# **SMALL CARNIVORE CONSERVATION**



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



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# SPECIES SURVIVAL COMMISSION



Binturong (Arctictis binturong). Photo by J.W. Louwman, Wassenaar Wildlife Breeding Centre, Holland.



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

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

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# EDITORIAL

With this number of SMALL CARNIVORE CONSER-VATION we are celebrating a birthday: It is the 10th issue, and accordingly, with two issues per annum, the newsletter is now in its fifth year.

From its very beginning the threat of extinction always hovered over the newsletter, as much as it hovers over many of our species of concern. This comparison of "extinction threats" to the newsletter and to species may seem odd at first glance, but not if one takes a closer look. The newsletter's future was threatened at times due to lack of money and lack of interest. Species are also often threatened by lack of money and interest.

Now some will contradict and argue that species are threatened by habitat destruction, trade, hunting, competition, hybridisation and what else there is of the well-known things. Yes, correct, but it still boils down to money and interest. If there is enough interest in the survival of a species, many of these threats can be avoided. And often it is a single person equipped with enough interest and dedication making all the difference. The history of species conservation is full of such examples. The will to make it happen is often *the* essential ingredient in a conservation project, though sufficient amounts of money on hand will no doubt help, and will be essential in many cases.

Here comparison with the history of the newsletter fits in: While at times there was not enough interest to provide us with good material for publication, and financially there were problems too, it was largely due to the interest and dedication of Harry Van Rompaey, our editor-in-chief, that extinction of the newsletter was never allowed to happen.

At the moment the future looks reasonably bright: Notes, reports, and papers are being sent in good numbers, though we

would wish to receive much more on the rarer viverrids, procyonids, and tropical mustelids.

Right now the newsletter is also financially secure, and this is almost entirely due to the support received from Rotterdam Zoo (for printing the newsletter) and the Royal Zoological Society of Antwerp (for mailing the newsletter).

Unfortunately, quite a number of our subscribers seem to have a fairly relaxed attitude towards renewing their subscriptions. Only subscription money combined with the support from the Antwerp and Rotterdam Zoos will allow us to continuously produce the newsletter. We do neither have the funds nor the time to remind late payers individually. We have continued to send newsletters to people who have not paid for over a year, but we cannot afford to do this forever. As any victory over extinction is never final (species and newsletters alike) please pay your subscriptions.

Turning to the more positive aspect again, it is probably fair to say that in its five years of existence the newsletter has become an important medium for the exchange of information on the lesser known small carnivores. Most encouraging, several young people are now working with great dedication to set up conservation projects for hitherto virtually unknown species. Dave Fawcett's work on the Colombian weasel *Mustela felipei* and Shelagh Heard's planned project on Owston's palm civet *Chrotogale owstoni* are fine examples. It is hoped that Dave's and Shelagh's efforts will motivate others to initiate similar projects.

#### **Roland Wirth**

Chairman IUCN/SSC Mustelid, Viverrid & Procyonid Specialist Group

# Some new information on the distributions of the American and European mink (*Mustela* spp.) in former Yugoslavia

# Boris KRYSTUFEK<sup>1</sup>, Huw I. GRIFFITHS<sup>2</sup> and Marjan GRUBESIC<sup>3</sup>

#### **Introduction**

The American mink, *Mustela vison*, and the European mink, *M. lutreola*, have generally been regarded as being absent from the republics of former Yugoslavia. Recently, Miric (1992) has provided some discussion on the occurrence of the two species, but fails to deal with the subject comprehensively. Here we provide further details of these two carnivore taxa in the Balkans, and additional data on their occurrence.

#### The American mink, Mustela vison Schreber, 1778

The American mink has been widely introduced throughout Europe as a furbearer (Niethammer, 1963). Escapes, and the deliberate release of captive stocks from fur farms, have led to the formation of feral populations in Iceland, the United Kingdom, Ireland, France, Germany, Spain, Poland, and many of the countries of Fennoscandia, the Baltic, and the western part of the former Soviet Union (Dunstone, 1993; Görner & Hackenthal, 1987). Despite this, until now there have been no records of the species in the states of south-eastern Europe, e.g. Bulgaria (Markov, 1959), Greece (Ondrias, 1964), and the former Yugoslavia (Djulic & Miric, 1967), leading most authors to conclude that the species had failed to establish any feral populations here, despite the presence of numerous mink farms.

In the last few years, a small number of records have come to light of mink within the area of the former Yugoslavia. In Slovenia, a mink farm was established in the 1960's at Vnanje Gorice, near Ljubljana. Although this farm was closed in 1972, during its short existence animals escaped, and the formation of a feral population was suspected in the southern margins of the wetlands near Ljubljana (at Ljubljansko barje). However, no mink were trapped following the farm's closure, and the last wild mink was captured in 1972 (Krystufek, 1991). Miric (1992) also provides a record of a feral American mink trapped in Vojvodina (northern Serbia) on 15 September 1972. This animal was caught at Banatska Palanka on the River Danube, near the border with Romania (Fig. 1.)

Although there were no mink farms in the Republic of Macedonia, one was established near Lake Kastorias in northern Greece (S. Petkovi, pers. comm.); thus, although the American mink has had ample opportunity to become established in the Balkans, it has failed to do so. This provides an interesting contrast with the situation in northern Europe, where feral American mink are rapidly becoming a component of many local faunas and, in some places, are also suspected of being the cause of various conservation problems (Sidorovich, 1991). Why the mink has failed to become established in the Balkan States remains unknown, although if any reader has further records of mink from this region, we would be very glad of details.

#### The European mink Mustela lutreola (L., 1758)

Youngman (1982) provided a detailed review of the distribution of the European mink. From the data available to him, it is clear that he believed that the species was entirely absent from the republics of former Yugoslavia. De Beaufort (1991) reports the species from "moins de 33% de l'aire européene en Grèce", but provides no further data or references, whereas neither Ondrias (1965), nor Adamakopolous et al. (1991) list the species within the Greek fauna. Despite this, the species was reported from Yugoslavia by Djulic & Tortic (1960), Djulic & Miric (1967), and Miric (1970). All these reports derive their information from earlier records by Martino (1941) in the hunter's journal "Lovac", published in Belgrade. Martino possessed one skull, taken from a locality named Zabalj in Vojvodina, northern Serbia. This is the same locality as that later reported by Petrov (1968). Martino was a very competent worker, who had a great deal of experience of Balkan mammal faunas, hence the accuracy of this determination cannot be doubted. His collection has now been dispersed between various museums, mainly the Natural History Museum of London, and the Zoological Institute of St. Petersburg, Russia. However, it is not known whether this particular skull is now housed at either of these institutions. Martino (1941) also cites a report of an "unusual animal" (although he had not personally viewed this specimen) which he believed to be M. lutreola. This animal was collected on one of the islands in the River Save. Miric (1970) restated these records, but was unable to provide further details, other than that he believed the second specimen to have been collected from somewhere in the vicinity of Belgrade. These represent the only records of the species in former Yugoslavia.

These records derive from below what is generally considered to be the southernmost border of the range of M. lutreola (Schreiber et al., 1989) therefore, although it is generally agreed that the distributional range of the European mink is in recession (Rozhnov, 1993), these records are difficult to explain. To our knowledge, there is no palaeontological evidence of the species'



Fig. 1. Known localities for the two species of mink in the area of former Yugoslavia. Closed stars = Mustela lutreola, open stars = M. vison. Locality numbers: 1 - Ljubljansko barje, 2 - Banatska Palanka, 3 - Zabalj, 4 - vicinity of Belgrade. Question mark denotes uncertain record. SLO - Slovenia, CRO - Croatia, BiH - Bosnia and Herzegovina, MTG - Montenegro, Mac - Macedonia, SRB - Serbia, Voj - Vojvodina, Kos - Kosovo.

occurrence within Serbia (Malez, 1986) although *M. putorius* and *M. eversmanni* are known from the modern fauna (Djulic & Miric, 1967; Miric, 1976). The possibility of confusion of these taxa by a worker as experienced as Martino must be considered highly unlikely. This suggests that *M. lutreola* may have been present in the southern part of the Pannonian Basin in the first part of this century, although whether this represented an autochthonous population, or a transitory faunal event remains unknown. According to Youngman (1982), the last Hungarian record of *M. lutreola* is of a single individual, taken at Lake Balaton in 1952. The species was certainly more widespread in Hungary in the early part of the century (Paszlavsky, 1918), thus providing at least some support for the contention that European mink may have once penetrated into northern Serbia.

#### **Concluding remarks**

Recent collections from the Sub-pannonian part of eastern Slovenia include over ten specimens of the polecat, *M. putorius*, but provide no evidence for the presence of either *M. vison* or *M. lutreola*. Furthermore, neither have ever been recorded in Slovene game-bag statistics, although revier based hunting is operated, and detailed data are compiled each year. The same applies to the lowlands of Croatia, from which the species have also never been reported.

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# **Update on Fisher studies**

Fishers (*Martes pennanti*) are small carnivores of the mustelid family. Historically they were found throughout densely forested areas in the State of Washington (USA). They were trapped commercially for fur until the practice was prohibited in 1933. In spite of the elimination of trapping, Washington populations have not recovered. At present the fisher is considered to be rare statewide and possibly absent from the southern and eastern portions of the state. No comprehensive effort has been made to document the present distribution. In 1992 staff at Northwest Trek successfully bred fishers in captivity. However, their animals came from the eastern United States and were considered likely to be a separate and different subspecies from the native population of fishers in Washington.

To provide information needed for recovery planning and the potential use of captive breeding, the 'Center for Wildlife Conservation' is currently funding a genetics research program to confirm the existence of genetic subspecies and a photo trapping survey to locate populations within the state. The genetics research program was started in October of 1993 and is expected to be completed by September 1994. This program is being conducted at Washington State University by Prof. James Hallett, using DNA fingerprinting. The technique being used requires blood or a small piece of ear taken with a punch used for eartagging. This material will be obtained from zoos and other researchers conducting field studies. We expect to get material of the Pacific subspecies (*Martes pennanti pacificus*). Obtaining fresh material for subspecies from the East (*M. p. pennanti*) and from British Columbia (*M. P. columbiana*) will be more difficult.

As an alternative, the researchers have begun to investigate the use of museum specimens for DNA analysis. Material was obtained from M. p. columbiana (1), M. p. pacifica (18), and M. p. pennanti (5). Some of the museum specimens are over 100 years old. Because of the degradation of the DNA over this time it is necessary to use DNA amplification techniques.

The distribution survey will take place this winter and will utilize remote cameras placed in areas where fishers sightings have occurred. The objective of this study is to locate one or more populations in the state suitable for more detailed studies.

> Center for Wildlife Conservation, Monthly Newsletter, December 1993.

# Notes on the behaviour and ecology of the Binturong (Arctictis binturong) in Vietnam

## Viatcheslav V. ROZHNOV

The Binturong (Arctictis binturong, Raffles, 1821) is a rare carnivore and the biology of this species, and particularly the ecology and behaviour, are little-known. Detailed information on this species in Vietnam has been presented by Pham Trong Anh (1992).

Pham Trong Anh (1992) gives the dimensions of an adult male binturong taken by him in the province of Laityau (northern Vietnam): body length 800 mm, tail length 400 mm, length of hind foot 90 mm, height of ear 42 mm, body weight 19 kg. The fur was black with a silver hue owing to white hairs. The edge of the fur was white and the ear had a bunch of long hairs. The stomach of the animal contained only the fruits of *Ficus*, although in addition to this fruit the binturong feeds on young plant branches and, to a small extent, small mammals, birds, lizards, fish, worms, and insects.

In October through to November 1986, and in April 1987, at the Eakao Station (7 km from Buonmetkhuot, South Vietnam) observations were made of the activity and behaviour of a male binturong, captured in the wild and maintained in an open-air cage,  $2.0 \times 1.8 \times 1.8$  m in size. The open-air cage contained cover for the animal and also the branches and trunks of small trees, which permitted the use of its three-dimensional space within the cage. The outward appearance of the animal fits the description reported by Pham Trong Anh (1992). In October through to November observations continued for four days; in April, for two days. During the time of these observations, night time was between 17.00 hrs and 5.00 hrs.

Activity period	n	M±m	limits
Total activity:			
- total duration, mins		261±88	82-479
<ul> <li>total duration, in % 24 hours</li> </ul>		18.2±6.1	5.7±33.3
<ul> <li>total number of activity periods</li> </ul>		11±3	5-18
Locomotor activity:			
<ul> <li>total number of activity periods</li> </ul>		16±4	6-23
- duration of one period, mins	65	$6 \pm 0.8$	1-30
<ul> <li>number of long periods</li> </ul>			1-2
<ul> <li>duration of one long period, mins</li> </ul>	4	198±65	79-337
<ul> <li>number of short periods</li> </ul>		$10 \pm 3$	4-17
- duration of one short period, mins		6±1	1-24
Rest outside cover during activity period:			
- total duration, mins		755±6	742-771
- total duration, in % 24 hours		52.4±0.4	51.5-53.6
<ul> <li>number of rest periods</li> </ul>		12±4	3-21
- duration of one period, mins	48	14 <b>±6</b>	1-250
Nocturnal rest period			
Total duration of nocturnal rest, mins		<b>42</b> 4±91	190-601
- in % 24 hours		29.4±6.3	13.2-41.7
General characterization of rest periods:			
- number of rest periods		10±3	4-17
- duration of one period, mins	41	41±13	1-429
Long periods of rest:			
- number of long periods		2±0.7	1-4
- duration of one period, mins	8	168±47	65-429
Short periods of rest:			
- number of short periods		8±2	3-13
- duration of one period, mins	33	11±2	1-53
<b>•</b> ·			

Table 1. General characteristics of the activity period and of the nocturnal resting period in the binturong in October-November





Our findings concerning the behaviour of the binturong and other arboreal species of viverrids were reported elsewhere (Rozhnov *et al.*, 1992).

The locomotor activity of the binturong in October to November started roughly half an hour after dusk; in daytime the animal stayed under cover. In April it was almost twice as active (33.3% of the day) compared to October-November (18.2%). In October-November the binturong spent 1,179  $\pm$  88 min under cover (81.8% of the day), in April -960 min (66.7% of the day). When outside, the animal was either engaged in locomotor activity (94  $\pm$ 31 min or 65.5% and 132 min or 9.1%, respectively), or else it rested in the outside shade. The period of such rest accounted for 168  $\pm$ 66 min (11.7%) and 348 min (24.2%), respectively.

At night, when the binturong was outside it displayed periods of direct locomotor activity (walking about the open-air cage, climbing the walls or other objects) and periods of rest outside the cover, or passive activity (the animal climbed to the roof of the shelter and lay there without sleeping). The total characterization of the periods of activity and nocturnal rest of the binturong in October-November is presented in Table 1.

In October-November, the locomotor activity of the binturong showed two pronounced peaks (Fig. 1): the first period was between 18.00 and 19.00 hours, and the second between 02.00 and 05.00 hours. In April, along with the greater duration of locomotor activity, the binturong increased the number of activity peaks. The first peak accounted for the time between 20.00 and 21.00 hours, the second between 22.00 and 24.00 hours, and the third between 01.00 and 03.00 hours in the morning. Fig. 1 also shows the dynamics of the relationship between locomotor

and passive activity in the binturong throughout the day in both October-November, and in April.

The binturong moves about gently, often coming to a stop, and often using its tail to keep balance, clinging to a branch. The rate of movement is 1.5 m/sec. We have never seen it jump from branch to branch -a peculiarity which was noted by other observers (Ogilvie, 1958).

The binturong shows a pronounced comfort behaviour associated with grooming its dense and long fur -it shakes, licks its hair, and scratches. Shaking is the most characteristic element of comfort behaviour -in October-November it was observed, on average, 6.5 times a day, and in April, 1.5 times. Licking of the fur was respectively observed 2.8 and 3.0 times a day, but scratching, only 0.8 times a day in October and November, and never recorded in April.

Of undoubted interest from the viewpoint of chemical communication is the description of the methods whereby the binturong leaves scentmarks which, similar to those of other mammals, are primarily associated with the physical processes of excretion. Owing to the few observations of the binturong available, marking behaviour has received little attention (Kleiman, 1974).

The binturong leaves faeces in positions characteristic of other carnivores. It stands on the digits of the hind feet, its legs bent, and crouches low, bending the posterior part of the body. The tail is kept either parallel to the ground or arched, the head is turned down, and the neck is bent low. The duration of defecation is fairly long (about 2 min). The portions of the faeces and the faeces themselves are large. The position of urination does not differ from that of defecation, much urine being left. On average, the binturong defecates 11 times and urinates 1.3 times a day.

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## Badger TB and Mad cow breakthrough

Badgers are blamed for causing tuberculosis (TB) breakdowns in cattle herds in southwest England, and also illogically in southern but not in northern Ireland. Despite some twenty years' research, it is unknown how cattle might realistically catch respiratory lung TB from badgers in the field. Indeed, various forgotten studies have shown that cattle cannot easily catch TB from grazing heavily infected pasture, so that contamination with badger infected urine is a very unlikely route of transfer (Benham, 1991; Francis, 1947). Badger TB is initially detected clinically via head lymph glands, so it is primarily dietary and transfer **from** cattle **to** badgers may be quite efficient via dung beetles (Hancox, 1992 a&b).

Recently herd breakdowns have occurred in new areas which have been TB-free for years in Somerset, Wales, etc. This upswing has happened despite three drought summers, whereas in the past TB has cycled loosely in relation to wet/dry summers and bacillus survival. The over-riding new factor is that over the last seven years there have been 100,000 cattle to be replaced duc to the Mad Cow epidemic (BSE, Bovine Spongiform Encephalopathy). Given a 5% insensitive skin test, that would amount to 5,000 possibly latent TB carrier cattle missed to start new cycles. This is 700 a year predicted, which corresponds neatly with the 600-700 actual TB cattle found. These breakdowns can hardly be blamed on TB badgers, since official figures for two decades note only 11 TB+ out of 1,200 badgers in Somerset and 22 out of 2,071 in Wales. Since these breakdowns must logically be due to cattle 'missed' TB carriers, a study of the dozen or so breakdown farms using the new live badger blood Brocktest should show a graded series of badgers with TB reflecting the severity of the preceding cattle herd problem. This would hence demonstrate that badgers are still catching TB from cattle and invalidates the badger culling or vaccination strategy to control cattle TB. The answer is simple: better cattle tests are already available (Hancox, 1992 a&b). Unfortunately politics is more important than science in such cases, and badgers are still being culled in Austria because of rabies, despite the fact that the main vectors are foxes, and badgers were almost wiped out pointlessly in areas such as Belgium, Luxemburg, and parts of Germany.

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# Morphometric variation in the Badger (*Meles meles*): Clinal variation in cranial size and shape across Eurasia

# John M. LYNCH

The Eurasian badger (*Meles meles*) currently occupies most of the woodland and steppe zones of the Palaearctic. The northern limit of the species range is about 65° in Scandinavia, whilst the southern boundary runs through Palestine, Iran, Tibet, and southern China. The species has a subalpine distribution (below 1,600-1,700 m; Henry et al., 1988) within these regions and only rarely penetrates the Arctic Circle. Insular populations are found in Ireland, Britain, Sicily, Crete, Rhodes, Korea, and Japan (Corbet, 1978).

Despite this widespread Palaearctic distribution, there have been few studies of osteometric variation across the range of the species. Geographical variation is known to be considerable but there has been little consolidated examination of this variation. Ellerman & Morrison-Scott (1951) recognise 24 subspecies, while Long & Killingley (1938) retain 15 subspecies, but recommend that systematic revision was very much necessary. Most published studies have examined temporal variation since the end of the Pleistocene (Degerböl, 1933; Kurtén, 1965, 1967; Clutton-Brock, 1990; Grundbacher et al., 1990). These studies have found a general increase in the mean size of cranial and dental measurements over the last 10,000 years. Other studies have presented data on variation within restricted geographic areas. For example, Hell & Paule (1989) provide an examination of variation patterns within 210 crania from the Slovak Carpathians. In addition to comparing their data to other published univariate studies they offer an examination of sexual dimorphism within the species, concluding that, although the crania of males were significantly larger than those of the females, it was impossible to sex specimens accurately on the basis of cranial morphology, echoing the results of Hysing-Dahl (1954). Wiig (1986) re-examined Hysing-Dahl's data using a combination of various multivariate statistical methods, and found that, although there were size differences between the sexes, the primary difference was one of shape.

Lynch (1993) provides an analysis of craniometric variation among badgers from Europe. Substantial variation was found both in gross craniometry between populations from Ireland, England, Scotland, Czechoslovakia, and Norway, and in the degree of cranial sexual dimorphism exhibited within these

Principal Component II (4.85%)





populations (Lynch, in prep.). As part of this study, an attempt was made to quantify variation in the species across Eurasia. Crania of adult specimens were examined in museum collections throughout the British Isles. In total, 347 crania were available from 14 countries, with samples belonging to six putative subspecies, namely: *M. m. meles*, *M. m. marianensis*, *M. m. anakuma*, *M. m. leptorhynchus*, *M. m. ponticus*, and *M. m. tianschanensis* (Ellerman & Morrison-Scott, 1951). Eleven standard craniometric measurements were taken from each specimen and population means obtained separately for males and females. These data were logtransformed, and subjected to a principal component analysis (separately for each sex).

Full details of these procedures are given in Lynch (1993), suffice it to say that this analysis results in new variables (principal components) that allow the separation of size and shape variation. The analysis demonstrates the significant morphological variation in the badger across its Eurasian range. Male badgers could be differentiated both in skull size (PC1, 93.0% of total variation; Fig. 1), and relative skull breadth independent of size (PC2, 4.9% of variation). There was a general clinal trend in this variation, with western badgers having larger, relatively broader skulls and eastern badgers having small, relatively narrow skulls. Japanese specimens were characterised as having short skulls which were relatively as broad as those from western specimens. A similar pattern of variation exists for female badgers (Fig. 2).

Badger subspecies have traditionally been described on the basis of coat colour, form of the head stripe and presence or absence of the vestigial first premolar (Long & Killingley, 1983). While it must be recognised that further study is required, it would appear that East-West clinal variation occurs across Eurasia and the sole cranially distinct form occurs in Japan, although the sample sizes must be recognised as being rather small. Thus, *Meles* may be represented by two subspecies, the nominate form (occurring throughout Eurasia) and *M. m. anakuma* in Japan. Indeed, the results of this analysis also support the elevation of *M. m. anakuma* to specific status (as proposed by Baryshnikov & Potapova, 1990), giving two allopatric species in the genus *Meles*.



Fig. 2. Separation of female badger specimens on the basis of the first two principal components extracted from log-transformed population means.

There is no craniometric evidence for the proposed subspecific status of British Isles populations as M. m. britannicus Satunin, 1906, thus following the observations of Miller (1912) and Dadd (1970). As Long & Killingley (1983) note, many of the named 'kinds' of badgers are merely localised phenotypes of 'family' groups. insignificant microgeographic variants or intergrades between races. A conservative taxonomic revision will likely show that they are synonyms.

*Meles* appears to have evolved in the temperate forests of Asia and to have spread westwards into Europe. Thoral's badger (*M. thorali*) is evidently ancestral to modern Asian and European populations (Kurtén, 1968). By the early Middle Pleistocene, fossil forms were very similar to modern specimens, both in Asia and Europe (Kurtén, 1968). One can envisage a scenario by which ancestral populations migrated across Asia and Europe, increasing in size in response to favourable interglacial conditions (as may have occurred in other species; Geist, 1971, 1987; Endler, 1977; Thurber & Peterson, 1991; Hewitt, 1993). Similar clinal variation occurs in head pattern, resulting in three distinct geographical groups (Long & Killingley, 1983). The increase in size would appear to have occurred across both space and time (Degerböl, 1933; Kurtén, 1965, 1967; Clutton-Brock, 1990; Grundbacher et al., 1990).

Norwegian populations apparently originated from Denmark, whilst those in Finland originated from the southeast (Kurtén, 1968). British populations presumably colonised via the now submerged late glacial forest tundra of the North Sea (Starkel, 1977; Griffiths, 1993). The origin of the Irish populations has been discussed in Lynch (1993) and Lynch & Hayden (1993), and there appears to be some evidence for human-aided colonisation of the island during post-glacial times (rather than colonisation via a landbridge as previously assumed).

It is of note that variation among badgers in the British Isles is as great as variation between these populations and populations in mainland Europe (Lynch, 1993; in prep.). This, together with the distinctiveness of the Japanese population, shows the relative importance of peripheral isolates as sources of novel morphotypes (and one assumes, genotypes). Further study of other island badger populations is of interest to general theories about the role of peripatric populations in macroevolution (Mayr, 1963; Bush, 1975; Frey, 1993).

Further systematic studies within the genus are likely to have implications for the conservation status of individual populations, and thus form a priority for badger research in Eurasia (Griffiths, *et al.*, 1993). There remains an urgent need for morphometric and genetic clarification of the taxonomic status of the endemic putative subspecies on Crete and Rhodes, in line with requirements for other basic research on these populations (Griffiths & Thomas, 1993). Should these populations, in particular, prove unique, all possible attempts should be made to ensure their survival.

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# How to identify the tracks of the European mink (*Mustela lutreola*), the American mink (*M. vison*) and the Polecat (*M. putorius*) on waterbodies

## Vadim E. SIDOROVICH

Skills in identifying the signs of activities of mink and polecat are of great importance to the researchers of these species. They are also useful for amateur naturalists, photographers, and hunters.

As the practice in examining these animals in the wild as well as the confessions of numerous hunters indicate, the tracks of mink and the polecat are often very difficult to distinguish. In this paper I present detailed descriptions of various differences between the tracks of these carnivore species, based on the literature (Danilov & Tumanov, 1976; Heptner *et al.*, 1967; Rukovski, 1988), conversations with colleagues, and long-term personal observations of the animals in the wild. The distinctive features described may not always be clearly expressed, depending, above all, on the structure of the substratum in which the tracks of the animals are imprinted. Therefore, every possible feature has to be used to identify a species by tracks.

When examining the pads in the feet of mink and the polecat, it can be easily noticed that the European mink and the polecat have relatively large pads, while the American mink has considerably smaller ones. The differences are particularly convincing when individuals with approximately equal dimensions and weight are examined. In Fig. 1, the topography of the prints of the fore (above) and hind (below) feet of the polecat, the American mink, and the European mink are shown. Due to the specific character of foot construction, their tracks on soft ground or fine-granulated snow turn out differently. So, in the European mink and the polecat, the area of a track filled by the prints of digital and heel pads turns out to be considerably larger than in the American mink. Besides, some differences in the construction of heel pads can be noticed in a detailed figure of their tracks (Fig. 1). The possibility of identifying the European mink and the American mink on the ground was demonstrated by the author to Dr. Tiit Maran in Tallinn Zoo. The animals were kept in enclosures and were in their shelters. Identification of species by tracks on thin snow gave unerring results.



Fig. 1. Tracks of 1, Mustela putorius; 2, Mustela vison; 3, Mustela lutreola. F, forefoot; H, hindfoot.



Fig. 2. Grouping of the tracks: 1, Mustela lutreola; 2, Mustela vison; 3, Mustela putorius.

Another important feature of mink and polecat tracks is the way how the tracks are grouped in their succession. This can be observed on the snow, but also on muddy or sandy banks or on riverside deposits. The tracks of mink lie in pairs or in threes and fours (Fig. 2). At that, only one certain type of grouping prevails (80-100%) among a 200-300 metre-long mink trail. In the polecat, tracks are grouped differently, lying confusedly in twos, threes, and fours (Fig. 2), with pairs forming 40-60% of the trail.

In addition, Dr Włodzimierz Jedrzejevski (Mammal Research Institute, Polish Academy of Sciences) reports (pers. comm.) that he and his colleagues have been using another feature of track grouping for identifying the trails of the American mink and the polecat (Fig. 3). Namely, while polecat tracks lie evenly in a group and do not pass one another, the tracks of the American mink lie nearly always on an oblique line. I verified that this feature does not fit for distinguishing between the tracks of the European mink and the polecat, because like the polecat, the European mink sets its front and hind feet evenly, without passing one another. But this feature is very useful for identifying the tracks of the American mink in cases of the American mink and either the polecat or the European mink occurring together.

Several of the features that differentiate the tracks of these mustelids are known. On the whole, the European mink's tracks lie only in pairs, while the American mink's trails more often consist of three- or four-track groups (Fig. 2). The polecat's tracks lie at a minimum distance from one another, often being contiguous, the tracks of mink are a little more separated. The way in which an animal investigates the riverbank can also tell us a lot. This can be observed by tracks in the snow. Mink trails are very winding and run mainly across the bank, the American mink going more often to the flood plain and the nearby forest than the European mink. A polecat living on a body of water also remains mostly on the bank but it goes very often to the flood plain and the forest. Polecat trails are considerably straighter than those of mink. Besides, at temperatures below minus 3°C a polecat goes to the water in search of prey only extremely rarely as its fur is unfit for hunting in the water under severe winter conditions.

In spite of the variety of distinctive features, the tracks of the European mink, the American mink, and the polecat are difficult to distinguish even for experienced researchers of these species. Therefore, these distinctive features should be used cautiously in studies, especially in those connected with the collection of quantitative data.

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Fig. 3. Tracks of: 1, Mustela lutreola; 2, Mustela vison; 3, Mustela putorius.

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# **Badgers and bovine TB: update**

The Ministry of Agriculture in Britain (MAFF) announced a new 5-year badger cull on the 8th December 1993, in an attempt supposedly to control tuberculosis in cattle. This is completely unbelievable, since it involves a cull of only TB badgers with a 'Brocktest' that is only 41% sensitive, which was deemed to be impractical by the 1980 government report by Lord Zuckerman (Hancox, 1992, 1994). Moreover, the 1986 report by the Dunnet team even seven years ago noted that badger culls were ineffective, uneconomic, and logically should cease.

How can this extension of the 23-years old farce have been allowed to continue? It is as one ex-MAFF vet put it "political expediency pursued to the point of absurdity". Thus, there has been an upswing in cattle TB, but this is blindingly obviously a feedback to the replacement of 115,000 Mad Cows (bovine spongiform encephalopathy). And the situation will hence get worse until the better blood tests for cattle already available are brought in (Hancox, 1994). It is a lovely irony that the pressure from vets and farmers forced MAFF to check badgers on some 23 Exmoor farms which have been clear of TB for up to 40 years, but where up to 65% of badgers **now** have TB...i.e. caught from the cattle. That cow to badger transfer does **not** happen is the pivotal assumption underlying the whole badger cull scheme, and so it is beyond belief that everyone can now ignore this and condone more culls. Any cull or vaccine strategy is totally meaningless. Perhaps the most important lesson from all this is that the conservation and animal welfare bodies that are apparently prepared to condone this farrago, are in some cases involved with ongoing 'research' and other vested status and similar interests. The conflict between some other black and white conservation problems and vested 'scientific' or bureaucratic interests is seen elsewhere (Mowat, 1987; Schaller, 1993), or as F.W. de Klerk said on apartheid "when a policy becomes unworkable it becomes immoral to continue with it".

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# Wanted: Bile acid and hair samples from viverrids and herpestids For the past two years I have been conducting doctoral research on the small carnivore community of the Dzangha-Sangha Reserve in the south-western Central African Republic. In the course of this work, I have amassed a large scat collection. I plan to identify these seats by recovery of bile acids and hairs ingested by the scat-makers. Thope to be able to obtain reference examples (of oven-dried facces and of hair) from the following genera: Nandinia, Atilax, Bdeogale, Poiana, and Crossarchus. I would be very grateful if anyone with knowledge of the whereabouts of any captive specimens could contact me: Justina C. Ray, 3029 Ordway Street, Washington, D.C. 20008, USA. Tel: (202) 966-3188 / Fax. (202) 363-5480.

# Preliminary data on the status of the European mink's (*Mustela lutreola*) abundance in the centre of the eastern part of its present range

# Vadim E. SIDOROVICH and Aleksandr V. KOZULIN

In several papers (Tumanov & Zveryev, 1986; Rozhnov, 1993) the Tver (former Kalinin) and Smolensk Regions have been considered as the centres of the European mink's present range, with the most numerous populations of this vanishing species living there. Since these judgements are based mainly on a questionnaire sent to the members of hunting organizations in the years 1982-1984 (Tumanov & Zveryev, 1986), the actual status of the European mink may be quite different there at present. As no newer publications on this topic are available in the zoological literature, we tried to start research on the problem which is of utmost importance for the preservation of the Species in the Tver, Smolensk and Pskov regions is essential for getting a picture of the status of populations in north-east Belarussia, whether or not they are isolated (Sidorovich, 1992).

From 22 August to September 1993, abundance of the European mink was studied in the Nelidovsk and West-Dvina District of the southeastern Tver region. During this period, nine rivers of various magnitudes were studied, either partly or entirely: small rivers Arbuzovka, Mozhaika, Velesa, and Kamenka, which form the upper course of the medium-length Velesa River in the vicinity of the Central Forest Biosphere Reserve; an approximately 120-km stretch of the medium-length Mezha River between Krivtsovo and Zharkovkij villages, and its small tributaries Mglaya, Chichatka, Shesnitsa, and Chernushka. On the whole, about 200 km of rivers were studied within 13 days.All the studied parts of the rivers are located in areas that are relatively little transformed, and sparsely populated by man.

Unfortunately, it is very complicated to make precise counts of mink during snow-free periods. Therefore, the data obtained do not permit calculation of the exact density of the European mink on the studied parts of rivers, so the results presented below have to be taken as approximate. We covered the Mezha River by boat, examining all the bank sections favourable for the European mink. Small rivers were examined on foot along both banks. At that, existence and abundance of mink tracks were observed. 1-1.5 km river sections where tracks were concentrated were taken as home ranges of one adult mink (in case there were relatively few tracks there) or of a family group consisting of a

female and cubs (in case tracks were especially numerous and of different size). This is in full correspondence with literature data on the relative extent of the European mink's home range (Heptner et al., 1967; Danilov & Turnanov, 1976). According to the results of Danilov & Tumanov (1976) and our own data (Sidorovich, 1993), we assume that the average litter consists of about 3.5 cubs the moment of their separation. Based on the approximate data obtained, we attempted to estimate the European mink's population density in the pre-reproductive period (March-April) and its probable population density in the post-reproductive period by the beginning of the hunting season (November). Such an approach is perfectly fit to express estimates of the status of a species' abundance. As far as possible, we tried to ascertain whether the American mink inhabits the rivers, and what part does it forms of the mink population. We succeeded in taking a closer look at three minks, two of which were unquestionably American ones. We also tried to identify the species by clear tracks found on the ground during an original distinction between these two species (Sidorovich, 1994). In the European mink, the area of a track filled by the imprints of the heel and digital pads is considerably larger, which can be explained by the comparatively bigger size of the pads. We also questioned seven local hunters. One of them gave us the skulls of two American minks he had caught on the River Velesa near the village of Vibiryevo in January 1993.

The results of the study are presented in Table 1. The table indicates that the probable population density of the European mink in the study area ranges from one specimen per 20 km of riverbank to two specimens per 10 km. This is the density typical of the European mink's vanishing populations in NE Belarus (the Vitebsk region) at present. According to our information, in a relatively stable population of the European mink on the upper course of the Lovat river, the population density of the species ranged from 4 to 10 individuals per 10 km of bank prior to the year 1989. Similarly, the relatively stable populations of the European mink in the Pskov region also showed such high densities. The Tver, Smolensk, Pskov, and Vitebsk regions are located next to each other and are similar in ecological conditions. All this refers to the fact that the present status of the European mink in the examined areas of the Tver region of Russia is close to critical.

River, lenth (km)	Number of mink home ranges (incl. family home ranges)	Distances between home ranges (km)	Approximat density (inc	Approximate percentage of American mink in the population	
			Pre-repr. period	Post-repr. period	
Mezha (120)	18(7)	3 to 12 (avg. appr. 6)	1.5	3.5	
Mglaya (21)	3(1)	3 to 8	1.4	3.1	
Chichatka (10)	1(0)		1.0	1.0	appr. 20 %
Shesnitsa (12)	1(1)	-	0.8	3.8	
Chernushka (8)	0	-	0	0	
Upper Valesa (29): Arbuzovka, Mozhaika, Velesa, Kamenka	7(4)	2 to 5	2.4	7.2	60-80 %

The species is vanishing rapidly, far more rapidly than many researchers and conservationists imagine. So, in NE Belarus some comparatively stable, or even prospering local populations of the European mink in the basins of medium-length rivers, have come to the verge of extinction within 5-7 years. Within 10 years the process of disappearance will probably have come to an end.

The data obtained in the Tver region point to two kinds of reasons of the European mink's extinction. On the upper course of the Velesa River, the American mink is expanding, and the active supersession of the European mink is probably taking place. This complicated and intense process was studied in detail on the upper course of the Lovat River (Sidorovich, 1993), where a prospering population of the European mink lived before the American mink's appearance. On the Mezha River, the depression of the European mink's population seems not to be caused by the American mink's expansion. It has probably been called forth by other factors presented in the literature (Tumanov & Zveryev, 1986; Schröpfer & Paliosha, 1989) or by some complicated reasons, as yet unstudied.

The results of our study suggest that the notion of the status of the European mink's abundance in the centre of its current range in the Tver, Pskov, and Smolensk regions of Russia requires prompt revision. Urgent qualified research of rivers in the area under discussion is absolutely necessary.

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# Some causes of death in reproductive female mink (Mustela vison)

Losses due to mortality and sterility among female American mink in fur farms are significant and a better knowledge of their pathology should prove important in the captive breeding of the European mink (M. lutreola). In order to clarify this point the authors investigated cadavers of adult females from different ranches (most highly infected with Aleutian disease [AD]) which had died in the mating season, at different times in pregnancy or lactation, or had been discarded and slaughtered as rejects. Foetal mortality was recorded in half of all the gestating females. The number of dead fetusses was 40.4% including 14.4% resorbed embryos, 2.7% mummified embryos and 23.3% of foetusses with deformities e.g. with the intestine growing outside the abdominal cavity, with defective extremities or curved spine or jaws. In six instances, incorrect positioning of the foetus was noticed. Deaths of the foetusses were noticed in all growth stages, but more often in the latter half of the gestation period. Resorption of the embryos occurred in the females that were in the first stage of gestation.

Carcasses with lesions of the reproductive system frequently showed pathologic signs in other organs such as AD, TB, purulent pleuritis, septicaemia, and urolithiasis. AD and fatty liver syndrome due to a faulty diet accounted for 70% of all the losses among adult females (Martino & Villar, 1987). Moreover, investigations carried out in recent years have established that AD accounted for the largest numbers of deaths among adult mink in our farms (Martino *et al.*, 1991; Martino, 1989). Also, reproductive failure (distocia, abortion, ruptured uteri during parturition with peritonitis) led to 3% of the diagnosed deaths, but prevalence is potentially high. In some instances we found cases of purulent vaginitis, ovary cysts, cervicitis and secondary ulcerative metritis with incrimated streptococcal infection. The presence of foreign bodies like vegetable material during oestrus is suspected to be a predisposing factor.

Eclamptonic toxemia can occur a few days pre-whelping, and can result in the death of the foetusses but rarely of the dam. Also nursing sickness and mastitis usually occur at wearing and have very slow mortality. Shock caused by stress is common in this highly susceptible species, it frequently terminates fatally in sudden death with little post-mortem change. Bacteriologic cultures of the uteri and foetusses usually revealed agents like E. coli, Proteus spp., coliforms and Bacillus spp. (Martino et al., 1991). The isolation of these organisms is probably only significant when they are present in pure culture, although the presence of E. coli should always be viewed with suspicion (Martino & Villar, 1990). Brucellosis and toxoplasmosis were not detected in our study, although they seem to play a role in fetal mortality in view of the serologic evidence. In spite of this the role of hygiene in controlling opportunistic pathogens has not been fully evaluated: care in cleanliness and disinfection of premises should not be overlooked. In some cases normal fertility has only been restored to breeding animals after a move to new premises. Strict compliance with the rules of hygiene for the maintenance, feeding and care of the animals especially of gestating females, should help to reduce embryonic mortality, thereby enhancing the fertility of females.

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# Sables (Martes zibellina) in managed forest of northern China

#### Steven W. BUSKIRK, MA Yiqing and XU Li

The Sable (Martes zibellina), a close relative of the Eurasian pine marten (M. martes), occurs in five countries: Russia, Outer Mongolia, People's Republic of China, North Korea, and Japan. The sable underwent severe declines in distribution and abundance in the 19th and early 20th centuries. In Russia, it has largely recovered, in part because of strict protection and transplantations of over 15,000 animals (Bakeyev & Sinitsyn, in press). But in China, the sable has continued to decline throughout this century and is now endangered (Buskirk et al., 1993). This is the result of uncontrolled hunting, the conversion of Chinese forests to other land uses, and timber cutting. In October 1991, we began a study of sable ecology in the Daxinganling Mountains of northern Heilongjiang, People's Republic of China (51°52'N, 123°12'E; Fig. 1). Our goal was to understand better the commonalties of habitat use among sables and other martens, and how timber cutting of coniferous forests influences sable behavior and populations. Our understanding of other martens, especially the American marten, enabled us to predict specific ways that sables should respond to habitat attributes and habitat disturbance. We expected that sables would prefer old coniferous stands, with large standing trees; that they would associate with high densities and diameters of coarse woody debris (logs, branches, and root masses) and that they would forage mostly where logs and other woody debris penetrated the snow surface. We also predicted that human cutting of trees and removal of coarse woody debris would affect sables' site preferences. If the sable were found to be sensitive to ecological succession and forestry practices, it could be a useful model for investigating the effects of forestry practices on other wildlife of boreal Asia. Forests of northern Heilongjiang are dominated by conifers: larch (Larix gmelini) and Mongolian pine (Pinus sylvestris var. mongolica). In addition, brushy pine (P. pumilla) is locally common as a mid-story shrub on ridgetops and north-facing slopes. Poplar (Populus spp.) and birch (Betula spp.) also are common in various growth forms. Our study area had been partially logged by selective cutting of large-diameter larch and Mongolian pine 3-10 years earlier, and intensive cutting of understory shrubs, mostly Rhododendron, was locally common. Clearcutting is not used in northeastern China, therefore we were unable to study the sable's response to it.

We have studied several aspects of sable ecology and behavior. Habitat use while foraging was investigated by tracking in new snow. Resting sites were located by snow tracking and by radio telemetry. Telemetry was also used to study diel activity patterns. Diets are being studied by collecting scats (n>250) from along snow trails, and from latrines at resting sites. We also sampled small mammals available in the study area with baited mouse traps. Small mammal captures will be compared with sable diets.

Sables are rare enough that we had difficulty finding places in which to study them. We captured sables with baited box traps and leghold traps, using a variety of baits and lures. Under ketamine hydrochloride anesthesia, we weighed and sexed them and attached 19-g radio collars. Once collared, sables were tracked to resting sites daily. Our first two years of study suggest that sables are rather non-selective of habitat attributes for foraging, but that while resting they prefer attributes associated



Fig. 1. Study area for sables in northern Heilongjiang, People's Republic of China, October to December 1991. Circles indicate resting sites of radio-collared sables.

with late successional stages: large-diameter trees, and large diameters and volumes of coarse woody debris. Sables appear to prefer mixed-species associations of shrubs over pure stands for both foraging and resting. Loggers selectively cut large, old trees, which leaves stumps larger than naturally occurring stumps.

Our results from two field seasons suggest that sables prefer the same habitat attributes as the American marten, and that selective cutting of large-diameter trees may be expected to influence sable behavior and populations. The Chinese sable appears to be a useful, albeit endangered, model for examining the effects of forestry practices on coniferous forest vertebrates in East Asia. Sables exhibited patterns of habitat selection consistent with the premise that boreal forest martens occupy a single circumboreal habitat niche. The role of coarse woody debris in addressing specific life needs of forest vertebrates, for example, thermoregulation (Taylor, 1993) and access to subnivean spaces (Corn & Raphael, 1992), is being recognized increasingly. This line of investigation is helping to illuminate how coarse woody debris - the dynamics of which are influenced in opposing ways by succession and forestry practices - can affect behavior, and perhaps populations of forest wildlife.

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# Trade in civetone from the Indian small civet (Viverricula indica) from Malabar, India

# R.S. Lal MOHAN

The Small Indian civet (*Viverricula indica*) is kept in many households for extracting 'civetone'. The extraction of 'civetone' (which is known locally as 'merupuzhu' in Malayalam), is a commercial enterprise amongst the people of the districts of Cannanore, Kozhikode, Malappuram, and Trichur (Kerala State). The skin of the civet is also used in the preparation of ayurvedic medicine against epilepsy. The skin is known as 'merupatta', and it is also used for medicinal purposes.

Ayurvedic physicians use it for ayurvedic medicines such as 'gonoganadhi' pills for general health, 'vayugulika' for gastric complaints, and 'dasamularishtam' for asthma. 'Balathailam' which is given for internal injuries contains 'civetone'. Fresh 'civetone' is also mixed with tea or coffee and given to asthma patients.

According to Battacharyya (J. Chem. Soc., 114, 1963) civetone' is a semi-solid, yellowish brown, unctuous substance, unpleasant and sub-acrid, with a noxious odour, but becoming pleasant at great dilutions, and burning without much residue. It is insoluble in water, and is partly soluble in hot alcohol and in ether.

Chemically 'civetone' is a 9-cycloheptadien-1 with the formula  $C_{17}H_{30}O$ . Its molecular weight is 250.41 (81.5% C, 12.1% H, 6.4% O). Its melting point 31°-32°C, density 0.92, boiling point 742°C. It also contains ethylene ketal ( $C_{19}H_{34}O_2$ , melting point 21°-22°C), semi-carbazone ( $C_{18}H_{33}N_{30}$ , melting point 190.5°-191°C), oxima ( $C_{17}H_{31}NO$ , melting point 92°C), and p. nitrophenylhydrazone ( $C_{23}H_{34}N_3O_3$ , melting point 125°C).

The civets are kept in captivity for a period of about 3-4 years. They die in captivity and animals are replaced from the wild. They are caught by specially made traps. Mortality during capture is common. A few are recovered from empty wells into which they fall whilst chasing birds or lizards.

The meat of civets and palm civets is in great demand .ocally as it is believed to have medicinal properties.

In captivity they are fed with domestic waste (rice and curry), rats, meat, egg, and even fruits like plantain. They seem to be omnivorous in captivity, but they prefer meat. The Indian variable lizard (*Calotes versicolor*) is its favourite food. The civets produce more 'civetone' when fed with *Calotes*. Civets are not easily domesticated. Though young ones are reared along with cats, they show their ferocious characters when they become adult. When anyone approaches their cage they snarl vehemently. Usually only one animal is kept in a cage, but keeping two or three animals together is not uncommon. In one household, civets are

kept along with a palm civet, *Paradoxurus hermaphroditus*, though they fight. The civets are not known to breed in captivity, but artificial insemination is practised in the households.

The civets are kept in cages made of wooden planks with two compartments. Cages with wire mesh sides are also common. The cages are  $1.75 \times 0.80 \times 0.75$  m. Local mango tree timber is used. The cages are provided with a provision to keep an aluminium rod of 2-4 cm diameter against which the civet can rub its anal gland. The 'civetone' is removed from the rod periodically. It is estimated that 1 g of civetone can be obtained from an adult civet every 4-5 days.

The 'civetone' is sold at a rate of 30-40 Rs./g. It is rather difficult to get pure 'civetone' as it is often adulterated with butter, ghee, or even plantain. A certain amount of 'civetone' is smuggled from the Arabian countries and sold as 'javad'. It is quite possible that 'civetone' from Nepal finds its way here due to the high prices here. Currently there are about 250 households holding about 500 Indian small civets in captivity. Hence the total yield may be about 2kg/month, with the value of the trade being about \$ 32,000/annum. Furthermore there is also a prevalent trade in live animals. Though young ones are sold for Rs. 100-200 (\$ 3-7), adult, captive-bred animals are sold at a rate of Rs. 800 (\$ 25). The fabrication of the cages and the marketing of the 'civetone' also generates trade-related business.

The Indian Wildlife Protection Act of 1972 and its recent Amendment in 1990 totally prohibit both the keeping and capturing of civets without either a licence or permit from the Department of Forestry. The implementation of such rules is very difficult, as the animals are kept in captivity in remote villages, very often in Muslim households (which are difficult to approach). Due to the fear of being raided by forest officials, the animals are kept in secrecy and without veterinary care. For these reasons, the mortality of civets in captivity is quite high. Paraplegia is the commonest symptom seen in these civets.

It is worthwhile that 'civet farming' is encouraged as in some of the African countries, so that the animals can be reared scientifically, and proper medical care can be given. The government should give licences freely, and the 'civet farmers' should be registered and free veterinary treatment and welfare care made available. The population of civets is becoming depleted due to habitat loss and habitat degradation, along with other anthropogenic causes. Under current conditions scientific farming may be the only way to save the civet.

### Conservation of Nature Trust, Calicut - 673 005, India

#### Erratum

The National Federation of Badger Groups have asked us to point out that the "Seminar on treatment and rehabilitation of radgers" (reviewed in issue N°9, p. 24) is simply an unedited transcript of talks given at a one-day seminar hosted by the Wiltshire Badger Group. The booklet is therefore not a formal publication and is not available from NFBG free-of-charge.

# Viatcheslav V. ROZHNOV

The milk teeth of the ferret-badgers and hog-badgers are little known. The most detailed information on this system in young badgers and in other mustelids, with a review of milk teeth in this family is given by Baryshnikov & Averianov (1990). However, these authors had limited material of *Melogale* and *Arctonyx*, so I'd like to complete these data in this article.

There are two skulls of young *Melogale personata* and *Arctonyx collaris* from Vietnam in my collection. The young female of *M. personata* was caught on 7.10.1986 in the southern part of Vietnam (Central Annam, Zalai Province, 50 km north of Ankhe City, 14°20'N, 108°36'E, primary tropical forest, 700-800 m ASL). The young female of *A. collaris* was caught on 6.5.1989 in the northern part of Vietnam (Tonkin, Bakthai Province, 10 km south of Cho Don village, 22°05'N, 105°40'E, bamboo forest, 600 m ASL). Below I characterize the milk teeth of these specimens. Their designation is given after Baryshnikov & Averianov (1990). The measurements are given in Table 1.

On the upper jaw the young female of M. personata has four permanent interior incisors 11-2, and the outermost milk incisors dI<sup>3</sup> (behind dI<sup>3</sup> the permanent I<sup>3</sup> are visible in alveoles). The canines are milk teeth (dC<sup>1</sup>), but in front of them the permanent ones are visible in alveoles. All the upper molars are milk teeth  $(D^{2-4})$ . The first upper molar  $D^{1}$  (the same as  $Pm^{1}$  in adults) is present. The place behind D4, where the adults have M1 is vacant, but through a small triangular hole in the jaw the developing  $M^1$  is visible. The  $D^1$  and  $D^2$  have the same height; D<sup>2</sup> is slightly inclined inside. In the lower jaw, four permanent incisors I<sub>1,2</sub> are formed and I<sub>1</sub> is cut, the milk incisors are absent. The canines are milk teeth  $(dC_1)$ , the permanent ones are visible in alveoles in front of them. The lower molars are milk teeth  $(D_{\gamma,i})$ , the first lower molar D, (the same as Pm, in adults) is present. The place behind  $D_{4}$  is vacant (where the adults have  $M_{1,2}$ ), but through an enlarging hole in the lower jaw the forming M, and M, are visible. The structure of the milk teeth of this specimen of M. personata corresponds to the description of that of M. orientalis by Baryshnikov & Averianov (1990).

The ratio of the height of D<sup>1</sup> and D<sup>2</sup> of the upper jaw is very interesting. That of Pm<sup>1</sup> and Pm<sup>2</sup> in adults is a diagnostic character in *Melogale* (Everts, 1968): *M. moschata* have similar Pm<sup>1</sup> and Pm<sup>2</sup>, but the Pm<sup>1</sup> of *personata* is smaller than the Pm<sup>2</sup>. If this skull belonged to *M. moschata*, then this ratio in the young specimen had to be regular; but the adults of this form have the same ratio of Pm<sup>1</sup> and Pm<sup>2</sup>. It is the skull of *M. personata* and the observed ratio that can reflect the phylogenetic relationships of both species, and the process of specialization of *M. personata*. During this process Pm<sup>1</sup> is reduced at the expense of an increase of Pm<sup>4</sup>. The presented phylogenetic scheme corresponds to that of Everts (1968).

The young female of *A. collaris* has the following teeth structure. In the upper jaw the incisors are completely absent, but all six strongly developed incisors in alveoles seem to be permanent. Before the milk canines  $dC^1$  the permanent ones are visible in the alveoles.  $D^1$  and  $D^2$  are cut and very small. They are behind  $dC^1$  and close to each other. A great diasteme separates the formed

Measurement	Melogale personata	Arctonyx collaris	Measurement	Melogale personata	Arctonyx collaris
Upper jaw			Lower jaw		
<ul> <li>dl<sup>1</sup> width height</li> <li>dC<sup>1</sup> length width</li> <li>D<sup>1</sup> height</li> <li>D<sup>2</sup> length width height</li> <li>D<sup>3</sup> length width</li> <li>metastil length</li> <li>talon length</li> </ul>	0.9 2.2 2.1 1.2 1.5 2.5 1.1 2.0 5.1 3.0 2.5 1.3	- 3.1 2.2 - 2.4 0.9 - 5.8 2.1 2.0 1.1	dC, length width height D <sub>2</sub> length width height D <sub>3</sub> length width height D <sub>4</sub> length talonid length	2.0 1.5 3.8 2.0 1.1 2.7 3.3 1.5 2.7 5.5 1.4 2.4	3.7 2.3 5.6 - - 4.5 1.9 3.1 7.3 0.9 3.0
talon width	1.7	0.2	talonid width	2.4	1.4
height D <sup>4</sup> length width height	4.0 3.3 3.6 2.2	2.6 4.4 3.0 2.1	height	3.3	4.5

Table 1. Measurements (in mm) of milk teeth of young badgers.

 $D^3$  and  $D^4$  from  $D^1$  and  $D^2$ . An absence of the talon is characterizing  $D^3$ . Behind  $D^4$  there is a lengthening, but narrow, hole in the jaw, and the formation of  $M^1$  is visible. In the lower jaw the milk incisors are also absent. There are six permanent incisors in alveoles.  $D_1$  and  $D_2$  are cut, but they are very small and one is close to the other.  $D_3$  and  $D_4$  are formed and separated from  $D_1$  and  $D_2$ by a great diasteme. Behind  $D_4$  there is a lengthening and narrow hole in the jaw, and the formation of  $M_1$  is visible.

The structure of the milk teeth of this specimen of A. collaris corresponds to an analogous description by Baryshnikov & Averianov (1990). It confirms the reduction of the talon of  $D^3$ and the inequality of this species of mustelid suggested by these authors. The presence of the strongly developed incisors in alveoles makes doubtful the existence of milk incisors in this species. The question is passed over by Baryshnikov & Averianov. The present data on the milk teeth of A. collaris could lead to a conclusion about the evolution of badgers. They confirm the regularity marked by Baryshnikov & Averianov (1990), and particularly a tendency towards reduction of the milk incisors in Mustelidae. These authors proposed an increased reduction of the incisors in the sequence Helictis (=Melogale) - Meles - Taxidea. But the level of reduction of these teeth in Arctonyx is the same (if not more) than in Taxidea. This shows on one hand a great degree of completion, and on the other hand, the parallelism of these processes in Melini and Taxidini.

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# Mountain coati project in Colombia

The Mountain coati (*Nasuella olivacea*) is the only procyonid that lives higher than 2,000 metres above sea level. It becurs in the high Andes of Colombia, Venezuela, and Ecuador. Mthough described 150 years ago by Gray (1843) the species is practically unknown and its natural history and biology have not been studied, in contrast with the other members of the procyonid tamily.

The mountain cusumbo inhabits the cloud forests of the Andes. These ecosystems are very delicate and, because of the uman activity of cutting down trees to turn land into agricultural elds or grasslands, these forests are in danger of disappearing. We feel that, by studying the species living in such forests and by carning about their faunistic value, these ecosystems will receive fore attention and hopefully greater protection.

The purpose of the project "Mountain coati in Colombia" to make a contribution to the understanding of the ecology of tis small carnivore. This project's activities will include studies the species' home range, feeding habits, the make up of social troups and the social behaviour of the mountain coati. During the titial phase of this project (which will take place from October 493 to May 1994) we will define the characteristics of the home anges of the social groups and of solitary males, and also their ceding habits. The females and young coatis that comprise the social groups will be captured with net traps, and the solitary tales with individual traps. Males and females will be fitted with tansmitter collars for tracking by radiotelemetry. Feeding habits will be determined by faecal analysis and by direct observation tom hides at places at which they are most frequently found.

The Carpanta Biological Reserve has been designated as restudy site. Located in the eastern mountain range of Colombia, us biological reserve is made up of 1,600 hectares and from hich sightings of the species have been frequently reported.

So far a grant of 1,500 US\$ has been donated by the WCS-YZS, the Wildlife Conservation Society Division of the New ork Zoological Society, GEA Ecological Group, and the Divion for the Environment FES of Colombia. The total costs of the roject will amount to 6,075 US\$. Some logistic support has also een provided by the Nature Foundation of Colombia and the



Aqueduct and Sewege System Company of Santafé de Bogota, who run the Carpanta Reserve.

Anyone who is interested in details of the project may write for a copy of the whole project (in Spanish). At the same time any donations of equipment or money that anybody could contribute would be received with great pleasure. Write to:

# Abelarde Rodriguez Bolanes & Alberto Cadena, Instituto de Ciencas Naturales, Universidad Nacional, Apartado Aereo 7495, Santafé de Bogota, Colombia (FAX: (57-1) 268 24 85

#### News

#### rom Anthony C. Sebastian ...

Project Proposal: Preliminary observations on the Otter civet *Cynogale snettil* in captivity:

te presence of two male otter civets at Zoo Negara, Kuala Lumpur (Malaysia) wides an opportunity to make some preliminary observations on this species, pservations such as this, which are extremely difficult to make in the wild, can wide useful information on behaviour and feeding habits, and would be luable in determining the habitat. The results could enable field surveys to cotify populations in the wild, and could also be used as a base for the rmulation of ecological and biological studies on this species.

Asian Wetland Bureau, Institute of Advanced Studies, University of Malaya, Lembah Pantai, 59100 Kuala Lumpur, Malaysia

#### from Rodney A. Mead ...

The Center for Wildlife Conservation (Seattle, WA) has recently funded studies to:

- Use DNA fingerprinting techniques to study genetic variability among Fishers (*Martes pennanti*) in North America and determine whether fisher in the Pacific Northwest are genetically distinct from other populations.
- Utilize remote cameras to survey areas in the State of Washington known to contain fishers in order to locate a resident population for intensive study.
- Develop noninvasive techniques for analysis of faecal steroid metabolites to assess the fertility and stress levels of wild populations.
- Establish one or more captive breeding groups at Northwest Trek to perfect methods of husbandry, breeding, and rearing of fishers.

University of Idaho, College of Letters & Science, Dept. of Biological Science, Moscow, Idaho 83844-3051, USA

### Michael ALBERICO

Schreiber et al. (1989) reviewed the state of our knowledge about the little known Colombian weasel (Mustela felipei) and made a plea for its study and protection, calling it "probably South America's rarest carnivore". They cited three specimens known to science from Colombia and one from Ecuador, and made some tentative suppositions about the likely ecological preferences of this species.

More recently, Fawcett (1993a, b) included some preliminary information about another specimen collected by myself and students from the Universidad del Valle. Given the interest this species has awakened in the conservation community, it seems worth while to give more detailed data regarding our specimen and the conditions under which it was collected as these might aid future researchers in discovering resident populations.

The new specimen of *M. felipei* was collected at Alto de Galapagos, on the border between the Departments (=States) of Valle del Cauca and Choco,  $(04^{\circ}51'N, 76^{\circ}25'W, ca. 2,000 \text{ m} ASL)$ , on the night of 4 Aug. 1988. The collecting party included Jorge H. Restrepo, Omaira Ospina and myself. We set a total of 100 traps; the specimen was captured live in a folding Sherman live-trap (8 x 9 x 23 cm) placed 10-15 m from the roadside in mixed grassy and low herbaceous vegetation, and baited with cracked corn mixed with large pieces of canned sardines in oil. This particular site represents the crest of the western cordillera of the Andes where the only road has been cut leading to San José del Palmar. The slopes are very steep and there are no permanent watercourses.

This record represents the first report of this rare species for the Departamento del Valle del Cauca, the Departamento del Choco, and the western Cordillera of the Andes. It also represents the northernmost extension of its distributional range. Based on the now confirmed localities we could hope to find populations in suitable habitat in all three Colombian cordilleras.

The collecting site is surrounded by partially intervening cloud forest. This locality is of botanical interest and is very rich in ferns, Gesneriaceae, and Ericaceae. Extensive plant collections are housed principally in the Herbarium of the Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogota (J. Luteyn, in litt.).

The Alto de Galapagos has also been a locality of interest for faunal collections, especially mammals and amphibians. During our visits from 1984 to 1986 we collected the following specimens: Didelphis albiventris (1), Marmosops impavidus (1), Caenolestes convelatus (3), Heteromys lomitensis (1), Oryzomys albigularis (23), Aepeomys fuscatus (1), Thomasomys aureus (12), T. cinereiventer (23), Rattus rattus (1), and Echinoprocta rufescens (1). With the possible exception of the first and last species, all of these could be considered as potential prey for weasels.

The live *M. felipei* was given a thick slice of cold sandwich-style sausage before the trip to Cali on 5 Aug., but was found dead on arrival. The specimen was prepared as a standard skin and skull (field number, MSA 1756) and catalogued in the Universidad del Valle Collection of Mammals (UV 7483). This individual is a female (no embryos or other signs of reproductive activity) with the following standard skin and body measurements: 347-122-38-18; 138 g. These are somewhat greater than those of the holotype and paratype (Izor & de la Torre, 1978) for total length and tail length, but slightly shorter for hind foot.

The skin coloration agrees with that described for the type specimens (Izor & de la Torre, 1978). The elongated dark brown oval on the underside of the neck measures roughly 18 mm and is separated from the shoulders by about 10 mm.

The skull shows fused naso-maxillary sutures, indicating an adult animal (Hall, 1951). Some comparative skull measurements are: condylobasal length, 41.8; zygomatic breadth, 25.4; mesaptrygoid fossa breadth, 4.0; least interorbital breadth, 10.3; postorbital constriction, 11.6; maxillary toothrow, 12.5. The following teeth show considerable wear: left I3, left C, right C, right PM2 (only the root embedded in the alveolus remains), and left PM3.

Izor & de la Torre (1978) mentioned that *M. felipei* has dark dorsal coloration, resembling that of *M. vison*. They also noted that the palmar and plantar surfaces lack hair. Fawcett (1993b) apparently misinterpreted these authors and cited them as saying that *felipei* resembled vison ecologically. Schreiber et al. (1989) stated that this species "has been collected along rivers" and, later, concluded: "If the species depends on riverine habitats...it must be considered to be of great conservation concern" (italics mine). Wirth (1990) suggested that *M. felipei* might be seriously endangered by mercury pollution of rivers resulting from gold panning.

The Alto de Galapogos locality is an important addition to the body of knowledge concerning M. felipei. The fact that this site is not near any riverine or riparian habitats casts doubt on the suppositions about its "semi-aquatic" habits. The naked foot surfaces and interdigital webbing, if adaptive, rather than implying aquatic habitats, may be useful for life in the tropical cloud forest, where the almost-daily rains and high humidity maintain the soil near saturation.

It seems to me that any attempt to place ecological constraints on this little-known carnivore would be for the moment premature. All carnivores probably visit bodies of water regularly in search of prey, but this is not necessarily indicative of habitat restriction.

#### Acknowledgements

In addition to the students mentioned above, I would like to thank Dave Fawcett for his encouragement to publish this note and Luis German Naranjo for critically evaluating the manuscript.

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# Symposium on the Viverridae in Vietnam

This symposium, which summed up the results of research opperation between different scientific organizations of Vietam on the theme "Study of techniques of captive breeding of ome economical endangered species of Viverridae in Vietnam", ook place in Hanoi last year. The symposium was organized by ne Institute of Ecology and Biological Resources of NCST of SRV and Hanoi University. The collection of articles summarized 11 the main researches of Vietnamese Viverridae during the last pree years.

There were 35 scientists who attended this symposium, 32 them were from Vietnam, two from Russia and one from Australia. The symposium was opened by the report made by Dr tham Trong Anh, the famous specialist in carnivorous mammals tvictnam. He mentioned in particular the successful breeding of ome rare Vietnamese species of civets, such as *Chrotogale asstoni*, *Paguma larvata*, *Arctictis binturong* and *Paradoxurus crmaphroditus*.

Dr Nguyen Thi Ha (Hanoi Zoo) brought new data on ceeding civets in captivity, including the diet consisting of different fruits and animal protein, and a percentage of different components in the balance of foodstuff for civets.

Dr Ngo Bich Nga (Hanoi Zoo) in her report analysed the tiseases of civets. She showed that symptoms of diseases of civets are similar to symptoms of human haemorrhagic fever. The origin d diseases of *Chrotogale owstoni* was not clear yet, because the fead civets had untypical symptoms, but the symptoms of kidney and liver diseases were most similar to arbovirus infection.

Dr Nguyen Xuan Dang (IEBR NCST) described the menods of breeding some species of civets in captivity. He conirmed his data by a great number of histological and physiologial facts. The most interesting data were obtained for postimbryonal evolvement of such rare species as *Chrotogale owstoni*, recause for the first time in the world this species of civet bred in aptivity. It happened in Hanoi Zoo. After the main reports there was a discussion about the problems connected with all sides of research of the Viverridae. Dr Trinh Viet Chong (Veterinary Institute) pointed out that symptoms of civet diseases are very similar of those of dogs.

Prof. Pham Thi Lang (Veterinary Institute) and Dr Nguyen Thi Giao (Hanoi Institute of Tuberculosis) spoke about the symptoms of specific diseases of civets, their early diagnosis and first of all the control of contagious diseases. Dr Pham Trong Anh (IEBR NCST) emphasized that the classification system of the Viverridae is not clear yet and this problem needs some investigation.

Dr G.V. Kuznetsov (Russia) thanked the organizers of the symposium for the invitation, and mentioned the great success of Vietnamese zoologists in the study of the Viverridae, because the last three years were very successful, especially in breeding the rare species *Chrotogale owstoni*. He emphasized that the serious researches were made possible thanks to the help of the Hanoi Zoo.

The director of the Hanoi Zoo Mr. Le Sy Thuc spoke about the many problems in the study of carnivores, and mentioned that all organizations involved in these researches must cooperate more closely, using modern scientific equipment and technical staff.

In the conclusion the director of the IEBR NCST Prof. Dang Huy Huynh thanked all participants of the symposium and emphasized the importance of such symposiums, because of the urgent necessity of breeding many rare animals in captivity.

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# **Otter and Mink in France**

The French Mammal Society (Société Française pour l'Etude et la Protection des Mammifères, SFEPM) had its annual meeting last October in Niort. The agenda was devoted to two European mustelids that are both endangered, the European otter (*Lutra lutra*) and the European mink (*Mustela lutreola*). More than 200 people attended the meeting, coming from eight different countries.

The SFEPM had been engaged in two research programmes, one on each of these two species, with grants from the French Ministry of Environment. The programme ended in 1993 for the otter but is still continuing for the mink. Results were shown in the field of radiotracking, ecotoxicology, food ecology and protection for the otter. Speakers from other countries, from Algeria to the Shetland Islands, exposed their own experiences.

For the mink, the research programme starting with a survey of its actual distribution, follows the same protocol in Spain and in France. The programme will last for five years and the results of the first two years were presented. In France, 17 departments have been surveyed, all along the western Atlantic side, where the historical repartition of the species seems to be. The survey unit is represented by hydrographic areas.

A special trap has been developed so that the animals can be measured easily. They are released on the spot. After two years, 37 areas have been surveyed and 13 still have European mink. A total of 25 animals has been caught. In every trapping session, 76% of the captures were made within the first 10 days. No animal has been found in Brittany. All the areas with mink are in the south west part of the historical range. The average weight of the French male European mink is 943 g.

Some results have also been presented for Spain where animals have been found only since 1989, first in Navarra then at the mouth of the Elbe River and in october 1993 in the Cantabrics Mountains. All were found below 700 m of altitude. Some were caught in really polluted waters: 174 ppm for PCB! A 460 g female was radio-tracked.

Besides this field work, laboratory tests have been developed to try to distinguish easily between European and American minks, using saliva or blood tests. A female is kept in captivity in France and the idea of developing a captive breeding group has been discussed. The experience of Tiit Maran in this discussion was important. The proceedings will be edited by the SFEPM in 1994.

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# **IUCN General Assembly 1994**

In January 1994, the IUCN had its General Assembly in Buenos Aires, Argentina, attended by more than 1,000 people. It started with a meeting of the Species Survival Commission on january 15-17. This was a good opportunity to meet a lot of people of the SSC.

A presentation of the new criteria for threatened and endangered species was made by Georgina Mace as well as the work of the World Conservation Monitoring Centre for the establishment of animal Red Lists. For instance, 535 mammals were listed as 'Red' in 1990 and in 1994 there are 741! But in the case of mammals, only 50% of the 4,600 species have a status. For birds, 100% are supposed to be evaluated when the figure is really non significant for invertebrates.

The new criteria are more complete than the previous. At first they may look a little complicated, but seem to be usefull. These new criteria will change the status of 130 mammal species.

After that, we learned a lot about conservation in South America, and all the specialist groups represented gave, through their chair or any representative, a small lecture of their actions. I did not expect to meet any of the Small Carnivore Group but all the members are well informed through the newsletter and through *Species* of all that is done.

From january 18 to 26 the General Assembly held its sessions. The main impression is that conservation was more present in the talking, especially through the NGOs, than development. Many of the resolutions, adopted during the sessions, referred rather to conservation than to development, which had been asked during the SSC meeting by many experts. In fact, this is the real 'raison d'être' of the IUCN.

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# Cattle and human consumption... Badger 'scrofula' ?

One absolutely pivotal issue in this long running debate on budgers and bovine tuberculosis is that of relative likelihood of IB transmission between the two reservoirs of the disease: -badler to cattle or vice versa. A reappraisal of the classic studies on aethiology/pathology/epidemiology combined with the latest data in immunosuppression and an AIDS-related upswing in human IB would seem to indicate that there are two different routes of transmission.

Based on pathogenesis studies, an initial focus of infection hay become manifest via associated lymph nodes. Aerogenous pread in man hence produces a Ghon lung focus with pulmonary mph node exaggeration and primary complex of Ranke (Grange, 988). Cattle TB is almost entirely respiratory 'consumption' and t a directly comparable pathogenesis as shown by Francis (1947, 958).

Children used to get dietary 'scrofula' from unpasteurized ilk, and this was manifested via swollen tonsils and neck lymph ides as cervical lymphadenitis (Grange, 1988). Studies of adger TB have found that clinical diagnosis reveals some 70% cases via submandibular lymph nodes. This is dietary scrofula most certainly picked up from dung bectles under cow pats hich may be infectious for up to a year (Hancox, 1991). The unslation of such dietary TB into an apparent 'respiratory' case th lung lesions may occur rapidly in even six-month old cubs, nce underground dwelling may lead to lung immunoimpromisation via fungal adiaspiromycosis and silica dust just pneumoconiosis and silicosis render human miners pro to TB Hancox, 1991; Grange, 1988). The lung appears to be an especily vulnerable organ as regards TB in rabbits and cattle (Francis, 947), and there are at least 14 Mycobacterium species of lung scase in man (Grange, 1988). Significantly, experimental injecon in both badgers and cattle becomes a 'lung' case via sematogenous spread (Francis, 1947; Mahmood, 1987), whereas

intra-tracheal inoculation in the former study failed to achieve infection in badgers.

The comparative pathogenesis of TB in badgers, cattle, and man would hence suggest that badgers are far more likely to acquire TB from cattle during herd breakdowns than vice versa; innocent bystander rather than cause (Hancox, 1991, 1992). Badger TB is hence not of respiratory aetiology despite lung involvement (Dolan, 1992). And the pivotal assumption underpinning the badger culling strategy to control cattle TB is based on the erroneous belief that cattle are not giving badgers TB via infectious cow pats (Dunnet *et al.*, 1986: para. 60; Francis, 1947:89-90, 93, 95, 124).

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# **Coming events**

#### The exploitation of mammals

A symposium organised by 'The Mammal Society' in ssociation with 'Universities Federation for Animal Welfare', to the held at the Meeting Rooms of the Zoological Society of condon on Friday-Saturday 25-26 November 1994,

The major theme of this meeting concerns the various ays in which mammal populations are exploited world-wide, the incept of sustainable use, and the resulting welfare considetions for the animals involved. For further details contact:

#### Ms Victoria Taylor, UFAW, 8 Hamilton Close, South Mimms, Potters bar, Herts. EN6 3QD, UK. Tel. 0707 658202 - Fax. 0707 649279

#### International MARTES Symposium

The second International *Martes* Symposium will be held the University of Alberta, Canada, 12 to 16 August 1995. Assions will deal with marten, fisher, and sable populations, landscape ecology, habitats, timber harvests and fire effects, physiological ecology, evolution, ecology, biogeography, population and harvest management, and monitoring. Meetings will include paper sessions, interactive papers (posters), and audiovisual presentations. Participants are invited to submit four hard copies of an abstract (typed single-spaced within a 18- x 18-cm box) and a disk (WordPerfect V 5.1 on 3.5" or 5.25" disk) before September 12, 1994. Notice of acceptance will be sent by October 31. Full-size papers (<10 letter-size pages; there will be a minimum page charge) must be received before January 1, 1995 for review and inclusion in the proceedings. For additional information, contact:

Gilbert Proulx, Alpha Wildlife Research & Management Ltd. 9, Garnet Crescent, Sherwood Park, Alberta, Canada T8A 2R7, Tel. 403-464-5228

Paul Woodard, Forest Dept., 751 Gen. Serv. Building, Univ. of Alberta, Edmonton, Alberta, Canada T6G 2H1, Tel. 403-492-4413

#### The Stone marten

Lachat, N. 1993. Ecology and ethology of the Stone marten (Martes foina Erxleben, 1777) in the Swiss Jura Mountains. Ph.D thesis, 187 pp.

This field study was realized in La Chaux d'Abel in the Swiss Jura Mountains. The aim was to improve existing knowledge about the stone marten's ecology and ethology and to show some local particularities.

Thirty-three captures of 24 stone martens were realized. Nine martens (5 females, 3 males, and 1 juvenile) were tracked. In the Swiss Jura, stone martens are associated with wooded habitats (wooded pastures, selvedges, forests) when hunting but their anthropophily is obvious when resting: 92.1% of the day-hides were located in buildings, almost in rural settlements (N=518).

Stone martens take advantage of man's proximity and of relatively easy life conditions. Day-hides are mostly good ones and food resources abundant all year long. Martens so reduce their activity costs, hunting in smaller home ranges than individuals strictly associated with forests. The activity pattern is influenced by the farmers' way of life and by the weather and the seasons.

The study of the diet is based on the analysis of 140 scats. Stone martens are generalist predators, eating a wide variety of animal and vegetal matter. The diet changes with the seasons, demonstrating the opportunistic behaviour of these mustelids. There are also annual variations according to fluctuations of the water voles (*Arvicola terrestris scherman*) populations. During a population peak, these rodents become the marten's main prey. This significant correlation between vole abundance and their consumption by stone martens is the first demonstration of this kind for the genus *Martes*.

There is no significant competition in the study area between stone martens and domestic cats, although their ecological niches are very close. Stone martens and Pine martens (*Martes martes*) coexist in this environment.

Copies of the thesis are available from:

Mrs. N. Lachat Feller, Joux-Perret 21, 2300 La Chaux-de-Fonds, Switzerland

or: University of Neuchâtel, Institute of Zoology, Chantemerle 22, 2007 Neuchâtel, Switzerland.

## **Carnivores of Europe**

Suminski, P., Goszczynski, J. & Romanowski, J. 1993. Ssaki drapiezne Europy (Carnivores of Europe). Warszawa, Panstwowe Wydawnictwo Rolnicze i Lesne. 298 pp.

This is the first monograph on European carnivorous mammals published in Poland. It contains comprehensive essays on predators living in the wild in Europe, followed by original chapters on ecology, field identification, game practice, and protection of these animals. The authors accepted the broadest possible definition of Europe (delimited by the Ural Mountains in the east and the Caspian and Mediterranean Sea in the south), and tried to summarize the results of all studies conducted in this area, both in West and East Europe.

The largest part of the book is devoted to the description of morphology, distribution, habitat, behaviour, diet, reproduction, population structure, and natural enemies of 35 species of European Carnivora (including 15 mustelid species!). Chapter 2 is entirely devoted to general problems of carnivore ecology, a.o. territoriality, hunting techniques, selectivity and the impact on prey populations. Following sections give practical hints on field identification, game organization and conservation needs of carnivores. The closing chapter presents the carnivores in European culture and describes legends, proverbs, and names associated with these animals. The book is aimed at the propagation of dependable knowledge about carnivores and their role in nature. It is illustrated with colour plates portraying the animals, maps of their geographic ranges, and some figures, drawings and tables as well. The text is entirely in Polish, with the use of Linnean names. The book concludes with an extensive bibliography and indexes of Polish and Latin names.

#### **Badger literature**

Vink, J. 1993. The badger (Meles meles L.) -a bibliography of literature up to October 1993. Fifth edition. Vereniging voor Zoogdierkunde en Zoogdierbescherming (VVZ), Utrecht. Available from: The Dutch-Flemish Mammal Society (VZZ), Emmalaan, 41, NL-3581 HP Utrecht, Holland. (17 guilders).

If anyone was ever in any doubt that the Eurasian badger has attracted considerable attention from scientists and naturalists, this would soon be dispelled by browsing through any of the earlier editions of Vink's badger bibliography, now in its fifth year. The amount of work that's been done on badgers is truly astonishing, and Vink seems to have found and catalogued all of it! All the standard fodder of zoological research work is here (denning, dispersal, growth, evolution, craniometry, territoriality, diet, etc...) and placed into the appropriate chapters. There is also some wonderfully obscure stuff, for example, Hancox's 'the nidicolous fauna of badger setts'' and also, what must surely be a classic of zoological obscurity, Popov's " the presence of bugs (Heteroptera) in Holocene coprolites of badgers''. Whatever you may (or even may not) want to know about badgers, it's all here.

This is the first edition to be published by VZZ, and there have been a few changes which are most welcome. The most notable is that an author index has been provided, and this makes the bibliography a lot easier to use. Also, as the various citations have been placed into chapters, each of specific merit, Vink has not been afraid to enter an article twice where this would increase its accessibility. One thing that I find a little irritating (being an academic snob) is that Vink is unselective, and lists literally everything, including works of fiction and children's books. However, in all fairness, the work is a bibliography, so where should it start and end? Including everything is the only fair solution.

This work is a goldmine of information on badgers. Any person or institute seriously considering any involvement with the Eurasian badger would be foolish not to obtain a copy: it is an essential purchase. My congratulations to the author: compiling bibliographies is a thankless task that requires great singlemindedness and determination. I hope Vink's dedication will be repaid by future authors citing his efforts in their research papers. *(review by H. Griffiths)* 

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The aim of the Newsletter is to promote communication between all interested in mustelid, viverrid and procyonid 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.