

# MUSTELID & VIVERRID CONSERVATION

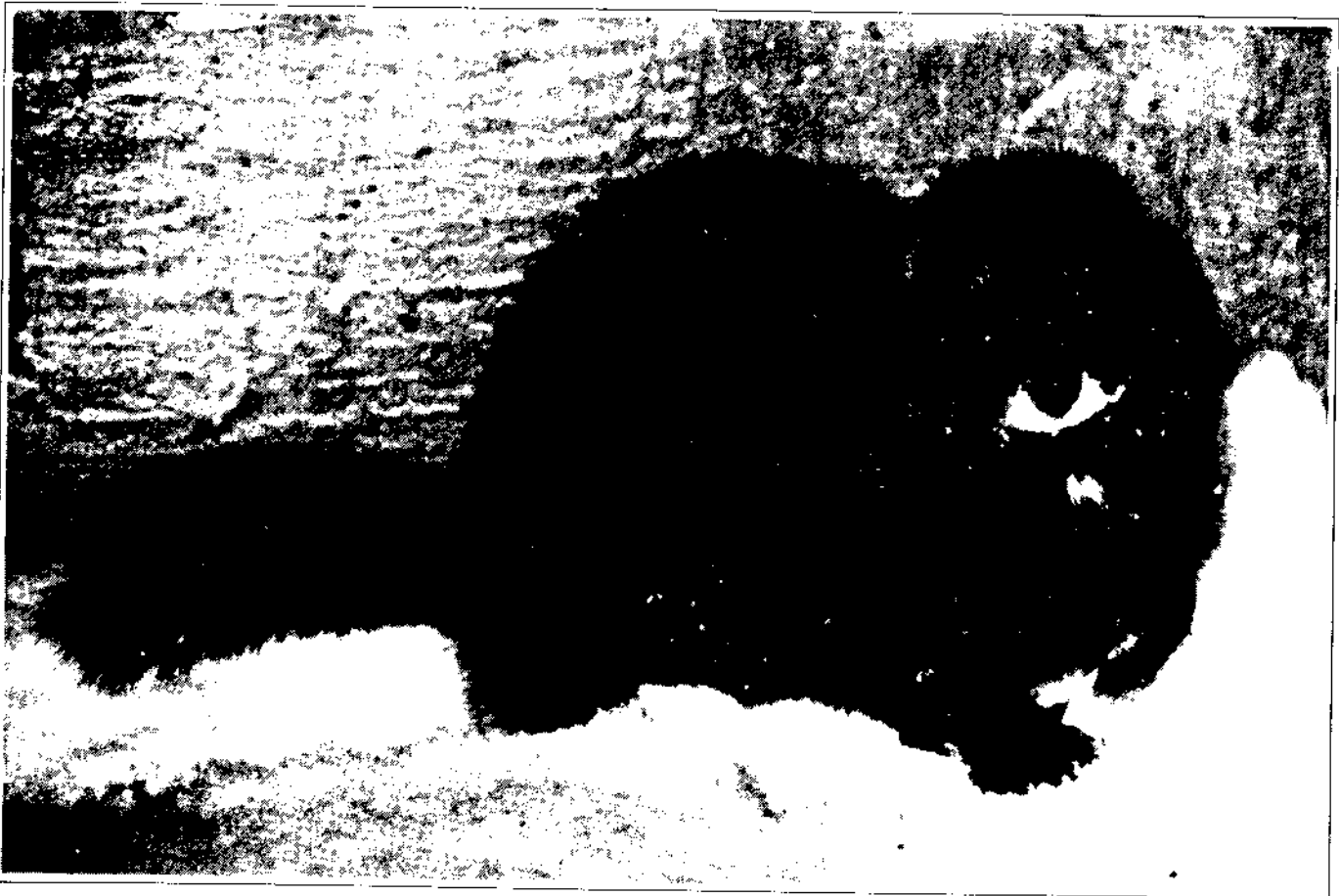


The Newsletter of the IUCN/SSC  
Mustelid & Viverrid Specialist Group



Number 2

April 1990



European mink (*Mustela lutreola*). Photo by Väino Silm & Tiit Maran.



This number was produced with the support of the "Royal Zoological Society of Antwerp", Antwerp, Belgium.

# **Mustelid & Viverrid Conservation**

The Newsletter of the IUCN/SSC Mustelid & Viverrid Specialist Group.

**Editor-in-chief:** Harry Van Rompaey, Edegem, Belgium

**Editors:** Michael Riffel, Karlsdorf, FRG  
Arnd Schreiber, Heidelberg, FRG  
Roland Wirth, München, FRG

The views expressed in this Newsletter are those of the authors and do not necessarily reflect those of the IUCN, nor the IUCN/SSC Mustelid & Viverrid Specialist Group.



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



The aim of this Newsletter is to offer the members of the IUCN/SSC M&VSG, and those who are concerned with mustelids or/and viverrids, brief papers, news items, abstracts, and titles of recent literature.

All readers are invited to send material to:

---

**Mustelid & Viverrid Conservation**  
**c/o Dr. H. Van Rompaey**  
**Jan Verbertlei, 15**  
**2520 Edegem**  
**Belgium**

---

# Fisher (*Martes pennanti*): Birth, growth and development in captivity

Tom LaBARGE, Alan BAKER and Don MOORE

## Introduction

The North American Fisher (*Martes pennanti*) is found in the Canadian and Transition Life Zones, but its original southern range has been reduced by overharvest and other anthropogenic factors (Strickland *et al.*, 1983). Translocations of hundreds of fisher to supplement depressed populations have occurred since the 1930's and are reviewed by Berg (1981).

We have worked with these animals in captivity since 1986 and have found them to be a challenging species. Although relatively common now throughout most of its range, the fisher is rarely exhibited and is difficult to breed in captivity - the last captive-bred and born fishers were recorded in the literature in the 1920's (Hodgson, 1925). However, there are a few fisher which claim the status of 'captive born' by virtue of the fact that some wild caught females arrived in captivity pregnant. We were fortunate to acquire a pregnant female in January 1989 and we subsequently had one of the few litters of fishers born in captivity in many years.

Parturition has been previously recorded from late February through early April; litter size is 1-4 with a mean of 2.7 (Coulter, 1966). On March 15, 1986 our wild-caught female gave birth to two male and one female kits in a remote, quiet area of our facility. The decision was made to remove the kits later for hand-rearing in order to socialize them to humans, with the hope that hand-reared fisher may be calmer in captivity, therefore breed successfully there. The following notes summarize the growth and development of these hand-reared individuals.

## Growth and development

Coulter (1966) detailed the growth and development of his three mother-raised fisher, born in captivity March 3rd. Newborn fisher are altricial, sparsely-haired and weigh less than 40 grams. The mother-reared young gain about 5-10 g per day, so that by 40 days of age they should weigh about 220 g (cf. our animals, which weighed 360-410 g on day 34, Table 1). The young started crawling in the eight week; their eyes opened at 53 days. They were walking at 63 days, and climbing at age 70 days. The dam did not give the young meat until 62 days, at which time the deciduous canine teeth had erupted. Nursing continued until day 114; the young were 124 days old before they could effectively kill prey. Littermates were very aggressive when competing for food (Coulter, 1966). Coulter was as careful about handling his litter as we were, due to the great probable risk that an adult mustelid will kill or abandon her litter if it is handled: his kits were not handled until their 37th day, and his early weight data comes from dead neonates whelped in captivity. However, Coulter's and our nest boxes were arranged such that we could monitor or observe neonates with minimal disturbance to the dam.

For the first three days, our dam's nestbox was not checked at all; monitoring of neonates was by listening for faint "baby noises" (short, high-pitched cries as in domestic kittens). We first checked the kits visually on day 4; like Coulter's, at that time they were blind, approximately 8-10 cm in length and covered with a very thin coat of light gray hair. By week 2, we observed that the

kits were growing fast, and their fur color was light silvery-gray. Around day 21, the kits began to change color to a dark brown, mostly around their heads and underparts.

Table 1. Recorded weights (grams) of 21 Fisher kits at the Burnet Park Zoo, Syracuse, N.Y. 1989

AGE (days)	Male #M89016	Male #M89017	Female #M89018
34	408.5	381.5	362.5
35	408.7	375.5	356.1
36	420.0	384.5	368.0
37	444.5	403.5	368.0
38	459.9	417.3	393.7
39	479.9	434.1	407.0
40	504.8	459.0	427.0
41	502.5	460.0	429.7
42	519.5	473.0	441.5
43	522.0	477.1	447.0
44	534.5	479.5	457.9
45	539.9	498.5	460.0
47	549.0	527.0	466.0
48	576.5	544.5	479.0
49	588.0	555.5	486.0
50	584.5	559.0	496.5
51	602.5	564.5	515.0
55	680.0	635.0	570.0
57	730.0	679.0	605.0
61	815.0	776.0	677.0
63	903.0	844.0	732.0
65	979.0	897.0	776.0
68	1087.0	1017.0	874.0
70	1175.0	1089.0	911.0
72	1240.0	1176.0	980.0
76	1338.0	1349.0	1076.0
78	1443.0	1377.0	1142.0
82	1590.0	1530.0	1220.0
Average gain/day	x = 24.6 g	x = 23.9 g	x = 17.9 g

At 34 days, the dam was separated from the kits, which were pulled for hand-rearing. During hand-rearing, the kits were weighed daily at 8:00 am using a triple-beam metric balance. Weight gain alone is not necessarily an accurate indication of development (that is, body **weight** may increase, but less rapidly than relative body **length** increase: the result is a real loss in body **condition**). Nonetheless, long-term weight monitoring provided us with an accurate measure of growth; body condition was assessed subjectively based on our collective experience with other neonate mammals.

At 34 days, total length of the kits was 34-36 cm. Length measurements were discontinued early because of the difficulty of keeping these active animals restrained (Coulter also noted that



Fig. 1 Three Fisher (*Martes pennanti*) kits aged ca. 35 days. The eyes are still closed. Photo Burnet Park Zoo, Syracuse, NY.

after day 68 his weight measurements were disrupted and finally discontinued due to the excitement and stress that accompanied any form of physical or mechanical restraint of young fishers). We did take heart girth measurements on our kits for a while (Table 2).

We felt tooth eruption in the kits at day 40, when premolars began to show. The deciduous canines started to erupt at the same time, but were not fully erupted until day 50 or so.

Date of eye opening was very variable in our kits. Male #M89017 had opened eyes at 48 days of age (Fig. 2). Male #M89016, largest of the litter, opened both eyes at day 54. Female #M89018 opened her eyes on day 55. This is close to the data presented by Coulter (1966) and Powell (1982), who indicated eye opening at 48-53 days.

Most of our results are consistent with Coulter's. However, he indicated that sexual dimorphism in body size may not be apparent until after the fourth month. We noticed a marked relative size difference between our males and female at age three months; we feel this may be when growth rate changes dramatically (Table 1). At age 6 months, the males weighed 4.4 and 4.5 kg each; the female weighed 2.5 kg. Wild caught adults weigh 3.5-5.5 kg (males) and 2.0-2.5 (females); their body length is 90-120 cm (males) and 75-95 cm (females) (Strickland *et al.*, 1983). We try to keep our captive individuals within these wild animal weight ranges.

## Hand-rearing techniques

Hand-rearing was based on the advice of Frank Webb of New York and Tom Hoenig of Massachusetts, who had the opportunity to hand-rear fisher themselves. Webb and Hoenig were in agreement that if possible the kits should be removed from the mother sometime between the 4th and 5th week of age prior to the opening of their eyes. This strategy gives the kits mother's milk for as long as possible; milk replacer is then used only for adequate

nutrition during the period of socialization with humans.

On April 18, the fisher kits were removed for hand-rearing. Esbilac, a commonly used bitch's milk replacement, was chosen as the formula. In our literature search we haven't come across any published milk composition analysis for fisher, but Esbilac closely resembles the composition in protein/carbohydrate/fat content for the ferret (*Mustela putorius forma furo*), a well known mustelid species (Borden, Inc. technical staff, pers. comm.). Table 3 gives a summary of the feeding record for one of the hand-reared fisher kits (male #M89016).

Rubbing the anal region with a paper towel soaked in warm water proved sufficient to stimulate defecation and urination in the kits. This procedure was performed after each feeding until the animals were able to defecate on their own.

Introduction of the animals to the milk replacer formula was with a 6 cc syringe if the kits refused a pet nurser bottle. Soon, however, we were using a Four Paws Pet Nurser bottle and nipple to "suckle" the kits. Bottles were cleaned, washed and sterilized between feedings. Milk was made fresh daily to prevent feeding of milk contaminated with bacteria.

The first solid food given was a soupy mixture of Esbilac and strained chicken baby food. We fed this mixture in increasing amounts until, near weaning date, we mixed in a small amount of Nebraska Brand Canine Diet (a coarsely-ground, whole horsemeat mix) to the solid food mix. All solid food given was pre-heated to human skin temperature until the kits were weaned.

From the age of 34-82 days (12 days "post-weaned"), our hand-reared kits gained an average of 17.9 g (female) to 24.6 g (male) per day (Table 1). Coulter's recorded gains for days 40 through 68 were 8.4 and 10.5 g/day for mother-reared kits (both females). Our kits continued eating a baby food/canine diet mixture for three weeks after weaning. Then, they were given canine diet with vitamin supplement. The diet was also occasionally supplemented with small amounts of hard-boiled egg and chopped herring.

Gradually the diet was changed to include increasing amount of Fisher Chow mixed into the horsemeat. Fisher Chow is a 50:50 mixture of Big Red Cat Chow and Rise floating Fish Diet made to simulate commercial mink chow, and ground to a coarse

Table 2. Heart girth measurements (cm) of 2.1 Fisher kits at the Burnet Park Zoo, Syracuse, N. Y. 1989

AGE (days)	Male #M89016	Male #M89017	Female #M89018
43	15.5	14.5	12.5
51	15.5	15.0	14.0
58	16.0	15.0	15.0
66	16.0	16.0	15.5
71	17.5	17.5	17.0

Table 3. Feeding record of neonate male Fisher #M89016 from day 34 to day 70, Burnet Park Zoo, Syracuse, N. Y. 1989

Age (days)	WT.(g)	Formula	Interval	Daily amount offered / taken
34	408.5	Esbilac	6 x day	60 cc / 45 cc by syringe
35	408.7	"	"	66 cc / 64 cc "
36	420.0	"	"	70 cc / 68 cc syringe & bottle
37	444.5	"	"	80 cc / 78 cc by bottle
38	Loose fecal. Reduced daily intake to 75 cc.			
42	519.5	"	5 x day	75 cc / 75 cc by bottle
45	539.9	"	"	77 cc / 77 cc "
49	588.0	"	"	78 cc / 78 cc "
50	First vaccinations given. Began giving a small amount of Gerber strained chicken 2cc with milk replacement. Used a 50:50 Milk/Baby food mix.			
52	602.5	Esbilac+	4 x day	85cc milk+10cc mix Bottle & dish
56	680.0	"	"	91cc milk+16cc mix "
61	815.0	"	"	100cc milk+35cc mix "
65	Bottle removed. Diet changed to a 3:1 mixture of baby food and milk replacement. Small amounts of Nebraska Brand Canine diet added to mixture. Discontinued heating diet.			
68	1087	Mixture	3 x day	110 cc mix Dish
70	1175	"	"	120 cc mix "
Vaccination boosters given. Animals considered weaned, amount of milk replacement in diet reduced slowly as more Canine diet is added.				

powder. It was added in increasing amounts over a two week period until the diet mixture was 2:1 Canine Diet to Fisher Chow.

By the age of three months the kits were restricted to 2X/day feedings. The diet was gradually increased to accommodate growth. By the age of six months each animal was receiving 142 g of diet per day. The average adult fisher at our zoo receives 142 to 227 g of diet daily depending on body weight and condition.

## Summary

Our hand-reared fisher kits are well-acclimated to the presence of humans, and to our captive conditions and thus should be less stressed during the breeding season. Because they were reared together and are now within sight of others of their species, hand-rearing should have caused few behavioral changes in them. The female should be easily handled for the determination of precise estrous cycling, and all animals will be more easily handled for health exams and medical procedures.

Successful captive propagation of fisher, although desirable, is not the final goal of our work. Our goal is to understand the captive management needs and reproductive biology of this relatively common species as a model for other, endangered, mustelid species, particularly those in the genus *Martes*. More generally, the above postpartum monitoring, infant handling and hand-rearing techniques were successful, and should be applicable to a variety of mustelids and viverrids in the wild and in captivity.



Fig. 2. Young male Fisher (*Martes pennanti*) ca. 50 days old, just after his eyes opened. Photo Burnet Park Zoo, Syracuse, NY.

## References

- Berg, W. E. 1981. Reintroduction of fisher, pine marten, and river otter. Pp 159-173 in G. C. Sanderson, ed. *Proc. 43rd Fish and Wildlife Conf.*, Wichita, KS, USA.
- Coulter, M. W. 1966. *Ecology and management of Fisher in Maine*. Ph. D. thesis. NYS College of Environmental Science and Forestry, Syracuse, N. Y.
- Hodgson, R. G. 1925. *Fur farming the weasel family*. Fur Tr. J. Canada, Oshawa, Ontario, 138 pp.
- Powell, R. A. 1982. *The Fisher: life history, ecology and behavior*. University of Minnesota Press, Minneapolis, MN, 217 pp.
- Strickland, M. A., Douglas, C. W., Novak, M. & Hunzinger, N. P. 1983. Fisher. Pp 586-598 in J. A. Chapman & G. A. Feldhamer, eds. *Wild mammals of North America: biology, management, economics*. John Hopkins University Press, Baltimore, MD, 1147 pp.

## Products mentioned in the text

- Nebraska Brand Canine Diet, distributed by Animal Spectrum, Inc. PO Box 6307, Lincoln, NE 68506-0307, USA.
- Big Red Cat Chow & Rise Floating Fish Diet, products of Agway, Inc., Butternut Drive, DeWitt, NY 13214, USA.
- Esbilac Milk Replacer, product of Borden, Inc., Pet/Vet Products, Rt. 1 Box 127, Elgin, ILL 60120, USA.
- Four Paws Pet-Nurser bottle and nipple. Four Paws, Inc., Central Islip, NY 12788, USA.

**Burnet Park Zoo, Syracuse, NY 13204, USA.**

# The Gola Project in Sierra Leone: Report on the viverrids

Glyn DAVIES

Surveys were conducted in the Gola Forest Reserves, eastern Sierra Leone, by Glyn Davies in 1984-85 (Davies, 1987), and there is currently a more detailed ecological research programme going on in the reserves, focussing on Gola North (Fig. 1). The main emphasis of the investigation has been on primates and duikers, which account for the bulk of the mammalian biomass in the forests, and are commonly hunted. However there have also been detailed surveys on the avifauna, and sightings of all mammals have been accumulated by project members. The distribution of viverrids is shown on Fig. 2.

Owing to their stealthy foraging strategies and often nocturnal habits, there are relatively few sightings of any small carnivores. Therefore only simple statements can be made about their ecology, based on the habitats in which they have been recorded; there are no feeding records nor can the population densities be calculated from available data (Fig. 2).

## Forest genet (*Genetta pardina*)

Seen thrice in the daytime, once in young farmbush (two years after farming), once on a logging road in forest from which commercial timber was extracted three years earlier, and once in the closed-canopy forest on Tiwai. They are expected to occur in primary forest as well as in these disturbed habitats, but generally they appear sparsely distributed in the forest zone.

## African linsang (*Poiana richardsoni*)

Not recorded in recent times in the Gola forests, although it occurs in similar habitats in Liberia and may well occur in Sierra Leone.

## African civet (*Civettictis civetta*)

This is the commonest of the viverrids. It has been recorded in all parts of Sierra Leone, from the guinea savannah of the north to the rain forests of the Golas. They are found in farms, coffee/cocoa plantations and town gardens. Animals are often seen crossing or travelling along roads, and there are sufficient records to map the nation-wide distribution, as their occurrence in the Gola area.

## Two-spotted palm civet (*Nandinia binotata*)

Reported from the closed-canopy secondary forest on Tiwai Island, and seen in the primary forest in the centre of Mogbai. It has a distinctive booming "hoo, hoo, hoo" call which has been heard at night in coffee/cocoa plantations around Gola.

## Cusimanse (*Crossarchus obscurus*)

This engaging mongoose is commonly detected by the piping contact calls made between members of foraging parties (4-12 indiv.) as they rummage through leaf-litter, presumably in search of insects and fallen fruits. When alarmed, a single high-pitched "peep" is given and all the rustling sounds stop as animals pull their noses out of the leaves and look about for danger. I have

watched animals leap up on the sides of tree trunks to get a clearer look at whatever danger threatens.

They occur in primary forest, logged forest, farmbush and plantations, indeed anywhere where there is leaf-litter to forage through. All records collected during this project are from the wetter zone of the country, but how they fare in guinean savannah is unclear.

## Slender mongoose (*Herpestes sanguineus*)

Another common and widely distributed mongoose, which specializes in stealing chickens from villages at night. It is a tenacious hunter which has been recorded in all habitats: cocoa/coffee plantations, farmbush, logged forest, closed-canopy secondary forest, but not closed-canopy forest in the centre of Gola North. Solitary animals and pairs have been seen, but no larger parties.

## Marsh mongoose (*Herpestes paludinosus*)

Solitary individuals of this mongoose have been recorded foraging on the forest floor on Tiwai and in the closed-canopy forests in the central part of Gola North. One individual was also watched in logged forest, walking along a stream bed and feeling beneath submerged rocks and logs for crustaceans. There are records of the species in young farmbush, and two adults with a juvenile crossed a road in an intensive farmed area.

## Ichneumon (*Herpestes ichneumon*) & White-tailed mongoose (*Ichneumia albicauda*)

They are both expected in the drier savannah areas of Sierra Leone, but have also been recorded in non-forest habitats well into

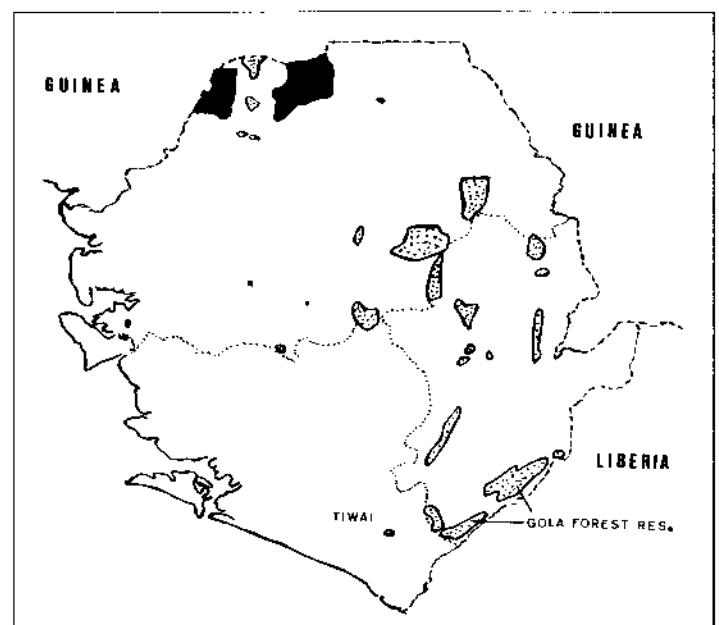


Fig. 1. Sierra Leone showing the Forest Reserves (dotted), the proposed National Park (black), and the Gola Forest Reserves with adjacent Tiwai Island.

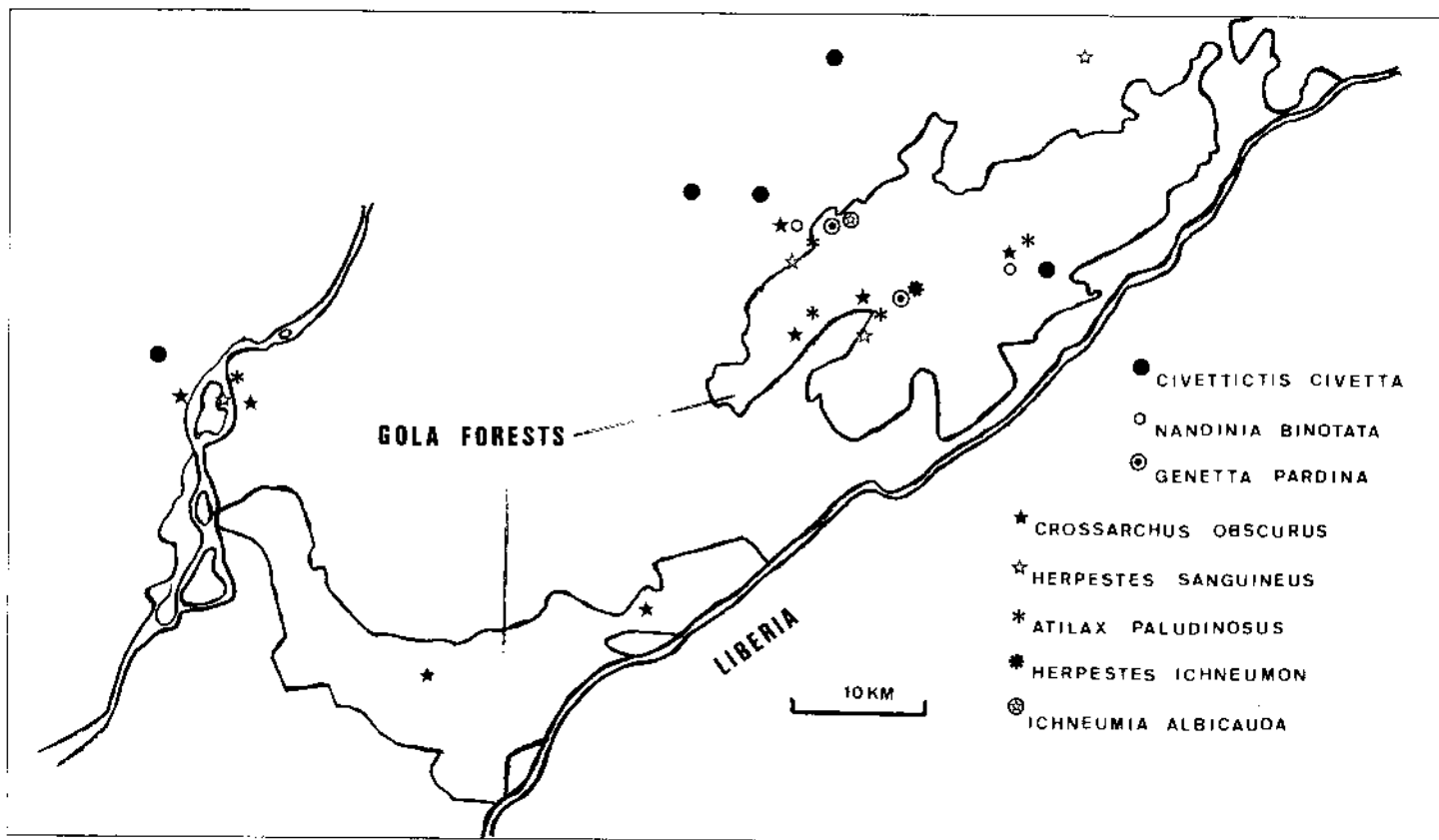


Fig. 2. Viverrids of the Gola Forests: species and/or signs recorded.

the forest zone. This exemplifies how savannah-preferring species extend into the forest zone along corridors of farmbush scrub.

Conservation of these viverrids does not seem to depend on preservation of primary forest since, with the possible exception of the African linsang, all adapt to exploit non-forest habitats. However, much more information is needed on population densities and ecology before conclusive statements can be made about species' conservation, especially since these mammals, like most others in Sierra Leone, are eaten.

During a one-year survey of Kenema (pop. 15-20,000), the nearest town to Gola, civets were sold for meat in the market on most days (2-8 carcasses/morning) and genets were also sold. It may, therefore, be necessary to monitor the effect of hunting on the rarer species before we can feel comfortable about their future.

### Acknowledgements

The current research is funded by the Overseas Development Authority-UK (ESCOR), and data have been contributed by Ministry of Agriculture Natural Resources & Forestry staff, University of Sierra Leone students, and the UEA/ICBP Bird Survey team.

### Reference

Davies, A. G. 1987. *The Gola Forest Reserves, Sierra Leone*. IUCN, Gland, Switzerland and Cambridge, UK.

**Gola Project, Conservation Society,  
P. O. Box 1292, Freetown, Sierra Leone.**

# The African weasel: A Red Data Book species in South Africa.

David T. ROWE-ROWE

With a mass of 340 g for adult males and 250 g for adult females (Rowe-Rowe, 1978a), the African weasel (*Poecilogale albinucha*) is, together with the dwarf mongoose (*Helogale parvula*), Africa's smallest carnivore. This small mustelid occurs in suitable habitat in sub-Saharan Africa from South Africa, northwards to Mozambique, north-eastern Zimbabwe, Malawi, Zambia, Angola, Zaire, Rwanda, Burundi, Tanzania, and Kenya.

## Habits

The African weasel (Fig. 1.), also known as the African striped weasel and the white-naped weasel, is terrestrial and predominantly nocturnal, occasionally seen during daylight. These weasels are usually solitary, but may occur in groups of two to four: generally an adult female and her young. The weasel is a good burrower, often excavating its own holes. Other shelters, such as hollow logs and rock crevices, are also used. In defence, like the zorilla (*Ictonyx striatus*), the weasel ejects a foul-smelling fluid from its anal glands. Six different vocalizations by adults and three by blind young have been recognized (Channing & Rowe-Rowe, 1977), and categorised according to function. Sonographic analysis indicated that the language is similar to that of the zorilla.

## Food

The diet consists almost exclusively of small rodents, with small insectivores and young birds on the ground occasionally taken (Rowe-Rowe, 1978b). The weasel has evolved as a specialist killer of small mammals, being capable of killing rodents up to

its own size. The predator employs a well-directed bite at the back of the neck, usually accompanied by lateral rolling (to knock the prey off its feet), curling around the prey, claspng it with the fore-feet, and treading vigorously against it with the hind-feet (to break the spine).

This weasel does not eat snakes, eggs, or insects, as has been stated in some of the general mammal handbooks.

## Reproduction

In South Africa the breeding season extends over spring and summer (Rowe-Rowe, 1978c). Copulations are extended, lasting 60 to 80 minutes. The gestation period of 32 days appears to be the shortest recorded in any carnivore without delayed implantation. Litters consist of between one and three altricial, hairless young. The canine teeth erupt at ca. 35 days, when the young begin to eat solid food, and the eyes open at ca. 52 days. When about 13 weeks old the young are able to kill small mammals, and are full-grown at 20 weeks. One litter per season is normal, but if all of the young die at an early stage, the female may mate again and have a second litter.

## Conservation

*Poecilogale albinucha* is listed in the South African Red Data Book as 'rare' (Smithers, 1966). The categories used in the South African Red Data Books are the same as those used in IUCN Red Data Books. 'Rare' thus refers to 'Taxa with small populations



Fig. 1. Adult male African weasel (*Poecilogale albinucha*). Photo D. T. Rowe-Rowe.

which are not at present endangered or vulnerable, but which are at risk'. As a specialist feeder on small mammals, and because of its low population density, and apparent association with particular habitats which are being altered or lost, the African weasel does appear to be 'at risk'.

Distribution of the African weasel in South Africa is limited mainly to the moist grassland areas which have an annual rainfall in excess of 600 mm.

South Africa's human population of almost 32 million (27/km<sup>2</sup>) is increasing at the rapid rate of 2.8% per annum. There is therefore an increasing need to produce more food, and the country's moist grassland areas have suffered under this pressure. Large tracts of grassland have come under the plough to grow food crops (mainly maize), or cash crops such as sugar cane or pine-apples, while each year more moist grassland is planted with introduced softwood (*Pinus* spp.) and hardwood (*Eucalyptus* spp.) trees for paper-pulp and timber. Overgrazing, particularly in subsistence farming areas is also a serious problem, as numbers of grassland small mammal prey species decline in the absence of sufficient cover. Another threat emanates from the increasing number of dogs in rural areas. The dogs compete with the weasels for food, and often kill them.

Each of the four provinces in South Africa has its own nature conservation ordinance. In the Cape Province *Poecilogale albinucha* is listed as a protected animal: i.e. it is protected in nature reserves in which it occurs and it may not be hunted without a permit outside of reserves. In the other three provinces (Natal, Transvaal, Orange Free State) the weasel is protected in nature reserves, but unprotected outside of them. Trade in live animals is not allowed, however. The numbers of protected areas in which African weasels have been recorded are 10 in Natal, possibly occurring in another 12 reserves, at least four in Cape Province, and one in Transvaal. So far, it has not been recorded in reserves in the Orange Free State.

In the province of Natal the African weasel is used by the Zulu people in tribal medicine. Wearing the skin, or a piece of skin, brings good luck. Sometimes the skin or other parts of the weasel's body are burnt; inhaling the smoke or taking the ash as snuff gives protection against physical harm and brings luck. Secing a live weasel also brings luck. In certain areas part of the weasel is used in a love charm (where people have knowledge of the weasel's courting and mating behaviour), while some rural inhabitants place the skin above the door to keep rodent pests out.

Dealers in tribal medicines are generally of the opinion that the weasel is becoming scarcer: possibly as a result of continued high demand and fewer animals in the wild (A. Cunningham, Univ. of Natal, pers. comm.).

#### References

- Channing, A. & Rowe-Rowe, D. T. 1977. Vocalizations of South African mustelines. *Z. Tierpsychol.*, 44:283-293.
- Rowe-Rowe, D. T. 1978a. The small carnivores of Natal. *Lammergeyer* 25:1-48.
- Rowe-Rowe, D. T. 1978b. Comparative prey capture and food studies of South African mustelines. *Mammalia* 42:175-196.
- Rowe-Rowe, D. T. 1978c. Reproduction and post-natal development of South African mustelines (Carnivora: Mustelidae). *Zoologica Africana* 13:103-114.
- Smithers, R. H. N. *South African Red Data Book - Terrestrial mammals*. S. Afr. National Scientific Programmes Report 125, 214 pp.

**Natal Parks Board, PO Box 662,  
Pietermaritzburg, 3200 South Africa**

## Fifth International Theriological Congress, Rome 22/29 aug. 1989.

#### Papers

- Alkhalili, A.D. Post-embryonic development of the Indian grey mongoose, *Hepstes edwardsi ferrugineus* (Geoffroy, 1818) on Bahrain Islands.
- Baker, C. The use of behavioural characters in the systematics of some southern African Herpestinae.
- Creel, S. Evolutionary and mechanistic aspects of reproductive suppression in the dwarf mongoose, *Helogale parvula*.
- Maddock, A.H. Resource partitioning in an assemblage of viverrids.
- Masi, E., Dessi-Fulgheri, F., Piazza, R. & Messeri, P. Social vocalizations of the banded mongoose.
- Taylor, M. E. Craniometric analysis of the African mongooses in the subgenus *Galerella*.
- Taylor, P. J. & Meester, J. Craniometric evidence for the existence of two species of yellow mongoose (*Cynictis*).

Waser, P. M. & Rood, J. P. Dwarf mongoose dispersal: age and sex specific benefits and risks.

#### Posters

- Cavallini, F. & Nel, J. A. J. Home range and activity of the cape gray mongoose *Galerella pulverulenta*.
- Colyn, M. & Van Rompaey, H. Population structure analysis of the genus *Crossarchus* F. Cuvier 1825 in central Africa: A craniometric study.
- Fuller, T. K., Biknevicius, A. R. & Kat, P. W. Movements and behaviour of large spotted genets near Elmenteita, Kenya.
- Palomares, F. & Delibes, M. Comparative ecology of the common genet and the ichneumon in southwestern Spain.
- Taylor, M. E. Ecology and conservation of *Liberiictis*.
- Van Hensbergen, H. J. & Erasmus, D. L. Home range and behaviour of genets in the Southern Cape fynbos (macchia).
- Wirth, R. Conservation in viverrids.

# The distribution and status of the badger in Glamorgan, Wales.

H.I. GRIFFITHS<sup>1,4</sup>, D. C. HICKS<sup>2,4</sup>, and V. A. MORRIS<sup>3,4</sup>

## Introduction

The Eurasian badger (*Meles Meles* L.) has a long history in the British Isles and is known from fossil assemblages dating from around 120,000 years ago (Sutcliffe, 1985). However, modern populations are thought to derive from the reinvasion of Britain that followed the end of the last (Devensian) glaciation at approximately 10,000 B. P. (Yalden, 1982).

The badger is Britain's largest terrestrial carnivore, and, although traditionally regarded as a benevolent animal, it has periodically been the subject of persecution by gamekeepers, farmers, and sportsmen. With the decline in the numbers of gamekeepers since the 1914-1918 war, badger populations have risen markedly (Cresswell *et al.*, 1989). However in many parts of Britain and in Glamorgan in particular, the badger still suffers extensive persecution - primarily through its pursuit in illegal field sports.

## Distribution and status

There have been a number of attempts to produce distribution maps of the range of the badger in Great Britain (Neal, 1972; Clements *et al.*, 1988). Only in the latter of these two reports detailed data were presented for much of Wales, although the authors freely admit that distributions for South Wales are based largely on inadequate data or guesswork.

Since its inception in 1983, The Glamorgan Badger Group has been collecting information on the status of the badger in the three counties of Mid, South, and West Glamorgan (Fig. 1). At the time of collation for this report (January, 1990), there were approximately 185 active badger setts known to exist within the area. The major concentration of animals is in the sparsely populated arable region of the Gower Peninsula, West Glamorgan. In most other parts of Glamorgan, badgers are largely confined to stretches of forestry administered by the Forestry Commission or to isolated pockets of woodland amongst arable farmland and pasture. The badger is scarce in the fertile coastal belt of South Glamorgan and largely absent from the old industrial mining valleys of the Rhymney, Rhondda, and Cynon, and from the areas surrounding major towns. The former distribution of the badger in the three counties is largely unknown and sett censusing is an ongoing concern, particularly in West Glamorgan and in the northern forestry of Mid Glamorgan.

Nationally, the major anthropogenic threats to badger populations are habitat destruction, culling and illegal sports, although in some areas badgers may also suffer heavy mortality from road traffic accidents (Cheeseman *et al.*, 1989; Neal, 1986). Habitat destruction usually takes the form of changes in land use, urban encroachment or the expedition of large civil engineering projects. Although badger populations have been lost to all of these agencies in the past, none currently pose a significant threat to badgers in Glamorgan. In Britain the culling of badgers is strictly controlled although the Ministry of Agriculture, Fisheries and Food (M. A. F. F.) are authorised to exterminate badgers infected with *Mycobacterium bovis* to control bovine tuberculosis

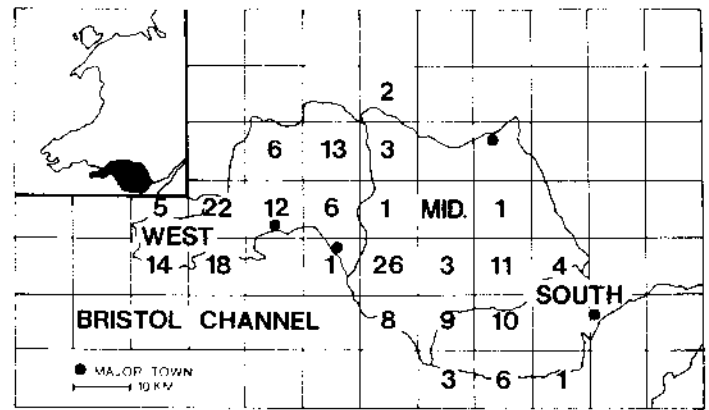


Fig. 1. The distribution of active badger setts in the three counties of Glamorgan.

(Cheeseman *et al.*, 1989). M. A. F. F. may also occasionally grant licences for the culling of pest badgers that destroy crops, poultry, or property. In Glamorgan, bovine T. B. is absent (Anon., 1988) and no licences have been issued for badger culling, although there was a single unsuccessful application in 1983 (Welsh Office Agriculture Department, Pers. comm.). It would seem therefore that badger sports are the sole remaining threat to populations in South Wales.

Badger-related sports include badger-digging (the disintering of badgers with the aid of dogs) and badger-baiting (the fighting of captive badgers against dogs). These "sports" characteristically involve the use of the larger "working" breeds of terrier, such as the Patterdale and Fell terrier, both traditionally used for the digging of foxes. Badger "sports" are sadly still widespread in Britain. Recently, Cresswell *et al.* (1989) reported that nationally 10.5% of active main setts had been dug and considered that this could account for the loss of some 9,000 badgers per annum. The effects of badger-digging in Glamorgan are shown in Fig. 2. At 54% and 38% respectively, the percentages of setts attacked in both Mid and South Glamorgan far exceed the national average. The high-density area of West Glamorgan appears to be less markedly affected, with approximately 10% of setts known to have been dug, although this may well reflect inadequacies in reportage rather than any true improvement over the situation in the rest of the three counties. South Wales has a strong tradition of terrier sports (Harcombe, 1989) and this is reflected in the high rates of attack upon badger setts reported in the area.

## Badgers and the law

British animal legislation is complex but statutes of direct relevance to the badger are usefully reviewed by Skinner *et al.* (1989). In practice badgers are protected from digging and other acts of cruelty and exploitation by the Badgers Act 1973 as amended by the Wildlife and Countryside Act 1981 and the Wildlife and Countryside (Amendments) Act 1985. The Protection of Animals Act 1911 also protects from abuse badgers that are deemed captive under the terms of the law. Animals inhabiting forestry have further protection under the terms of Forestry Commission bye-laws that outlaw any form of pursuit or harassment of wild animals in lands under their jurisdiction.

Unfortunately, much of this legislation is poorly constructed and difficult to enforce, with the result that many of the

prosecutions brought by the police eventually fail in the courts (for an example see Cook, 1989). Furthermore, as awareness of Badger legislation increases, badger offences become more difficult to detect and to prosecute. Badger diggers have been known to take a dead fox to a dig to facilitate the legal defence that they were digging for foxes, not badgers (the fox has no protection under U. K. law). In the event of a prosecution, lawyers who specialise in the defence of these cases are now available to the accused.

Although the Badgers Act allows magistrates to impose short prison sentences and fines of up to £2,000 per offence, in practice the courts are reluctant to inflict stringent penalties, and fines in excess of £500 per offence are unusual. When compared with the reports of the large wagers that accompany badger contests and of prices in excess of £500 commanded by captive animals on the black market, such fines are hardly punitive. Until such times as badger legislation is revised or magistrates assume a stronger stance on penalties, the only way to prevent badger-digging is to monitor continuously those setts regarded as being at high risk. This is certainly beyond the remit of official agencies and beyond the means of local conservation or animal welfare groups.

## Conclusions

The effects of localised, intensive digging upon badger populations are as yet unclear. However, badgers have been eradicated from a number of sites in South and Mid Glamorgan as a direct result of badger-digging. There is no doubt that South Wales is a major focus of badger sports and this is further shown by the recent convictions of South Wales men for badger-related offences in the neighbouring counties of Dyfed, Powys and Gloucestershire and also the counties of Devon, Somerset, Cornwall, Dorset, and Avon.

Cresswell *et al.* (1989) have estimated that there are currently some 250,000 adult badgers in Britain. This perceived abundance has led to some calls for the relaxation of Badger legislation to permit the hunting of badgers on a quota basis (Harcombe, 1985). In the light of the extremely high rate of attack upon the badger populations of Glamorgan in defiance of protective legislation, any relaxation of the protected status of the badger is undesirable and would certainly result in the rapid loss of the badger from large areas of South Wales.

## Acknowledgements

We would like to thank all those members of the Glamorgan Badger Group who have contributed to the sett recording scheme and the League Against Cruel Sports for their assistance. We would also like to thank the Chief Constable of South Wales for his permission for one of the authors (D. C. H.) to contribute to this paper. Dr. David Thomas of the School of Pure and Applied Biology in Cardiff kindly commented on an earlier draft of the manuscript.

The Glamorgan Badger Group would like to acknowledge the financial support of "Care for the Wild".

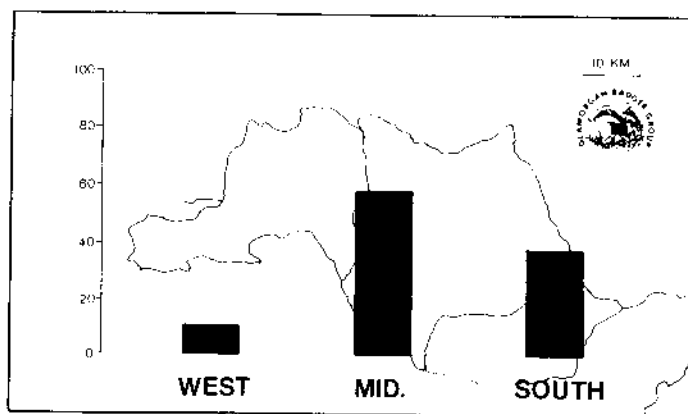


Fig. 2. Percentages of badger setts attacked in each of the three counties of Glamorgan.

## References

- Anon. 1988. Bovine tuberculosis in badgers. Twelfth Annual Report by the Ministry of Agriculture, Fisheries and Food. H. M. S. O., London.
- Cheeseman, C. L., Wilesmith, J. W. & Stuart, F. A. 1989. Tuberculosis: the disease and its epidemiology in the badger, a review. *Epidemiology & Infection* 103:113-125.
- Clements, E. D., Neal, E. G. & Yalden, D. W. 1988. The National Badger Survey. *Mammal Review* 18:1-10.
- Cook, P. J. 1989. Badger protection and the Animals Act 1911. *Justice of the Peace* 153:828-830.
- Cresswell, W. J., Harris, S., Bunce, R. G. H. & Jefferies, D. J. 1989. The badger (*Meles meles*) in Britain: present status and future population changes. *Biol. J. Linn. Soc.*, 38:91-101.
- Harcombe, D. 1985. *Badger digging with terriers*. Fieldfare, Llandeilo.
- Harcombe, D. 1989. *The world of the working terrier*. Fieldfare, Llandeilo.
- Neal, E. 1972. The National Badger Survey. *Mammal Review* 2:55-64.
- Neal, E. 1986. *The Natural History of the badgers*. Christopher Helm, London.
- Skinner, P., Jefferies, D. & Harris, S. 1989. Badger persecution and the law. Occasional publication 10. The Mammal Society, London.
- Sutcliffe, A. J. 1985. *On the track of ice age mammals*. British Museum (Natural History), London.
- Yalden, D. W. 1982. When did the mammal fauna of the British Isles arrive? *Mammal Review* 12:1-57.

<sup>1</sup> Environment. Lab., School of History and Archaeology, University of Wales College at Cardiff, P. O. Box 909, Cardiff CF1 3XU, U. K.

<sup>2</sup> South Wales Police, Pontypridd Police Station, Berw Road, Pontypridd CF372TR, Mid. Glamorgan, U. K.

<sup>3</sup> Carreg Pentwyn, Mynydd Alltyrgu, Ystalyfera, West Glam., U. K.

<sup>4</sup> The Glamorgan Badger Group, Glamorgan Nature Centre, Fountain Road, Tonddu, Bridgend CF32 OEH, U. K.

# The Indian Grey Mongoose (*Herpestes edwardsi*) in the Circeo National Park: a case of incidental introduction.

Giuseppe M. CARPANETO

The Indian grey mongoose, *Herpestes edwardsi* (Geoffroy, 1818), is one of the commoner and more widespread viverrid species: it ranges from the Arabian east coast southwards to southern India and Sri Lanka and eastwards to Assam. Moreover, because of its snake-eating and rodent-eating behaviour, it was often introduced by man into new areas, forming well established populations remote from the original range: i. e. in Malaya, the Ryukyu Islands, Mauritius, and the Greater and Lesser Antilles. Several native animals (endemic species) of these countries were endangered by the presence of this invader.

The Circeo National Park (south of Rome, in central Italy) has always lead a difficult life owing to various and hard problems: illegal housing, exceeding road network, arson, water pollution, stray and feral dogs, wild boars in excess, etc. During the last thirty years mongooses have represented a further, till now unresolved, problem of wildlife management.

In the early 1950's (likely 1952), near S. Felice Circeo, the owner of a hotel purchased some mongooses and kept them free-ranging in his garden, in order to eliminate both vipers and rodents. Shortly afterwards he lost control of these animals, who spread into the surrounding countryside. Subsequently, four specimens were trapped by rangers and kept in captivity for exhibition to visitors; one of them was preserved in the local museum collection and, today, it is the only material evidence of the fact. According to Toschi (1965), other skins were sent to the British Museum (Natural History) and identified by R. W. Hayman as *Herpestes edwardsi*; under this name the species was quoted in the Italian fauna (Toschi, 1965; Biondi, 1985; Vigna Taglianti, 1988). The erroneous quotation of Corbet (1978) who mentioned the presence of *H. ichneumon* in the Circeo N. P. was later rectified by himself (Corbet, 1984).

In the subsequent years ('60's and '70's) the Park direction had many problems to face so that the problem of the mongooses was neglected. These animals had all the time to spread all over Mt. Circeo and downwards to the Pontine Plain (Fig. 1). In fact, between 1978 and 1980, the mongooses reached their maximum expansion and were frequently observed on the southeastern shore of Sabaudia Lake (loc. Bagnara and Molella). The same time, according to the rangers, the polecat (*Mustela putorius* L.) became rare in that area, probably because of the competition with the newcomer.

The Indian grey mongoose, in the Park, showed a diurnal behaviour and did not fear man: some individuals were often seen in the picnic areas of Mt. Circeo, feeding on tourists' leftovers, or accepting food from them.

In the early 1980's, the number of mongooses decreased suddenly without any reliable explanation: no observation has been made since 1984 up to the present. In order to verify their apparent extinction, a specific investigation was carried out by Maurizio Biondi (pers. comm.) who set a number of traps with meat or fruit as bait during the spring and summer of 1984. Only black rats were collected this way, showing that *Rattus rattus* is common and widespread in the area while the mongoose might be extinct or very rare.

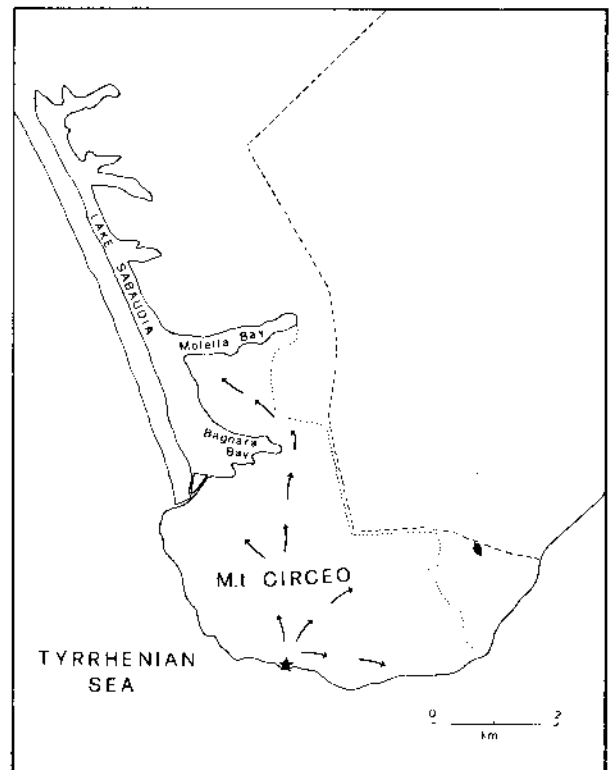


Fig. 1. Spread of the Indian grey mongoose (*Herpestes edwardsi*) in Circeo National Park. Black star: starting area (ca. 1952); dots: presumed range in the period of maximum expansion (1978-1980); dashes: border of the national park.

No information is available on damage caused to wildlife by the introduced mongooses (besides the above mentioned decrease of the number of polecats). Groundnesting birds are very scarce in the area but we lack data on the situation before the mongoose "invasion". No census of free-ranging mongooses was ever made. Furthermore it would be difficult to distinguish between the damage caused by the mongoose and that by the black rat. The effects of the latter on wildlife have proved to be devastating everywhere, and the mongoose evidently has not been an efficient remedy against it.

## References

- Biondi, M. 1985. *Aspetti faunistici del Parco Nazionale del Circeo*. Quaderni del Parco, 6. Min. Agr. For., P. N. Circeo, Sabaudia, 47 pp.
- Corbet, G. B. 1978. *The mammals of the Palearctic Region: a taxonomic review*. British Museum (Nat. Hist.), London, 314 pp.
- Corbet, G. B. 1984. *Idem. Supplement*. British Museum (Nat. Hist.), London.
- Toschi, A. 1965. *Mammalia. Lagomorpha-Rodentia-Carnivora-Artiodactyla-Cetacea*. Fauna d'Italia, Calderini, Bologna.
- Vigna Taglianti, A. 1988. Stato attuale delle conoscenze sulla biologia e la conservazione dei Carnivori in Italia. *Ric. Biol. Selvaggina* (suppl.), 14:401-417.

Department of Animal and Human Biology  
University of Rome I, Italy.

# Estrogen-based conditioned aversion to control egg predation: A non-lethal alternative for mongooses.

Lowell K. NICOLAUS

Because mongooses (*Herpestes* sp.) sometimes consume the eggs and young of endangered species on oceanic islands and elsewhere, they have been the object of occasionally heroic poisoning and trapping campaigns. Since these activities are often far from selective, they risk unintended environmental damage including removal of rare or endangered mustelids and viverrids.

Recently, it has been shown that when free-ranging mammalian egg predators consume one or two meals of eggs containing a very small dose of oral estrogen (17 alpha-ethinyl estradiol) they form generalized conditioned aversion to eggs (Nicolaus *et al.*, 1989, in press; Semel & Nicolaus, in press). That is, the estrogen induces an illness lasting for approximately two hours and long after recovering from the illness predators avoid eggs whether they contain estrogen or not. This is because the effective dose of estrogen in egg is undetectably small and so the taste of the egg is itself associated with the illness.

When captive and free-ranging mongooses (*Herpestes auropunctatus*) consumed eggs containing the cholinergic agonist carbachol, they formed conditioned aversion to eggs (Nicolaus & Nellis, 1987). But, the taste and scent of eggs treated with carbachol appeared to change in the heat when placed into the field. As a result, the aversion was short-term (a matter of weeks) apparently because mongooses eventually discriminated between treated and untreated eggs.

This problem may be reduced by using estrogen. An egg with a volume approximately 35 ml constitutes a full meal for a 350 g female mongoose and nearly a full meal for a 500 g male (Nicolaus & Nellis, 1987). If such an egg contained 10 mg of estrogen, the dose for the female would be 28.6 mg per kg mongoose body weight and for the male the dose would be 20.0 mg per kg. These doses are within the range likely to produce conditioned taste aversion. Since female mammals may be somewhat less affected by estrogen than males (Gustavson *et al.*, 1989; Semel & Nicolaus, In press), the somewhat higher dose that the standard treated egg would deliver to female mongooses should be an advantage.

Since one or two moderate acute doses of oral estrogen are unlikely to produce sterility, the only lasting effect should be aversion to eggs within an otherwise intact population of mongooses.

## Collaboration

Many among the readership may have access to free-ranging or captive mongooses that can be used for research on questions relating to an effective estrogen-based aversion technology. I would welcome hearing from anyone interested in collaborating in this work.

## References

- Gustavson, C. R., Gustavson, J. C., Young, J. L., Purmariega, A. J. & Nicolaus, L. K. 1989. Estrogen induced malaise. In: *Neural control of reproductive function* (J. M. Lakoski, J. R. Perez-Polo & D. K. Rassin, eds.). Alan Liss, Inc., New York.
- Nicolaus, L. K. & Nellis, D. W. 1987. The first evaluation of the use of conditioned taste aversion to control predation by mongooses upon eggs. *Appl. Anim. Behav. Sci.*, 17:329-346.
- , Farmer, P. V., Gustavson, C. R. & Gustavson, J. C. 1989. The potential of estrogen-based conditioned aversions in controlling depredation: A step closer toward the "magic bullet". *Appl. Anim. Behav. Sci.*, 23:1-14.
- , Herrera, J., Nicolaus, J. C. & Gustavson, C. R. In press. Oral estrogen as an aversion agent to control egg predation by free-ranging predators.
- , Semel, B. In press. Estrogen-based conditioned aversion to eggs among free-ranging raccoons.

Department of Biological Sciences, Northern  
Illinois University, DeKalb, IL 60115-2861, USA.

## ABSTRACTS

### New records of two species of rare viverrids from Liberia

Three species of rare viverrids, the Liberian mongoose (*Liberiictis kuhni*), African linsang (*Poiana richardsoni*), and Johnston's genet (*Genetta johnstoni*) have restricted distributions in West Africa and are believed to be endangered. The Royal Ontario Museum and Toronto Zoo mounted an expedition to Liberia to determine whether *L. kuhni* was present in Sapo National Park and if not whether it was still present in previously known localities. None of the three species was found in Sapo N. P. but an adult female *L. kuhni* was collected from the Gbi National Forest, approximately 32 km south east of Tapeta, and according to the villagers of Mali, *L. kuhni* was also present in the Gio Forest to the east of Mali (about 45 km north of Tapeta). From questioning villagers in southern Nimba, northern Grand Gedeh and Sinoe Counties it appeared that *Liberiictis* is no longer present in many areas where it once existed. Two specimens of *P. richardsoni liberiensis* were collected as native skins from eastern Liberia: one from Mali, and one from Bao Town. No trace was found of *G. johnstoni*.

Taylor, M. E. 1989. New records of two species of rare viverrids from Liberia. *Mammalia* 53(1):122-125.

### The mongooses of the genus *Galerella* in Angola.

The author argues that *Myonax nigratus* Thomas 1928, and *M. shortridgei* Roberts 1932, both of them collected in Angola, represent two colour phases of the same species, to which he proposes the colloquial name Larger red mongoose; and that the prior scientific name of this species is *Galerella flavescens* (Bocage, 1889) (original name: *Herpestes gracilis*, var. *flavescens* Bocage 1889, *Jorn. Sci. Math. Phys. Nat.*, (2)1:179, Benguela, Angola). The author considers that *Galerella <sanguinea>* together with *G. pulverulenta* is a superspecies, represented in Angola at least by three species: *G. bocagei* in the central plateau, northeastwards to Lunda, *G. cauxi* in the south, near the Ovamboland border, and *G. flavescens* which is rather common in Angola in semi-desertic areas of the southern littoral, extending eastwards to the fringes of the plateau, where it possibly meets or overlaps *G. cauxi* and *G. bocagei*.

Crawford-Cabral, J. 1987(1989). The prior scientific name of the larger red mongoose (Carnivora: Viverridae: Herpestinae). *García de Ota, Sér. Zool.*, 14(2):1-2.

# Conservation of the European mink in Estonia

Tiit MARAN

The status of the European mink (*Mustela lutreola*) has changed drastically during the last century in Estonia, as well as on a global scale. The number of the species has been estimated to be 40,000-45,000 in the Soviet Union. As the major part of the European mink's distribution is on the territory of the Soviet Union, its total number cannot be considerably higher (Tumanov & Zverjev, 1986). Although this figure seems to be high, it actually is not, considering the range of the species, and the accuracy of the number has occasionally been questioned. The range of the European mink has decreased by almost 80%, and if the speed of decline does not slow down, the species may be extinct within 15-20 years. In such a situation captive breeding becomes essential as a safeguard for the species' survival.

In 1983 the first efforts were made in Tallinn Zoo to obtain European minks. In 1984 project "Lutreola" was started.

The project has the following aims: to evaluate the distribution and numbers of the European mink in previous times; to collect data on its current status; to clear up the causes of the decline of its number; to capture minks in the wild; to study the various biological aspects of the mink, and to find possibilities for establishing a nature reserve for minks.

During 1984-1988 the status and distribution of the European mink in Estonia were clarified (Fig. 1; Maran, 1988) and the enclosures for the breeding programme were built in Tallinn Zoo. Some of the founder stock was lifetrapped in Estonia and additional animals were obtained from other localities in the European part of the Soviet Union:

- nine (8.1) from North Estonia (1984-1988)
- one (1.0) from Central Estonia (1987)
- four (1.3) from the Central Forest Nature Reserve Kalinin region (1985).
- one (0.1) from the Leningrad region (1987)
- two (1.1) from a fur farm (1984 and 1987), which, however, were not used in the breeding programme because of their unknown subspecific origin.

Two types of enclosures were used to keep the mink in captivity:

- Twelve enclosures measuring 5 x 2 x 2 m with a pool (1 x 1 x 0.5 m). The enclosure has two walls made of bricks and another two consisting of 2.5 cm mesh welded wire panels. The floor is made of concrete with a sand layer (0.4 m) on it. In every enclosure there are one or two two-chamber nest boxes.
- Fur farm type cages measuring 0.90 x 0.45 x 0.45 m with a wooden one-chamber nest box on one side.

The first results in breeding European minks were obtained in 1986 when two of the zoo's females gave birth\*. All four young grew up successfully. In 1987 there were two litters totalling three kits, but all three died from unknown causes. In 1988 we could not achieve any success at all, probably because of disturbances caused by noises from building activities in the neighbourhood and some disturbing experiments. The year 1989 was very successful: all three breeding females gave birth. One young died in its first month, but the others (four females) grew up successfully.

The 1989 success was in great part achieved thanks to the advice received from the "Black-footed ferret Recovery Team".

At present we have 15 European minks (8.7) in Tallinn Zoo, with eight of them born in captivity. Hopefully we will be able to breed the species regularly in the years to come.

The aims for the following two years are:

1. to secure regular breeding of the European mink in captivity
2. to maintain and possibly increase genetic variability in the captive population
3. to establish a second breeding centre outside of Tallinn's urban area
4. to investigate the possibilities of establishing a nature reserve for the European mink somewhere within its previous range
5. to seek international co-operation in studying different aspects of the biology of this species
6. to set up additional mink colonies in other captive breeding institutions with animals born in Tallinn Zoo

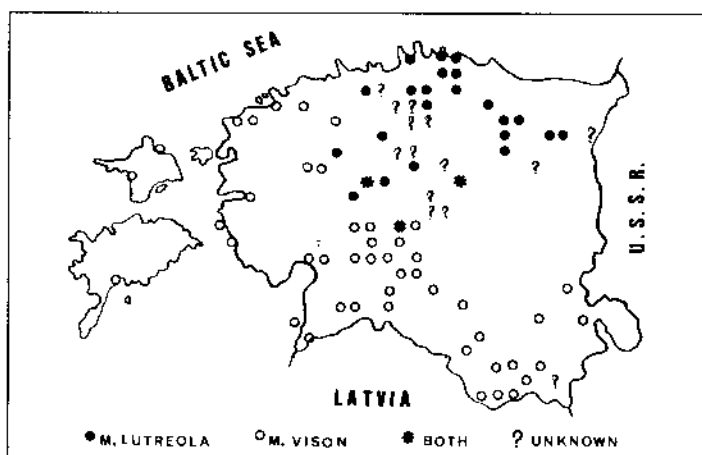


Fig. 1. Distribution of the European mink (*Mustela lutreola*) and the American mink (*Mustela vison*) in Estonia in 1980-1987.

There are many open questions concerning the biology as well as the conservation of the European mink which are difficult to solve on a local level. The task of preserving a species is an international one, therefore it would be useful to extend mink research and conservation to an international co-operative project.

\*Regular breeding of the European mink was obtained for the first time by Dr. D. V. Temovsky in the Institute of Biology in Novosibirsk ca. 25 years ago. The minks were also regularly bred by Dr. N. N. Moshonkin on the Astrahan Nature Reserve during 1977-1983.

## References

- Maran, T. 1988. Naaritsa levik Eestis: ajalooline ülevaade. *Eesti Uluk* 5:29-50.
- Tumanov, I. & Zverjev, E. L. 1986. Sovremennoe pasprostronienie i tsislennost evropeiskoi norki (*Mustela lutreola*) v SSSR. *Zool. Z.*, 65(3):426-435.

# Minks in Poland

Jerzy ROMANOWSKI

At present, Poland's American mink (*Mustela vison*) population is still increasing in number. The native species, the European mink (*Mustela lutreola*), became extremely rare in the beginning of this century, and no data are available on its actual presence. Is this animal extinct or unnoticeable because it is so rare nowadays in Poland?

In the 17th century the European mink was a rare species in central Europe and little was known of its distribution and biology. The Polish naturalist Pietruski (1853) was probably the first to keep this species in captivity, and being very proud to possess an animal that "Linnaeus and Buffon could never have seen alive" he gave some details on its habits. By that time European minks occurred in Poland in two areas: the northern (Odra River basin), where they became extinct already in the 1830's, and the eastern (Mazurian Lakes and areas along the eastern border of Poland), where they were found up to World War II. In the Bialowieza Primeval Forest the last European mink was observed before 1903, and the last specimens in Poland were collected in the northeast near Elblag in 1925-26 (the history of the occurrence of the European mink in Poland is told by Ruprecht *et al.*, 1983).

There are, nevertheless, some later observations of animals that could be European minks. They were reported by the forest officer from the Mazurian Lakes in 1952-1964. However, the species identification cannot be certified; the shot animal was identified by the presence of a white spot on the chest, but such spots can also appear on American mink furs (Ruprecht *et al.*, 1983). There are also pictures taken by W. Puchalski that were for the first time published in 1951. These pictures portray two young minks, both with regular white patches around the nose, and as thus identified as European mink. As Puchalski died in 1979, it is possible to verify now whether these pictures were taken on the Narew River, in northeast Poland, or earlier, near Lvov, where this well-known photographer lived in the 1930's.

It seems that -despite the lack of evidence- the presence of European mink in eastern Poland is quite possible. Hardly any data can be collected on such a rare and secretive animal without a special project, and such a project has not been undertaken yet. Suitable habitats such as streams and rivers bordered by vegetation, and marshy areas as well are still commonly found in that

area, and another semi-aquatic mustelid, the otter, has survived here in high numbers. It is also known that the European mink still occurs in the USSR in the vicinity of the Polish border.

On the other hand we may expect that the widespread American mink, which is still increasing in number (Ruprecht *et al.*, 1983; Romanowski *et al.*, 1984; Zurowski & Kammler, 1987) can reduce the chance for survival of the European mink in Poland. Although a negative influence of the former on the European mink is controversial, it is often reported to occupy areas abandoned by the aboriginal species. American minks were observed in Bialowieza Primeval Forest and near Elblag (i. e. where the last European minks in Poland were recorded), and this probably indicates the extinction of the native species in these areas. Perhaps the best chances for survival of the European mink are the far northern and far southeastern parts of the country. These areas offer not only relatively unchanged habitats, but are also sparsely inhabited.

So it is still not possible to answer the question whether the European mink survives in Poland or not. An action to involve naturalists and hunters in collecting data on minks is being prepared. There is also the possibility that field surveys will be carried out this year. But will there still be European mink in Poland?

## References

- Pietruski, S. K. 1853. *Natural History of mammals*. Lwów. (in Polish)
- Romanowski, J., Kaszuba, S. & Kozniowski, P. 1984. New data on the occurrence of minks (Mammalia, Mustelidae) in Poland. *Prz. Zool.*, 28:221-223. (in Polish with English summary)
- Ruprecht, A. L., Buchalczyk, T. & Wójcik, J. M. 1983. The occurrence of minks (Mammalia, Mustelidae) in Poland. *Prz. Zool.*, 27:87-99. (in Polish with English summary)
- Zurowski, W. & Kammler, J. 1987. American mink in beaver's sites in Poland. *Prz. Zool.*, 31:513-521. (in Polish with English summary)

**Polska Akademia Nauk, Instytut Ekologii,  
Dziekanów Lesny, 05-092 Lomianski, Poland**

## MEETING ON THE EUROPEAN MINK IN FRANCE 13 FEBRUARY 1990 MINISTRY OF ENVIRONMENT, NEUILLY S/SEINE, FRANCE

### Participants:

- Martine Bigan Direction de la Protection de la Nature, Ministère de l'Environnement,  
14, boulevard du Général Leclerc, 92524 Neuilly s/Seine Cedex.
- Marie-Charlotte Saint-Girons Présidente de la Société Française pour l'Etude et la  
Protection des Mammifères (S.F.E.P.M.), Bohallard, Puceul, 44390 Nort-  
sur-Erdre.
- Alain-Jacques Braun Groupe d'Etude Vison d'Europe, Le Marh, 56370 Le-Tour-du-  
Parc.
- Lionel Lafontaine Groupe mammalogique breton "Reunig", Maison de la Rivière,  
29450 Sizun.
- Jean-Marc Lernoùl Parc Zoologique et Botanique, 51 rue du Jardin Zoologique,  
68100 Mulhouse.

- Hervé Maurin Secrétariat Faune Flore (S.F.F.), Muséum National d'Histoire  
Naturelle, 57 rue Cuvier, 75231 Paris Cedex 05 (Trésorier de la S.F.E.P.M.)
- Pierre Migot Office Natl. de la Chasse (O.N.C.), 85bis Av. de Wagram, 75017 Paris.
- François Moutou C.N.E.V.A.-Laboratoire Central de Recherches Vétérinaires, BP  
67, 94703 Maisons-Alfort Cedex (Secrétaire de la S.F.E.P.M.)

Martine Bigan, on behalf of the Ministry of Environment opened the meeting and welcomed the participants. Four other persons had been contacted but were unable to come. The meeting on the European mink took place in the context of a larger project called "Observatoire de la faune et de la flore" where special species could receive special attention and act as sentinels. *Mustela lutreola* is one of them.

(Continued on page 14)

# European minks: Captive breeding, hybridisation, and introduction

Roland WIRTH

Through Tiit Maran we learned of the research and breeding programme carried out by Dr. Ternovsky in Novosibirsk. Dr. Ternovsky has been studying the European mink (*Mustela lutreola*) for several decades and is running a quite successful breeding programme. In addition to breeding pure European minks he is also attempting to produce hybrids between this species and various other Eurasian mustelids, notably polecats (*Mustela putorius*), and Siberian weasels (*Mustela sibirica*). Such hybrids proved to be fertile and Dr. Ternovsky believes that they would make particularly valuable fur animals. He also tried to hybridize European and American minks (*Mustela vison*), but despite many attempts never succeeded. He now believes that the two mink species are not at all closely related. Both species also have different chromosome numbers, 38 in *lutreola* and 30 in *vison* respectively. The superficial morphological similarity between the two species, therefore, could be a result of convergence rather than close taxonomic relationship.

Because Dr. Ternovsky believes that the rapidly expanding American mink population in Europe may eventually outcompete every single surviving free-living European mink (an assumption not everybody agrees with, and clearly much more research is needed here) thus causing the species to become extinct, he undertook some attempts to introduce captive bred European minks to areas where the species is not native and the American mink does not (yet?) occur. So he released 338 minks on the islands Iturup and Kunasir in the Kuril Archipelago in the period 1981-1988. There are some indications that the released animals have started to multiply and that the population is increasing. In 1988 Dr. Ternovsky released 106 minks in Tadzhikistan. In addition he sent 25 specimens to a fur farm in the Tatar Autonomous Region and another 50 animals to a fur farm in Kasir, Siberia. Some 45 specimens are still in his institution in Novosibirsk as core breeding stock.

The breeding successes achieved at Dr. Ternovsky's institute are remarkable (and we are happy that he shares our concern for the survival of the species), but we are worried about the

introduction experiments. Nearly everywhere where non-native species were introduced successfully, they have upset the local ecosystem. This is especially true with introduced carnivores and concern has already been expressed in the Soviet Union that the minks introduced to the Kuril Islands could exterminate some of the rare endemic reptiles there. Although conservation of the world's threatened mustelid and viverrid species is our main concern, we should nevertheless discourage any conservation activity for any of these species which puts other threatened wildlife in jeopardy.

Introducing European minks to some ecological or true island which the American mink cannot colonize naturally may eventually be needed to safeguard the survival of the European mink, but this should preferably be done within the historic range of the species and in any case (whether within or outside the natural range) only after a detailed and extended study of the identified release area to make sure that by solving one conservation problem (i. e. establishing a safe free-living population of *Mustela lutreola*) we are not creating another one. No such study has been undertaken in the Kuril Archipelago.

I have two more concerns. We were unable so far to exclude that the animals at the Novosibirsk Institute are subspecies hybrids. Preferably only animals of well-known geographic origin should be used in any re-introduction or introduction project. And finally, if mustelid species hybrids make indeed good fur animals and will eventually be bred in large numbers in commercial fur farms - what if they escape? There is probably not a single large fur farm from which an occasional animal has not escaped or animals have been released by ill-informed animal welfare groups. If such hybrid animals establish themselves in the wild and start to backcross with either or both of the parent species we may witness the disappearance of local populations or even whole subspecies and species through hybridisation.

**Franz-Senn-Strasse 14, 8000 München, FRG.**

What we know of the European mink in France is still weak. The map from the "Atlas des Mammifères sauvages de France", published by S.F.E.P.M. in 1984 is a first step. The result of the survey carried out by O.N.C. in 1984 and which is still to be published, may add some information, as the local surveys from Brittany (north: L. Lafontaine; south: A.-J. Braun). The question of the clear distinction between native European and feral American minks is still to be solved. The next issue of the "Encyclopédie des Carnivores de France" published by S.F.E.P.M. is devoted to the two species of minks. It will be available very soon and bring together all that we know today.

Three populations of European mink may still persist in France. One in Brittany, in danger because of trapping of American mink (considered as a pest) and through misidentification. Another along the Charente River, and a third in the Landes. The latter two may be in better condition.

We intend to plan a survey in every department where historical records of the European mink exist. This could be done between O.N.C. and S.F.E.P.M. It is also important to check the history of American mink farming in order to know when the first escapes may have happened. In the field however, European mink may be misidentified as American mink or as Polecat in the dark phase. As a result of the survey, especially important areas may be located: the kind of rivers, banks, and vegetation most appreciated for instance, and there special trapping can be undertaken to catch a few animals alive. This could help to clearly identify the species

(colour pattern, morphology, genetic tests from blood- or hair samples). The idea of starting a captive breeding group must be considered already.

The decisions are as follows:

- O.N.C. will check if the survey involving their local officers is possible and when
- S.F.F. will publish the map of the European mink distribution based on S.F.E.P.M., O.N.C., and Brittany data files
- All parties involved have to consider what they can contribute to the next meeting (scheduled for April 26, 1990) in regard to trapping, genetic tests, and captive breeding.

In the mean time, when European mink or "suspected European mink" are trapped or found dead, they must be kept in deep freeze and not be lost. A local Natural History Museum will be asked to collect them.

As colleagues outside of France are interested in what may be done here, we will stay in touch with them and inform them of our project (I.U.C.N., Osnabrück University, and Tallinn Zoo for instance).

**François Moutou, C.N.E.V.A.  
Laboratoire Central de Recherches Vétérinaires.  
BP67. 94703 Maisons-Alfort Cedex, France**

## Viverrid and mustelid captive breeding highlights

1989 saw a number of significant captive breeding achievements involving four endangered or little known species.

The first of these is the tremendous success of the Black-footed ferret, *Mustela nigripes*, breeding programme. No less than 79 kits were born during 1989 and 62 survived, thereby more than doubling the number of known surviving black-footed ferrets in the world.

The Black-footed Ferret Recovery Team also assisted by sending very detailed information on mustelid captive management to the Tallinn Zoo (Estonia), for application to their European mink, *Mustela lutreola*, breeding programme. Practical success was achieved when all three females in Tallinn whelped in 1989. Although one female killed and ate her kits, the other two successfully raised four offspring.

Cincinnati Zoo (USA) reported the birth of two Banded linsangs, *Prionodon linsang*, in May. Although banded linsangs are not thought to be threatened at present, they are very poorly known. To the best of our knowledge, the specimens in Cincinnati are the only ones in captivity outside south east Asia, and it is only the second time that births of the species have been recorded outside Asia. The first birth occurred in 1968 in the now defunct Wassenaar Zoo in the Netherlands.

Finally, a single Fossa, *Cryptoprocta ferox*, was born at San Diego Zoo (USA) in June. While fossas have multiplied in captivity in three European zoos in recent years (the parents of the San Diego fossa baby are themselves captive born in Europe) the breeding success in San Diego represents the first captive breeding for this species in the western hemisphere.

While the upsurge in interest in mustelids and viverrids as indicated by these breeding achievements is most encouraging, it should also be born in mind that of the species mentioned above only one, the black-footed ferret, is subject to a long term conservation oriented breeding programme. In fact, apart from a regional programme for the wolverine in Scandinavia, the black-footed ferret is the only species under the mandate of the Mustelid & Viverrid Group which is subject to a SSP-type breeding programme.

However, breeding programmes for two other species are in the process of being developed. One involves the Liberian mongoose, *Liberiictis kuhni*, for which the Metro Toronto Zoo (Canada) has recently initiated a major conservation programme. If Toronto Zoo's efforts in Liberia in 1990 are successful and females are obtained for the single male that is present in Toronto, this will be turned into a full scale SSP programme as soon as possible.

Attempts are also under way to expand the European mink breeding programme in Tallinn and to turn it into an international cooperative effort involving other institutions.

It is important to note that each of the three species programmes mentioned above also include considerable efforts to study, protect and reestablish these animals in the wild.

Many other species would also benefit from projects which combine conservation efforts in the wild and captive breeding initiatives. We hope that the cited examples will stimulate more zoos to cooperate with the Mustelid & Viverrid Group in planning and initiating programmes for other species.

## Colombian weasel threatened by mercury pollution?

Wildlife Conservation International in New York reports that Ecuador's Podocarpus National Park is threatened by the intrusion of nearly 2,000 gold seekers. Although poorly known internationally, Podocarpus NP is a crucially important protected area for a number of threatened species. It probably represents the last major stronghold for two parrot species: the Golden-plumed parakeet (*Leptosittaca branickii*) and the Red-faced parrot (*Haplosittaca pyrrhops*). It also holds populations of numerous other rare species, including the mountain tapir, *Tapirus pinchaque*.

The Colombian weasel, *Mustela felipei*, has never been collected or reported from or in the vicinity of the park. However, only a single specimen has been collected in Ecuador, and from what little we know about the habitat preferences and altitudinal distribution limits of the species, it may well occur in Podocarpus NP. When Robert Izor (one of the scientists who originally described *Mustela felipei*) prepared a map of the assumed distribution of the species for our Group's Conservation Action Plan, he included the southern Ecuadorean Andes where Podocarpus NP is situated.

If the Colombian weasel does occur in this area, it is probably seriously endangered by the mercury pollution of rivers

resulting from gold panning. I have recently drawn Wildlife Conservation International's attention to the fact that this animal, which is generally described as South America's rarest and least known carnivore, may exist in Podocarpus NP and have suggested that the species be included in the planned wildlife status survey for the region. Furthermore, the Colombian weasel may be a key species for studying the extent and effects of the mercury pollution.

Learning more about *Mustela felipei* is one of the Group's highest priorities. Group member Merav Ben-David and Roger Cox have prepared a proposal to study the weasel either in Colombia (if and when the political situation allows) or in Ecuador. Anybody willing to help with funding should write to Ms. Merav Ben-David, 10 Haddar Street, 75910 Rishon Le-Zion, Israel for further details.

**Roland Wirth, Franz-Senn-Strasse, 14  
8000 München 70, FRG.**

## Mustelids and viverrids in Southeast Asian zoos

From Koen Brouwer of the "National Foundation for Research in Zoological Gardens", The Netherlands, we received a "Who's keeping What?" in various zoos of Thailand, Malaysia, and Singapore.

Up till November 1989 the following species were held:

Mustelids:

1. Yellow-throated marten (*Martes flavigula*) :  
Bangkok 1.1 (0.2 born DNS), Chiang Mai 0.1
2. Large-toothed ferret-badger (*Melogale personata*) :  
Bangkok 0.1, Chiang Mai 0.1

Viverrids:

1. Large Indian civet (*Viverra zibetha*) :  
Bangkok 1.1, Chiang Mai 1.1
2. Malayan civet (*Viverra tangalunga*) :  
Singapore 0.0.1 (not with certainty identified)
3. Large-spotted civet (*Viverra megaspila*) :  
Bangkok 1.1, Chiang Mai 1.3
4. Small Indian civet (*Viverricula indica*) :  
Bangkok, Chiang Mai
5. Spotted linsang (*Prionodon pardicolor*) :

- Bangkok 1.2 (last litter born DNS)
6. Banded linsang (*Prionodon linsang*) :  
Bangkok 1.1, Khao Kheow 1.0, Pata 0.0.2
7. Small-toothed palm civet (*Arctogalidia trivirgata*) :  
Bangkok, Kuala Lumpur
8. Common palm civet (*Paradoxurus hermaphroditus*) :  
Pata 0.0.1 (albino), Bangkok, Kuala Lumpur (many), Singapore
9. Masked palm civet (*Paguma larvata*) :  
Kuala Lumpur, Malacca, etc.
10. Binturong (*Arctictis binturong*) :  
Kuala Lumpur, Singapore, Malacca, Bangkok, etc. (many)
11. Banded palm civet (*Hemigalus derbyanus*) :  
Bangkok 2.2, Pata 0.0.2, Kuala Lumpur 0.1
12. Javan mongoose (*Herpestes javanicus*) :  
Kuala Lumpur, Bangkok
13. Short-tailed mongoose (*Herpestes brachyurus*) :  
Kuala Lumpur
14. Crab-eating mongoose (*Herpestes urva*) :  
Bangkok

## The otter-civet: good and not so good news

The single otter-civet (*Cynogale bennettii*) in Bangkok Zoo has died. This was, to our knowledge, the only representative of this species in captivity at the moment. Otter-civets were, at different times, kept in Bangkok (Thailand), Calcutta (India), Taipeng (Malaysia), Wassenaar (Holland), London (UK), and San Diego (USA). On the other hand, a number of sightings of the otter-civet in Sabah, Borneo, are reported by Chen Hin Keong in *Malayan Nature* (1988, 4(3/4):67): An old record dating from 1957 and involving an animal of unknown sex, but also two times a female and one young, in a stream on Tiger Estate, Tawau. Records dating from 1980 to 1982 of animals crossing the Sandakan-Lahad Datu Road at Sungai Pin, also road kills and hunting

deaths. More recently, in 1987, an animal was observed in a tributary of the Bole River. The fact that most of these areas, especially Tiger Estate and Sungai Pin now are plantations and that extensive logging is going on in Borneo, together with the fact that no specimens are kept in captivity anymore makes it all the more urgent that the "Recommended Actions" proposed in the "Mustelid & Viverrid 1989 Conservation Action Plan are implied as soon as possible. The otter-civet has always been thought rare and declining throughout its range and its last stronghold may well be Borneo. It is of the utmost importance that a study of the species' exact habitat requirements should be undertaken and that an experimental breeding project is started.

## ...from Jarujin Nabhitabhata: Viverrid news from Thailand

At present, I am conducting a survey of the captive mustelids and viverrids in both government and private zoos; also on the occurrence of all the native species in the protected areas of this country.

Good news from Bangkok (Dusit) Zoo: the pair of spotted linsangs (*Prionodon pardicolor*) have had a third litter. The director of the zoo, Mr. Jira Mekvichai, is interested to conduct a captive breeding programme for endangered species and asked me to co-operate. I hope to be able to report on all this soon.

Recently, from December 1987 to December 1988, a study was conducted in Huai Kha Khaeng Wildlife Sanctuary in western Thailand to determine the following aspects of viverrids in the wild:

- species survey within the Sanctuary
- home range, local movements, and daily activity of each par-

ticular species by radio-tracking; their relations to the changing seasonal climate

- food preferences and sources; analysis of droppings

The investigator, Mr. Saksithi Simcharoen, radio-tracked and followed for several months, some even throughout the year, five specimens of following species: one male Small Indian civet (*Viverricula indica*), two male Common palm civets (*Paradoxurus hermaphroditus*), one female Masked palm civet (*Paguma larvata*), and one male Large Indian civet (*Viverra zibetha*).

Additional species, also observed but not radio-tracked, were the Small-toothed palm civet (*Arctogalidia trivirgata*), the Binturong (*Arctictis binturong*), and the Large-spotted civet (*Viverra megaspila*). The study has been completed and after presenting it to the Faculty of Forestry, Kasetsart University, it will be reported on in one of the next issues of the Newsletter.

# Metropolitan Toronto Zoo: 1990 Liberian Mongoose Research

Again, our goals will be to try and obtain information on the status and distribution of this rare species and what can be done regarding its conservation. The IUCN has proposed that as part of a conservation effort a captive breeding group of Liberian mongoose be established. We are proposing two breeding plans in this regard. The first will involve a small number of animals (up to 6) and if successful part of the first generation offspring may be introduced back to Liberia and monitored. Once we find out more about the species and its distribution, we will then be able to assess the need for the second, long term, breeding program which will involve at least 14 founders. The best chance for success will be to sponsor an M.Sc. graduate student to work in Liberia on this project.

## Objectives:

1. To continue attempts to capture and study the Liberian mongoose (*Liberiictis kuhni*) in Gbi and Sapo National Park, and to continue the general survey and conservation education programs for the species in Liberia. At most, three pairs of *Liberiictis* will be removed over the first year to establish a captive breeding colony at the Metro Toronto Zoo and the FDA orphanage.
2. To complete surveys of mammalian fauna begun in Gbi and Sapo National Park.
3. To conduct a comparative study of mammalian community structure in disturbed (Gbi) versus undisturbed (Sapo) forests.
4. To assay genetic variation in natural and captive populations of the Liberian mongoose as a guide to breeding strategy and maintenance of genetic diversity in captive breeding stock.

## Rationale:

Additional study of the distribution, ecology, and natural history of the Liberian mongoose is needed to locate extant populations, ensure preservation of critical habitat, and maximize the potential for successful reintroduction. We propose parallel studies of the structure and composition of vegetation and mammalian communities associated with known capture sites of *Liberiictis* (Gbi National Forest) and the most likely area for reintroduction (Sapo National Park). This information will be used to suggest a protection and management plan for *Liberiictis* and the associated flora and fauna in Gbi, to gauge if Sapo is a suitable site for release of captive bred animals, and to help locate other potential sites for reintroduction. We also propose to survey the genetic variation in natural populations of the Liberian mongoose and to monitor genetic parameters of the captive breeding colony. This information will be used to develop a breeding strategy to maximize genetic variation in the captive colony and preserve the genetic

heterogeneity present in the founder stock. Because the original group of founders likely will be small, a carefully designed breeding program is required to avoid loss of genetic variation through inbreeding and genetic drift.

## Methods:

Two field seasons (1990-1991) will be required to realize the project objectives. During 1990, we propose to spend approximately six months in the field attempting to locate and capture mongooses, and to begin the study of diversity and community structure of mammals in the two forest reserves. The majority of fieldwork (three to four months) will be conducted by an M.Sc. student from the University of Toronto (Mr. Peter Van de Groot) and a Liberian field assistant. The community study will be the basis for Peter's M.Sc. thesis.

Blood samples will be taken from live trapped mongooses prior to their inclusion into the breeding program or to their release. Samples will be assayed for protein variation at approximately 30 genetic loci, using gel electrophoresis, to determine levels of genetic variation in natural populations and in the captive breeding diversity the mitochondrial DNA also will be examined. Viverrid carnivores are highly variable chromosomally, however, the karyotype of *Liberiictis* is unknown. The karyotype and any chromosomal variation in the captive colony will be examined using cultured white blood cells. All analyses will be performed by Dr. Engstrom, Assistant Curator of Mammalogy, at the Royal Ontario Museum.

In the comparative ecological study of Gbi and Sapo forests, dominant vegetation will be mapped and identified with the aid of local Liberian forest specialists. Small mammals (primarily rodents, shrews, and possibly bats) will be the focus of the comparative study of habitat use and mammalian community structure, because they have sufficiently high population sizes to yield statistically meaningful samples. Small mammals will be trapped using Sherman live traps, then individually marked and released. Two sampling grids of 100 to 150 traps each will be set for ten days per month at each site; one grid will be set in the trees and the other on the ground. Habitat use and daily movements will be estimated from localities of recapture and fluorescent tracking.

**John Carnio, Curator of Mammals,  
Metropolitan Toronto Zoo, P. O. Box 280,  
West Hill, Ontario M1E 4R5, Canada**

## Coming events

"The 6th International Colloquium on the Ecology and Taxonomy of Small African Mammals", sponsored by the Israel Academy of Sciences and Humanities, will be held at Mitzpe Ramon, Israel, August 11-16, 1991.

Oral and poster presentations as well as offers to organize special sections or discussions are welcome.

Further information can be obtained from:

Mr. Abraham Haim  
University of Haifa Oranim  
P. O. Kiryat  
Tivon 36910  
Israel.

## A preliminary survey of the two rare viverrids: Malabar civet and Brown palm civet of the Western Ghats, India

The moist forest belt along the Western Ghats in south-western India is very rich in endemic flora and fauna, and of particular interest to the M&VSG. No less than three of the five threatened mustelid and viverrid species in India occur in this region. An ecological study and survey of the Western Ghats' endemic viverrids was stated as a priority project in the Action Plan for the Conservation of Mustelids and Viverrids (IUCN, 1989).

Dr. A. J. T. Johnsingh of the "Wildlife Institute of India" organised a three month field study of the Malabar civet (*Viverra civettina*) and the Brown palm civet (*Paradoxurus jerdoni*). The survey is carried out by Dr. N. V. Ashraf Kunhunu who's objectives are to assess:

1. The approximate densities of the two species in the two areas where they have been reported recently.
2. Their habitat preferences.
3. The feasibility of a long term study on the ecology of these species.

The survey started with a visit to the museums of the Bombay Natural History Society (Bombay) and the Zoological

Survey of India (Calicut) to examine the skins of the two species. The actual survey will be carried out in two phases, one for each of the two study areas: at Elayur (near Calicut district of Kerala state) from where the only recent confirmed sighting of the Malabar civet was reported, and at Anamalai Wildlife Sanctuary (near Coimbatore district of Tamil Nadu state) where a brown palm civet was recently sighted.

While the vegetation at Anamalai Wildlife Sanctuary is primarily a rainforest interspersed with moist deciduous forest and grasslands, the vegetation at Elayur could possibly be degraded moist deciduous forest with rubber- or coconut plantations.

In each study area the survey will begin by collecting information regarding sightings by local people and forest department officials. Based on this information, surveys will be made during night hours (on foot and by vehicle) using spotlights for behavioral observations. Scats of the spotted individuals will be collected for later analysis. An approximate duration of 20 days will be spent in the field at each survey area.

This project is funded by the "Zoological Society for the Conservation of Species and Populations", München, FRG.

## On *Arctictis gairdneri*

In 1916 Thomas described a new species of binturong, *Arctictis gairdneri*, from a specimen collected in Sai Yoke, S. W. Thailand by K. G. Gairdner. He did so solely on the basis of a skull, stating it was "so conspicuously larger than any other known that it evidently represented a distinct species". The specimen is in the BM(NH), London as No. 15.12.1.26.

Its validity as a distinct species was doubted already in 1917 by Kloss who mentioned the large variation in characteristics and size which are shown even by binturong skulls from one district.

Pocock (1933) shared Kloss' opinion that "it was merely an exceptionally well-developed old male skull not differing even racially from the binturong of the Malay Peninsula" and made it synonymous with *A. binturong binturong*.

Up to 1939 (Pocock) it was the biggest skull of *Arctictis* on record. While studying the *Arctictis* skulls in the BM(NH) I came upon No. 63.1503, the skull of an old binturong of unknown sex, purchased from J. Keenan, and collected in the forest N. W. of Kanang, W. of Sumpabum (1,200-1,500 m ASL), N. Burma. Its greatest skull length is 160.0 mm and the condylo-basal length is more than 157.4 mm (one occipital condyle is missing and the other is damaged), while the Sai Yoke skull measures respectively 152.2 and 151.6 mm. The N. Burma skull is larger in 8 and smaller in 7 of the 15 measures taken.

Gao Yaoting *et al.* (1987) gave 159.2 mm as greatest skull length for the holotype of *A. b. menglaensis*, an adult female

collected in Mengla, Yunnan, China in 1964 and held in the Kunming Institute of Zoology, Kunming, Yunnan, China.

As the N. Burma skull belongs to *A. b. albifrons*, a subspecies which is not based on large skull size but on pelage characters, and the Chinese skull belongs to yet another subspecies, *A. b. menglaensis*, it seems we may agree with Kloss' remark on the large size variation in binturong skulls and that we also can conclude that Pocock was right when he made *A. gairdneri* synonymous with *A. binturong binturong*.

### References

- Gao Yaoting *et al.* 1987. *Fauna Sinica. Mammalia. Vol. 8: Carnivora*. Science Press, Beijing.
- Kloss, C. B. 1917. On a third collection of Siamese mammals. *J. Nat. Hist. Soc. Siam* 2(4):288-318.
- Pocock, R. I. 1933. The rarer genera of oriental Viverridae. *Proc. Zool. Soc. London* 1933(4):969-1035.
- . 1939. *The fauna of British India. Mammalia. Vol. 1*. Taylor and Francis, London.
- Thomas, O. 1916. A new binturong from Siam. *Ann. Mag. Nat. Hist.*, 17:270-271.

**Harry Van Rompaey,  
Jan Verbortlei, 15, 2520 Edegem, Belgium.**

# Recent Literature

## Mustelidae

- Akkermans, R. & Criel, D. 1986. *Predatory animals in Belgium and Netherlands. A critical look at nine native species*. Stichting Kritisch Faunabeheer, Nat. Campagne Bescherming Roofdieren, Graveland & Gavere. 63 pp. (In Dutch)
- Beaucornu, J. C. & Aubert, M. F. S. 1986(1987). A propos des mallophages de carnivores sauvages en France (Mallophaga: Trichdectidae). *Bull. Soc. Fr. Parasitol.*, 4(2):273-278. (*Martes foina*)
- Bekker, J. P. 1988. Daubenton's bat *Myotis daubentonii* as prey of beech marten *Martes foina* in subterranean pits. *Lutra* 31(1):82-85 (In Dutch with English summary)
- Blomstedt, L. 1989. Histological determination of different stages of pelage development fur growth of mink. *Acta Agric. Scand.*, 39(1):91-99.
- Broekhuizen, S. 1988. Interaction between carnivorous animals and their environment. *Neth. Res. Inst. Nat. Manage. Annu. Rep.* 1987:45-46.
- Broekhuizen, S. 1988. Research on the ecology and distribution of terrestrial mammal species in the Netherlands. *Neth. Res. Inst. Nat. Manage. Annu. Rep.*, 1987:47.
- Brown, M. K. 1986. Status of the pine marten in New York. *N. Y. Fish Game J.*, 33(1):1-10.
- Cherfas, J. 1989. Wild hopes for western bandits. *BBC Wildlife* 7(10):670-677. (*Mustela nigripes*)
- Da Silva, J. & Macdonald, D. W. 1989. Limitations to the use of tooth wear as a means of ageing Eurasian badgers, *Meles meles*. *Rev. Ecol. (Terre Vie)* 44(3):275-278.
- Davies, J. M. 1987. *Scent marking with faeces and anal secretion in the European badger*. Ph. D; dissertation, Univ. Sussex (U. K.). 210 pp.
- Derting, T. L. 1989. Prey selection and foraging characteristics of least weasels (*Mustela nivalis*) in the laboratory. *Amer. Midl. Nat.*, 122(2):394-400.
- Dumartin, B., Ribes, C., Souloumiac, J., Charron & Canivenc, R. 1989. Experimental study of the fetal growth in the European badger *Meles meles* L. *Mammalia* 53(2):279-285.
- Evans, P. G. H., Macdonald, D. W. & Cheesman, C. L. 1989. Social structure of the Eurasian badger (*Meles meles*): genetic evidence. *J. Zool.*, 218(4):587-595.
- Fagerstone, K. A. 1987. Status of the black-footed ferret and the effects of canine distemper on the recovery program. *Proc. Student Amer. Vet. Med. Assoc. Symp.*, 6 pp.
- Frafjord, K. 1988. Some Norwegian newspaper's attitude towards large predators. *Fauna* (Oslo) 41(3):101-103. (In Norwegian with English summary) (*Gulo gulo*)
- Hammer, D. A. & Anderson, H. A. 1989. A test chamber to evaluate chemical attractants. *Wildl. Soc. Bull.*, 17(1):74-77. (*Mustela eversmanni*)
- Hancox, M. 1989. Badger conservation via captive-bred releases and translocations. *Int. Zoo News* 36/3(214):16-18.
- Holmes, T. Jr. 1989. *Sexual dimorphism in North American weasels with a phylogeny of the Mustelidae*. Ph. D. dissertation, Univ. Kansas, 324 pp.
- Humphrey, S.R. & Setzer, H. W. 1989. Geographic variation and taxonomic revision of mink (*Mustela vison*) in Florida. *J. Mammal.*, 70(2):241-252.
- Innavaer, S. H. 1985. *Habitat use, movements, and population characteristics of urban striped skunks*. M. S. thesis, Univ. Wis. (Stevens Point), 60 pp.
- Janchev, J. & Genov, T. 1988. *Angiostrongylus daskalovi* sp. n. (Nematoda: Filarioidea) from Mustelidae in Bulgaria. *Helminthologia* (Bratisl.): 25(2):81-88.
- Jedrzejewska, B. 1987. Reproduction in weasels *Mustela nivalis* in Poland. *Acta Theriol.*, 32(31):493-496.
- Jedrzejewska, B. 1989. Variation in weasels' response to transient and resident bank voles, enclosure experiments. *Acta Oecol. Oecol. Gener.*, 10(2):149-154.
- Johnson, S. A. 1984. *Home range, movements, and habitat use of fishers in Wisconsin*. M. S. thesis, Univ. Wis. (Stevens Point), 78 pp.
- Johnson, W. A., Fuller T. K., Arribillaga, G., Franklin, W. L. & Johnson, K. A. 1988. Seasonal changes in activity patterns of the Patagonian hog-nosed skunk (*Conepatus humboldti*) in Torres del Paine National Park, Chile. *Rev. Chil. Hist. Nat.*, 61(2):217-221.
- King, C. 1989. *The natural history of weasels and stoats*. Christopher Helm, 224 pp.
- Koster, M. 1988. A marten lurking its prey. *Eesti Loodus* 1988(3):176. (In Estonian)
- Kruuk, H. 1989. *The social badger. Ecology and behaviour of a group-living carnivore*. Oxford University Press. 176 pp.
- Laing R. I. & Holroyd, G. L. 1989. The status of the black-footed ferret in Canada. *Blue Jay* 47(2):121-125.
- Lesinski, G. 1988. Beech martens as predators of bats. *Wzschswiat* 89(9):210. (In Polish)
- Linn, I. & Birks, J. D. S. 1989. Mink (Mammalia: Carnivora: Mustelidae): correction of a widely quoted error. *Mammal Rev.*, 19(4):175-179.
- Marchesi, P. & Mermod, C. 1989. Régime alimentaire de la marte (*Martes martes* L.) dans le Jura suisse (Mammalia: Mustelidae). *Rev. Suisse Zool.*, 96(1):127-146.
- McKinney, M. A. 1989. *Introduction of antibiotic resistant microorganisms from chickens to mink*. Ph. D. dissertation, Mich. State Univ., 107 pp.
- Miles, I. W. 1982. *The fisher - Martes pennanti - in Nova Scotia*. B. S. honors thesis, Acadia Univ. (Canada), 38 pp.
- Minta, S. C. & Marsh, R. E. 1988. Badgers (*Taxidea taxus*) as occasional pests in agriculture. *Proc. Vertebr. Pest Conf.*, 13:199-208.
- Nams, V. O. 1989. A technique to determine the behavior of a radio-tagged animal. *Can. J. Zool.*, 67(2):254-258. (*Mephitis mephitis*)
- Novak, M., Baker, J. A., Oibard, M. E. & Malloch, B. (eds.) *Wild furbearer management and conservation in North America*. Ministry of Natural Resources, Ontario, 1150 pp.
- Pigozzi, G. 1988. The diet, food availability and use of space in the European badger in the Maremma Natural Park, Central Italy. *Monit. Zool. Ital.*, 22(4):545 (Abstract only)
- Poglayen-Neuwall, I., Durrant, B. S., Swansen, M. L., Williams, R. C. & Barnes, R. A. 1989. Estrous cycle of the tayra, *Eira barbara*. *Zoo Biol.*, 8(2):171-177.
- Randla, T. 1986. On a new occurrence of wolverine in Estonia. *Eesti Loodik* 4:77-78. (In Russian with English summary)
- Reumer, J. W. F. 1988. A useful difference between the skulls of the weasel (*Mustela nivalis*) and the stoat (*Mustela erminea*). *Cranium* 5(2):106-108. (In Dutch)

Rosatte, R. C. & Kelly-Ward, P. 1988. A surgical procedure for implanting radio transmitters in striped skunks, *Mephitis mephitis*. *Can. Field-Nat.*, 102(4):713-715.

Seal, U., Thorne, T., Bogan, M. & Anderson, S. (eds.). 1989. *Conservation biology and the black-footed ferret*. Yale University Press, 328 pp.

Skinner, P., Jefferies, D. & Harris, S. 1989. *Badger persecution and the law*. Mammal Society, 23 pp.

Steele, P. 1989. *Stoats and weasels, polecats and pine martens*. Whittet, 128 pp.

Spencer, W. D. 1987. Seasonal rest-site preferences of pine martens in the northern Sierra Nevada. *J. Wildl. Manage.*, 51(3):616-621.

Thompson, I. D., Porter, M. S. & Walker, S. L. 1987. A key to the identification of some small boreal mammals of central Canada from guard hairs. *Can. Field-Nat.*, 101(4):614-616.

Weber, D. 1989. The ecological significance of resting sites and the seasonal habitat change in polecats. *J. Zool. (London)* 217:629-638.

Weber, D. 1989. The diet of polecats (*Mustela putorius* L.) in Switzerland. *Z. Säugetierk.*, 54:157-171.

Weber, D. 1989. Foraging in polecats (*Mustela putorius* L.) of Switzerland: The case of a specialist anuran predator. *Z. Säugetierk.*, 54:377-392.

Wiig, O. 1989. Craniometric variation in Norwegian wolverines *Gulo gulo* L. *Zool. J. Linn. Soc.*, 95:177-204.

Wolsan, M. 1988. Morphological variations of the first upper molar in the genus *Martes* (Carnivora, Mustelidae). *Mém. Mus. Nat. Hist. Nat. Sér. C Sci. Terre* 53:241-254.

## Mustelidae & Viverridae

Ansell, W. F. H. 1989. *African mammals 1938-1988*. The Trendline Press, St. Ives, 77 pp.

Carpaneto, G. M. & Gemmi, F. P. 1989. The mammals in the zoological culture of the Mbuti pygmies in north-eastern Zaire. *Hystrix* (n. s.) 1:1-83.

Crawford-Cabral, J. 1987(1989). Distributional data and notes on Angolan carnivores (Mammalia: Carnivora). *Garcia de Orta, Sér. Zool.*, 14(2):3-27.

Dathe, H. H. & Schops, P. (eds.) *Pelztieratlas*. VEB Gustav Fischer Verlag, Jena, 323 pp.

Delany, M. J. 1989. The zoogeography of the mammal fauna of southern Arabia. *Mammal Rev.*, 19(4):133-152.

Legendre, S. & Roth, C. 1988. Correlation of carnassial tooth size and body weight in recent carnivores (Mammalia). *Hist. Biol.*, 1:85-98.

Rochrs, M., Ebinger, P. & Weidemann, W. 1989. Cephalization in Viverridae, Hyacnidae, Procyonidae, and Ursidae. *Z. Zool. Syst. Evolutionsforsch.*, 27(2):169-180.

Schreiber, A. 1989. Mysterious mustelids, very mysterious viverrids. *BBC Wildlife* 7(12):816-823.

Sheng, G., Yanjiusuo, K. & Daixue, Z. 1983. *Birds and beasts of Hainan Island*. Science Press, Beijing, 458 pp.

Sumner, J. W., Shaddock, J. H., Wu, G.-J. & Baer, G. M. 1988. Oral administration of an attenuated strain of canine adenovirus (type 2) to raccoons, foxes, skunks, and mongooses. *Amer. J. Vet. Res.*, 49(2):169-171.

## Viverridae

Acharjyo, L. N. & Patnaik, S. K. 1987(1988). Occurrence of large Indian civet (*Viverra zibetha*) in Orissa. *J. Bombay Nat. Hist. Soc.*, 84(1):418-421.

Ansell, W.F. H. 1989. Mammals from Malawi: Part 2. *Nyala* 13(1/2):41-65.

Ayyadurai, M., Natarjan, V., Balasubramanian, P. & Alagar Rajan, S. 1987. A note on the food of the small Indian civet (*Viverricula indica*) at Point Calimere Wildlife Sanctuary, Tamil Nadu. *J. Bombay Nat. Hist. Soc.*, 84(1):203.

Bain, O., Chabaud, A. G. & Georges, A. J. 1987. Nouvelle filaire du genre *Cercophthilaria*, parasite d'un carnivore africain. *Parassitologia* (Roma) 29(1):63-69. (*Nandinia binotata*)

Blaszkiewicz, B. 1989. Ergänzende Mitteilung zum Lebensalter beim Larvenroller (*Paguma larvata* Temminck). *Bongo* 15:123-124.

Bosman, C. A. & van den Berg, A. B. 1988. Egyptian mongoose, *Hepstes ichneumon*, in southern Turkey. *Zool. Middle East* 2:5-7.

Delibes, M., Rodriguez, A. & Parrero, F. F. 1989. Food of the common genet (*Genetta genetta*) in northern Africa. *J. Zool.*, 218:321-326.

Disi, A.M. 1987. On a collection of mammals from Jordan. *Disarut* 14(12):131-136. (*Herpestes ichneumon*)

Eisenraut, M. 1989. Das Gaumenfallermuster bei einigen madagassischen Viverriden und ein Vergleich mit festländischen Vertretern. *Bonner Zool. Beitr.*, 40(2):79-84.

Gupta, V. & Fatma, S. 1987. On four canthocephalan (sic) parasites of vertebrates from Uttar Pradesh and Tamil Nadu. *Indian J. Helminthol.*, 39(2):128-142. (*Herpestes auro-punctatus*)

Heaney, L. R., Heideman, P. D., Rickart, E. A., Utzurrum, R. B. & Klompen, J. S. H. 1989. Elevational zonation of mammals in the central Philippines. *J. Trop. Ecol.*, 5:259-280.

Holecikova, D. & Tomasova, K. 1988. The first record of a fossa for Czechoslovakia. *Ziva* 36(1):33-34. (In Czech)

Hornsey, T. 1989. The hand-rearing of a suricate meerkat. *Ratel* 16(2):48-51.

Hunt, R. M. Jr. 1989. Evolution of the aeluroid Carnivora: significance of the ventral promontorial process of the petrosal, and the origin of basicranial patterns in the living families. *Amer. Mus. Novit.* 0(2930):1-32.

Maddock, A. H. 1989. Anaesthesia of four Viverridae with ketamine. *S. A. J. Wildl. Res.*, 19:80-84.

Paxton, M. 1988. Foraging associations between pale chanting goshawks, honey badgers and slender mongooses. *GABAR (Growth Biol. Afr. Raptors)* 3(2):82-84.

Rana, T. 1987. Some reproductive parameters in the grey mongoose (*Herpestes edwardsi* Geoffroy 1819) of Pakistan. *Pak. J. Zool.*, 19(4):444-446.

Roeber, J. J., Kelche, C. & Vogel, E. 1989. Flank rubbing in genets (*Genetta genetta* L.): Histological correlates. *Z. Säugetierk.*, 54(5):324-328.

Taylor, P. J. & Meester, J. A. J. 1989. The type locality of *Cynictis penicillata coombsii* Roberts, 1929 and *Gerbillus paeba coombsii* Roberts, 1929. *Z. Säugetierk.*, 54(5):329-330.

Thohari, M. & Santosa, Y. 1984. A preliminary study on the role of civet (*Paradoxurus hermaphroditus*) in the natural regeneration of palms (*Pinanga kuhli* and *P. javana*) at Gunung Gede-Pangrango National Park, West Java. *Biotrop. Spec. Publ.* 21:151-153.

Trivedi, K. K. 1987. Nematode parasites of vertebrates. 9. On a new nematode, *Pulmostrongylus stunkardi* sp. nov. (Strongylidae: Protostrongylidae) from mongoose, *Herpestes ferrugineus* from Udaipur, Rajasthan, India. *Riv. Parasitol.*, 48(2):207-214.

Wells, D. R. 1989. Notes on the distribution and taxonomy of peninsular Malaysian mongooses (*Herpestes*). *Nat. Hist. Bull. Siam Soc.*, 37(1):87-97.

# IUCN/SSC M&VSG membership

## Chairman

Mr Roland Wirth  
Franz-Senn-Strasse, 14  
8000 München 70  
FRG

## Members

Prof. R. Alagnac  
Parc Zoologique de Vincennes  
53, Avenue St. Maurice  
75012 Paris  
France

Mr Mahedi Andau  
Jabatan perhutanan  
Peti Surat. 311  
90007 Sandakan, Sabah  
Malaysia

Ms Merav Ben-David  
Dept. Zool. Tel Aviv University  
Ramat Aviv  
69978 Tel Aviv  
Israel

Dr B. Boeadi  
Curator, Dept. Mammals, Mus. Zool. Bogor  
Jl. Ir. H. Juanda, 3  
Bogor, Java Barat  
Indonesia

Mr A.-J. Braun  
Etude Louvre/Vison  
56370 Le-Tour-du-Parc, Le Marh  
France

Dr G. B. Caddick  
Director, Breeding Projects Belize Zoo  
P. O. Box 474  
Belize City  
Belize

Dr. John Curcio  
Curator Mammals, Metro Toronto Zoo  
P. O. Box 280  
West Hill, Ontario M1E 4R5  
Canada

Dr Gerardo Ceballos  
Apartado Postal 23-D  
Toluca, Mex. 50120  
Mexico

Dr T. W. Clark  
Northern Rockies Conservation Coop.  
Box 2705  
Jackson, WY 83001  
USA

Dr M. Colyn  
104, Avenue de la Heronnière B 34  
1160 Bruxelles  
Belgium

Mr A. D. Cuaron  
Curator Mammals, Inst. Historia Natural  
Apto postal 6  
Tuxtla Gutierrez, Chiapas 29000  
Mexico

Dr Glyn Davies  
Dept. Anthropol., Univ. London  
Gowerstreet  
London WC1E 6BT  
UK

Dr Gao Yaoting  
Inst. of Zoology, Academia Sinica  
Haidan - Beijing  
China

Shri R. K. Ghose  
Mammal & Osteo. Sect., Zool. Surv. India  
Lindsay Street, 8  
Calcutta 700087  
India

Dr C. P. Groves  
Dept. Prehist. & Anthropol. Austr. Ntl. Univ.  
G. P. O. Box 4  
Canberra ACT 2601  
Australia

Dr Robert Izor  
Curator, Div. Mammals, Field Mus. Nat. Hist.  
Roosevelt Road at Lake Shore Drive  
Chicago, IL 60605-2496  
USA

Dr Paul Joslin  
Int. Snow Leopard Trust  
16463 Southeast Thirty-fifth Street  
Bellevue, Washington 98008  
USA

Dr. K. U. Karanth  
Centre for Wildlife Studies  
499, Kuvempu Nagar  
Mysore 570 023  
India

Dr G. U. Kurup  
Zool. Surv. India, West. Ghat Region St.  
2/355 Eranhipalam  
Calicut 673 006, Kerala  
India

Mr Tiit Maran  
Curator, Tallina Loomaaed  
Paldiski mnt., 145  
200035 Tallinn, Estonia  
USSR

Prof. Rodney A. Mead  
Dept. Biol. Science, University Idaho  
Moscow, ID 83843  
USA

Mr. Donald E. Moore III  
Curator Mammals, Burnet Park Zoo  
500 Burnet Park Drive  
Syracuse, NY 13204  
USA

Mr Jarujin Nabhitabhata  
Curator, Thailand Inst. Sci. & Tech. Res.  
196 Phahonyothin Road, Bangkok  
Bangkok  
Thailand

Dr M. Nicoll  
WWF-Representation Madagascar  
B. P. 4373  
101 Antananarivo  
Madagascar

Mr F. Palomares  
Estacion Biologica de Doñana  
CSIC - Apdo. 1056  
41080 Sevilla  
Spain

Dr Gustav Peters  
Zool. Forsch. Inst. & Mus. A. Koenig  
Adenauerallee, 150-164  
5300 Bonn 1  
FRG

Dr R. A. Powell  
Dept. Zool., North Carolina State Univ.  
P. O. Box 7617  
Raleigh, NC 27695  
USA

Mr R. Ratajszczak  
Curator, Wielkopolski Park Zoologiczny  
ul. Browarna, 25  
61-063 Poznan  
Poland

Mr Michael Riffel  
Hebelstasse, 5  
7528 Karlsdorf  
FRG

Mr Paul Robinson  
Curator, Southport Zoo  
Princes Park  
Southport, Lancashire  
UK

Mr Jerzy Romanowski  
Dept. Vert. Ecol., Inst. Ecology  
05092 Dzielanow Lesny  
Poland

Dr D. A. Schlitter  
Curator Mammals, Carnegie Mus. Nat. Hist.  
5800 Baum Boulevard  
Pittsburg, PA 15206  
USA

Mr Amd Schreiber  
Zool. Inst., Heidelberg University  
Im Neuenheimer Feld, 230  
6900 Heidelberg  
FRG

Prof. Rüdiger Schröpfer  
Universität Osnabrück, Biol./Chemie  
Barbara Strasse, 11  
4500 Osnabrück  
FRG

Dr M. F. Taylor  
Biol. & Environm. Consulting  
160 Woodycroft Avenue  
Toronto, Ontario M4J 3B9  
Canada

Dr E. T. Thorne  
Game & Fish Lab., Univ. Wyoming  
P. O. Box 3312  
Laramie, WY 82071  
USA

Dr Harry Van Rompaey  
Jan Verberlei, 15  
2520 Edegem  
Belgium

Prof. Wang Yingxiang  
Head Dept. Vert. Taxon., Kunming Inst. Zool.  
Academia Sinica  
Kunming, Yunnan  
China

Dr Chris Wemmer  
Curator-in-charge, Ntl. Zool. Park  
Conservation & Research Center  
Front Royal, VA 22630  
USA

Dr W. C. Wozencraft  
Div. Mammals, Ntl. Mus. Nat. Hist.  
Smithsonian Institution  
Washington, DC 20560  
USA

## Subscriptions

Subscription for 1990 (two numbers planned) is 600 Belgian francs (approx. 15 US\$ or 10£ or 30DM).

United Kingdom residents please send a cheque for £10 to:

Paul Robinson  
Southport Zoo  
Princes Park  
Southport, Merseyside PR8 1RX  
UK

West Germany residents please send a cheque for DM30 to:

Roland Wirth  
Franz-Senn-Strasse, 14  
8000 München 70  
FRG

All other subscribers please send, if possible, a Eurocheque for 600 Belgian francs (no banking costs deducted!). On other cheques or when in foreign currency, please add 30% to cover currency converting and banking costs and send to:

Harry Van Rompaey  
Jan Verbertlei, 15  
2520 Edegem  
Belgium

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

**In order to do so we should be financially independent.**

**Any assistance in the form of donations, sponsorship, and subscriptions is most welcome.**