4th European Beaver Symposium
3rd Euro-American Beaver Congress
Freising, Germany, 11-14 Sep. 2006

Programme

Abstracts

Participants

Welcome

Dear participants,

welcome to the 4th European Beaver Symposium and the 3rd Euro-American Beaver Congress in Freising!

It's a great pleasure to host the world's biggest beaver meeting in Bavaria, where the return of the beaver to the Danube watershed had it's origin 40 years ago.

Meanwhile, the beavers have, moving by themselfs or being moved on trailers, re-occupied waters in almost all countries along the Danube and its tributaries, and they are moving on to fill the gaps in the next decades.

Nature's great architect is restoring destroyed rivers and he is creating habitat for numerous other plant and animal species. He is adding lost dynamics to river systems, but he is also interfering with human land use, requiring wise management of beavers and of men.

We all, being scientists, managers, or "just" friends of the beaver, come together to share the knowledge and skills to promote the beaver not only in the landscape, but also in the heads and hearts of the general public.

Enjoy the scientific program as well as the social events, renew old friendships, and make new friend among the world's beaver enthusiasts.

The organisation committee

Volker Zahner, University of Applied Science, Weihenstephan
Gerhard Schwab, Bund Naturschutz in Bayern e.V.
Markus Schmidbauer, Bund Naturschutz in Bayern e.V.
Karl-Andreas Nitsche, Castor Resarch Society
Peter E. Busher, Boston University

Sponsors

We say **"THANK YOU VERY MUCH"** to the authorities and organisations supporting the 4th European Beaver Symposium and 3rd Euro-American Beaver Congress.

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Am Hofgarten 4
85354 Freising

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Bayerisches Staatsministerium für Umwelt, Gesundheit und Verbraucherschutz
Rosenkavalierplatz 2
91925 München

Deutsche Umwelthilfe
Fritz-Reichle-Ring 4
78315 Radolfzell

Bund Naturschutz in Bayern e.V.
Landesfachgeschäftsstelle
Bauernfeindstr. 23
90471 Nürnberg

HAUS im MOOS
Umweltbildungsstätte und Freilichtmuseum
Kleinhohenried 108
86668 Karlshuld

PROGRAMME

Monday, September 11th

08.00 Registration
10.30 Opening of the 4th European Beaver Symposium & 3rd Euro-American Beaver Congress

Session 1: Genetics and Morphology
Chairman: Michael Stubbe

11.00 **Algimantas Paulauskas**
Analysis of genetic polymorphism in beaver populations from Lithuanian and Norway

11.30 **Volker Zahner**
Does the beaver tail has a main function in thermal regulation?

12:00 **Wieslaw Babik**
Phyogeography of the Eurasian beaver: mitochondrial and MHC data

12.30 Lunch

Session 2 Beaver Ecology 1
Chairman: Göran Hartmann

14.0 **Anna Buczma**
Seasonal changes in the beaver's diet diversity in the Bory Tucholskie forest, N Poland

14.30 **Peter Busher**
The Evolution of Monogamous Mating in Beavers: A Comparison of Hypotheses

15.00 **Pjotr Danilov**
Ecological peculiarities of Canadian and European beavers in the Russian European North (comparative analysis

15.30 Coffe break

Session 2 Beaver Ecology 2
Chairman: Andrzej Czech

16.00 **Alius Ulevičius**
Canals of land reclamation as the beaver (*Castor fiber*) habitat in Lithuania

16.30 **Aleš Vorel**
The beaver population under the floods on the Elbe River

17.00 **Christof Wimmer**
Use of coniferous trees by beavers

PROGRAMME

Tuesday, September 12th

Session 3: Beaver and ecosystem 1
Chairman: Peter Busher

09.00 **Mateusz Ciechanowski**
Does foraging and building activity of beavers affect habitat use by bats (Chiroptera)?

09.30 **Andrzej Czech**
Influence of beavers on ecosystems and economy in Poland.

10.00 **Glynnis A. Hood**
Beaver regulate wetlands during drought

10.30 Break

Session 3: Beaver and ecosystem 2
Chairman: Rosemarie Parz-Gollner

11.00 **Aleksander V. Krylov**
The cladocera plankton of the small rivers at a flow regulated by the person and beavers

11.30 **Göran Sjöberg**
Beaver dams and fish fauna in forest streams – a three-year study

12.00 **- cancelled -**

12.30 Lunch

Session 3: Beaver and ecosystem 3
Chairman: Vadim E. Sidorovich

14.00 **Olga Tselmovich**
The beaver pond's role in the processes of self-purification on the small river

14.30 **Volker Zahner**
Beaver induced structure change along a stream in Bavaria and its influence on fish fauna and and indicator beetles

15.00 **Adrian Zwolicki**
Impact of the canopy gaps made by beavers on the forest undergrowth herb structure in Bory Tucholskie, North-Poland

15.30 Coffe break

Session 4 Beaver and Men 1
Chairman: Vlasimil Kostkan

16.00 **Marijan Grubesic**
A decade of the beaver in Croatia

16.30 **Markus Schmidbauer**
Management of beavers in fish pond areas

19:00 Confernce dinner

PROGRAMME

Wednesday, September, 13th

Session 4 Beaver and Men 2
Chairman: Alius Ulevicius

10.00 **Vlastimil Kostkan**
Management plan for European Beaver in Czech Republic

10.30 **Barba Mertin**
Beaver interpretation in beaver enclosures and exhibitions

11.00 **Olivier Rubbers**
Ecotourism about the beaver in Belgium

11:30 **Thomas Borup Svendsden**
SSSSSSSHHHHHHHHH – Not a word about biology !
The Danish Beaver reintroduction Programme: Local management and monitoring

12.00 Lunch

13.30 Poster and Film Sessions

16.00 Beaver Market (literature, products)

17:00 Student Award & Photo Contest Winners

Thursday, September, 14th

8:30 Field trip

20:00 Return to Freising

Friday, September, 15th

(optional, not part of the EBS / EBAC)

10:00 Opening of the exhibition “Von Menschen und Bibern”
Schafhof, Freising
with brunch on invitation of the nature conservation agency of the county of Freising

PRESENTATIONS

Babik, Wieslaw
Phylogeography of the Eurasian beaver: mitochondrial and MHC data

Bierła, Joanna; Giżejewski, Zygmunt; Breed, William
Spermatogenesis and sperm morphology of European beaver *Castor fiber*

Buczma, Anna; Zwolicki, Adrian
Seasonal changes of diversity of beaver food

Busher, Peter
The evolution of monogamous mating in beavers: a comparison of hypotheses

Ciechanowski, Mateusz; Rogalska, Weronika; Rynkiewicz, Aleksandra; Zwolicki, Adrian
Do foraging and building activities of beavers affect habitat use by bats (Chiroptera)?

Czech, Andrzej
How to minimize beaver-human conflicts and increase benefits from beaver building behaviour? A few examples from Poland

Danilov, Pjotr, Fyodorov, Fyodor, Kanishiev, Vladimir
Ecological peculiarities of Canadian and European beavers in the Russian European North (comparative analysis)

Grubesic, Marijan; Glavaš, Milan; Margaletić, Josip; Pernar, Renata; Ančić, Mario; **Krapinec, Krešimir**
A decade of the beaver (*Castor fiber* L.)in Croatia

Hood, Glynnis A.; Bayley, Suzanne
Beaver regulate wetlands during drought

Kostkan, Vlastimil; Vorel, Aleš
Management plan for European Beaver in Czech Republic

Krylov, Aleksander; Chalova, Irina
The cladocera plankton of the small rivers at a water flow regulated by men and beavers

Mertin, Barbara
Beaver Interpretation in beaver enclosures and exhibitions

Paulauskas, Algimantas; Žiemienė, Birutė; Rosef, Olav; Rosell, Frank
Analysis of genetic polymorphism in beaver populations from Lithuania and Norway

Rubbers, Olivier; Van Den Bogaert, Jorn
Tourism in Beaverland (Belgium)

Schmidbauer, Markus
Beaver management in fishpond areas

Sjöberg, Göran; Hägglund, Åsa
Beaver dams and fish fauna in forest streams – a three-year study

Svendsen, Thomas Borup
SSSSSSSHHHHHHHHH – Not a word about biology !
The Danish Beaver reintroduction Programme: Local management and monitoring

Tselmovich, Olga; Otyukova, N.
The role of beaver ponds in the processes of self-purification of a small river

Ulevičius, Alius; Jasiulionis, Marius
Canals of land reclamation as the beaver (*Castor fiber*) habitat in Lithuania

Vorel, Aleš
The beaver population under the extreme floods on the Elbe River

Wimmer, Christof
Use of coniferous trees by beavers

Zahner, Volker; Hanöffer, Stefan.; Schurli, Catharine.; Müller, Sandra.
Beaver induced structure change along a stream in Bavaria and its influence on fish fauna and an indicator beetles

Zahner, Volker; Müller, Reinhold
Thermoregulation – a main function of the beaver tail?

Zwolicki, Adrian
Impact of the canopy gaps made by beavers on the forest undergrowth herb structure in Bory Tucholskie, North-Poland

POSTERS

Aepler, Jörg; Nitsche, Karl-Andreas; Schwab, Gerhard
Dental anomalies in beavers (*Castor fiber* L.) from Bavaria

Berthelsen, Jørn Pagh; Madsen, A.B.; Svendsen, Thomas Borup; Asbirk, Sten; Bau, Lena M.
Castor fiber in Denmark. Population development and effects on flora and fauna

Bobrov, Aleksandr A.
Interaction of beaver and river vegetation in the Upper Volga Region (Russia)

Buchanan, Claire; Campbell, Roo; Rosell, Frank
Reproductive rates in captive and wild Eurasian beavers (*Castor fiber)*

Cirovic, Dusko
Distribution of the beaver (*Castor fiber* L. 1758) in Serbia

Cirovic, Dusko
Winter diet of the beaver (*Castor fiber* L. 1758) in Serbia – preliminary results

Gorshkov, Dmitry
Habitat use of beavers after reintroduction in Volzhsko-Kamsky Reserve

Gorshkov, Dmitry
Results of beaver reacclimatization in Tatarstan Republic (Russia)

Grubešić, Marijan; Ćirović, Duško; Kunovac, Sašan; Margaletić, Josip; Pernar, Renata; Ančić, Mario
Status and perspectives of beaver (*Castor fiber* L). in the Sava river basin

Grygoruk, Mateusz
Estimation of beaver ponds' impact on water circulation in forest catchment

Ionescu, Georgeta; Ionescu, Ovidiu; Juri, Ramon; Pasca, Claudiu; Popa, Marius; Sarbu, George; Scurtu, Marius; Visan, Daniel
8 years of beaver reintroduction in Romania

John, František; Kostkan, Vlastimil
Compositional Analysis and GPS/GIS for Study of Habitat Selection by the European Beaver in the Central Morava River

John, František; Vorel, Aleš; Válková, Lenka; Kostkan, Vlastimil
Integration GIS and GPS within the European Beaver Home Range Analysis and Population Monitoring

Kaltenegger, Dieter
Underwater beaver (*Castor fiber* L.) signs

Korablev, Nikolay
Metric and non-metric characteristics of maternal and reintroduced beaver populations of European Russia

Kostkan Vlastimil
Selected beaver adaptation on densely iced waters

Lindemann, Peter Wilhelm, Nitsche, Karl-Andreas
30 years beavers (Castor fiber albicus Matschie, 1907) in Mecklenburg-West Pomerania, especially on the Warnow river – A successful reintroduction project

Nitsche, Karl-Andreas
Development and activities of a local beaver (*Castor fiber albicus* Matschie 1907) population in the vicinity of Dessau, 19998-2006

Papchenkov Vladimir G.
A feed of a beaver in Volga River basin

Parz-Gollner, Rosemarie, Vogl, Wolfgang
Numbers, distribution and recent beaver conflicts in Austria

Recker, Wilhelm; von Lührte, Angela; Krauß, Manfred
The beaver is back in town" – the recolonisation of Berlin rivers and lakes by beavers – problems and management perspectives

Rubbers, Olivier; Van Den Bogaert, Jorn
Beaver ecotourism

Saveljev, Alexander P.
New beaver investigations (dissertations) in Russia and adjacent countries: A review

Savelejev, Alexander; Schwab, Gerhard
Beaver reintroduction and genetics – what do you release in ESU-free watersheds

Saveljev, Alexander P.; Stubbe, Annegret; Stubbe, Michael; Unzakov, V.V.; Kyrgys, V.V.; Molokova, N.I.; Putincev, N.I.; Ducroz, J-F.; Samjaa, R.; Durka, W.
Beaver research in Tvva Republic/Russia

Schwab, Gerhard
The return of the beaver to the Danube watershed

Sidorovich, Vadim E.; Januta G.G.
Benefit of otters (*Luttra lutra*) and minks (*Mustela lutreola* and *Mustela vison*) from construction activity of beavers (*Castor fiber*) in small watercourses in Belarus

Tikhonenkov, Denis V.; Kosolapova, Natalia
The beaver's activity influence on the planktonic heterotrophic flagellate's community structure modification in the Latka River (Russia)

Tokarskyy, Victor
Modern state of beaver population in the North- Eastern Ukraine

Ulevičius, Alius
Preliminary results on reproductive performance of female beavers in Lithuania

Ulevičius, Alius; Brasiūnaitė, Rita
Fluctuating asymmetry in beaver (*Castor fiber*) population in Lithuania

Ulevičius, Alius ; Janulaitis, Martynas
Small mammals in beaver lodges

Valachovič, Dušan; Tomeček, Jozef
Actual distribution and status of beaver population in Slovakia

Vorel, Aleš
The European beaver monitoring status in the Czech Republic

Vorel, Aleš; Přikrylová, Petra; Miholová, Daniela
Heavy metals in the fur of the European beavers in the Czech Republic

Vorel, Aleš; Válková, Lenka; Maloň, Jaroslav; Hamšíková, Lenka; John, František
Monitoring of the beaver population in the Czech Republic

Zavyalov Nikolay
The European beaver (*Castor fiber* L.) in Rdeysky Reserve and in adjacent territories (NW Russia)

DENTAL ANOMALIES IN BEAVERS (*CASTOR FIBER* L.) FROM BAVARIA

Aepler, Jörg (Gartenstrasse 10, 39114 Magdeburg, Germany)
Nitsche, Karl-Andreas (Castor Research Society Akensche Str. 10, 06844 Dessau, Germany)
Schwab, Gerhard (Bund Naturschutz in Bayern e.V, Deggendorfer Str. 27, 94553 Mariaposching, Germany, email: GerhardSchwab@online.de)

Dental anomlies in beavers are reported in several cases. We found 3 new cases of anamolies in the dentition of Bavarian beavers legaly taken.

No. 1:
Juvenile beaver, age 10-12 month. Both incisors in the lower were not developed (hypodontia). Upper incisors elongated, extreme elongation (ca. 45mm, - 390°) on upper jar 1, ingrown in os incisivum. Left M3 in the upper jar with root fracture and periapikal local parodontitis.

No. 2:
Fracture of elamin and dentin in both upper incisors, opening of pulp with elongation of both inicisors. Right incisor with fracture in the incisal teeth crown. Bleeding from the pulp into dentin causing devitalistation of the tooth (disintegration of the brown color of the enamel). Tooth II not developed due to an enossal process in the lowar jar with repression of teeth PM and M3 and bloated bone in the Corpus mandibulae.

No. 3:
Tooth crown fracture in the upper right incisor. Root fracture in the lower left incisor with pulpitis and progressive inflammation, abcesses and developing osteomyelitis in the whole left mandible. Right upper incisor with fracture in the incisal teeth crown and opening of pulp.

In our poster we present photos, x-rays and diognosis of the anomalies from a dental point of view and discuss possible causes for the anomalies.

PHYLOGEOGRAPHY OF THE EURASIAN BEAVER: MITOCHONDRIAL AND MHC DATA

(Presentation)

Babik, Wieslaw (UFZ Centre for Environmental Research Leipzig-Halle, Department of Community Ecology, Theodor-Lieser-Str. 4, 06120 Halle/Saale, Germany, email: wieslaw.babik@ufz.de)

The Eurasian Beaver (*Castor fiber*) experienced a drastic population bottleneck, caused by overhunting, at the end of the 19th century. The total number of animals at this time is estimated at ca. 1200 individuals in eight relict, widely geographically scattered, populations. Some of these populations consisted of only ca. 30 individuals. In order to assess the effect of the bottleneck on the level of genetic variation in the relict beaver populations and to get insight into the Pleistocene history of the species we studied sequence variation of the mitochondrial DNA (mtDNA) and Major Histocompatibility Complex II (MHC II).

Our sampling focused on the indigenous populations or areas colonized from these populations. Nucleotide variation in an approximately 490 bp fragment of the mtDNA CR was studied in a total of 152 individuals grouped into eight populations representing all currently recognized subspecies. Sixteen haplotypes were detected, none of them shared among populations. Intrapopulation sequence variation was very low. Phylogenetic analysis revealed the presence of two mtDNA lineages: eastern (Poland, Lithuania, Russia and Mongolia) and western (Germany, Norway and France), the former comprising more divergent haplotypes. The low level of sequence divergence of the entire cytochrome *b* gene among six individuals representing six subspecies suggests differentiation during the last glacial period and existence of multiple glacial refugia.

MHC monomorphism at several MHC class I and II loci was previously reported for two neighboring northern European populations and reduced selection for polymorphism has been hypothesized. Here, we analysed a partial sequence of the second exon of the MHC II DRB locus from seven relict European and Asian beaver populations. We detected 10 unique alleles among 76 beavers analysed. Only a western Siberian population was polymorphic, with four alleles detected in 10 individuals. Each of the remaining populations was fixed for a different allele. Sequences showed considerable divergence, suggesting the long persistence of allelic lineages. A significant excess of nonsynonymous substitutions was detected at the antigen binding sites, indicating that sequence evolution of beaver DRB was driven by positive selection.

Extreme genetic structure found both in mtDNA and MHC could result from human-mediated extinction of intermediate populations. However, it seems more likely to be an effect of a prior substantial structuring of the beaver populations, with watersheds of major Eurasian rivers acting as barriers to gene flow; in case of MHC differential pathogene pressure could have contributed as well. Current MHC monomorphism and extremely low mtDNA variation in most populations could have resulted from the superimposition of the bottleneck on the preexisting genetic structure.

At least two evolutionary significant units (ESU) can be identified, defined by the western and the eastern mtDNA lineages. The individual relict populations should be regarded as management units, the individual eastern populations possibly also as ESUs.

THE BEAVER *CASTOR FIBER* IN DENMARK. POPULATION DEVELOPMENT AND EFFECTS ON FLORA AND FAUNA

(Poster)

Berthelsen, Jørn Pagh (National Enviromental Institute, Kalø, Grenåvej 14, 8410 Rønde, Denmark, email: jpb-dmu.dk)
Madsen, A.B. (National Enviromental Institute, Kalø, Grenåvej 14, 8410 Rønde, Denmark)
Svendsen, Thomas Borup (Danish Forest and Nature Agency, Klosterheden State Forest District (KLS), Gl. Landevej 35, 7620 Lemvig, Denmark, email: tbs@sns.dk)
Asbirk, Sten (Danish Forest and Nature Agency, Haraldsgade 53, 2100, Copenhagen, Denmark, email: sta@sns.dk)
Bau, Lena M. (Holbergsvej 127, 4293 Dianalund, Denmark, email: lenabau@privat.dk)

Structural changes in agriculture, including a strong reduction in the number of grazing animals, have caused meadows and wetland areas to become considerably overgrown. Drainage of marginal arable areas and wetlands, as well as regulation of watercourses, have reduced the quality of these habitats. Because of the ability of the beaver to create dynamism in its habitat, the species was reintroduced to Denmark with the aim of: Improving the quantity and quality of habitats in regulated watercourses, ponds and wetland areas; Responding to the increasing interest in nature restoration in marginal arable areas and meadows and responding to the increasing public interest in experiencing wildlife and nature.

After a period of seven years in the Danish environment, it is evident that the reintroduced beavers have created dynamism and variation in a number of variable habitat types. Monitoring and research in the period 1999-2006 included: Population development – Impact on arable land - Fish – Incects - Amphibians - Bats - Birds – Vegetation in meadows and streams. Surveys indicate that biodiversity locally increases as a result of the ecological “key-effect” of the beaver. The population size has increased from 18 in 1999 to a minimum of 80 beavers in 2006. The mortality is observed to be low. The public, landowners and tourists have shown great interest in visiting beaver sites in the State Forest District. More than 2 500 people annually participate in guided tours, and there has been a strong general increase in sightseeing numbers. There have been relatively few complaints from landowners, these mostly concerning felled trees and flooding. Management problems and conflicts with private landowners have been reduced due to a great effort by the Forest District staff to actively communicate with local landowners. In general, local residents and landowners have responded positively to the presence of the beavers.

According to EU legislation, a landowner cannot receive EU agricultural subsidies if the area in question is flooded as a result of beaver activity. Danish management strategies include the decision that no compensation will be provided for damage caused by beavers. However, during the period of establishing a viable beaver population the State Forest District offers management support to landowners affected by beaver activity to help alleviate the problems they encounter. Gaining access to the beaver sites is fairly easy in the release area as most of the area is owned by the government. Public relation activities, such as guided tours and education, are in high demand for all age groups. One consideration is whether more information aimed at private landowners could prevent or minimise encounters leading to management problems.

SPERMATOGENESIS AND SPERM MORPHOLOGY OF EUROPEAN BEAVER *CASTOR FIBER*

Bierła, Joanna (Department of Clinical Sciences Faculty of Veterinary Medicine, Warsaw Agricultural University, ul. Nowoursynowska 160, 02-787 Warsaw, Poland, email: joangol@poczta.onet.pl)
Giżejewski, Zygmunt (Institute of animal Reproduction and Food Research,Polish Academy of Sciences, ul. Tuwima 10, 10-747 Olsztyn, Poland, email: Zygmunt.Gizejewski@wp.pl)
Breed, William (Discipline of Anatomical Sciences, Faculty of Health Sciences, The University of Adelaide, Adelaide, SA 5005, Australia, email: bill.breed@adelaide.edu.au)

In the present study the morphology of the spermatozoon of the European beaver, *Castor fiber*, and changes that take place during spermiogenesis are described.

For this, tissue was obtained from the testis and excurrent ducts of 9 individuals in the breeding season. It was fixed in routine fixative, for light, scanning and transmission electron microscopy, dehydrated, embedded in resin, and thin sections cut and stained for transmission electron microscopy.

We found that in the testis 9 different germ cell associations were present within which 13 different stages of spermiogenesis could be recognised. The nucleus changes from a round to paddle-shape and, during steps 7 to 9 of spermiogenesis, a very large acrosome develops. The final form of the spermatozoon was generally spatulate but shows marked pleomorphism with about 10 different shapes, of what appears to be normal, spermatozoa being identifiable apart from a number of clearly pathological forms.

We conclude that the beaver has an unusual sperm morphology for a rodent and that, like a few other mammalian species, shows a high degree of pleomorphism the reasons for which are not known at the present time.

INTERACTION OF BEAVER AND RIVER VEGETATION IN THE UPPER VOLGA REGION (RUSSIA)

(Poster)

Bobrov Alexander A. (I. D. Papanin Institute for biology of inland waters of the Russian Academy of sciences, 152742 Borok, Yaroslavl prov., Nekouz distr., Russia, email: lsd@ibiw.yaroslavl.ru)

Analysis of «beaver—river—vegetation» relationships are carried out in streams and rivers of the Upper Volga Region. 3 types of relations are distinguished:

1) Beaver is capable «to conquer» a river. Animals build dams. Watercourse turns into cascade of ponds. Current is practically absent. Vegetation undergoes strong changes. In a channel the phytocoenoses peculiar to small waterbodies are formed, along bank and on flooded sites sedge, willow and black alder bogs are developed. Such scenario is observed in streams and the smallest rivers, in headwaters of larger rivers practically in all territory. They are usually watercourses with small water discharges, frequently subjected to disturbance by human activity.

2) Beaver cannot block a river channel. No changes in hydrological regime occur. Influence of beaver is limited by direct eating of aquatic vegetation, bank meadows and bushes, falling down of separate trees. It affects mainly nymphaeids and riverside willow bushes which animals feed on. In such rivers a balance between press of beaver and ability to restoration of vegetation is observed. This type of relations exists in many small and medium rivers of the region.

3) Intermediate variant when beaver is capable to build dams on a river, but they almost do not affect hydrology of a watercourse. In a number of forest rivers there is such balance. Cascade of low dams is observed through which as through natural abatises or riffles a river flows, not feeling any barrier. Changes in vegetation are insignificant. In a channel, usually before dams, conditions for the best development of duckweed communities are created.

The research is supported by grants № 01-0168 of the INTAS and №№ 01-04-49524, 04-04-49814 of the RFBR.

REPRODUCTION IN WILD AND CAPTIVE EURASIAN BEAVERS (*CASTOR FIBER*)

(Poster)

Buchanan, Claire (School of Biological Sciences, University of East Anglia, Norwich, NR4 7TJ, United Kingdom, email: c.buchanan@uea.ac.uk)
Campbell, Ruairidh (Wildlife Conservation Research Unit, University of Oxford, Tubney House, Abingdon Road, Tubney OX13 5QL, United Kingdom, email: roo.campbell@hit.no)
Rosell, Frank (Telemark University College, Department of Environmental Sciences. N-3800 Bø, Norway, email: Frank.Rosell@hit.no)

Reproduction in Eurasian beavers (*Castor fiber*) exhibits individual, annual and geographical variation. Many causes have been proposed to explain these differences however a simple study of equivalent captive populations with the premise of elucidating reproductive mechanisms in the wild has not yet been undertaken for this species. Reproductive data were compared between samples of wild living female beavers in Norway (N=27; years 1998-2005; 48 reproductive events) and captive living females (N=13; years 1989-2006; 14 reproductive events in 8 facilities) identified through the International Species Inventory System. Wild litter sizes were significantly smaller than captive litter sizes (mean wild = 1.6 kits, SD = 0.69, range 1-3; mean captive = 2.85 kits, SD = 1.52, range 1-5) indicating that food supply plays a major role in driving reproductive variation since all captive beavers are fed ad libidum. Captive beavers were maintained in larger groups than those naturally found in the wild (mean captive group size = 4.33, SD = 2.6, range 2-9; mean wild group size of 3.18, SD = 1.44, range = 2-11). No senescence effects upon wild litter size were found with 2-year-old females weaning similar litter sizes (1.54 kits/litter, SD = 0.66, n = 13) to 8-year-old females (1.75 kits/litter, SD = 0.5, n = 4). Productivity appeared to be highest in the 7 year age class (N=3, 2.33 kit/litter, SD = 0.58). Conversely, captive litter size was found to increase with dam age. Further characteristics such as kit sex ratio, reproductive rate and between litter interval were also established for wild beavers. The role of captive research should be enhanced to allow further extrapolation between the groups.

SEASONAL CHANGES IN THE BEAVER'S DIET DIVERSITY IN THE BORY TUCHOLSKIE FOREST, N POLAND
(Presentation)

Buczma, Anna (Department of Vertebrate Ecology and Zoology, University of Gdańsk, Al. Legionow 9, 80-441 Gdańsk, Poland, email: cranium@poczta.onet.pl)
Zwolicki, Adrian (Department of Vertebrate Ecology and Zoology, University of Gdańsk, Al. Legionow 9, 80-441 Gdańsk, Poland, email: prosoche@poczta.onet.pl)

The study was conducted in the home range of one beaver family situated along the small tributary of Wda river in the Bory Tucholskie forest (northern Poland). During the studie period six beavers have been observed in the area.

Data were collected from 5th July 2003 to 4th June 2005. The study area was visited every fourth week (altogether 26 controls). During the controls each tree and shrub grieved by beavers was determined to species level and marked. We classified phanerophytes according to the level of damage made by feeding beavers.

Seasonal changes in the number of damaged and cut phanerophytes were similar in both years. The largest number of damage and cut phanerophytes we observed in late autumn- early winter, the least in late summer. Beaver food was more varied in winter and autumn than in spring and summer in both years. Diversity indices (H') of the beaver's diet during the whole year were different between seasons.

THE EVOLUTION OF MONOGAMOUS MATING IN BEAVERS: A COMPARISON OF HYPOTHESES

(Presentation)

Busher, **Peter E. (**Division of Natural Science, College of General Studies and Center for Ecology and Conservation Biology, Boston University, 871 Commonwealth Ave., Boston, MA 02215 USA, email: pbusher@bu.edu)

The two beaver species (Eurasian beaver, *Castor fiber* and the North American beaver, *Castor canadensis*) are in the small percentage of mammals (3%-5%) and even smaller percentage of rodents that form monogamous pair bonds. Two types of monogamy are generally considered: (1) genetic (exclusive) monogamy when the male and female confine their mating exclusively to the same partner, and (2) social (biparental) monogamy when the partners maintain a close association after fertilization and care for the young, but mating may not be exclusive.

Beavers appear to exhibit both genetic and social monogamy since they mate exclusively with one partner (although this has yet to be confirmed by DNA analysis in most cases), have a high degree of biparental care of the young, and the pair bond is maintained for multiple years. Beavers are also considered to exhibit obligate monogamy based on the extent of male parental care and lack of behavioral dimorphism. Many aspects of beaver ecology and behavior support the formation and maintenance of the monogamous pair bond. Among these are territorial defense, relatively slow maturation of young (approximately two years to sexual maturity) and presence of older family members living with the family group.

A beaver group defends a territory, which can be a length of shoreline on a large river or lake or an entire section of a smaller stream (including ponds created by dam construction) and this territory includes their lodge(s), dams and winter food cache. In many northern latitudes there is reduced plant productivity during the winter and the ponds and streams freeze restricting beaver mobility and access to food. In this type of climate a monogamous mating system may help insure access to a mate (breeding generally takes place in January-February and the estrus period is short). Beavers illustrate all the criteria for long-term pair bonds and the beaver mating system represents an ideal model for investigating the evolution of monogamy.

Five hypotheses for the evolution of monogamy that are appropriate for beavers are: (1) indispensable, non-shareable male parental care is critical for female reproductive success, (2) shareable (not indispensable) male parental care is important for female reproductive success and the female gains no advantage through a polygynous mating system, (3) female aggression constrains the male from additional mating, (4) monogamy evolved as a male mate-guarding strategy, and (5) female dispersion does not allow a male to monopolize more than one female. Hypotheses 1 and 2 involve the importance and degree of male parental care while hypotheses 4 and 5 relate to male mate-guarding and female dispersion.

This presentation reviews the past and current knowledge of the social organization of the two extant beaver species and critically evaluates the beaver social group in light of the evolutionary and ecological constraints, which shape the mating system.

DO FORAGING AND BUILDING ACITIVTIES OF BEAVERS AFFECT HABITAT USE BY BATS (CHIROPTERA)?

(Presentation)

Ciechanowsk, Mateusz (Department of Vertebrate Ecology and Zoology, University of Gdańsk, al. Legionów 9, 80-441 Gdańsk, Poland, e-mail: matciech@kki.net.pl)
Rogalska, Weronika (Department of Vertebrate Ecology and Zoology, University of Gdańsk, al. Legionów 9, 80-441 Gdańsk, Poland, e-mail: weronikarogalska@wp.pl)
Rynkiewicz, Aleksandra (Department of Vertebrate Ecology and Zoology, University of Gdańsk, al. Legionów 9, 80-441 Gdańsk, Poland, e-mail: plazik@gdynia.ids.pl)
Zwolicki, Adrian (Department of Vertebrate Ecology and Zoology, University of Gdańsk, al. Legionów 9, 80-441 Gdańsk, Poland, e-mail: prosoche@poczta.onet.pl)

Beaver (*Castor fiber)* strongly modifies its environment not only by building dams, lodges and creating ponds, which slower the water flow, but also by selective cutting and removing trees, which changes the spatial structure of forest. Due to these activities, beaver is considered as a keystone species in the ecosystems of small river valleys, a mammal that profoundly transforms plant communities and assemblages of various animal taxa. The following research has been conducted in order to verify the hypothesis that beaver activity promotes new foraging sites for insectivorous bats (Chiroptera). The beaver's influence can be especially significant on aerial hawkers, prefer moderate structural clutter, like *Pipistrellus* species (by creating new canopy gaps) and on water-surface foragers, like *Myotis daubentonii* (by creating ponds with smooth water surface). The field studies were carried out on small streams in Bory Tucholskie (northern Poland) which were settled and heavily modified by beavers. Bat flying activity was recorded with Pettersson D-980 broadband ultrasound detector on the two line-transects which comprised of both beavers-transformed and not transformed stream sections. The number of bat passes was significantly higher in the sections modified by beavers (flooded and subjected to intensive tree cutting) than in untransformed sections (Mann-Whitney test; all species: $U=0.00$, $Z = –3.13$, $p<0.002$; *Pipistrellus nathusii*: $U=1.00$, $p<0.003$; *P. pipistrellus*: $U=4.00$, $p<0.009$; *Nyctalus noctula*: $U=8.50$, $p<0.05$). Contrary to the expectations, no foraging of *Myotis* species was recorded on one of the transects, possibly because the surface of beaver ponds was covered by duckweed (Lemnaceae), which is known to produce clutter echoes reducing prey detection by echolocating *M. daubentonii*.

DISTRIBUTION OF THE BEAVER (*CASTOR FIBER* L. 1758) IN SERBIA
(Poster)

Ćirović, Duško (Faculty of Biology, University of Belgrade, Studentski trg 16, 11000 Belgrade, Serbia, email: dcirovic@bf.bio.bg.ac.yu)

A total of 75 beavers were transported from Bavaria to two localities (Zasavica and Obedska Bara) in three turns during the period 2004-2005. The project was realised in scope of the national introduction programme, in cooperation with the partner from Bavaria.

During the period of winter monitoring in 2005/2006, a total of 19 beaver territories were confirmed in Serbia. Specimens that have settled in Zasavica and Obedska Bara later dispersed and spread along the course of the River Sava, which is in close vicinity of the two localities. It is estimated that the population numbers 110-120 specimens. The range of dispersion from localities into which they were introduced measures from 1m to 102 km.

The constant immigration from the territory of the neighbouring Hungary is present along with the dispersion from the area into which they were reintroduced to Serbia. This fact is confirmed both by the so far registered individual specimens as well as by the first family that has settled at the riverbank of the Danube (in vicinity of Bogojevo) in northern Serbia.

WINTER DIET OF THE BEAVER (*CASTOR FIBER* L. 1758) IN SERBIA – PRELIMINARY RESULTS

(Poster)

Ćirović, Duško (Faculty of Biology, University of Belgrade, Studentski trg 16, 11000 Belgrade, Serbia, email: dcirovic@bf.bio.bg.ac.yu)

Winter diet of the beaver in Serbia was analysed in the area of Zasavica, one of the two localities where the beavers were reintroduced. The diet was analysed on four territories during the first two years after they have settled in this area.

A total of 24 species of trees were registered in the winter diet of the beaver in the area of Zasavica, which is directly correlated to the potentially available food. The most frequent species of trees in the diet were willow (*Salix* sp. 43.43%), ash (*Fraxinus angustifolia* 27.73%), poplar (*Populus* sp. 9.12%) and elder (*Sambucus nigra* 6.57%). Over 80% of cut trees had a diameter larger than 20 cm, while in 3% it was larger than 30 cm.

During their winter feeding, the beavers were active only within the belt up to 20 m far from the water edge. More than 90% of cut trees were within the belt 10 m far from the water edge, both in the water and on the riverbank.

HOW TO MINIMIZE BEAVER-HUMAN CONFLICTS AND INCREASE BENEFITS FROM BEAVER BUILDING BEHAVIOR? FEW EXAMPLES FROM POLAND
(Presentation)

Czech, Andrzej (Natural Systems, Uherce Mineralne 285, 38-600 Lesko, Poland, email. czech@naturalsystems.pl)

As a result of over-trapping and deforestation, beavers (*Castor fiber*) were nearly extinct in Poland by 1900. Following legal protection and reintroduction efforts they now number 20.000 – 40.000. With their resurgence, beavers are affecting changes that include higher groundwater levels, increased sedimentation in beaver impoundments, growing biodiversity of lentic communities, and diminished streambank erosion. By 2005 beavers created about 80.000 ha of wetlands and improved habitat for other animals and plants on roughly 300.000 ha. Increased beaver numbers have intensified beaver-human conflicts. Management strategies that retain the benefits of beavers while minimizing related economic losses are outlined. Some options for generating direct and indirect benefits from beaver presence are discussed.

ECOLOGICAL PECULIARTIES OF CANADIAN AND EUROPEAN BEAVERS IN THE RUSSIAN EUROPEAN NORTH (COMPARATIVE ANALYSIS)

(Presentation)

Danilov, Pjotr (Institute of Biology, Karelian Research Center RAS, Pushkinskaya 11, 185910 Petrozavodsk, Russia, email: danilov@krc.karelia.ru)
Kanshiev, Vladimir (Institute of Biology, Karelian Research Center RAS, Pushkinskaya 11, 185910 Petrozavodsk, Russia, email: kansh@krc.karelia.ru)
Fyodorov, Fyodor (Institute of Biology, Karelian Research Center RAS, Pushkinskaya 11, 185910 Petrozavodsk, Russia, email: ffyodor@krc.karelia.ru)

There are 2 beaver species in the Russian European North today – European (*Castor fiber* L.) and Canadian (*C. canadensis* Kuhl). It gives a good opportunity to compare ecological peculiarities of species which inhabit in the same ecological conditions.

The studies were conducted in the Kola Peninsula, Karelia and Leningrad region.

The distribution of the Canadian beaver across biotopes is identical to that of the European beaver. Their settlements have been found on all types of natural waterbodies, from the smallest brooks to large lakes, and equally so on man-made water facilities if aspens, willows and birches grow on those banks.

The winter diet of both animals species in the studied area is equal. It's known 23 tree and shrub species eaten by beavers. There is geographical variation in the diet composition. Beavers consume 23 species of the tree and shrub vegetation in southern, 14 – in middle and 8 – in northern taiga. Thus differences across geographical regions are related to the availability of the certain foods in the habitats.

The construction activity of the Canadian beaver is very much the same as that of the Eurasian species and its manifestations are determined by habitat settlements. The lodges were recorded in 73.1 % of Canadian beaver settlements (n=52) and in 74.5 % of European beavers (n=51) ones. Dams were met in 78.8 % and 70.6 % of settlements respectively.

Distinctive reproductive features of the Canadian beaver are earlier sexual maturation, the high fecundity and the high part of females taking part in breeding in comparison with European species. The European beaver fecundity is 2.7 embryos (n=22) and 2.2 newborns (n = 45). By the end of the summer only an average of 1.9 kits survive. At the same time an average Canadian beaver litter in Karelia is made up of 3.3 kits.

HABITAT USE OF BEAVERS AFTER REINTRODUCTION IN VOLZHSKO-KAMSKY-RESERVE

(Poster)

Gorshkov, Dmitry (Volzhsko-Kamsky National Nature Biosphere Reserve, 422537, Russia, Tatarstan, Zelenodolsky distr., p/o Raifa. pos. Sadovy, email: gdu1977@mail.ru)

Beavers were reintroduced to Volzhsko-Kamsky reserve to preserve and restore its unique ecosystems. 21 beaver were reintroduced; five of them were implanted with the abdominal transmitters. Radiotelemetry, helped us not just to monitor movements of reintroduced beavers but also to determine seasonal changes in beavers settlement size, and to investigate some peculiarities of beaver territorial behavior. Radiotelemetry was used together with field observations.

Taking in the account that first of all beavers settle down optimal habitats and only then suboptimal habitat, flowing lakes and ponds that were formed after peat excavation are supposed to be optimal for beaver in the reserve.

A good habitat for beaver is combination of river – lake. During the winter beavers often used parts of rivers with high velocity, where river do not frozen, also rivers frozen later and melt earlier than lakes. During the period of summer droughts, when the water level in rivers going down, beaver move to the lakes where water level is more stable. Also rivers are used for the spread of young animals.

Monitoring beaver movements, we determined the home ranges of the reintroduced beavers to be 0.8-7 ha (on average 3.2 ha, n=20) on lakes and bogs and 400-850 m (on average 620 m, n=16) along rivers.

Beaver settlement – is the dynamic unit not only because of changes of number of animals in it, but it is dynamic in space. In addition, to the family territory there are smaller patches of habitat that are used during the winter. For example, the female with radiotransmitter was located, during the winter, in an area less than 1 ha. Her feeding territory was not further then 80 meters from her den. Winter feeding territories of the other beavers varied from 0.06-1 ha (0.35 ha on average, n=21).

During the first two years after release sizes of winter settlements were 5-6 times smaller than summer settlements. After third year of settlements existence such a big difference was not noticed. Sizes of winter settlements were the same, but sizes of summer settlements decreased.

Ten years after first beaver release in Volzhsko-Kamsky reserve, there are fifteen beaver settlements with a population about 60 individuals. Finally, we should mention, that the beavers do not currently occupy all of the available, suitable habitat. We expect some changes in the spatial structure of the primary population of the beavers in the reserve as the available habitat becomes occupied and the density of the beaver's increases.

RESULTS OF BEAVER REACCLIMATIZATION IN TARTASTAN REPUBLIC (RUSSIA)

(Poster)

Gorshkov, Dmitry (Volzhsko-Kamsky National Nature Biosphere Reserve, 422537, Russia, Tatarstan, Zelenodolsky distr., p/o Raifa. pos. Sadovy, email: gdu1977@mail.ru)

Before the middle of 18-th century, beaver occupied all suitable for it habitat on the territory of present Tatarstan Republic. But due to the high hunting pressure and habitat lose it was extirpated.

During the work on beaver reacclimatization, which was started in 1949, 52 animals were released, besides this inside regional relocations were made. Some beavers moved to the territory of Tatarstan Republic from nearby regions. Natural movements were occurred along the big “movement avenues” – rivers Volga, Kama, Vyatka. Now a day’s numbers of beavers in Tatarstan Republic is around 4000 individuals. Beaver settled down most of the rivers and lakes of the region and is hunting-trade specie.

Before 1980, because of the small initial number, the growth rate of population was low and didn’t exceed 4-6 %. Then, up to the middle of 1990 the carrying capacity of the places, where a beaver release had been carried out, was saturated. During that time there was an intensive occupation of the nearby basins. When the beaver number stabilized at the level of 700-800 individuals, growth rates went down. Now, when there is a population growth in a newly settled habitat, growth rates are increasing and reach 16 %.

The territory of Tatarstan Republic covered with a forest just for 16%, there are almost no rivers whose bank is covered with a forest along all length. Also the territory of the region is divided in several parts by big water bodies – water reservoirs that make the natural dispersal of beaver difficult. That’s why beaver population in Tatarstan Republic has a mosaic distribution.

The exploitation of beaver population began in 1982 when beaver number was around 800 individuals. In the last 10 years the top level of trapping limit was 70-90 beavers per season. Average number of annually trapped animals was around 40 specimens, it is about 3-10% of a total number, and this is when the usual standard is 10-25 %. The main reason of the low trapping rate during the first years was that hunters didn’t exactly know how to trap this «reanimated» specie. Now it is economically non-beneficial to trap beavers. Low prices for the pelts – 10-15$ don’t cover all the costs for trapping. Traditionally in Russia beavers are mostly trapped for pelts not for meat.

STATUS AND PERSPECTIVES OF BEAVER (*Castor fiber* L.) IN THE SAVA RIVER BASIN

(Poster)

Grubešić, Marijan (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: grubesic@sumfak.hr)
Čirović, Duško (Biološki fakultet, Univerziteta u Beogradu, Studentski trg 3, 11000 Beograd, Serbia, email: dcirovic@bf.bio.bg.ac.yu)
Kunovac, Sašan (Faculty of Forestry, Zagrebačka 20, Sarajevo, Bosnia and Herzegowina, email: sasakunovac@yahoo.com)
Margaletić, Josip (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: josip.margaletic@inet.hr)
Pernar, Renata (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: rpernar@sumfak.hr)
Ančić, Mario (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: ancic@sumfak.hr)

The Sava River, with its 945 km course, river basin covering 95,719 km^2 and rich network of tributaries, presents great habitat potential for the beaver. This is a formerly beaver-rich area, though this species disappeared from this area at the end of the 19th century.

The action to return beavers to the Sava River basin began in 1996. In less than two years, a total of 56 beavers brought in from Bavaria were released at Lonja and Česma.

The introduction of beavers to the old sleeves of the Sava River in Serbia (at the location Obedska bara and Zasavica), continued in 2004 and 2005 when 75 beavers were brought in and released.

Bosnia and Herzegovina also got involved in the beaver revival project and in 2005 and 2006, a total of 40 beavers were brought in and released at two locations (Semešnica and Sokočnica- a tributary of the Pliva River).

Ten years after the inception of the revival project, all three sites have proven to be very acceptable habitats for the beavers that are successfully reproducing and expanding into new habitats, making this project a success.

Over the past decade, beavers have spread to a distance of 115 km in Croatia and Slovenia, and now cover a territory of about 1210 km^2.

In Serbia, beavers have spread to a distance of about 100 km.

In Bosnia and Herzegovina, the recently released beavers have already been located at 12-15 km from the site of their release (3 families – one on the Vrbas River, two on the Pliva River).

A monitoring program has established the dynamics of the spread of beavers. Based on projections of monitoring conducted to date, it can be concluded that beavers will inhabit the entire drainage area of the Sava River within the next 10–15 years.

A DECADE OF THE BEAVER (*Castor fiber* L.) IN CROATIA
(Presentation)

Grubešić, Marijan (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: grubesic@sumfak.hr)
Glavaš, Milan (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: magovac@sumfak.hr)
Margaletić, Josip (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: josip.margaletic@inet.hr)
Pernar, Renata (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: rpernar@sumfak.hr)
Ančić, Mario (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: ancic@sumfak.hr)
Krapinec, Krešimir (Faculty of Forestry, Svetošimunska 25, 10000 Zagreb, Croatia, email: krapinec@sumfak.hr)

The beaver (*Castor fiber* L.) disappeared from Croatian territory in the second half of the 19th century. The revival project (entitled: BEAVER IN CROATIA) brought the beaver back to appropriate habitats along the Sava and Drava Rivers in the period from April 1996 to March 1998. In that period, 85 individuals were brought to Croatia in 14 shipments from Bavaria.

Over a decade of monitoring, the population dynamics and spatial expansion of the beaver was monitored. The locations of individual families were established and approximate population numbers estimated.

In the monitoring period, beavers were found to have expanded their range to a distance of more than 230 km of water courses, covering an area of about km2, and increasing the number of families to over 80 (active sites). This marks a four-fold increase in both the number of families and the total population number.

Each year, the beavers spread out an average of 20 km, and the population number doubled every 5 years.

The results of research to date form the basis for a management plan for beavers in Croatian territory for the coming period, and a basis for predicting their continued spread.

ESTIMATION OF BEAVER PONDS' IMPACT ON WATER CIRCULATION IN FOREST CATCHMENT

(Poster)

Grygoruk, Mateusz (Warsaw University, Faculty of Geography and Regional Studies, Department of Hydrology, ul Krakowskie Przedmiescie 30, 00-927 Warsaw, Poland, email: mgrygoruk@interia.pl)

Permanent expansion of European beaver (*Castor fiber*) on new stands in Poland and building activity of this rodent causes lots of changes in local water circulation systems. In regard witch hydroecological consequences of beavers' presence in catchment, it is necessary to describe impact of beaver ponds on valley storage, channel detention, pondage and alteration of runoff processes.

In Podlasie region (north-eastern Poland), where study area is located, lives about ¼ of total polish *Castor fiber* population. Study site is the catchment of Krzemianka (area of watershed - 33 sq km, river length – 7 km) located in The Knyszynska Forest. In the catchment few small beaver ponds and one big beaver pond (0,25 ha) exist. About 200m above and 20m below big beaver pond gauge profiles were located, where water stages, discharge, water temperature were measured and water chemistry was examined. Research indicated significant storage role of pond during base-flow periods followed by rain events, which must not be omitted while defining general storage ability of the catchment. In addition, water chemistry research indicated the positive impact of beaver dam and pond on water quality (i.e. improvement of oxygen indexes (BOD, dissolved oxygen), Kjeldahl's Nitrogen).

Preparing balance of benefits and disadvantages caused by beavers in environmental systems (catchments) and economy (forestry) it is necessary to get a wide knowledge about effects of beaver's environmental activity. Moreover, quantative describe of storage and runoff modification may become an important aspect in beaver population management - it may point the value of natural (caused by beavers) alterations of ecosystems such as enriching particular stands in water. Considering, that the number of stands settled by European beaver in Poland will increase, its necessary to prepare the full hydrological description of wetlands and ecosystems that exist in consequence of beavers constructive activity, when describing water resources of watershed.

As a decision support system (DSS) in modeling of environmental systems, beaver's role in water management of small forest catchments might become a cause of gave up constructing hydraulic structures, if existing beaver ponds have sufficient storage capacity.

BEAVER REGULATE WETLANDS DURING DROUGHT
(Presentation)

Hood, Glynnis A. (University of Alberta and Parks Canada, 8336 -76 Avenue, Edmonton, Alberta, Canada, T6C 0J1, email: gahood@telus.net)
Bayley, Suzanne (University of Alberta and Parks Canada, 8336 -76 Avenue, Edmonton, Alberta, Canada, T6C 0J1, email: sbayley@ualberta.ca)

In the context of predicted change in North American climate and historical wetland losses due to development, other factors influencing wetland hydrology may be critical. We examined how of varying levels of temperature, precipitation and beaver (*Castor canadensis*) activity influenced the variability in the area of open water in wetlands over a 54-year period in the mixed-wood boreal region of east-central Alberta, Canada. Our study assessed open water in wetlands from 12 aerial photo mosaics from 1948 to 2002, which covered a period when beaver were absent on the landscape to a time when they had become well established. The number of active beaver lodges explained over 80% of the variability in the area of open water; most importantly, the presence of beaver was related to increased open water retention even during extreme drought.

8 YEARS AFTER BEAVER REINTRODUCTION IN ROMANIA
(Poster)

Ionescu, Georgeta (ICAS, Closca, no. 13, 2200 Brasov, Romania, email: titi@icaswildlife.ro)
Ionescu, Ovidiu (ICAS, Closca, no. 13, 2200 Brasov, Romania, email: ovidiu@icaswildlife.ro)
Juri, Ramon (ICAS, Closca, no. 13, 2200 Brasov, Romania, email: ramon@icaswildlife.ro)
Pasca, Claudiu (ICAS, Closca, no. 13, 2200 Brasov, Romania, email: office@icaswildlife.ro)
Popa, Marius (ICAS, Closca, no. 13, 2200 Brasov, Romania, email: marius@icaswildlife.ro)
Sarbu, George (ICAS, Closca, no. 13, 2200 Brasov, Romania, email: geo@icaswildlife.ro)
Scurtu, Marius (ICAS, Closca, no. 13, 2200 Brasov, Romania, email: smarius@icaswildlife.ro)
Visan, Daniel (ICAS, Closca, no. 13, 2200 Brasov, Romania, email: daniel@icaswildlife.ro)

Hunted for fur, meat and castoreum, the beaver disappeared from Romania at the end of the XIX century (the last mention in newspaper was in 1824). Manuscripts, archaeological findings, toponymy and ethnobotany data sustain the idea of the existence of the beaver over the entire Romanian territory.

The Wildilife Unit of Forest Research and Management Institute in collaboration with Bund Naturschutz in Bayern e.V. was involved in a reintroduction project as a challenge for Romanian scientific world.

This reintroduction action was constituted from three steps:
Preparation: 1997-1998
Reintroduction: 1998-2003
Monitoring: permanent

The reintroduction of beaver was done after an evaluation of habitats, using the Heidecke method. After the general evaluation, the river Olt was chosen for the first reintroduction action.The Olt River was evaluated on the total length of 210 km, from which 96 km (60%) were evaluated as favorable for reintroduction.

In November 1998, a number of 8 beavers coming from Bavaria were released on Olt River in the nearby of Brasov City. In November 1999, other 19 beavers were released on the same river. There were 6 families with 2 to 5 members and 9 single individuals. 80 km of river were covered by the reintroduction and the minimum distance between families and/or individuals was 2 km. Finally in 2001, 91 beaver individuals were reintroduced on Olt River (38 individuals in 2000 and 26 in 2001).

After 8 years of reintroduction the Olt River is populated with ca. 180 beaver individuals that represent an increasing of population with 100%. The same population development was observed on Mureş River (95%). On Ialomița, because of flash floods the population was stagnating.

The reintroduction action has covered two other important rivers from Romania: Mureş and Ialomița (56 individuals on Mureş and 35 on Ialomița River).

The great majority of the reintroduced beavers maintain the territory nearby the releasing points but some of them moved up and down the stream or on smaller tributaries rivers. One individual was find at 40 km distance from the releasing place in a mountainous affluent named Tărlung.
We conclude that the beavers have been consolidating a viable population on the superior course of the Olt River, Mureş and Ialomița.

In time, some problems appeared, regarding interaction between beavers and human population. Some of the beaver have produced damages in sugar beat and corn crops. There was find some cases of beaver killed by man because of lack of knowledge's regarding these specie. Therefore important efforts were made for public information.

We consider the start of this project as a scientific success and we are optimistic about beaver population development.

COMPOSITIONAL ANALYSIS AND GPS/GIS FOR STUDY OF HABITAT SELECTION BY THE EUROPEAN BEAVER IN THE CENTRAL MORAVA RIVER
(Poster)

John, František (Department of Ecology and Environmental Sciences, Faculty of Science, Palacky University, tr. Svobody 26, 771 46 Olomouc, Czech Republic, email: frantisek.john@post.cz)
Kostkan, Vlastimil (Department of Ecology and Environmental Sciences, Faculty of Science, Palacky University, tř. Svobody 26, 771 46 Olomouc, Czech Republic, email: kost@prfnw.upol.cz)

All the previous studies of habitat selection by the both beaver species used the site-attribute design, in which the environmental factors were related to the animal response. The importance of the spatial scale was not taken into consideration. In this research we have applied Aebisher's compositional analysis to compare utilized with available habitats in two levels, examining home range selection within the total study area first (Johnson's second-order selection), than habitat use within the home range (Johnson's third-order selection).

The study area was conducted in the part of the Morava River (70 km) and the oxbow Mlynsky Stream (25 km). Main part of the study area lies in the Litovelské Pomoraví PLA, where the beavers were released in 1991, 1992 and 1996.

In the study area, defined as the 50 m wide zone parallel to the shorelines on both river sites, the habitat types were mapped using GPS, GIS and aerial photography. From August 2004 to July 2005 all current beaver signs (cut trees, bark stripping, tracks, scent mounds, lodges etc.; n = 2.696) were collected using GPS. For each colony (n = 53) the Minimum Convex Polygon (MCP) home range was estimated in the GIS environment using the GPS locations.

Comparison of habitat use from MCP home range compared to habitat availability in the study area gave Λ=0.057 (P=0,001). A simplified matrix ranked beaver habitat in the order: Riverine willow scrub > Hardwood forests of lowland rivers > Willow-poplar forests of lowland rivers > Spruce plantations > Gravel banks > Meadows > Fields > Ash-alder alluvial forests > Oak-hornbeam forests > Ruderal bank vegetation > Urban area.

Use of the habitat types based on GPS locations distribution differed significantly from the habitat distribution within the MCP home range (Λ=0.409, P=0,001). A ranking matrix ordered the habitat types in the sequence: Riverine willow scrub > Willow-poplar forests of lowland rivers > Spruce plantations > Ash-alder alluvial forests > Hardwood forests of lowland rivers.

The results correspond with the importance of woods as beaver food and canopy cover.

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INTEGRATION GIS AND GPS WITHIN THE EUROPEAN BEAVER HOME RANGE ANALYSIS AND POPULATION MONITORING

(Poster)

John, František (Department of Ecology and Environmental Sciences, Faculty of Science, Palacky University, tř. Svobody 26, 771 46 Olomouc, Czech Republic, email: email: frantisek.john@post.cz)
Vorel, Aleš (Department of Ecology, Czech University of Agriculture, Kamycka ul. 121, 165 21 Prague, Czech Republic, email: vorel@fle.czu.cz)
Válková, Lenka (Department of Ecology and Environmental Sciences, Faculty of Science, Palacky University, tr. Svobody 26, 771 46 Olomouc, Czech Republic, email: valkova1lenka@seznam.cz)
Kostkan, Vlastimil (Department of Ecology and Environmental Sciences, Faculty of Science, Palacky University, tř. Svobody 26, 771 46 Olomouc, Czech Republic, email: kost@prfnw.upol.cz)

We analyzed the European's beaver home range with using of GIS (Geographic Information System) and GPS (Global Positioning System). The method was already tested for monitoring status of the European beaver population in the Czech Republic.

The data were collected in the winter time when the beaver's home ranges are smallest. All current beaver activity marks (lodges, cut trees, trails, scent mounds etc.) were recorded and located by GPS. Then, these data were transformed into GIS for further analysis. The primary indicator of a colony was set out as presence of an active winter lodge. If any lodge was not founded, the winter food store was counted, instead of. The individual colony home range was separated by a section of stream without beaver signs, but there was a difficulty in delineating colony borders where no such section existed. In these cases the marks on the edges were attributed towards to the nearest colony or where the activity was more continuous.

In fact, the GPS locations represent a subsample of a beaver's behavior pattern with the possibility to estimate and to quantify the beaver family home ranges. The simple method used for a river system is based on quantifying the length of the section of the stream settled by beaver family. We have discussed the possibility of aerial methods for estimating the beaver's home range – the simplest method minimum convex polygon, and other advanced methods that rely on utility distribution (harmonic mean, kernel).

This research was supported by the Czech Ministry of the Environment (VaV/620/1/03).

UNDERWATER BEAVER (*CASTOR FIBER* L.) SIGNS
(Poster)

Kaltenegger, Dieter (Hahngasse 7/23, 1090 Vienna, Austria, email: d.kaltenegger@gmx.at)

Beaver leave there signs not only on surface. Cut wood, beaver faeces and entrances of beaver lodges show their presence under water. In case of high beaver density, beaver sign research under water can help to define beaver territories, if the water is clear enough to find them.

The under water observations started 1999 on assignment of the Austrian Academy of Sciences (ÖAW) and the City of Vienna during the research of beaver colonization as a part of the Restoration Program Wienfluss Flood Control Basins. While working on the beaver monitoring on the Danube Island in Vienna 2001-2003 under water beaver signs search developed to a useful tool in a heavy modify waterbody. So the home range of the beaver was better to determine because off less scent marks on blocky bank stabilization of the New Danube.

In the Danube wetlands and in some small waters near the river March under water beaver signs were collected 2002-2004 during the beaver monitoring and management project by the ÖAW and the department of nature conservation in Lower Austria. Until 2006 in search of beaver underwater signs surface waters in Austria, Bavaria, Switzerland an East-Germany were visited.

For the search after under water beaver signs it is needful to be a trained scuba diver with drysuit experience because of the cold water staying long time there. Best season to find under water beaver signs is winter because of the low water level in rivers and the clear water.

Beaver droppings are compacted balls of sawdust deposit in the water when beaver preferred willow and poplar in winter.

During under water excursions there were found also dead beavers they never could be found on ordinary surface beaver research. Accidental underwater observation of wild beavers swimming or diving were also possible but rare.

METRIC AND NON-METRIC CHARACTERISTICS OF MATERNAL AND REINTRODUCED BEAVER POPULATIONS OF EUROPEAN RUSSIA
(Poster)

Korablev, Nikolay (Central-Forest Nature Biosphere Reserve, 172513 Zapovedny settlement, Nelidovo district, Tver region, Russia, e-mail: cranlab@mail.ru)

The intensive and unattended harvested of European beaver (*Castor fiber* L.) during centuries has resulted in its number decrease of their natural habitat, afterwards for it insularization and progressing reduction of geographically isolated populations. The beaver's scanty populations kept on the Voronezh and Berezina rivers. Strict protection, organization of refugiums and huge translocation saved from disappearance of this species.

The purpose of all these researches is to reveal microevolutionary changes, estimate their rates and direction in different populations of European beaver on the base of skulls series.
Aboriginal relict populations represented by Voronezh (Voronezhsky Zapovednik, n=85) and Berezina (Berezinsky Zapovednik, n=49) rivers. Reintroduced daughters populations represented by upper Volga basin (Central-Forest Zapovednik, n=120), Oka basin (Oksky Zapovednik, n=255, Mordovsky Zapovednik, n=73). Reintroduced daughters of Berezina populations include: Janja river (Pskov region, n=71), Desna river (Bryansk region, n=12). Total number of the investigated skulls - 665 pieces.

Were used 15 metric parameters including 7 bilateral signs which were measured on the both sides of the skull. The analysis of asymmetry of metric parameters was made with analysis of variance (ANOVA). The morphological craniometrical divergence investigated with ANOVA, canonical discriminant analysis, cluster analysis and nonlinear modeling. 22 non-metric traits include 65 phens of the beaver skull were used for phenetic diversity analysis. The manifestation of bilateral non-metric traits was analyzed on the both sides of cranium. The Zhivotovsky method was used to evaluate the level (μ) and structure (h) of phenetic diversity. Population similarity/dissimilarity measure for polymorphic characters used for evaluation of non-metric distances. Also was analyzed stability of ontogenesis.

On the basis of skull's studies from different populations it is possible to allocate three groups of European beavers with different sizes. The largest skulls have beavers from Voronezh, Oksky reserves and basin of Desna (Bryansk region), medium sizes – beavers from Central-Forest, Mordovsky reserves and Janja river (Pskov region), smallest sizes – beavers from Berezinsky reserve.

The absence of craniometrical sexual dimorphism in all extent of beaver's life is confirmed. Growth rate of a skull in populations of Central-Forest and Berezinsky reserves is greatest and beavers of the Voronezh reserve are characterized by slow growth rate. Most scale of morphological transformation presented in populations of Bryansk and Pskov regions. Coefficient of variance and level of fluctuating asymmetry of non-metric and metric traits indicate more intensive microevolutionary processes in reintroduced populations in comparing with maternal.

Morphological transformation in reintroduced population carry character of continuous variability and do not allow to distinguished subspecies on the basis of craniometrical differentiation. It is necessary to consider the direct asymmetry in analyzed series of beaver's skulls as population features.

There is a stochastic factor concerned with the founder's effect in small groups of reintroduced beavers at formation of morphological and non-metric shape of animals' skulls from geographically isolated populations.
Increased level of fluctuating asymmetry and presence of odontological anomalies in reintroduced populations are sign of inbreeding.

SELECTED BEAVER ADAPTATION ON DENSELY ICED WATERS
(Poster)

Kostkan, Vlastimil (Department of Ecology and Environmental Sciences, Faculty of Sciences, Palacký University. Trida Svobody 26, 771 46 Olomouc, Czech Republic, email:. kost@prfnw.upol.cz)

In the winter of 2005 intensive survey effort was carried out on the collection of extensive baseline data relating to beaver population distribution and density. The comprehensive survey approach also uncovered other interesting observations concerning beaver ecology and behaviour.

One such observation was specific holes dug out into the banks from old burrows where the beavers accessed the water bodies during extremely deep temperatures (about -20^{o} or less) when the ice covering the ponds and streams was 20cm or more. Instead of their normal behaviour, which is to enter the water from burrows under the waters surface or from the banks using slides.

During the time when the water is frozen beavers are leaving their burrows and swimming sometimes more than a hundred meters under the ice cover. It is often possible to see lines of air bubbles marking their way. These 'dangerous dips' were well oriented to the holes described above which were open to the surface several meters from the waterline and through soil 0.5 – 1.5m thick. These excavations isolated the water in the hole from deep temperatures and the beavers where able to keep these 'way outs' free from ice. Several photographs of these holes were taken during survey sessions.

This behaviour raises new questions. How do beavers take their bearings under the ice, especially if the ice is covered by snow? The beaver has limited time to find the 'way outs' restricted by their lung capacity. It could be that loss of orientation under the ice and subsequent drowning may be an important mortality factor. We have already found, during spring after ice melt, several dead beavers where dissection has shown water in their lungs.

The beaver is an amazing animal and the poster illustrates a new aspect of their life.

MANAGEMENT PLAN FOR EUROPEAN BEAVER IN CZECH REPUBLIC
(Presenstation)

Kostkan, Vlastimil (Department of Ecology and Environmental Sciences, Faculty of Sciences, Palacký University. Trida Svobody 26, 771 46 Olomouc, Czech Republic, email: kost@prfnw.upol.cz)
Vorel, Aleš (Department of Ecology, Faculty of Forestry and Environmental Sciences, Czech University of Agriculture, Kamýcká 129, 165 21 Prague 6, Czech Republic, email: vorel@fle.czu.cz)

During the last 20 years some regions of the Czech Republic have seen a rapid increase in the population of European beaver and the continuing trend is expansion to new areas. Following this expansion the first conflicts between beaver activity and the human economy were recorded towards the end of the 1990's. This kind of conflict in the past, following a reintroduction programme in the early 1800's, led to the species being hunted to extinction (hunting encouraged by land owners, especially fish pond owners). In order to manage the expansion of the beaver population and to address legislative and public awareness issues, investigations have been carried out to identify risk factors for the population in several different parts of the country. Work has also been done on the history of recent colonisation and the suitability of theses areas for continued development of the population.

During 2003 – 2005 a Management Plan for European beaver in the Czech Republic was prepared. The document describes crucial aspects of beaver ecology, distribution and dynamics, and recommends processes to help state administration in decision making for the next ten years.

The Management Plan has divided the Czech Republic into three distinct areas with different levels of protection. 'Zone A' covering the NATURA 2000 sites and other optimal habitats for beaver as the core areas for conservation protection of the beaver population. 'Zone B' covering areas where the beaver is protected during sensitive periods of its life cycle i.e. reproduction and over-wintering, and where beaver are managed to prevent disruption to human activities such as construction, river regulation and intensive fish farming. 'Zone C' a relatively isolated area with a high density of fish ponds, where beaver activities could be a significant hazard to dams, buildings, roads and consequently human health. This area has not been settled by beaver yet. Should the beaver colonise this area all the animals will be captured and translocated elsewhere, or humanely dispatched.

The Management Plan also proposes the setting up of an advisory group to aid decision making with regard to beaver management. The group should contain professionals from the state administration, scientists, hunters, foresters, river managers and so on i.e. stake holders. The advisory group would also be responsible for refining the public relations strategy outlined in the Management Plan.

As well as outlining practical steps for the application of national as well as European legislation (NATURA 2000) the Management Plan proposes substantial research activities to evaluate the efficiency of beaver conservation by analysing data concerning population dynamics and the genetic structure of the population. The findings to be integrated into the preparation of the following Management Plan, which should be prepared during 2013 -2015.

THE CLADOCERA PLANKTON OF THE SMALL RIVERS AT A WATER FLOW REGULATED BY MAN AND BEAVERS
(Presentation)

Krylov Alexander (I.D. Papanin Institute for Biology of Inland Waters RAS, Borok, Nekouz region, Yaroslavl district, Russia, 152742, email: krylov@ibiw.yaroslavl.ru)
Chalova Irina (I.D. Papanin Institute for Biology of Inland Waters RAS, Borok, Nekouz region, Yaroslavl district, Russia, 152742, email: chalov@ibiw.yaroslavl.ru)

After the regulation of small rivers as result of human and beavers activity the species diversity and quantitative abundance of zooplankton have increased mainly due to Cladocera (Krylov, 2001, 2002, 2005).

The aim of our investigation was to carry out the comparative analysis of changes in cladocerans structural and functional characteristics in water flow, regulated by man and beavers, and to estimate the effect of water from beaver ponds on fecundity of the test-object – *Ceriodaphnia affinis* Lill (Crustace, Cladocera). Both field studies in two small rivers in the Upper Volga basin) and laboratory experiments were carried out

The received data testify that the regulation of small rivers runoff promoted increase of variety, number, biomass, production and diet of cladocerans. But the most prominent changes were marked at the river sites regulated by beavers. Hence, it is possible to assume, that beavers can change the conditions of zooplankton existence not only by the dams erection, but also by the whole complex of factors. Our assumption was confirmed by the results of laboratory experiments: the maximum quantity of *C. affinis* posterity was fixed in beaver pond water.

Thus:
1. The small rivers runoff regulation results in increase of cladocerans quantitative abundance, production and diet.
2. The greatest values of the number, biomass, production and the amount of the consumed food are the salient feature of the river sites regulated by beavers.
3. The results of biotests of river water from various sites allow to judge that the increase of Cladocera structural and functional parameters in beavers ponds is caused not only by the flowage change, but also by effect of complex of factors, presumably caused by the products of beavers vital activity.

The work was carried out under support of « Russian Science Support Foundation »

30 YEARS BEAVERS (*CASTOR FIBER ALBICUS* Matschie, 1907) IN MECK-LENBURG-WEST POMERANIA, ESPECIALLY ON THE WARNOW RIVER - A SUCCESSFUL REINTRODUCTION PROJECT

(Poster)

Lindemann, Peter Wilhelm (Haus Biber & Co., An der Eiche, 19412 Alt Necheln, Germany, e-mail: nabu-parchim@worldonline.de)
Nitsche, Karl-Andreas (Castor Research Society Akensche Str. 10, 06844 Dessau, Germany)

In 1990 and 1992 eleven (n = 11) Elbe-beavers (*Castor fiber albicus*) were released in the basin of the Warnow river near Schwerin (Mecklenburg-West Pomerania). In 2005 the current estimated stock of beavers is 270 individuals in the Warnow river basin. In 2003 existed an estimated stock of 164 beavers in 41 beaver sites along the middle Warnow river valley in following different habitats (n = numbers of beavers / b. s. = number of beaver sites and [%]: course of rivers n = 42 / b. s. = 11 [27%], tributaries and ditches n = 30 / b. s. = 8 [19%], lakes and ponds n = 65 / b. s. = 15 [37%], fens and beat-pogs n = 15 / b. s. = 4 [10%], and other water bodies n = 12 / b. s. = 3 [7%].

The beavers have spread far off in eastern and south western directions. It is probable that the Warnow-population has fused with the beaver population in the Peene river basin, which was reintroduced in 1975/76, and also with the origin population along the lower Elbe river in Lower Saxony. Thus, the genetically pool of *Castor fiber albicus* in the area of northern Germany is ensured. Presently, we should be recording and mapping all beaver sites in the total covering area. The monitoring in 2005 is finished only for selected areas in the Peene, Recknitz, Trebel, Tollense, and Warnow river basins. Total 73 grid squares(g.s.; scale 1:25.000) was occupied by beavers. In detail we record 4 different local beaver populations: Elbe river basin (10 g.s.), Warnow (11 g.s.), Peene-Recknitz-Tollense incl. coastal waters and Usedom Island (48), Feldberger Lake area and Havel river (4). We estimated an total stock of 720 individuals for Mecklenburg-West Pomerania (3.6 beavers per settlement). In the last years was found some beavers (black phase) in the eastern regions from Poland.

In the last years we have done an extensive public relation campaign for beavers and their acceptance. A nature protection station (Haus Biber & Co.) was established for this reason. This station will inform residents and tourists about measures to prevent beaver damages. The “Haus Biber & Co.” leads yearly a “Beaver-Day” for local residents.

BEAVER INTERPRETATION IN BEAVER ENCLOSURES AND EXHIBITIONS
(Presentation)

Mertin, Barbara (Park Ranger & Beaver Manager,Kochgasse 22/11,1080 Wien, Austria, email: barbara.mertin@chello.at)

By the end of the 19th century beavers were nearly hunted to extinction in Europe. As a former, native wildlife species their reintroduction later in many countries was quite successful. While some people started to appreciate the presence of beavers in the countryside, others did not. Intense landscape use and the loss of ecological understanding subsequently followed into projects for beaver management.

By establishing beaver enclosures and offering beaver exhibitions in protected areas where once beavers have lived most valuable support for improving the public opinion was initiated. Examples of best practise in Austria (National Park Danube Floodplains), Germany (Biosphere Reserve Middle Elb / National Park Bavarian Forest) and Switzerland (Nature Reserve Sihltal) aim at giving inspirational input to those who are interested in setting up new standards for beaver interpretation. Additionally different zoos and wildlife parks as well as didactical methods of the recent past will show and highlight beaver interpretation on a high professional level.

Both beaver enclosures and beaver interpretation are the natural consequence of the need for informing the public as these actions support greatly the last frontier of beaver protection.

DEVELOPMENT AND ACTIVITIES OF A LOCAL BEAVER (*CASTOR FIBER ALBICUS* MATSCHIE, 1907) POPULATION IN THE VICINITY OF DESSAU, 1998-2006

(Poster)

Nitsche, Karl-Andreas (Castor Research Society, Akensche Str. 10, 06844 Dessau, Germany)

The beaver territories and beaver activities in the vicinity of Dessau were observed from 1998 to 2006. All beaver sites are drawn in maps (scale 1:25.000) typically with lodges, dams and important activities. The beavers were observed during the year (mainly from October to March) and the stock was estimated in some sites without direct observa-tions. Yearly data was listed and compared. Only in 2004 was the influence of human activities on beaver sites investigated especially for protection measures. Beavers inhabited all suitable bodies of water during the investigation period.

Due to the utilisation of the capacities of the natural environment (particularly, the ever scarcer food resources), there were no significant increases in numbers found in the investigation area. The local population has already exceeded its maximum growth limit. There was no reproduction in some beaver families for two or even three years. The number of family beaver sites with annual reproduction is limited due to occupied neighbouring territories as well as lacking food resources. High-water-periods, wild boar *Sus scrofa* activities and anthropogenic interferences (removal of shrubs, tearing down of beaver dams) have made negative impacts on the beaver population. The influence of an area-covering occurrence of mink *Mustela vison* on beaver reproduction could not yet be verified. The migration of beavers into bodies of water close to the city was observed during and after the flood in 2002. My poster will present data relating to the colonisation of beavers, numbers of active beaver lodges and dams, and the estimated and observed beaver stock numbers. Proposals are made for protective measures that would make a positive impact on the beaver population.

The voluntary care of beaver territories should be continued and should receive more support by the appropriate authorities because these are subject to EU legislation (FFH Guidelines) and German nature conservation legislation. Especially the protection of beaver habitats must be guaranteed because such are also habitats and retreat areas for many species of plant and animal.

A FEED OF A BEAVER IN VOLGA RIVER BASIN
(Poster)

Papchenkov, Vladimir G. (Institute for Biology of Inland Waters RAS, 152742, Borok, Russia, email: papch@mail.ru)

The food spectrum of a *Castor fiber* on the Upper and Middle Volga regions was studied. Gastric contents of 104 beavers extracted in the Mari and Chuvash Volga regions and 827 wood and grassy plants eat rounded by beavers in the Yaroslavl Volga region have been seen. 19 tree and 24 grasses species are noted. On Middle Volga occurrence of wood plants in a beaver feed has made 70 % (Betula pubescens, Salix acutifolia - on 17, Populus tremula - 13, Quercus robur - 9, Salix triandra - 6, Ulmus - 4 %, and al.) and grassy - 30 % (Carex acuta – 4, Nuphar lutea - 3 %, and al.), on the Upper Volga - 79 and 21 %, accordingly (Salix triandra - 20, Alnus incana - 15, Populus tremula - 9, Populus sp. and Salix fragilis - on 7, Nuphar lutea and Salix pentandra - on 6, Salix myrsinifolia - 5, Carex, Phragmites and Scirpus lacustris - on 4 %, and al.). Thus, food spectrum of a beaver on the Upper and Middle Volga regions as a whole are similar - wood forages are used in 3-4 times more often than grassy, among wood forages prevail Salix and Populus, among grasses - Nuphar and Carex. At the same time on Middle Volga essential value in a feed have Betula, Quercus and Ulmus, and on Upper Volga - Alnus.

NUMBERS, DISTRIBUTION AND RECENT BEAVER CONFLICTS IN AUSTRIA
(Poster)

Parz-Gollner, Rosemarie (Univ. of Natural Resources and Applied Life Sciences, Dept. of Integrative Biology and Biodiversity Research, Inst. of Wildlife Biology and Game Management (IWJ), Gregor Mendelstrasse 33, 1180 Vienna, email: parz@mail.boku.ac.at)
Vogl, Wolfgang (Austrian Academy of Science, Konrad-Lorenz Institute for Ethology (KLIVV), Savoyenstrasse 1A, 1160 Vienna, email: W.Vogl@klivv.oeaw.ac.at)

Beavers in Austria are protected by national laws on provincial level (nature conservation or hunting law) as well as by EU-legislation (FFH, Bonn Convention). About 30 year ago beavers have been reintroduced in small numbers in Austria at the Danube and the Inn river. The great majority of the population still is concentrated in two provinces along the lowland river systems of the Danube, March and Inn. Nowadays this part of the population is numerous and well established, occupying to a great extent all suitable habitats. The rest of Austrian is only sparsely populated with few pairs known as founder population showing an increasing tendency to disperse. The estimate of the recent national population is 2800 – 3000 individuals.

The overall loss of natural water systems on one side and the modification of artificial water bodies in the cultural landscape on the other side plus intensive agriculture increased and changed the habitat use and distribution of the beavers in general. As a result of the dense population in core areas, beavers already enlarged their habitat ranges and can be found living at „sub-optimal“ locations along many tributaries recently.

Already five years ago first beaver management activities in one province, Lower Austria, started, to coordinate the monitoring as well as the collection of reported conflict cases and possible mitigation measures. During this period conflicts were restricted to few cases and small areas with tree cutting or flooding of agricultural areas. Topics and amount of conflicts increased sharply in the following years.

The main conflict categories in Austria concern: forestry, agriculture, water management and cases, where the increasing habitat fragmentation of the landscape due to urbanization forces more frequent encounters. With respect to the actual numbers, density and local situation, the perception and therefor level of conflicts between beavers and humans differ.

Experiances from the first management period lead to a new beaver management concept in Lower Austria. Provided that the favourable status of the species is secure a stepwise action plan is proposed in case of severe conflicts. There are basically two possible stategies, which should be applied preferable in the following order:
1. management of the habitat - e.g. funding of protected areas and buffer zones, decreasing the attractiveness of the habitat for the beaver;
2. management of the population – capture and removal of individuals.

Depending on the econmic values affected, avoidance of risk for human life or settlement (dams, water supply, roads), public oppinion or political interests, solutions need to be handled flexible. In practice, pilot studies are carried out in the following year in Lower Austria to evaluate the new beaver management plan.

ANALYSIS OF GENETIC POLYMORPHISM IN EUROPEAN BEAVER POPULATIONS FROM LITHUANIA AND NORWAY

(Poster)

Paulauskas, Algimantas (Vytautas Magnus University, Vileikos 8, Kaunas, Lithuania, email: a.paulauskas@gmf.vdu.lt)
Žiemienė, Birutė (Vytautas Magnus University, Vileikos 8, Kaunas, Lithuania, email:)
Rosef, Olav (Telemark University College, Hallvard Eikas Plass, 3800 Bo, Norway, email:)
Rosell, Frank (Telemark University College, Hallvard Eikas Plass, 3800 Bo, Norway, email: Frank.Rosell@hit.no)

The random amplified polymorphic DNA and several isoenzymes technique may be used to explore semi-aquatic rodent polymorphisms. there were assessed its applicability to investigate semi-aquatic rodents. The aim of this study is to compare the genetic structure between Lithuanian and Norwegian European beaver (*Castor fiber*). populations using allozyme and RAPD (Random Amplified Polymorphic DNA) method. We will also investigate the population migrations.

The genetic variation among six subpopulation of European Beaver (*Castor fiber*) from different rivers basins in Lithuania and one population from Norway analysed using polyacrylamide gel electrophoresis and random amplified polymorphic DNA (RAPD) analysis This results were comparing with analysis data of beaver populations from German (Kohler, 1999).
Twelve polymorphic loci of liver tissue proteins were detected with two to six alleles in each of them.

Ten random decamer primers were used for RAPD analysis: ROTH-180-01, -, ROTH-180-10 (5'-GCACCCGACG-3', 5'-CGCCCAAGC-3', 5'-CCATGGCGCC-3', 5'-CGCCGATCC-3', 5'-ACCCCAGCCG-3', 5'-GCACGCCGGA-3', 5'-GCACGCCGGA-3, 5'-CGCCCTCAGC-3', 5'-GCACGGTGGG-3', 5'-CGCCCTGGTC-3'. Four primers (ROTH-180-05, ROTH-180-06, ROTH-180-07 and ROTH-180-09) fitted for genetic analysis of beaver.

The analysis of genetic variation among subpopulation shows that standard measures (frequency of gene, of genotype, the proportion of polymorphic loci (P=41.2-88.2), the total gene diversity (Ho=0.307-0.492) and expected mean heterosygosity (He=0.284-0.537), the mean number of alleles at all loci (A=1.4-2.9) are different for different subpopulation of European Beaver in Lithuania and Norway.

Relative genetic distance and similarity between subpopulation quantified according to Nei and Roger for proteins and Dice's coefficient for RAPD data.

This study was supported by Lithuanian State Science and Studies Foundation and ENLINO (Environmental Studies in Lithuania and Norway).

„THE BEAVER IS BACK IN TOWN“ – THE RECOLONISATION OF BERLIN RIVERS AND LAKES BY BEAVERS – PROBLEMS AND MANAGEMENT PERSPECTIVES

(Poster)

Recker, Wilhelm (Grimaustr. 58, 12439 Berlin, Germany)
von Lührte, Angela (Stadt-Wald-Fluss - Büro für Landschaftsplanung und ökologische Gutachten, Schloß-Str. 22, 14059 Berlin, Germany, email: von.luehrte@t-online.de)
Krauß, Manfred (Stadt-Wald-Fluss - Büro für Landschaftsplanung und ökologische Gutachten, Schloß-Str. 22, 14059 Berlin, Germany, email: krauss@bund-berlin.de)

In most parts of Germany the beaver (*Castor fiber* L.) was extinct in the 19th century. Only in the region of the “Mittlere Elbe” a population of about 90 families had survived in 1952. Due to protective measures this population increased and expanded, additionally enhanced by reintroductions[w1]. The population development was intensively monitored by voluntary conservationists. They observed a slow recolonisation[w2] of the waters in the surrounding of Berlin around 1980. The first settlement within the city boundary was detected in the northern part of river Havel in 1994. More than 9 home ranges have recently been established and some individuals are even visiting urban areas, like parks and canals. However, within 7 years at least 7 beavers have been killed by traffic.

As beavers are strongly protected by law, management measures should now help minimising problems related to a further expansion like: low food supply of urban riverbanks, mortal danger near roads and habitat fragmentation by technical barriers

TOURISM IN BEAVERLAND (BELGIUM)
(Presentation)

Rubbers, Olivier (Pays des Castors – Beaverland – Beverland – Biberland, Rue du Centre 78, 6250 Aiseau, Belgium, email: contact@paysdescastors.be)
Van Den Bogaert, Jorn (Netwerk Bever – Vlaanderen, Bertheide 19, 2200 Herentals, Belgium, email: netwerkbever@hotmail.com)

History
After extinction at the beginning of the XX century, the beaver has reappeared for the first time in Belgium in 1991. Since then, the beaver population has grown and is estimated today between 400 and 500 beavers. The beaver has colonized most of the rivers south of the Maas and in the Dyle Valley. Nowadays, Belgium is an important indispensable link in western Europe to connect the Dutch, German and French beaver populations.

Beaver tourism
Beaverland is a project of promotion of Belgium through ecotourism around the beaver. Actually, in the project of Beaverland, Belgium is Beaverland.

Beaverland tourism? Why then the beaver ? …
- Belgian identity: The beaver is the animal that has determined names of cities, villages, rivers, families, etc. in Belgium as no other animal and as no other country in the world.
- Key species: The beaver is a key species. Nature can be discovered through the activity of the beaver. The beaver creates landscapes of great natural interest.
- Visibility: The achievements of the beaver are quite visible and often spectacular. They have a great interest for ecotourism and education.
- Emblem:The beaver is linked to the history of Belgium and symbolizing at best real wildlife. Belgium has the honour to have a lot of the biggest beaver dams in western Europe. Black storks, kingfishers, dippers, frogs, toads, newts, even the rare European crayfish and a lot of other rare wildlife, develop in Belgium thanks to the beaver.

Beaverland tourism integrates the principles of ecotourism.
- Respect of nature: groups of max. 15 persons, led by a beaver guide, in full respect of nature
- Local economical development: organization of the consumption locally (restaurants, etc.)
- Local human interest: meeting of local culture, social life, gastronomy and people

Beaverland tourism integrates a diversified offer.
- Standard offer: guided beaver tours are organized all year through, on request or fixed dates.
- Fomulas offer: discovery of the beaver combined with other activities, such as:
  1. “Castor and Chouffe”: Lunch at the Chouffe Tavern, guided tour in the Chouffe brewery and degustation of Chouffe beer
  2. “Castor et concert”: Evening dinner at the Petite Fontaine and concert in the evening from 22h to 2 h
  3. “Castor en deers” : watching rutting deers and beaver sites during the day
- Beaver week-ends offer: Beaver week-ends are organized with overnight stay in youth hostels, hotels or … in the tent.

Beaverland is promoted by almost all web sites about tourism and tourist offices for Wallonia. The press and national TV has already covered the subject many times. Beaverland is becoming progressively popular and is generally seen as an interesting project, on both economical and ecological levels.

Discover Belgium's 3 B's: Brussels, Bruges and … Beaverland!

ECOTOURISM IN BEAVERLAND
(Poster)

Rubbers, Olivier (Pays des Castors – Beaverland – Beverland – Biberland, Rue du Centre 78, 6250 Aiseau, Belgium, email: contact@paysdescastors.be)
Van Den Bogaert, Jorn (Netwerk Bever – Vlaanderen, Bertheide 19, 2200 Herentals, Belgium, email: netwerkbever@hotmail.com)

Beaverland is a project of promotion of Belgium through ecotourism around the beaver. Actually, Belgium is Beaverland.

Tourism in Beaverland? Why then the beaver ? …
- Belgian identity … The beaver is the animal that has determined names of cities, villages, rivers, families, places in Belgium as no other animal and as n no other country in the world.
- Key species … The beaver is a key species. Nature can be discovered through the activity of the beaver. The beaver creates landscapes of great natural interest.
- Visibility … The achievements of the beaver are quite visible and often spectacular. They have a great interest for ecotourism and education.
- Emblem … The beaver is linked to the history of Belgium and symbolizing at best real wildlife. Belgium has the honour to have a lot of the biggest beaver dams in western Europe. Black storks, kingfishers, dippers, frogs, toads, newts, even the rare European crayfish and a lot of other rare wildlife, develop in Belgium thanks to the beaver.

Beaverland tourism integrates the principles of ecotourism.
- Respect of nature: groups of max. 15 persons, led by a beaver guide, on authorized paths
- Local economical development: organization of the consumption locally (restaurants, hotels, etc.)
- Local human interest: meeting of local culture, social life, gastronomy and people

Beaverland tourism integrates a diversified offer.
Standard offer: guided beaver tours are organized all year through, on request or fixed dates.
Fomulas offer: discovery of the beaver combined with other activities, such as:
1. “Castor and Chouffe”
Guided tour in the Chouffe brewery and degustation of Chouffe beer, brewed with water having passed through no less than 50 beaver dams.
2. “Castor and concert”
Evening dinner with concert (music of the sixties, seventies and eighties).
3. “Castor and deers”: watching rutting deers
4. “Castor et chocolate”: guided tour in the chocolate factory of Samrée and degustation
5. “Castor, Chouffe and Chocolat”: the Axis of Good, along a way of 15 km.
Beaver week-ends offer
Beaver week-ends are organized with overnight stay in youth hostels, hotels or … in the tent.

Discover Belgium's 3 B's: Brussels, Bruges and … Beaverland!

NEW BEAVER INVESTIGATIONS (DISSERTATIONS) IN RUSSIA AND ADJACENT COUNTRIES: A REVIEW

(Poster)

Saveljev, Alexander (Russian Research Institute of Game Management and Fur Farming of RAAS, 610000 Kirov, Russia, email: saveljev.vniioz@mail.ru)

I made a review of 49 theses on beaver made in the Soviet Union for 60 years (up to 1993) (SAVELJEV 1995). Later 4 theses were added to this list. Since 1994 further 19 theses were prepared, among them 16 for the first academic degree (Candidate of Sci., equiv. PhD.), and 3 for the second academic degree (Droctor of Sci. in Biology). Thus, at present the total list of “beaver” theses made in the former USSR includes 72 qualitative investigations. In recent years new papers appear regularly: two papers each of 2002-2004, three ones – in 2005. The overwhelming number of PhD (13 of 16) deals with different aspects of beaver ecology (environment forming activities, spatial structure, population dynamics, ecotoxicology, interspecific interactions, including Eurasian v. Canadian beavers). There are interesting papers on cytogenetics, paleontology and morphological microevolution. Three theses for the second scientific degree are of a generalizing character. All these facts are indicative of a lively interest of researchers in beaver during some ten-year periods as a keystone species in riparian ecosystems of Eastern Europe and Siberia and as a species that has the greatest utilitarian significance there. Some beaver populations can be considered as the most effectively managed units (MU), another ones – as unordinary, evolutionary significant units (ESU).

BEAVER REINTRODUCTIONS AND GENETICS – WHOM DO YOU RELEASE IN ESU-FREE WATHERSHEDS?

(Poster)

Saveljev, Alexander P. (Russian Research Institute of Game Management and Fur Farming of the RAAS in Kirov/Russia, email: saveljev@vniioz.kirov.ru)
Schwab, Gerhard (Bund Naturschutz in Bayern e.V, Deggendorfer Str. 27, 94553 Mariaposching, Germany, email: GerhardSchwab@online.de)

The once widespread beavers had been hunted almost to extinction by the mid-19ths century. The few small remaining populations in France, Germany, Norway, Poland, Russia, China and Mongolia were regarded as different subspecies, sometimes even different species.

Newer genetic research shows low genetic variability within the distinct relict populations and distinct genetic differences between the subpopulations. This is explained by genetic differentiation on watershed level, superimposed by the human caused bottleneck. Based on the data, an eastern and a western line, originating from different glacial relict populations is postulated, these lines can be seen as evolutionary significant units (ESU). The single relict populations are regarded as management units.

For reintroductions in West and Central Europe it's recommended, to use only beavers from the western line. This recommendation would have been difficult to put to work in the Danube watershed: beavers released in the upper reaches should have been from the western line, beavers released in the lower reaches from the eastern line. Historically this problem was "solved" due to lack of genetic data: beavers from at least 4 different subpopulations from the eastern and western line were used for reintroduction.

We propose to use the "Danube method" also in other completely beaver free watersheds in Western Europe. With the release of a beavers from different subpopulations, an increased genetic variability in these newly founded populations is possible, mitigating impact of human caused bottlenecks. On the other side, the surviving relict subpopulations can be managed in their respective areas.

BEAVER RESEARCH IN TYVA REPUBLIC/RUSSIA
(Poster)

Saveljev, Alexander P. (Russian Research Institute of Game Management and Fur Farming of the RAAS in Kirov/Russia, email: saveljev@vniioz.kirov.ru)
Stubbe, Annegret (Martin-Luther-University Halle/Germany, email: stubbe@zoologie.uni-halle.de)
Stubbe, Michael (Martin-Luther-University Halle/Germany, email: stubbe@zoologie.uni-halle.de)
Unzakov, V.V. (Zapovednik „Azas“ in Tyva Republic/Russia, email: azas@tuva.ru)
Kyrgys, V.V. (Zapovednik „Azas“ in Tyva Republic/Russia, email: azas@tuva.ru)
Molokova, N.I. (Zapovednik „Azas“ in Tyva Republic/Russia, email: azas@tuva.ru)
Putincev, N.I. (Ministry for Environment of the Tyva Republic/Russia, email: putincev@tuva.ru)
Ducroz,J-F. (Center of Environmental Research Leipzig-Halle/Germany)
Samjaa, R. (National University Ulan-Bator/Mongolia, email: rsamjaa@yahoo.com)
Durka, W. (Center of Environmental Research Leipzig-Halle/Germany, email: walter.durka@ufz.de)

International research groups are engaged in the exploration of ecology of autochthonous beaver populations of the Palaearctic and their protection and management.

Main goals of actual beaver research in Tyva
Protection and preservation of the endangered beaver subspecies *Castor fiber tuvinicus* Lavrov, 1969 and *Castor fiber birulai* Serebrennikov, 1929 on the territory of Russia and Mongolia. Live-catching of beavers in the Zapovednik „Azas“ and development of methods and action plans in all aspects of beaver management. Translocation of Tuvinian beavers and foundation of new populations in other tributaries of Upper Yenissej-river as well as to stabilize settlements of *Castor fiber birulai* on Tes-gol. Investigations of population structure in connection with reproduction strategy, age groups, mortality and sex ratio. Collection of samples for the investigation of population genetics and genetic diversity of Eurasian autochthonous beaver populations.

First results 1998-2004
In all Russian-German-Mongolian beaver expeditions of the last years the Siberian method of live-catching of beavers were established with great success. It was possible to estimate the population at Azas-river with about 100 animals in two subpopulations, divided by stream-rapids. Between these subpopulations there is not a genetic barrier, recapture of marked beavers has shown genetic exchange.

In August adult *Castor fiber tuvinicus* (n = 45) had a mean body mass of 18.37 kg, juveniles at the same time 3.23 kg, yearlings 9.84 kg and animals in the 3rd year 13.30 kg. In the mountain taiga of South Siberia population increasing is restricted when rivers are in flood after thaw or heavy rainfalls as well as by wolves (Canis lupus) and taimens (Hucho taimen). After a first experiment of beaver acclimatization from Azas to Bash-khem river (1989) we founded in 2003 and 2004 a new population at Bilin-river near the eastern border of Tyva.

In 1985 and 1988 as well as in 2002 we brought Mongolian beavers (*Castor fiber birulai*) to the Tes-river, which belongs to the basin of Uvs-nuur region and is crossing Mongolian and Tuvinian territory. Now there are registered also beaver settlements in the Tuvinian part (Ersin district) of this river system.

Results of investigations of genetic diversity have shown in the DNA structure that we will distinguish two clear different lineages of Eurasian beavers which will be discussed in future in connection with theirs history. 2005 two fundamental papers on these topics were published in Journal of Mammalogy and Molecular Ecology.

Castor fiber tuvinicus belongs to the protected animals from Red Data Books of Tyva and Russia and the world heritage site in biodiversity of South Siberia. This status is also necessary for *Castor fiber birulai* on Tuvinian territory at Tes-khem basin as well as in Mongolia.

MANAGEMENT OF BEAVERS IN FISH POND AREAS
(Presentation)

Schmidbauer, Markus (Jahnstr. 16, D-93093 Donaustauf, Germany,email: markus.schmidbauer@t-online.de)

After reintroduction in the 70th, the European Beaver spread successfully in Bavaria. 2006 up to 9.000 beavers are estimated. In the beginning of the 90th beavers had discovered fishponds as a new home. The average size of Bavarian fish ponds is between 0,5 to 3 ha. But there are exceptions up to a size of more than 50 ha. The complete water surface of all ponds is estimated up to 20.000 ha in Bavaria. Fish as carps, trouts, walleyes and catfish are bred economically in those ponds. Nowadays also Japanese Kois, with a value up to several thousand Euros per fish, are also kept in Bavarian fishponds. Nearly all of owners live on their fish.

There occur different problems due to the presence of the beavers in fishponds:
The beaver undermines the dams.
Neighbouring fish ponds are based on different levels and separated by dams. The beaver mainly starts to dig from the lower level upward. In progress the dam starts to leak and the pond of the higher level will loose water and will soon be dry. The fish are escaping with the water or if not they die in the pond without water.
Sometimes water rushing down causes a chain reaction of breaking dams and possibly causes severe flooding in the closer area.
For prevention we try to secure the dams. Stones or iron bars stabilize against digging activities. But first we have to weigh costs and effect. Depending on the local situation and the method to secure one meter of a dam costs 40 to 160 Euro. If it the costs are too high we have to remove the beaver.

Dam building activities of the beaver can also cause problems. The beaver blocks the ditch and water stops flowing into the fish pond. Some oxygen sensitive species of fish suffer very much under these conditions or even die. The beaver dam has to be destroyed as soon as possible. To prevent rebuilding we use electrical fences, swimming constructions or on the bank, blinking lights, radio or chains of swimming cans.

Sometimes the beaver clogs the drainpipe of the pond - the result: the fish can't be harvested, because it is not possible to reduce the water level for fishing.
And if water can't pass the drainpipe because of clogging, it will find its way over the pond's dam as a streamlet. This possibly causes a collapse of the pond's dam with the consequences above.
We use fences around the drainpipe or complex constructions with pipes and iron fences to keep the beaver off.

In winter another problem occurs. Special wintering ponds shelter a high density of wintering fish. Beaver activities could be an enormous stress for these fish. They loose weight, are easily attacked by diseases or simply die. To avoid serious conflicts it is necessary to trap beavers invading such a winter pond system. For prevention we try to minimize attraction of such a winter pond. We fell all possible food trees around the winter ponds. Another method is the use of an electrical fence to prevent invasion of a beaver.

All these conflicts cause a lot of extra work and controlling time for the fishpond owners, about one or two hours a day depending on the season.

40 YEARS OF BEAVERS IN THE DANUBE WATERSHED
(Poster)

Schwab, Gerhard (Bund Naturschutz in Bayern e.V, Deggendorfer Str. 27, 94553 Mariaposching, Germany, email: GerhardSchwab@online.de)

The Danube watershed, one of the biggest in Europe, was completely free of beavers by the mid of the 19th century. The new history of beavers in the Danube covers now 40 years of a successful return, from the first releases in Germany in 1966 to the most recent reintroduction in Bosina-Herzegowina in 2006.

In the poster I present the present status of the beaver in the Danube and the history of the come back.

BENEFIT OF OTTERS (*LUTRA LUTRA*) AND MINKS (*MUSTELA LUTREOLA* AND *MUSTELA VISON*) FROM CONSTRUCTION ACTIVITY OF BEAVERS (*CASTOR FIBER*) IN SMALL WATERCOURSES IN BELARUS

(Poster)

Sidorovich Vadim E. (The Vertebrate Predation Research Group, Institute of Zoology, National Academy of Sciences of Belarus, Akademicheskaya str. 27, Minsk-220072, Belarus, e-mail: vadimsid@mustbel.open.by)
Januta G.G. (The Vertebrate Predation Research Group, Institute of Zoology, National Academy of Sciences of Belarus, Akademicheskaya str. 27, Minsk-220072, Belarus, e-mail: fellows@predators.ws)

To reveal how do otters and minks benefit from construction activity of beavers, the following questions were investigated during the long-term (since 1983, mainly in 1995-2006) studies in Belarus: (1) variety and intensity of construction activity of beavers; (2) population density of beavers in different habitat types; (3) correlations between distribution patterns of otters (or minks) and construction activity of beavers; (4) changes in numbers of semiaquatic mustelids in connection with expansion of beavers; (5) seasonality in usage of beaver settlements by otters and minks; (6) changes in food supply of otters and minks in relation to damming by beavers and euthrophication of beaver ponds with age, five prey categories such as fish, crayfish, frogs, aquatic beetles and small rodents were considered doing the study on food supply; (7) hydrochemistry of beaver ponds having different water area and euthrophication rate; (8) a role of beaver burrows and lodges for semiaquatic mustelids as shelters, dens, and access to water environment during freezing-over period.

The study were conducted in small watercourses where construction activity of beavers is the most pronounced and has a great importance for otters and minks. Doing the study we considered seven following types of small watercourses that have specificity in construction activity of beavers and its influence on semiaquatic mustelids: (1) fast flowing small rivers (10-100 km long) with narrow mostly dry valleys; (2) moderately flowing small rivers (10-100 km long) with medium-sized partly swamped valleys; (3) slowly flowing small rivers (10-100 km long) with relatively wide and overswamped valleys; (4) brooks of 2-10 km long; (5) brooks of 0.5-2 km long; (6) forested drainage canals; (7) drainage canals in agriculture.

BEAVER DAMS AND FISH FAUNA IN FOREST STREAMS – A THREE-YEAR STUDY

(Presentation)

Sjöberg, Göran (Department of Animal Ecology, SLU, SE-90183 Umeå, Sweden, email: goran.sjoberg@adm.slu.se)
Hägglund, Åsa (Department of Animal Ecology, SLU, SE-90183 Umeå, Sweden, email:)

The beaver (*Castor fiber*) is now again shaping the forested landscape of Sweden, including morphology and dynamics of streams. This affects living conditions for fish, in particular where the activities of beavers include building of dams. Behaviour of fish as well as species composition may be influenced by beaver-induced habitat changes.

We studied the fish fauna in seven small to moderate-size streams with beaver in central Sweden, using electro-fishing and fish traps, over a three-year-period. Beaver ponds and adjacent riffle sections were compared to unaffected reference sections. Some changes in dam occurrence appeared during the study period.

Minnow (Phoxinus phoxinus) and brown trout (Salmo trutta) dominated the fish fauna, but additional species, bullhead (Cottus gobio), burbot (Lota lota) and pike (Esox lucius) occurred in lower numbers.

Differences in species composition between stream sections will be presented, as well as dynamics occurring over time.

SSSSSSSHHHHHHHHH – NOT A WORD ABOUT BIOLOGY! THE DANISH BEAVER REINTRODUCTION PROGRAMME: LOCAL MANAGEMENT AND MONITORING

(Presentation)

Svendsen, Thomas Borup (Danish Forest and Nature Agency, Klosterheden State Forest District (KLS), Gl. Landevej 35, 7620 Lemvig, Denmark, email: tbs@sns.dk)

The paper describes the local management at the Klosterheden State Forest District (KLS) with emphasis on:

- General management aspects
- Co-operation/involvement of the local landowners and other local ”stakeholders”
- The approach for estimation of the total beaver population
- Beavers and the press. Beaver branding.
- Ecology tourism/“Nature Interpretation” that focuses on beaver issues.

The general management aspects involved are i.e. fencing of vulnerable trees, dam management, damage assessment, eventually removing of beavers and evaluation of beavers as nature managers.

The co-operation/involvement of local stakeholders encompasses direct contact, guided tours, participation in a local steering committee for KLS, providing continuous information through local media and participation in a monitoring programme.

Estimation of the total beaver population is done by different methods. Basically the staff at KLS and the monitoring personnel from the National Environmental Research Institute (NERI) map the active territories of the different beaver families. Once a year (previously twice), a larger ”beaver count” is carried out. The beaver count is done by volunteers (neighbours, “land-/beaverowners”, nature freaks, staff etc.) and takes place during two days with counting 1 hour at dusk and 1 hour at dawn (4 observations) in April and October. These counts are finally supplemented with single observations of additional cubs etc.

Beavers and the press. The press has in general been very interested in the beaver reintroduction programme. Beavers are actually used in branding the region.

Nature interpretation is carried out by 7 different persons at KLS. The interest from the public has been tremendous, with 50 – 80 guided tours a year with 1700 – 2500 participants. The tours have different setup. “Beaver on business class” includes meals, shelter accommodation and costs app125 Euros. Other tours lasts a few hours and are free of charge.

THE BEAVER'S ACTIVITY INFLUENCE ON THE PLANKTONIC HETEROTROPHIC FLAGELLATE'S COMMUNITY STRUCTURE MODIFICATION IN THE LATKA RIVER (RUSSIA)

(Poster)

Tikhonenkov, Denis (Institute for Biology of Inland Waters, Russian Academy of Sciences. Borok, Yaroslavskaya obl. 152 742 Russia, email: tikhon@ibiw.yaroslavl.ru)
Kosolapova, Natalia (Institute for Biology of Inland Waters, Russian Academy of Sciences. Borok, Yaroslavskaya obl. 152 742 Russia, email: kng@ibiw.yaroslavl.ru)

Heterotrophic flagellates (HF) are a polyphyletic group of phagotrophic protists (that is, unicellular, plasmodial or colonial eukaryotes) that use one or more flagella for motility and/or for the collection of food particles. HF are an obligatory component of microbial communities in the water ecosystems of all types. On the one hand, bacterivorous flagellates play a critical role in nutrient cycling by grazing bacterial biomass and remineralizing the growth limiting nutrient contained in the bacteria. On the other hand, HF can be consumed efficiently by ciliates and planktonic metazoa.

This investigation was carried out in 2001-2005 at planktonic sites of the Latka River (Russia, Yaroslavskaya oblast) in the flowing biotopes and beaver ponds from the river head to lade.

One hundred and eleven species and forms of HF were identified in the investigated biotopes. Flagellates from the following groups: cercomonads, chrysomonads, kinetoplastids, euglenids, choanoflagellids and a group of *incertae sedis* species, were dominant in terms of species richness.

Samples from the beaver ponds were the richest, whereas the community in the flowing biotopes was characterized by the lower species richness, abundance and biomass. This is an evidence of increase of the trophic status of beaver ponds owing to reduction of removal of organic matter after the flow regulation by beaver dams.

The communities cluster analysis classification by species compositions indicates two groups of communities: beaver ponds' coenosis and flowing biotopes' coenosis. The representatives of phalansterids and apusomonads (typical for boggy sites and rare in rivers and large reservoirs) were observed in beaver ponds.

HF abundance in beaver ponds in 2005 was decreased in comparison with 2001. It is connected, possibly, with the ageing of beaver ponds and reduction of their flowage. As a result, number of a filter feeder zooplankton species (which are the main HF consumers) is noticeably increases. Decrease of HF abundance can be caused by increase of flow regulation and, as consequence, increase of the top-down control from planktonic metazoa.

MODERN STATE OF BEAVER POPULATION IN THE NORTH-EASTERN UKRAINE

(Poster)

Tokarsky V.A. (V.N. Karazin Kharkiv National University, Svobody Square 4, 61077, Kharkov, Ukraine, email: tokarsky@univer.kharkov.ua)

Reacclimatization works took place at the middle flow of the river Severskiy Donets at the beginning of the 70th. 20 beavers well adapted at flood-lands lakes of the river.

At present beavers have been found in the steppe zone of Kharkov and Lugansk regions at riverbanks of Nizhnyaya Dvurechnaya, Krasnaya, Loznaya, Gnilaya.

At Poltava region beavers have settled at tributaries of Vorskla and Psel.

THE ROLE OF BEAVER PONDS IN THE PROCESS OF SELF-PURIFICATION OF A SMALL RIVER

(Presentation)

Tselmovich, Olga (Institute for Inland Water Biology RAS, 152742 Borok, Yaroslavl district, Russia, email: otselm@ibiw.yaroslavl.ru)
Otyukova, N. (Institute for Inland Water Biology RAS, 152742 Borok, Yaroslavl district, Russia, email:)

Active settling of beavers results in the changes of the main characteristics of water ecosystems that are particularly evident in small rivers. The present work is devoted to the research of the influence of beavers vital activity on the processes of self-purification in small rivers. For that purpose the chemical composition of water (macro components, O2, CO2, organic matter, suspended particles) was investigated along the river. The observations were done during the vegetation period in the years 1999-2005 in the tributary of the Rybinsk reservoir (Russia, Yaroslavl region),the length of it is not more than 20 km. Till 2005 the sewage waters of the cheese dairy entered the river. At the beginning of our observations the beaver dams stood only upstream the source of pollution, at present 25 dams have been constructed. The release of sewage waters caused a considerable deterioration of water quality in the downstream section of the river. The number of suspended particles and the amount of organic matter increased distinctly, the quantity of biochemical consumption of oxygen reached 200 mgO2/l, the amount of soluble oxygen decreased up to the values which are critical for the hydrobionts. The negative influence of sewage waters was traced at the distance of 5-6 km downstream. After the construction of a dam 2.5 km downstream the place of the release a big pond was formed where the transformation of the sewage waters took place. As a result the water entering the pond through the dam had better characteristics. The number of suspended particles and the amount of organic matter decreased in times, the concentration of soluble oxygen increased.

The products of beavers vital activity create favourable conditions for the formation of specific communities of hydrobionts and microflora in beaver ponds. As a result of biochemical oxidation the utilization of organic matters in the ponds goes more actively and the processes of self-purification intensify. Hence, beaver ponds are of positive importance in the improvement of the quality of water in a small being polluted river.

PRELIMINARY RESULTS ON REPRODUCTIVE PERFORMANCE OF FEMALE BEAVERS IN LITHUANIA

(Poster)

Ulevičius, Alius (Faculty of Natural Sciences of Vilnius University, Čiurlionio 21/27, 03101 Vilnius, Lithuania, email: alius.ulevicius@gf.vu.lt)

Reproductive performance of the female beavers can be an informative source of data analyzing mechanisms of self-regulation of dense beaver populations. In Lithuania, density of the present beaver population is very high, locally comprising up to several beaver colonies per square kilometer.

We attempted to sample hunted female beavers to describe their reproductive status. A total of 40 females were sampled in 2002-2006. Five (12.5%) of them were 0+ -aged, seven (17.5%) – 1+, seven (17.5%) – 2+, and 21 (52.5%) – adults. The reproductive status of a female was estimated by uterus development, presence of embryos or scars from the former embryos (Lavrov 1980). Development of nipples was an additional trait of a female fertility in late summer and autumn. Some morphometric data on females and embryos are provided.

Fertile females were found in two age groups – 2+ and adults. They comprised only 29% and 62% within these age groups, respectively. Mean fertility rate was 2.1 embryo (embryo scar)/female (n=14). Number of embryos (embryo scars) varied from 1 (5 cases) to 4 (2 cases). These results show quite high level of reproductive suppression of adult and especially 2+ aged females suggesting presence of some mechanisms of reproduction self-regulation in dense beaver populations. On the other hand, reproductive performance of female beavers might be highly influenced by exploitation effects, when beaver pairs are destroyed by unselective hunting. At present, hunting press on beaver population in Lithuania is comparatively high comprising by expert evaluation more than 20% every year.

FLUCTUATING ASYMMETRY IN BEAVER (*CASTOR FIBER*) POPULATION IN LITHUANIA

(Poster)

Ulevičius, Alius (Faculty of Natural Sciences of Vilnius University, Čiurlionio 21/27, 03101 Vilnius, Lithuania, email: alius.ulevicius@gf.vu.lt)
Brasiūnaitė, Rita (Faculty of Natural Sciences of Vilnius University, Čiurlionio 21/27, 03101 Vilnius, Lithuania)

The present beaver population in Lithuania has developed from several genetically different centers of spread. Earlier investigations showed phenetical, genetical and morphological differentiation of this population even under conditions of high density of population (Ulevičius, Paulauskas 2003). Genetically different groups of individuals (local populations) may unevenly respond to environmental stress on morphological level. The aim of this study was to estimate differences in the fluctuating asymmetry (FA) level among local beaver populations.

FA was studied using craniological material from four local populations of beavers inhabiting four different of-the-second-order river catchments: the Merkys River (n=30), Dubysa River (n=27), Šešupė River (n=16), Jūra River (n=21). Beaver crania were sampled in 1986-1988 when beavers were already numerous in all the country. FA level was estimated using five metrical and 14 non-metrical traits of beaver crania.

Statistically significant differences in FA level among local beaver populations were found by four non-metrical traits. The highest difference in FA level was estimated between two local beaver populations inhabiting the Merkys River and the Šešupė River catchments. The first one has originated from natural immigrants from the upper reaches of the Nemunas River (Neman in Belarus) in the beginning of 1940's. The second local population of beavers has developed after the reintroductions from Voronezh (Russia) in 1947 and especially from Gomel region (Belarus) in 1955 (30 individuals were released). The neighboring Dubysa and Jūra populations showed no significant differences in FA level. Most probably, these beaver groups started to developed at nearly the same time from a "genetical mixture" of spreading reintroducent offspring.

FA level by separate non-metrical traits was rather variable in different beaver populations. Portion of asymmetrical individuals in the Merkys population varied from 8 to 36%, in Dubysa – 0–63%, in Šešupė – 0–56%, in Jūra – 0–48%. These figures suggest relatively high FA level by separate traits in Lithuanian beaver population which is comparable to FA level in some populations of grey seals inhabiting highly polluted zones of the Baltic Sea (Zakharov et al. 1989). Differences in FA level among local populations of beavers may be influencend by their different origin.

SMALL MAMMALS ON BEAVER LODGES
(Poster)

Ulevičius, Alius (Faculty of Natural Sciences of Vilnius University, Čiurlionio 21/27, 03101 Vilnius, Lithuania, email: alius.ulevicius@gf.vu.lt)
Janulaitis, Martynas (Faculty of Natural Sciences of Vilnius University, Čiurlionio 21/27, 03101 Vilnius, Lithuania)

Beaver lodges and burrows can be important shelters for many other animals. Earlier investigations discovered more than 20 vertebrate species dwelled in beaver burrows (Barabash-Nikiforov 1950). The aim of the presented study was to estimate abundance and diversity of small mammals on beaver lodges.

Small mammals were sampled using snap-traps on ten beaver lodges three times per year (spring, summer and autumn) in a model territory in Eastern Lithuania from 2002 to 2005. The total amount of trap effort was 2478 trap/night.

Totally, 229 individuals representing nine species were caught. Distinct dominant by frequence of occurrence (42.4%) and relative abundance (14.5 ind./100 trap/nigth) was the bank vole (*Clethrionomys glareolus*); the subdominant – yellow-necked mouse (*Apodemus flavicollis*) – 14.1% and 1.3 ind./100 trap/nigth, respectively. Small mammals of the other species were caught rather ocassionally.

The most interesting finding in this study was that seasonal changes in relative abundance of small mammals on beaver lodges were only slight. E. g., relative abundance of dominated species, the bank vole, was very similar in spring and summer (10.8 and 11.7 ind./100 trap/nigth, respectively), and more increased in autumn to 20.9 ind./100 trap/night. This suggests beaver lodges being important survival stations for bank voles during the winter season. Spring is usually characterized by extremely low abundance of small mammals.

Diversity of small mammals due to strong dominance by bank vole was found to be rather low on beaver lodges (Shannon diversity index reached 0.8). These preliminary data show certain importance of beaver lodges as a small mammal habitat (survival station), first of all for the bank vole.

CANALS OF LAND RECLAMATION AS THE BEAVER (*CASTOR FIBER*) HABITAT IN LITHUANIA

(Presentation)

Ulevičius, Alius (Faculty of Natural Sciences of Vilnius University, Čiurlionio 21/27, 03101 Vilnius, Lithuania; email: alius.ulevicius@gf.vu.lt)
Jasiulionis, Marius (Faculty of Natural Sciences of Vilnius University, Čiurlionio 21/27, 03101 Vilnius, Lithuania)

Canals of land reclamation comprise ca. 83% of the hydrographical network in Lithuania. A significant part of the meliorated land was never used for intensive agriculture due to unsuitable soil or infrastructure conditions. Considerable part of the drainage canals are self-destructing after the abandonment, or are affected by outside agents, like beaver. Beaver is considered one of the most important species for restoring biodiversity in the anthropogenically-changed landscape of Lithuania. Restore of the canalized riverbed is one of the current basic impacts on environment of inland wetlands.

About one third of beaver population inhabits canals of land reclamation (ca. 18% – in rivers, 20% – in rivulets, 12% – in lakes) in Lithuania. A slight increase of this portion was detected during ten last years: from 30.2% in 1996 to 35.3% in 2005. However, the selectivity of this habitat by beavers differs among regions. It depends on habitat structure of a certain region. E.g. in the clayey plain landscape (Mid. Lithuania) under conditions of shortage of natural water bodies, share of beaver population inhabiting canals reaches up to 48%, whereas in sandy plains and hilly moraine eminencies (SE Lithuania) with numerous lakes and rivers – from ca. 25 to 34%.

Mean estimated density of beaver colonies in drainage canals is 2.6 colonies/10 km. In conditions of dense beaver population, more than 40% of beaver colonies persist for decades at the same site, thus, the canal renaturalisation effects are most pronounced there. Approximatelly 23% of beaver colonies disappear from the former sites in drainage canals, mainly due to persecution by man (destroying of dams, intensive hunting).

Beaver activity in canals of land reclamation is basically expressed by damming and burrowing activity. Average damming intensity in a model territory was estimated to be 11.4 damms/10 km of investigated canal. Mean burrowing intensity exceeds 30 burrrows/km of investigated canal. By expert evaluation, beaver ponds located in drainage canals contain ca.10, 000,000 m^3 of the surface water in all the country (Lamsodis, 2000), or about 154 m^3/km^2.

ACTUAL STATUS AND DISTRIBUTION OF BEAVER POPULATION IN SLOVAKIA

(Poster)

Valachovič, Dušan (State Nature Conservancy of Slovak Republic, Protected Landscape Area Záhorie, Vajanského 17, 901 01 Malacky, Slovakia, email: dvalach@sopsr.sk)
Tomeček, Jozef (State Nature Conservancy of Slovak Republic, Protected Landscape Area Záhorie, Vajanského 17, 901 01 Malacky, Slovakia, email: tomecek@sopsr.sk)

In Slovakia, native population of beaver (*Castor fiber*) was exterminated in 1865. Recolonisation of Slovak territory begun at the end of 70´s (1977 - Morava river, 1981 - Ondava river, 1985 - slovak stretch of the Danube river, 1986 - Poprad river, 1995 - Dudváh river and Jurský Šúr wetlands, 1999 - Orava river, 2000 - Topľa and Laborec rivers, 2001 - Dunajec river, 2002 - Váh river, 2003 - Malý Dunaj branch of the river Danube, Nitra river). Most abundant population occurs in western part of Slovakia, with approximately 140 localities at Záhorská nížina lowland (Morava river) and approximately 25 localities at Podunajská nížina lowland (Danube river).

This population arose probably from 39-42 individuals released in Austria (8-9 specimen of scandinavian *Castor fiber fiber*, 14-15 north-american *Castor canadensis* and 17-18 east-european *Castor fiber vistulanum*). Until now, no evidence for presence of north-american beaver has been found (6 beaver skulls examined were all classified as *Castor fiber*).
First phase of recolonisation by beaver – settlement of optimal localities - lasted 10 years, nowadays beavers colonize also sub-optimal localities. Within Morava river alluvium, population grows exponentially, expanding its distibution towards Chvojnická and Myjavská pahorkatina downs. The present day, 49% of beaver distribution area is included within Natura 2000 sites. Second National Conference/Expert Meeting - Natura 2000 in Slovakia suggested that at least 70% of beaver distribution area should be assigned as part of NATURA 2000 network.

However, with expanding population and colonisation of synantropic habitats this become hardly applicable. Growing beaver population collides with human economical interests: 5% of population causing serious problems (ponds and facilities threats), 20% causing year-long problems (permanent flooding of fields and forests), 60% seasonal problems (problems with crop sowing or harvesting). For that reason, a manual with instructions to reduce collisions of beaver and human activities was published. Individual protection of trees, beaver dams drainage and protection of road facilities were applied.

With dietary preference for autochtonous plant species, beaver can enhance spreading of invasive plants in Slovakia. However, beaver acts mainly as an important factor in renaturation of artificial channels, enhancing retention capacity of river basins, preventing destructive floodings, contributing to the regeneration of alluvial forests.

Potential for continuous population growth is located mainly in lowlands and basins below 950 m a.s.l. We suppose that beaver occurence is possible anywhere within *Salicion triandrae*, *Salicion eleagni*, *Salicion albae*, as well as *Ulmion* associations. Based on the evaluation of beaver diet preferences, geomorphological structure, terrain elevation, potential vegetation and population trends, we prepared a map of potential beaver localities in Slovakia.

THE BEAVER POPULATION UNDER THE EXTREME FLOODS ON THE ELBE RIVER

(Presentation)

Vorel, Aleš (Department of Ecology, Czech University of Agriculture, Kamycka ul. 121, 165 21 Prague, Czech Republic, email: vorel@fle.czu.cz)

Since 1992 had began the development the European beaver population on Elbe River. Up to date there are 14 families of the European beavers. The beaver's habitat and the population are strongly influenced by anthropogenic and ecological factors such as by civilisation and industry development. The main natural ecological factor of the area settled by beavers is the annual flood. Aim of the article is focused on estimation of behavioural and territorial reaction on the extremely fluctuated water level in the river settled by European beaver.

Data were collected from year 2000 up to 2006. Mapping of the 14 families were carried out each year pending normal water level and after extreme water growth and falling-down, too. Recorded were all marks of beaver activity on both banks of the Elbe River and related water sheets, also. Beside the quantitative and qualitative characteristics were the coordinates of each point (GPS) of activity located.
Data were tested with hypothesis: 1) does the territory length change through or immediately after the floods, 2) does the territory centre changes through or immediately after the floods, 3) use the beavers another food sources through extreme water level, 4) if differs behavioural activity during floods in comparison with activity throughout usual water levels.

Results tell that: 1) territory length doesn't significantly differs on tested water levels, 2) as well the territory centre doesn't have significantly different location, further 3) beavers use another spatial food-sources but of the same quality and quantity, and at the last 4) the beavers have had in part another distribution of behavioural activity within their territories during the extreme floods.

HEAVY METALS IN THE FUR OF THE EUROPEAN BEAVERS IN THE CZECH REPUBLIC

(Poster)

Vorel, Aleš (Department of Ecology, Czech University of Agriculture, Kamycka ul. 121, 165 21 Prague, Czech Republic, email: vorel@fle.czu.cz)
Přikrylová, Petra (Department of Ecology, Czech University of Agriculture, Kamycka ul. 121, 165 21 Prague, Czech Republic, email: petrow@centrum.cz)
Miholová, Daniela (Department of Chemistry, Czech University of Agriculture, Kamycka ul. 121, 165 21 Prague, Czech Republic, email: miholova@af.czu.cz)

Population of the European beaver *(Castor fiber)* in the Elbe region has been stabilized since 1992. But the census of that population in comparison with rest of the population (in the Czech) is significantly smaller. The Elbe district represents an area with adverse living conditions, potentially is the area contaminated with pollutants and heavy metals, among others.

The hypothesis was created, that 1) one of the possible causes deterioration in quality of the population could be the adverse living conditions, mainly caused by strong contamination of toxic metals.

The heavy metals are absorbed in various tissues of the beaver's body. The possible vector of contamination of the beaver's organism may be food-source. Because of the willows and poplars leaves and branches extremely accumulate the heavy metals.

The beaver's fur were collected (n=47) out of four stabilized population ("Elbe population" included) around the Czech. The aim was to compare the concentration values of the heavy metals in the fur of two tested groups. First sample of the beaver's fur originate from the Elbe region and the second group was the rest of captured beavers from the whole Czech Republic.

The concentration values of the heavy metals (cadmium, chromium, cooper, mercury, nickel, lead, zinc) were determinate for the chemical analysis. Material was analyzed with using of atomic spectrometry. The conclusion is that the 1) beavers from the Elbe region showed an increased concentration of the mercury and the lead. On the other hand the South Moravia region showed higher concentration of chromium.

MONITORING OF THE EUROPEAN BEAVER IN THE CZECH REPUBLIC
(Poster)

Vorel, Aleš (Department of Ecology, Czech University of Agriculture, Kamycka ul. 121, 165 21 Prague, Czech Republic, email: vorel@fle.czu.cz)
Válková, Lenka (Department of Ecology and Environmental Sciences, Faculty of Science, Palacky University, tr. Svobody 26, 771 46 Olomouc, Czech Republic, email: valkova1lenka@seznam.cz)
Maloň, Jaroslav (Department of Ecology and Environmental Sciences, Faculty of Science, Palacky University, tr. Svobody 26, 771 46 Olomouc, Czech Republic, email: slaimer@seznam.cz)
Hamšíková, Lenka (Department of Ecology, Czech University of Agriculture, Kamycka ul. 121, 165 21 Prague, Czech Republic, email: leninkah@seznam.cz)
John, František (Department of Ecology and Environmental Sciences, Faculty of Science, Palacky University, tr. Svobody 26, 771 46 Olomouc, Czech Republic, email: frantisek.john@post.cz)

The first monitoring of the European beaver population in Czech Republic took place in the winter 2006. Aim of the article is to obtain the detailed information about size, quality and time changes in the important population of this large mammal. Monitoring status is targeted at the observing of the development of large, stabilized beaver population and is focused primarily on Protected Landscape Areas.

Firstly, the field data were collected. All signs of beaver activity were noted down, together with their GPS position. Beaver signs were categorized in accordance with the characteristic activity indicated e.g. feeding activity, lodges, other dwellings, dams, channels, slides, scent marks, trails etc. Than the density spot clusters were generated by analyse of the data under GIS software. For generate the number and size of the families was used spatial analyse – based on the kernel density estimates. Field experience (species ecology and habitat knowledge) was used to modify the clusters into more congruous shapes, too.

The monitoring proceeds in 5 EIH (Europen Important Habitats of the Natura 2000 net) and here are the results. EIH Litovelské Pomoraví has 54 beaver families. In the EIH Chropyňský luh was found 17 beaver families, further in the EIH Strážnicko has 4 beaver families. In the EIH Labské údolí was found 12 beaver families. The largest population is in the EIH Niva Dyje & Soutok Podluží, there was on record 102 beaver families. The monitoring status is going to be carried out in the future, again. The sense of is to obtain the time series data, which may indicate the changes in the dynamics of the all observed population.

BEAVER (*CASTOR FIBER L.*) IN THE SPREEWALD, 2004 – 2005: HABITAT ADEQUACY AND ASPECTS FOR A MANAGEMENT PLAN

(Poster)

Willharms, Anke (Braunschweiger Str. 65, 12055 Berlin, Germany; email: willharms@bund-berlin.de)

After 100 years of absence, first signs of the beaver have been found at the UNESCO biosphere reserve Spreewald in 2001. Within the diploma thesis the beaver occurrences and the adequacy of the waters as a beaver habitat have been examined. A conflict- and hazard analysis has been made and a management concept to promote the habitat was developed. The area under investigation included the waters of the nature reserve “Innere Ober- und Unterspreewald” and the course of the river Spree. The most important results are displayed on my poster.

The adequacy of the waters has been determined according to HUGO (2001). The revision of the results reveals serious failings of this method in regard to the evaluation of food resources. This makes it impossible to give a definite statement about the adequacy of the waters as a beaver habitat. Accordingly, the method has been supplemented with an analysis of the mapping of biotope and forest.

The examinations point out that the limiting factor for beaver settling in the Spreewald will be food. First of all, the alder which is the prevalent tree in the Spreewald is a minor food resource for the beaver. In addition to that, a mostly unfavourable composition of species and age groups has emerged in the woods as a result of farming as well as changed hydrological conditions. Accordingly, the contingent of areas which is appropriate for settling is as low as 6% at the Unterspreewald. At the Oberspreewald, nearly the half of the waters can be classified as adequately. Due to the lack of food resources or their poor quality, it is very doubtful that a permanent beaver settling will be possible in many areas of the Spreewald.

A main task in the mangement concept will be to advance the food resources. Accordingly it is of great importance to cultivate suitable riverine vegetation stocks as a crucial precondition for long-term settlings. Another point of action will be intensive public relation as well as the development of a carers’ network for the beaver habitats. The conflict- and hazard analysis shows that conflicts might arise because the watersides are partially too narrow and artificially modified. Another point of conflict is to be presumed in the utilisation of the waters by flood protection, pond fishery, forestry and agriculture. Furthermore, the potential hazard of beavers caused by the extensive recreational use of some waters and barriers in the form of bridges and weirs must be taken into account.

Altogether it must be stated that the Spreewald is not an ideal habitat for beavers. According to its adaptability, the beaver can establish itself nonetheless.

REASONS FOR USE OF CONIFERS BY BEAVERS (*CASTOR FIBER* L.)
(Presentation)

Wimmer, Christoph (Fachhochschule Weihenstephan, Fachbereich Wald und Forstwirtschaft, Am Hochanger 5, 85350 Freising, email: christoph-wimmer@web.de)
Zahner, Volker (FH Weihenstephan/University of applied sciences, Fachbereich Wald und Forstwirtschaft, Lehrgebiet Zoologie, Tierökologie, Am Hofgarten 4, 85350 Freising, Germany, email. volker.zahner@fh-weihenstephan.de)

So far use of coniferous trees was only noted by North-American Beaver (*Castor canadensis* Kuhl). In many regions of Bavaria, Germany, it can be observed that coniferous trees also belong to European Beaver's (*Castor fiber* L.) diet.

In detailed studies two observation areas in Southern Bavaria, Germany, (Gadenerau, Freising; Geiselsberg, Roding) with high spruce populations (*Picea abies* L.) were investigated and compared. Within the scope of that work the whole tree population, chest high diameter and the tree distances from the borders were taken down. Past it use of trees by beavers was differed into bark stripping and cuttings. On barked trees the dimensions of those damages as well as the progress of rottenness were documented.

In both tree populations bark stripping and cuttings caused by beavers were significantly higher on spruce than on deciduous trees. Especially within a distance of ten meters from the borders a high use density of spruce by beavers was observed. The main period of use is located during the months of May and June which is corresponding to observations made by different authors. A seasonal dependence of use of coniferous trees by beavers can be confirmed.

BEAVER INDUCED STRUCTURE CHANGE ALONG A STREAM IN BAVARIA AND ITS INFLUENCE ON FISH FAUNA AND AN INDICATOR BEETLES
(Presentation)

Zahner, Volker (FH Weihenstephan/University of applied sciences, Fachbereich Wald und Forstwirtschaft, Lehrgebiet Zoologie, Tierökologie, Am Hofgarten 4, 85350 Freising, Germany, email. volker.zahner@fh-weihenstephan.de)
Hanöffer, Stefan (FH Weihenstephan/University of applied sciences, Fachbereich Wald und Forstwirtschaft, Lehrgebiet Zoologie, Tierökologie, Am Hofgarten 4, 85350 Freising, Germany)
Schurli, Catharine (FH Weihenstephan/University of applied sciences, Fachbereich Wald und Forstwirtschaft, Lehrgebiet Zoologie, Tierökologie, Am Hofgarten 4, 85350 Freising, Germany)
Müller, Sandra (FH Weihenstephan/University of applied sciences, Fachbereich Wald und Forstwirtschaft, Lehrgebiet Zoologie, Tierökologie, Am Hofgarten 4, 85350 Freising, Germany)

We studied the impact of beaver on a stream by dam building and on floodplain forests by flooding and felling trees. On a small scale view Mühlbach stream was divided in three sections. In section 2 the beaver alter the stream with dam building, changes swift and sedimentation amount. Water ph, concentration of oxygen and water temperature didn't show any significant change due to the beaver dam. 5 electro fishing surveys were carried out over 38 years.

Comparison with former electro fishing before dam building shows, that the impact of beaver dam enhanced backwater species only in one section. The proportion of rheophil fish stayed almost the same over the years. The number of river trout and grayling dropped from 1964 on continuously, although the beaver dam was first built in1995. The section where the beaver dam was build never was an important habitat for river trout. So the beaver as only a local effect and was not the explanation for decline of streaming fish species.

In the floodplains where the beaver occurs there is a significant difference in the amount and composition of dead wood. The number rises explicit with the activity of beaver. From 86 m3 in average per ha 88% of the dead wood was caused by beaver in a 20 m stripe along the river bank. A wide range of diameters and decomposition was found, 63% of the standing snags were exposed to sun. 203 stems were investigated closer. The number of stems populated by the beetle *Pyrochora coccinea* indicates habitat quality for the FFH- directive species *Cucujus cinnabarinus* was almost the same, but the density in the beaver area was more than 10 times higher.

The beaver creates structures like lodges or food caches that are important hideouts against predation and dead wood that functions as a habitat connection along floodplains even for lesser mobile organism groups.

THERMOREGULATION- A MAIN FUNCTION OF THE BEAVER TAIL?
(Presentation)

Zahner, Volker (FH Weihenstephan/University of applied sciences, Fachbereich Wald und Forstwirtschaft, Lehrgebiet Zoologie, Tierökologie, Am Hofgarten 4, 85350 Freising, Germany, email: volker.zahner@fh-weihenstephan.de)
Müller, Reinhold (Fachhochschule Landshut, Am Lurzenhof 1, 84036 Landshut, Germany, email: reinhold.mueller@fh-landshut.de)

The warmest spots of the beaver body were eyes, ears and the proximal vessels of the beaver tail. After bringing the beaver to ambient temperatures of 29°C, the largest amount of heat was transferred over a large part of the back while eye, ear and tail temperatures remained constant. The beaver tail has several obvious functions like storing fat, steering and stabilizing the beaver while feeding in the water. According to our data, however regulation of heat losses at high temperature levels does not appear to be a principal function of the tail. Mainly responsible for heat losses is the large back where the surface temperature rose by 2°C. At the back almost no fat is stored and heat is lost rapidly to the ambient. Due to the blood vessels in its proximal portion, the tail does lose some heat, but this is not a reaction to increased temperatures. Special adaptations to avoid heat losses, which is a problem over most of its range of occurrence, are much more important for beavers.

THE EUROPEAN BEAVER (*CASTOR FIBER* L.) IN RDEYSKY RESERVE AND IN ADJACENT TERRITORIES (NW RUSSIA)

(Poster)

Zavyalov, Nikolay A. (State Nature Reserve Rdeysky, Chelpanova 27, 175270 Holm, Novgorod Province, Russia, email: zavyalov_n@mail.ru)
Letsko, Ivan V. (School "Naslednik", Borisovskie prudy 7/2, Moscow, Russia, email: lecko@list.ru)

In 2002-2006 walking surveys of Rdeysky Reserve and adjacent territories is carried out. The purpose of these surveys was the account of beaver settlements and definition of a modern condition of beaver population. In total 105 settlements are surveyed.

Distribution of beaver settlements on the different water bodies: lakes - 7 (11%), small rivers with natural cannel - 38, small rivers with ameliorated cannel - 22, drainage canals - 31, swamps - 7. Thus, in 25-30 years after reintroductions of 1969-1979 the beavers have occupied all hydrological network of area, up to its most remote sites.

The majority of beaver settlements are located in habitats that have been subjected to various disturbances: woodcuttings, ameliorations, and fires. Beavers poorly populate not disturbed bog water-currents, river sites with a slope of more 6 m/km and sites of the elm (Ulmus laevis) riparian forests.

The longest dams, largest ponds and greatest areas of the dried forests are marked on border of the bog and mineral soils. Beavers build here the big dams in length up to 300 m, the big ponds were formed, and the river valleys are strongly boggy. In the middle sections of the rivers, the length of dams is 6-12 meters. Here beavers only raise the water level of the channel and do not create extensive impoundments, but the multi-channel systems are formed. In the small rivers there are 4-6 dams per kilometre of stream channel. The beaver building activity results in fast succession of the riparian forests therefore the standing stock and availability of forages is reduced and the beaver density is reduced. The beaver population is in a phase of number decline.

IMPACT OF THE CCANOPY GAPS CREATION -MADE BY BEAVER'S IMPACT ON THE FOREST UNDERGROWTH HERB STRUCTURE IN BORY TUCHOLSKIE, NORTH-POLAND

(Presentation)

Zwolicki, Adrian (Department of Vertebrate Ecology and Zoology, University o Gdansk Legionów 9, 80-441, Gdańsk, Poland, email: prosoche@poczta.onet.pl)

One of the consequences of the beaver foraging behaviour poorly described in the literature is creation of the forest canopy gaps.Their characteristics, structure and significance influence on the undergrowth herb community still remains unknown.

The aim of this study was:
- to describe and quantify the canopy structure in the forest exploited by beavers,
- to estimate the influence of the canopy gaps created by beavers eon the undergrowth herb community.

The research study was conducted in Wda river-basin in Bory Tucholskie Forest (northern Poland). Data were collected on in two beaver sites in 2003 – 2004.

To estimate the influence of the beavers' foraging activity on the forest canopy structure, hemispherical photography method was applied. Gap Light Analizer (GLA 2.0) was used to calculate the percentage of the canopy openness. In the two study areas 12 transects (10 m wide and 60 m long) were fixed. They were situated perpendiculary to the river bank and divided into 12 plots. The photography was taken 1 m above the ground on each plot. Within every each plot an estimation of the understory plant species composition was made using modified Braun-Blanquet cover abundance scale.

The study results show that:
- beavers' foraging behaviour increases openess of the forest canopy which size depends on the number and size of the eliminated large trees,
- negative correlation between the size of the canopy gaps and the distance from the river bank was found,
- total herbs' cover and species biodiversity is was significantly higher on plots composed with canopy gaps created by beavers.

Participants

Allgöwer Rainer
Büro für Ökosystemforschung
Hermann-Hesse-Str. 14/1
D-75417 Mühlacker
Germany
phone +49-7041-6445
fax +49-7041-6445
email R.Allgoewer.bfoe@t-online.de

Asbirk Sten
Danish National Forest and Nature Agency
Haraldsgade 53
DK-2100 Copenhagen
Denmark
phone +45 39 47 29 26
fax +45 39 27 98 99
email sta@sns.dk

Angst Christof
Biberfachstelle SchweizCSCF,
Centre Suisse de Cartographie de la Faune
Terreaux 14
CH-2000 Neuchâtel
Switzerland
phone +41-32 725 72 57
fax +41-32 717 79 69
email christof.angst@gmx.ch

Babik Wieslaw
UFZ-Centre for Environmental Reserch
Halle-Leipzig
Theodor-Lieser-Str. 4
D-06120 Halle/Saale
Germany
phone +49-345-558-5315
fax +49-345-558-5329
email wieslaw.babik@ufz.de

Baker Shaun
Department of environmental sciences
Faculty of science,
Palacky University
Třída Svobody 26
CZ-77200 Olomouc
Czech Republic
phone +420 604992499
email shaun.baker@hotmail.co.uk

Bau Lena
Holbergsvej 127
DK-4293 Dianalund
Denmark
phone 4053 4155
email lenabau@privat.dk

Beibl Regina
Biberberaterin Lkr. Freising
Kulturgrabenstr. 5
Phone +49-8761-4265
Email Regina.Beibl@gmx.de

Berthelsen Jørn Pagh
National Inviromental Institute, Kalø
Grenåvej 14
DK-8410 Rønde
Denmark
phone +45-89201700
email jpb-dmu.dk

Bierła Joanna
Dep. of Clinical Sciences
Faculty of Veterinary Medicine
Warsaw Agricultural University
ul. Nowoursynowska 160
PL-02-787 Warsaw
Poland
email bierla@alpha.sggw.waw.pl

Bobrov Aleksandr A.
I.D. Papanin Institute for Biology of Inland Waters
Russian Academy of Science
RUS-152742 Borok, Yaroslavl district
Russia
phone +7-48547-24486
fax +7 48547 24042
email lsd@ibiw.yaroslavl.ru

Buchanan Claire
University of East Anglia
UK-NR4 7TJ, Norwich
United Kingdom
phone +44-7763112454
email c.buchanan@uea.ac.uk

Buczma Anna
Departament of Vertebrate Ecology and Zoology
University of Gdańsk
Al. Legionow 9
PL-80-441 Gdańsk
Poland
phone +48-58 344-02-15
email cranium@poczta.onet.pl

Busher Peter
Division of Natural Science / Center for Ecology and Conservation Biology
Boston University
871 Commonwealth Ave
USA-02215 Boston
United States
phone +1-617-353-2886
fax +1-617-353-5868
email pbusher@bu.edu

Campbell Roo
Telemark University College & WildCRU
Hallvard Eikas Plass
N-3800 Bø i Telemark
Norway
Phone +47 35 95 26 95
fax +47 35 95 27 03
email roo.campbell@hit.no

Chalova Irina V.
I.D. Papanin Institute for Biology of Inland Waters
Russian Academy of Science
RUS-152742 Borok, Yaroslavl district
Russia
phone +7-48547-24042
email chalov@ibiw.yaroslavl.ru

Ciechanowski Mateusz
Department of Vertebrate Ecology and Zoology
University of Gdańsk
Al. Legionow 9
PL-80-441 Gdańsk
Poland
phone +48-520-16-90
fax +48-341-20-16
email matciech@kki.net.pl

Cirovic Dusko
Faculty of Biology
University of Belgrade
Studentski trg 16
SCG-11000 Belgrade
Serbia
phone +381-11637024
email dcirovic@bf.bio.bg.ac.yu

Czech Andrzej
Natural Systems
Uherce Mineralne 285
PL-38-600 Lesko
Poland
Phone +48-601912965
fax +48-601912965
email ac@naturalsystems.pl

Danilov Pjotr
Institute of biology
Karelian Research Centre RAS
Pushkinskaya, 11
RUS-185910, Petrozavodsk
Russia
phone +7-8142-769810
email danilov@krc.karelia.ru

Deufl Katrin
Biberbeauftragte RP Tübingen
Johann-Strauß-Weg 4
D-89134 Blaustein
Germany
phone +49-179-4585532
email katrindeufel@yahoo.de

Fyodorov Fyodor
Institute of biology
Karelian Research Centre RAS
Pushkinskaya, 11
RUS-185910, Petrozavodsk
Russia
phone +7-8142-769810
email ffyodor@krc.karelia.ru

Gattringer Robert
Naturwache Oberösterreich
Obergassolding 44
A-4342 Baumgartenberg
Austria
Phone +43-69917696619
Email rgatt.naturwache@aon.at

Glavaš Milan
Faculty of Forestry
Svetošimunska 25
HRO-10000 Zagreb
Croatia
phone +385-1-2352-467
fax +385-1-2352-510
email magovac@sumfak.hr

Goździewski Jan
Polish Hunting Association
1-Maja Street 25
PL-16-400 Suwałki
Poland
phone +48-87-566-57-24
email castor@knieja.home.pl

Grossenbacher Kurt
Naturhist. Museum der Bürgergemeinde Bern
Bernastrasse 15
CH-3005 Bern
Switzerland
phone +41-31-350-7282
fax +41-31-350-7499
email Kurt.Grossenbacher@nmbe.ch

Grubsić Marijan
Faculty of Forestry
Svetošimunska 25
HRO-10000 Zagreb
Croatia
phone +385-1-2352-467
fax +385-1-2352-510
email grubesic@sumfak.hr

Grygoruk Mateusz
Department of Hydrology
Warsaw University
Ul. Krakowskie Przedmiescie 30
PL-00-927 Warsaw
Poland
phone +48-606404121
email mgrygoruk@interia.pl

Hamšíková Lenka
Departement of Ecology
Czech University of Argriculture
Kamycka 129
CZ-165 21 Prague
Czech Republic
phone +420 224 382 868
email Lenka.Hamsikova@seznam.cz

Hartman Göran
Dep. of Conservation Biology
Swedish Univ. of Agricultural Sci.
Box 7002
S-750 07 Uppsala
Sweden
Phone +46-18-672266
Email Goran.Hartman@nvb.slu.se

Heidecke Dietrich
Martin-Luther-Universität Halle-Wittenberg
Institut für Zoologie
Domplatz 4
D-06108 Halle/Saale
Germany
phone +49-345-5526455
fax +49-345-5527152
email heidecke@zoologie.uni-halle.de

Hermann Sonja
Wasserschloß Moos
D-92245 Kümmerbruck
Germany
phone +49-9621-86523
fax +49-9621-83352
email info@wasserschloss-moos.de

Hiemer Dieter
Bund Naturschutz e.V.
Alte Reichsstr. 40
D-91522 Ansbach
Germany
phone +49-9802-7871
email biberdieter@web.de

Hiller Alexander
Frankfurter Str. 27
D-61184 Karben
Germany
phone +49-6939-44494
fax +49-94422622
email alexus13@aol.com

Hood Glynnis A.
Parks Canada and University of Alberta
8336 - 76 Avenue
Edmonton, Alberta, Canada, T6C 0J1
Canada
phone +1-780-490-7764
email gahood@telus.net

Horn Susanne
University Leipzig
Lipsisustr. 45
D-04317 Leipzig
Germany
phone +49-341-681-582
email susanne_horn@gmx.de

Ionescu Georgeta
ICAS
Closca, no. 13
RO-2200 Brasov
Romania
phone +40-268-419936
fax +40-268-415338
email titi@icaswildlife.ro

John František
Department of environmental sciences
Faculty of science
Palacky University
Třída Svobody 26
CZ-77200,Olomouc
Czech Republic
email frantisek.john@post.cz

Kaltenegger Dieter
Hahngasse 7/23
A-1090 Wien
Austria
phone +43-676-9316720
email d.kaltenegger@gmx.at

Kanshiev Vladimir
Institute of Biology
Karelian Research Centre RAS
Pushkinskaya, 11
RUS-185910 Petrozavodsk
Russia
Phone +7-8142-769810
email kansh@krc.karelia.ru

KattnerEva
Biberbeauftragte RP Tübingen
Frauenstr. 5
D-89134 Blaustein
Germany
phone +49-179-4585532
email evikattner@yahoo.com

Korablev Nikolay
Central-Forest State Nature Biosphere Reserve
Zapovedny settlement, Nelidovo district, Tver region
Russia
phone +7-8266-22-4-29
fax +7-8266-22-4-33
email cranlab@mail.ru

Kostkan Vlastimil
Department of environmental sciences
Faculty of science
Palacky University
Třída Svobody 26
CZ-77200 Olomouc
Czech Republic
phone +420 585 634 564
email kost@prfnw.upol.cz

Krauß Manfred
BUND-Flussbüro
Crellestraße 35
D-10827 Berlin
Germany
phone +49-30-78790046
fax +49-30-78790018
email krauss@bund-berlin.de

Krylov Aleksander V.
I.D. Papanin Institute for Biology of Inland Waters
Russian Academy of Science
RUS-152742 Borok, Yaroslavl district
Russia
phone +7-48547-24042
email krylov@ibiw.yaroslavl.ru

Kunovac Sasa
Wildlife Preservation and Hunting
Faculty of Forestry
University of Sarajevo
Zagrebacka 20
BIH-Sarajevo
Bosnia and Herzegowina
phone +387-33-614003
fax +387-33-611349
email sasakunovac@yahoo.com

Malon Jaroslav
Department of environmental sciences
Faculty of science
Palacky University
Třída Svobody 26
CZ-77200 Olomouc
Czech Republic
phone +420-605520743
email Slaimer@seznam.cz

Marcaletić Josip
Faculty of Forestry
Svetošimunska 25
HRO-10000 Zagreb
Croatia
phone +385-1-2352-467
fax +385-1-2352-510
email josip.margaletic@inet.hr

Mertin Barbara
Park Ranger & Beaver Manager
Kochgasse 22/11
A-1080 Wien
Austria
phone +43-1-4080189
fax +43-1-4080189
email barbara.mertin@chello.at

Nitsche Karl-Andreas
Castor Research Society
Akensche Str. 10
D-06844 Dessau
Germany
Phone +49-340-2206965

Papchenkov Vladimir G.
Institute for Biology of Inland Waters RAS
RUS-152742 Nekous, Yaroslavl
Russia
phone +7-485-47-24551
fax +7-485-47-2-4042
email papch@mail.ru

Parz-Gollner Rosemarie
University of Natural Resources and Applied Science
Departement of Integrative Biology
Institute of Wildlife Biology and Game Management
Gregor Mendel Str. 33
A-1180 Vienna
Austria
Phone +43-1-47654-4450
Email parz@boku.ac.at

Pasca Claudiu
ICAS
Closca, no. 13
RO-2200 Brasov
Romania
phone +40-268-419936
fax +40-268-415338
email office@icaswildlife.ro

Paulauskas Algimantas
Vytautas Magnus University
Vileikos 8
LT-44404 Kaunas
Lithuania
phone +37-37-327905
fax +37-37-327916
email a.paulauskas@gmf.vdu.lt

Popa Marius
ICAS
Closca, no. 13
RO-2200 Brasov
Romania
phone +40-268-419936
fax +40-268-415338
email marius@icaswildlife.ro

Pubal Josef
Mendel University of Agriculture and Forestry in Brno
Faculty of Forestry and Wood Technology
Zemědělská 3
CZ-61300 Brno
Czech Republic
phone +420-603227988
email pubalp@seznam.cz

Ramsay Paul
Bamff Castle, Alyth,
Blairgowrie, Perthshire ,
Scotland, PH11 6LF
United Kingdom
Phone +44-1828-632992
Fax +44-1828-632347
email paulramsay@bamff.demon.co.uk

Ramsay Louise
Bamff Castle, Alyth,
Blairgowrie, Perthshire ,
Scotland, PH11 6LF
United Kingdom
Phone +44-1828-632992
Fax +44-1828-632347
email louiseramsay@bamff.demon.co.uk

Rosell Frank
Telemark University College
Department of Enviornmental and Health Studies
Hallvard Eikas Plass
N-3800 Bø i Telemark
Norway
phone +47-35952762
fax +47-35952703
email Frank.Rosell@hit.no

Rubbers Olivier
Pays des Castors – Beaverland – Beverland – Biberland
Rue du Centre, 78
B-6250 Aiseau
Belgium
phone +32-71-761138
fax +32-71-761139
email contact@paysdescastors.be

Sarbu Gorge
ICAS
Closca, no. 13
RO-2200 Brasov
Romania
phone +40-268-419936
fax +40-268-415338
email geoi@icaswildlife.ro

Saveljev Alexander
Russian Research Institute of Game Management and Fur Farming of RAS (VNIIOZ)
Engels str.,79
RUS-610000, Kirov
Russia
email saveljev.vniioz@mail.ru

Schaffland Reinhard
Hauptstrasse 16
D-92655 Grafenwöhr / Hütten
Germany
phone +49-9641-3925
email reinhard.schaffland@t-online.de

Schmidbauer Markus
Bund Naturschutz in Bayern e.V.
Jahnstr. 16
D-93093 Donaustauf
Germany
phone +49-9403-969912
email Markus.Schmidbauer@t-online.de

Schumacher Annett
Biosphärenreservatsverwaltung Mittelelbe
Kapenmühle
PF 1382
D-06813 Dessau
Germany
phone +49-34904-421119
fax +49-34904-42121
email annett.schumacher@lvwa.lsa-net.de

Schwab Gerhard
Bund Naturschutz in Bayern e.V.
Deggendorfer Str. 27
D-94553 Mariposching
Germany
phone +49-9906-677
fax +49-9906-94106
email Gerhard.Schwab@t-online.de

Scurtu Marius
ICAS
Closca, no. 13
RO-2200 Brasov
Romania
phone +40-268-419936
fax +40-268-415338
email smarius@icaswildlife.ro

Sidorovich Vadiim S.
Institute of Zoology
National Academy of Sciences of Belarus
Akademicheskaja str., 27
BY-220072 Minsk
Belarus
phone +375-17-2841462
email vadimsid@mustbel.open.by

Sjöberg Göran
Dept of Animal Ecology
SLU
S-90183 Umeå
Sweden
phone +46-90-7876 8296
fax +46-79-786 8296
email goran.sjoberg@szooek.slu.se

Stubbe Michael
Martin-Luther-Universität Halle-Wittenberg
Institut für Zoologie
Domplatz 4
D-06108 Halle/Saale
Germany
phone +49-345-5526453
fax +49-345-5527152
email stubbe@zoologie.uni-halle.de

Stubbe Annegret
Martin-Luther-Universität Halle-Wittenberg
Institut für Zoologie
Domplatz 4
D-06108 Halle/Saale
Germany
Phone +49-345-5526479
Fax +49-345-5527152
email annegret.stubbe@zoologie.uni-halle.de

Stundner Claus
Amt der Niederösterreichischen Landesregierung
Landhausplatz 1
A-3109 St. Pölten
Austria
email claus.stundner@noel.gv.at

Svendsen Thomas Borup
Danish Forest and nature Agency
Klosterheden State Forest District
Gl. Landevej 35
DK-7620 Lemvig
Denmark
phone + 45 97 81 00 33
email tbs@sns.dk

Thomsen Liat
Fladholm 27
DK-6200 Aabenraa
Denmark
phone +4574627031
email liat_rt@hotmail.com

Tikhonenkov Denis Victorovich
Institute for Biology of Inland Waters
Russian Academy of Sciences
RUS-152742 Borok Yaroslavskaya oblast
Russia
Phone +7-085-4724042
Email tikhon@ibiw.yaroslavl.ru

Tokarskyy Victor
V. N. Karazin Kharkiv National University
Svobody Square, 4
UK-61077 Kharkov
Ukraina
email tokarsky@univer.kharkov.ua

Tomeček Jozef
State Nature Conservancy of Slovak Republic
Protected Landscape Area Záhorie
Vajanského 17
CZ-901 01 Malacky
Slovakia
phone +421-34-772-072
fax +421-34-7722-735
email tomecek@sopsr.sk

Trupčević Mladen
V. Nazora 32
HRO-10410 Velica Gorica
Croatia
phone +385-1-622-7212

Tselmovicha Olga
I.D. Papanin Institute for Biology of Inland Waters
Russian Academy of Science
RUS-152742 Borok, Yaroslavl district
Russia
phone +7-48547-24042
email otselm@ibiw.yaroslavl.ru

Ulevičius Alius
Faculty of Natural Sciences
Institute of Ecology of Vilnius University
Čiurlionio 21
LT-03101Vilnius
Lithuania
phone +370 699 89023
email alius.ulevicius@gf.vu.lt

Valachovič Dušan
State Nature Conservancy of Slovak Republic
Protected Landscape Area Záhorie
Vajanského 17
SK-901 01 Malacky
Slovakia
phone +421-34-772-072
fax +421-34-7722-735
email dvalach@sopsr.sk

Válková Lenka
Department of environmental sciences
Faculty of science
Palacky University
Třída Svobody 26
CZ-77200 Olomouc
Czech Republic
phone +420-724306029
email valkova1lenka@seznam.cz

Van Den Bogaert Jorn
Netwerk Bever – Vlaanderen
Bertheide 19
B-2200 Herentals
Belgium
phone +32-496-458085
email netwerkbever@hotmail.com

Visan Daniel
ICAS
Closca, no. 13
RO-2200 Brasov
Romania
phone +40-268-419936
fax +40-268-415338
email daniel@icaswildlife.ro

Vogl Wolfgang
Konrad Lorenz-Institute for Ethology
Austrian Academy of Science
Savoyenstrasse 1A
A-1160 Vienna
Austria
phone +43-1-5158-12733
fax +43-1-5158-12800
email w.vogl@klivv.oeaw.ac.at

von Lührte Angela
Stadt –Wald – Fluss
Büro für Landschaftsplanung und
ökologische Gutachten
Schloß-Str. 22
D-14059 Berlin
Germany
phone +49-30-3222291
email von.luehrte@t-online.de

Vorel Aleš
Department of Ecology
Czech University of Argriculture
Kamycka 129
CZ-165 21 Prague
Czech Republic
Phone +420 224 382 868
Email vorel@fle.czu.cz

Wäschle Christian
Weiherdammstr. 16
D-78176 Blumberg
Germany
phone +49-172-9445968
fax castorchristian@gmx.com

Willharms Anke
BUND Berlin
Braunschweiger Str. 65
D-18055 Berlin
Germany
phone +49-30-6846957
email willharms@bund-berlin.de

Zahner Volker
Fachbereich Wald und Forstwirtschaft
Fachhochschule Weihenstephan
Am Hochanger 5
D-85350 Freising
Germany
phone +49-8161-71-5910
fax +49-8161-71-4526
email volker.zahner@fh-
weihenstephan.de

Zavyalov Nikolay
State Nature Reserve Rdeysky
Chelpanova 27
RUS-175270 Cholm, Novgorod Province
Russia
phone +7-81654-51408
email zavyalov_n@mail.ru

Ziemer Susanne
(Universität Osnabrück
Fachbereich Biologie, Abteilung Ethologie)
Hauptstr. 48
D-49577 Ankum
Germany
phone +49-5462-742744
email supezi@web.de

Zwolicki Adrian
Department of Vertebrate Ecology and Zoology
University of Gdańsk
Al. Legionow 9
PL-80-441 Gdańsk
Poland
phone +48 058 3412016
fax +48 058 3412016
email prosoche@poczta.onet.pl