

**25<sup>th</sup>**

**Mustelid Colloquium**

**4-7 October 2007**



**Třeboň, Czech Republic**

**BOOK OF ABSTRACTS**

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**Editors: PETRA HÁJKOVÁ & OLGA RŮŽIČKOVÁ**

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# **25<sup>th</sup> Mustelid Colloquium**

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*Organized by*

**Czech Otter Foundation Fund**

**Agency for Nature Conservation and Landscape Protection of the Czech  
Republic**

**Institute of Vertebrate Biology, v.v.i., Academy of Sciences of the Czech  
Republic**

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## PROGRAMME

### Thursday 4th October

**18:00 – 21:00 Registration**

### Friday 5th October

**8:00 – 10:00 Registration**

**9:00 Welcome addresses**

#### **Session I (Chairman Anna Loy)**

**9:20 Risto Sulkava:** Growth and stabilisation of the density dependent otter (*Lutra lutra*) population in central Finland

**9:35 Jens Persson & Peter Segerström:** Wolverine (*Gulo gulo*) demography and the importance of adult females for conservation of Scandinavian wolverines

**9:50 Vinciane Schockert et al.:** Follow-up of the European badger (*Meles meles*) through the updating of the badger dens atlas in the Wallonia Region (*South of Belgium*)

**10:05 Manlio Marcelli & Romina Fusillo:** Inferring anthropogenic influences on otter distribution in Southern Italy: a multimodel inference approach

*10:20 – 10:45 Coffee break*

#### **Session II (Chairman Lukáš Poledník)**

**10:45 Václav Hlaváč:** Management Plan for the otter and up-to-date results of otter monitoring in the Czech Republic

**11:00 Manuela Panzacchi, Piero Genovesi & Anna Loy:** An Action Plan for the conservation of otter in Italy

**11:15 Mikhail Vaisfeld:** The otter (*Lutra lutra*) in Russia in the new millennium

**11:30 Romina Fusillo & Manlio Marcelli:** Effectiveness of the Natura 2000 network for the conservation of the otter (*Lutra lutra*) in Italy

**11:45 Clara Grilo, John Bissonette & Margarida Santos-Reis:** Effects of road mortality on mustelids in southern Portugal: sensitivities and management implications

*12:00 – 14:00 Lunch*

**Session III (Chairman Aleš Toman)**

**14:00 Vilmar Dijkstra:** First results of monitoring pine marten cubs by infra-red camera

**14:15 Chris Achterberg, Bram Achterberg & Vilmar Dijkstra:** The secret life of pine martens (*Martes martes*): behaviour of mother and cubs in the den

**14:30 Lukáš Šimek & Zuzana Kadlečková:** Hunting behaviour and feeding success of patch fishing of Eurasian otter (*Lutra lutra*) in Lužnice river, Czech Republic

**14:45 Luís M. Rosalino, Carla Marques & Margarida Santos-Reis:** Highly specialist or just an efficient opportunism: otter predation in a trout fish farm of central-east Portugal

**15:00 Maria Eskreys-Wójcik & Izabela Wierzbowska:** The food habits of stone marten (*Martes foina*) inhabiting the city of Krakow

*15:15 – 15:30 Coffee break*

**15:30 – 16:30 Poster session**

**Session IV (Chairman Margarida Santos-Reis)**

**16:30 Manlio Marcelli & Romina Fusillo:** Testing the increase of the otter (*Lutra lutra*) occupancy in Southern Italy: recolonization or survey efficiency?

**16:45 Andreas Kranz, Lukáš Poledník & Aleš Toman:** The recovery of otters in Styria

**17:00 Lukáš Poledník et al.:** How to monitor otter populations in Natura 2000 Network sites?

**17:15 Bernd Gruber et al.:** A new method for estimating visitation rates of cryptic animals via repeated surveys of indirect signs

**17:30 Reinhard Klenke et al.:** Spatio-temporal activity patterns of Eurasian otters (*Lutra lutra* L., 1758) in the pond landscape of Upper Lusatia (Saxony, Germany)

*17:45 – 19:30 Dinner*

**19:30 – 21:30 Workshop (Chairman Andreas Kranz)**

**How to assess the conservation status of otters in context of EU legislation?**

**Saturday 6th October****Session V (Chairman Silke Hauer)**

**9:00 Saskia Jancke, Peter Giere & Ulrich Zeller:** Habitat fragmentation and otter (*Lutra lutra*) road mortality in the Uckermark, Brandenburg

**9:15 Jan Herr & Timothy J. Roper:** Socio-spatial organisation and denning behaviour of urban stone martens (*Martes foina*) in Luxembourg

**9:30 Nuno M. Pedroso & Margarida Santos-Reis:** Response of otters to new habitat opportunities: the islands of Alqueva reservoir (SE Portugal)

**9:45 Jenny Mattisson, Jens Persson & Peter Segerström:** GPS-collars provide new insight into wolverine (*Gulo gulo*) behaviour–movement and activity pattern

**10:00 Mária Tóth et al.:** Top predator, pet and pest: the intensive urbanisation of stone marten in Budapest

*10:15 – 10:45 Coffee break*

**Session VI (Chairman Natália Martínková)**

**10:45 Helmut Bayerl & Ralph Kuehn:** Noninvasive genetic monitoring of the Eurasian otter (*Lutra lutra*) in Eastern Bavaria

**11:00 Simone Lampa et al.:** Mark-recapture study on otters (*Lutra lutra*) in Upper Lusatia (Eastern Germany) using microsatellite genotyping of faecal DNA

**11:15 Peter Vallo, Natália Martínková & Petr Koubek:** Genetic variability in Moravian polecats: a pilot study using mitochondrial DNA sequences

**11:30 Hermann Ansorge et al.:** Raccoon dog *Nyctereutes procyonoides* populations in the area of origin and in colonised regions – the epigenetic variability of an immigrant

**11:45 Natália Martínková, Robbie A. McDonald & Jeremy B. Searle:** Stoats reveal a complex colonization history of the British Isles

*12:00 – 13:45 Lunch*

**Session VII (Chairman Risto Sulkava)**

**13:45 Natalia V. Sidorchik & Viatcheslav V. Rozhnov:** Some features of the European badger (*Meles meles*) ecology in Darwin reserve, north-west of European Russia

**14:00 Jasja J. A. Dekker et al.:** The ecology of Dutch polecat traffic victims: reproduction, body condition and diet

**14:15 Karol Zub et al.:** How to survive in a cold (and changing) world?

**14:30 Laima Baltrūnaitė:** Diet of the otter (*Lutra lutra* L.) in fish farms in Lithuania

**14:45 Johanna Civett & Anna Roos:** The diet of the otter (*Lutra lutra*) using stomach and intestine content and stable isotope analyses

*15:00 – 15:30 Coffee break*

**Session VIII (Chairman Hermann Ansorge)**

**15:30 Michaela Nováková & Petr Koubek:** Moving activity of polecat *Mustela putorius*

**15:45 Sandrine Ruelle, Jean-Michel Vandel & Michel Albaret:** Landscape characteristics and habitat of pine martens (*Martes martes*) and stone martens (*Martes foina*) in the Bresse area, France

**16:00 Jan H. Seelig & Hans-Heinrich Krüger:** Radio-tracking of stoats (*Mustela erminea*) in north-west Germany

**16:15 Zbigniew Borowski, Monika Wiczorek & Paweł Kardynia:** Problem with interpretation the coexistence of two ecologically similar carnivorous species - the least weasel (*Mustela nivalis*) and the stoat (*M. erminea*) as a sample

**16:30 Mariana B. Lainez, Ilona Brinkmann (b. Behrmann) et al.:** Reintroduction of the European mink *Mustela lutreola* (Linné 1761) in an announced FFH-Area in the Prims-Blies-Hügelland in the Saarland, Germany

*16:45 – 17:15 Coffee break*

**Session IX (Chairman Christian Seebass)**

**17:15 Jana Zschille, Norman Stier & Mechthild Roth:** Nocturnal or diurnal? Activity patterns of mink (*Mustela vison*) in a fish pond area in Northern Germany

**17:30 Aline Bifulchi et al.:** Reproduction of feral American mink in Western France

**17:45 Jonathan Reynolds:** Use of the GCT Mink Raft to control American mink *Mustela vison* for conservation purposes in lowland river systems

**18:00 Asunción Gómez & Santiago Palazón:** Status and the control of American mink in Spain

**18:15 Frank Drygala et al.:** Dispersal of the raccoon dog (*Nyctereutes procyonoides*) in North-Eastern Germany

**18:30 Closing ceremony**

**20:00 Student competition awards, followed by Banquet & Farewell party**

**Sunday 7th October****Excursion**

**Morning:** field trip to Třeboňsko Biosphere Reserve & Protected Landscape Area

**Lunch**

**Afternoon:** ZOO Hluboká

## ORAL PRESENTATIONS

### **The secret life of Pine Martens (*Martes martes*) Behaviour of mother and cubs in the den**

CHRIS ACHTERBERG, BRAM ACHTERBERG & VILMAR DIJKSTRA

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Female pine martens (*Martes martes*) often use hollow trees as denning sites in the Netherlands. Until recently it was only possible to observe, from the outside, glimpses of what happened inside the tree. With the use of a small infrared sensitive surveillance camera mounted on the top of a carbon fibre fishing rod it is now possible to look inside the den. This method was first tested in 2004 and was used extensively in the denning seasons of 2005, 2006 and 2007. The use of an infrared sensitive camera yields much new information on litter size, development and mortality of young pine martens. It is also a valuable tool in determining where pine martens occur and if there is reproduction in a certain area; an important issue in the Netherlands where the population is small and fragmented. During 2006 and 2007 several mothers and cubs were observed for longer periods by placing a video camera in the tree cavity. This gives a unique insight in the behaviour of young pine martens and the interaction with their mother.

## **Raccoon dog *Nyctereutes procyonoides* populations in the area of origin and in colonised regions – the epigenetic variability of an immigrant**

HERMANN ANSORGE<sup>1</sup>, MARYANA RANYUK<sup>2</sup>, KAARINA KAUHALA<sup>3</sup>, RAFAŁ KOWALCZYK<sup>4</sup> & NORMAN STIER<sup>5</sup>

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<sup>5</sup>*TU Dresden, <sup>5</sup>Dresden University of Technology, Chair of Forest Zoology, Piennner Str. 7, 01737 Tharandt, Germany*

The genetic variability and the relationship between raccoon dog populations recently immigrated into Europe have been rarely investigated. As well, nothing is known about the genetic features of their populations of origin. Using 1046 raccoon dog skulls from seven European localities and the Amursk area of the species' origin, the epigenetic variability within and the epigenetic distance between these populations were studied on the basis of the occurrence of 24 non-metric characters. Additionally, the fluctuating asymmetry of these bilateral characters was evaluated to obtain information on the developmental stability of the different populations.

The intra-population epigenetic variability of the European raccoon dogs was generally lower than those of native carnivore species of the same region. However, native raccoon dogs from the Amursk region showed the same low level of epigenetic variability, possibly due to the old phylogenetic age of this canid.

Epigenetic distances between raccoon dog populations were generally high except between two Finnish populations and between three of four German populations. The German regions themselves, having been colonized later, formed a separate cluster with a rather high epigenetic distance to the Finnish-Polish group. Also considering the relatively high distance of three German regions to the fourth German population, this indicates probably different migration lines of the species. The native raccoon dogs of the Amursk region were completely separate from the European populations due to their very high level of epigenetic-trait expression. This is most likely a consequence of the distinct reproductive isolation of about 60 years, as well as an effect of the colonisation and migration history of the species.

The degrees of fluctuating asymmetry of the studied raccoon dog populations did not give any indication of genetic stress. However, remarkable differences could be interpreted as being due to an influence of general environmental disturbance, since distinctly lower asymmetries were found in raccoon dogs from areas with generally lower human influence.



## **Diet of the otter (*Lutra lutra* L.) in fish farms in Lithuania**

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The diet of otters was studied in four fish farms in eastern Lithuania based on scats analysis. The frequency of occurrence and biomass consumed were estimated. Fish made the bulk of the otter diet, comprising over 95 percent of biomass consumed. Usually carp predominated among fish; still, other species (pike, perch, other cyprinids) were also frequently recorded. Mammals, birds, amphibians, very few insects, mollusks, and crayfish (just in one fish farm) composed a minor part of the diet.

Data on occurrence of other carnivores' species (red fox, raccoon dog, American mink, polecat, and martens), semi-aquatic mammals (beaver, muskrat) and cormorants were also registered, as well as cases of poaching. Owners were asked to evaluate possible damage caused by otters in comparison with other, above mentioned species and poaching.

General information about state of fish farming in Lithuania is also discussed.

## **Noninvasive genetic monitoring of the Eurasian otter (*Lutra lutra*) in Eastern Bavaria**

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After being close to extinction in the 1970s and 80s, the Eurasian otter (*Lutra lutra*) is currently spreading from the Czech-Bavarian-Austrian border triangle westward into Bavaria. However, rising otter populations comprise an increasing conflict potential between otters and local fish farmers and anglers. In order to create an objective data basis for conservation and future management plans, an effective monitoring system which allows assessing otter numbers is needed. Up to date, standard monitoring methods of otter populations mostly imply mapping of otter tracks and spraints, snow tracking and the analysis of carcasses. However, these methods hardly allow an estimation of otter numbers in an investigated area or are feasible only during the winter season. We established a genetic monitoring system for the otter by genotyping 10 microsatellite loci using spraints as a noninvasive source of DNA. Investigations were carried out in two model areas in Bavaria close to the Czech and Austrian borders. Using this method, we were able to identify a minimum number of otters in the investigated areas and individual home ranges.

## Reproduction of feral American mink in Western France

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American mink (*Mustela vison*) was introduced in Europe in the 1920s for fur industry. In Western France, an important raise in fur farms development, both in number and size, was observed in the 1960s. Animals were either deliberately released or escaped, and first feral mink populations were mentioned in the 1970s. American mink is considered as one of the most important threats to native fauna in Europe. In South-western France, this alien species co-occurs with the highly endangered European mink. A long-term plan for the protection of the European mink must encompass the management of feral mink populations. The comprehension of reproductive patterns of mink populations is therefore of crucial importance. In order to understand how mink withstand to culling, we drew reproductive parameters from trapping operations in Brittany (Western France). The proportion of reproducing females was assessed by examining the general aspect of reproductive tracks (form, colour, structure). Foetus or placental scars counts were used to estimate pregnancy rate and litter size at birth. Moreover, age structure was examined using canine tooth cementum annuli. Our results showed that more than 80% of the subadult and adult females we examined were reproductively active. The mean number of placental scars was  $7.4 \pm 1.2$ . These results, and demographic data estimated in the area, confirm the existence of sustainable feral populations and imply urgent management efforts to control their expansion.

**Problem with interpretation the coexistence of two ecologically similar carnivorous species - the least weasel (*Mustela nivalis*) and the stoat (*M. erminea*) as a sample**

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The coexistence of similar species is possible when they are isolated in space and time. When ecologically similar species coexist, from evolutionary theory point of view one of these species (the best fit) should alive, when another should disappear. However, the similarity of two carnivorous species such as least weasel and stoat do not fit this theory. To answer the question why it is possible, we studied population of these two predators in the same area, Biebrza National Park, Poland. It is simple ecosystem with one main prey, the root vole. During the study we monitored simultaneously population of two predators and the root vole from 2003 (low phase of vole cycle) till 2006 (peak phase of vole cycle). We tried to find the mechanisms that allow these two predators to coexist in the same area. Three different techniques were used in this field study: radio-tracking, live-trapping and snow-tracking. During the study 70 weasels and 7 stoats were caught. All captured stoats (7) and 10 weasels were radio-tracked during the late summer and autumn. Habitat selection during the winter time was studied by snow tracking in February for three consecutive winters: 2003/03, 2004/05, 2005/06. In the studied populations, the body mass of these two species strongly overlapped between weasel males and stoat females (in range from 120 to 150 g), suggesting a strong trophic competition between them. However, some differences in habitat selection between these two carnivorous species were observed. During the late summer and autumn weasel preferred meadows, avoided willow and elevated habitats, whereas stoats preferred elevated habitat with willow trees. However, during the winter time both species prefer the same elevated habitats covered by trees. There is strong evidence that in for food resources critical winter period these two species coexist in the same habitat. Daily activity rhythm of these two predators differs: stoat was active both during the day and night whereas weasel was active only during the day. We concluded that in our study area weasel and stoat coexist rather than compete with each other. While weasel population dynamics is strongly dependent on vole population dynamics, stoat population dynamics is independent from voles. It suggests that in studied stoat population root vole is not a basic food resource which shapes stoat's population dynamics.

## **The diet of the otter (*Lutra lutra*) using stomach and intestine content and stable isotope analyses**

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The aim of this study was to determine the diet composition and the trophic position of the otter (*Lutra lutra*), using stomach and intestine content and stable isotope ( $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$ ) analyses of muscles. A total of 124 stomachs and intestines from northern (70) and southern (54) Sweden were studied. Furthermore, stable isotope analyses on otters from Sweden (157) were compared with otters from Latvia (8). The results showed that otters from northern Sweden and Latvia are feeding on a significantly higher trophic level than those from southern Sweden. Fish was the most dominant food item (70%), but amphibians (22%) were also important, especially during the spring and winter. However, crayfish (5%) and bird (3%) was also found in the stomach and intestine.

## **The ecology of Dutch polecat traffic victims: reproduction, body condition and diet**

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As with most mustelids, field-research on the polecat (*Putorius putorius*) is difficult, expensive and time consuming, as polecats are secretive and often nocturnal. Because information of this species is still relevant for conservation, we used animals that were killed by traffic to learn more about the ecology of the Dutch polecat population.

Using a standardized protocol, we recorded data on biometry, condition, reproductive status and diet of polecats that were found and brought to Alterra by volunteers.

In this presentation, we will discuss the seasonal changes and sexual differences in these characteristics. The latter is especially interesting, as the polecat, like the other mustelids, is sexually dimorphic. We will show whether this sexual dimorphism results differences in diet, and thus in resource partitioning, in the polecats of the Netherlands.

## **First results of monitoring pine marten cubs by infra-red camera**

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In a part of 'Veluwezoom', a forest area in The Netherlands near Arnhem, the use of trees cavities by pine marten as day-resting site or denning site is monitored since 1994. The research area is about 2.000 ha of forest that contains pine, oak, beech and birch. Since May 2004 a small infra-red camera mounted on a fishing-rod is used to inspect the tree cavities. After finding a nest, litter size is determined, and weekly camera inspections are carried out to recover mortality of the cubs and to get a better insight on when the cubs were born. Between May 2004 and July 2007, a total of 23 nests were found accounting for a total of at least 57 cubs (2.5 cubs per nest). Four cubs were found dead in or underneath the nest tree. Because of the strong indication in literature that small mammals are the most important food source, in the coming years the indices for both the voles/mice and for the amount of seeds of oak and beech will be defined. These indices will be compared with litter size and cub mortality.

## Dispersal of the raccoon dog (*Nyctereutes procyonoides*) in North-Eastern Germany

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Besides over-exploitation and habitat loss, invasive species are considered as a serious threat to biodiversity. They are thus a deleterious impediment to conservation and sustainable use of global, regional and local biodiversity, with significant undesirable impacts on the goods and services provided by ecosystems.

The raccoon dog *Nyctereutes procyonoides* is an introduced canid in Europe. Few raccoon dogs were recorded in Germany until the early 1990s, but thereafter an exponential increase in the hunting bag was evident and in the hunting season 2005/2006 approximately 30,000 animals were shot. By now the species has become a permanent member of the fauna of North-Eastern Germany and still increasing bag numbers indicate that the population has not reached the carrying capacity of the environment yet.

Information on dispersal pattern, natal home range size, date of recoveries, distance of dismigration and sex ratio of dispersing animals can help to understand the invasion process and the ecological implications of the species in its new living space.

Thus, we ear-tagged 145 and radio-collared 44 young (< one year) raccoon dogs in Mecklenburg-Western Pomerania between June 1999 and October 2006. Until now, 60 animals were recovered and the mean distance between the marking place and the place where the animal was recovered, measured as the straight line distance, was 13.9 km.

Most juvenile raccoon dogs were recovered nearer than 10 km from the marking place. Equivalent dispersal of young male and female raccoon dogs was detected and no marked animals were recaptured in their natal home range. Thus, offspring do not remain on parental territory as helpers.

Furthermore we analysed the mortality factors of dispersing young (found death, shot, killed by roaming dog, road-killed, re-captured). Road-kills and hunting were most important for a high mortality rate among young racoon dogs. However, first signs point to an impact of sarcoptic mange on raccoon dog populations in Mecklenburg-Western Pomerania.

## Effectiveness of the Natura 2000 network for the conservation of the otter (*Lutra lutra*) in Italy

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In this study we examine the effectiveness of the Natura 2000 (N2K) network in Southern Italy in terms of its representativeness of potential distribution of the otter *Lutra lutra*, and evaluate the additional contribution of other protected areas (PAs) to the conservation of this species.

We collected data on otter distribution in southern regions of the Italian peninsula through a field survey between 2002 and 2004. Then we modelled the otter probability of presence ( $p$ ) by fitting an autologistic regression model to the presence/absence survey data. The model included landscape descriptors as covariates. Based on the model, we produced a map of the potential distribution of the otter and suitability of hydrographic network in southern regions.

We used  $p$  values  $\geq 0.4$  for mapping the otter presence as suggested by the model evaluation. We considered the hydrographic network with  $p$  values  $\geq 0.8$  as indicating optimal habitats important for species persistence.

In order to assess the effectiveness of the N2K network for otter conservation, for each region we quantified the percentage of river network with  $p$  values  $\geq 0.4$  and  $\geq 0.8$  that is included within the region boundaries, and within the regional N2K network. We evaluated also the effectiveness of the N2K network with respect to other PAs calculating for both categories of conservation areas the percentage of occupied hydrographic network and optimal habitats for otters that are under protection compared with the percentage of protected area in southern regions.

Results showed that the N2K network in southern regions includes about 14% of the river network occupied by otters and 16% of optimal habitats. These percentages increased twofold when one considers additional PAs and, in particular, the national parks.

The effectiveness of the N2K network is variable among regions. In particular, in the Basilicata region, that includes 46% of the hydrographic network occupied by otters in Southern Italy and 47% of optimal habitats for the species, the 2NK regional network protects only about 9% of both indicators. Also in Calabria the N2K network seems insufficient to include an adequate fraction of fluvial habitats occupied by otters. On the contrary, Campania and Puglia regions show satisfactory representation of otter habitats ensured respectively by a great effort in terms of area protected, and an optimal spatial allocation of the N2K areas.

The PAs additional to N2K network contribute to reach an adequate level of representativeness of otter river network in Calabria and to improve it in Basilicata. Nevertheless, in the Basilicata region the spatial pattern and total amount of protected areas remain inadequate with respect to the importance of this region for the otter conservation.

The additional PAs represent a better allocation of conservation efforts than the N2K network. In fact the area protected as PAs is about one half of that protected as the N2K network but they ensure similar representation of otter potential distribution and habitat.

## **Status and control of American mink in Spain**

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American mink's original distribution ranges over North America. In Spain it was introduced to the fur farms in the north and in the centre since 1960s. From these farms a lot of animals escaped or were released, and they adapted in the nature and produced feral populations. That kind of cases can produce environmental damages for the conservation of the biodiversity in our rivers.

In Spain there are four big populations: in Galicia, Central Spain, Catalonia and Teruel-Castellon. Besides, in Basque country there are three more populations (Alava, Bizkaia and Gipuzkoa), surrounded by European mink population. These three last populations, together with Central Spanish, are an important threat for European mink survival in Spain. American mink can predate on protected and endangered species and is a competitor of other semi-aquatic mustelids. Since 2003, there is a National Plan of Control and Eradication of American mink in Spain in different territories (Alava, Burgos, La Rioja, Navarra, Gipuzkoa, Bizkaia, Aragón, Cataluña, Castellón, Segovia, Palencia and Lugo), coordinated by Spanish Environment Department. Until now, more than 1,600 minks have been sacrificed by bloodless methods. American mink trapping is very important to conserve and preserve the European mink population. A lot of people are working inside of that Program, forest guards from different administrations and trapper specialists. Without them, European mink will be one of the species who can disappear first of all from our rivers.

In La Rioja and Alava it is forbidden to set new fur farms, but there are still three farms in Gipuzkoa and Navarra, inside of the European mink distribution area. The last result of American mink trapping control in Alava has allowed the recolonization of the European species. It shows the positive way, but the effort must be sustained in the space and time, and it involves a high cost in persons and money.



## A new method for estimating visitation rates of cryptic animals via repeated surveys of indirect signs

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Assessing visitation rates is difficult for cryptic animals like wild otters (*Lutra lutra*). Therefore indirect measurements of visitation rates are needed. We present a new maximum likelihood approach to estimate the visitation rate from collected old and new spraints using a repetitive sampling regime. We derived confidence intervals using standard maximum likelihood procedures. The approach can be extended to any species for which it is possible to discriminate between old and new signs or tracks. We compare the performance of the new estimator to three different estimators that have been used previously and use one type of information only, namely either fresh or old signs or simply combined old and new signs, which is the most commonly used estimation procedure. The new maximum likelihood estimator shows the best performance in terms of accuracy (a combination of bias and precision) of all estimators. We demonstrate the advantage of the maximum likelihood approach over other approaches and encourage using this kind of approach for similar systems in ecology and conservation biology.

## **Socio-spatial organisation and denning behaviour of urban stone martens (*Martes foina*) in Luxembourg**

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The stone marten (*Martes foina*) is common throughout continental Europe and occurs readily in urban ecosystems, where it often conflicts with human interests by denning in attics and by damaging car engine components. We studied the behavioural ecology of stone martens in two towns in Luxembourg, using radio-telemetry to track 13 individuals. Female and male home ranges averaged 35 ha (n = 10) and 114 ha (n = 3) respectively, which is smaller than in rural environments. Population density was limited to between 3.5 - 4.5 adult martens per km<sup>2</sup> by a pattern of intra-sexual territoriality, resembling that found in rural environments. Martens restricted their activities all year round to residential zones, although rural and forested areas were within easy reach. Martens used on average between 4 and 5 den sites per 15-day periods. The majority of den sites were associated with buildings both inhabited and uninhabited by humans. Natural den sites were used only rarely (< 1% of days). We conclude that habitat use and den selection clearly demonstrated the presence of well-established populations of stone martens specialized to residing year-round in urban areas.

## Management plan for the otter and up-to-date results of otter monitoring in the Czech Republic

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The Eurasian otter is a protected species according to the nature conservation law in the Czech Republic since 1956. However, it is causing significant economic damages on fish in last few years as well. The damages caused by otter are paid by state, but still there is a pressure of the fisherman on reduction of the otter population. On the other hand, the otter is threatened because of environmental changes, river and stream treating and especially because of more and more increasing traffic on the roads. As the otter is obviously a conflict species, the decision to prepare a management plan for the otter was done in 2004. The plan is prepared according to the IUCN guidelines and on the present it is in the process of approval by the Ministry of Environment.

The analysis of mortality factors is one of the most important bases for assessment of threatening reasons for the otter population in the Czech Republic, as well as for setting the strategy for the future protection. A total of 101 dead otters were found between 1995 and 2004. From this number, 58% died on the roads, 8% from natural reasons, 5% were illegally killed by humans and 23% were unexplained. As the majority of illegally hunted otters is not found, the following sequence of threatening factors was prepared:

1. illegal hunting
2. traffic
3. destruction of the environment and loss of the biotopes
4. pollution.

Progress of the otter population in last years is a very important factor for setting the management plan goals. Between 1989 and 1992, the permanent occurrence of the otter was recorded in 135 squares (20%) and irregular in 51 squares (8%). The population was estimated on 350 individuals at that time. New distribution survey between 1997 and 2001 detected spreading of otters into new areas. Their occurrence was recorded on 43% of the whole republic area (30% with permanent occurrence).

Last distribution survey was done in autumn 2006 using the modified standard IUCN/SSC Otter Specialist Group method. The occurrence of otter was found in 510 squares (75% of the whole country area). The irregular occurrence was found in 15 % of the area, whereas the permanent occurrence in 60 % of the Czech Republic. The population size was estimated between 2000 and 2200 individuals.

According to the management plan, the main goals are to sustain the population size and area of the distribution, as well as to preserve the conditions for permanent and self-sustainable existence of the otter in the Czech Republic. Detail precautions to fulfil the goals are planed in the management plan. The most important activities planned are:

1. change of legislative dealing with the compensations of damages caused by otter
2. elaboration of the methodology for building safe otter underpasses under the roads
3. evaluation of the otter influence on the fish populations in trout streams

The management plan involves a detail plan for the monitoring of the population in next ten years and the PR activities as well.

## **Habitat fragmentation and otter (*Lutra lutra*) road mortality in the Uckermark, Brandenburg**

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In order to reduce otter road mortality, the localities of traffic accidents involving otters *Lutra lutra* were assessed. A total of 88 accident sites from the years 1990-2003, as recorded by the Naturschutzstation Zippelsförde des Landesumweltamtes Brandenburg (Brandenburg State Office for Environment), were categorized regarding traffic and road patterns, otter habitat suitability, as well as presence and type of watercourse crossings. Using this information, the localities were classified according to their level of threat (ranging from “very dangerous” to “not dangerous”). From these numerical data, a list of characteristics was compiled to identify other potentially dangerous sites where otter road traffic accidents are likely to occur. With a Principal Component Analysis using SPSS, three groups of accident sites were categorized. Ultimately, Arcview<sup>®</sup> GIS was used as a tool to identify further potential accident sites.

In many other regions, otter road accidents mainly occur where roads cross or pass watercourses. However, because of the Uckermark’s abundance of lakes, accidents very often occur further away from watercourses, as otters move between lakes across dry land. Constructing wildlife underpasses between two important habitats, and creating banks as natural as possible under bridges where watercourses flow under the road, should diminish the otters’ need to cross over the road. Furthermore, the use of vegetation and fences to guide otters towards these tunnels and banks may improve the acceptance of these measures. An otter traffic sign plus speed limit, an option which is used already in other regions, can also be used to reduce otter deaths at problem sites. This method can be implemented instead of, or in conjunction with, the structural mitigation measures described. For every recorded, and some potential, accident sites, mitigation measures are suggested.

## **Spatio-temporal activity patterns of Eurasian otters (*Lutra lutra* L., 1758) in the pond landscape of Upper Lusatia (Saxony, Germany)**

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We have analysed the spatial distribution of Eurasian otters (*Lutra lutra* L., 1758) by a synchronous survey of fresh spraints around all ponds with wintering fish in an area of approximately 90 km<sup>2</sup>. The ponds are situated in the lowlands of Upper Lusatia (Saxony, Germany) and show a strong clustered distribution. On the five consecutive days of the study period the daily sums of fresh spraints over all ponds were nearly comparable but the proportions for each pond area differed significantly. We also found differences between the daily distributions of fresh spraints within each pond area. The results indicate a high short time dynamic in the spatial use of the resources. With this study we have proofed a sampling approach securing detailed information about location and age of the spraints found. Such an approach should be not only useful for surveys of the otter activity but it is also a crucial basis for the estimation of otter densities with a combination of genetic and statistical methods. The study was performed as a practical course with students, partially financed by the European Commission within of the FP 5 project "Framework for biodiversity reconciliation action plans", contract no: EVK 2-CT-2002-00142-FRAP.

## Reintroduction of the European mink *Mustela lutreola* (Linné 1761) in an announced FFH-Area in the Prims-Blies-Hügelland in the Saarland, Germany

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This project aims on the reintroduction of the European mink in an announced FFH-Area in the Prims-Blies-Hügelland in the federal country Saarland and on the development of its first stable population in Germany. The formerly wide-spread European mink has suffered a long-term decline in both abundance and distribution. It is included in the 2000 IUCN red List of Threatened Species as endangered (Annexes II and IV of the Habitats Directive). Its still remaining populations in Spain, Russia and in the Danube delta are threatened by the invasive American mink *Mustela vison* and by the destruction of its habitats. Based on the knowledge of previous reintroduction projects, a gradually release of social groups increases the survival rate and the philopatry, respectively. Thus, the release of a) pregnant females, b) mother with their litters and c) pregnant females with their mated males in 3 steps are planned. Before release all animals will be a) chipped by a microchip, b) part of them will be fitted with implantable radio transmitters and c) trained in prey catching to increase the survival rate. The success of the release and the behaviour of the European mink will be monitored by radio-tracking, live-trapping and snow-tracking.

In 2006 the reintroduction has started with the release of 12 pregnant females and 2 males in spring and 3 females with their litters (4, 6) in summer. Fifteen animals (4, 11) have got implantable radio transmitters. In spring of 2007 the reintroduction continued with the release of 7 pregnant females and 5 males. Nine animals (5, 4) have got implantable transmitters. In summer of this year two females with their litters are released. Each animal has been introduced into enclosures for at least one week before the release. The enclosures have been constructed in the releasing site into riparian zones of suitable for European mink watercourse. During these years the animals and their offspring are controlled by radio-tracking, foot-prints, live-trapping and snow-tracking.

Based on the results of 2006 this year the reintroduction has been carried out with a similar method. If this protocol continues being successful the same procedure will be done in 2008. The results of the first two years of the reintroduction will be presented.

## Mark-recapture study on otters (*Lutra lutra*) in Upper Lusatia (Eastern Germany) using microsatellite genotyping of faecal DNA

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In order to maximize the conservation effectiveness of otters (*Lutra lutra*), to evaluate the endangerment and to monitor populations, a reliable population size estimation is of prime importance. Without information on population size the protection of otters is not sufficiently feasible. Known methods, like the standard method recommended by the IUCN/SSC Otter Specialist Group, are not appropriate to provide results concerning the population size. Microsatellite genotyping of non-invasive DNA sources like faeces is a novel and increasingly applied approach which enables to analyse not only the genetic diversity, relatedness, and population structure but also the population size of elusive animals such as otters. The data thus obtained can be applied to mark-recapture models to gain a reliable estimation of the population size. We analysed 303 fresh spraint samples collected from wild otter populations in Upper Lusatia, Saxony, Eastern Germany within five consecutive days in March 2006. At least seven microsatellites were used to identify every single individual and to calculate the population size by processing the data in the computer program CAPTURE using the null model  $M_0$ . We will discuss the applicability of this new method in terms of accuracy achieved and effort (time and money) needed.

## **Inferring anthropogenic influences on otter distribution in Southern Italy: a multimodel inference approach**

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Eurasian otters (*Lutra lutra*) have disappeared from north central Italy in the last decades, but remain in the southern regions of peninsula. Although a recolonization process has been documented in recent years in the Southern peninsula, Italian otters occupy a small range showing a fragmentation at the northern periphery and a decreasing presence towards the southern and eastern boundaries.

To develop a conservation management plan for the species and freshwater/riparian habitat, knowledge of the anthropogenic factors that influence otter distribution in Southern Italy is essential, especially to plan habitat restoring and actions for anthropic pressure mitigation.

In order to investigate the relative importance of anthropogenic influences, we developed logistic regression models with otter presence-absence as the dependent variable and landscape variables extracted from GIS and site variables measured in the field as the predictors. Otter data originated from a survey of 327 stream sites (2001-2004) distributed in an area of 53535 km<sup>2</sup>.

Landscape variables described hydrographic richness (mean of stream order), road density, human population density and proportion of land used for intensive agriculture in concentric buffers from the home range (5 km radius) to regional scales (>30 km radius), and the proximity of reservoirs-dams.

Site variables (200-600 m transects) measured on ordinal scales level of water pollution, width of riparian vegetation, abundance of riparian trees, and presence of lowhead dams. The width of wetted riverbed was recorded as continuous variable. To model spatial autocorrelation in the data spatial terms were also considered by a trend surface analysis.

A multimodel inference approach based on Akaike's information criterion (AIC) was used. As the main potential factors controlling distribution of the otter were unclear, an exploratory approach was taken and all possible subsets of predictor variables and scales were modelled and considered in the analysis. In the first step we selected the scale for each landscape variable and selected the best predictors among collinear variables. In the second step we developed discrete non-parametric logistic regression models to distinguish deviations from linearity. In the third step we assessed the relative importance of variable by Akaike weights of all possible models and estimate coefficients by model averaging. Among anthropogenic factors intensive agriculture (negative association), water pollution (negative association), and width of riparian vegetation (positive association), were the most important predictors. Surprisingly reservoirs-dams influenced positively the occupation of hydrographic network within 15 km. Stream order was an important determinant (positive association) of habitat quality at the home range scale.



## Testing the increase of the otter (*Lutra lutra*) occupancy in Southern Italy: recolonization or survey efficiency?

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In recent years, extensive surveys carried out periodically have shown a progressive recovery of otters (*Lutra lutra*) in some European countries. Periodical large scale surveys were not conducted in Italy between 1985 and 2001. In these years, some local surveys documented the extinction of the residual populations in Northern and Central Italy and persistence in the Southern Italy.

In the period 2002-2004 we carried out a large survey of the otter distribution the Southern regions of peninsula during a research project supported by the Cilento and Vallo di Diano National Park.

We surveyed 327 stream sites distributed in 318 10 km UTM squares. Presence of otter was recorded in the 40.9% of squares. To evaluate the trend in otter status in Southern Italy we acquired and georeferenced presence-absence data collected in the 1985 National Survey. In both surveys the standard methodology (spraints search) was used.

We selected for analysis a sub-sample of 144 squares surveyed in both surveys. Apparently otter occupancy increased of 160% ( $\chi^2 = 32.85$ ,  $df = 1$ ,  $p < 0.0001$ ) during the 17 years separating the two surveys, whereas MCP (Minimum Convex Polygon) area comparison showed a recolonization of range peripheries of 90%. In the 2002-2004 presence of otter was recorded in 77 squares, including confirmed in 28 squares among 30 ones recorded as positive in the 1985. Apparently otters were able to recolonize 49 squares during the 17 years.

Nevertheless, the trend estimation could be biased by different efficiency of survey protocols and surveyors in minimizing false negatives between the two surveys. If the 49 squares recorded in the 2002-2004 were already occupied by the otter in the 1985, recolonization would be actually 0%. In order to test a recolonization process we generated alternative data sets by random allocation of 30 squares among the 79 positive squares recorded in the two surveys. In this way we simulated the outcomes of a sampling process with 49 false negatives. In a Monte Carlo test we compared the longitudinal (LGR) and latitudinal (LTR) ranges of the 30 occupied squares detected in the 1985 with the distribution of values obtained from 999 simulations. Both the observed measures were smaller than the simulated distribution (LGR,  $p = 0.02$ ; LTR,  $p = 0.04$ ), suggesting a significant recolonization/expansion along the latitudinal and longitudinal directions. Recovery of otter populations in Southern Italy may be related to acute and frequent disturbances in the period from 1960 to 1985 when freshwater habitats were impacted by the construction of many dams, industrial installations and roads. Since the end of 1980s intensive habitat alteration came to an end, perhaps allowing otter recolonization in recent years.

## Stoats reveal a complex colonization history of the British Isles

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Species change their distribution ranges in response to changes in climate, but the dynamics of the range change is variable. The stoat, *Mustela erminea*, is extremely temperature tolerant and can survive in arctic as well as warm temperate conditions. It can be expected that it survived the last glaciation close to the ice sheets. We have collected 1.8 kb of mitochondrial DNA sequence from stoats throughout their range, with a particular focus on Ireland and Britain. Contrary to expectations, Irish and British populations are both more closely related to stoats from continental Eurasia than to one another, indicating that contemporary Irish stoats are not descendants of the contemporary British population. The Irish lineage is considerably more variable, and thus older, than the British. We conclude that stoats colonized Ireland prior to the last glacial maximum and survived there till today. In Britain, a relict lineage has been fully replaced by new colonizers after climate amelioration.

## **GPS-collars provide new insight into wolverine (*Gulo gulo*) behaviour – movement and activity pattern**

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The wolverine (*Gulo gulo*) is a large nocturnal terrestrial mustelid roaming expansive areas in often remote and inaccessible boreal and mountainous areas. Previous data on movement and area use have been based on radio-tracking predominantly during daytime. Recent development of GPS-collars provides new possibilities for gaining information on wolverine behaviour and movements.

We equipped a total of 17 wolverines (14 females, 3 males) with GPS-collars during 36 different periods ranging from 21 to 151 days. The collars were programmed to store a GPS-location every third hour. The average fix rate was 47% (6-76%). The low success in obtaining fixes may be explained by wolverine behaviour. Straight-line 3-hr movement distance was 2.2 km for females (n = 6 277) and 3.0 km for males (n = 1 564). The maximum straight-line distance travelled was 18 km (females) and 20.1 km (males), which gives a minimum speed of 6 km/h and 6.7 km/h respectively. Males showed a more pronounced daily activity pattern than females but both sexes were most active during night (20.00 - 08.00) and least active between 11.00 and 17.00. Our results confirmed previous data that wolverines exhibit intrasexual territoriality and that one male territory overlaps that of 3-5 females. However, extensive movements of adult females into other resident females have been observed. Furthermore, we provide new information on female denning behaviour, e.g. date of parturition, distance travelled from den site and duration of natal den use.

The use of GPS-collars has greatly improved the knowledge of wolverine behaviour in the wild. This new technology provides detailed information on area use and movement patterns previously hard to achieve. This can be very helpful for the conservation of the wolverine.

## Moving activity of polecat *Mustela putorius*

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The western polecat (*Mustela putorius*) occurs almost in the whole Europe, but during the last 150 years, they have declined or disappeared from many countries of Central and Western Europe. Abundance of polecat has been permanently decreasing in the Czech Republic. According to hunting statistics, at present no individuals per year are hunted, compared to more than 20 000 individuals in the beginning of the 70s of the last century (Ministry of Agriculture of the Czech Republic, unpubl. data).

Duration of activity bouts and home range of polecats were studied in pheasantries Nosislavský les and Horní les (near Velké Němčice, Czech Republic). From 2005 to 2007 three polecats (one male and two females) were monitored by radio-tracking for a period of five days, three and 12 months (3 500 locations and 1 156 hours of observation in total). Individuals were tracked during 8-24 hours continuous sessions. Seasonal variations of home range were analyzed.

All animals were more active during night, but they were further active during the day very often, especially during summer and autumn. This diurnal activity was independent on the actual weather. Tracking data indicated that the activity rhythms of polecat varied between individuals and seasons.

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## An Action Plan for the conservation of otter in Italy

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Even though there are indications of a slow, widespread recovery of otter (*Lutra lutra*) populations throughout Europe, the distribution range is still highly fragmented and in several countries the species is absent or rare. The status of the Italian otter population is particularly critical, as the species recently disappeared from the northern and most of the central part of the country in the early 1980s, thus preventing any possibility for a connection with other European populations in the near future. Recent estimates suggest that the Italian otter population is composed by less than 300 individuals divided into a small sub-population in south-central Italy, and a bigger, southern sub-population that do not seem to be connected with the former one.

In regard of the general concern for the conservation of otters, the Italian Ministry of Environment assigned to the Italian Wildlife Institute (INFS – the Italian Government agency for research and conservation of wildlife) the task to produce an Action Plan for the conservation of the species. The Action Plan is being produced in cooperation with the University of Molise and with the support of a team of leading otter experts.

The main preliminary results are: (i) the production of the most comprehensive and updated distribution map of otters in Italy to date; (ii) a review of literature regarding the species' ecology and genetic characteristics, with particular focus on the Italian populations; (iii) an expert-base assessment of the main threats and limiting factors for the recovery of the Italian population; (iv) a web page for the real-time collection of information regarding otters found dead or wounded in Italy, with a distribution map of the casualties; (v) a series of thematic maps for conservation purposes based on a otter habitat suitability model validated with most recent information on otter distribution; (vi) an expert-base assessment of the most critical areas where to focus priority conservation efforts; (vii) a series of protocols providing guidelines for standardising monitoring methods, captures, the recovery of wounded or dead animals, autopsies, and for the management of captive breeding programmes.

Based on the above-mentioned elements, the Action Plan suggests priority actions for the conservation of otter in Italy. In order to implement these actions, the Ministry of Environment promoted a formal agreement with all the relevant actors (local and national authorities, NGOs, protected areas), and established a consultation table with all the signatory subjects.

Considering the highly fragmented administrative structure of Italy, and the wide variety of sectors involved in otter conservation (angling, fish farming, water management, landscape management, infrastructures, etc.), the main challenge for the implementation of an effective conservation policy is the involvement of all relevant societal sectors, and the effective coordination of different subjects. The strategy adopted for the production of the Action Plan (clear political mandate, independent scientific review, priority to the coordination of all sectors involved) has the potential to ensure that the key conservation measures will be translated into real policy, even though this will require a medium-long term commitment of all key institutional authorities.

## **Response of otters to new habitat opportunities: the islands of Alqueva reservoir (SE Portugal)**

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The largest reservoir in Europe (Alqueva Dam) was built in Guadiana river (SE Portugal), with a 250 km<sup>2</sup> flooding area. This dam started to be flooded in 2002 and in late 2006 achieved the maximum water level (around 150 meters).

The construction of the Alqueva Dam resulted in the disappearance of important habitats, including large stretches of riparian gallery and had a strong short-term impact on Eurasian otter (*Lutra lutra*) populations. During the flooding period, population disturbance/instability occurred, with individuals moving to most suitable habitats outside the main flooded rivers. The lack of vegetation in the new reservoir margins, as a result of deforestation and water level fluctuation, also affected refuge availability.

With the flooding, around 200 islands were created within the reservoir, most of which maintaining a good vegetation cover because deforestation stopped at the altitude of 150 meters leaving the top of the hills undisturbed. Moreover, these islands have been protected from human presence and intervention, thus offering otters a new habitat opportunity.

A total of 27 islands, chosen according to location and access, were surveyed to assess otter presence. Islands varied in perimeter from 50 m up to 5344 m, with the longest distance from a surveyed island to the nearest shore being 700 m. Linear pedestrian transects for searching otter signs were conducted at each island, with a minimum length of 200 meters, or the total island perimeter (when smaller than 200 meters). Transects were extended until otter presence was confirmed or total island perimeter was surveyed with negative results. A total of 12 246 meters surveyed resulted in the finding of 500 otter signs. Most islands (96%) were positive for otter presence. The exception were two very small islands (64 m and 50 m of perimeter) and two medium ones (350 and 1000 m of perimeter), all with none or insignificant vegetation cover. No association was found between distance to island and otter absence.

As a conclusion, Eurasian otters respond positively to the presence of the islands, which may act as safe heaven, offering refuge that is almost absent in the reservoir's margins. It is therefore important to protect these, so far undisturbed areas (discussion around island use for tourism or protection for fauna is going on), in order to allow otter population to somehow recover from earlier impacts of deforestation and flooding.

Besides further surveys future work may include use of camera traps, as well as faecal DNA analysis to assess the number and sex of individuals using each island.

## **Wolverine (*Gulo gulo*) demography and the importance of adult females for conservation of Scandinavian wolverines**

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The wolverine is one of the northern hemisphere's least known carnivores. In Scandinavia, the wolverine is classified as endangered, and its main prey is semi-domestic reindeer. Thus, wolverines live in conflict with reindeer husbandry, which is deeply tied to the Sámi culture of Scandinavia. Therefore, managers are faced by the challenge to compromise between sustainability of an indigenous culture and conservation of wolverines. Knowledge of wolverine ecology in general and demography in particular is essential for a sound management of wolverines in Scandinavia. We analyzed demography and behaviour in a long term individual based study of radio-collared wolverines in northern Sweden. Wolverine females started producing offspring no earlier than at 3 years of age, the proportion of adult females reproducing was 0.53, and average birth rate was 0.74 young per female. Reproduction incurred costs on female wolverines that affected reproduction in the subsequent year. Experimental food-supplementation of females in early winter enhanced reproductive rates, suggesting that reproduction is limited by winter food availability. The low productivity of females implies that wolverines have a low capacity to compensate for increased mortality. Poaching was the most important cause of adult mortality and an important limiting factor for population growth. Intraspecific predation was the main cause of juvenile mortality. Elasticity analysis showed that survival of adult females is the single most important determinant of the growth of wolverine populations. Furthermore, we show that adult females are strictly territorial and dispersal of young females is determined by territory availability. Hence, the importance of adult female survival has both demographic and behavioural components. This long term individual-based study emphasizes the importance for managers to consider especially adult female survival when developing and implementing conservation policies and harvest regulations.

## How to monitor otter populations in Natura 2000 Network sites?

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The Eurasian otter is listed in Annex II and IV of the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. One obligation arising from this directive is to regularly report on the status of populations in sites of Community importance (NATURA 2000 sites). A method has been standardised by IUCN Otter Specialist Group in the last decade how to monitor the distribution of otters. However such information is imperfect and the data about population size and its trend are needed, but are very difficult to obtain. Due to the diversity of the sites (e.g. running water versus ponds, small areas of about 47 ha to large areas of about 120 000 ha) one single method is not effective. Thus several methods were proposed and tested in the Czech Republic to evaluate the status and trends of otter populations in NATURA 2000 sites: spraint counting on stretches of water bodies, one-shot spraint counting under bridges, visiting rate evaluation and measuring of tracks. We suggest using different methods fitting for specific sites.

## Use of the GCT Mink Raft to control American mink *Mustela vison* for conservation purposes in lowland river systems

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The American mink is a problematic alien species in Europe. Because of its impact on certain native European bird and mammal species, local population control is now widely practised as a conservation tool. The GCT Mink Raft is a simple, cheap, low-technology monitoring device used to guide mink population control effort. The raft has two modes of action: monitoring and trapping. In use, it spends most of its time in monitoring mode, and reverts to monitoring after each brief spell of trapping. In monitoring mode, the raft records the footprints of visiting mink, and can be left to accumulate such evidence over a period of one to two weeks. On inspection, traps are set only on rafts that have recorded evidence of mink within the last check period. The mink will then usually be caught within a few days. Each trap is operated for a maximum of seven to 10 days, after which the raft is returned to monitoring mode to determine whether there is still a mink to be caught. In this way, the mink control effort becomes self-assessing, and it is easy to see whether trapping is effectively controlling mink numbers.

A succession of carefully documented trials in the UK, on lowland river catchments up to 50 km in length, has allowed operating rules to be refined for optimal efficiency. It was shown that a substantial impact on mink numbers could be made in a short time, at a reasonable cost, humanely, and with negligible impact on non-target species. Catchments could be rendered mink-free and maintained so in the long-term. The cost of control is readily calculated, allowing strategic planning of mink management for prey species at risk.



## Highly specialist or just an efficient opportunism: otter predation in a trout fish farm of central-east Portugal

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Eurasian otters (*Lutra lutra*) are usually considered fish-eaters throughout their distribution range. Nevertheless, in some regions authors consider them to be more generalist predators shifting their diet according to prey availability, such as in southern European latitudes. To contribute to this discussion, we evaluated otter feeding preference/avoidance towards the elements of the fish guild inhabiting a Mediterranean environment in central Portugal (Côa River) and assessed the influence of proximity to a surplus of trophic resources (a rainbow trout production farm). Almost two years' data showed that otters prey almost exclusively upon fish (94% of consumed biomass), especially the rainbow trout (87% of consumed biomass), although some seasonal variations are detected: in summer this diet is complemented with reptiles and amphibians consumption. We hypothesised that in the presence of a constant food surplus, such as the trout farm, the observed otter specialization in rainbow trout represents an extreme opportunistic behaviour.

## Landscape characteristics and habitat of pine martens (*Martes martes*) and stone martens (*Martes foina*) in the Bresse area, France

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Since autumn 2003, a study on pine martens and stone martens in the Bresse area (France) is underway to estimate demographic parameters, especially survivals. From December 2003 to June 2007, 45 pine martens and 42 stone martens were captured and followed using telemetry. Home-range size were estimated from 31 stone martens (13 females and 18 males) followed more than 60 days and on average 220 days (min. 60, max. 502 days), and from 28 pine martens (12 females and 16 males) followed more than 60 days and on average 211 days (min. 62, max. 621 days). We investigated home-range variations between sexes, seasons and reproduction status using minimum-convex polygon and Kernels methods.

This paper describes first results on habitat use by pine and stone martens in the same fragmented area. We compare the selection of resting sites and point out the differences in habitat use by the two species in the same area.

## Follow-up of the European badger (*Meles meles*) through the updating of the badger dens atlas in the Wallonia Region (South of Belgium)

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In Wallonia at the beginning of the 1980s, the European badger populations were at their lowest level: they suffered dramatic declines due to the massive gassing of existing dens. At that time, rabies was causing a great dilemma. To control the disease, lots of foxes (*Vulpes vulpes*) were killed by that drastic method, causing effectively a dramatic mortality side-effect in the badger populations. Fortunately, the use of rhabdovirus vaccine over the whole area was successful to eradicate rabies after several operations. Meanwhile, the badger took advantage of this break to reconstitute progressively its populations.

In order to follow the badger status in Wallonia, four previous dens censuses were performed. The first two took place in 1980: primary during the gassing operations, secondly just after their interdiction. The third inventory was launched after three rabies vaccination campaigns (1982-1985), while the fourth one was led in 1994. The aim of that last dens census was to control the evolution of badger reoccupation.

Since 2006, a new inventory ordered by the Ministry of Nature Conservation of the Wallonia Region is in progress. We will use an updated atlas of the badger dens to follow up the evolution of this species actual status. This campaign was initiated because we suppose a significant development of the Wallonian population of *Meles meles*. This phenomenon is revealed by two main factors: the increase of road traffic victims, mainly in the South area, and the augmentation of the complaints number for damages occurring in corn plantations (and due to the badger).

From that fifth campaign, we already collected interesting information concerning the general status of more than 800 badger dens (occupied, occasionally used, abandoned, destroyed,...):

- We analysed the occupation rate of the occupied dens;
- We studied the number of openings by den and sorted out the results in different categories to better understand the environment occupation;
- We also studied the age of the dens when it was known;
- We quantified the different types of deteriorations identified and the potential threats for each den;
- Finally, we considered the cohabitation of the badger with other mammal species (fox, rabbit, wild cat).

To complete the available information and better appreciate the actual situation of the badger, we are realizing an estimation of the badger population in Wallonia. In order to count the number of individuals by den in a representative sample, we selected 50 typical dens over the 800 data available regarding the occupation rate, the number of dens mouths and the biogeographical area in which the den is located. Each selected site is visited three times in standard conditions to evaluate the numbers of animals and reduce the potential errors.

The badger population estimation is expected to be completed in autumn while the dens inventory should be ended in 2008. These results should provide the necessary information to establish a conservation plan adapted to the badger status in Wallonia.

## **Some features of the European badger (*Meles meles*) ecology in Darwin Reserve, north-west of European Russia**

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Darwin Biosphere Reserve is situated in north-west of European Russia. Badger population density's studies began here in the mid-1960s. Behavioural ecology studies began in 2001. Landscape of Darwin Reserve is unusual for badgers. Peat bog areas constitute greater part of reserve territory and subterranean waters lie close to the surface. Such soil conditions are unfavourable for setts construction. Badgers dig setts in old coal-bunkers – ring shaped rising ground, remains of charcoal trade of 19th century. Coal-bunker's area occupies up to 194.7 m<sup>2</sup>. There are about 2000 coal-bunkers in the reserve. 599 of them were marked in 1963 and then checked up for species using burrows (badger, fox or raccoon dog) up to 1998. Badgers used only 14 % of coal-bunkers for sett constructing.

Our data indicate that badger burrows are mainly associated with large coal-bunkers. Perhaps, coal-bunkers surroundings fragmentation may affect sett-site selection as well. Badgers setts possess from 1 to 27 entrances (n = 83). Burrows lie close to surface as compared to data from other localities in European part of Russia. There are an average 0.63 m deep (n = 16).

Diet of the badger was studied by scat analysis. Faeces were collected in 2001-2006 from 15 setts (n = 38). Most often latrines consist of 1-2 dung pits and are situated as far as 2-15 m from sett entrances. Faeces occur in setts in May – first half of June and sometimes in autumn, when badgers prepare for winter hibernation. Our data indicate that badgers consume 11 different food items. Amphibians, insects and fish are prevailed food for badgers in the reserve. Preliminary results of microscope search of earthworm remains in scats (n = 14) showed that badgers hardly consumed earthworms because of their low abundance.

## Hunting behaviour and feeding success of patch fishing of Eurasian otter (*Lutra lutra*) in Lužnice River, Czech Republic

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All observations of hunting behaviour of otters (*Lutra lutra*) were collected in the same, short (200 m long) stretch of natural shore of Lužnice River, in the 'Stará řeka' National Nature Reserve, the core area of the Třeboň Biosphere Reserve, during the winters of 2003-2006 (in early morning light). This stretch of the river was very frequently visited by otters, because of its exceptionally good conditions for patch fishing: high density of fish prey, mostly roach (*Rutilus rutilus*), bleak (*Alburnus alburnus*) and bream (*Abramis brama*) with size categories 5 - 25 cm in length. River depth varied from 0.3 - 1.5 m, the river bed having a very uneven surface. During patch fishing in this river otters used mainly two hunting strategies:

- swimming and diving along river shore with frequent 'dolphin-like' jumps (percentage of recovery emergences, 39%); and
- fishing in direction directly towards the river shore (as opposed to along it) with recovery emergences typically with smooth, quiet water and very infrequently with 'dolphin-like' jump (percentage of recovery emergences, 9 %).

Individuals combining both techniques were very infrequently observed (only 12% of observations, n = 115).

A typical hunting session, i.e. continuous hunting activity, consisted of several fishing bouts (2-15 bouts per session; n = 21). Hunting sessions lasted from 3.56 min to 31.73 min. Each fishing bout was a complete series of several dives. Sometimes only one dive was enough for catching prey (females and sub-adults, 26% of all bouts, n = 71; males, 35% of bouts, n = 44). Dives differed in time: in patch fishing in the Lužnice River, dives lasted 3 - 8 sec and a dive series consisted of 1 - 9 dives.

During a fishing bout, i.e. a diving series, the otter emerges for breathing and orientation, but all such activity can still be considered as only one hunting action. Thus percentage feeding success rate is derived from the success of catching of prey per single fishing bout. Feeding success as derived from result of each fishing boat was 98% (n = 71) in females and sub-adult animals, and 92% (n = 44) in males. This difference might be the result of the different size of fish prey caught by these two groups: considering only two categories of fish prey size (<15 cm or >15 cm), females (and sub-adults) caught 6.8 fish <15 cm long, and 3.4 fish >15 cm long per hunting session, whereas males caught 3.5 and 3.8 fish in the same size categories per hunting session.

## **Growth and stabilisation of the density dependent otter (*Lutra lutra*) population in central Finland**

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The population of otter (*Lutra lutra*) has been studied in central Finland since 1980s. Maybe the most important method has been yearly counting of otters by snow-tracking. The counting of individuals makes it possible to monitor the population exactly, and for example to study the number of new cubs in the area. It is also possible to calculate the birth rate or growth rate of the population in the study area. The aim of this presentation is to demonstrate how the otter population grows up, stabilises after the rapid growth phase, and to show the latest changes (2003-2007) of the population in the study area.

In Finland, the long winter with permanent snow cover and ice on lakes creates an excellent opportunity to study animal movements. Moving on snow is natural for otters when they are searching for new feeding areas. Between November and April only few rapids and some outlets of large lakes remain unfrozen. Except these ice-free areas, all lakes and ponds are totally covered by ice, and ice covers most of the flowing rivers, too. It is therefore possible to see nearly all movements of an animal by their tracks in the snow. The main snow-tracking method used in this study was home range mapping method (HMM). In this very intensive field method, exact estimating of the number of cubs and adult otters is possible. Three different snow-tracking methods were earlier presented, e.g. in Sulkava (2006, 2007) and Sulkava & Liukko (2007).

Growth of the total otter population in the study area from 1985 to 2006 was sigmoidal. The otter population increased rapidly from 1985 to 1993. Since then, the population has varied between 40 and 60 individuals. Population growth at its most rapid phase (1985-93) was 143%. This represents on average 17.9% per year. At present, in central Finland the otter population is dense and probably fully saturated at a low local carrying capacity. The mean litter size decreased in the study period with increasing density of the population. However, the birth rate was equal in the whole study period. Increasing number of deaths is the most possible explanation for decreasing growth rate of the population. After year 1993, when the otter population reached the local carrying capacity, the population size has oscillated up and down, indicating intraspecific competition between otters. Although there is abundant water in the study area, the carrying capacity is low. The limiting factor is the time when waters are open, i.e. competition for food intensifies when nearly all waters are covered by ice in winter. When the population density increased, the shortage of winter food became evident, and the litter size decreased. Also the density-dependence of offspring production indicates intraspecific competition in the population.

The shortage of food could also be seen in cub production in different river systems. Only females living in the river systems with large open waters in winter could produce many offspring. The increased competition could also be seen in the number of death otters as the population density increased. Today the density of otters in central Finland (about 0.7 individuals per 10 km of river) was more or less equal to that in the same latitudes in Scotland (0.7) and in Russian Karelia (0.6-1.3).

## **Top predator, pet and pest: the intensive urbanisation of stone marten in Budapest**

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The multi-scale investigations on the urbanization process of the stone marten in Budapest have been started in 1996. Data collection was based mainly on the several hundreds of sightings of inhabitants from all over the Capital's huge administrative area (525 km<sup>2</sup>). The stone marten's urban sprawl cannot be attributed to diminishing natural habitats; it is a widespread carnivore in Hungary. It lives practically side by side with humans, shows tameness, prefers attics, roofs, and suspended ceilings as den-sites, and utilizes different kinds of available food sources. Public opinion of the presence of this species is doubtful, and the coexistence may result in economical and health problems.

Our program has five objectives: 1. to monitor the spreading process on the basis of registrations; 2. to analyse and reconstruct the diversity and seasonal changes of the diet by determining the food remains from numerous scats; 3. to characterize preferred shelters, possible corridors, and barriers within the matrix of the town; 4. to point out the pathogens from blood samples of live-captured stone martens; and 5. to create contact with the public to give and gain information about this creature.

Food source analysis seems to conclude that the scale and intensity of urban presence is not driven by the availability of the food but rather by the availability of a large number of shelters. Martens did not follow or adhere to the green lines and paths of the capital; they reached the inner suburbs and integrated into the city's unique and largely unexplored food network. As we suggested, martens may get distemper, thus becoming the transmitter of this disease. The key to the success of the stone marten's urbanisation lies in its unique adaptability to anthropogenic environment including humans. The absence of larger carnivores and low density of competitors contributed to their successful reproduction and intensive spreading too.

## The otter (*Lutra lutra*) in Russia in the new millennium

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Until the start of socio-economic reforms of the 1990s, the welfare of the otter in Russia mostly depended on the intensity of economic activities, i.e. on the state of the habitat, rather than on hunting. Harvesting was limited by licensing; poaching was restrained. The reforms caused significant ecosystem transformation and disorder in use of natural resources. Within timeframe 1991-1995 about 30 mil hectares of arable lands and 17,000 settlements were abandoned. Anthropogenic load on ecosystems went down, including impact on water ecosystems and adjacent areas. Those for the otter positive processes, however, have not resulted in the population growth, mostly due to unprecedented growth of poaching. From 1991 the income of the population rapidly decreased, after the default of 1998 they collapsed and the great majority of population lived in extreme poverty. Unemployment increased tremendously (in 1991 it was 1% of the active population, in 1992 - 5.2%, in 1996 – 9.7%, reaching its maximum 13.2% in 1998 and then started decreasing). The people simply struggled for survival. Rural population that had lost the means of substance turned to “socially forced poaching” that threateningly increased. Collapse of the state control over hunting also favored it. Hunting load, mostly illegal, increased manifold, especially hunting of two “meat” species in Russia – elk and wild boar (between 1991-1995 population of these two species decreased two times, at some places – three times!). Otter has suffered less from poaching as its hunting is very time-taking and requires high qualification. However, due to uncontrolled and irregular hunting its number in Russia also decreased that time from 60,000 to 52,000. The decrease occurred practically in all regions; however the taiga areas were less impacted. Boundaries of the habitat or its belt-lacy structure have not changed. Main otter resources in 1995 were in the European North of Russia (13,900 animals) and Far East (17,100). In the following years otter population started increasing along with improving economic situation and establishing order in hunting and use of natural resources. In 1997 its number was 53,800; in 1998 – 56,900; in 1999 – 60,900. Up to 35% of the total population was that time in the Far East. In the current millennium the growth trend continues. In year 2000 63,100 animals were counted, in 2001 – 63,800, in 2002 – 68,300 and in 2003 – 73,880. Over 40% of the resources locate now in the European North-West of Russia, 18% - in the Far East. Legal otter hunting is about 500 animals per year (in 1998 – 310). Illegal hunting is not accountable. It might be ten times more. In the former years otter hunting was rather intensive in Russia: in 1904-1913 annual harvest was about 20,000 skins, in 1942 – 2,000; in 1954 – 9,500 skins. In the foreseeable future otter’s welfare in Russia, especially in the vast taiga areas of the Russian North, Siberia and Far East, is not an issue of concern. However, in densely populated central areas with intense economic activities, the otter numbers will be unstable. In those regions a strict control over hunting, use of natural resources and condition of the natural ecosystems will be required. Establishing new natural reserves might be also needed.

## Genetic variability in Moravian polecats: a pilot study using mitochondrial DNA sequences

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Moravian part of the Czech Republic has traditionally been regarded as an area of sympatric occurrence of both European polecat species, the western polecat *Mustela putorius* and the steppe polecat *Mustela eversmanni*. Besides still uncertain phylogeography and systematics of polecat taxa, concerns have recently arisen about specific purity of European polecats, which may be seriously influenced by hybridization with feral ferrets *Mustela cf. furo*.

In our material, specimens of both western and steppe polecats of Moravian origin were present, as determined by phenotypical traits. Nonetheless, feral ferrets might have been unwittingly assigned to any of the species. We assessed variability of sequences of the mitochondrial control region and explored phylogenetic relationships using parsimony and neighbour-joining methods, as well as median-joining network approach. Revealed haplotypes exhibited low nucleotide diversity. Three groups of haplotypes could be recognized. Genetic divergence among them was lower than expected for separation on specific level. Indeed, topology of trees suggests a careful evaluation of taxonomic status of the respective forms. Originally assumed western polecats split up into two groups, one of which showed a close affinity to ferrets. Surprisingly, phenotypically identified steppe polecats exhibited paraphyletic relationship with western polecats, making the actual status of Moravian steppe polecats highly questionable. Comparison with GenBank available polecat sequences brought no clear explanation of our findings. On the contrary, it supports a need for a large scale exploration of phylogenetic relationships and search for introgression of ferret genome in local polecat populations of Europe.



## The food habits of stone marten (*Martes foina*) inhabiting the city of Krakow

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Feeding habits of stone marten (*Martes foina*) were studied by scat analysis in the city of Krakow (Poland) between October 2005 and August 2006. A total of 400 scats have been collected on two different study areas occupied by stone martens. The locations differ greatly in their environmental characteristics mainly by available food resources. We have decided that in order to compare the food habits of stone marten, the environmental conditions of selected study areas should be different. The first study area is located in the old part of the city center. It comprises high density of old apartment houses with scarce greenery and numerous citizens and tourists. The second study area is included in the suburbs of Krakow (Wola Justowska district), with semidetached houses, considerable large green lands (gardens, orchards, forest) and low density of citizens.

The scats were collected every two weeks in both study areas. Analysis of scats followed the standard procedure described by Goszczynski (1974). Food composition was expressed by both percent of biomass consumed and percent of occurrence in scats. The biomass of consumed prey was calculated by using the coefficients of digestibility.

Several categories of food items have been defined: birds, mammals, fruits and grains, other plant materials, egg-shells, insects and trash.

Stone marten's diet in the city center is mainly based on birds (73% Bio), mammals (18% Bio), fruits with grains (15% Bio) and other plant material (10% Bio). In the suburban area proportions are different, the most important food were fruits and grains (44% Bio), next were mammals (25% Bio), and birds and other plant material constituted each 15% of consumed biomass.

In addition, we have recorded garbage remains (represented mainly by plastic wrapping, rope, chewing gum, etc.) in scats. In the city centre, garbage was found in scats mainly during autumn (9% Occ) and winter (13% Occ). In the suburbs it appeared through the whole year (2-5% Occ).

The research has proved that martens are feeding generalists; they feed on food that is most abundant in particular environment. Those living in the city center feed mainly on birds, especially pigeons *Columba livia* that are very common in the center of Krakow. On suburbs stone martens preferred fruits and grains (mainly European yew *Taxus baccata*, wild cherry *Prunus avium* and European grapevine *Vitis vinifera*) that are common since this area is full of gardens and orchards.

## **Nocturnal or diurnal? Activity patterns of mink (*Mustela vison*) in a fish pond area in Northern Germany**

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The circannual and the circadian activity patterns of mink (*Mustela vison*) were studied in a fish pond area in northern Germany. Fourteen minks were radio-tracked, nine of them (four females and five males) for more than six up to 21 months. Both sexes reduced their activity rates in winter months (October to February) and showed a considerable increase of activity during the mating season (March). In the summer months - during the pup raising period - female activity level remained high, whereas male minks were less active with the exception of August and September. In these months dispersing juveniles caused a change in territorial system which influenced also the activity and behaviour of adult minks.

Circadian activity rhythm differed markedly between the sexes. All investigated females exhibited a regular and constant diurnal pattern in winter as well as in summer. Activity during twilight and night was significantly lower than during daylight. Three investigated male minks showed a typical nocturnal and crepuscular course throughout the year. The daylight activity of these animals was very low. During dusk the activity rates increased, remained at a high level during night, and decreased at dawn again. Two males behaved arrhythmic; no preferred activity period was found. The temporal strategies detected are discussed in context of different influencing factors, e.g. the avoidance of intersexual competition.

## How to survive in a cold (and changing) world?

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Body mass (BM) and resting metabolic rates (RMR) are two important traits directly affecting energy expenditures in mammals and in consequence their mortality. For all species living in temperate zone winter is most demanding period due to harsh thermal conditions and limited food availability. Weasels, characterised by extremely high metabolic rates and specialized in hunting for rodent are especially exposed to risk of starvation. Thus, to increase fitness these predators should minimize energy expenditures in winter (decrease mortality) and maximize energy expenditures in summer (increase reproductive effort).

We found considerable variation in genetic relatedness among individuals, which positively co-varied with phenotypic similarity in both BM and RMR. This allowed us to apply Ritland's (2000) marker-based method to estimate narrow sense heritabilities ( $h^2$ ) for these traits. Body mass of weasels was characterized by relatively high narrow sense heritability, ranging from 0.99 for raw BM values, to 0.55 for phenotypic variation corrected for effect of weaning time and mean body mass of prey. Heritability estimates of RMR were lower than of BM and ranged from 0.38 to 0.63. Daily energy expenditures of weasel males, measured using double labeled water technique (DLW), were directly proportional to the body masses and activity time of animals. Therefore larger individuals were more vulnerable to risk of predation, since they had to extend hunting time to satisfy their higher energy demands. Contrary to common expectations daily energy expenditures of weasels were not related to temperature and were not affected by prey abundance.

To avoid constraints imposed by energy expenditures weasels adopted numerous morphological, behavioral and physiological strategies. Morphological adaptations involve decrease of body mass in animals born late in the season as well as decrease of brain case volume in older individuals. In weasels heritability of RMR was lower than heritability of BM and could be adjusted to unpredictable changes of climatic and nutritional conditions. Therefore outside the breeding period RMR of weasel males was significantly lower than during mating season. Shortening of activity time was most efficient mechanism reducing excessive energy expenditures by non-reproducing weasel males and in winter was limited to about 1.4 hour per day. In winter weasels also cumulated significant amount of subcutaneous fat, which allowed them to survive periods of unfavorable weather conditions. As result of all adaptations total amount of energy expended by weasel males was significantly lower outside mating season than in periods when they searched for mates (in spring and late summer).

## POSTER PRESENTATIONS

### **European Mink (*Mustela lutreola*) in Ukraine: current state and problems of conservation**

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The European Mink is very rare species in Ukraine. Its presence is confirmed in the Carpathian Mts. and Danube and Dnister river delta areas, which are two main centres of the European mink distribution in Ukraine. Single observations are known from some other parts of the country. It is probably extinct in some other regions.

The most numerous populations of the European Mink occur in the Danube river delta. It is estimated to be about 390-550 inds. (Zhud 1999, Volokh 2004). The Mink is observed as well in the Dnister river delta (about 10 inds.) (Rozhenko 2001).

Sufficient information about this species in the Carpathians is known only from some high mountain areas of the southern part of Ukrainian Carpathians. Not complete data have been used by scientists, allowing sketching the localities of the species: mountain streams in Gorgany, Shyrokoluzhansky, Svydovets and Chornohora massifs. General number of the mink here is evaluated by up to 60 individuals.

The main factors of decreasing of the European Mink population in Ukraine are degradation of important habitats, human disturbance, poaching, predatory, and probably competition with another mink species.

## **Diet of stone martens (*Martes foina*) in the Iberian Peninsula: a comparative analysis**

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Food habits of stone martens (*Martes foina*) in Iberian Peninsula were reviewed and compared using 8 data sets (2 from Portugal and 6 from Spain). Data on the diet were taken from literature and new results from an ongoing project in Southern Portugal. Diet composition was estimated by scat and gut analyses and the frequency of occurrence was used for comparative purposes. We assessed geographic and seasonal effects on diet similarities through PCA analysis. Geographically, studies analysed were separated in two main groups, mostly due to the variation found in the consumption of arthropods (variation explained 77.7%). As for season, also two main groups were consistently found, but while in spring/summer diet of one group was based on arthropods and the other on mammals and birds, in autumn/winter the first group was predominately based on the consumption of fruits and the other on arthropods and mammals. Correlation tests revealed a negative relation between altitude and frequency of occurrence of arthropods.

The ongoing study in Southern Portugal (Serra de Grândola) confirmed the importance of arthropods (81.11%) and fruits (78.32%) in terms of frequency of occurrence, but considering consumed biomass the fruits were the most important food item (78.68%) for stone martens. The seasonal frequency of occurrence showed higher values of arthropods in winter and spring, being replaced by fruits in autumn and summer; while mammals and birds assumed the highest values in winter. With respect to biomass, fruits were the most important item during all seasons; mammals and arthropods reached their maximum in spring, while birds in winter.

Our results are consistent with the assumption that stone martens are generalist feeders but consume predominantly insects and fruits, with small mammals also being important to compensate e.g. their seasonal fluctuations.

The comparative analyses indicate that the Iberian populations have a wide range of trophic strategies and some populations in Mediterranean-type areas share feeding behaviours with Eurosiberian populations. Habitat diversity and climatic fluctuations, typical for the Mediterranean areas, may be influencing these results and should be further investigated due to the effects of feeding strategies on population density and other ecological attributes in medium-sized carnivores.

## **Wildlife and Human in the Bavarian-Czech-Austrian border Region – an Interreg project with the example of the otter**

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The otter belongs to the heavily endangered mammals in Europe and is therefore specifically protected through the Annex II and IV of the EU habitat directive. The reduction of the otter population which took place throughout the last 200 years was caused by a complex of factors: direct loss of habitat (e.g. development, drainage, loss of flood plains), indirect destruction of the habitat (e.g. water pollution, reduction of other animals' populations, i.e. food basis), and hunting by man are named as the major causes.

During the last 20 years, a slow recovery of the otter population could be noticed in Bavaria and in the neighbouring countries. The existing conflict of interest between the owners of ponds and environmentalists could not be resolved clearly so far in the sense of an integrated management. Therefore an Interreg Project was started in 2006 to elaborate solutions through an integrated approach, which takes into account aspects of otter protection as well as damage prevention. Methods of genetic analysis, habitat evaluation and social sciences are applied. The general approaches of the project as well as selected interim results are presented.

## **Comparing the efficiency of two survey methods for the European marten (*Martes martes*)**

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A well known method to monitor martens, based on camera-trapping with baits on trees, is used in survey programs for the American pine marten (*Martes americana*). While testing the efficiency of a monitoring scheme for wild cats (*Felis silvestris silvestris*) in north-western Switzerland, we noticed that marten often comes to lure sticks scented with valerian. On this sticks, the animal leaves its hair, which allows identifying the species by microscopic and genetic analysis. In my diploma work, the efficiency of these two methods is compared to find out which method is eligible to survey the European pine marten (*Martes martes*) in Switzerland.

## Interaction between European mink and American mink in Salburúa Wetland, Álava, Basque Country

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Salburúa is a wetland close to a city with more than 200,000 people, Vitoria-Gasteiz, in Basque Country. The surface of this wetland is 204 ha, but it has only 66 ha of water. Salburúa consists of three lakes and four rivers, all of them inside Zadorra basin. It is Interesting Community place, included in RAMSAR list and a Special Interest Area for European mink.

Salburúa was one of the first places where European mink was found in 1950 decade in Spain. Between 2000 and 2002, 12 different European minks were trapped (16 recaptures) with 8 females. Along these three years new individuals were captured, that means the population has been renewing.

First American mink was captured in spring of 2002. In 2002-03, the trapping was very intensive, to preserve the European mink. In these two years, 14 American minks (9 males and 5 females) were captured and sacrificed. In 2004, due to intensive trapping carried out the last two years, no American mink was trapped. In 2005 and 2006, seven American minks were captured. Between 2003 and 2004, six different European minks were found, but only three females. And between 2005 and 2006, only two European minks were captured, both males. This decrease of captures of European mink can be mainly due to one reason: the presence of American mink since 2002 and the competition against European mink.

Besides, since 2001, two hybrids (*Mustela lutreola* x *Mustela putorius*) were captured 11 times. One male was caught in 2001 and 2002. One female was caught in 2006 and 2007, when it was retired from wild. The appearance of hybrids between European mink and polecat is a characteristic fact from border areas and near the extinction of native mink. The current situation in Salburúa wetland for European mink is really complicated and its conservation in this area must start with the eradication of American mink around Salburúa, and in the future continue with the release of European mink from ex-situ Spanish program to reinforce this population.

## Mitochondrial DNA phylogeography of the European polecat (*Mustela putorius*) in Portugal

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The European polecat (*Mustela putorius*) is now experiencing a population decline across its range. Major causes for this trend have been habitat destruction, direct persecution, and hybridisation with feral ferrets. We have recently initiated an investigation (as part of the PhD of Mafalda Costa) of the levels of genetic variation and structure of this species in Portugal, where its demographic status is poorly known and genetic information is totally missing. Here we present preliminary results concerning the phylogeographic structure of the polecat across Portugal, as inferred from a 586 bp fragment of the mitochondrial DNA control region. Overall, the levels of genetic variation were low, both in polecats and ferrets, and although genetic differentiation among polecat haplogroups was also low it was statistically significant. Provisionally, and using two distinct methods of haplotype network construction (statistical parsimony, as implemented in TCS; and median-joining algorithms, as implemented in Network), we have detected three haplogroups: two of them including samples from both south and north of the country, and the third one essentially restricted to Estremadura (a coastal region roughly at middle of the country). All the positively identified ferrets we examined, coming from different regions, grouped together in a fourth haplogroup that related with the smaller of the haplogroups containing polecat samples from south and north of the country. Therefore, our preliminary mitochondrial DNA data seems to suggest that ferrets in Portugal may stem from a single or few domestication events and/or that domestication mostly sampled from the same polecat genetic diversity. Obviously, more samples and the screening of several nuclear microsatellite loci will allow us to assess these preliminary conclusions, as well to identify and quantify putative instances of polecat-ferret hybridisation throughout the country.



## **AnimalTrack – A software to support measurements from photos of track of cryptic animals**

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Since the mid of the 1990s scientists have started to use footprints to identify individual animals (Smallwood & Fitzhugh 1993). The basic idea behind this approach is to group photos of tracks by various statistical analysis to individuals (e.g. discriminant function analysis or neuronal networks) and infer the number of animals living in a given area by using transect or capture-recapture methods. To use these methods someone needs to measure various characteristics of the photographed tracks such as spread of outer toes or heel width, which can be quite tedious, when the number of photos is high. Here we present computer software that supports the measurement of predefined characteristics of photos. We developed the software to test the method by using tracks of otters, though the software can be applied to virtually any species as the set of measured characteristics can be freely defined. Finally measurements can be stored in a text file that can be directly analysed with standard statistical packages. The software can be downloaded from the author's webpage [<http://www.ufz.de/index.php?en=1902>].

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## Genetic structure and recent population decline in Eurasian otter (*Lutra lutra*) populations in the Czech and Slovak Republics

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Over the latter part of the 20th century, Eurasian otter populations suffered dramatic declines, resulting in extinction or fragmentation of populations in many Western and Central European countries. In the Czech Republic, most of the otter population became totally isolated around the 1970-80s, while the Slovak population remained partly connected to the relatively continuous Central and Eastern European otter distribution range. We studied the genetic structure and past demographic history of otters in the Czech and Slovak Republics using DNA extracted from tissue (n = 134) and faeces (n = 63), amplified for 10 microsatellite loci. A relatively high level of genetic differentiation was found between the Czech and Slovak populations ( $F_{ST} = 0.154$ ), supported by a perfect assignment in Bayesian clustering using the STRUCTURE programme. Analyses using two different programmes (BOTTLENECK, MSVAR) indicated the occurrence of a recent population bottleneck in both populations. The timing of the decline was in accordance with published data from otter surveys, suggesting that the strongest decline probably occurred between 1970 and 1995. Although populations have started to recover in most European countries, our study indicates that the present effective population size in both Slovakia and the Czech Republic may still be very low. The populations, therefore, remain vulnerable to any violent demographic change and, despite fish-farmers and anglers calling for culling, it is highly desirable that they remain a strongly protected species in both countries. The spreading and reconnection of otter populations recently observed is essential for the future health of the populations, and should be supported through habitat conservation.

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## Road mortality of mustelids in the Czech Republic

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An extensive monitoring of the fauna road mortality was realised in the Czech Republic in 2006 and 2007. The goal of this research was to estimate the numbers of killed individuals of selected species on all roads in the Czech Republic, as well as to explain the effect of traffic density, terrain surrounding, season and other factors on the mortality of different species. Walking along the roads was used as a method for searching the carcasses. All found vertebrates were identified, and the position of the carcasses on the road as well as the surrounding of the accident place was described for each case. During 13 months 1282 km of roads and highways were checked in both directions: 321 km of highways and high speed roads, 302 km of 1st class roads, 355 km of 2nd class roads and 304 km of 3rd class roads. A total of 2144 specimens of 103 vertebrate species were found. All mustelid species living in the Czech Republic, except of the steppe polecat, were found during the checks. Following numbers of mustelids were found: 80 stone martens, 24 weasels, 10 stoats, 7 pine martens, 4 otters, 3 European polecats, 2 American minks and 1 Eurasian badger. The dependence of the mortality on traffic intensity, terrain surrounding, season and other factors was measured for most frequently found species (stone marten, weasel, and stoat).

## **Distribution of the otter (*Lutra lutra*) and minks (*Mustela vison*, *M. lutreola*) in the South Urals**

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Urals Mountain is located on a joint of Europe and Asia and these are often used as the dividing line between Europe and Asia. The South Urals is one of the most ecologically unfavorable regions because of overabundance enterprises doing a lot of harm to nature. Since the 19th century the intensive exploitation of natural landscapes became the reason of wild nature degradation and species diversity reduction. But complex mountains relief and difficult access have contributed to the preservation of parts of the original wild. The eco-region's territory has a high diversity of nature communities, high density and absolute number of species, including rare and threatened ones.

Among mammals inhabiting the Urals, the European mink (*Mustela lutreola*) is the most endangered on the present. It is included in the Red Data Books of the Busckiria, Chelyabinsk, Ekaterinburg, Perm and Orenburg Regions. The European mink still exists in some small mountain rivers of the west and north parts of Chelyabinsk Region. The populations are balancing on brink of disappearance. In the Ilmensky State Nature Reserve, the European mink was last time recorded in 1985.

American mink came up in South Urals in 1940-1950 and now it is recorded everywhere in the region. In the territory of Ilmensky Reserve American mink have begun to be registered in the middle of 1970s.

Otter (*Lutra l. lutra*) inhabits mountain rivers of western and northwest part of Chelyabinsk region. Number of the otter population is low and decreasing constantly.

## Protecting fish farms from otter (*Lutra lutra*) predation

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With increasing numbers the Eurasian otter (*Lutra lutra*) will become more and more a conflict species of major concern. Otters are considered to be a pest at commercial fish ponds and are a high priority species for conservation. No special permissions are granted for the killing of otters on fish farms and in most parts of Germany no compensation is currently paid for damage caused by otters. Therefore preventive strategies such as fences have to be used in order to keep otter predation on a tolerable level. The aim of this study was also to reduce the risk of illegal trapping and killing otters by fish farmers. Until now we have tested an electric fence in a semi-natural enclosure with good results. Thus, we decided to test different types of electric fences in a fish pond area to find the most efficient fence design to exclude otters. Beside this aim the protected ponds are serving as demonstration models.

We have installed three different types of fences:

- type I: an electric fence with two wires (wires on heights of 10 and 20 cm)
- type II: a combination of wire mesh (height 60 cm) and a single electric wire on the top of the mesh
- type III: a 60 cm broad band of pond foil with a hump in the middle and an electric wire on the top of the hump.

Until now the fences are working well but the results are primarily.

## **Microsatellite analyses of *Mustela nivalis* to estimate the genetic relationship in the investigation area near Trier**

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The least weasel (*Mustela nivalis*) as the smallest recent carnivore is infrequently viewed because of its cryptic living. It is rampant nearly all over Europe and widespread all over Germany. For analysing the genetic relationship, 60 traps were positioned in the area of Konz-Kommlingen and Oberemmel. In the period of two years, 128 least weasels were caught. From each individual a small piece of the ear was taken for the following analysis. The investigation area is located near the confluence of the Saar into the Mosel. For comparison between the populations, ten least weasels of an area in France about 200 kilometres away were integrated into the tests.

For analysing the reproduction range 128 samples were tested by microsatellites. The five used primers showed highly variable loci which were defined by nine to nineteen alleles. But it was not possible to show direct relationships. The variable combination of the alleles generates gene diversity near one. As well on closer inspection of a neighbour-joining-tree, autapomorph attributes dominate the structure and represent this gene diversity.

The analysed population has been separated into four groups: field, forest, wine yard population and a group where the least weasels were caught between those structure components. The calculated genetic distances show the speculation that it is, by the genetic point of view, a clear togetherness of the four populations. Only the distance to the group caught in France showed a small differentiation.

Due to the high density and cross in the area Konz-Kommlingen/Oberemmel, the population has to be considered as a vital population, which is not threatened if there is an adequate supply of food.

## Habitat suitability for otters in Italy: problems of scale and accuracy

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The Eurasian otter is one of the most endangered mammals in Italy. The species survives with a viable population only in the southern part of the peninsula. Surveys conducted in the years 2000-2007 revealed the existence of a core population located in the river basins of Basilicata and Campania, while peripheral nuclei still occur in the regions of Molise, Puglia, Calabria, and, following a recent finding, Abruzzo. IUCN-OSG guidelines for the conservation of the European otter strongly support actions promoting the natural re-colonisation of vacant areas by the species. It is therefore important to assess the distribution, consistency and connectivity of suitable habitats that can support the survival and natural expansion of otter populations. Our study focuses on the otter population in Molise with the objective to develop an index that identifies suitable habitats and that could be applied to identify suitable areas outside the current range where the otter could potentially expand. For this purpose we selected a number of environmental factors that may influence otter fitness and survival, i.e. factors directly or indirectly related to the availability of food, resting sites, and human disturbance. The model is spatially explicit and factors have been reported on a fine scale GIS. Among others, a riparian vegetation map has been specifically produced at a 1:5000 scale through photo-interpretation using the CORINE Landcover classification on a 300 m buffer around water bodies. Point data have been interpolated by using different algorithms according to the nature of the datum. Suitability indices have then been produced at different geographic scales, i.e. 1, 10, and 50 km, to evaluate which scale offers the best predictive index. Indices will be validated using presence and absence data derived from field surveys.

## **Earthworms as indicator for feeding specialisation: a study on the diet of Eurasian badger (*Meles meles*) in the Veluwe, the Netherlands**

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Nature management organisations in the Netherlands on many occasions buy up and change agricultural grassland into nutrient poor areas. The reason is to increase species diversity, to stimulate the reoccurrence of important species from a historical point of view and to make it attractive to the public. The badger (*Meles meles*) tends to feed mainly on earthworms and is even described as an earthworm specialist. It is therefore suggested that disappearance of these earthworm rich feeding grounds could affect badger populations. The objective of this study was to get insight in the feeding strategy of badgers by quantifying the badger's diet in an earthworm poor and rich environment. The diet composition was determined by analysis of fresh faecal samples collected on a weekly basis from single dung pits and latrines in close proximity of badger sets. The study was carried out from March until June 2007 in an earthworm rich (Veluwezoom NP) and poor habitat (Hoge Veluwe NP), Holland. During the study period a total of 184 faecal samples were collected and analyzed (Veluwezoom NP: n = 101, Hoge Veluwe NP: n = 83). The most important food classes observed were earthworms, fruit, beetles, larvae, vertebrates and amphibians. Preliminary results show a higher estimated volume of earthworms within the diet in the earthworm rich habitat during March and May. At that time, badger diet in the earthworm poor habitat shows an increase in amphibians (March), larvae and beetles (May). Throughout the study period, the earthworm rich habitat shows a high trophic niche breadth. The poor habitat shows a lower niche breadth during May which can be explained by the increased availability of larvae, beetles and berries.



## Raccoon dog (*Nyctereutes procyonoides*) population development in the Czech Republic

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Raccoon dog (*Nyctereutes procyonoides*) is a small carnivore originally from Far East, Indochina, southeast end of Russia and Mongolia. In context with expansion of this species in Asia and Europe, detailed map of raccoon dog distribution and also population changes in numbers are required for individual countries. Object of this study was to find out actual distribution of raccoon dog population in the Czech Republic (CR), development trends during last 50 years and hypsometric distribution.

Development of raccoon dog population was processed on base of recent published data and particularly from data obtained from questionnaire made by IVB AS and NM in Prague sent in 1991 – 2006 to every hunting ground in the Czech Republic and to the Czech Republic Nature Protection workplaces. In total, 3645 records about distribution of this species were collected.

In period 1990 – 1994, raccoon dog was recorded in 41 squares of map net (7 % of CR area); permanent occurrence of this species was recorded only in 1 square (0.2 % of CR area). In period 1995 – 1999, raccoon dog was found in 203 squares of map net (32 % of CR area), and its permanent occurrence was recorded in 8 squares (1 % of CR area). In period 2000 – 2004, raccoon dog was recorded in 410 squares of map net (66 % of CR area) and occurred in 78 squares (12 % of CR area) permanently.

Occurrence of raccoon dog was observed in altitudes 120-1050 m a. s. l.. Withal raccoon dog is continually expanding to higher altitudes.

During last forty years, raccoon dog has become a common species of our fauna. Regarding its high adaptability and fast dispersion, we suppose that numbers of raccoon dog in the Czech Republic will increase in future.

## Otter (*Lutra lutra* L.) research in south Croatia

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Today, rivers in Croatia are exposed to the great pressure caused by different anthropogenic impacts: pollution resulted from tourism and agricultural activities, pollution by waste waters and waste disposal sites, building of road infrastructure, hydro-electric power plants and other.

One of the affected species is otter (*Lutra lutra* L.) and it is especially endangered since they need high quality habitats. According to Red Data Book of the Republic Croatia published by State Institute for Nature Protection in 2004, *Lutra lutra* was in category DD, i.e. Data Deficient. Systematic research about otter distribution and population in Croatia has never been implemented.

Through this research data about otter distribution on the rivers Ljuta, Neretva, Matica, Cetina, Zrmanja, Krupa, Krka, and Guduča (Dalmatia) and Una (Lika) were collected, and present otter habitats in south Croatia are defined.

In parallel, communication activities have been conducted in order to obtain data about otter distribution in the past, and to improve attitudes of local people towards the otter as well as knowledge about threats to otters caused by humans. Results of the field surveys have been correlated with results of communication activities and survey of present and planned human impacts in order to propose future otter conservation activities on the rivers in south Croatia.

## Secondary damage on fish caused by the otter

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Fish are exposed to a number of adverse factors in water environment. These factors give rise to stress, and that is why fish suffer from metabolic derangements and disorders. The gravity of these problems depends on stress intensity and duration. The stress reaction can be caused by water chemistry (e.g. decreasing amount of dissolved oxygen, increasing hydrogen sulphide and ammonia amount, water acidity), but also by predators, especially in overwintering fish. One of such predators is the otter (*Lutra lutra*). Its predation on intensively managed ponds, dams and watersheds has been often discussed by fishermen and specialists in the last few years. Fishermen consider the otter to be a problem, because of its predation and secondary damages to fish stock. The term “secondary damages” includes weight loss and increased disease susceptibility, caused by predator’s presence. Moreover, according to fishermen, under extreme conditions in winter the predator can cause “rise of fish stock” resulting in huge fish kills. Fishermen estimate that secondary damages may reach double the price of primary damages (i.e. double of direct loss due to otter consumption of fish). However, assessment of otter influence on mass fish kills is very difficult as their occurrence can be caused by complex of above mentioned factors. Up to the present day secondary damages caused by otter on fish stock have not been confirmed by any published study. In the Management Plan for the Otter in the Czech Republic for years 2006 – 2015, research on secondary damages has the highest priority. Illegal otter hunting, motivated by damages on fish stock, is a significant factor threatening otter population in the Czech Republic. One of the main goals suggested by the management plan is to improve relationships between fishermen and otters.

## Providing compensation for damages caused by otter in the Czech Republic

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Fishery has a long tradition in South Bohemia. However, the development of fishery has always been connected with a significant and continuous chase for otters. The otter (*Lutra lutra*) is perceived negatively by the part of public and there are also some cases of cruel killing of this species. There were attempts to reduce illegal chase for otters and in 2000 a new Act was approved. This Act makes possible to compensate damages caused by specially protected species, including the otter. According to the Act No. 115/2000 Coll. is possible to provide a compensation for the caused damages on fish bred in the ponds, stews, fish hatcheries and fish breeding cages, the trout farms or free waters (if the otter really occurs in these damaged places).

The amount of damages on the fish caused by the otter is proved by the specialized 'expert statement' and these are processed by e.g. Czech Otter Foundation Fund and also by the Agency for Nature Conservation and Landscape Protection. Majority of these statements are processed in South Bohemia as it is the region with most fishponds. Method for compensation of these statements is based on the simplified calculation in cases when there are more ponds with many owners or users. The calculation reflects the average cost of fish, size of the pond, estimated level of activity of the otters (time spent by otters at the site), number of otters at the site, and the amount of food consumed by the otter per day. An estimated loss does not take into account any secondary damages, because it is very difficult to verify the real cause (disturbance, weather, bad management, poaching etc.). It is necessary to judge individually possible claims for secondary damages or in other specific cases.

Between 2000 and 2007, the Czech Otter Foundation Fund processed 643 expert statements (in 2000 - 2 statements, 2001 - 25 statements, 2002 - 80 statements, 2003 - 97 statements, 2004 - 94 statements, 2005 - 127 statements, 2006 - 127 statements, 2007 (until the end of July) - 91 statements). Altogether there were 54 statements processed for the Czech Fishing Union, 139 statements for larger fisheries and 450 statements for the individual owners. On the basis of these expert statements the refunded compensation was 32.6 millions CZK (1.16 million €) between 2000 and 2007. The Czech Fishing Union was paid 2.45 millions CZK (87 350 €), larger fisheries 24.5 millions CZK (873000 €), and individual owners were paid 5.65 millions CZK (202 000 €).

Based on current experience and from the results of this research comes out large distrust in the system of compensation and environmental protection in general. The fishing public is relatively well-informed about the existence of the Act, but their imaginations about the process of compensations and their information are very biased (except the larger fisheries, where the majority of them are relatively satisfied with the compensations). Local organizations of CFU, however, do not use the possibility of compensations on the ponds. A very problematic group is mainly small owners. Large part of them is persuaded that their costs for getting the compensation will exceed the received amount.

## **Ecological aspects in establishing island populations of European mink (*Mustela lutreola*) in Hiiumaa Island, Estonia**

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Recovery of European mink started in Hiiumaa Island in 1998. First task was to remove feral American mink (*Mustela vison*) population, it was managed successfully. The parameters of captured American minks are presented.

First European minks were released in the island in 2000. Radio-tracking was used to estimate the mortality of released European minks in period 2000-2003. The total number of radio-tracked individuals was 54. Home ranges, habitat use and the diet were investigated as well. Snow-tracking and trapping with box-traps were used to find out the mortality in longer period, and also to search reproduction of released animals between 2000 and 2006. The results of diet analysis are also presented. For that, 564 excrements were collected and analyzed. Differences between habitats and between individuals were explained, also yearly and seasonal differences.

**Dietary risk factors for urate urolithiasis in European otters (*Lutra lutra*)**

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Urolithiasis due to ammonium urate calculi is a significant problem in captive Eurasian otters (*Lutra lutra*). To assess the risk factors for otters to form ammonium urate calculi, feeding trials were conducted in a group of five captive otters under seven dietary regimens. The animals were adapted to the appropriate diet for five days, followed by a urine collection for five days. The urine was quantitatively collected in metabolism cages. The composition of each diet was assayed for purine content, dry matter, crude ash, crude fiber, crude protein and crude fat. Each urine collection was assayed for pH, uric acid, creatinine, ammonium and allantoin concentrations. The average urine volume was 405 ml per 24 hours. For the blood tests, plasma from 15 otters was obtained and the uric acid concentrations were determined.

High concentrations of uric acid (3.3 mmol/l; 0.5 mmol/ mmol creatinine) and ammonium (103 mmol/l; 15 mmol/mmol creatinine) were found. The impact of purine intake on the renal uric acid excretion was significant. The urinary allantoin excretion, expressed as mmol/mmol creatinine, was 2.7 and higher than that reported for dogs. The mean plasma uric acid level of our otters (0.15 mmol/l) was higher than that in dogs, but not reaching critical levels above which uric acid is prone to precipitate.

In conclusion, risk factors for the formation of urate calculi in captive otters can be influenced by diet. The correlation between purine intake and renal uric acid excretion provides an opportunity to minimize this risk factor for urate urolithiasis in the captive population.

## Rehabilitation of Mustelids at AOPK ČR Otter Station Pavlov

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The building of Station for Fauna Conservation in Pavlov has started in 1989. From the beginning it is a governmental project. In the present it is a part of Agency for Nature Conservation and Landscape Protection of the Czech Republic. The main function of the Station in the first years was keeping and reproducing the otter (*Lutra lutra*), which was critically endangered species with only two small and isolated populations in the country. The reintroduction project in northeast part of the Czech Republic (Jeseníky) was stopped in 2003 (in 2004 last two young otters born in Pavlov were released). As the time went the station became also place for taking care of handicapped (e.g. injured, abandoned, confiscated) animals and for breeding and protecting of some endangered species.

In 2001 Pavlov Station joined the European breeding programme for the European mink (*Mustela lutreola*). In the period 2003-2007, a total of 15 mink cubs were born. Because the necessity of bigger enclosures for successful breeding of non-aggressive animals is now known, we hope to be able to build new big cages for our European minks.

Pavlov is the only Czech animal station specialized in otters; the Station has seven natural "otter-enclosures" for rehabilitation. Altogether 23 otters came to Pavlov in the years 2004-2007 (until August). From this number, 14 were abandoned cubs in age about 1-3 months, and after rehabilitation seven of them were released back to the wild, one cub died and six are still in human care (two of them will be probably released next year, while the rest are older animals which could not be released). The remaining nine otters which entered the Station were adult animals, injured mostly by car, and only two of them survived and were released. We also take care about some other mustelids; they come mostly as abandoned young animals, or injured from car or capture into death-trap. In 2004-2007 it was 11 animals, mostly stone martens, and only two survived – one is in the Station while the second one was released. For feeding of young mustelids we use successfully commercial milk for cats. However, young otters in age about 4 weeks can already feed also on fish. The biggest problem with abandoned mustelids is that they often become tame (for example, young otter needs one year long care), and consequently it is not possible to release them. Putting the otter (and other animals) back into the nature is also difficult due to the bureaucracy. It is quite complicated to find suitable place for releasing (enough food, away from houses and roads, without strong otter population), and to obtain all necessary permissions at the same time.

We are active also in field work, including specialized survey and monitoring, collecting dead otters and data about their findings, etc. The Station also provides special reports for compensation of damages caused by the otter. From years 2006 and 2007 we had 16 dead otters, mostly road-kills but also poisoned. In the last few years the use of very strong poison, carbofuran, has become a big problem (e.g. in February 2006 we had 5 poisoned mustelids from one place). What we have the data about, is probably very small part of the mustelids who lost their lives by "unnatural" way (we have data mostly from our district, Vysočina). The protection of predators is a problem due to negative attitudes of some people, meaning that predators have no place in the nature. Therefore, every year we are putting more and more efforts to public education (visitors, presentations at schools, articles in press etc.), which we hope can help to protect animals and all the nature around.

**Preliminary results of a field study on *Mustela nivalis* and *Mustela erminea*: space and habitat use**

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Small predators like least weasels and stoats are substantial elements of natural landscapes in Western Europe. Specialized in preying on small rodents, the least weasel, in particular, functions as natural pest control in agricultural landscapes.

During a post-doc study in eastern Luxemburg, which is being conducted from March 2006 to February 2008, least weasels and stoats were live-trapped and tagged. We could show that especially least weasels enlarged the size of their home ranges when density of prey was low. In addition to this, site fidelity decreased and animals became transient. In this study least weasels and stoats made use of areas of more than 50 ha in size.

However, population density and home ranges of weasels are not only influenced by the density of prey, but also by habitat structure. As “habitat generalists” they are able to populate almost every kind of habitat as long as richness in habitat structure exists and availability of prey is given. Weasels particularly make use of linear structures like overgrown ditches, fences, marginal strips or grassy borders in order to travel safely and to search for prey.



## **EuroNerz e.V. – activities and projects for conservation of the European mink *Mustela lutreola***

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EuroNerz e.V., a German non-profit organization for conservation of the endangered European mink *Mustela lutreola*, was founded 1998 as a consequence of the first successful *ex-situ* breeding of European mink in Germany.

Being part of the European Endangered species breeding Program EEP for *M. lutreola* our first aim is the maintenance of a breeding stock in Germany. Actually, the stock comprises roughly 80 individuals, kept by EuroNerz e.V. and its member institutions.

With a new concept, we combine breeding and educational work: following a centralized mating done by EuroNerz e.V., pregnant females are loaned to member institutions like zoos and game parks during the period of pregnancy and cub-rearing. In autumn, EuroNerz e.V. ensures the takeover and placement of the offspring and provides single individuals for presentation during the winter/spring period.

With their numerous visitors, these institutions act as strong multipliers for dissemination of information on this highly endangered but almost unknown species. On the other hand, the zoos profit by the offer of know-how and the participation in an EEP project without (1) the necessity to keep higher numbers of individuals offstage or (2) problems with the placement of cubs.

With individuals deriving from our breeding stock, we support reintroduction programs. In 2006, such a project was initiated by EuroNerz e.V. and conducted with several cooperative partners, starting in the federal country *Saarland* in south-western Germany.

In addition knowledge on behaviour and ecology of the European mink is still insufficient, complicating effective measurements for *in-situ* and *ex-situ* conservation. Therefore, EuroNerz e.V. supports studies especially on the reproduction behaviour and behavioural ontogeny of *M. lutreola*. For this, we cooperate with Dr. Elisabeth Peters and Prof. Dr. R. Schroeffer, Dept. of Ethology/University of Osnabrueck.

**Some aspects of badger (*Meles meles*), red fox (*Vulpes vulpes*) and raccoon dog (*Nyctereutes procyonoides*) interactions in badger setts in Darwin Reserve, north-west of European Russia**

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Badger *Meles meles*, red fox *Vulpes vulpes* and raccoon dog *Nyctereutes procyonoides* use the same setts. Red fox and raccoon dog may occupy badger setts and sometimes share them with badgers. In Darwin Biosphere Reserve badgers dig setts in old coal-bunkers – ring shaped rising ground, remains of charcoal trade of 19-th century. 599 coal-bunkers were marked in 1963 and then checked up for species using burrows (badger, fox or raccoon dog) up to 1998. Data were collected once a year, in May – first half of June, i.e. in the period of cub's raising. Species using the burrow was determined according to various animal signs (tracks, faeces etc.). Direct observations were rare. There were 24 incidents when badger, fox and raccoon dog shared the sett.

We described some aspects of interspecific interactions between badger, red fox and raccoon dog in badger setts. Observations were obtained with game cameras Wild view Xtreme II and Leaf River DC-2BU. Data were collected for 243 days in 5 badger setts. We took 102 animal photos with 6 cameras. Cameras recorded 4 visits of foxes and raccoon dogs of badger setts. Preliminary results showed that foxes and raccoon dogs visit setts even after the period of cub's raising. Foxes and raccoon dogs visiting badger setts do not come inside the burrows. Badgers, foxes and raccoon dogs may use the same sett one after another. We recorded badger using the sett during October 2005 – first half of May. Then this sett was used by raccoon dog during latter half of May – June for cubs raising. Badger returned to this sett in latter half of July. Fox visited the sett in July as well. Preliminary data may describe daily activity of species in setts.

## The peculiarities of distribution and hunting significance of badgers in the eastern European part of Russia

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The investigations were carried out in 2001-2006 in the eastern European part of Russia in Vyatka river basin (Kirov region, 56°30' - 61°40' N, 41°17' - 56°56' E). There were registered two species of badgers: European badger *Meles meles* and the Asian one, *M. leucurus*. *M. meles* is distributed in the western and northern districts of Kirov region, while East and South of Kirov region are inhabited by *M. leucurus* and *M. meles*. The sympatric zone between these species is space between Cheptsya and Vyatka rivers. The badgers are distributed throughout the researched territory, but their settlements density decreases from south to north with the raising of percentage of forest and weakening of agricultural usage. Badgers do not inhabit vast dense forest tracts. Therefore, in the northern part, where the forestland exceeds 80% they are absent on the area of 70 000 ha. Here badgers build burrows not far away from rivers, which have definite forestless valleys, fields and forest glades. Their population density is not more than 0.25 ind./1000 ha of forestland. In districts with 50-80% of forest, badger density varies around 0.2-0.75 ind./1000 ha of forest. Maximum population density was in the southern part of Vyatka river basin: 0.8-7.2 ind./1000 ha of forested area. It depends on landscape mosaic (i.e. forest-field alternation) and favorable orographic and soil conditions. The forestland here is less than 40%, and agricultural developing is over 50%. Statistic correlation between forest density and density of badgers population:  $r = -0.63$ ,  $n = 39$ ,  $p < 0.01$ .

Local hunters traditionally catch badgers for their fat, which is used in traditional medicine. Animals store up it during summer and autumn. In August-October period subdermal fat composes 11.26-39.13% ( $25.25 \pm 2.76$ ) of body weight ( $n = 13$ ). The period of hunting for a badger in the Kirov region is from August, 15th till October, 31st.

Significant number of hunters dealing with badger hunting ( $n = 53$ ) uses traps located near their burrows (45%), with the help of dogs (10%), guarding them near passages (5%). There are 40% occasional cases of catching. During a season hunters get from one to four animals, but some of them cannot manage it every year. Only hunters from districts with low percentage of forestland consider badger hunting as a popular event. It occurs due to high population density, availability of nature resources potential, high demand (mainly in big cities) and high price of badger fat.

Price of 250 g melted fat is about 15 Euro, so hunters' income from one badger may be 350 Euro (2006 data). Now there are many firms of making creams, ointments and food additives (more than 10 kinds of production) based on badgers fat.

Thus, in the eastern European part of Russia badger population density has a negative statistic correlation with the percentage of forestland. Badger hunting takes place throughout the area, but is more widely spread in low dense forest. Fat as a result of badger hunting is very popular among locals and also has a very high value.

## The otter (*Lutra lutra*) home range use in the European Russia

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The otter has been studying in the European Russia in different seasons since 1970s. The principal method of studies was otter tracing on "black" and "white" paths.

Otter distribution in the region follows the network of small rivers and streams. The density of population is from 0.2 up to 3.5 individuals per 10 km of the river channel. During distant migrations from one river system to another the predator sometimes overcomes up to 40 km per day, more than a halfway by land. In the north of the region it even easily crosses mountain ranges. Otter is most settled in the summer time and in the middle of winter. In these periods all otter migrations occur only within the habitat site, whose borders are stable enough. Winter habitat sites are usually larger than the summer ones. Sites of the neighbouring males never overlap, whereas individuals of different sex and also females may have the join part of the territory.

Usually the otter most actively uses no more than 10-15% of its habitat site territory, sometimes only some favourite places. The predator hunts there during one to three days, and after that moves further on within the site. It bypasses the whole territory within 5-10 days. With stream otter almost everywhere swims. Going up the stream it crosses meanders by land. It forms paths (sometimes up to 300-400 m long and 15-20 cm wide) that are constant in the summer time and therefore clearly seen. Within its habitat site otter always has both temporary (sandy banks, snags, isolated stones), and permanent marking points. Here the predator at each detour constantly marks the territory by excrement and urine. In Russia these marking points are called "otter's lavatories". Occasionally there are points within the site, which we have called "bathing points". They also have marking functions. The otter does not leave excrements there, however the smell of a predator's secret of anal glands is very distinct. The otter there turns around and somersaults (as if bathing), tightly compressing the substratum. Bathing points, same as many constant otter's lavatories, are often located under the spreading crowns of fur-trees and firs located near a shoreline. Some of them are amazingly constant. In the north of the region local hunters know some lavatories for more than 20 years! Total number of marking points within one site may reach several tens. They hold the information on occupation of a site and serve as a passive defence measure. A network of marking points is thicker near the boundary and on the commonly populated sites. If they are not visited and marked for a long time, another individual quickly intrudes to the abandoned territory and includes it into its own site. Males are especially active in it. Thus, otter is a species with a very distinct territorialism, with all attributes of passive and active defence of the territory.

## Testing the bait-marking method on otters (*Lutra lutra*)

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Most of the researches focused on studying the feeding ecology and distribution of otters, but there are only a few who address specifically the habitat preferences. Our aim was to test a relatively new method, the bait marking, which might be effective to estimate the habitat selection, or even the home range of the signed individuals. Otters are protected, endangered species all over the world so we think that all the non-invasive methods will get priority in the field works.

Our sampling area covered three different but interconnected parts of the lower session of the backwater of the Rába River and the Otter-Park at Petesmalom. Otters got small Cyprinidae specimens as bait, which were fed or signed externally by small glass pearls. The pearls were visible in their spraints mostly on the next days.

This method is much cheaper than the radio-telemetry, or the use of isotopes, do not require live-trapping and catching the animal, or veterinary assistance.

Intensive field-work and inspections are necessary to check the pearls on the sampling area. The results would help monitoring the migration routes, habitat preferences of individuals or a given population, and might be useful for the vaccination.

## **Distribution and population size of the otter (*Lutra lutra*) in south-western Poland**

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Using questionnaires, distribution and population size of the otters in 360 hunting districts (total area 16,600 km<sup>2</sup>) that are supervised by Directorate of the Regional State Forest in Wrocław was studied in 1994 and 2007. In 1994, data on the otter distribution from 348 hunting districts were obtained. At this time the otters were recorded only in 27 hunting districts (7.8%). The remaining hunting districts (n = 321; 92.2%) did not show the otter presence. The survey carried out in 2007 showed a strong expansion of the otter population. The species occurred in 124 hunting district (34.7%). There was no evidence of the otter in 233 hunting districts (65.3%). It means that between 1994 and 2007 the otters increased their distribution by 28.6%. Now the species occupies mainly northern and western part of the study area. The population size estimated by hunters in 2007 was equal to 765 animals. Unfortunately, there was no significant correlation between otter population density and the water abundance index. It indicates that probably the guess-estimate population census of the otter carried out by hunters does not reflect the real number of otters in hunting districts. Thus, application of the hunting statistics data in otter studies is limited to information on the distribution of the species in the study area.

## What spraints have told us about otters in the Třeboňsko Protected Landscape Area

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The otters (*Lutra lutra*) are rare and elusive animals, mostly with nocturnal activity. Therefore, it is difficult to study abundance and structure of their populations. In the last few years, genetic methods have become available for such a kind of studies. If non-invasively obtained samples, such as faeces, are analyzed, disturbing or even observing the animals is not required. We aimed at assessing the abundance of the otter population in the Třeboňsko Protected Landscape Area & Biosphere Reserve in the Czech Republic, using non-invasive genetic sampling. We also studied sex ratio of the population as well as spatial distribution and activity of the animals. Altogether, 250 spraint samples were collected in 100 km<sup>2</sup> study site during cold months of 2003 and 2004. From this number, 137 samples were successfully genotyped on 10 microsatellite loci. Thus the genotyping success rate was 55%. The best sample type was anal jellies with 82% success rate. Frequency of genotyping errors was 20% of allelic dropout and 3.5% of false alleles. During the whole sampling period, 50 individuals were identified. Analysing only two more intensive sampling periods, presumably representing more accurate estimate of actual population size, the abundance was estimated at 46 individuals. This equals to density of 0.46 individual per 1 km<sup>2</sup>. From this number, 25 were males and 21 females, which means sex ratio 1.2 : 1. Subsequently, mark-recapture data modelling procedure implemented in CAPWIRE software was used. The computed point estimate of population size was 76 individuals (CI<sub>95%</sub> = 49-96), since the major part of individuals was captured only once and thus the model assumes that there exists a certain number of animals that were not captured at all. Thirteen individuals were assigned as residents, being recorded repeatedly over a time span of more than one month. For the residents, minimum home range size was assessed as the linear distance between the most distant points of their occurrence. For males it ranged from 600 to 4600 m, for females from 200 to 1000 m. The non-invasive genetic sampling confirmed high density of the otter population in Třeboňsko and brought forward new information on its population structure and spatial distribution. High otter density is caused by large number of fishponds and channels providing extremely high food supply. This makes Třeboňsko a unique otter habitat in Europe.

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## The effect of prey abundance on diet composition and density of weasels

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The weasel *Mustela nivalis* plays important role in shaping cycles of rodents, therefore detailed data on diet composition and numerical response may shade new light on relationships between this predator and its prey. To estimate number of weasels we used trapping, snow- and radio-tracking. Diet composition were analysed based on examination of scats found in the traps and at the resting sites of animals. The diet of weasels in open habitats of the Białowieża Forest was dominated by voles (mainly *Microtus* sp., occasionally with low proportion of water vole *Arvicola terrestris*). The share of voles in weasel diet in consecutive years varied from 80% to 100%, but was affected neither by differences in abundance of this prey nor by changes in the structure of rodent community. The only plausible explanation of lack of clear functional response is the asynchrony of rodent dynamics in different habitats. Voles attained highest abundance in meadows and river valley in different years, so weasels were able to exploit neighbouring habitats and transitional zones between them.

Mean density of weasels in summer in open areas varied from 9.2 to 20.0 individuals per 1 km<sup>2</sup>, and in the whole study area was not proportional to abundance of rodents. Only in the meadows number of weasels reflected changes of prey abundance, whereas in the river valley weasels attained high density irrespectively of changes of rodent abundance. Observed pattern of weasels' distribution probably results from higher reproduction rates and lower mortality of animals in the later habitat. In winter both in meadows and in the river valley weasel density approximated abundance of rodents, varying from 1.3 to 10.2 individuals per 1 km<sup>2</sup>. The significant numerical response of weasels in cold period provide further support for hypothesis that differences between habitats observed in summer were mainly affected by various rates of reproduction. In our system, where availability of alternative prey is low, weasels continue hunting on voles, but select different habitats according to actual abundance of preferred prey.



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