompaey Collection, Edegem, Belgium
RMCA	Royal Museum for Central Africa, Tervuren, Belgium
SBP	Station Biologique Paimpont, Paimpont, France

Gazetteer

AGUDAMA: 05°00+'N, 06°15.5' E
on right (W) bank of River Nun, across from Tombia.

AHOADA: 05°04.5'N, 06°39.51' E
on right (W) bank of Sombreiro River

AKPEDE Camp: 05°18'N, 06°30'E
about 3 km SE of Asambiri on E bank of Niger, slightly upstream of Nun-Forcados bifurcation

ASEINGBENE: ca. 05°05'N, 06°19'E
on right (W) bank of Taylor Creek

AZIKORO: 04°53.'N, 06°17.5'E

AZAMA/KASSAMA: 04°53'N, 05°59.5' E
Azama (Aziama on maps) on W bank of Apoi Creek / Kassama is the next village westward of Azama

AZUZUAMA: 04°43+'N, 05°57'E
on E bank of Middleton River (between Apoi and Ikebiri Creeks)

BISENI: 05°14.5'N, 06°32.5 E

EBUBU: 04°47'N, 07°09'E

EDE-EPIE: 04°57.5'N, 06°22'E
on S bank of Epie Creek

ELELE-ALIMINI: 05°3.39'N, 06°44.35'E
on headwaters of New Calabar River

GBANRAUN: 04°47.5'N, 05°53.5'E
on right (NW) bank of Pennington River (in Apoi clan, not to be confused with Gbaran clan slightly N of Yenagoa).

GBARANTORU: ca. 05°00'N, 06°15'E
on E bank of River Nun, upstream side of Tombia

IKIBIRI: 04°55'N, 06°12'E
on W bank of River Nun

IGOVIA: 04°58+'N, 06°29'E
S side of Orashi River and 6 km E of Okarki

KAIAMA: 05°07'N, 06°18'E
on the W bank of the Nun River

KALA-OGBOGOLO:
several km upstream of Opu-Ogbogolo

KAMABUGO:
several km E of Diebu, tidal freshwater zone, Kamabugo is used by outsiders, natives call it AKAMABUBO

KREIGANI: 05°18'N, 06°37'E
on E bank of Orashi River

MBIAMA: 05°03.6'N, 06°27.3'E
on right (W) bank of Orashi River

NDELLE: 04°58+'N, 06°44.5'E

OBIOFU: 05°25'N, 06°29.08'E
on the E bank of the Niger River

OGBOTOBO: 04°59.3'N, 05°31'E
on W bank of creek connecting Ramos and Dodo estuaries

OKOGBE: 05°04'N, 06°31'E

OKOLOBIRI: 05°02'N, 06°19.5'E

OKORDIA: ca. 05°08'N, 06°27' E
on Taylor Creek

OKOROBA: 04°37.86'N, 06°10.45'E
NE of Nembe

ONUEBUM: 04°48.5'N, 06°15.5'E
N side of Alagbafama and 13 km S of Yenagoa, on E bank of Ekole Creek

OPU-OGBOGOLO: 04°54.2'N, 06°33.9'E
on W bank of Orashi River

OTUAKA: 04°47+'N, 06°19-'E
on Otuaka Creek, between Ekole and Koto Creeks, 16 km SSE of Yenagoa

OTUOKPOTI: ca. 04°51'N, 06°15.5'E
on left (E) bank of Ekole Creek, 8 km S of Yenagoa

OZOCHI: 04°57'N, 06°32'E
on the Orashi River (ABESSA on maps)

PORT HARCOURT: 04°43'N, 07°10'E

SAMPOU-APOI: ca. 04°55'-N, 06°00+'E
3.5 km NNE from Azama

SWALI: 04°54'N, 06°15'E

TABAA: 04°44'N, 07°25'E

TOMBIA: 05°00'N, 06°15'E
on the E bank of Nun River, between Yenagoa and Taylor Creek entrance (=TOMBIA-EKPETIAMA, the Tombia of the Ekpetiama Clan, as distinct from other Tombia's in other ethnic areas e.g. Tombia-Kalabiri)

TUNGBO: 05°07.4'N, 06°10.2'E
on E bank of Sagbama Creek, 4 km SW of Sagbama/Forcados confluence, 10.5 km SSSW of Patani Bridge

UDODA: ca. 04°58.5'N, 06°30'E
on right (S) bank of River Orashi (OKOLOBIAMA on maps)

UMUANWO: 05°00'N, 06°52'E
on Port-Harcourt-Elele road, N side of Isiokpo and ca. 29 km NNW of Port-Harcourt

UZERE: ca. 05°21'N, 06°14'E

YENAGOA: 04°55.3'N, 06°15.5'E
at junction of Ekole and Epie Creeks

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The European mink (*Mustela lutreola*) in the Danube Delta

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Abstract

The European mink (*Mustela lutreola*) is considered to be the most threatened terrestrial carnivore in Europe. One of the last strongholds of this species may be the Romanian Danube Delta. However, until recently, the scientific community and conservationists have not acknowledged its existence there. In order to prove the presence of the European mink, preliminary field investigations have been carried out since 1998. The evidence gained so far indicates that European mink inhabit the Delta. It is however uncertain whether this is also true for the American mink. The status of both species will be investigated systematically. Additionally, a comprehensive study over the following years will highlight the basic ecology of and main threats for the European mink.

Introduction

The European mink is the most threatened small carnivore in Europe. This species has been in a rapid decline during the last fifty years (Maran & Robinson, 1996), which is thought to be due to several factors including direct persecution and competition from other small carnivores like the American mink (*M. vison*) or even the polecat (*M. putorius*). The European mink is still present in some European countries. In spite of certain references (Youngman, 1982; Negrutiu, 1983; Nania, 1991), at present there is almost nothing known about this species in Romania. However, the Danube Delta might be one of the last refuges of the European mink. This paper presents some aspects of the Danube Delta as a natural habitat, the results gained with the research done so far, and also plans for the future conservation of this species in the Danube Delta.

Research done so far

From the point of view of the European mink, data from the Danube Delta are very scant or are completely unavailable. Only few authors (Youngman, 1982; Negrutiu, 1983) mention the presence of the European mink in the Danube Delta. Youngman's evidence is based on skeletons and furs from certain European museums, showing that mink were still caught by local trappers in different regions of the Delta (Murariu cited in Youngman, 1982). Negrutiu's evidence is based on the mink annual harvest in the Delta. He also suggested that the European mink should be protected there. In recent literature, only the possibility that a small population still survives in the Danube Delta is mentioned (Murariu & Ionescu in Maran, 1995). Taking into consideration the rapid decline of the European mink world wide, the necessity for urgent conservation actions and the data above, a pilot study was started in October 1998 with the approval of the Danube Delta Biosphere Reserve (DDBR) authority.

The main objective of this project was to prove the existence of the European mink within the Danube Delta on the base of live trapping. It was also supposed to find out whether the American mink is either present there or not, and to investigate the necessity and possibility to set up a larger conservation project for the European mink in the Danube Delta.

Until now, five field investigations were carried on, as follows:

- October 5 - 10 and November 20 - 26, 1998: investigations on the left bank of the St. Gheorghe branch of the Danube at Km 57 and the area of the Perivolovca channel;
- December 16 - 23, 1998: investigations within Babina and Cernovca polders (Chilia branch of the Danube);
- April 19 - May 3, 1999: investigations in proximity of Uzlina agricultural polder (St. Gheorghe branch of the Danube);
- July 23 - 28, 1999: investigations in the Uzlina region (St. Gheorghe branch of the Danube).

During the first two expeditions only basic observations were possible. Field observations continued in December, when live trapping started. In conditions of freezing time and foul weather, live trapping was unsuccessful, in spite of the 70% of the partially or completely eaten bait. In the same time, an undercover investigation of accidentally caught mink was conducted in two villages: Chilia Veche and Periprava.

Live trapping was still unsuccessful during both April and July expeditions. In the Uzlina region, mink excrements were abundant in one old willow marsh area, but were absent in another one just one km apart. This might be due to a different hunting pressure of muskrat trappers. In the same time, major aspects for a future larger project were possible to be outlined on the base of all the experience, information and proofs gained so far.

The Danube Delta as a natural habitat for the European mink

With a surface area of about 4,152 km^2 (not considering lagoon complex Razim-Sinoie and the lakes situated north of the Chilia branch), the Danube Delta is the second largest delta in Europe, is among Europe's last largely natural landscapes and one of the world's largest wetland areas.

Although not subject to major interventions by man, the Danube Delta was subject to some measures meant to improve its navigability and agricultural efficiency. However, it still holds an amazing amount of species and the wetland dynamics are still in action. Situated at the intersection of the main European bird migration routes, the Danube Delta is a real paradise for birds, offering breeding, feeding and resting places for large populations of 325 bird species.

One of the most extended ecosystems in the Danube Delta is constituted by the flooded reed beds, which are situated mainly under the sea level. This ecosystem, with the reed (*Phragmites australis*) as the main component, gives a characteristic aspect for most of the delta territory. Because it is situated under the water throughout the year and because of lack of tree species, this ecosystem might not offer good housing and resting conditions for mink, except the areas where willows are still present. On the other hand, it is very difficult to investigate those areas because of the high and dense vegetation.

Unlike flooded reed beds, floating reed beds offer good breeding, feeding and resting conditions for mink, but their extent is far behind the first ecosystem described. This ecosystem is situated within flooded reed beds or close around the lakes.

Another important ecosystem for mink is constituted by riparian willow formations. These are situated mainly along the Danube branches, and it benefits by the presence of many old willow trees, mainly representing three species: *Salix alba, S. fragilis and S. pentandra*. The proximity of the Danube, which could offer the possibility of feeding during the strong freezing winter periods, when small channels are completely covered by ice, and the presence of the old willow trees for breeding and resting is thought to allow mink to live there in very good conditions.

However, a great part of these riparian formations have been replaced with poplar plantations (*Populus* sp.) before 1989, in order to increase the wood production in the delta. Fortunately, this process has stopped as well as any other major landuse changes of the Delta, and only actions for ecological restoration of disturbed areas are being carried out at present.

Preliminary results

According to an expert of the Danube Delta Institute (Kiss, 1996), mink are present in many regions of the delta. The estimation of the population size is based on declarations of the local muskrat trappers who have accidentally caught mink in their traps. Being aware of the fact that only incomplete declarations were available and local people do not distinguish between the European and the American mink, we can only give the estimated mink population size in the Danube Delta which is presented in Table 1.

While having in mind that these estimations may be far too low (according to the bycatch of muskrat trappers, every winter about 500 mink are thought to be caught), they still are proof of the existence of mink in the Danube Delta. All these mink are considered to be European mink, and there is no mention of any American mink. The presence of mink in the Danube Delta was proved during the field investigations done so far. Many footprints and faeces were found in all investigated areas, but it was impossible to decide if either European or American mink were present there.

Year	Estimated number of minks
1993	225
1994	226
1995	322
1996	371

Table 1: European mink population estimate for the Danube Delta

Region	Number of analysed furs
Matita Lake	1
Crisan	4
Uzlina	3
Caraorman	2

Table 2: European mink furs found during an undercover investigation in winter 1998/1999

So far, the confirmation of the presence of the European mink there was possible only through the analysis of the furs of some accidentally caught mink during the winter 1998-1999 hunting season (Table 2). The white patch was very present on both upper and lower lips of every fur, and a genetic analysis of the furs is in preparation.

The following factors are thought to be possible threats for the European mink in the Danube Delta:

1. Local muskrat trappers, who are still using unselective traps, into which the minks are accidentally caught. According to the DDI specialists, the number of mink accidentally caught is up to 1% of the entire harvest, which is up to 50,000 muskrats per year (J.B. Kiss, pers. comm., 1999).
2. Fish traps are set for big fish and therefore they have no stop grids to hinder otters or mink to enter the traps. They are mainly used in places with stagnant water, like interior small lakes or in the neighbourhood of interior willow formations or flooded reed beds.
3. The American mink could be a serious threat for the local European mink, as it is in many other places. Although there is no proof yet for its presence there, the American mink could spread within the Danube Delta from the fur farm from Izmail, Ukraine, in the north of the Delta (E. Schneider, pers. comm., 1998).
4. Cutting of willows situated on the banks of the interior channels occurs when a channel is cleaned from mud. The technology used at present may have a strong negative impact on mink populations as this habitat is thought to be of a particular importance for the species.

Conclusions

On the base of the research done so far, a very important question was answered: are there European mink in the Danube Delta? The visual analysis of the 10 furs has shown that all of them were European mink. However, there are other important questions still unanswered:

- How common are the European mink within the Danube Delta? What is their distribution there?
- Are there American mink? How seriously do the possible threats acknowledged so far affect the mink population?

All the information and experience gained so far guide to the conclusion that a future larger project is needed to answer all these questions and many others, like details of the ecology of the species. Successful conservation strategies could be developed only after all these questions have been answered. In order to be able to answer the questions asked, specific activities should be scheduled for the next months and years, as follows:

1. Periodical footprint and scat samplings within different areas: in this way a draft of the distribution map could be shaped;
2. Development of the live trapping techniques: it is strictly necessary for catching mink, in order to prove or invalidate the presence of the American mink within the Delta, and also for the telemetry project;
3. Meetings with local muskrat trappers to convince them to use selective traps instead of traditional unselective ones in some experimental areas. A promotional folder and field signs could help in this attempt. The effect of the unselective traps on mink population could be quantified on the base of the study of the population size in following years;

- A telemetry project which could answer several questions regarding details of the ecology of the species, possible sympatric occurrence of both mink species in certain areas, resource competition and intraguild aggression.

These actions are intended to be integrated in a European ...de research effort, which will contribute to the conservation of ... European mink.

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Request for hair and tissue samples

Despite their diversity, scientific and ecological impor...ce, the viverrids remain the least known carnivores. In order to ...ntain their biological diversity, an improved understanding of ... phylogeny and evolution is of major importance.

In order to pursue our clarification of the phylogeny of the ...verridae (Veron & Catzeflis, 1993; Veron 1995; Gaubert et al., ...9; Veron & Heard, submitted; Yoder et al., in prep.), we are ...rching for hair and tissue samples suitable for molecular analyses.

Hairs (with root bulbs) and tissues of living or freshly dead ...mals could provide DNA for our studies. They must be put in ...ohol but hairs can also be sent dry. Biopsies could also be of ...at interest for chromosomal studies as well as for molecular ...alyses (material to preserve biopsies could be sent on request).

A great number of researchers doing field studies pro...de us with samples, particularly hairs samples, so that, added those coming from several other sources, we have material for ...st of the viverrids species, but we hope to enlarge our sampling ... new contributions coming from all the parts of the viverrids ...nge, in order to initiate new molecular phylogenetic studies. ...nyone who has access to viverrids hairs or tissues is welcome to ...llaborate.

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