SMALL CARNIVORE CONSERVATION

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

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SPECIES SURVIVAL COMMISSION

Scandinavian wolverine (*Gulo gulo gulo*). Photo by Franz Müller.

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

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The aim of this publication is to offer the members of the IUCN/SSC M,V&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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An action plan for procyonids and ailurids ready soon

Angela GLATSTON

The animals considered in this action plan are all small-bodied members of the Order Carnivora: none of them are truly carnivorous in their feeding-habits and the largest specimens are no bigger than a well fed domestic cat. The majority are confined totally to the New World where they can be regarded as the local equivalent of the Old World viverrids which they resemble both in body size and in ecological niches filled. They comprise a small group of arboreal or semi-arboreal, plantigrade or semi-plantigrade, omnivores and frugivores most of which are totally nocturnal in their habits. Their distribution encompasses the whole American continent from Palaearctic to tropical regions: from Canada to Argentina. They have adapted to live in a wide variety of habitats ranging from tropical rain-forest to arid semi-desert regions and chaparral. Nevertheless, there is one factor generally common to all these species in all their habitats and that is an affinity for tree cover; all these species climb trees to escape danger and all, with the exception of prairie dwelling raccoons, have their young in tree nests. The only exception to this picture is the red or lesser panda, *Ailurus fulgens*.

The New World procyonids comprise five or six genera: *Procyon*, the raccoons; *Nasua*, the coatis; *Potos*, the kinkajous; *Bassaricyon*, the olingos; and *Bassariscus*, the ringtails or cacomistles. *Nasuella*, the mountain or little coati is usually placed apart from the other coatis in its own genus.

Seven years have elapsed since 1985 when the project to develop an action plan for these species was initiated. This is an inordinately long time for the completion of a slim document covering only the few species represented by this Action Plan. However, in our defence it must be noted that in the procyonids and ailurids (i.e. the red panda) we are generally dealing not only with species of which little is known but also often with species for which the interest of the scientific and conservation communities is limited to a few species: there are few data available from the field and fewer scientists available to collect them. This has meant that the compiler of the action plan has had to send a continuous stream of letters to various organisations and individuals associated with Nature Conservation in those countries where procyonids are endemic, in order to glean scraps of information. The recipients of these letters were only remotely connected with the species of interest and so the information which they were able to supply has been limited. The difficulties of the task will be amply reflected in the nature of the information presented in the action plan when it is finished and the duration of the task.

The title of the action plan, "An Action Plan for the Conservation of Procyonids and Ailurids", gives a hint of some of the problems and confusions which confronted the compiler while producing this report, foremost amongst these is the taxonomic confusion which besets this whole group from the family to subspecies levels. These arguments include the question of whether the red panda should in fact be classified as a procyonid or the status of the various island forms of raccoon or the five currently recognised species of olingos are other examples. To avoid confusion to the reader and irritation to various experts as regards the red panda (the only Old World member of the procyonidae according to classical taxonomy), the term "Ailurid" has been used throughout the action plan to refer to the red panda while the term "Procyonid" is used only for the New World species under consideration.

The procyonids and ailurids are, with the exception of some raccoons and coatis, a group of species relatively unknown and little studied by the scientific community. The limited nature of our knowledge of these species is one major factor contributing to the fact that, until recently, not one single member of either of these groups was mentioned in the IUCN Red List of Threatened Species. It has also meant that very few procyonid (sub)species have been afforded the protection Appendix II or even Appendix III of CITES. In several instances it can be categorically stated that these omissions have indeed been a reflection of our ignorance of these species rather than a cause for optimism about their future.

The comparative absence of recent field studies or suveys of most of the species has resulted in a dearth of information as to the numbers, actual distribution, habitat requirements, etc. In terms of this report this means that, in many cases, we do not have direct information regarding the status of, or threats to, the species concerned but rather that we have had to deduce these from direct evidence; for example, where high levels of deforestation have been reported in many of the countries comprising the range of a largely arboreal or forest dwelling species we may assume that the species is threatened even if direct proof of this fact is not available. In addition, the lack of familiarity with these species has lead to known instances of misidentification by field workers or local informants which in turn casts doubt on the reliability of some of the data we have received. One example which illustrates this problem is a report on the occurrence of the red panda from Burma. This report stated that red pandas were still fairly common in some areas and as proof, the report was accompanied by a photograph of a "red panda" taken during a visit to one such area, the photograph in question depicted a species of civet. Other examples are to be found where field workers in Central America who, when questioned about the occurrence of the mountain coati, were uncertain as to whether the animals which they had seen in the field belonged to this species or to that of the more familiar Central American coati. Similarly, reports of the Guadeloupe raccoon are confused by the fact that some respondents indicate that the species they have seen on the island is the crab-eating raccoon rather than the local endemic species.

The collection of data and its evaluation has been hampered by the taxonomic problems mentioned above which will be covered in detail later. The most surprising of these related to the actual relationship of the red panda to the procyonids; one expert was so adamant that the red panda could not be considered as a procyonid that he refused to work for or with a group called the Procyonid Specialist Group which also dealt with the red panda. Luckily this only occurred on one occasion but it serves not only to illustrate the kind of reaction which may be encountered when people's (scientific) beliefs are questioned but also that taxonomic questions can have far reaching effects.

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Comparative analysis of the diets of European mink (*Mustela lutreola*), American mink (*M. vison*), and Polecat (*M. putorius*) in Byelorussia

Vadim E. SIDOROVICH

Introduction

The problem of the rapid reduction of both the range and numbers of the European mink (*Mustela lutreola*) remains unresolved, although discussed by many authors (Danilov & Tumanov, 1976; Ternovsky, 1977; Henttonen & Lahti, 1978; Granquist, 1981; Tumanov & Zverev, 1986; Ternovsky & Ternovskaya, 1988; Schropfer & Paliocha, 1989; Sidorovich, 1990). For an explanation, some postulate competition with the American mink (*M. vison*), an ecologically similar species introduced into Europe (Heptner *et al.*, 1967; Henttonen & Kahti, 1978; Sidorovich, 1990). Other workers have favoured increased competition with the polecat (*M. putorius*) in habitats altered by man (Schropfer & Paliocha, 1989).

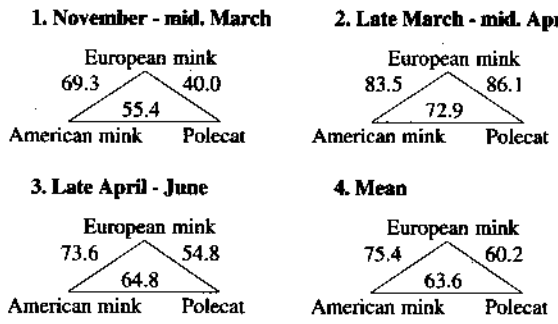
There is a large literature dealing with the nutritional ecology of these species, which includes comparisons of feeding spectra (Grigoriev & Teplov, 1939; Heptner et al., 1967; Danilov & Tumanov, 1976; Tumanov & Smelov, 1980). However, all these authors presented data gathered from large geographical areas. In the analysis of interspecific interactions, dietary information is required that is derived from the study of animals in patchy, local environments that are simultaneously inhabited by all species (Begon et al., 1986; Sidorovich, 1990). Such information is lacking when the two species of mink and the polecat are considered together.

The three species co-exist along a medium-sized river, typical of northern Byelorussia. This provided an opportunity to undertake a comparative study of their feeding ecology. By examining dietary similarities between these species, the possibility of interspecific competition through dietary overlap could be investigated. This study is connected with a research programme investigating the decline of the European mink.

Table 1 - Diet of European mink on Lovat River, 1989-91

Prey classes	% prey items			
	Nov.-mid Mar.	Late Mar. -mid Apr.	Late Apr. -June	Mean
Insects	18.9	8.1	26.4	15.5
Dytiscidae	18.9	8.1	18.9	13.4
Other insects	-	-	7.5	2.1
Fish	8.1	8.1	15.1	10.2
Esox lucius	-	1.0	-	0.5
Perca fluviatilis	2.7	1.0	-	1.1
Rutilus rutilus	-	2.0	1.9	1.6
Misgurnus fossilis	2.7	2.0	5.7	3.2
Gasterosteus aculeatus	2.7	1.0	5.7	2.7
Other fish	-	1.0	1.9	1.1
Amphibians	56.8	55.1	35.8	50.3
Rana arvalis, temporaria	56.8	55.1	30.2	48.7
R. ridibunda, esculenta	-	-	3.8	1.1
Bufo sp.	-	-	1.9	0.5
Birds	2.7	3.1	9.4	4.8
Mammals	13.5	25.5	11.3	19.3
Murinae	2.7	1.0	-	1.1
Arvicola terrestris	5.4	6.1	3.8	5.3
Other Microtinae	2.7	4.1	3.8	3.7
Soricidae	2.7	7.1	1.9	4.8
Other small mammals	-	7.1	1.9	4.3
	n=37	n=98	n=53	n=187

Figure 1 - Dietary similarity in Minks and Polecat on Lovat River, 1989-91



Material and methods

The study was carried out along a 40 km stretch of the River Lovat (West Dvina Basin, Gorodok District, Vitebsk Region) between April 1988 and May 1991. River width varied between 5 and 20 m, depth between 0.5 and 20 m, and flow speed between 0.2 and 0.5 km/h. The area is characterised by diverse riparian habitats; the width of the floodplain ranged between 100 and 800 m, with about 30% of its total area covered by open meadows. Elsewhere, willow (*Salix* spp.), shrubs and conifer-dominated forests occur in equal proportions. Between 10% to 90% of the floodplain of the river corridor was subject to innundation.

The contents of both scats and gastero-intestinal tracts were analysed. Scats were collected on a regular basis from dens where the identity of the occupant was known, either by trapping or from observation. Stomachs and intestines were collected from trapped specimens. A total of 78 scats and 11 stomachs and intestines were collected from European mink, 64 scats and 16 alimentary tracts from American mink, and 43 scats and 5 alimentary tracts from polecats.

The identity and size of prey items were determined from remains extracted from stomachs, intestines and scats. The material examined consisted of chitinous insect remains, fish scales and vertebrae, amphibian bones, avian bones and feathers, and the teeth of mammals (see details in Sidorovich, 1991; Pikulik & Sidorovich, in press).

To analyse seasonal variation in diets, study data were divided between three periods: November to mid March, late March to mid April, and late April to late June (see Tables). These periods were characterised by different environmental conditions and the diets of semi-aquatic mustelids appeared different in each (Sidorovich, 1990). No data were collected between August and October, although it is probable that the diets of all three species during this period did not differ markedly from their diets during the months of May, June, and July (cf. Heptner *et al.*, 1967; Tumarov & Smelov, 1980; Sidorovich, 1991).

Trophic similarity was determined using the equation:
$T = \Sigma_h \min (P_{ih}, P_{jh})$
where P_{ih} and P_{ij} are the fractions of prey h in the diet of species i and j (expressed as percentage biomass)

Results

Five prey classes were present in the diets of the mustelids on the River Lovat: amphibians, small mammals, fish, birds, and insects (Tables 1-3). A total of 22 species were found in the diet of the European mink, 30 species in the diet of the American mink, and 24 species were recorded in the polecat's diet. Amphibians and small mammals contributed most to the dietary biomass of the species studied, although fish were also important constituents of the diets of both mink species (Table 4). Amphibia were the major type of prey taken by both species of mink, but made up a greater proportion of the diet of American mink than of European mink (47% and 31% respectively). Small mammals were a major component of the diet of the polecat (65%) with amphibia contributing a further 21.5% by biomass. Birds were of minor importance in the diets of all species, contributing between 8-10% of prey biomass. Insects were of negligable importance, comprising no more than 1.5% of the prey items recovered.

The trophic similarity of the species studied is shown in Fig. 1. The maximum mean index value observed was between the two mink species (75.4%). Dietary overlap between the polecat and both species of mink was lower (60%)(Fig. 1). In all three species pairs, similar variability of trophic overlap was observed. This reached its maximum level in early spring and a minimum in late autumn/winter.

Discussion

Every prey item present in the diets of the mustelid species studied may be considered to be a potential prey item for any of these three species.

The data presented show that different prey items were taken in differing proportions by different species. The frequency differences between major prey items is one of the indices that classifies the trophic plasticity of a predator. The range of major prey species taken by American mink on the River Lovat was more diverse than that of either the European mink or the polecat. American mink preyed upon more species of fish and small mammals, whilst polecats took less fish but a wider range of mammalian and avian prey than did European mink. American mink appeared to be a more generalist predator than did native European mink. This suggests a greater competitive ability in the introduced species. Comparison of the diets of European mink and the polecat, on both the River and in adjacent riparian habitats, showed that the European mink may be more competitive in unfavourable environments. This is due to its greater ability to forage underwater. Thus, when feeding conditions in riparian habitats become unfavourable, European mink can respond by foraging in the river itself.

Table 2 - Diet of American mink on Lovat River, 1989-91

Prey classes	% prey items			
	Nov.-mid Mar.	Late Mar. -mid Apr.	Late Apr. -June	Mean
Insects	7.4	5.8	14.0	8.2
Dytiscidae	7.4	5.8	12.0	7.7
Other insects	-	-	2.0	0.5
Fish	23.9	23.5	28.0	24.7
Esox licius	1.4	9.8	2.0	5.5
Perca fluviatilis	3.0	1.0	8.0	3.2
Rutilus rutilus	3.0	2.9	10.0	4.6
Misgurnus fossilis	7.5	5.9	4.0	5.9
Gasterosteus aculeatus	5.9	1.0	-	2.3
Other fish	3.0	2.9	4.0	3.2
Amphibians	37.3	42.1	30.0	37.8
Rana arvalis, temporaria	32.8	41.2	18.0	33.3
R. ridibunda, esculenta	4.5	1.0	6.0	3.2
Bufo sp.	-	-	6.0	1.4
Birds	1.4	2.9	10.0	4.1
Mammals	29.8	24.5	18.0	25.1
Murinae	1.5	1.0	-	0.9
Arvicola terrestris	7.5	8.8	6.0	7.8
Other Microtinae	7.5	3.9	2.0	4.6
Soricidae	11.9	9.8	4.0	9.1
Other small mammals	1.5	2.0	6.0	2.7
	n=67	n=102	n=50	n=219

Table 3 - Diet of Polecat on Lovat River, 1989-91

Prey classes	% prey items			
	Nov.-mid Mar.	Late Mar. -mid Apr.	Late Apr. -June	Mean
Insects	3.2	5.0	11.1	5.8
Dytiscidae	3.2	5.0	5.6	4.3
Other insects	-	-	5.6	1.5
Fish	2.2	7.5	2.8	4.3
Amphibians	27.4	55.0	44.4	40.0
Rana arvalis, temporaria	27.4	50.0	25.0	33.3
R. ridibunda, esculenta	-	-	5.6	1.5
Bufo sp.	-	5.0	13.8	5.1
Birds	4.8	5.0	13.8	7.3
Mammals	61.3	27.5	27.7	42.8
Murinae	8.1	-	2.8	4.4
Arvicola terrestris	6.5	5.0	5.6	5.8
Microtus agrestis	8.1	7.5	2.8	6.5
M. arvalis	8.1	2.5	2.8	5.1
Clethrionomys glareolus	19.4	5.0	8.3	12.3
Soricidae	4.8	2.5	-	2.9
Other small mammals	6.5	5.0	5.6	5.8
	n=62	n=40	n=36	n=138

Studies of seasonal dietary variation showed that the greatest trophic plasticity was that of the American mink. In winter the species takes terrestrial prey (small mammals) more often than the European mink (Tables 1 & 2). Sometimes American mink feed exclusively on small mammals in winter (Sidorovich, 1991). The ability of American mink to prey upon small mammals allows the species to adapt to prey scarcities caused by the winter freezing of riparian habitats, when access to water may be either limited or impossible. In winter European mink preyed primarily on amphibia (especially *Rana temporaria*) that overwinter in ponds. Thus, during the early stages of freezing over, when lack of access to water limits foraging, conditions become much poorer for European mink than for American mink. In winter polecats feed primarily on small mammals (61.3%). However, polecats cannot forage in water when the air temperature drops below 0°C, their fur becomes wet easily and this makes aquatic foraging bioenergetically expensive. When the winter availability of small mammals decreases, e.g. during periods of snow cover, the polecat is in a poorer nutritional situation than either species of mink.

Comparison of the seasonal changes in dietary composition and prey availability show that all species (and particularly American mink) tend to take prey according to its availability. Birds and insects were most frequently preyed upon in summer. Furthermore, American mink preyed most heavily upon various amphibian and fish species during their spawning periods, behaviour that is not typical of either the European mink or the polecat. A high degree of nutritional plasticity in American mink, in terms of predation upon small rodents and birds, has also been reported in other areas (Pulliainen, 1984; Arnold & Fritzell, 1987). All these facts lead to the conclusion that the American mink has a greater trophic plasticity and competitiveness on ponds and adjacent riparian habitats than either of the other mustelids studied.

Table 4 - Composition of diet of Minks and Polecat on Lovat River 1989-91

Prey classes	% biomass		
	European mink	American mink	Polecat
Insects	1.5	0.7	0.3
Fish	13.3	28.5	3.3
Amphibians	47.0	31.2	21.5
Birds	10.8	8.1	9.4
Small mammals	27.4	31.5	65.5
	n=187	n=219	n=138

The greatest trophic similarity observed was between the two species of mink (75.4%) with little seasonal variation. The high level of overlap during the period of unfavourable environmental trophic conditions may lead to intense competition between the two species (Giller, 1984; Begon *et al.*, 1986). Trophic similarity between the two species of mink and the polecat was somewhat lower (about 60%). However, seasonal variation was greater, with the lowest indices being observed in winter. Therefore, differences in the diets between European and American mink and the polecat were sufficiently large to prevent intense competition. Such competition may occur near ponds however, where high densities of all three species were observed during periods of poor feeding conditions.

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Changes in the occupation of badger setts in the environs of Vilnius within the last decade

Census data show that the number of badgers in Lithuania has decreased during the last ten years. Although the reliability of Lithuanian badger census data is somewhat questionable, it is evident that the number of badgers in the suburbs of Vilnius has decreased within this period. Systematic observations have shown that badgers have abandoned eight setts during the last decade. In 1980 suburban setts were used by badgers, foxes and raccoon dogs. Nowadays badgers inhabit only two setts out of eleven, whereas ten setts were inhabited in 1980. Foxes currently live in only one of these setts, and both foxes and badgers are absent from nine others. Now only raccoon dogs use these setts from time to time. What are the reasons for these decreases in the numbers of foxes and badgers in the suburbs of Vilnius? The main reason is increased anthropogenic pressure upon these areas. Built-up zones have sprung-up around the patches of forest in which the setts were originally excavated. Continuous disturbance of the setts followed; children blocked the holes with logs and stones, whilst poachers placed snares. It is interesting to note that raccoon dogs have occupied some setts that have experienced high levels of human disturbance. Perhaps this is due to the ecological plasticity of the raccoon dog in Lithuania. Raccoon dogs dispersed into Lithuania from Latvia and Byelorussia between 1948 and 1960, so the species is new to Lithuania. The raccoon dog has been forced to search for its own ecological niche in the Lithuanian ecosystem, and to adapt itself to this different environment. In conclusion it is necessary to mention the following:

1. In the suburbs of Vilnius the raccoon dog has occupied setts vacated by badgers and foxes.
2. It is important to increase environmental education for children to teach them how to care for wildlife, and how to observe suburban animals, but not to disturb them.

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The biology and status of Owston's palm civet in Vietnam

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Ecology and biology

Owston's palm civet *(Chrotogale owstoni* Thomas, 1912), is one of the rarest members of the viverrid family in Vietnam and a critically endangered species worldwide.

It is a very beautiful animal (Fig. 1). The brown pelage has four large triangular black bands crossing the back, and two black bands running along the shoulders on each side. The long tail has two complete brown rings at its root, the rest being completely black. *Chrotogale* is a medium-sized viverrid with a head and body length of 560 to 720 mm, a tail length of 350 to 470 mm, and an ear length of 40 to 50 mm. The body weight is between 2,500 and 4,000 g.

Very little is known of the ecology and biology of the species. It prefers humid habitats; valley forests, hillsides, foothills with streams, lakes, and the headwaters of rivers. They also inhabit the shrubby surroundings of forests, bushland along river banks and even scrub near cultivated fields. *Chrotogale* makes simple dens under large tree-trunks or in dense bushes (Le Hien Hao, 1973; Pham Trong Ahn, 1982). They also frequently use natural holes in trees, rocks, or in the ground for nesting and resting. These dens are not used for long periods of time, they often change dens in response to the availability of food resources and changing seasons.

Owston's palm civet is terrestrial but can climb very well. In their search for food they often climb trees to prey on small animals (birds, lizards, insects, etc.) or to take fruits. Being nocturnal they remain in their den during the day. Emergence time depends on the security of the habitat, the food supply, and their physiological status. Usually activity commences at dusk and ends early in the morning. Sometimes they may go out late in the afternoon at sunset. Pregnant and lactating females often become active later than the others (Le Hien Hao, 1973). They are most active between 21.00 h and 24.00 h (Pham Trong Anh, 1982). Our observations of captive specimens revealed that they were active for between 7 and 10 hours per day. During daytime they usually

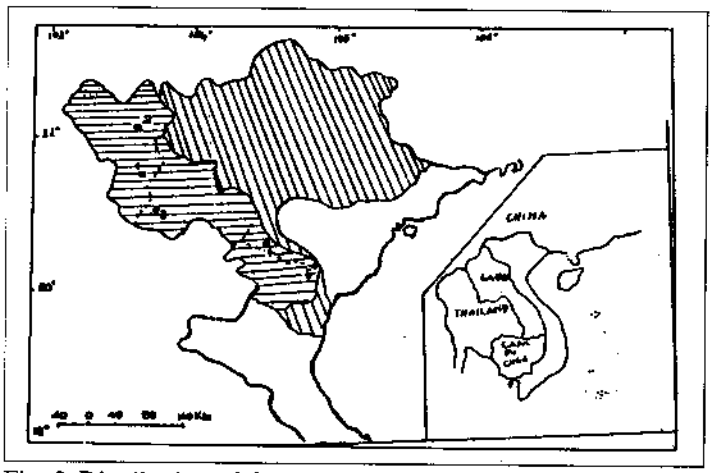

Fig. 2 Distribution of Owston's palm civet in Vietnam
▨ Distibution before 1973
▭ Probable present distribution
● Recent records: 1. Muong Phang, 2. Muong Te, 3. Sop Cop, 4. Hoa Binh, 5. Cuc Phuong Nat. Park

Fig. 1 Owston's palm civet (*Chrotogale owstoni*) in captivity. Photo by Nguyen Xuan Dang.

only leave their dens for a few minutes, either to drink or urinate. Activity begins begins between 17.00 h and 20.00 hours and ends between 04.00 and 06.00 hours the next day. During the activity period, rests lasting between 30 min to 2 h are taken. Subadult animals are active for longer than adults. Food is usually searched for in forest surroundings, along rivers, and in cultivated fields. Sometimes they may take poultry from local villages.

Owston's palm civet marks its home territory with the secretions from scent glands located in both sexes' ano-genital region. Whilst moving the animal suddenly stops, lowers his/her pelvis and touches the ground, tree, etc. with the ano-genital region, after which the animal stands up quickly and moves on. The frequency of marking increases when the animal enters new territory, or when an unfamiliar animal enters their territory. They habitually defecate and urinate at the same spot near the den.

According to Le Hien Hao (1973) and Pham Trong Anh (1982), *Chrotogale* is solitary except during the breeding season. Our captive specimens live in social groups of two or three females, or in mixed-sex groups. Moreover, the animals usually lie side by side or even on top of one another. They appear of a peaceful disposition; readily accepting new members to their group without any show of aggression or fighting.

Owston's palm civet is usually silent but can produce a sound similar to that of a domestic cat. The diet is specialized, consisting mainly of earthworms plus a small percentage of other small animals and fruits. Stomach contents'revealed that earthworms may make between 65 to 100% of the total contents (Le Hien Hao, 1973; Pham Trong Anh, 1982). Earlier research also found eathworms in the stomach contents (Nowak & Paradiso, 1983; Dao Van Tien, 1985). Other prey items include amphibians, birds, rats, eggs, and insects (locusts, crickets, cockroaches). In captivity our animals willingly take earthworms, lean beef, chicken, frogs, small birds, eggs, and insects. Of all the fruits given, they

prefer bananas and chiku fruit (*Manilkara achras).* It was estimated that an adult animal can eat about 100 g meat (beef, chicken, earthworms) and 200 to 300 g of fresh fruit per day.

Chrotogale has one or two litters per year, each consisting of one to three kits. The gestation period lasts about 60 days (Le Hien Hao, 1973). The mating season appears to be mainly from January to March, but breeding may last until November. Le Hien Hao (1973) described fully-grown embryos as having a total length of 180-193 mm and a weight of 75-88 g, with a pelage similar to the adult's. A newborn female of about 3-4 days old looked helpless, had closed eyes, and had a total length of 190 mm, a tail of 110 mm and a body weight of 86 g.

Status and conservation

The distribution of Owston's palm civet is confined to a very small area in Asia that includes northern Vietnam, northern Laos, southern Yunnan and southern Guangxi in China (Schreiber *et al.*, 1989). In Vietnam the species has been found in most of the northern provinces (Fig. 2), but always in low numbers (Le Hien Hao, 1975; Pham Trong Anh, 1982; Dao Van Tien, 1985).

Habitat loss and disturbance and intense hunting pressure during the last few decades have eliminated much of their former range and critically reduced the number of animals.In Vietnam *Chrotogale* is protected by law as an endangered species and listed on the "Checklist of National Endangered Species" and the "Red Data Book of Vietnam".A number of nature reserves have been gazetted in their range, but the Cuc Phuong National Park is the only reserve where the occurrence of the species is occasionally recorded.

At present, evidence for the occurrence of Owston's palm civet comes only from the provinces of Lai Chau, Na Son Binh, and Son La, and the Cuc Phuong National Park. In the mean-time, habitat loss, disturbance, and intense hunting pressure still remain immediate threats which could lead the species to extinction in the near future.

Since 1990 the Institute of Ecology and Biological Resources, NCSR of Vietnam, has started to implement the "Programme of Conservation and Restoration of Owston's palm civet in Vietnam". The aims of this Programme are:

- to assess the exact status and distribution of the species in Vietnam
- to elaborate recommendations relevant to the conservation and restoration of the species
- to select suitable sites for the establishment of *Chrotogale* reserves
- to establish a captive population in Vietnam for reintroduction in well-managed reserves. The first attempt at captive breeding has been conducted (Nguyen Xuan Dang *et al.*, 1991)
- to study the biology and ecology of the species
- to seek international cooperation in the conservation and restoration of the species in Vietnam

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Better protection for the Hog-nosed skunk ?

A motion to include the genus *Conepatus* in Appendix II of CITES was made by Argentina. The genus *Conepatus* is distributed over nearly the whole of southern America. Four species, *Conepatus chinga, C. castaneus, C. rex,* and *C. humboldtii* are recognized but the population size of none of them is known.

In Argentina *Conepatus* skins are used in the fabrication of a. o. bags, and in former times, the meat was used for consumption. During the period 1972-1979, 1,243,129 skins were officially exported; the number contains all four species without any numbers known for any of the species. The remarkable reduction of the number of skins exported since 1983 could be ascribed partly to the inclusion of *C. humboldtii* in CITES Appendix II but may also be the result of skins becoming scarcer, while the demand for skins is rising since 1990. Illegal trade in skins and trade in live animals is considered as insignificant.

It is considered necessary to include all four species of *Conepatus* in CITES Appendix II in order to obtain data on the trade in the different species, to estimate the exploitation level, and to enforce a better control of the exports, and to avoid that one of the species is exported under the name of any of the other species.

MANAGING FOREST CARNIVORES

A special session "Managing Forest Carnivores" featuring presentations on habitat relations of forest carnivores throughout the world will be held at: International Union of Game Biologists, Congress XXI, Halifax, Nova Scotia, Canada, 15 to 20 August '93 Those interested in making a poster or platform presentation should contact: Steven Buskirk, Associate Professor, Department of Zoology and Physiology, University of Wyoming, P.O.Box 3166, Laramie, Wyoming 82071-3166, USA, Tel. 307-766-2357

New distributional information on Owston's palm civet

Viatcheslav V. ROZHNOV, German V. KUZNETZOV & PHAM TRONG ANH

Owston's palm civet, *Chrotogale owstoni* Thomas, 1912, is a rare and insufficiently known species occurring in southeastern Asia (Fig. 1). Sokolov (1979) and Wenzel & Haltenorth (1972) mentioned that its range includes only northern Vietnam (formerly Tonkin) and northern Laos. Schreiber *et al.* (1989) and Tan Banjie (1989) also included southern Yunnan and southwestern Guangxi provinces in China.

The distribution of Owston's palm civet in Vietnam is little known. Its presence was only observed in the north of the country, in the regions of Yenbai, Myongmin, Shapa, Nganson, Thainien, and Hoabinh (Thomas, 1912, 1928; Osgood, 1932; Bourret, 1944). One of the authors (Pham Trong Anh) recorded *Chrotogale* in the provinces of Langshon, Bacthai, Tuenkuang, Vinhphu, and Hoabinh. Van Peenen *et al.* (1969) did not include this species in the list of mammals of South Vietnam. Thus, up till now, the most southern known locality of *Chrotogale*'s distribution was in northern Laos.

We caught two specimens of *Chrotogale* in two localities in the northern part of the Thainguen Plateau in Zalai Province (formerly Zalai-Kontum), Vietnam (Table 1).

Table 1. Data on the specimens of *Chrotogale* caught in the central part of Vietnam

Sex	Date of capture	Body mass, g	Length, mm			
			body	tail	hindfoot	ear
?	14.01.1988	2,100	560	400	93	58
female	14.01.1990	3,500	610	450	60	48

The first locality (14°34'N, 108°35'E) is in the upper reaches of the rivers Ba and Kon, approximately 75 km north of Ankhe city. The animal inhabited primary tropical forest, 900 m ASL.

The second locality is situated more to the south, in the suburbs of Buon Lyoi (14°20'N, 108°36'E), 50 km north of Ankhe city. The animal, an adult female, dwelled also in an area of high primary tropical forest, 600 to 700 m ASL.

Since the study area is in the central part of Vietnam, formerly being a part of South Vietnam, there is no need to exclude the species from the list of mammals of southern Vietnam, as has been done by Van Peenen *et al.* (1969). The southern limit of *Chrotogale*'s range should be extended to the province of Zalai, thus changing our view on the distribution of this species.

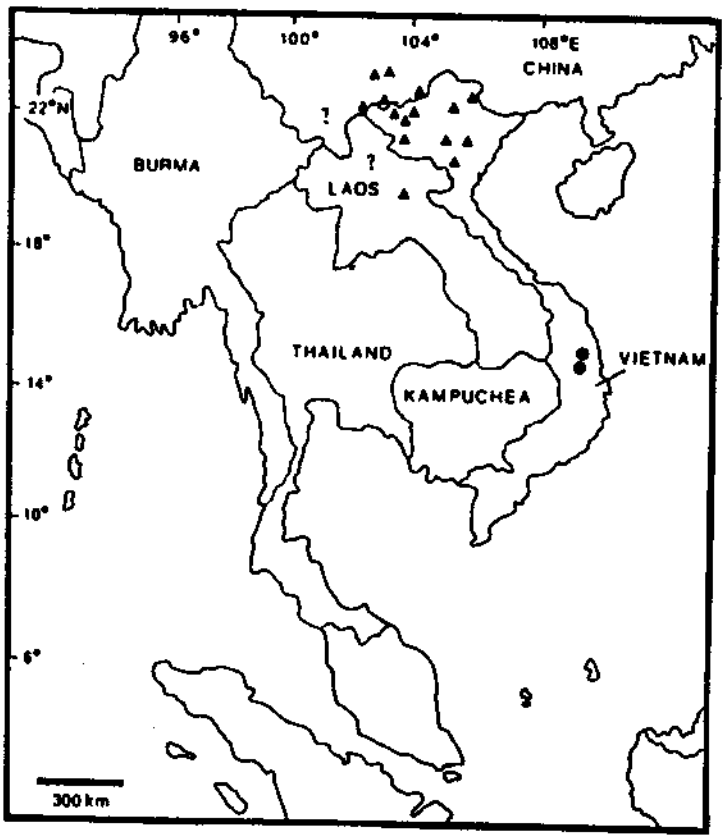

Fig. 1. Distribution of Owston's palm civet (*Chrotogale owstoni*). Black triangles indicate known localities (modified from Schreiber *et al.*, 1989); black circles indicate new localities.

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Report on the Norwegian wolverine (*Gulo gulo* L.)

Kjetil BEVANGER

Introduction

As a classic top predator, the wolverine naturally has never been abundant. This and the fact that its habitats are often located in difficult terrain in relatively inaccessible, mountainous areas, help to make the biology of the species poorly known. Its position in folklore also reflects this. Numerous tales and stories about the wolverine chiefly tell of its strength and ability to consume huge quantities of food, abilities which naturally could be transferred to those who dressed it into fur.

Conflicts with domestic animals have dominated the debate on the wolverine in Norway for several decades, a debate which has grown in recent years due to the increasing numbers of sheep killed by wolverines in some mountain areas of southern Norway (Skogland, 1991).

Because Norway is one of the few European countries that still has a viable wolverine population, the responsibility for managing the species has increased. Consequently, Norway has ratified an international agreement obliging it to protect the wolverine. Conflicts with farmers and domestic animals have led to a dramatic decrease in the population in the last 150 years. Today, only 120-150 animals are left (Kvam *et al.*, 1984). Man is therefore the most dangerous enemy of the wolverine. Because of the way the conflict has developed during the last few years, prospects are poor for winning improved understanding and tolerance for the species. Thus, ecologists, wildlife managers, and nature conservancy groups still have to fight a rather lonely battle.

Although there is no immediate risk of the species becoming extinct, the position for the subpopulation of southern Norway is at present an open question. Thus it is imperative that we follow the species with Argus eyes.

Distribution and biology

Although wolverine tracks may frequently be met with high up in the mountains, the northernmost coniferous forest, the taiga, is the main home of the species (Bjärvall, 1982). In Norway, it is mostly to be found in subalpine birch forests. Six subpopulations are normally recognized (Kvam *et al.*, 1984). Two of these are isolated Norwegian ones and four are border populations which should be considered together with Swedish wolverine populations.

The wolverine belongs to the Holarctic fauna (Krott, 1959; Liskop *et al.*, 1981). Although the question is frequently discussed, the North American and Scandinavian wolverines are today regarded as a single species (Grinell *et al.*, 1937; Kurtén, 1973; Chapman & Feldhammer, 1982; Røskaft, 1990). The wolverine is the largest of the mustelid species. The average weight of a female is 10 kg, while an adult male weighs 15-20 kg (Røskaft, 1990) which means that it overlaps the autumn weight of a badger.

Nocturnal behaviour together with excellent audible and olfactory senses make the chances of observing the animal in the field limited. Using specially-placed carrion, it has been shown that the animals are able to change direction from their original route up to 3 km away and walk straight to the carrion (Røskaft, 1990). They are therefore extremely sensitive to the smell of humans and are difficult to trap. As with most mammalian communication, olfactory stimuli are important. Places in the territory that are marked with urine or excrements are usually elevated, exposed, windy spots where the smell is easily distributed to neighbouring areas (cf. Haglund, 1966).

Telemetry has shown that adult males in Alaska need a home range of more than 600 km^2 (Magoun, 1985). Home-range figures are lacking in Scandinavia. However, preliminary studies at Dovrefjell in central Norway indicate that the size of the home range depends on both animal density and the type of the habitat, but there does not seem to be room for more than one female wolverine in each mountain valley (Røskaft, 1990). Skogland (1991) reports having found four dens in the Dovrefjell area during the last few years, three having been used each year. He stresses that dens regularly used for reproduction have not been found elsewhere in the mountain areas of southern and central Norway.

The wolverine may reach an age of 12-14 years, but does not normally live more than 5-8 years (Rausch & Pearson, 1972). The mating season seems to be April-August (Røskaft, 1990). During that time, the male and female stay together for 2-3 days. After copulation the fertilized blastocyst remains in the uterus and the development of the young does not start until up to six months later (delayed implantation) and active pregnancy lasts 30-40 days (Rausch & Pearson, 1972). The cubs are born between February 15th and March 15th (Røskaft, 1990), and their birth corresponds closely with the period when the hunting conditions for reindeer are optimal (Haglund, 1966). The den where the birth takes place is usually located just above the timberline far into a narrow mountain valley. The area should have large, deep snowdrifts and a rocky scree in the neighbourhood (Røskaft, 1990). The female burrows into the drift, making a birth chamber in the snow. Usually the cubs are moved between several chambers and different dens (Haglund, 1966; Lidholm & Johansson, 1977). The den often has a complicated network of tunnels, up to 50-60 m long. Towards the end of April or the beginning of May when the thaw is at its maximum, the cubs are moved into a rocky scree (Røskaft, 1990).

The mean litter size seems to be 2.5 (Kvam & Røskaft, 1987). The newly born cubs have white fur, weigh barely 100 g and

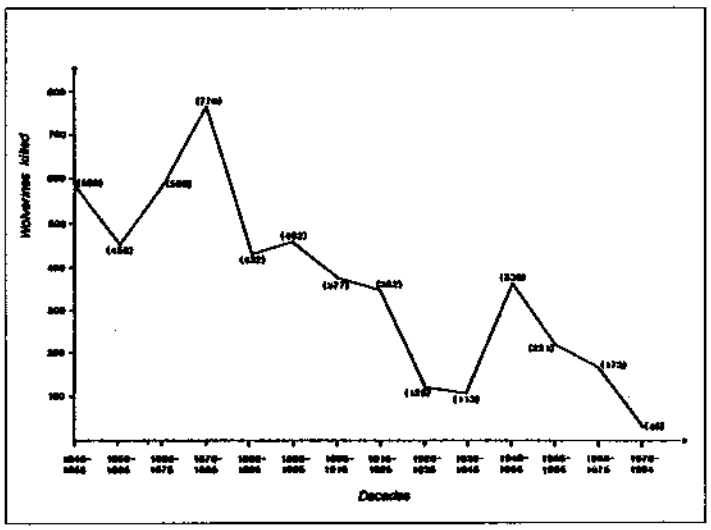

Fig. 1. Bounties paid for wolverines killed per decade 1946-1984 (after Kvam *et al.*, 1984).

are about 130 mm long (Mehrer, 1975; Myrberget & Sørumgård, 1979). The cubs grow quickly and the fur soon becomes brown. After a suckling period of two months, they begin to take solid food in addition to the milk from the mother. By mid-May, the cubs weigh nearly 3 kg, and towards the end of the month the mother and cubs leave the den area and walk around in the territory of the mother (Kvam & Røskaft, 1987; Røskaft, 1990).

In Scandinavia, reindeer are the main prey of the wolverine (Lønnberg, 1936; Haglund, 1966; Myrberget, 1968; Myhre & Myrberget, 1975), but it also catches foxes, mountain hares, rodents, and birds such as willow grouse and ptarmigan (Haglund, 1966; Bjärvall, 1982). In some areas, other cervid species like moose, red deer, and roe deer are also important prey. The wolverine is therefore regarded as an exclusively carnivorous species. The menu of the North American wolverine is more varied (Hornocker & Hash, 1981; Magoun, 1985), probably because it is more or less independent of reindeer meat (Røskaft, 1990).

The high mountain areas of Norway can be dangerous, especially during winter. Single reindeer, as well as large herds, are each year killed in avalanches. Therefore, the wolverine normally has few problems in getting enough food. In areas where such catastrophes have taken place and where there are numbers of reindeer carcasses, it is possible to see several wolverines at the same time. The skull, the strong jaw muscles and the construction of the teeth enable wolverines to crush large bones and eat frozen meat.

In America (Magoun, 1985), the average walking speed of male wolverines is 8.6 km per hour and females have been observed to walk at 4.6 km per hour. The wolverine is especially well known for its endurance; it may well walk up to 30-80 km during a single night (Makridin, 1964), the males usually further than the females. This ability is naturally closely connected with the hunting behaviour. In Sweden (Haglund, 1966), it has been observed that wolverines particularly hunt after heavy snowfalls. In the wolverine world, snow is a dominating factor for most of the year. The animal is perfectly suited to this environment, having, for example, large paws which distribute the body weight evenly on the ground, i.e. the pressure per unit area is small. Where the snow is loose and reindeer (and skiers) have to give up, the wolverine "floats" without any problem. When a wolverine reaches a reindeer that is standing in deep snow, it quickly jumps on its neck and kills it efficiently with a powerful bite across the neck vertebrae. This of course means that weak animals and those that are ill are easily caught. A close correlation has actually been shown to exist between the health of the reindeer and which individuals are caught by the wolverine. The age of the reindeer killed by the wolverine in the late winter was 10-13 years and all animals had completely worn down teeth and were consequently in a poor physical condition (Skogland, 1991). The wolverine is therefore a selective hunter and makes its contribution to keeping the wild reindeer herds of southern Norway in a healthy condition.

In summer, the opportunities for hunting are severely reduced. The menu then consists to a great extent of carcasses, small rodents, bird's eggs, insects, etc. (cf. Krott, 1960). Consequently, like man, it has developed abilities to hoard food when a surplus is available. Individuals which manage to find appropriate places to store and conserve food in summer manage best. Natural selection has ensured that the genes responsible for this behaviour were passed from one generation to the next. The species has therefore developed an ability to kill more prey than it needs in good periods to store for poor times. The ability to be a surplus killer is extremely important for an animal living under extreme conditions which only now and then give an opportunity for killing more than one prey on each hunting trip. Proper storage facilities for surplus food in the high mountain areas of Norway during summer are nature's own natural fridges -swamps, snowdrifts, and rocky screes.

The development of the Norwegian wolverine population during the last 150 years

The development of the Norwegian wolverine population during the last 100-150 years is a depressing story. Bounties for 432-770 wolverines were paid for each 10-year period between 1846 and 1906 (Kvam *et al.*, 1984). The numbers fell steadily from 1906 to 1946, from 377 animals in the first period to 113 in the last one. Only 173 were killed between 1966 and 1975 (Fig. 1), in spite of improved possibilities for effective hunting, e.g. by using snow scooters.

If we assume that a rather strong, healthy wolverine population can stand a 10% yearly harvest, the bounty statistics of 50-80 animals a year, such as we had before the turn of this century, indicate a maximum wolverine population during this period of about 500 animals, i.e. three times higher than today. The harvest was obviously far beyond what a population could stand; a steady decrease was the result, a decrease which seems to have culminated with a minimum population some time during the 1960's (Røskaft, 1990).

Fortunately, it now looks as if this negative trend has turned and the population seems to be slowly recovering. However, strained relationships with farmers make it difficult to obtain data to confirm this. And it is important to stress that so far there are no data or research results on the population biology of the wolverine that give a basis for estimates of the minimum size of a viable population (cf. Kvam *et al.*, 1984).

The conflict between wolverine and sheep

In Norway, increasing numbers of sheep are released into mountain areas during summer season. During the last 10-15 years, sheep owners have doubled the number of sheep in the core area of the South Norwegian subpopulation in the Dovre area (Skogland, 1991). Naturally, sheep are no match for the wolverine and are easily killed. Consequently, the wolverine from time to time revels in this dish. Some sheep farmers may loose hundreds of sheep this way during one summer season within relatively restricted areas. This situation has resulted in a rather bitter conflict between sections of the Norwegian agricultural community and wildlife managers and ecologists. Of about two million sheep and lambs which are released on to rough grazing every year, about 100 000 disappear, i.e. about 5%. Each year, economic compensation is paid for sheep killed by the wolverine for about 2.5% of the animals that disappear, i.e. 1/1000 of all the sheep released to outdoor grazing (Røskaft, 1990). From a national point of view, this is a small problem for which a rich country like Norway can so far afford to pay. However, the individual sheep farmer, losing up to 80% of his flock, naturally takes a different view.

Consequently, the wildlife authorities each year give dispensation from the protection regulations to allow individual wolverines to be shot in areas where losses are heaviest, although the population numbers clearly tell us that any killing should be banned. Another important point in this connection is that the shooting of such "killer" individuals has not affected the extent of

the sheep loss, only displaced the losses in time and space (Skogland, 1991).

Illegal killing of wolverines - carried out by the sheep farmers themselves - also gives great cause for concern. As recently as last summer, a sheep farmer in the Central Norwegian valley of Lesja (in the core area of the South Norwegian subpopulation) was convicted for having shot two wolverines illegally. The penalty for this type of poaching has so far not been especially severe, but it has increased during the last few years, which will hopefully have a preventive effect. But farmers who take the law into their own hands are still an obvious threat to the wolverine.

However, a Gallup Poll (Dahle *et al.*, 1990) indicates that the attitude of the majority of Norwegians towards the preservation of populations of wolverines, bears, and wolves in Norway is more positive, although the figures give some cause for concern. Of the 1000 persons interviewed, 78% wanted to keep these species as part of the Norwegian fauna, 9% wanted to eradicate the wolverine, 28% wanted to reduce the population, and 50% wanted to increase it.

Research

Even though the wolverine has been the object of considerable publicity in recent years, because of its status as a vulnerable species and its conflicts with the domestic animal industry, few serious attempts have been made to gather proper data on the species. This, of course, is related to the cost of carrying out research projects on species like the wolverine, which will necessarily be enormous. Status reports on the Norwegian wolverine, based upon data on animal and track observations received more or less fortuitously, have been published regularly (e.g. Myrberget *et al.*, 1969; Myrberget & Sørumgård, 1975). In 1978, the Directorate for Nature Management in Trondheim initiated a systematic gathering and analysis of reports on wolverines (and other large predators) in an attempt to provide a basis for better population estimates and management strategies (Kvam *et al.*, 1984; Vaag *et al.*, 1986). Not until 1986 did the Norwegian authorities decide to start a research project on the species, organized by the Applied Ecology Research Programme (cf. Kvam & Røskaft, 1987).

In spite of a substantial investment of resources in the project and the use of modern technology like the helicopter, the project did not succeed in catching a wolverine. The project was abandoned after a couple of years - at the same time as the Applied Ecology Research Programme was wound up and the Norwegian Nature Research Institute (NINA) was established. Since 1990, research on the wolverine in Norway has become part of a long-term, broad-scale, high mountain ecology project at NINA where prey-predator interaction studies, especially relating to wolverine-arctic fox-reindeer form a central part. So far, one animal has been equipped with a radio transmitter.

The steadily increasing conflict with the domestic animal industry makes it very difficult in practice to do research on the wolverine in Norway at the moment. Both the wildlife management authorities and research ecologists are entirely dependent on a close and positive relationship with the local population. Sabotage to traps is one way the researchers experienced in this conflict.

Thus, there can scarcely be any doubt that the Norwegian sheep farming industry at the moment is more or less the deciding factor for the structure of the wolverine subpopulation of southern Norway. It is naturally totally unacceptable that a policy without perspectives beyond short-sighted economic profit is allowed to be practised. However, this seems to be the classical situation in most countries whenever the question of biodiversity preservation is raised.

To be honest, the future prospects are not too bright when not even one of the world's richest nations seems to be willing to sacrifice some sheep for one of the most unique species in the North European arctic fauna.

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Status, abundance and distribution of mustelids in Lithuania

Eduardas MICKEVICIUS and Kazimieras BARANAUSKAS

Introduction

The earliest scientific studies of the mustelids of Lithuania were made by Dr. Maldziunaite in the 1950's and 1960's. Scientific interest in the group faded in the 1970's and no further work was undertaken until mustelid research was resumed in the early 1980's. This work continues to this day.

Nine mustelid species are currently recognised in the Lithuanian fauna (see list). The national game census includes four of these species: the badger, otter, American mink, and the marten. Unfortunately the number of martens recorded in the census includes both Pine and Stone martens together, with no distinction being made between the two. Only two of these four species, the pine marten and the American mink, play a significant rôle in Lithuanian game management.

The mustelid fauna of Lithuania

Mustela nivalis	Weasel
Mustela erminea	Stoat
Mustela putorius	Polecat
Mustela lutreola	European mink
Mustela vison	American mink
Martes martes	Pine marten
Martes foina	Stone marten
Lutra lutra	Eurasian otter
Meles meles	European badger

As some mustelid species have not been censused, and because of a shortage of scientific data on others, much of our information is derived from pelt returns. These data allow a more objective determination of the number and distribution of some species, although it is well known that pelt return data can only partly reflect the genuine number of each species. In some cases even pelt returns may not accurately reflect the situation over the last 25 years, the majority of pelts having failed to reach official collecting centres. This was particularly marked when the purchasing power of the rouble fell, making the official rates paid for pelts unsatisfactory. Hunters responded by selling their furs on the "black market", where pelts often commanded prices four to ten times higher than those paid at state purchasing centres.

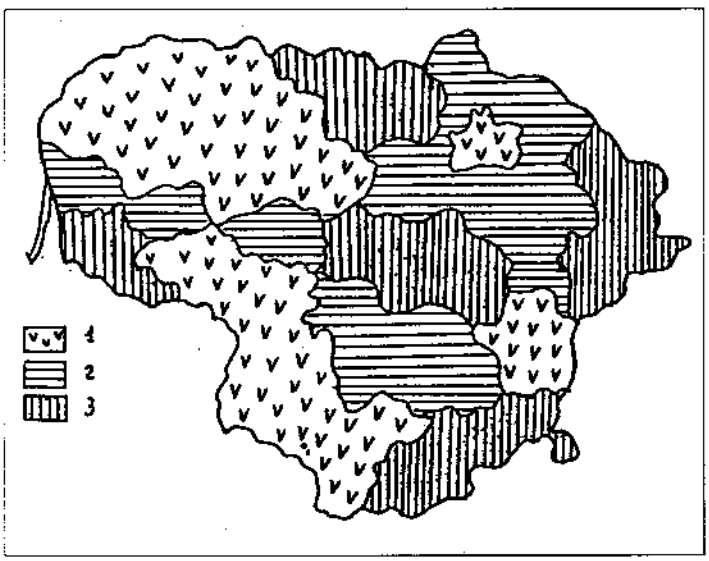

Fig. 1. Distribution and estimated mean densities (per 10,000 ha) of the American mink in Lithuania, 1987-1989 (adapted from Blumza, 1990)
Key: 1 = 0.1-1.5 American mink/unit area
2 = 1.6-3.5 American mink/unit area
3 = 3.6-12.2 American mink/unit area

The biology and distribution of most Lithuanian mustelids is inadequately documented. In the 1960's there were some studies of the pine marten, otter and badger, as was the case for the weasel and pine marten in the 1980's. Recently a European mink research programme has been initiated and some features of the biology of badgers have been examined. Spring 1991 saw the commencement of research to ascertain the true status of the otter in Lithuania. There are also plans to prepare a questionnaire to help collect information on the distribution of the stoat and stone marten in the republic.

Finally we must stress that detailed surveys are needed to determine the true status of the mustelids in Lithuania.

Conservation measures

Two mustelid species, the otter and European mink, are listed in the Lithuanian Red Data Book. However, mustelid conservation measures involve more than just this, and there are established fines for the illegal hunting of each species. These range from 150 roubles for the poaching of stoats, to a fine of approximately 2,000 roubles for poaching otter. In Lithuania the average monthly salary is about 400 roubles. These fines are increased by 1.5 fold if:

1. Poaching takes place in a reserve or some other conservation area.
2. Poaching involves the use of snares.
3. Burrows are destroyed during poaching (this applies only to badgers).

The hunting of European mink, otter, weasel, and stoat is totally forbidden. The hunting of all other species (except the polecat) is regulated by operation of closed seasons.

STOAT *(Mustela erminea)*

Until recently there were no scientific studies of the ecology of the stoat in Lithuania, and the species had never been censused. For this reason we were only able to estimate the abundance and distribution of the stoat indirectly, using pelt returns from different districts and occasional reports of sightings.

Stoats seem to have been abundant in Lithuania in the past, their winter fur being an important commodity for trade and barter. In the early 1920's the traders of Panevezys still bought approximately 500 stoat furs yearly (Elisonas, 1931). From 1946 until 1964 Lithuanian hunters only supplied around 19 stoat pelts per year (Prusaite, 1988). These figures allow us to hypothetise that the species' abundance decreased markedly after World War II. This decrease, coupled with the stoat's secretive way of life, meant that the stoat declined in importance as a game species during the post-war period and hence no census was taken.

It is believed that the stoat still occurs throughout Lithuania. According to pelt returns from between 1955 and 1960, stoats were

found in eastern, north-eastern, south-western, and central Lithuania. The stoat could also have lived in the reserves in the south and north of the country at that time, i. e. in the very areas where they occur now.

As the true abundance of the species is unknown, it is difficult to determine its status. Because of the evidence of decreases in stoat numbers, hunting has been forbidden since 1970. The fine for illegal hunting is 150 roubles.

Stoats have been observed in recent years, usually in areas where their natural environment is still intact (reserves and marshes). These include the Zuvintas and Cepkeliai Reserves in the south and the Kamanos Reserve in the north, where stoats were observed during the summer of 1988. Towards the end of the 1980's stoat observations were occasionally reported from Kaunas city and the regions of Klaipeda and Silute. In spring 1989, the corpse of a stoat was found in the Kaisiadorys region.

WEASEL *(Mustela nivalis)*

There has never been a weasel census in Lithuania, and our knowledge of the weasel is similar to our knowledge of the stoat. As yet there has been little weasel research in Lithuania, other than some craniometric and ethological studies.

From the information available, it seems that weasels are more abundant than stoats. According to data from the 1950's, hunters supplied slightly more pelts from weasels than from stoats. At that time most weasel furs came from the western and northern parts of the country (Maldziunaite, 1963). In the 1980's weasels were caught and observed much more frequently than stoats. In 1981 and 1982 weasels were caught in the Trakai region and, in 1987-1989, in the Pasvalys and Moletai regions. In autumn 1990, we found weasel tracks in a suburb of Vilnius and in 1991, three weasels were accidently caught in mouse traps in this area.

The hunting of weasels has been forbidden since 1970, but weasels are often caught in traps set for moles and mice. For example, in autumn 1981, 53 weasels were caught in such traps in an area of a few square kilometres in Trakai region (Prusaite, 1988). Thus weasel numbers may be decreased in areas in which mole traps are used. The fine for hunting weasels illegally is 150 roubles.

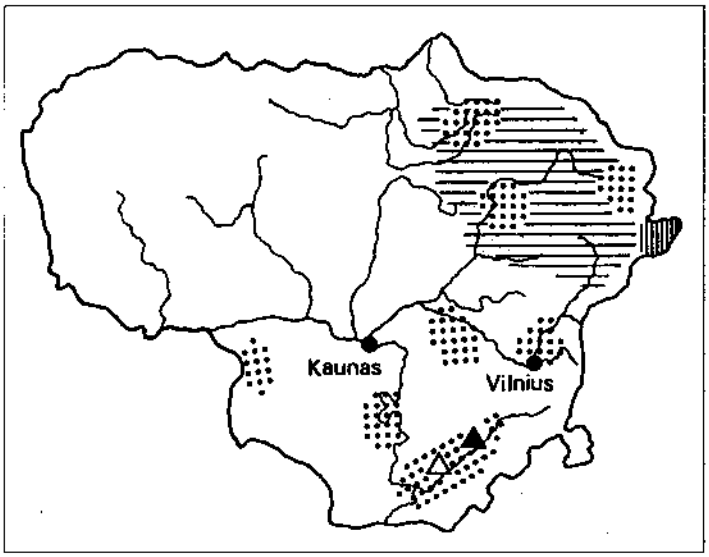

Fig. 2. The European mink in Lithuania between 1900 and 1949.
▲ = Last live observation (1978)
△ = Last animal trapped (1979)
▤ = Range of European mink, 1949-1951
□ = Recent European mink search areas
▥ = Area where European mink may still survive

AMERICAN MINK *(Mustela vison)*

The American mink was brought to Lithuania in 1930 and bred at a fur farm near Kaunas. In 1950, 37 American mink from this fur farm were set free in the Utena and Zarasai regions. In 1953, a further 76 American mink from the Tatar Republic were set free in the Ukmerge and Zarasai regions. Despite this, it is believed that the first American minks may have been introduced to the wild during the Second World War. Mink reached the Nemunas Delta when they escaped from a private fur farm near Königsberg (Maldziunaite, 1963). American mink continued to spread all over the country until the mid 1980's.

The distribution and average density of American mink in Lithuania is shown in Fig. 1. According to data from the 1986 census, there were a maximum of about 2,400 American mink. During the last four years species' numbers have decreased dramatically, the 1990 census having recorded about 1,400 animals in the whole country. This decrease seems to be due to licensed hunting, which has been permitted since 1985 (Bluzma, 1990). The closed season for hunting is from 15 March until 1 October and the fine for poaching is 500 roubles.

EUROPEAN MINK *(Mustela lutreola)*

According to zoological literature from the 18th and 19th centuries, European mink were formerly found in many parts of Lithuania. However, by the middle of the last century Lithuanian zoologists always stated that the species was rare. From the beginning of this century until the Second World War, European mink still occurred in many parts of Lithuania, especially in the south-east (Prusaite, 1988). Since 1940 the national game census has reported 76 live European mink from five different regions.

Between 1949 and 1951 a small number of European mink (between 5 and 17 annually) were recorded from four regions in north-eastern Lithuania (Fig. 2). From 1953, when American minks were first set free and began to spread, there was no reliable information on the status of the European mink until the late 1970's. In 1978 a live European mink was observed near the River Merkys, in the south. In 1979 a further animal was caught in a spring trap near the Spengla River, Merkys Basin (Fig. 2). These are the most recent records of the European mink in Lithuania.

In 1989 and 1990 special attempts were made to search for European mink in eight areas (Fig. 2). Although no animals were discovered, it is possible that the species may still occur in the east, on the banks of the River Birvete, Dauguva Basin in the Ignalina and Svencionys regions (Fig. 2). Investigation of these areas is planned in 1992. Currently, the nearest known European mink localities are 300-400 km away, in Estonia and northern Byelorussia (Maran, 1990; Sidorovich, 1988).

POLECAT *(Mustela putorius)*

Polecats have been abundant in Lithuania throughout history. According to Dr. Maldziunaite, data from the 1950's and the early 1960's showed polecats to be the most abundant carnivore in Lithuania. At that time Lithuanian hunters supplied fur centres with between 3,000 and 7,000 (average: 4,500) polecat furs each year. Polecats had a rather homogenous distribution throughout the country (Maldziunaite, 1963).

Nowadays polecats are widespread and common, although there is some evidence that their numbers have decreased during

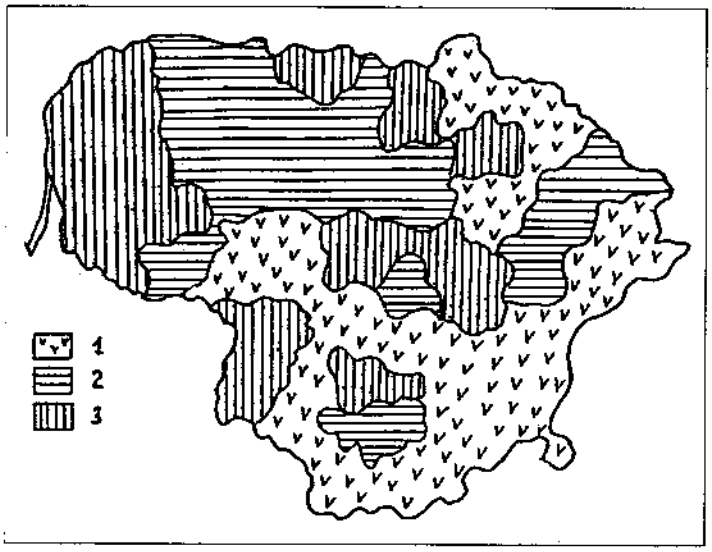

Fig. 3 Distribution and estimated mean densities (per 1,000 ha of forestry) of the Pine marten in Lithuania, 1987-1989 (adapted from Blumza, 1990)
Key: 1 = 1.6-2.5 Pine martens/unit area
2 = 2.6-3.5 Pine martens/unit area
3 = 3.6-7.4 Pine martens/unit area

the last few decades. This appears to be due to the removal of isolated farmsteads and the reconstruction of old villages. Today polecats are quite rare in these settlements, where there are few suitable hiding places around the new houses.

Although the data available do not permit an assessment of the polecat's abundance and distribution, it seems that the species' distribution has not changed in the last 30 years and remains uniform.

No special measures are taken to protect the polecat, hunting having always been occasional. In most cases polecats are killed by peasants to control predation upon poultry.

PINE MARTEN *(Martes martes)*

In the first half of the century pine martens were rare throughout Lithuania, only 916 being recorded in the 1938 game census (Maldziunaite, 1959). After World War II, the hunting of martens was forbidden and numbers began to increase, peaking at more than 8,000 animals between 1965 and 1975 (although this number also included stone martens). Later the number of martens decreased slightly, but during the last ten years it has remained stable at between 5,500 and 6,000 animals.

Pine martens inhabit woodlands all over Lithuania, their distribution and numbers in different areas depending on the type of forest present. In most cases they prefer deciduous or mixed forest where there are more food and permanent nesting sites (Maldziunaite, 1959). Densities approach 3.6-7.4 martens per ha of forest in western Lithuania, and in some parts of the Middle Lithuanian Lowlands where mixed forests predominate (Bluzma, 1990). The lowest densities (1.6-2.5 martens per 1,000 ha of forest) were recorded in the pine forests of south-east and east Lithuania. The distribution and average density of the pine marten in Lithuania between 1987 and 1989 is shown in Fig.3. Between 1981 and 1985, the average density was 3 martens per 1,000 ha of forest (Prusaite, 1988). Since World War II, a record density (13.5 martens per 1,000 ha of forest) was recorded in the Vilkaviskis region in the early 1950's. Pine martens are currently widespread throughout the country, and vary only in their numbers.

The hunting of martens is permitted under licence. The closed season is from 15 March until 3 November and the fine for poaching is 500 roubles.

STONE MARTEN *(Martes foina)*

There is scarcely any information available on the stone marten in Lithuania, so it is difficult to determine the species' true status. In the 1920's stone martens were found in some parts of the Birzai, Panevezys, and Ukmerge regions (Elisonas, 1931) and in the 1930's, stone martens were often encountered in the old town and suburbs of Kaunas.

Between 1940 and 1985 information was available only on single individuals, either observed or hunted in the Vilnius and Marijampole regions and the city of Kaunas. As a result stone martens have often been considered to be rather rare in Lithuania, although this appears only to be true for some areas. During recent years hunters' reports from the south-west indicate that, in some areas, the number of stone martens is greater than that of pine martens. For example, between 1985 and 1991, 17 stone martens and only 9 pine martens were killed in the 20,000 ha Sunskai forest, Marijampole region. It is possible that a viable stone marten population has existed since the end of the last war, both in Sunskai and throughout south-western Lithuania. Some evidence for this is provided by pelt returns from the 1950's, when 1/3 of all marten pelts were found to be those of stone martens. During recent years stone martens have been recorded in 8 of the 44 regions of Lithuania.

We must stress that the status of the stone marten may not be as poor as it might appear. The lack of field investigations and of differentiated census data for both species of marten may be misleading. A special effort is needed to determine the true distribution and abundance of the species in Lithuania.

EUROPEAN BADGER *(Meles meles)*

Badgers are widespread in all regions of Lithuania, though not very abundant. According to the annual official census, badger numbers appear to have fluctuated considerably (Table 1).

Table 1. The number of badgers in Lithuania

Year	Number of badgers
1938	3,740
1948	1,900
1961	10,000
1970	8,700
1980	4,800
1984	2,150
1989	1,250
1990	1,330
1991	1,180

We believe that these data do not accurately reflect badger abundance. The figures from the 1960's seem to have been inflated; raccoon dogs *(Nyctereutes procyonoides)* may have been counted together with badgers in some places -such mistakes being due to the newness of the raccoon dog to the Lithuanian fauna in the 1960's, when they were spreading throughout the republic (Prusaite, 1988). The data from the 1980's seem to show a considerable decrease in numbers. However, our data from a few localities in the Moletai, Sirvintos, and Vilnius regions, show that the numbers of badgers in these areas are much higher than stated by official figures. We believe that the genuine number of badgers in Lithuania is at least three times higher than the official 1980's

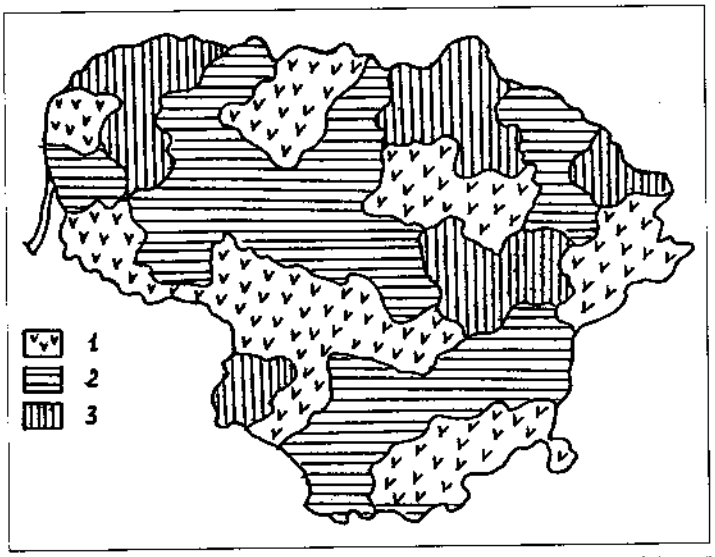

Fig. 4 Distribution and estimated mean densities (per 1,000 ha of forestry) of the European badger in Lithuania, 1987-1989 (adapted from Blumza, 1990)
Key: 1 = 0.1-0.4 Badgers/unit area
2 = 0.5-1.3 Badgers/unit area
3 = 1.4-4.5 Badgers/unit area

census data indicate, although the reasons for this are complex and beyond the scope of this report.

The distribution and number of badgers in various parts of Lithuania is more dependent upon forest type than extent. In districts where dry pine forest predominates and where there are few water bodies, badger densities are lower than in regions where the number of water bodies is higher, but there is less woodland (Maldziunaite, 1960).

The highest densities recorded (1.4-4.5 badgers per 1,000 ha of forest) are in the north-east of Lithuania and in some western regions of the republic (Fig. 4; Blumza, 1990). A peak average density (estimated at 6.9 badgers per 1,000 ha of forest and shrub) was recorded in 1961. The average badger density in the 1980's was 2.9 individuals per 1,000 ha of forest (Prusaite, 1988).

The hunting of badgers is limited by a closed season from 1 January until 3 November. During November and December unlicensed hunting is permitted. The fine for illegal hunting is 500 roubles, but if the sett is destroyed, the fine rises 1.5 fold to 750 roubles.

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Abstracts

The Bushy-tailed mongoose: a new record for the Arabian Peninsula

In April 1988 a mongoose was collected by M. Al-Safadi about 12 Km NW Sana's, Sana's Province, Yemen Republic. It proved to be an immature female Bushy-tailed mongoose (*Bdeogale crassicauda*), a rather rare East African species. The specimen represents the first record of the species in Arabia. Taking into consideration the geographic separation of the Yemen specimen from the known range of the species in East Africa (about 2,300 km as the crow flies from the northern known record in south central Kenya) in addition to obvious size differences, this specimen may represent a distinct geographical race.

Nader, I. A. & Al-Safadi, M. 1991. The Bushy-tailed mongoose, *Bdeogale crassicauda* Peters, 1850, a new record for the Arabian Peninsula (Mammalia: Carnivora: Herpestidae). *Zool. Anz.*, 226(3/4):202-204.

Legal protection of the polecat and the stoat in Holland

Up till now the polecat *(Mustela putorius)* may be hunted from mid August to mid February, and the stoat *(Mustela erminea)* from mid October to mid February.

A proposed law will completely forbid the hunting of the two carnivores. The main reasons for the decline in numbers are road-kills and the disappearance of suitable habitat, but hunters and "polecat-diggers" who track the animals down with dogs and dig them out are also responsible for a number of losses.

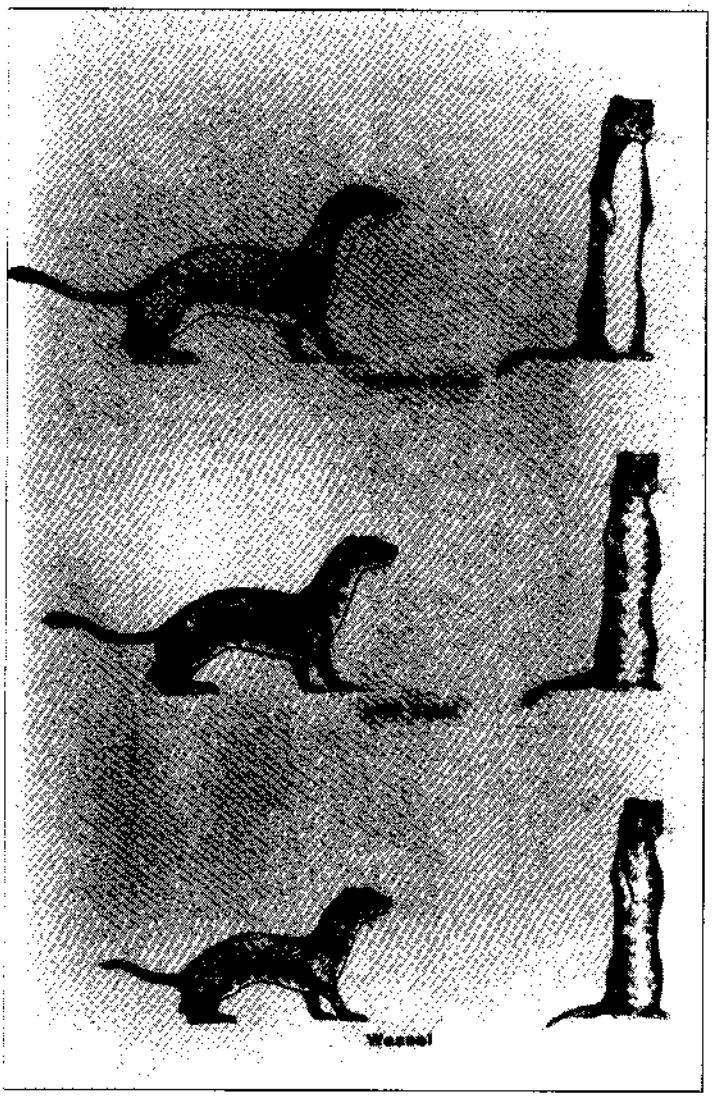
Anon. *De Volkskrant* 30 November 1991

The Irish stoat, *Mustela erminaea hibernica*

Paddy SLEEMAN

In the last century, in Ireland, there was an upsurge of interest in things specifically Irish. This included an increased interest in Irish culture, particularly language and literature (Sheey, 1980). This interest found expression in science by the descriptions of supposedly unique Irish animals. Several of these were mammals, including an Irish rat! Most of these descriptions have not stood the tests of time. However today we recognize three subspecies of Irish mammals described at that time namely the Irish hare, Irish otter and the animal discussed here the Irish stoat.

At the time (1895) the description of the distinct Irish stoat aroused considerable curiosity, with live specimens being displayed at Dublin and London Zoological gardens (Anon., 1895; Sleeman, 1987). The original describers of the Irish stoat were Oldfield Thomas, an Englishman, and the noted Irish zoologist, Gerald Barrett-Hamilton (Fairley, 1984). Barrett-Hamilton later called the Irish stoat 'the most mysterious of all our mammals' (Barrett-Hamilton, 1912). The Irish stoat was described as being smaller and darker than the British stoat,and indeed most Irish stoats have a wiggly back/belly borderline, which, with its black tipped tail give it characteristics of both the British stoat and the British weasel (Fig. 1). The original describers of the Irish stoat, Thomas and Barrett-Hamilton, were of the opinion that it was an intermediate between the British stoat and weasel. As there are no weasels in Ireland there is a certain logic to the argument that the stoat here had evolved to fill both the weasel and stoat ecological niches, and indeed, many years after its description, ecologists were speculating that this indeed had happened to the Irish stoat (Hutchinson, 1959; Williamson, 1972; Pontin, 1982).



However, for a variety of reasons, including the fact that many Irish stoats are as large as British stoats, and the wiggly back/belly borderline, as in the British weasel, it is very likely to have more to do with the fact that the Irish stoat does not turn white in winter (snow is usually short-lived in Ireland), rather than with any weaselyness about it. The idea that the Irish stoat is an intermediate between the stoat and the weasel can therefore be dismissed (Sleeman, 1987; 1989). However as Ireland is the only substantial area of Europe where stoats occur in the absence of weasels it is interesting to speculate as to what, if any, are the consequences of this for the stoat in Ireland.

Recent studies have shown that Irish stoats are much smaller in the north of Ireland (Fairley, 1981; Sleeman, 1987) and this may or may not be associated with the fact that in the south of Ireland there are more Irish stoats found with straight back/belly borderlines (like British stoats) than in the north. The existence of the small Irish stoats in the north of Ireland remains an enigma which will hopefully be addressed in the years to come.

Other aspects of the Irish stoat's ecology have also been investigated. It appears to prefer woodland habitat (Sleeman, 1991) and tends to den in ex-rat holes, and hence get infested with rat fleas (Sleeman, 1990). It eats quantities of shrews but of far greater importance to its diet is rabbits. As rabbits are an introduced species in Ireland, as well as most of the rodents what did the Irish stoat live on before man introduced these prey? Could they have existed without such prey (see Sleeman, 1986)?

The recent introduction of the Bank vole to southwest Ireland has given us an opportunity to see the effect of the addition of one prey species on our predators. Oddly enough, stoats have not been reported to take many bank voles, despite being short of prey species which is a puzzle, in view of the fact that the other Irish predators such as the Barn owl take significant numbers of these voles (Sleeman, 1987; Smal, 1987).

The Irish stoat is widely distributed and appears to be thriving, despite being a regular road-traffic victim (Sleeman, 1988) and being killed by domestic dogs and cats. It is certainly not endangered, nevertheless it is a protected species in the Republic of Ireland although not in Northern Ireland. It appears to be more frequently found in towns than the British stoat, but similar to the weasel, which are found in British towns. This may well be an effect of the absence of the weasel in Ireland, but as yet, like much about the Irish stoat we are not sure.

Acknowledgements

I wish to thank the many people from all walks of life, who collected road casualty stoats all over Ireland.

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Symposium on the biology and management of martens and fishers Laramie, Wyoming, USA, 29 May - 1 June 1991

Following presentations were made (authors in alphabetic order):

Anderson, E. Evolution, prehistoric distribution and systematics of *Martes*.
Aubry, K. B. & Houston, D. B. Distribution and status of Fishers in Washington State.
Bailey, T. N. *et al.* Ecology of marten on the Kenai Peninsula, Alaska.
Bailey, T. N. *et al.* Genetic and phenotypic diversity among marten from the Kenai Peninsula and mainland, interior populations in Alaska.
Baker, J. M. Spatial organization and seasonal habitat use of marten on southern Vancouver Island, British Columbia.
Bakcyev, N. N. & Sinitsyn, A. A. Sables in the Soviet Union.
Bakeyev, Y. N. *Martes foina* in the Soviet Union.
Balharry, D. Group stability and intra sexual territoriality in Pine martens *(Martes martes).*
Beaudette, P. D. Forest management planning for marten habitat supply - The New Brunswick experience.
Berg, W. E. & Kuehn, D. W. Return of two natives: Fisher and marten demographics and range in a changing Minnesota landscape.
Bissonette, J. A. Regression in forest successional stages and its implication for core sensitive species: A global look at marten habitat futures.
Bonar, R. L. *et al.* Supply analyses for marten, fisher, and timber in an integrated forest management system.
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Is the Javan ferret-badger a subspecies or a species ?

Charles A. LONG

In Riffel's (1991) interesting update on the Javan ferret-badger, he stated that *Melogale* has been a "taxonomist's nightmare" and that "no taxonomic study is available". He suggested there are four ferret-badgers, the Large-toothed, *Melogale personata* (Geoffroy, 1831), the Small-toothed or Chinese, *Melogale moschata* (Gray, 1831), the Kinabalu (or Borneo) ferret-badger, *Melogale everetti* (Thomas, 1895), and the Javan form, *Melogale orientalis* (Horsfield, 1821). Sody recognized two subspecies from Java, a larger western subspecies *M. o. sundaicus* and the nominate subspecies *M. o. orientalis*. Riffel mentioned some new records of *orientalis*, and included the first and second records from the nearby island of Bali. The taxonomic status of the Javan ferret-badger is problematic.

Two taxonomic studies overlooked included Pocock's (1941) work on the mammals of British India and my own study (1978) on the classification of badgers (and *Melogale* in particular). About 1980, I wrote the publisher (Taylor & Francis Ltd., London) of Pocock's rare classic, who replied he had no knowledge of it and asked for a citation to it. My own study was published as a small museum pamphlet with small distribution. However, both works were summarized by Long & Killingley (1983).

Pocock (1941) had made about the same arrangement Riffel suggested. However, he went one step further, calling attention to the similarly large teeth in *orientalis* and *personata*. This had been noted long ago by Thomas (1895) and Bonhote (1903). The reason Pocock (1941:414) accorded specific status to the Javan ferret-badger, which is "without intermediates linking it to *personata*", was that it is impossible to demonstrate intermediates (i.e. hybrids) between mainland and isolated insular forms. Arranging a closely resembling insular taxon as a subspecies of a mainland species suggests their evolutionary relatedness and infers cross-breeding might be possible if taxa were not geographically isolated. Long (1978) and Long & Killingley (1983) arranged *orientalis* as a race of *personata* for that reason, and to discourage others (e.g. Neal, 1977) from lumping *orientalis* with *everetti* from Borneo (of similar color and pattern, see also Thomas, 1895).

The records of specimens of Long (1978) and Pocock (1941) may be of interest. Mine from Cheribon (=Tjirebon), Madagalengka 600 m (Amer. Mus. Nat. Hist. Nos 102074, 102076, 102086, and 102088) and Pocock's Buitenzorg, 855 ft. (not found) and Tassikmalaga (=Taskimalaja), Preanger, 1,145 ft. include ferret-badgers of normal size (Table 1). One must regard the validity of *sundaicus* with doubt, if it is based only on the character of supposed larger size. To sum up the known characteristics of the Javan ferret-badgers, they often resemble in color the ferret-badgers of Borneo. However, in the important character of large teeth they resemble the mainland species *Melogale personata* (Table 1). In length of upper carnassial they actually stand intermediate between *moschata* and *personata*, but there is hardly any overlap between *orientalis* and *moschata*. The other cheek teeth in *orientalis* likewise resemble those in *personata*, and the tiny first upper premolar is similarly reduced in size. Even Pocock (1941) said "the difference is not very striking".

The specific status of the Borneo subspecies, *M. everetti*, which likewise is an insular form, is better defended. The cheek teeth there are smallest of all (Table 1), and Thomas (1895) mentioned a difference in the baculum.

The baculum and karyotypes would be very valuable information in clarifying relationships among these ferret-badgers, especially *orientalis*, but none is available. The first priority now is to prevent the extinction of any of these colorful and primitive mustelids.

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Table 1. Postorbital breadth and critical length of the upper carnassial in ferret-badgers. Males may be a little larger, but the sexes are combined. Postorbital breadth is an indication of overall size and shows little variation. *M. personata* and *M. p. orientalis* also have larger upper molars, and reduced first upper premolars. *M. personata* and *M. moschata* are sympatric without hybridization over a wide region on the mainland of southeast Asia (Long & Killingley, 1983).

Taxon	N	Postorbital breadth	N	P^4	Source
Melogale everetti	3	17.0 (16.5 - 17.8)	5	5.84 (5.5 - 6.0)	Pocock, Thomas, Long
M. moschata millsi	8	17.1 (16 - 19)	8	6.2 (6 - 7)	Pocock
M. m. taxilla	5	17.4 (17 - 19)	5	5.5 (5 - 6)	Pocock
M. m. moschata	2	19.5 (19 - 20)	2	6 (6 - 6)	Pocock
M. personata personata	5	16.6 (14 - 18)	5 or 8	8.1 (7 - 9) 8.2 (7 - 9)*	Pocock
M. p. nipalensis	2	18 (17 - 19)	2	7.75 (7.5 - 8)	Pocock
M. p. pierri	3	16 (15 - 17)	4	8.37 (8 - 9)	Pocock
M. p. laotum	2	17 (17 - 17)	2	8.0 (8 - 8)	Pocock
M. p. orientalis	4	18.4 (17.2 - 19.1)	4	7.5 (7.3 - 7.8)	Long
or					
M. orientalis			5	7.0	Pocock

* Includes 3 young specimens

Badgers and bovine tuberculosis: An irreconcilable farming / conservation dilemma ?

M. HANCOX

The first tuberculous badger *(Meles meles)* was discovered in 1971 in Glos. (UK), although a zoo case had been noted in 1938 and another case is known from Switzerland in the 1950's. Twenty years on, it is quite extraordinary that the two key issues remain unsolved:

1. Culling badgers as part of the cattle TB eradication programme remains of unproven value, and is unproveable since no formal scientific assessment has been instigated either in England or in Ireland.
2. The mode of transmission between badgers and cattle is unknown (Wilesmith, 1986), since the disease is largely respiratory in both species.

Cattle were in contact with infected badgers for six years before a herd breakdown occurred in Glos. (Cheeseman, 1988, 1989). Similarly, in Sussex, the risk of infection passing to cows was low (Wilesmith, 1986). And it must be concluded that grass contaminated by badger urine or sputum is not often likely to infect cows by either the theoretically possible retropharyngeal lymph nodes or eructation of rumen gases route to the lungs (Zuckerman, 1980).

By contrast, transmission from cattle to badger is probably an efficient process (Little, 1982). Indeed, a largely forgotten French study a century ago showed that earthworms could transport bacilli in the gut, which were later virulent for guinea pigs; and worms are an important decomposer of cow pats (Satchell, 1983:49 and 375), and likely to ingest bacteria from cow contaminated grass too. Dor beetles *(Geotrupes* sp.*)* are also important cow dung decomposers and sought after by badgers when staple worm food is scarce: -up to 60 beetles per badger scat, with a peak consumption from August to March with scats containing beetles as percentages of 13, 33, 23, 11, 3, 5, 3, and 3 (N=96 scats of 2000 sampled)... which could relate to the spring flush in TB prevalence in both badgers and cattle. Rat-tailed maggots may also be sought after in slurry pits, and bacteria can survive for weeks if not months in cow faeces (Little, 1982).

The clinical diagnosis of TB in badgers was made from submandibular lymph node aspirate in 70% of the cases (Cheeseman, 1988) suggesting an alimentary route of infection, and such head lymph nodes may be primed to overcome environmental Mycobacteria by regular exposure (Mahmood, 1987). The final piece of the jigjaw puzzle lies in the presence of dental abscesses in up to 6% of some 1500 badger skulls, related to teeth loosened, damaged, excessively worn or lost altogether (Hancox, 1988), as part of normal wear and tear in foraging, territorial fights or coarse bedding collection.

It is hence easy to postulate an efficient mechanism whereby badgers become infected via cattle dung, and when some 40% of cows had TB up to 54% of cow pats had TB bacilli (Little, 1982). Even now, although open case TB excreting cows are said to comprise only 2% of samples, these could top up or initiate new badger TB breakdowns. And studies from northern Ireland suggest that a far higher number of reactor cows are actually open case excretors (Neill, 1988).

Given that cow to badger transmission is probably far more efficient than vice versa, it follows hat a number of anomalies are more readily explained. Indeed, it casts doubt on the value of the entire badger culling strategy.

Both badgers and cattle can develop to the open excretor stage within six months which is well below the test interval for cattle so a number of reactors will slip through the net. And the time lag of from 6 to 18 months or so between a cattle breakdown and preliminary badger investigation means that TB badgers will almost certainly be found after bad herd breakdowns as in Dorset, Staffordshire, and Sussex studies (Little, 1982; Hewson, 1987; Wilesmith, 1986). According to the figures for herd breakdowns by counties all of the worst ones have had badger TB cases, and in a nicely graded series as regards prevalence in the 24 counties recorded to date (Cheeseman, 1989).

Anything from 41 to 76% of badger removal operations produce no TB badgers, which reflects the exposure risk from the preceding herd breakdown. And the upswing in cattle TB over the last three years is mirrored by an upswing in badger prevalence from some 13% 1974-1987 to over 19% in 1990 (MAFF, 1991). The high level of badger TB in Ireland of over 10% or up to 36% in one study mirrors the high level in cattle rather than any genetic susceptibility of the badger population (Little, 1982).

Perhaps most importantly however, the former pattern of distribution of cattle TB showed a blackspot in the midlands perhaps associated with pre-attestation imports in 1960, from the badly infected Irish population, and little TB in Cornwall or Devon. The present distribution shows a southwest problem area but the high badger population is uncorrelated to the cattle situation; the intensification of cattle farming in the region meaning it is also a blackspot for brucellosis, mad cow disease (BSE) , and Johnes' disease. The low prevalence of badger TB now in the midlands counties shows that TB will gradually die out in the absence of reinfection from cattle. A natural die out may have happened in one Sussex clan (Wilesmith, 1986), and similarly TB in pigs was resolved when the cattle primary source was dealt with.

The Dunnet review (1986) suggested that badger culling was unjustifiable on either economic or scientific grounds, and should cease if a high level of badgers culled were healthy. Culling fewer badgers using the new ELISA live test is unlikely to be more successful than previous culling strategies, although the Broctest is a valuable research tool in epidemiological studies. There seems absolutely no justification for continued badger culling. The answer to cattle TB is the synchronised area testing of cattle using an ELISA blood test (one herd roundup instead of two for skin test), and greater control of cattle movements. Cattle TB was reduced to EC acceptable levels of 0.05% of cattle and 1% of herds by 1970 in N. Ireland and 1965 in Britain outside the artificial 'problem area' of the southwest ignoring badgers as factor in the epidemiology entirely!

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Some aspects of the distribution and breeding biology of Honey badgers

The Ratel or Honey badger *(Mellivora capensis)* occupies an intermediate position between the true badgers (Melinae) and the mainstream weasel/polecats (Mustelinae) within the family Mustelidae. And following an Old World tropics origin of both the mustelids and viverrids, ratels are amongst the few members of their family able to compete with the viverrids there, apart from some otters, Striped weasels, and Zorillas; although the mustelids alone have expanded into the temperate holarctic and a few even into southern America. Delayed implantation is one factor in the successful expansion of mustelids into seasonal regions, although the pattern of reproduction varies considerably according to body size and longevity.

Ratels occur in much of Africa, the Middle East, and across into the southern USSR (Transcaspian region), Afghanistan, India Nepal, and Pakistan. Within Africa, ratels are found in most areas apart from rain forest and extreme desert, and so are present in a circum-Saharan fringe (Morocco, Mauretania?, Guinea, Niger, Chad, Sudan, Ethiopia, Somalia, and are probably recolonists in Egypt). They occur in Israel, Iran, Iraq?, Jordan?, Saudi Arabia, Syria, but apparently not in Turkey.

With such a wide distribution, ranging from the semi-deserts of Namibia to the steppes of Russia, the breeding biology of ratels is of particular interest. Alas, remarkably little is known regarding this subject. Breeding is said to be seasonal in Turkmenian USSR, with spring births (April-May) and autumn mating (September-October). Judging from captive breeding in England however, the picture may be more variable: births in February, March, April, July, and October...and known matings in October and November.

The European badger *(Meles meles)* gives birth and mates in the spring, but in captivity in Australia shows a neat reversal of seasonality: August births and October matings. Ratels show a confused picture however since a neonate was found in December in Zambia, a lactating female in November in Botswana, whilst matings were recorded in South Africa in February, June,and December.

In Central Africa the situation is even less clear, since births may be timed to coincide with the maximum availability of honey and the rainy season, or in Nigeria, mating may be sparked off by the availability of honey so that a link to rainy/dry seasons is flexible.

The gestation period of ratels is usually stated to be six months, but two zoo records of 153 and 162 days in England indicate some flexibility. A 5-6 months gestation might even permit more than one litter per annum in favourable years, although the zoo records indicate just one litter a year, usually of two cubs, range 1-4, and puberty at about one year old. The available data would suggest that, unlike the European badger, there is no post-partum estrus. In this respect the honey badger is more like the American badger *(Taxidea taxus)*. Both these species have delayed implantation, as do the Hog badgers *(Arctonyx)*, whereas the south-east Asian tropical ferret badgers *(Melogale)* apparently have a normal direct gestation. The flexability of reproductive strategies in badgers would repay further study, since the presence or absence of a post-partum estrus and the resultant duration of delay in implantation may reflect degrees of sociability and be a device to ensure paternality and hence to circumvent illicit sneak matings or kleptogamy by subdominant or visiting males.

The gestation period and time of the rut in the Eurasian badger were long debated, some claiming a spring rut whereas others witnessed mating in late summer. Mating can in fact occur in any month of the year, with however a spring peak, so that gestation may range from 2 to 12 months in duration, or even 15 months in a few captive cases. Surprisingly few observers have seen mating, despite the many thousands of badger-watcher hours each year, because the spring peak period is avoided by most watchers. Characteristic rumble-purring and pursuit by the boar was seen at 3 out of 10 setts in the first three weeks of January 1992, which suggests that early births, and cubs first above ground in early March may be commoner than is generally realised in southwest England.

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Reintroduction of Polecat (*Mustela putorius*) and Pine marten (*Martes martes*) in Britain

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Despite 122 carnivore species listed as threatened by IUCN and CITES (Inskipp & Barzdo, 1987; IUCN, 1990) there has been no organisation specializing entirely in the protection of all carnivore species.

In response to this situation, the International Carnivore Protection Society (Carnivore* for short) was founded and registered as a charitable trust in the summer of 1991. Its objects are the conservation of all carnivore species threatened with extinction and the protection of carnivores from human mistreatment. It is basically an international public relations and fund raising firm for carnivores. Its aim is to inform people around the world and motivate them to take action to protect carnivores, to support research and field work on the protection of carnivores and the conservation of their environment, and to initiate its own programmes when necessary.

Initially, Carnivore is focusing on Britain while it builds up membership and its first programme, in conformity with IUCN guidelines, is to restore polecats, pine martens and wildcats in Britain. Good reasons for these reintroductions are that the species need active encouragement to increase their populations, the programme will create much public interest and good publicity for conservation, and Carnivore cannot encourage people in other countries, particularly in the third world, to protect their carnivores without setting an example by protecting them in its own yard.

It is probable that these small carnivores nearly went extinct in Britain primarely through the efforts of gamekeepers protecting gamebirds for sport shooting (Langley & Yalden, 1977). The Enclosure Acts of the eighteenth and nineteenth centuries prepared the way for land to be owned privately and in which game could be protected from poachers and predators. Shooting was made easier and quicker in the mid-nineteenth century with the development of the percussion cap and the breechloader, which replaced the flintlock in military and sporting fields. Shooting estates became popular and gamekeeping became an intensive activity. By the end of the century all three carnivores survived almost entirely in the remoter regions of Britain, polecats in mid-Wales, and pine martens and wildcats in the north-west Scottish Highlands.

During the First World War it was the gamekeepers' turn to decline and their numbers plummeted from a peak of 22,000. With significantly less gamekeeping after the war, the animals began to increase and slowly recover lost ground (Langley & Yalden, 1977) but even today they still do not occupy more than 15 per cent of their former range.

It has been generally assumed that these carnivores are safe from extinction because their numbers have not declined further and because they now have some legal protection. However, they are still persecuted and their populations are so low that there is danger of a catastrophe wiping them out entirely. Since the 1950's, otters have disappeared from most of England and more recently common seals in the North Sea have declined drastically.

The reintroduction plan is to start with a pilot project on polecats, as they are the more obtainable species. Funding will be sought from the whole range of sources available to a charitable trust, from public appeals to business sponsorship. A commitee with relevant knowledge and skills is to be formed to guide the reintroduction. A carnivore group of volunteers from the public will be organised in the selected release area to help with surveys for the release sites, local public relations and habitat improvement. The released polecats will be the progeny of a breeding scheme in association with zoos. Post release monitoring will be by a research student and manpower from the carnivore group. If this formula is successful it will be repeated up and down the country for each species.

Reintroductions can be expensive if undertaken in professional isolation. So important additional aims are to carry out the reintroduction programme on a low budget with significant participation from the public. One way of accomplishing this is through the carnivore group, which will be independent, self-running and self-funding from its own efforts. As a sign of public support, subscriptions and donations have been coming in steadily and the reintroduction fund is growing daily, which is very encouraging. A progress report will follow.

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Mammals of Slovenia

Despite Slovenia's small size (20,251 km^2) its topograph is extremely diversified and it contains no less than 94 species of mammals of which 69 are autochtonous. The distribution of most of them is mapped. Seven species of mustelids occur: Stoat (*Mustela erminea*), Weasel (*Mustela nivalis*), Polecat (*Mustela putorius*), Pine marten (*Martes martes*), Beech marten (*Martes foiana*), Badger (*Meles meles*), and Eurasian otter (*Lutra lutra*). Feral American mink (*Mustela vison*) were recorded in the 60's and at the beginning of the 70's from the Ljubljansko barje marsh area in central Slovenia. The book is carefully edited, contains numerous drawings and maps, and 68 good quality photographs of which 42 are in colour. The literature list has 358 references. In Slovenian with English introduction.

Krystufek, Boris. 1991. *Sesalci Slovenije*. Prirodoslovni muzej Slovenije, Ljubljana. 294 pp.

Field research on the Red panda planned

Angela GLATSTON

In the last number of Mustelid & Viverrid Conservation, I reported on the Red Panda Workshop which was organised in Front Royal, Virginia, in June of last year. In this meeting, as I reported at the time, some important steps were taken towards a truly integrated, worldwide, captive management programme for this species. However, it was not only in the field of zoo biology where this workshop bore fruit. During this same workshop a number of experts experienced with red pandas in the wild, under the leadership of Pralad Yonzon and Chris Wozencraft, came together to draw up a plan of action for the red panda in the field.

The red panda is primarily distributed in the temperate forests of the Himalayas. Their range stretches from Nepal in the west, eastward through Bhutan, India, Myanmar (formerly Burma) and into China. To date there have been three field studies, one in Nepal (Yonzon, 1989) and two in China (Johnson *et al.*, 1988 and Reid *et al.*, in press). In these studies a total of nine individuals have been followed. Such limited data are obviously an indication that further field studies are necessary. This necessity was further emphasised by the results of a population viability analysis undertaken at the workshop which indicated there was well founded cause for concern as to the red panda's future. Therefore the working group concluded that it was critical to get a more accurate assessment of the red panda's status and through this to lay the foundation for future conservation activities. The group there by formulated a three phase approach to red panda conservation research.

Phase 1. A remote sensing survey to assess red panda distribution and habitat availability

The purpose of this study is to assess the availability of potential red panda habitat throughout its range and the degree to which this potential habitat is threatened by fragmentation. To obtain these data topographical data could be augmented by Landsat or Spot imagery to delineate the extent of forest within the appropriate elevational bands. In addition comparisons of recent imagery with that obtained a number of years ago should provide an indication of deforestation or changes in habitat over time. The cost of this project was estimated at US$ 8,000-20,000.

Phase 2. An extensive field survey to estimate red panda occupancy and to assess habitat quality

The delineation of potential habitat is not a measure of red panda numbers as there is no indication regarding the extent to which potential habitat is occupied by red pandas. The intention is therefore to augment the above project by field data. Field checks of habitat occupancy are planned using transect counts of latrines, droppings and other signs throughout the red pandas' range. Simultaneously habitat parameters could be measured at panda sites and at random points along the transects. Correlations between habitat parameters and indicators of red panda occupancy would further refine our current knowledge of red panda habitat. The cost of this study is estimated at US$ 50,000-100,000.

Phase 3. Estimating population biology parameters critical to conservation activities

As mentioned above our knowledge of red pandas in the wild is severely limited. Further data on mortality, fertility, and diet under natural conditions are urgently required. An area with a fairly large population of red pandas should be identified and detailed, and ecological/behavioural studies undertaken so that real trends in population can be estimated. The cost of such a study would be US$ 30,000-50,000 per year.

At the time of the Front Royal Workshop the money to finance these important projects was not available. However since that time Metro Toronto Zoo, Metro Toronto Zoological Society, and Columbus Zoo have stepped into the breach with the offer of sufficient funds to cover this project. The results of this work will be summarised in a future edition of our newsletter.

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Metro Toronto Zoo small carnivore projects

Metro Toronto Zoo's proposed "Liberian mongoose Research" had to be postponed because of political unrest in Liberia (see Newsletter No. 3). We are happy to announce that a team of three researchers has been sent to Ivory Coast to conduct the "Liberian mongoose and selected Viverridae Survey". Peter De Groot, a graduate student of the University of Toronto, is heading the expedition for Metro Toronto Zoo. Satellite pictures of the area were studied prior to departure and will be used to help assess the overall habitat picture. The team departed on February 4, 1992 and will stay for approximately one month.

Metro Toronto Zoo, joined by Metro Toronto Zoological Society and Columbus Zoo, is also sponsoring a field study "Determining the conservation status of the Red panda in the wild". This study will be headed by Drs. P. Yonzon and M. Hunter. See also "Field research on the Red panda planned" above.

We are grateful to the publishers of the two reports for their permission to publish following data.

Marojejy Nature Reserve

***Fossa fossana* Malagasy civet or Fanaloka**

One trapped in NW sector (800 m) overnight on 24 September on smoked dried fish bait. The trap was by a small muddy stream under enclosed forest, where locals had indicated a 'jabady' trail. One seen at 22.25 hrs in dense bamboo/*Aframomum* regrowth at 350 m in the SE sector.

***Galidia elegans* Malagasy ring-tailed mongoose or Vontsira**

All sightings/trappings were during the day.

- SW sector: two twos once each (800 m), with a single trapped near the first
- NW sector: up to six on ten days (800 m); sightings spread throughout the day. One trapped on fish bait, at the same site as the *Fossa fossana*.
- SE sector: none seen around 300 m; at 1300 m two in the camp on several days were trapped on dead fish bait.

Animals were equally frequent singly or in twos; no larger groups were seen. Apparently this is normal (Nowak & Paradiso, 1983); Albignac (1987) states family groups of three or four are usual. However August to October is within the pairing season (Albignac, 1987), which presumably explains why they were in singles or twos.

Noticeable size difference within a two was twice noted, once estimated as 10% when the larger animal was also considerably paler. They were inquisitive and several times investigated observers or the camp: one climbed onto an observer and chewed binocular rubber armouring; two followed an observer for 100 m at 20 m range. Mobbing was elicited separately from two Long-billed greenbuls *Phyllastrephus madagascariensis* and a Souimanga sunbird *Nectarinia souimanga*.

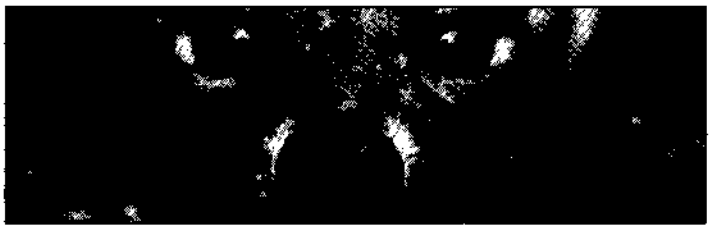
Although usually foraging on the ground, especially around fallen logs, or in thick leaf-litter, one ran up a sapling (similar girth to the animal's body) with considerable agility. Foraging animals were seen on large moss-covered trunks and once in epiphytes 20 m up in the canopy, among a mixed-species flock of birds.

Animals were occasionally seen rearing up on their hindlegs in the manner of true mongooses (Herpestinae). One scratched its ear with a back leg.

Calling was fairly common, even from single animals, though it is possible the observer had split a two (this certainly happened) and failed to notice the second individual. Quiet high-pitched tree-frog like 'peeping' whistles seemed to be for contact (as suggested by Albignac, 1987); an apparent alarm call was a low, indistinct groan or moan.

***Cryptoprocta ferox* Fossa**

Tracks found in the NW sector (800 m) were probably from a male animal seen intermittently in the camp. It looked emaciated and tired, and on one occasion allowed approach to within 1 m. Catholic tastes included the aluminium of Sherman traps baited



with dried fish, 'Paludrine' malaria tablets, soap, rucksac straps, leather boots, and a nylon coat. Most sightings were in the late afternoon; one night it was found sleeping on fire-warmed stones in the camp at 02.30 hrs.

Safford, R. & Duckworth, W., eds. 1990. *A wildlife survey of Marojejy Nature Reserve, Madagascar*. Report of the Cambridge Madagascar Rainforest Expedition 1988. ICBP, Cambridge, UK.

Ambatovaky Special Reserve

***Fossa fossana* Malagasy civet**

One was seen at Site 1 while night-torching at 21.26-21.34 hrs in a Primary Lowland Forest valley bottom at 550 m. The crunched-up remains of freshwater crabs were regularly found in the stream in this valley, probably representing feeding traces of this species.

***Galidia elegans* Malagasy ring-tailed mongoose**

There were four records at Site 1 of solitary animals and two records at Site 2, one of a solitary animal and one of a female with a single young (still dependent). At Site 1 the animals appeared to be confused by changes in the area due to building the camp itself. All were in Primary Lowland Forest in the altitude range 400-600 m. This species appeared to be relatively scarce and was not seen in pairs, unlike at Manongaviro for example (Quansah, 1988), suggesting that the courting/mating season had ended.

***Galidictis fasciata* Malagasy broad-striped mongoose**

A pair were observed foraging in a valley bottom while night-torching only 200 m from the camp at Site 1 at 550 m at 20.30-20.45 hrs on 9 February. Despite regular searches of the same area they were not seen again. One was slightly larger than the other, and was dominant in interactions (it always led and was groomed by the smaller one). They spent most of the time foraging with their tails held vertically while walking: searching the leaflitter, but also running up and down logs, and once climbing 1.5 m up a tree.

***Cryptoprocta ferox* Fossa**

Not seen, but reported by local people to be present in the area. As Malagasy carnivores, with the exception of the diurnal *Galidia*, are difficult to observe, the small number of records do not necessarily imply rarity, and it is encouraging that four of the six endemic species occurring in eastern rain forest occur in Ambatovaky. The other two, *Eupleres goudoti* and *Salanoia concolor*, are known from other sites in the north-eastern rain forests of Madagascar.

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