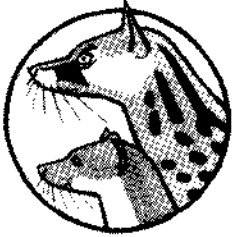


SMALL CARNIVORE CONSERVATION

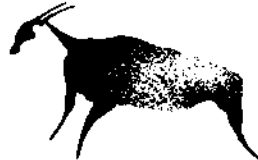


The Newsletter and Journal of the IUCN/SSC
Mustelid, Viverrid & Procyonid Specialist Group

IUCN
The World Conservation Union

Number 10

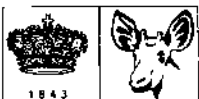
April 1994



SPECIES SURVIVAL COMMISSION



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



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SMALL CARNIVORE CONSERVATION

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

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

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:

Small Carnivore Conservation
c/o Dr. H. Van Rompaey
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Belgium

EDITORIAL

With this number of SMALL CARNIVORE CONSERVATION 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 KRYSTUFEK¹, Huw I. GRIFFITHS² and Marjan GRUBESIC³

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 (Djulich & 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 européenne 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 Djulich & Tortic (1960), Djulich & 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'

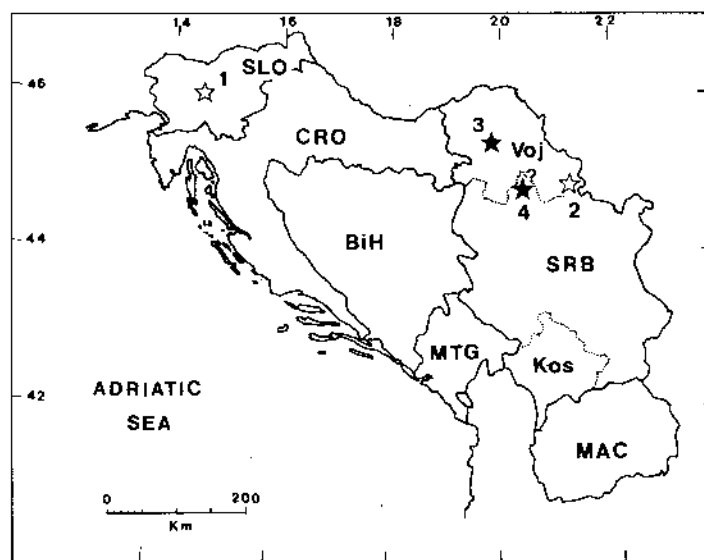


Fig. 1. Known localities for the two species of mink in the area of former Yugoslavia. Closed stars = *Mustela lutreola*, open stars = *M. vison*. Locality numbers: 1 - Ljubljansko barje, 2 - Banatska Palanka, 3 - Zabalj, 4 - vicinity of Belgrade. Question mark denotes uncertain record. SLO - Slovenia, 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. evermanni* are known from the modern fauna (Djulich & 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 ear-tagging. 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 Laiyau (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 x 1.8 x 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.

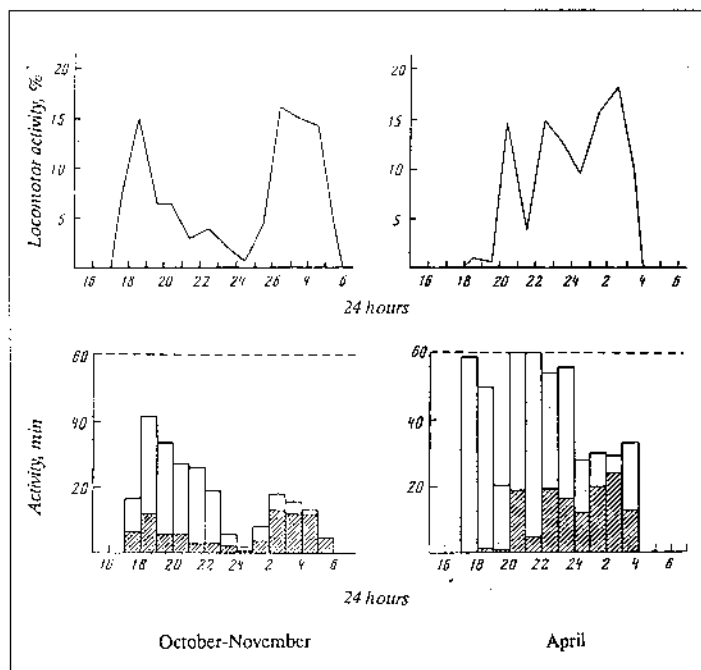


Fig. 1. The dynamics of 24-hour locomotor activity (above) and the relationship between locomotor (shaded areas) and passive (unshaded areas) activity of binturong in October-November and in April.

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

Activity period	n	M \pm m	limits
Total activity:			
- total duration, mins		261 \pm 88	82-479
- total duration, in % 24 hours		18.2 \pm 3.1	5.7-33.3
- total number of activity periods		11 \pm 3	5-18
Locomotor activity:			
- total number of activity periods		16 \pm 4	6-23
- duration of one period, mins	65	6 \pm 0.8	1-30
- number of long periods			1-2
- duration of one long period, mins	4	198 \pm 65	79-337
- number of short periods		10 \pm 3	4-17
- duration of one short period, mins		6 \pm 1	1-24
Rest outside cover during activity period:			
- total duration, mins		755 \pm 6	742-771
- total duration, in % 24 hours		52.4 \pm 0.4	51.5-53.6
- number of rest periods		12 \pm 4	3-21
- duration of one period, mins	48	14 \pm 6	1-250
Nocturnal rest period			
Total duration of nocturnal rest, mins		424 \pm 91	190-601
- in % 24 hours		29.4 \pm 6.3	13.2-41.7
General characterization of rest periods:			
- number of rest periods		10 \pm 3	4-17
- duration of one period, mins	41	41 \pm 13	1-429
Long periods of rest:			
- number of long periods		2 \pm 0.7	1-4
- duration of one period, mins	8	168 \pm 47	65-429
Short periods of rest:			
- number of short periods		8 \pm 2	3-13
- duration of one period, mins	33	11 \pm 2	1-53

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

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 due 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

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 log-transformed, 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*.

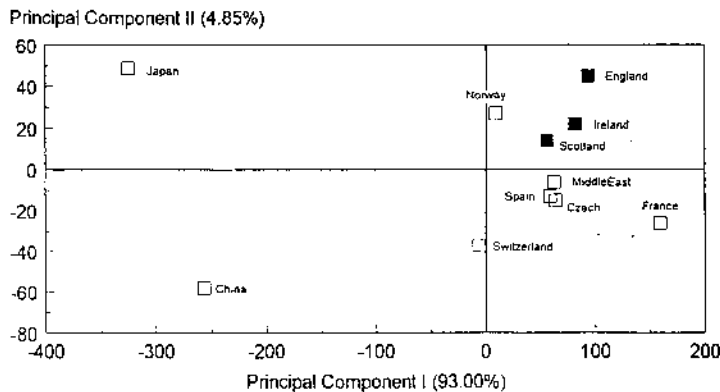


Fig. 1. Separation of male badger specimens on the basis of the first two principal components extracted from log-transformed population means.

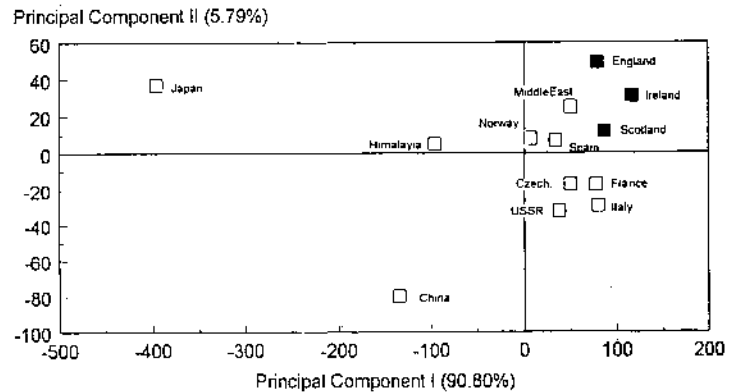


Fig. 2. Separation of female badger specimens on the basis of the first two principal components extracted from log-transformed population means.

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. Thorali'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.

Acknowledgements

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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.

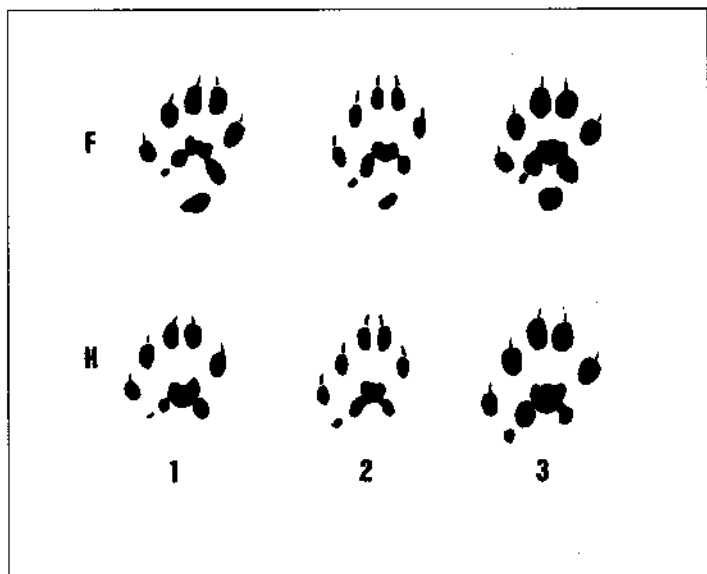


Fig. 1. Tracks of 1, *Mustela putorius*; 2, *Mustela vison*; 3, *Mustela lutreola*. F, forefoot; H, hindfoot.

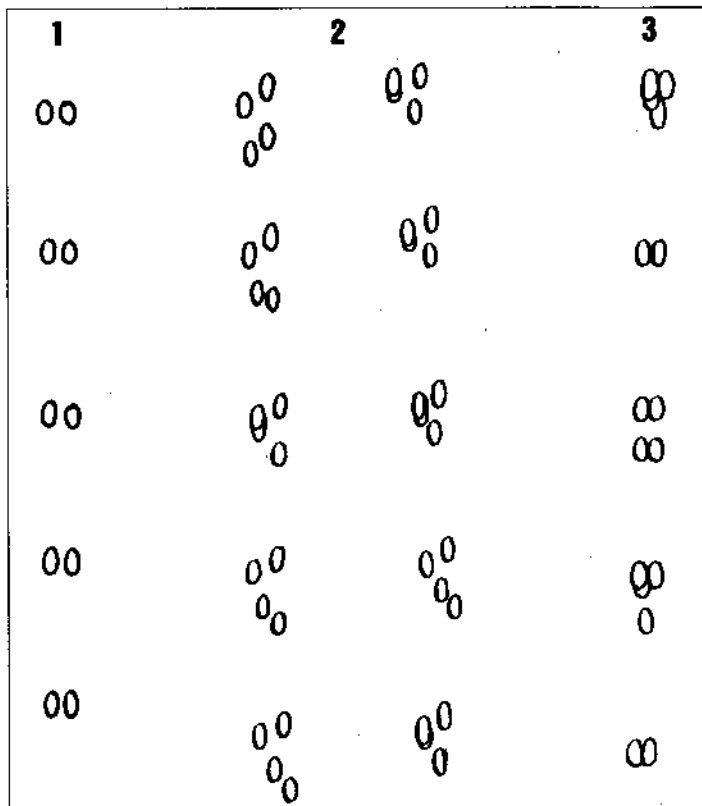


Fig. 2. Grouping of the tracks: 1, *Mustela lutreola*; 2, *Mustela vison*; 3, *Mustela putorius*.

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 Jedrzejewski (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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I am grateful to Drs J. Ruiz-Olmo, W. Jedrzejewski, S. Saluk, and T. Maran for useful discussions about recognition signs of the European mink, the American mink, and the polecat. This article has been translated from Russian into English with the help of EMCC.

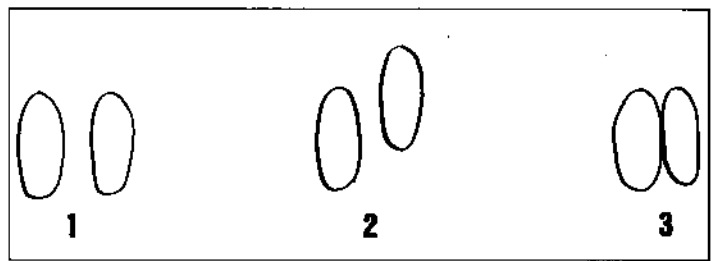


Fig. 3. Tracks of: 1, *Mustela lutreola*; 2, *Mustela vison*; 3, *Mustela putorius*.

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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 scats by recovery of bile acids and hairs ingested by the scat-makers. I hope to be able to obtain reference examples (of oven-dried faeces and of hair) from the following genera: *Nandinia*, *Attilax*, *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 European mink. Besides, information on the distribution 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 & Tumanov, 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 form 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, length (km)	Number of mink home ranges (incl. family home ranges)	Distances between home ranges (km)	Approximate population density (ind. per 10 km)		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 Velesa (29): Arbuzovka, Mozhaika, Velesa, Kamenka	7(4)	2 to 5	2.4	7.2	60-80 %

Table 1.