

BIENNIAL REPORT

INSTITUTE OF VERTEBRATE BIOLOGY
ACADEMY OF SCIENCES OF THE CZECH REPUBLIC

2003–2004



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Biennial Report 2003-2004

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PREFACE

The main mission of the Institute of Vertebrate Biology is to perform basic research in particular fields of biology. In the organization scheme of the Academy of Sciences of the Czech Republic, the Institute is included in the Section of Ecological Biology within the Department of Life Sciences and Chemistry. I am pleased to introduce this traditional report summarizing the main results of the Institute's activities in the last two years. This biennial report is addressed to colleagues from collaborating institutions as well as to broad public with the aim to describe the current state of the Institute and to present our important scientific achievements and their possible practical implications.



The financial funding of the Institute has originated primarily from the state budget. However, we look also for other sources of funding both within domestic and foreign agencies and institutions, and the proportion of this research money has been steadily increasing. The institutional budget assigned from the state contribution in the frame of the Institutional Research Plan achieved recently around 23 million of Czech crowns per year. Research grants and diverse contracting funding contributed to the budget with additional 10–13 millions of Czech crowns annually.

In 2003–2004, the Institute employed 28 research scientists and 16 technicians and administration fellows. On the basis of research grant funding, additional 20 researchers were contracted in this period. An important component of the Institute's research activities was more than 100 gradual and postgradual students. These students were coming from various universities and they elaborated their diploma and doctoral thesis in our laboratories under supervision of the researchers of the Institute. Most of these students have actually become an inherent part of our research teams.

The Institute has supported the research activities through building efforts and reconstructions of rooms and buildings. Building was concentrated mainly on detached departments in Studenec and Valtice. The dwelling bungalows in Studenec were completely reconstructed, and a new molecular laboratory was established within the Department of Ichthyology in Brno. New pieces of equipments were purchased, e.g. an automated sequencer for DNA analysis.

In the last two years, all the Czech research institutions supported from the state budget were subjected to evaluation of results of the Institutional Research Plan in the period 1999–2004. Within the Academy of Sciences, this evaluation acquired the shape of complex screening of activity and efficiency of individual institutions based on peer-review, scientometric analysis, and immediate experience of members of the expert commission. I am much delighted to be able to say that the Institute received high rating and ranked among the best institutes of the Academy of Science of the Czech Republic. This success enabled to improve significantly the position of the Institute within the Czech research area, and we expect that the high rating will also be reflected in the increase of the institutional budget in the next six years. I suppose that the successful evaluation of the Institute was influenced, besides the significant research findings and the extensive publication record, particularly by the promising age structure of the research staff (an average age of 42 years), and the fruitful cooperation with universities that was manifested in the high numbers of students attracted by our research programmes. We also provided extensive lecturing at universities, and we achieved important findings with a potential for implications in environmental policy and management. The staff of the Institute also offered varied popularization efforts addressed to general public.

We further succeeded to enrich notably both the extent and the intensity of international collaboration. An important impulse in this respect was the 4th European Congress of Mammalogy in 2003, as well as organizing of other international meetings held in the Institute. The Institute was the main organizer of the joint national conference of Czech and Slovak zoologists (“Zoological Days”) held annually in the recent years.

We succeeded for success in the competition for projects within the 6th Framework Programme of European Union, and four grants have recently been awarded to the fellows of the Institute. We further continued research proposed within various other bilateral and individual grant projects with international participation. Within the domestic funding competition, the researchers of the Institute obtained a grant enabling to establish a national research centre focused on biology and parasitology of fishes, and a postgradual research unit for PhD students.

The scientific results of the Institute achieved in the last two years are most appropriately summarized in the publication list. Altogether, 276 scientific publications authored by the fellows of the Institute appeared in 2003–2004. Most of the publications were papers published in international journals included in databases of the Web of Science (99 titles with the total impact factor of 87.3). Another important part of the publication output represented books and university textbooks. Some of the popular books obtained even international awards. The results achieved demonstrated also a significant contribution of findings to applied problems in the areas of nature conservation, fisheries, forestry, agriculture, game management, and epidemiological surveillance. We elaborated two studies aimed at evaluating the consequences of the catastrophic floods in the Czech Republic in 2002, with special respect to changes in natural fish communities and an assessment of epidemiological threats in the flooded areas.

I can highlight several particular examples of the successful studies performed. The staff of the Department of Medical Zoology took up research of biology and ecology of pathogens responsible for various emerging infectious diseases. The sequence analysis of the genome enabled to identify a new lineage of West Nile virus in central Europe, and this discovery is obviously of much epidemiological importance. The traditional research area of the Department of Population Biology is complex investigation of the hybrid zone of house mouse in western Bohemia and Bavaria. This research is relevant to various general problems of mechanisms in evolution and speciation, and the model studies in the house mouse brought new original data on pre-mating and post-mating barriers evolving in the process of origin of species. The studies of the ecological role of fishes as indicators of the quality of freshwater habitats are the traditional task of the Department of Ichthyology. This research has produced numerous useful applications, and the findings found their implication particularly in the European programme Natura 2000 in the Czech Republic. Other ichthyological studies, performed in the Department of Fish Ecology, provided remarkable results related to sociobiology of a model species – the bitterling. The conclusions of this research contributed significantly to understanding of the behavioural patterns and reproductive strategies applied in evolutionary events. A long-term research programme of the Department of Avian Ecology has concerned another interesting topic of sociobiology, the brood parasitism, and was exemplified in numerous case studies of common cuckoo and its hosts. Recently, the scientists of this department initiated other ambitious projects investigating the reproductive success in passerines or behavioural ecology of waterfowl. A broad international scale of our research can be demonstrated in a project running in the Department of Mammalian Ecology. This project is aimed to complex description of vertebrate diversity in the Niokolo National Park in

Senegal. Another project of this department investigated conservation biology of a population of chimpanzees in the Rubondo Island National Park in Tanzania.

The everyday work and problems should not prevent us from serious considering the future perspectives of the Institute. The sphere of research and development is still far to be stabilized in the Czech Republic, and the current turbulent developments in the domestic political scene suggest various possible scenarios of the final arrangement. In these days, the Parliament of the Czech Republic discusses a new act related to the establishment of public research institutions. The approving of this act will certainly initiate deep changes in the life of the institutes of the Academy of Sciences. Therefore, we should be prepared to respond appropriately such changes, and to propose an adequate scheme of re-structuring measures within the Institute as well as in respect to our external relationships.

I am quite sure that the Institute of Vertebrate Biology will be able to adapt successfully to diverse selection and competition pressures that can be predicted to occur in our environment in the future years. We should be able to follow the already introduced trend of scientific excellence and social usefulness.

Jan Zima



Dwelling bungalows at Studenec after reconstruction.

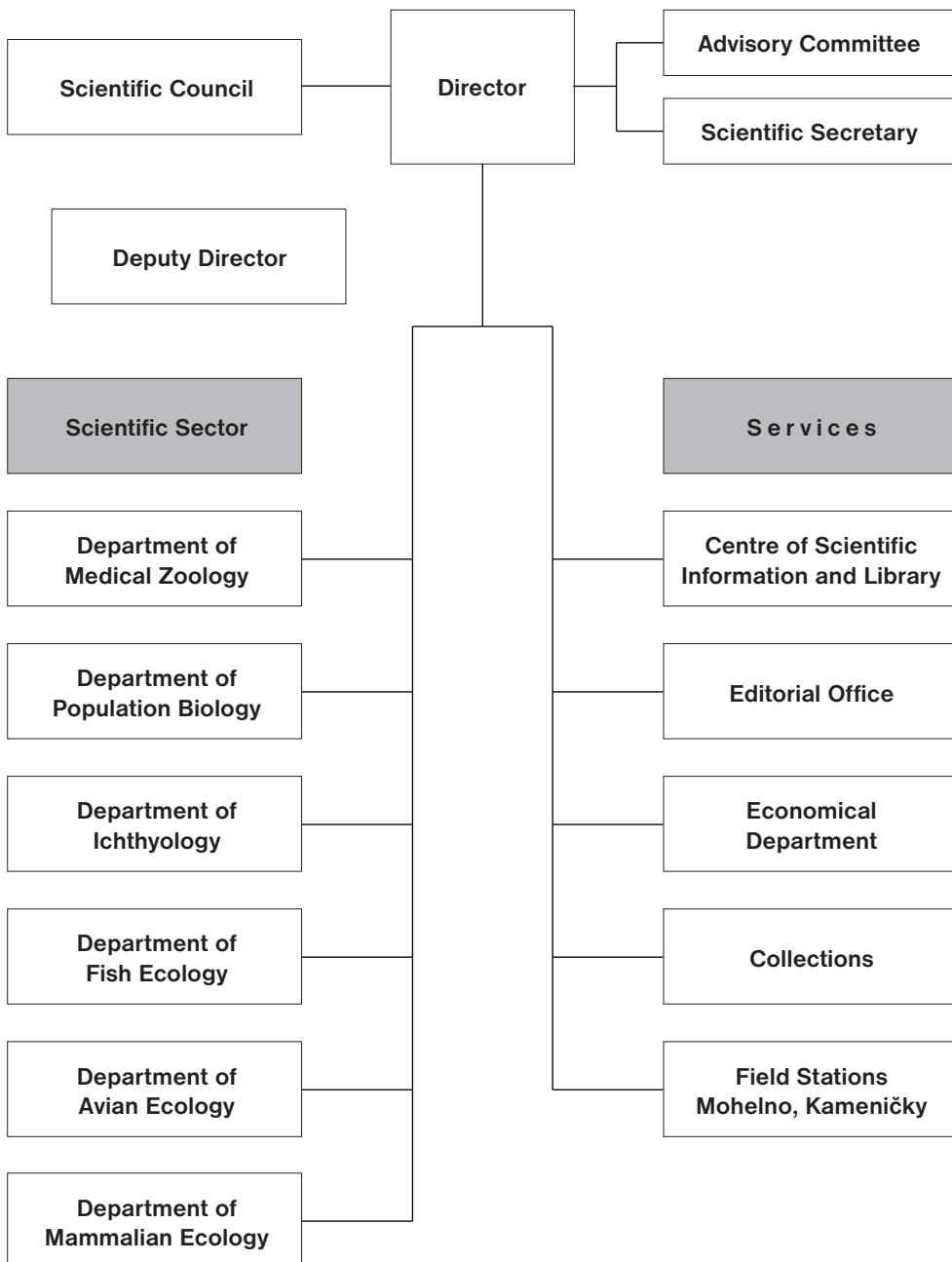


A new laboratory in Valtice.

CONTENTS

Preface	3
Contents	6
Organization structure of the Institute of Vertebrate Biology	7
Addresses	8
Management and Services	9
Scientific Council	10
Research projects	11
Institutional Research Plan	11
Program of Development of Basic Science Research in the Key Areas of Science	11
Projects supported by the Grant Agency of the Academy of Sciences	11
Projects supported by the Grant Agency of the Czech Republic	11
A project supported by the Ministry of Foreign Affairs	12
Projects supported by the Ministry of Agriculture	13
Projects supported by the Ministry of Environment	13
Projects supported by the Agency for Nature and Landcape Conservancy	13
International projects	13
List of publications	16
Books, textbooks, edited proceedings	16
Chapters in books	16
Papers in journals included in the databases of the Web of Science	16
Papers in other refereed journals	21
Papers in proceedings	22
Book reviews	25
Popularization books and articles	25
Scientific departments	27
Department of Medical Zoology	27
Department of Population Biology	32
Department of Ichthyology	38
Department of Fish Ecology	48
Department of Avian Ecology	53
Department of Mammalian Ecology	58
International activities	67
International scientific meetings organized by the Institute	67
Participation in international conferences	69
Membership in international organizations	69
Membership in editorial boards	70
Education and teaching activities	71
Teaching at universities	71
Undergraduate students working in the Institute and/or supervised by the Institute's fellows in 2003-2004	72
PhD students working in the Institute and/or supervised by the Institute's fellows in 2003-2004	73
Editorial activities	75
Publicity and popularization activities	76

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Ing. Petr R á b , DSc (*Institute of Animal Physiology and Genetics AS CR, Liběchov*)



Z. Hubálek (deputy director)



M. Čapek (scientific secretary)



M. Homolka (chair of the scientific council)

RESEARCH PROJECTS

Institutional Research Plan

- **A67/98:Z6-093-9-17** Diversity and life history of free-living vertebrates: implications in the strategy of conservation and sustainable management of natural resources, 1999–2004

Program of Development of Basic Science Research in the Key Areas of Science of the Academy of Sciences of the Czech Republic

- **KSK6005114** Biodiversity and functions of ecological systems, 2001–2004

Projects supported by the Grant Agency of the Academy of Sciences

- **IAA6045005** Characteristics and genetic differences of populations and species of genus *Gobio* and *Romanogobio* – contribution to description of their biodiversity – S. Lusk (coordinated by the Institute of Animal Physiology and Genetics AS CR), 2000–2003
- **IAA6093104** Ecological parameters of the stone loach (*Barbatula barbatula*) as determinants of its metazoan parasites communities – M. Prokeš, 2001–2003
- **IAA6093105** Standards of ichthyocoenoses and biotic integrity of streams in relation to the „health“ of river systems in the Czech Republic – S. Lusk, 2001–2004
- **IAA6093201** Behavioural genetic study of fitness components in a mammal hybrid zone – J. Piálek, 2002–2004
- **IAA6093203** Coevolution between common cuckoo *Cuculus canorus* and its hosts: adaptations of the cuckoo chick – M. Honza, 2002–2004
- **IAA6093403** Evolutionary determinants of brood parasitism in ducks – M. Honza (coordinated by Charles University), 2004–2008
- **IAA6093404** Species diversity and ecology of selected West African vertebrates – P. Koubek, 2004–2008
- **IAB6093106** Spatial and temporal distribution of 0+ juvenile fish in a floodplain river system – P. Jurajda, 2000–2003
- **IBS6093003** Management optimisation of big game in the Czech Republic – P. Koubek, 2000–2004
- **IBS6093007** Biological principles of the rehabilitation of natural character, function and biodiversity of riverine ecosystems of the rivers Dyje and Morava – S. Lusk, 2000–2003
- **IBS5045111** Molecular and other genetic markers applied in conservation of populations of endangered, rare and vanishing fish species in the Czech Republic – V. Lusková (coordinated by the Institute of Animal Physiology and Genetics AS CR), 2001–2005
- **KJB6005301** What happens when *Reynoutria* taxa reproduce by means other than vegetative? – J. Piálek (coordinated by the Institute of Botany AS CR), 2003–2005

Projects supported by the Grant Agency of the Czech Republic

- **GP206/00/D046** Thermal biology of newts *Triturus cristatus* superspecies (Amphibia: Salamandridae) – L. Gvoždík, 2000–2003

- **GA206/01/0562** Evolutionary and conservation genetics of two species of mammals endemic to the Tatra Mts.: the Tatra chamois and the Tatra pine vole - J. Zima, 2001-2003
- **GA206/01/0695** Why are species separated? Barriers to gene flow between species of the *Triturus cristatus* superspecies - J. Piálek, 2001-2003
- **GA206/01/1555** Habitat selection and short-time shifts of mouse-eared bat (*Myotis myotis*) in the Moravian Karst region - J. Zukal, 2001-2003
- **GA206/03/0726** Ecology of emerging arthropod-borne microorganisms - Z. Hubálek, 2003-2005
- **GA206/03/0757** Assessment of population size and population structure of Eurasian otter (*Lutra lutra*) in different habitats by a non-invasive genetic method - J. Zima, 2003-2005
- **GA206/03/Z022** Impact of extreme floods on fish communities in streams - S. Lusk, 2003
- **GA206/04/2003** Ecological interactions in populations of small rodents - M. Heroldová (coordinated by Palacký University), 2004-2006
- **GA310/03/Z033** Serological survey of Central-Bohemian population for antibodies against mosquito-borne viruses after the 2002 flood - Z. Hubálek, 2003
- **GA524/01/1314** A multidisciplinary study of larval stages (metacestodes) of tapeworms, parasites of freshwater fishes - V. Baruš (coordinated by the Institute of Parasitology AS CR), 2001-2003
- **GA524/01/1316** Population dynamics of the common vole and a new practical method to forecast its abundance - M. Heroldová (coordinated by Palacký University), 2001-2003
- **GA524/02/0924** Diversity of parasites of early stages of fish development under conditions of fragmented habitats - P. Jurajda (coordinated by Masaryk University), 2002-2004
- **GA524/03/0061** Comparative studies on dracunculoid nematodes, with special reference to agents of serious diseases of fish - V. Baruš (coordinated by the Institute of Parasitology AS CR), 2003-2005
- **GA524/04/1115** Fluctuating asymmetry in fish parasites: a new approach to assess environmental stress of aquatic ecosystem? - P. Jurajda (coordinated by Masaryk University), 2004-2006
- **GA524/04/1128** MHC class IIB genes of European cyprinid fish: their genetic variability and evolution in relation to the host life-history traits and parasitism - P. Jurajda (coordinated by Masaryk university), 2004-2006
- **GP206/01/D018** Mobility pattern among human populations of the late eneolithic: biomechanics and morphometrics comparison of diaphyseal cross-section properties - V. Sládek, 2001-2004
- **GP206/02/P068** Sex ratio in voles - can mothers manipulate sex of their offspring? - J. Bryja, 2002-2004
- **GP206/03/P134** Feeding strategy of large herbivore mammals between forest and field habitats - J. Kamler, 2003-2005

A project supported by the Ministry of Foreign Affairs

- **30/00-04/MZV/B** Protection et l'élevage de l'éland de Derby au Sénégal - P. Koubek (coordinated by the Institute of Tropical and Subtropical Agriculture, Czech Agricultural University), 2000-2004

Projects supported by the Ministry of Agriculture

- **QF3028** Development of new technologies of rearing commercially important riverine species of fish and crayfish endangered by environment degradation – M. Prokeš, (coordinated by University of South Bohemia), 2003–2007
- **QF3029** Harmonisation with the EU in application of the principles of pharmacovigilancy in aquaculture in the Czech Republic – M. Prokeš, (coordinated by University of South Bohemia), 2004–2006
- **QF4192** Methods for evaluating the game damage on the agricultural plants – J. Kamler (coordinated by Mendel Agriculture and Forestry University), 2004–2006

Projects supported by the Ministry of Environment

- Morava IV – Long-term monitoring of pollutants in the muscle tissue of the model fish species, chub (*Leuciscus cephalus*) in the net of water quality program in the Czech Republic – P. Jurajda (coordinated by the Water Research Institute TGM Brno), 2003–2005
- Long-term monitoring of young-of-the-year fish in profiles of the net of water quality program in the Czech Republic – P. Jurajda (coordinated by the Water Research Institute TGM Praha) 1999–2005

Projects supported by the Agency for Nature and Landscape Conservancy

- Methods used in monitoring fish species of importance according to EU legislation (Natura 2000) – S. Lusk, 2003–2005
- Research on fish populations in the hydrological network in the Beskydy Mts. Protected Landscape Area – S. Lusk, 2002–2004
- Ichthyofauna in streams of the Broumovsko Protected Landscape Area – K. Halačka, 2002–2004
- Analysis of distribution and density of large herbivores in relation to natural tree regeneration in the protected area of Králický Sněžník – J. Kamler, 2004
- Management plan of large carnivores (brown bear, wolf, lynx) in the Czech Republic – P. Koubek, 2003–2005

International projects

European Union – 5th Framework program

- QLRT-2000-01995 Risk assessment and prevention of alveolar echinococcosis – J. Červený (coordinated by the Faculty of Medicine of Charles University, Plzeň), 2002–2004

European Union – 6th Framework program

- Integrated project, contract no. 010284-2 Emerging diseases in a changing European environment – EDEN (coordinated by CIRAD Montpellier, France) – Z. Hubálek, 2004–2008

- Integrated project, contract no. 511237-1 Models for assessing and forecasting the impact of environmental key pollutants on marine and freshwater ecosystems and biodiversity - MODELKEY (coordinated by UFZ - Umweltforschungszentrum Leipzig - Halle GmbH, Germany) - P. Jurajda, 2005-2010
- Marie Curie Research Training Network, contract no. MRTN-CT-2004-512492 Sex to asex: a case study on transitions and coexistence between sexual and asexual reproduction - SEXASEX (coordinated by the Royal Belgian Institute of Natural Sciences, Belgium), J. Zima, 2004-2009
- INTAS programme, project no. 03-51-4030 A multidisciplinary study of hybrid zones in the common shrew (coordinated by the University of York, UK), J. Zima, 2004-2007
- INCO programme (International Cooperation Program of the European Commission) Coordination Action no. PL 510561 Integrated consortium on ticks and tick-borne diseases - ICTTD-3 - Z. Hubálek, 2004-2008

Bilateral Projects

- Royal Society, London
Population consequences of alternative mating tactics in the bitterling - P. Jurajda (cooperation with Queen Mary, University of London), 2001-2003
- Programme KONTAKT (project no. 18)
Evaluation of the impact of extensive animal husbandry and introduced large herbivores on the landscape and the native wild ungulates - M. Heroldová, M. Homolka, J. Kamler (cooperation with University of Milan), 2002-2004
- Programme KONTAKT (project no. 144)
Variability of social system in *Apodemus* mice (Rodentia) - J. Bryja (cooperation with Institute of Zoology, Academy of Sciences of the Slovak Republic), 2004-2005
- DAAD - AS CR, PPP program, project no. D2-CZ30/04-05 Mechanisms of speciation in rodents (collaboration with University of Essen-Duisburg, BRD) - J. Zima, 2004-2005

Individual Projects

- NATO-Royal Society Postdoctoral Fellowship
Alternative mating tactics in the European bitterling - M. Reichard (cooperation with Queen Mary, University of London), 2002-2003
- Leverhulme Trust (UK)
Adaptation and coevolution in an unusual symbiosis - M. Reichard (cooperation with University of Leicester), 2003-2005
- Institut Nationale de la Recherche Agronomique (INRA)
Evolution of the major histocompatibility complex (MHC) markers during population cycles of voles - J. Bryja (post-doc project supported by INRA, France), 2004
- EU - Large Scale Facility Project
Intraspecific diversity in selected cyprinid fish species in the conditions of Central Europe - J. Mendel (coordinated by the Institute of Aquaculture, University of Stirling, UK), 2005

Other projects

- Fisheries Society of the British Isles
Adaptation and co-evolution in an unusual symbiosis – M. Reichard (cooperation with Queen Mary, University of London), 2003
- National Research Council, USA (COBASE Programme)
Behavioral and genetic analysis of a prezygotic isolation mechanism in house mice – J. Piálek (cooperation with Butler University, Indianapolis, IN, USA), 2002–2004
- Istituto Zooprofilattico e Sperimentale, Teramo, Italia (Integrated Project)
Development of a new methods for the laboratory diagnostics of West Nile Virus disease in human and some other animals – Z. Hubálek, 2004–2005
- European Science Foundation
Integrating population genetics and conservation biology: Merging theoretical, experimental and applied approaches – J. Bryja, member of the steering committee, 2004–2009

LIST OF PUBLICATIONS

Books, textbooks, edited proceedings

- ANDĚRA M., ČERVENÝ J., 2004. Atlas rozšíření savců v České republice: předběžná verze. 4. Hlodavci (Rodentia) – část 3. Veverkovití (Sciuridae), bobrovití (Castoridae), nutriovití (Myocastoridae). Národní muzeum, Praha, 76 pp.
- BRYJA J., ZUKAL J. (eds.), 2003. Zoologické dny Brno 2003. ÚBO AV ČR, Brno, 244 pp.
- BRYJA J., ZUKAL J. (eds.), 2004. Zoologické dny Brno 2004. ÚBO AV ČR, Brno, 232 pp.
- ČERVENÝ J., HELL P., KAMLER J., KHOLOVÁ H., KOUBEK P., MARTÍNKOVÁ N., SLAMEČKA J., 2004. Encyklopédia poľovníctva. Ottovo nakladateľstvi – Cesty, Praha, 591 pp.
- ČERVENÝ J., KAMLER J., KHOLOVÁ H., KOUBEK P., MARTÍNKOVÁ N., 2003. Encyklopedie myslivosti. Ottovo nakladateľstvi – Cesty, Praha, 591 pp.
- HUDEK K., ČAPEK Jr. M., HANÁK F., KLIMEŠ J., PAVÍZA R., 2003. Soustava a české názvosloví ptáků světa. Muzeum Komenského v Přerově, Přerov, 462 pp.
- LUSK S., LUSKOVÁ V., HALAČKA K. (eds.), 2004. Biodiverzita ichtyofauny České republiky (5). ÚBO AV ČR, Brno, 168 pp.
- MACHOLÁN M., BRYJA J., ZIMA J. (eds.), 2003. European mammalogy 2003: 4th European congress of mammalogy Brno, Czech Republic, July 27 – August 1, 2003. ÚBO AV ČR, Brno, 268 pp.
- MÁLKOVÁ P., PROCHÁZKA P. (eds.), 2003. Proceedings of the European Conference Black Grouse – endangered species of Europe. Sylvia 39: 1-128.
- POKORNÝ J., LUCKÝ Z., LUSK S., POHUNEK M., JURÁK M., ŠTĚDRONSKÝ E., PRÁŠIL O., 2004. Velký encyklopedický rybářský slovník. Fraus, Plzeň, 668 pp.
- SLÁDEK V., GALETA P., BLÁŽEK V. (eds.), 2003. Evoluce člověka a antropologie recentních populací. Aleš Čeněk, Dobrá Voda u Pelhřimova, 117 pp.
- TRNKA A., ČAPEK Jr. M., KLOUBEC B., 2003. Vtáky Národnej prírodnej rezervácie Parížske močiare. Veda, Bratislava, 163 pp.
- ZIMA J., MACHOLÁN M., MUNCLINGER P., PIÁLEK J., 2004. Genetické metody v zoologii. Karolinum, Praha, 239 pp.

Chapters in books

- ANDĚRA M., ČERVENÝ J., 2003. Savci. In: Šumava: příroda – historie – život. Baset, Praha; 315–329.
- ČERVENÝ J., 2003. Perissodactyla. In: Kleiman D. G., Geist V., Hutchins M., McDade M. C. (eds.), Grzimek's animal life encyclopedia. Vol. 15 Mammals IV. Gale, Farmington Hills; 215–224.
- ČERVENÝ J., KOUBEK P., 2003. The brown bear in the Czech Republic. In: Kryštufek B., Flajšman B., Griffiths H. I., Living with bears: a large European carnivore in a shrinking world. Ecological forum of the liberal democracy of Slovenia, Ljubljana; 245–257.
- MARTÍNKOVÁ N., ZAHRADNÍKOVÁ A., 2003. The brown bear in Slovakia. In: Kryštufek B., Flajšman B., Griffiths H. I., Living with bears: a large European carnivore in a shrinking world. Ecological forum of the liberal democracy of Slovenia, Ljubljana; 259–271.
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Research priorities

Research is focused on the ecology of selected microbial pathogens (including new emerging diseases), the causative agents of human and animal infections. The phenomenon of natural focality is studied in respect of the role of wild endotherm vertebrates (hosts or reservoirs) and hematophagous arthropods (vectors) and under effects of the recently globally changing natural conditions.

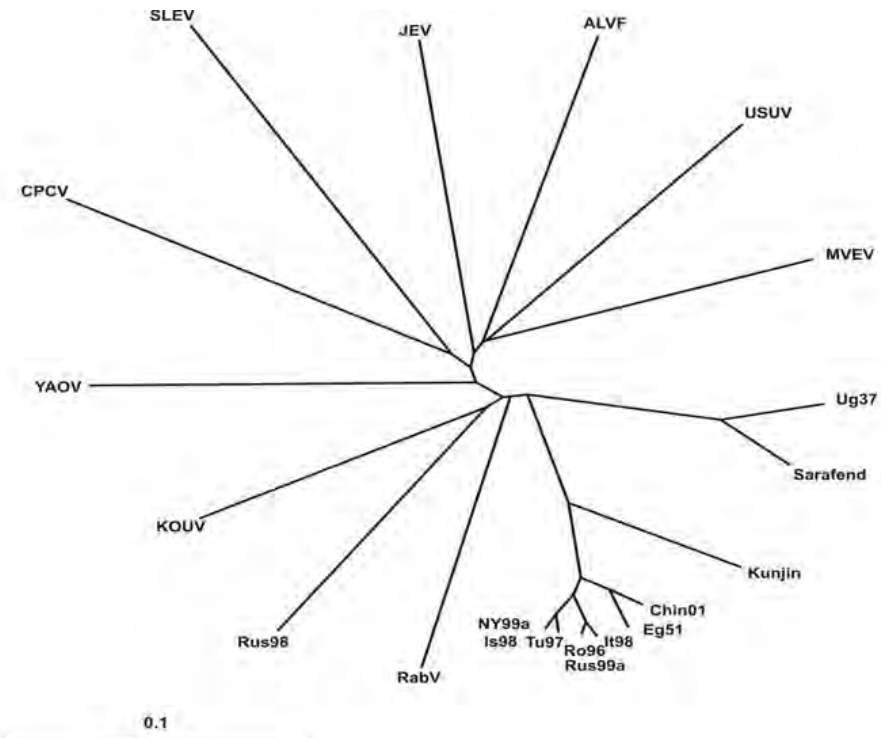
Main research topics:

- arboviruses (i.e. viruses transmitted by ticks, mosquitoes and other hematophagous arthropods, such as the West Nile, Sindbis, Táhyaňa, and tick-borne encephalitis viruses)
- spirochetes (*Borrelia burgdorferi*, the agent of Lyme borreliosis) and some other bacterial agents
- circulation of these pathogens in terrestrial and aquatic ecosystems under changing natural conditions including human impact
- application and optimization of a new molecular-biological methods for the detection and characterization of the pathogens studied
- free-living vertebrates and humans in relation to preventive medicine (human and veterinary), environmental protection, and nature conservation

Selected research results

Rabensburg virus: a new lineage of West Nile virus in central Europe

A flavivirus (strain 97-103) was isolated from *Culex pipiens* mosquitoes in 1997 following the flood in South Moravia, Czech Republic. The collection site was very close to the Czech-Austrian border, about 2 km away from the small Austrian town of Rabensburg. Consequently, the isolate 97-103 was tentatively called Rabensburg virus (RabV). The strain exhibited close antigenic relationship to West Nile virus (WNV) topotype Egyptian strain Eg-101 in cross-neutralization test. Experimental infection of laboratory mice showed a decreased peripheral pathogenicity of this isolate in comparison to the topotype strain. The complete nucleotide and putative amino acid sequences of isolate 97-103 were determined: it shares 75-77% nucleotide- and 89-90% amino acid identities with representative strains of WNV lineages 1 and 2. Another RabV strain (99-222) was isolated in the same location two years later; it revealed >99% nucleotide identity to strain 97-103 and similar characteristics of mouse pathogenicity. Phylogenetic analyses of these strains and other members of the Japanese encephalitis (JE) group demonstrated that RabV has to be considered either a new (third) lineage of WNV or even a novel flavivirus of the JE group. The complete genome sequence of RabV (flavivirus strain 97-103) has been deposited in the GenBank database under accession number AY765264.



Dendrogram of genomic relationships among representatives of the Japanese encephalitis virus group, including selected WNV strains, based on nucleotide sequences of the NS5 protein gene. Abbreviations of the viruses: JEV, Japanese encephalitis; ALFV, Alfuy; USUV, Usutu; MVEV, Murray Valley; Ug37 and Sarafend, lineage 2 WNV strains; Kunjin, Chin01, Eg51, It98, Ro96, Rus99a, Tu97, Is98 and NY 99a, lineage 1 WNV viruses; RabV, our 97-103 strain of WNV; Rus98, a WNV-like strain isolated from from ixodid ticks in Russia; KOUV, Koutango; YAOV, Yaounde; CPCV, Cacipacore, SLEV, St. Louis encephalitis.

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The first evidence of Babesia microti (Piroplasmida: Babesiidae) in ixodid ticks in the Czech Republic

Babesiosis is an emerging, tick-transmitted zoonotic disease caused by intraerythrocytic parasites of the genus *Babesia*. These piroplasmas are transmitted by ixodid ticks and are capable of infecting a wide variety of vertebrate hosts which are competent in maintaining the transmission cycle. Babesiae include also at least three species pathogenic for humans (*Babesia bovis*, *B. divergens* and *B. microti*). *B. microti* is documented in several European countries in some species of small vertebrates (murine rodents). The occurrence of *B. microti* in *Ixodes ricinus* ticks has not yet been investigated in the Czech Republic. The purpose of our study was to determine the prevalence of *B. microti* in *I. ricinus* ticks in a selected area of South Moravia (Czech Republic), where Lyme disease is endemic. A total of 350 host-seeking nymphs of *I. ricinus* were collected during 2003 by flagging the vegetation. All tick specimens were frozen at -60°C until further processing. Immediately before DNA isolation, nymphs were pooled. All ticks were surface sterilized with 70% ethanol and mechanically disrupted using a glass microblender. The total genomic DNA was extracted with QIAamp DNA Tissue Kit. Polymerase chain reaction was processed using primers specific for the *B. microti* gene encoding small subunit rRNA. The assay revealed five positive pools (out of 70 pools examined), corresponding prevalence rate was 1.5%. Sequence analysis of the PCR products confirmed their 100% homology with that of *B. microti*. The prevalence of *B. microti* in *I. ricinus* found in this study is close to the infection rates reported in other European countries like Germany, Switzerland and Hungary. The study represents the first evidence of *B. microti* in ixodid ticks in the Czech Republic.

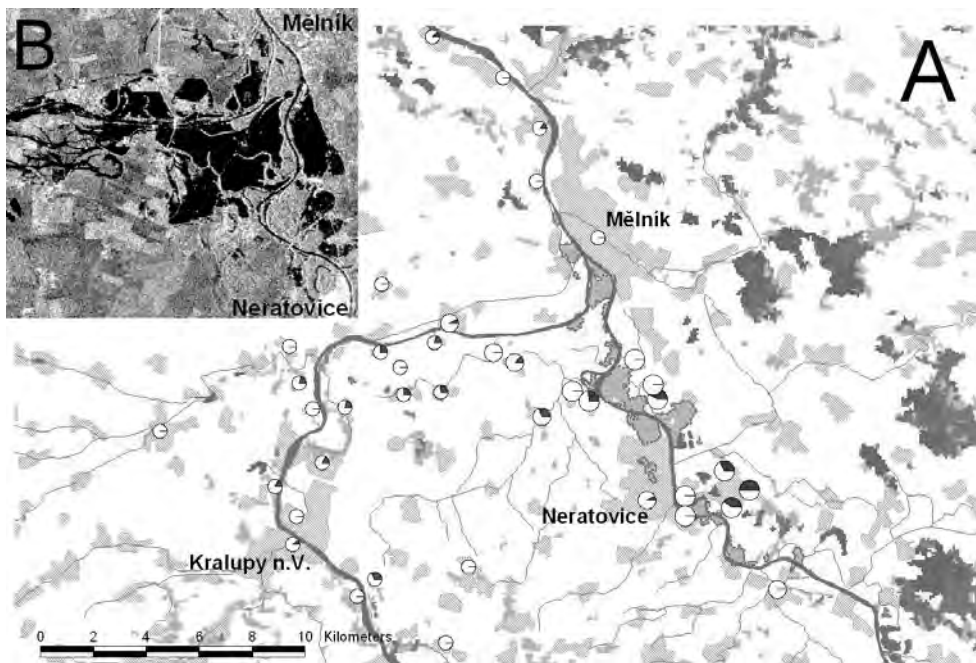
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Applications of research results

Antibodies to mosquito-borne viruses in Central Bohemian human population in the area affected by the flood in the year 2002

In the Central Bohemia area affected by the flood of 2002, we screened 497 residents for antibodies against the mosquito-borne viruses Třahyňa (TAHV), West Nile (WNV), Sindbis (SINV) and Batai (BATV) using the haemagglutination-inhibition (HIT) and plaque-reduction neutralization (PRNT) tests. Blood samples were collected in September 2002 when the

mosquito populations showed the maximum density following the flood. We detected antibodies against TAHV (16.5% persons), SINV (1.4%) and BATV (1.4%). The seroprevalence of TAHV showed no association with gender, increased with age and correlated with the mosquito peri-residential challenge (5.0% residents seropositive in a mosquito-free control zone (mostly from the area of Prague), 14.7% in a mild risk zone, 20.5% in a moderate-risk zone, and 28.0% in the most heavily mosquito-infested risk zone). The highest TAHV seropositivity rate (>25%) we found amongst the inhabitants of the villages Obříství, Kozly, Tuhaň, Chrást, Chlumín and Hostín. Paired blood samples we obtained from 150 persons at a 6-month interval: an infection episode with TAHV during or after the flood was clearly evidenced in one person living in Obříství, and less convincing findings of recent TAHV infections we found in three residents of Chlumín and Obříství (seroconversion and/or significant antibody titres increase detected in HIT only). This serosurvey indicated the existence of an active natural focus of TAHV infection stretched along the Labe river nearby Neratovice, and a low TAHV activity area along the lower reaches of the Vltava river. An increased population density of mosquitoes after the flood may have boosted the incidence of mosquito-borne virus diseases, particularly TAHV fever in Central Bohemia. An optimum prophylactic strategy to control these diseases would be epidemiological surveillance (including monitoring of both the density of mosquitoes and the rate of infection with viruses in natural foci) with following antiepidemic measures such as integrated mosquito control.



Potential foci of mosquito-borne virus diseases in the Mělník area – floodplain forests identified on Landsat MSS satellite images (red dotted line) – with hydrology and settlement in background, and the proportion of TAHV-seropositive residents at particular localities (large, medium and small circles indicate sites placed to the risk zone A, B and C, respectively). Insert B: a radar satellite image of the confluence of the rivers Labe and Vltava on August 17, 2002 shows the extent of floodwater (dark areas) two days after the flood culmination; inundated forests with subsequent massive occurrence of *Aedes* mosquitoes are visible as light areas surrounding the river Labe upstream of the conflux, and scattered lagoons seen in fields along both rivers far left and right turned to breeding sites of predominantly *Culex* mosquitoes.

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International cooperation

Emmonsiosis in subterranean mole rats

Subterranean rodents are burrowing mammals that find their food and spend most of their life underground. These remarkable rodents have sporadically (Spalacidae) or never (Bathyergidae) been examined for emmonsiosis (adiasporomycosis), a typical sapronosis occurring in rodents and less often in other animals, including man. The disease is caused by soil fungi of the genus *Emmonsia*, anamorphs of the genus *Ajellomyces* belonging to the family Ajellomycetaceae of the ascomycetaceous order Onygenales. The presence of adiaspores of the fungal genus *Emmonsia* was examined in the lungs of 85 mole rats representing three subterranean genera: blind mole rats (*Spalax galili* and *S. golani*) from Israel, Ansell's mole rats (*Cryptomys anseli*) from Zambia, and silvery mole rats (*Heliophobius argenteocinereus*) from Malawi and Zambia. Emmonsiosis (caused by *E. crescens* and *E. parva*) was found in 28% of the blind mole rats. All the Ansell's mole rats showed emmonsiosis (*E. parva*), whereas none of the silvery mole rats was infected. The study indicates that the perennial burrow system of the Ansell's mole rat forms an appropriate microhabitat for the saprophytic growth of *E. parva* and a potential source of emmonsiosis in the Lusaka region, Zambia. The striking difference between the two African mole rat genera (*Cryptomys*, *Heliophobius*) in prevalence of emmonsiosis can be explained by their diverse types and longevity of burrows (proximate cause) and differing social life strategies (ultimate cause).

This study was supported by a joint project of the DAAD - Academy of Sciences CR Programme.

- HUBÁLEK Z., BURDA H., SCHARFF A., HETH G., NEVO E., ŠUMBERA R., PEŠKO J., ZIMA J. (in press): Emmonsiosis in subterranean mole rats from the Spalacidae and Bathyergidae families. *Medical Mycology*.

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Research priorities

The studies are performed on both laboratory and natural populations. Empirical data supplemented by simulation modelling are used to discuss important questions of evolutionary biology, such as (model organisms given in parentheses):

- hybrid zones as barriers against gene flow and their role in speciation (*Mus*, *Sorex*, *Triturus*)
- study of factors affecting population dynamics (*Sorex*, *Microtus*, *Clethrionomys*)
- links between life history traits and population dynamics in small mammals (Arvicolinae)
- locomotion pattern differences in long bone biomechanics among past human populations (*Homo*)
- analysis of reproductive success by using DNA markers (paternity analyses), population dynamics and sex ratio problems in mammals, population genetics of endangered vertebrate species
- mechanisms and evolution of thermal physiology traits in ectotherms (*Triturus*)
- functional approaches in studying morphological adaptations (*Zootoca*, *Triturus*)

The results of these studies are used in preparing recommendations for nature conservation, rodent pest control, lecturing at universities in Prague, Brno, Olomouc and Plzeň.

Department has its own website, which can be accessed at <http://www.studenec.ivb.cz/>.

Selected research results

Sexual head size dimorphism in lizards: test of two alternative hypotheses

Zootoca vivipara is a small viviparous lizard with sexual dimorphism in head size. As ultimate causes of sexual differences in head size are considered either non-sexual selection (intersexual food competition) or sexual selection (competition over mates). We tested whether bigger head in males affects results of male-male contests and duration of mate searching, handling and copulation under laboratory conditions. Winners of male-male interactions had larger heads than losers. Males with larger heads successfully grasped a female faster than those with smaller heads. It follows that head size in males may affect reproductive success through direct and indirect intrasexual competition over mates. This suggests that sexual selection maintains the extent of sexual head size dimorphism in this species.

GVOŽDÍK L., VAN DAMME R., 2003: Evolutionary maintenance of sexual dimorphism in head size in the lizard *Zootoca vivipara*: a test of two hypotheses. *Journal of Zoology* 259: 7–13.

Postprandial thermophily in the Danube crested newt, Triturus dobrogicus

As a part of a wider study on thermal physiology of newts, preferred temperatures were compared between fed and fasted newts with respect to their locomotor activity in an aquatic thermal gradient (5–32.5°C). Locations and locomotor activity of 17 newts in postabsorptive phase were recorded over 24 h. Nine randomly chosen newts were fed (10% of their body mass) and behaviour of all newts was recorded over the next 24 h. Fasted newts preferred similar water temperatures during periods of both locomotor activity and inactivity. Newts preferred 2–3°C higher water temperatures after feeding irrespective of the behavioural state.

This provides (i) some evidence for coadaptation between thermoregulatory behaviour and thermal physiology in these species and (ii) important data for comparative analyses of this phenomenon from a little studied lineage of ectotherms.

GVOŽDÍK L., 2003: Postprandial thermophily in the Danube crested newt, *Triturus dobrogicus*. *Journal of Thermal Biology* 28: 545-550.



Horizontal thermal gradient (5 - 32.5°C) for measuring temperature preferences in aquatic animals.

B* chromosomes in wood mice, genus *Apodemus

The genus *Apodemus* is well known for the presence of B chromosomes which are supernumerary to the standard karyotype. Bs were reported in six species, *A. peninsulae*, *A. agrarius*, *A. sylvaticus*, *A. flavicollis*, *A. mystacinus*, *A. argenteus*, with high frequencies of Bs particularly in *A. peninsulae* and *A. flavicollis*. In the latter species, we found a significant relationship between the mean number of B chromosomes and body mass in males but not in females in a population from northern Bohemia. This is the first study indicating a heterotic effect of Bs on fitness, possibly in relation to survival during winter. However, this relationship could not be confirmed in a Polish population of the same species, in which also no measurable effect of Bs on overall genetic variability was revealed. Thus, it seems that the pattern of evolutionary dynamics of Bs can be distinctly different between geographical populations, and both the parasitic and the heterotic models can be applied to explain the maintenance of Bs in different populations.

ZIMA J., MACHOLÁN M., PIÁLEK J., 2003. Possible heterotic effects of B chromosomes on body mass in a population of *Apodemus flavicollis*. *Canadian Journal of Zoology* 81: 1312-1317.

WÓJCIK J.M., WÓJCIK A.M., MACHOLÁN M., PIÁLEK J., ZIMA J. 2004. The mammalian model for population studies of B chromosomes: the wood mice (*Apodemus*). *Cytogenetic and Genome Research* 106: 264-270.



C-banded karyotype of a specimen of *Apodemus flavicollis* with two B chromosomes.

Variability of mating systems in Apodemus mice

Promiscuity and monogamy are two extremes of fitness optimisation. Direct evidence for both extremes is documented in numerous studies where a measure of promiscuity / monogamy is often the number of fathers in individual litters using, for example, fragment analysis of highly polymorphic microsatellite loci. In this study, five known polymorphic microsatellite loci were used to assess biological parentage of 174 embryos of 24 pregnant females from a natural Czech population of pygmy field-mice *Apodemus microps* Kratochvíl et Rosický, 1952. The results revealed that the majority (67%) of litters were fathered by single males. However, there was a trend showing that the number of males successively (but not significantly) increased during the season, thus suggesting that monogamy in the pygmy field mouse is not obligatory but may depend on a population density and habitat type.

BRYJA J., STOPKA P., (in press): Facultative promiscuity in a presumably monogamous mouse *Apodemus microps*. *Acta Theriologica*.



H. Patzenhauerová, an undergraduate of Masaryk University studying inter- and intraspecific variation in mating systems of wood mice (genus *Apodemus*) in the molecular laboratory at Studenec.

Human Mobility in Central European Late Eneolithic and Early Bronze Age: Cross-sectional Geometry

Some scholars explain the absence of settlements in the Bohemian and Moravian Late Eneolithic (Corded Ware archaeological culture) as a consequence of pastoral subsistence with a high degree of mobility. However, recent archaeological studies argue that the archaeological record of the Late Eneolithic in Central Europe exhibits evidence for the sedentary subsistence with mixed agriculture similar to the subsequent Early Bronze Age. Since the archaeological data do not allow us to address unambiguously the mobility pattern in these periods, we used cross-sectional analysis of the femoral midshaft to test mobility directly on the human skeletal record. The results of the femoral midshaft geometry do not support a high degree of mobility in the Late Eneolithic in Central Europe. The conclusion is supported mainly by no significant differences in male groups between the Late Eneolithic and Early Bronze Age in mechanical robusticity and shape of the femoral midshaft. However, the Late Eneolithic females have significantly higher torsional and overall bending rigidity in the femoral midshaft because of a significantly higher medio-lateral second moment of area. This finding cannot be directly linked with the higher degree of long distance mobility for these females. A significant difference was also found in overall decrease of size parameters of the femoral midshaft cross-section for one of the Early Bronze Age sample, the Wieselburger females. Since the decrease of size and mechanical robusticity for Wieselburger females does not correspond with the parameters of the Early Bronze Age females, we can expect a mosaic pattern of changes during the Late Eneolithic and Early Bronze Age period instead of a simple unidirectional (diachronic) change of the mechanical environment.

SLÁDEK V., BERNER M., SAILER, R., (in press). Mobility in Central European Late Eneolithic and Early Bronze Age: Femoral Cross-sectional Geometry. *American Journal of Physical Anthropology*.

Applications of research results

Optimisation of a capillary electrophoresis single-strand conformation polymorphism (SSCP) analysis for MHC (major histocompatibility complex) genotyping

Analysis of a single strand conformation polymorphism (SSCP) using capillary electrophoresis (CE) is a novel method to study polymorphism of DNA sequences in large scale population studies. We optimised CE-SSCP analysis to study the major histocompatibility complex (MHC) Class II DQA gene polymorphism. Short-chain linear polyacrylamid (6%) as sieving matrix, TrisCl (pH 8.5) as buffer for sample dilution, and 27°C, 9 kV as electrophoresis parameters were suitable for sufficient resolution of all alleles using high throughput MegaBACE genetic analyser. By comparing results obtained by cloning-sequencing methodology and by CE-SSCP we found that almost 28% of clones contained a PCR artefact and strict criteria have to be applied when using cloning and sequencing to analyse the allelic diversity of MHC genes.

BRYJA J., GALAN M., CHARBONNEL N., COSSON J.F., 2005: Analysis of major histocompatibility class II gene in water voles using capillary electrophoresis-single strand conformation polymorphism. *Molecular Ecology Notes* 5: 173-176.

International cooperation

Behavioural and genetic analysis of a prezygotic isolation mechanism in house mice

Previous behavioural studies using inbred lines have suggested that the gene (*Abpa*) for the alpha subunit of salivary androgen-binding protein (ABP) plays a role in prezygotic isolation between house mouse (*Mus musculus*) subspecies. We tested this hypothesis in animals from wild allopatric (121 individuals from four samples) and parapatric (320 animals from 15 samples) populations sampled on the Czech–Bavarian transect across the hybrid zone between *M. m. domesticus* and *M. m. musculus*. The study did not reveal a consistent significant trend of homosubspecific preferences in individual allopatric and parapatric populations. Nonetheless, the whole pattern of preference was skewed toward homosubspecific preference mostly on the *M. m. musculus* side of the hybrid zone. The pattern of homosubspecific preferences was stronger for the time spent sniffing than it was for the first choice of the signal (the ratio of homosubspecific vs. heterosubspecific preferences for both sexes was 6 : 2 in allopatric and 21 : 9 in parapatric populations, while the same rates were 4 : 4 and 16 : 14 for the first choice). To the extent that Y-maze tests reflect preference under wild conditions, we suggest that this slight preference may not in itself be sufficient to impede gene flow between the two subspecies and thus act as a reproductive barrier. ABP most probably participates in a complex system of subspecies-specific recognition in the hybrid zone, but the picture is far too complex at this time to allow a conclusive evaluation of the importance of this role.

This study was supported by the National Research Council, USA, within the programme Collaboration in basic science and engineering (COBASE).

BÍMOVÁ B., KARN R.C., PIÁLEK J., 2005: The role of ABP in reproductive isolation between two subspecies of house mouse: *Mus musculus musculus* and *Mus musculus domesticus*. *Biological Journal of the Linnean Society* 84: 349–361.

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Research Priorities

The research of fishes is performed at various levels of spatial and biological organization (individual, population, and community), in relation to distribution, biology, ecology and diversity. The study reflects the heterogeneity of aquatic environment, both in term of habitats and microhabitats, and the biodiversity between and within species. Fishes are considered to be complex bioindicators of degradation as well as regeneration of aquatic habitats. Accordingly, a number of activities is aimed at restoring and revitalizing of aquatic ecosystems.

Main research topics:

- diversity of fish communities and population parameters of key species in various types of aquatic habitats
- genetic diversity of fish populations

- rehabilitation of aquatic habitats and ecosystems for restoration and conservation of fish biodiversity
- biology and conservation management of threatened species
- alien invasive species and their impact on native fish biodiversity

Selected research results

Distribution and genetic characteristics of gudgeon species in the Czech Republic and Slovakia

Although of no economic importance, gudgeons are an important component of fish communities in streams. The goal of our investigations was to review data on the distribution of *Gobio* spp. in the Czech Republic and Slovakia, to assess their intraspecific diversity and interspecific relationships. We used standard karyological methods, allozyme analysis by means of starch electrophoresis, the RAPD method, and direct sequencing of DNA markers (mtDNA D-loop, 726 bp, and nDNA S7 ribosomal protein gene, 521 bp).

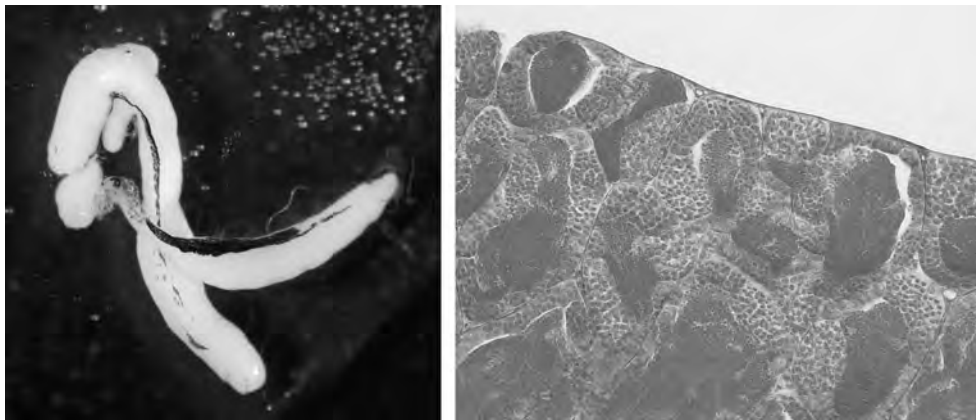
In the course of the past 50 years, the original ranges of *G. kesslerii* and *G. uranoscopus* and, to a smaller extent, *G. albipinnatus* decreased dramatically. Except for *G. gobio*, the remaining three species enjoy national and European protection. Their occurrence was thoroughly studied within the NATURA 2000 Programme and the so-called pSCI territories were proposed.

Karyological analyses confirmed $2n=50$ chromosomes in all the gudgeon species studied. Minor interspecific differences in the centromeric position in certain chromosomes corroborated the previously published data. Using specific enzyme staining, we evaluated allozyme paternity in 14 enzyme systems comprising 20 loci. The greatest polymorphism was found in *G. gobio*. The intraspecific diversity of *G. gobio*, determined on the basis of allozymes, was the highest in populations inhabiting the Black Sea hydrological system. We have ascertained diagnostic alleles that can reliably identify the four species under study and their hybrids. Factorial and cluster analyses of allozyme paternity enabled to identify the species status in all specimens examined, and the geographical origin from particular hydrological systems in specimens of *G. gobio*. In populations of *G. gobio*, the same results were obtained from dendrograms derived from D-loop sequences. The study of seven RAPD primers yielded eight characteristic fingerprints and 40 diagnostic markers that reliably identified the populations under study. Intrapopulation variability detected by the mtDNA marker was higher than the nucleic one; the highest variation was found in *G. gobio*. Phylogenetic dendrograms expressing the relationships within the genus *Gobio*, obtained from D-loop and S7 analyses, define three basic species groups, viz. (I) *G. gobio*, (II) *G. kesslerii*, and (III) *G. albipinnatus* + *G. uranoscopus*.

The values of interpopulation variability, detected by means of mean interspecific divergences of D-loop and S7 sequences, did not support the inclusion of *G. albipinnatus* and *G. kesslerii* in a separate genus *Romanogobio*.

- CALLEJAS C., LUSKOVÁ V., OCHANDO M.D., 2004: A contribution to the genetic characterisation of some species of the genus *Gobio*. *Folia Zoologica* 53: 433–436.
- KOŠČO J., LUSK S., HALAČKA K., LUSKOVÁ V., KOŠUTH P., (in press): Distribution of species of the genus *Gobio* in the Tisza River drainage area, Slovakia. *Folia Zoologica*.
- LUSK S., HALAČKA K., LUSKOVÁ V., HORÁK V., MENDEL J. (in press): Distribution of *Gobio* species in the Czech Republic. *Folia Zoologica*.

- MENDEL J., LUSKOVÁ V., HALAČKA K., LUSK S., VETEŠNÍK L., (in press): Genetic diversity of *Gobio gobio* populations in the Czech Republic and Slovakia, based on RAPD markers. *Folia Zoologica*.
- ŠANDA E., LUSKOVÁ V., VUKIČ J., (in press): Notes on the distribution and taxonomic status of *Gobio gobio* from the Morača River basin (Montenegro). *Folia Zoologica*.
- ŠLECHTOVÁ V., LUSKOVÁ V., ŠLECHTA V., LUSK S., HALAČKA K., (in press): Intraspecific allozyme diversity of *Gobio gobio* in Czech nad Slovak rivers. *Folia Zoologica*.



The gonad (total view and microscopic section) of a triploid male *C. auratus*.

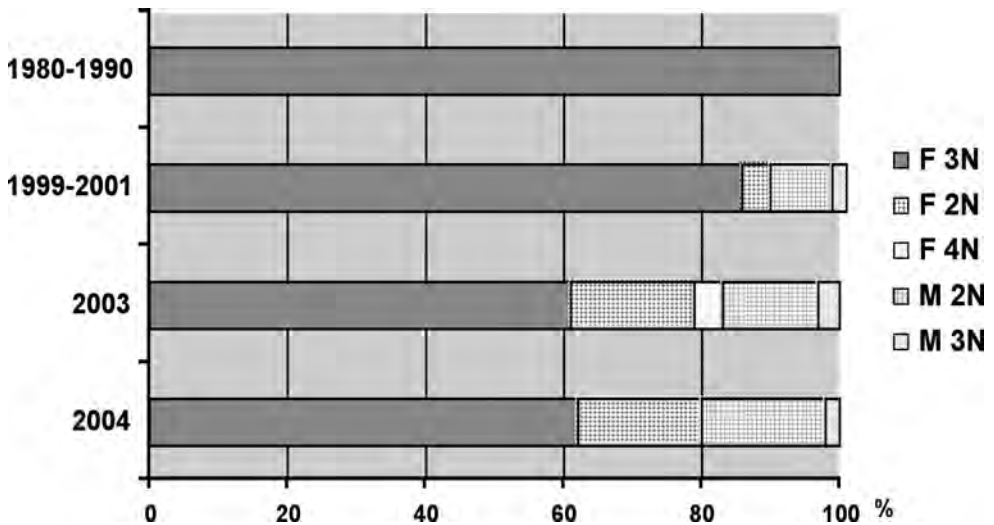
Transformation of the sexual and ploidy status of Carassius auratus populations in the Czech Republic

In recent years, radical changes have appeared in Czech populations of *Carassius auratus*. The initial populations which invasively occupied the waters of this country consisted of triploid females that reproduced gynogenetically. In the course of the past 10–15 years the original character of the populations changed into mixed bisexual populations consisting of individuals showing various ploidies. In the area of confluence of the Morava and Dyje rivers, invaded by *C. auratus* in the 1970s, the first males occurred in the late 1990s. Since that time the populations have been dynamically changing to the mixed type, characterised by a diploid-polyploid complex. The initially absolute prevalence of triploid females is gradually decreasing in favour of diploid individuals of both genders. Metapopulations inhabiting individual localities show considerable differences, however.

At the same time, the reproduction strategy is changing and besides gynogeny bisexual reproduction also appears. The complicated transformation process has been studied through artificial reproduction experiments since 2002. The results obtained suggest different reproduction strategies of certain groups of individuals within the given diploid-polyploid complex, and even within one ploidy group. Besides diploid females giving progeny with conspecific males, there also were females capable of producing interspecific hybrids or even reproduce gynogenetically. Deviation have been demonstrated in triploid females with presumably gynogenetic reproduction, giving only male triploid progeny: the progenies of some of the triploid females contained large percentage of triploid males; other females, having spawned with a diploid conspecific male, produced diploid progeny containing both sexes.

Division of individual *C. auratus*, based on ploidy alone, is too rough and does not reveal the actual conditions within a population. The use of new genetic-molecular methods will probably permit to differentiate individuals more precisely, e.g. on the haplotype level. This should explain the changes in the sexual and ploidy status within the diploid-polyploid complex in *C. auratus*. This part of the biology of *C. auratus* is immediately connected with its reproduction strategy, and it may be among the important causes of the successful expansion of its range.

- FLAJŠHANS M., LUSKOVÁ V., VETEŠNÍK L., HALAČKA K., RODINA M., LUSK S., GELA D., 2004: Diploid, triploid and tetraploid silver crucian carp *Carassius auratus* from the lower reach of Dyje River: the first results of reproductive characteristics and experimental hybridization. *Biodiverzita ichthyofauny ČR (V)*: 35-43.
- LUSKOVÁ V., HALAČKA K., VETEŠNÍK L., LUSK S., 2004: Changes of ploidy and sexuality status of "*Carassius auratus*" populations in the drainage area of River Dyje (Czech Republic). *Ecohydrology & Hydrobiology* 4: 165-171.



Development of sexual and ploidy composition of the *C. auratus* population in the area of confluence of the Morava and Dyje rivers. N - haploid chromosome number, F - females, M - males.

Alien fish species and native ichthyofauna

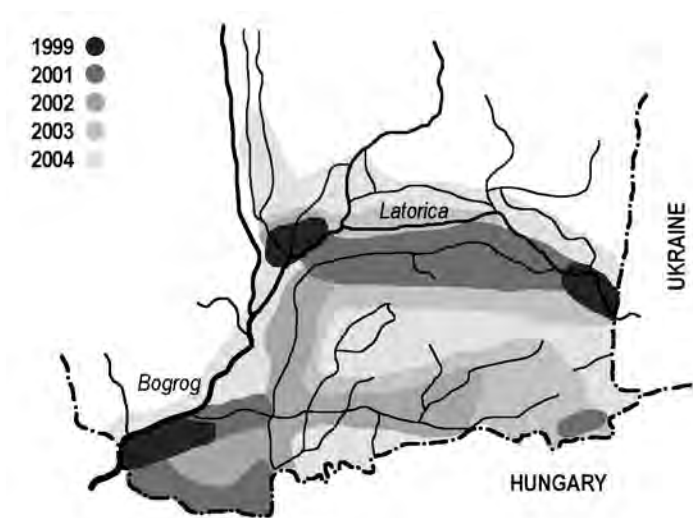
Non-native fish species are considered to present a significant risk for the native ichthyofauna. The period of headlong introductions of novel species in the 20th century is followed by a period of recognising the risks of such introductions for the native taxa. In the Czech Republic, around 35 cases of intentional introductions of non-indigenous species were recorded. Most of them, however, were unsuccessful due to various circumstances. Full naturalisation, i.e. the establishment of permanent populations maintained by natural reproduction, was only successful in *Carassius auratus*, *Ameiurus nebulosus*, and *Pseudorasbora parva*. *C. auratus*, a typical invasive species, occupied all suitable habitats and abundant populations occurred in the major rivers (the Morava, Dyje, Labe, and Odra). The occurrence of another seven non-native species depends on artificial reproduction and stocking in natural habitats. Most of these species are reared for fishery production. The recent occurrence of novel, non-indigenous fish species in Slovakia (*Perccottus glenii*, *Ameiurus melas*, etc.) through

natural migration indicates that the invasion of the Czech territory by such alien species can be expected later. This is confirmed by the occurrence of *Carassius auratus*, which invaded our parts of the drainage areas of the Morava and Dyje rivers through natural migration from the Danube via the Slovakian-Austrian section of the Morava River in 1975. This species distinctly devastated the indigenous *Carassius carassius* populations and negatively affected those of *Tinca tinca*. In most cases, man plays an intentional or unintentional role in the dispersion of such species, above all, helping them overcome barriers between drainage areas.

KOŠČO J., KOŠUTH P., LUSK S., KOŠUTHOVA L., 2004: Distribution of family Ictaluriade in the Slovakia and in the Czech Republic. Biodiverzita ichtyofauny ČR (V): 45–53.

KOŠČO J., LUSK S., HALAČKA K., LUSKOVÁ V., 2003: The expansion and occurrence of the Amur sleeper (*Percottus glenii*) in eastern Slovakia. Folia Zoologica 52: 329–336.

LUSK S., KOŠČO J., LUSKOVÁ V., HALAČKA K., KOŠUTH P., 2004: Alien fish species in the floodplains of the Dyje and the Bodrog rivers. Ecohydrology & Hydrobiology, 4: 199–205.



Invasive dispersal of *Percottus glenii* over the Latorica, Bodrog and Tisza river basins, eastern Slovakia.

Red list of lampreys and fishes of the Czech Republic

At present, the ichthyofauna of the Czech Republic includes 4 species of lampreys and 55 species of fishes. In recent years, the number of native species increased by three more species, viz., *Sander volgensis*, *Gymnocephalus baloni*, and *Proterorhinus marmoratus*, which penetrated the drainage areas of the Morava and Dyje rivers through natural migration from the Danube. These species are autochthonous in central Europe and therefore we consider them native even in the Czech Republic.

At present, according to the criteria of the IUCN, version 3.1, two lamprey species and six fish species are evaluated as „regionally extinct“. Most of these taxa are denoted as anadromous. One species has been classified in the category as „Extinct in the wild“. Two lampreys species and 25 fish species are considered to be endangered to various extent: one lamprey and 10 fish species are classified as „Critically endangered“; one lamprey and five fish species as „Endangered“; ten species as „Vulnerable“.

In the course of the past two centuries, attempts have been made at introducing about 35 fish species, of these, the introduction of 11 species can be evaluated as successful. Only four non-native species have established stable and naturally reproducing populations in natural conditions.

LUSK S., HANEL L., LUSKOVÁ V., 2004: Red List of the ichthyofauna of the Czech Republic: Development and present status. *Folia Zoologica* 53: 215–226.



Electrofishing at Svätá Mária in eastern Slovakia.

Associations between fish reproductive cycle and the dynamics of metazoan parasite infection

The seasonal cycle of the cestode *Proteocephalus sagittus* (Cestoda: Proteocephalidae) was studied for the first time in the stone loach *Barbatula barbatula*. The parasite occurred in loaches throughout the year but infection parameters differed significantly among seasons, with the highest values of prevalence and abundance from the late winter to the early summer. The rate of infection of loach with *P. sagittus* was neither dependent on the sex nor on the size of its fish host.

The prevalence of infection of *Raphidascaris acus* in *B. barbatula* ranged from 73.3 to 100% throughout the year. The abundance and the mean intensity of infection also varied with a peak in September. Larvae were located mainly in the liver parenchyma. High numbers of larvae and their migration through the tissue caused cyst- or abscess-like formations in the host parenchyma. The severity of the disease condition ranged from mild to severe.

The potential effect of the reproductive investment of the host, measured by gonad mass and gonado-somatic index (GSI), on the parasite infection was tested against the prediction that, during periods of high reproductive investment, the fish are more susceptible to parasite infection. The values of GSI showed a pattern of energy accumulation in the pre-reproductive period and at the beginning of breeding, a decrease during breeding and an increase in the post-breeding period. A similar pattern was observed for parasite abundance, a strong or weak increase in spring and/or autumn and a decrease during summer (July and August). Our results suggest that stone loach females are more susceptible to parasite infection in periods of higher reproductive investment. The parasite life cycle could be synchronized with the beginning of host reproduction, probably induced by increasing fish hormone levels in spring.

JARKOVSKÝ J., KOUBKOVÁ B., SCHOLZ T., PROKEŠ M., BARUŠ V., 2004: Seasonal dynamics of *Proteocephalus sagittus* in stone loach *Barbatula barbatula* from the Haná River, Czech Republic. *Journal of Helminthology* 78: 225–229.

- KOUBKOVÁ B., BARUŠ V., PROKEŠ M., DYKOVÁ I., 2004: *Raphidascaris acus* (Bloch, 1779) larval infection of the stone loach, *Barbatula barbatula* (L.), from the River Haná, Czech Republic. *Journal of Fish Diseases* 27: 65–71.
- ŠIMKOVÁ A., JARKOVSKÝ J., KOUBKOVÁ B., BARUŠ V., PROKEŠ M., 2005: Associations between fish reproductive cycle and the dynamics of metazoan parasite infection. *Parasitology Research* 95: 65–72.

Characteristics of population biology of the barbel, Barbus barbus, in Europe

An experiment with individually-tagged barbel, *Barbus barbus*, from the Jihlava river resulted in the assessment of survival and abundance. On the basis of known survival rate, the abundance was subsequently estimated. Using the Petersen capture-recapture method the mean value reached 303 110 individuals per hectare (minimum 195, maximum 498 ind.ha⁻¹). The Jolly-Seber method gave a mean 425 120 ind.ha⁻¹ and a range 233–563 ind.ha⁻¹. The abundance showed a significant tendency to increase during the four-year survey, which is in an accordance with the long-term changes observed in the dynamics of the fish community in this stream.

From the individually tagged and recaptured barbel from the same river stretch, 70,47% were considered as „resident“ because they were always recaptured in the same, relatively restricted (250–780 m) stream section, which always contained a pool and was demarcated naturally by riffles on both edges. The remaining 44 recaptured specimen (29.53%) belonged to the „mobile“ part of population, their movements encompassing two (or exceptionally more) adjacent stream sections and at maximum distance of 1680 m downstream or 2020 m upstream. The proportion of mobile barbel, relatively low in smaller and middle size classes, increased in the largest size classes (451–550 mm of SL). In the river stretch studied, with a rich patchy heterogenous habitat and well developed rifle-pool-raceway structure, each section (pool) can be considered as a more or less isolated spatial unit containing its own, and in a certain degree, isolated component of a metapopulation.

The similar results of mainly sedentary life of barbel, as recorded in submountain stretches of the Jihlava river, were also observed in the mesotrophic chalkstream in England.

- PEŇÁZ M., BARUŠ V., PROKEŠ M., HOMOLKA M., 2002: Movements of barbel, *Barbus barbus* (Pisces: Cyprinidae). *Folia Zoologica*. 51: 55–66.
- PEŇÁZ M., PIVNIČKA K., BARUŠ V., PROKEŠ M., 2003: Temporal changes in the abundance of barbel, *Barbus barbus* in the Jihlava River, Czech Republic. *Folia Zoologica* 52: 441–448.
- PEŇÁZ M., SVOBODOVÁ Z., BARUŠ V., PROKEŠ M., DRASTICHOVÁ J., (in press): Endocrine disruption in a barbel, *Barbus barbus* population from the River Jihlava, Czech Republic. *Journal of Applied Ichthyology*.
- WILIZZI L., COPP G.H., CARTER M., PEŇÁZ M., (in press): Movement and abundance of barbel, *Barbus barbus*, in a mesotrophic chalkstream. *Fisheries Management and Ecology*.

Applications of Research Results

Impact of extreme floods on fishes in rivers

The catastrophic floods that affected extensive regions of the Czech Republic in 1997, 1998, and 2002 revived the nearly forgotten natural phenomenon closely connected with streams. Floods do not appreciably affect native riverine fish species; they are rather beneficial for them. We observed the significantly decreased numbers only in benthic species confined to the river bottom (*Barbatula barbatula*, *Cottus gobio*) or of those living directly inside bottom sediments (*Lampetra planeri*, *Cobitis* spp.). Flood water discharges cause marked movements of bottom sediments and materials. Where the flood water could cover the adjacent floodplains,

we recorded only minimum damage to the river bed as well as minimum changes of the local fish stocks.

The floods caused subsequent losses and mortality of fish in places from which the fish were unable to return to streams with the retreating water. The greatest losses affected fish washed out of fishponds and reservoirs. Fishes washed out of the fishponds in southern Bohemia (above all, carp) largely accumulated in the lower lying valley reservoirs on the Vltava river, and this was subsequently reflected in the increase of their bags.



Flood on the Dyje River.

Flood water discharges also increased the diversity in most canalised streams. In a number of sections the streams returned to their original beds; numerous sections distinctly resumed their previous natural conditions. In such “revitalised” sections, the initial species composition of the fish stocks was restored within 2–3 years. The flood water discharges also caused a significant “recovery” of river bottoms by removing organic and silt sediments, rinsed the sand and gravel banks, and washed away noxious alien materials. New gravel and sand banks and dunes formed in the river beds gave rise to rapid sections showing specific streaming. This created conditions favouring successful reproduction of bottom-spawning fish species, as well as favourable conditions for species selecting habitats in such rapid stream sections (*Zingel streber*, *Gobio albipinnatus*, *Gobio kesslerii*, etc.).

In view of the native fish stocks in streams, floods cannot be considered as strictly negative phenomenon, as their positive consequences are distinctly predominant.

LUSK S., HARTVICH P., HALAČKA K., LUSKOVÁ V., HOLUB M., 2004: Impact of extreme floods on fishes in rivers and their floodplains. *Ecohydrology & Hydrobiology* 4: 173–181.

LUSK S., LOJKÁSEK B., HALAČKA K., LUSKOVÁ V., 2003: „Revitalisation“ caused by floods on the River Rožnovská Bečva. *Bulletin Lampetra* V: 106–111.

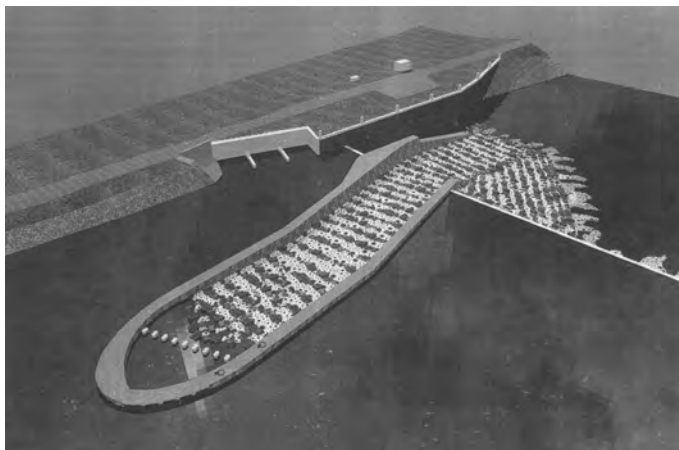
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Permeability of barriers on streams for migrating fish

In the Czech Republic, the river network, initially permeable for migrating fish, has been fragmented by various types of dams, weirs, and chutes to the extent that these constructions have become a serious obstacle preventing the renewal of the natural function of streams. Making migration barriers permeable for fish is an important political aspect in EU countries. It has become a part of the government resolution underlying the “Action plan for the construction of fish ladders” on the major streams in this country. At present, this

construction has become one of the major topics of revitalisation activities. The costs of the construction of fish ladders are ever increasing, now attaining around 30–60 million CZK annually. It is inevitable that these objects are functional, permitting free migration of fish along the longitudinal profile of the streams. Their projection must respect the biological requirements of fishes. Defining and including this aspect in the projection system of the fish ladders is one of the practical outputs of ichthyological research. It enjoys eminent interest of the Ministry of Environment of the Czech Republic (Agency for Nature and Landscape Protection) as well as the Ministry of Agriculture of the Czech Republic (the “River Authority” enterprises). In the case of small streams, we have taken part in elaborating a technical norm for the projection and construction of implements that will enable the fish to overcome such obstacles. Investigations carried out on concrete fish ladders make it possible to specify the drawbacks that limit their functionality. The results obtained are applied in implementation of projects within the “Fish Ladders Commission” at the Agency for Nature and Landscape Protection in Prague.

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A model of the fish ladder on the Dyje river in Břeclav.

Growth of Siberian sturgeon *Acipenser baerii*; morphometry and growth of sterlet *A. ruthenus*

In the five-year culture of the Siberian sturgeon and sterlet in Czech fish farms, the greatest increase in total length and mass growth rates was observed to occur in the first year (means 310–420 mm of total length and 120–257 g of mass by *A. baerii*; 295 mm and 147 g by *A. ruthenus*). A lower growth rate was found during subsequent years of life (reaching the means 800–1200 mm and 2500–3000 g in the fifth year of life by *A. baerii*; 505 mm and 530 g by *A. ruthenus*, respectively). On the basis of summarised growth, condition and production results, both sturgeon species can be considered to be appropriate for intensive aquaculture. However, the Siberian sturgeon is, due to its high resistance and higher growth rate, a more productive species. Sterlet, our native species, can be applied as material for stocking into running waters of the Czech Republic. A comparative analysis of sixteen morphometric characters between

the three different juvenile population of sterlet (Serbian wild population of the Danube River, and from two aquaculture stocks in the Czech Republic originating from Slovakian part of Danube River and from Russia) lead to conclusion that significant differences exist in seven morphometric characters. The two populations reared in aquaculture consistently showed lower morphological variability than the wild population.

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- PROKEŠ, M., BARUŠ, V., PEŇÁZ, M., BARÁNEK, V., OŠANEC, J., ŠUTOVSKÝ, I., 2003: Biomorphometry and growth rate of the sterlet (*Acipenser ruthenus*) in the Czech Republic. In: Švátora, M. (ed.), Sb. VI. česká ichtyologická konference. UK Praha, pp. 81-86.
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International Cooperation

Status of populations of the genus Cobitis in Slovakia

We investigated the species status of populations of *Cobitis* sp. in Slovakian waters. Until recently, the populations of this species were classified as *Cobitis taenia*. Genetic and karyological analyses of 15 populations have shown that *C. taenia* does not occur in the hydrological system of Slovakia. Five populations in the Danube drainage area were identified as hybrid diploid-polyploid complex *Cobitis elongatoides* x *C. tanaitica*. Five populations in the Slaná river drainage area were found belonging to the diploid species *Cobitis elongatoides*. Specimens of four populations of the Bodrog river drainage area were analyzed and assessed as hybrid diploid-polyploid complex *C. elongatoides* x *C. tanaitica*. Similarly, a hybrid complex of analogical karyological characteristics was recorded in the Tisza river drainage area.

These studies are based upon international bilateral cooperation with the Department of Ecology, University of Prešov, Slovakia.

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- ŠLECHTOVÁ V., LUSKOVÁ V., ŠLECHTA V., LUSK S., PIVOŇKOVÁ J., 2003: Potential species identification by allozyme protein markers in European spined loach. Folia Biologica (Kraków), 51 (Suppl.): 43-47.

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Research Priorities

The principal aim of the department is to investigate the biology and ecology of fishes. Research is conducted to evaluate and develop appropriate sampling and censusing techniques for fishes, perform behavioural studies and identify the ecological requirements of fishes in a variety of aquatic habitats. Research combines field studies, laboratory experiments and modelling to understand and predict the effects of environmental effects (river channelisation, habitat enhancement, artificial flooding, natural variation in river discharge) and biotic interactions (competition, predation, parasitism) on reproduction and recruitment in fishes. The results of many of our studies have wide implications for fisheries and wildlife management and conservation.

Thus, there are seven main programmes of research for the department:

- 0+ juvenile fish community structure in lowland rivers and their flood plains
- optimisation of methods for 0+ juvenile fish sampling
- impacts of metazoan parasites on 0+ juvenile fish development
- relationships between fish and their predators (otters)
- behavioural and evolutionary ecology of bitterling
- adaptation and coevolution of bitterling and their mussel hosts

Selected Research Results

The role of larval trematodes in the biology of fish host

In parasites with complex life cycles, especially trematodes and cestodes, fish often serve as the intermediate hosts. Completing of parasite life cycle also includes consuming of these infected fish by definitive host, which can be predatory fish, fish eating birds or mammals. Generally in the case of intermediate hosts, changes in host biology and behaviour associated with the parasite infection have been suggested as adaptive to facilitate transmission of parasite with complex life cycle to a definitive host.

As a model parasite organism, we investigated metacercariae of trematode *Posthodiplostomum cuticola* (family Diplostomatidae) and their effect on fish intermediate host. In our study area, *P. cuticola* is a common parasite of freshwater fish known as the agent of black-spot disease. This parasite has been considered as a pathogenic agent especially for early juvenile fish hosts. Although *P. cuticola* is known as a parasite infecting wide range of cyprinid fish, we found its tendency to infect primarily fish of the subfamily Leuciscinae. In selected leuciscine species we investigated the effect of parasite infection on the growth of juvenile fishes. Higher values of standard length and body weight of parasitized individuals than those of non-parasitized fish were obvious in fish before wintering, while in overwintered fish these differences disappeared. In addition, maximum enhanced growth of parasitized fish was found in months with low zooplankton densities, whilst the difference in growth between parasitized and non-parasitized fish was lower when zooplankton was abundant.

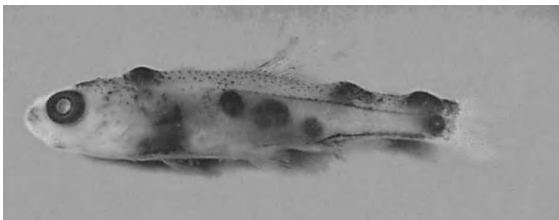
Then we studied the role of *P. cuticola* in regulation of fish population. During the years with low fish reproduction, high infection parameters of the *P. cuticola* infection could affect the survival of the 0+ fish indirectly by increased predation. Furthermore, in years with suitable conditions for fish reproduction (i.e. spring flood); the density of aquatic snails and wading birds (first and definitive hosts of *P. cuticola*) also increases. In spite of high infection parameters, the 0+ fish abundance at the end of the first growing season remained still high. Thus, in years with high fish reproduction, the infection of *P. cuticola* has a negligible direct or indirect effect on the fish population dynamics.

ONDRAČKOVÁ M., REICHARD M., JURAJDA P., GELNAR M., 2004: Seasonal dynamics of *Posthodiplostomum cuticola* (Digenea, Diplostomatidae) metacercariae and parasite-enhanced growth of juvenile host fish. *Parasitology Research* 93: 131-136.

ONDRAČKOVÁ M., ŠIMKOVÁ A., JURAJDA P., GELNAR M., 2004: *Posthodiplostomum cuticola* (Digenea: Diplostomatidae) in intermediate fish hosts: factors contributing to the parasite infection and prey selection by definitive bird host. *Parasitology* 129: 761-770.

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Juvenile roach *Rutilus rutilus* infected with metacercariae of *Posthodiplostomum cuticola*.

Efficiency of electrofishing techniques on river beaches

Point abundance sampling (PAS) by electrofishing has become a widespread method for 0+ juvenile fish sampling. Its efficiency, however, appears to be reduced on river beaches as fish are easily startled while using common PAS electrofishing on this type of the habitat. We compared efficiency of three PAS electrofishing techniques on river beaches: direct electrofishing (DE, the common technique of PAS electrofishing), thrown anode electrofishing (TE) and remote electrofishing (RE). During DE, the operator immerses an anode fastened on an extension pole. During TE, the anode is thrown at a distance from the bank. During RE, a prepositioned anode is activated after allowing sufficient time for fish to recolonize the area.

We found that both DE and TE disturbed fish and that fish tended to escape, thereby reducing efficiency of these techniques (they were only 30% as efficient as RE). As a consequence, RE caught more species per locality. All three techniques yielded significantly different estimates of the assemblage structures (in terms of relative abundances of most abundant species). These differences were probably caused by disturbing the fish during DE and TE. No significant difference was found in size structures of assemblages obtained by the three techniques. RE seems to be the most suitable PAS electrofishing technique for sampling 0+ fish assemblages on sandy river beaches and if its time consumption could be reduced, it would be also the most suitable for monitoring surveys.



PAS electrofishing techniques: direct, thrown anode and remote electrofishing.

JANÁČ M., JURAJDA P., (in press): Inter-calibration of three electric fishing techniques to estimate 0+ juvenile fish densities on sandy river beaches. *Fisheries Management and Ecology*.

JANÁČ M., JURAJDA P., 2004: Comparison of efficiency of different electrofishing techniques for juvenile fish estimates on river beaches. In: XI European Congress of Ichthyology. Abstract volume, p 52.

Applications of Research Results

Monitoring of 0+ juvenile fish in the Czech Republic

Since 1999, a monitoring program of young-of-the-year fish in selected profiles of the river network of water quality program in the Czech Republic is provided under the coordination by Water Research Institute TGM Praha. Central database is operated by the Czech Hydrometeorological Institute. Monitoring of the fish populations including the young-of-the-years age category were provided in the Elbe River basin, in a case of implementation of the Water Framework Directive by Ministry of Environment of the Czech Republic.

P. JURAJDA, M. JANÁČ, Z. VALOVÁ AND M. ONDRAČKOVÁ



Common electrofishing technique.

*Non-invasive genetic sampling in Eurasian otter (*Lutra lutra*)*

Within the study of the relationship between otter numbers and fish productivity, a new non-invasive genetic method was used to estimate numbers and population structure of otters in two different habitats. The method is based on DNA typing of otter faeces using microsatellite and SRY markers, and can provide identification of individuals, their sex and relatedness, estimates of population size and the level of genetic polymorphism, all without direct contact with the animals. The project is conducted in cooperation with the Czech Otter Foundation Fund, Czech Republic and the Administration of the Slovenský Raj National Park, State Nature Conservancy of the Slovak Republic. The results are being used by the Agency for Nature Conservation and Landscape Protection of the Czech Republic and State Nature Conservancy of the Slovak Republic. The method is proposed as one of research and monitoring methods for otter populations within a prepared Otter Action Plan for the Czech Republic.

HÁJKOVÁ P., BRYJA J., ZEMANOVÁ B. & ZIMA J., (in press): Testing the methodology of microsatellite DNA typing of spraints for studying otters in the Czech and Slovak Republics. Proceedings of European Otter Conference, Isle of Skye, Scotland, UK, 30. 6.-5. 7. 2003.

HÁJKOVÁ P., BRYJA J., ZEMANOVÁ B., HÁJEK B., ROCHE K., ROCHE M. & ZIMA J., 2003: The use of non-invasive microsatellite DNA typing for studying Central European otter populations. In: Macholán M., Bryja J. & Zima J. (Eds.): European Mammalogy 2003. 4th European Congress of Mammalogy, Brno, Czech Republic, July 27–August 1, 2003. Program & Abstracts & List of Participants, p. 108.

International Cooperation

Sexual selection and mating tactics in the European bitterling

Bitterlings (Acheilognathinae) are freshwater cyprinid fishes that evolved an unusual spawning symbiosis with living freshwater mussels. During the spawning season, male bitterling establish small territories around mussels and court females. Females inspect the mussel and, if they decide to spawn, they insert their long ovipositor deep inside the mussel gill cavity through the mussel's exhalant siphon and lay a small batch of eggs. Males fertilize eggs by releasing the

sperm over the inhalant siphon of the mussel, so that water filtered by the mussel carries the sperm to the eggs and they are fertilized inside the mussel's gill.

Sperm competition in the European bitterling is very high and many males engage in sneaking fertilization, when one male releases sperm into a mussel guarded by another male. Some males do not establish their own territory and instead mate by sneaking fertilizations. However, territorial males often also engage in sneaking in adjacent territories and the chosen tactic is largely opportunistic, with no distinction between territorials and sneakers. We studied individual and population consequences of those male mating tactics and found that male-male interference competition over the access to mussel and sperm competition may considerably decrease female spawning rate. The effects increased with male density, but – at the highest male density we investigated – territoriality broke down, fish switched from pair to group spawnings, and this stabilized spawning rate.

We then investigated the effects of male density on relative success of male mating behaviours and found that the reproductive success of territorial males (measured as proportion of offspring they fathered) decreased with male density, being equal to the success of intruding sneaker males at the highest density. Notably, this corresponded with a switch from pair to group spawning. Both territorial and sneaking males often release their sperm before a female lays her eggs and the capacity to outcompete other males before a female spawns was the best predictor of male reproductive success.

In other studies, we also compared sperm quality of territorial and sneaker males; and attempted to untangle the relative roles of male-male interference competition and female choice in the reproductive success of male European bitterling, using paternity assignment by microsatellite markers.

REICHARD M., BRYJA J., ONDRAČKOVÁ M., DÁVIDOVÁ M., KANIEWSKA P., SMITH, C., 2005: Sexual selection for male dominance reduces opportunities for female mate choice in the European bitterling (*Rhodeus sericeus*). *Molecular Ecology* 14: 1533–1542.

REICHARD M., SMITH C., JORDAN W.C., 2004: Genetic evidence reveals density-dependent mediated success of alternative mating behaviours in the European bitterling (*Rhodeus sericeus*). *Molecular Ecology* 13: 1569–1578.

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SMITH C., REICHARD M., JURAJDA P., 2003: Assessment of sperm competition by the bitterling (*Rhodeus sericeus*). *Behavioral Ecology and Sociobiology* 53: 206–213.



A pair of European bitterling *Rhodeus sericeus* at spawning.

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Research priorities

Our research focuses on understanding the ecological and evolutionary basis of reproductive strategies. Important goals of our research are to identify the ecological factors that promote parasitic reproductive behavior, predator avoidance and nest predation. We conducted studies adopting the adaptationist and optimality approach of behavioural ecology to examine fitness costs and benefits of various characters in bird populations. We are also studying differentiation of selected European passerines using ringing recoveries and stable isotopes for identifying the migratory divide within species and analysis of mtDNA sequences for a phylogeographic population structure. Further we aim at understanding the evolution and signalling function of secondary male ornaments in birds.

Selected research results

Edge effect on nest predation and viability of avian populations in mosaic landscapes

Habitat fragmentation may have a negative impact on bird populations by increasing nest predation along disruptive habitat edges. We evaluated the generality of the "edge effect on nest predation" hypothesis using artificial and natural nests of model species (*Carpodacus erythrinus*, *Tetrao tetrix*) in various habitat discontinuities in the Šumava Mts. National Park and in the Krušné Hory Mts. plateau. Predation rate on dummy nests (resembling black grouse nests) was low (17.7%) in the Krušné Hory Mts., and was similar among the three habitat types (young forest, mature forest, open habitats) and for edge and interior areas. This suggests that edge effect do not contribute to elevated predation on grouse nests. The resulting spatial pattern of artificial nest predation was further compared with the grouse occurrence. Predation pressure was lower in areas occupied by the grouse than elsewhere and our results thus do not support the ecological trap hypothesis for black grouse. Predation was the major cause of nest failure for scarlet rosefinches inhabiting wetland patches in the Vltava river valley, Šumava Mts. (92.3% of total nest losses). The most parsimonious model to explain variation in daily nest-survival rates (DSR) included nest concealment and distance to agricultural edge (nest survivorship: 41% for edge nests; 80% for interior nests, respectively). DSR were also consistently higher in large than in small wetland patches. Using habitat-specific demographic parameters, we found that mean per-capita annual productivity was 66.3% higher in core areas than in edge areas (≥ 100 m and < 100 m from an edge; 4.14 and 2.49 fledglings, respectively). Our results indicate that extensive and undisturbed interiors of wetland patches may provide surplus young to support the local rosefinch population ($\lambda > 1.0$), and perhaps act as a source area for other bird populations nesting here.

ALBRECHT T., 2004: Edge effect in wetland-arable land boundary determines nesting success of scarlet rosefinches, *Carpodacus erythrinus*, in the Czech Republic. *Auk* 121: 361–371.

SVOBODOVÁ J., ALBRECHT T., ŠÁLEK M., 2004: The relationship between predation risk and occurrence of black grouse (*Tetrao tetrix*) in a highly fragmented landscape: An experiment based on artificial nests. *Ecoscience* 11: 421–427.

ŠÁLEK M., SVOBODOVÁ J., BEJČEK V., ALBRECHT T., 2004: Predation on artificial nests in relation to the numbers of small mammals in the Krušné Hory Mts., the Czech Republic. *Folia Zoologica* 53: 312–318.

Escape decisions in incubating female mallards

In cryptically coloured birds, remaining on the nest despite predator approach (risk-taking), the likelihood that the nest will be detected and current reproductive attempt lost may decrease. By contrast, flushing may immediately reveal the nest location to the predator. Escape decisions of incubating parents should therefore be optimized based on the risk-to-parent / cost-of-escape equilibrium. Animal prey may assess predation risk depending on a variety of cues, including the camouflage that vegetation provides against the predator. We examined interactive effects of nest crypsis and the current reproductive value of a clutch on flushing distances in incubating mallards (*Anas platyrhynchos*) approached by a human. Our results were consistent with predictions of parental investment theory: flushing distances were inversely correlated with measures of the reproductive value of the current clutch, namely with clutch size, stage of incubation and mean egg volume. Independently of a reproductive value of a clutch, nest concealment explained a significant portion of the variation in flushing

distance among females; individual females tended to increase/decrease flushing distances according to change in nest cover. The results further suggest that vegetation concealment greatly influenced the risk of nest detection by local predators, suggesting that vegetation may act as a protective cover for incubating female. A female's ability to delay flushes according to the actual vegetation cover might thus be viewed as an antipredator strategy that reduces premature nest advertising to visually oriented predators. We argue, however, that shorter flying distances from densely covered sites might be maladaptive in areas where a predator's ability to detect incubating female does not rely on visual cues of nests.

ALBRECHT T., KLVANA P., 2004: Nest crypsis, reproductive value of a clutch, and escape decisions in incubating female mallards *Anas platyrhynchos*. *Ethology* 110: 603-613.



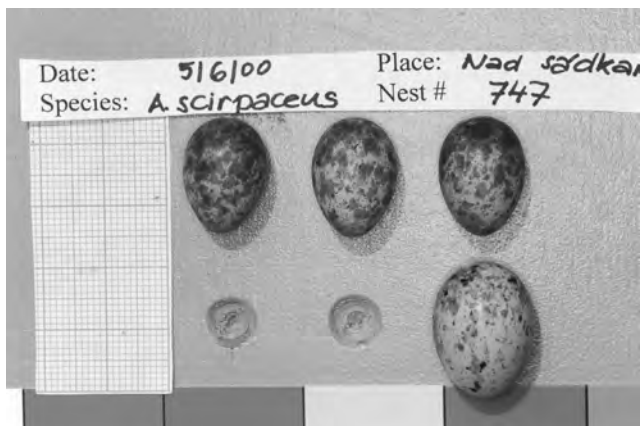
Monitoring of the eviction of the cuckoo chicks - installation of a video camera.

Coevolution between hosts and their brood parasites

Successive adaptations and counteradaptations by avian brood parasites and their hosts provide some of the best examples of direct coevolution observed in nature. Among cuckoos successfully parasitized hosts often raise only the cuckoo young and have zero reproductive success. This creates conditions for coevolutionary arms race between hosts and parasites. Since there is strong selection for host discrimination of parasitic egg, we studied egg recognition ability of three passerines. Low variation within clutches facilitates discrimination of parasitic eggs, whereas high variation among clutches makes it harder for the cuckoo to mimic the eggs of a certain host species. Furthermore, the high and consistent rejection frequency of parasitic egg found for this species supports the spatial habitat structure hypothesis, which claims that woodland-nesting species breeding near trees, presumably experienced a high level of parasitism throughout their range in the past and, therefore, their rejection behaviour, once evolved, spread rapidly to all populations. On the other hand an intermediate rejecter of parasitic eggs as the reed warbler exhibited low aggression and non-specificity of host responses.

In brood parasites, knowledge of spacing behaviour, habitat use and territoriality may reveal cues about how parasites find and use their hosts. To study the use of space and habitat of European cuckoos, *Cuculus canorus*, we radio-tagged 16 females during four consecutive reproductive seasons. We hypothesized that during the laying period cuckoo females should (1) use habitats selectively, and (2) attempt to monopolize potential egg laying areas to reduce competition for host nests. Our data are consistent with the first hypothesis: the use of pond edges compared to forest and transitional habitats was significantly greater than expected from the habitat availability in the total area and within individual female home ranges. This results has been supported by microsatellite DNA markers which were used to investigate parentage relationships in a population of common cuckoo *Cuculus canorus*. Thirty adults and 55 nestlings were genotyped at six loci from blood samples collected over a four-year period. To test whether each cuckoo female specialises in parasitising one single host species (Host Preference Hypothesis), the maternal relationships were used to record each female's host choice. The results supported the Host Preference Hypothesis since no female (N = 3) was recorded to have parasitised more than one of four congeneric host species breeding in the area. In contrast, the males (N = 4) did not show such specialisation since two of them sired offspring reared by different host species.

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- HONZA M., PROCHÁZKA P., STOKKE BG., MOKSNES A., ROSKAFT E., ČAPEK M., Jr., MRLÍK V., 2004: Are blackcaps current winners in the evolutionary struggle against the common cuckoo? *Journal of Ethology* 22: 175-180.
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- PROCHÁZKA P., HONZA M., 2003: Do common whitethroats (*Sylvia communis*) discriminate against alien eggs. *Journal of Ornithology* 144: 354-363
- PROCHÁZKA P., HONZA M., 2004: Egg discrimination in the yellowhammer (*Emberiza citrinella*). *Condor* 106: 405-410.
- SKJELSETH S., MOKSNES A., ROSKAFT E., GIBBS H. L., TABORSKY M., TABORSKY B., HONZA M., KLEVEN O., 2004: Parentage and host preference in the common cuckoo *Cuculus canorus*. *Journal of Avian Biology* 35: 21-24.
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A clutch of the reed warbler (top) parasitized by the common cuckoo egg (bottom).

International cooperation

Avifauna of the Parížske močiare Marsh

Ornithologists from the University of Trnava (Slovakia), Institute of Vertebrate Biology AS CR Brno and Třeboň Basin Protected Landscape Area and Biosphere Reserve Administration worked in close collaboration on the monograph on birds of the National Nature Reserve Parížske močiare Marsh. The reserve is located in SW Slovakia and it is one of the country's largest wetlands. Many rare and protected plant and animal species can be found there. For example, it is the only known breeding place of moustached warbler *Acrocephalus melanopogon* in Slovakia, and compared with other wetlands, much larger populations of some marsh bird species occur there. The marsh is not only an important nesting but also wintering and roosting place for birds and a foraging or resting stop during their spring and fall migration as well.

The book is the first ever work to cover all the breeding, wintering and migrating bird species occurring in the reserve. It is based upon original results obtained during the field research in 1982–2002. Besides we also tried to utilise published articles on birds of the marsh as well as unpublished data from the very beginning of ornithological research in the locality since 1954. In this way, we present as complete data on individual bird species and bird communities as possible and cover the whole period of ornithological studies of the marsh.

The results obtained revealed both national and international significance of the marsh as a unique ornithological locality and necessity of its protection. The complex propositions of management submitted in this work should at least partially mitigate the impact of negative factors on the marsh, and thus to contribute to the improvement of conditions for a majority of bird species.

TRNKA A., ČAPEK M., Jr., KLOUBEC B., 2003: Birds of the National Nature Reserve Parížske močiare Marsh. Veda, Bratislava.



National Nature Reserve Parížske močiare Marsh (SW Slovakia).

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Ing. Jiří Honzík
Mgr. Eva Janová
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Mgr. Martin Pokorný
Mgr. Jarmila Prokešová
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Research priorities

Research is focused on the ecology of selected mammalian groups. The results of investigations can improve management of forest stands, game management, rodent pest control, and protection of biodiversity.

Main research topics:

- feeding ecology of large herbivores and their impact on vegetation
- foraging ecology and anti-predator strategies of bats
- ecology and behaviour of large carnivores, and foraging ecology and distribution of mustelids
- synecology of small terrestrial mammals
- diversity and ecology of small mammals and ungulates of West Africa

Selected research results

Food ecology of large herbivores in the floodplain forest

The floodplain forests around the Morava River are remarkable from the point of view of forestry and nature conservation. The interests of ecologists, foresters, hunters and farmers interfere in this area, so it is desirable to study the relationships between deer and their habitat and consequently propose correct decisions in the game management. Food ecology of ungulates, red and roe deer, was not yet studied in the floodplain forest even though both species exert a substantial impact on vegetation structure, natural and artificial forest regeneration, and can cause considerable damage. The research was carried out to specify the role of deer in this habitat type. We analysed the annual diet composition of deer, their density and distribution in dependence to food supply in the forest and on the adjacent cultivated fields, and their browsing impact on woody plants in the shrub layer. We found that the deer density in this area is relatively high in comparison to other localities in the Czech Republic where similar research was carried out before. The browse of broad-leaved trees dominated in the diet of both species during whole year. The food sources on the arable fields were utilised only at the end of summer and formed only small part of the deer diet. The extent of their browsing impact was acceptable with regards to variable and nutritional food supply, and this conclusion suggests that the reduction of the game population is not currently required.

BARANČEKOVÁ M., 2004. The roe deer diet: is floodplain forest optimal habitat? *Folia Zoologica* 53: 285–292.
PROKEŠOVÁ J., 2004. Red deer in the floodplain forest: the browse specialist? *Folia Zoologica* 53: 293–302.



Data collecting in the floodplain forest.

Development of mountain forest habitats under ruminant influence

Mountain forests are very important type of habitat which contributes to maintain the biodiversity and ecological stability of landscape. Large herbivorous mammals are among the factors which influence regeneration of woody stands. Impact of deer species on the mountain forest stands was investigated in upper part of the Moravskoslezské Beskydy Mountains. Impact on vegetation was low and not dependent only on the herbivore density but also on other general environmental conditions as food supply. Forest conditions in the study area indicated the possibility to harmonize activity of foresters and game keepers in system of sustainable development of both the economic branches. Applying the progressive method of the diet quality analyses in ruminants contributed to better understanding of the intensity of impact on vegetation.

HEROLDOVÁ M., HOMOLKA M., KAMLER J., 2003: Breakage of rowan caused by red deer – an important factor for *Sorbeto-Piceetum* stand regeneration? *Forest Ecology and Management* 181: 131–138.

HOMOLKA M., HEROLDOVÁ M., 2003: Impact of large herbivores on mountain forest stands in the Beskydy Mountains. *Forest Ecology and Management* 181: 119–129.

KAMLER J., HOMOLKA M., KRÁČMAR S., 2003: Nitrogen characteristics of ungulates faeces: effect of time of exposure and storage. *Folia Zoologica* 52: 31–35.

KAMLER J., HOMOLKA M., PROKEŠOVÁ J., BARANČEKOVÁ M., 2002: Homogeneity of individual pellets in pellet groups: an important condition in herbivores' diet analyses. *Folia Zoologica* 52: 36–38.

KAMLER J., HOMOLKA M., ČIŽMÁR D., 2004: The suitability of NIRS analysis for estimating diet quality of free-ranging deer. *Wildlife Biology* 10: 235–240.

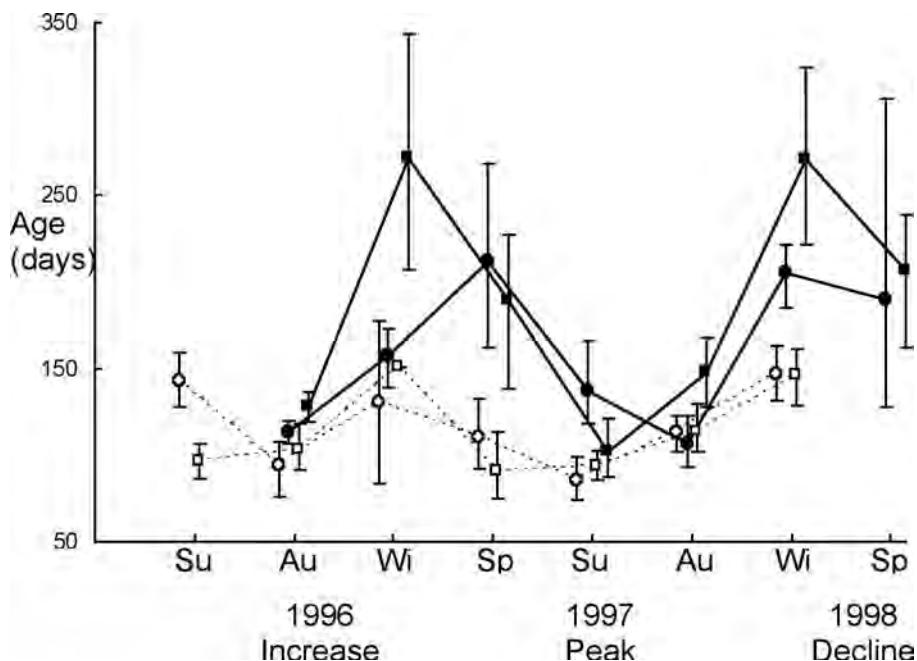


Breakage of rowan by red deer in the Moravskoslezské Beskydy Mts.

Age variation in a fluctuating population of the common vole

We analysed variation in age in a fluctuating population of the common vole (*Microtus arvalis*) in southern Moravia, to test the assumption of the senescence hypothesis that the age of voles increases with population density. Between 1996 and 1998, we monitored the demographic changes in a field population passing through the increase, peak and decline phase of the population cycle. We used eye lens mass method to determine the age in snap-trapped animals and those that died in live-traps. Winter males are clearly older after the peak breeding season than before it. No such phase-dependent shift in age, however, is observed in the female component. Males continue to grow old from autumn to spring over the pre-peak winter to achieve the oldest age in spring of the peak year. However, after the peak breeding season, the same age is already achieved in winter, with the decline males during the next spring tending to be younger. Females in spring populations are always younger than those in winter populations. Voles from livetraps are always older than voles from snaptraps, particularly in winter and spring populations, suggesting the presence of senescent animals. Although the density-dependent changes in age are consistent with those observed for other voles, they provide only weak evidence that population cycles in the common vole are accompanied by pronounced shifts in individual age, particularly in female voles. Besides age, the onset of senescence still has to be a function of other variables if senescence is to be of importance to vole population cycles.

Jánová E., Heroldová M., Nesvadbová J., Bryja J., Tkadlec E., 2003: Age variation in a fluctuating population of the common vole. *Oecologia* 442: 527–532.



Variation in pseudomedian age as revealed in male (circles) and female (squares) common voles by snap-trapping (open symbols, dashed line) and live-trapping (filled symbols, solid line). The pseudomedian (location parameter) for each sample is based on the ages re-calculated to the last day of a 3-month period. The bars indicate nonparametric 95% confidence intervals for the estimated pseudomedian.

Activity and ecology of bat hibernation in caves of the Moravian karst

The most of European bat species do not migrate during winter months but they stay near their summer roosts and hibernate in specific shelters. These shelters are mainly natural underground spaces (caves) and/or the localities with similar microclimatic conditions (abandoned mines, tunnels, large cellars etc.).

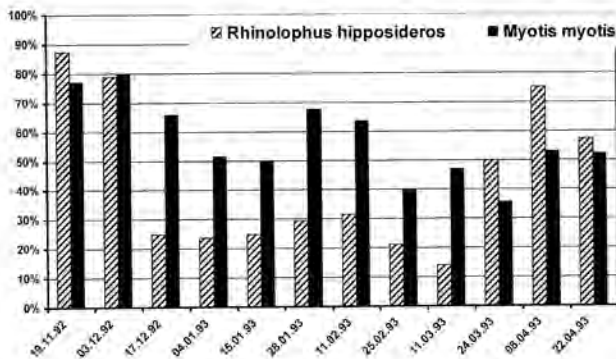
The movement activity during the hibernation period was studied in two bat species. The activity fluctuated in different ways and the hibernation period of *Rhinolophus hipposideros* could be divided into three different parts, while the level of *Myotis myotis* movement activity was relatively high during the whole season. The shelter selection of *R. hipposideros* was not dependent on the part of cave where the bats were hibernating, and it did not change during the season. Hibernating specimens of *R. hipposideros* used most frequently exposed places, in which they were always hanging free. *M. myotis* was recorded in all types of shelter. *R. hipposideros* is a highly specialized species which prefers parts of the cave with very stable conditions and, on the contrary, *M. myotis* appears to be indifferent to all parameters studied.

Second part of the research was aimed to assess the ecological (level of visits) and microclimatic parameters (temperature, humidity) of two natural caves in the Moravian Karst and their influence on hibernation of bats. *M. myotis* was selected as a model species. The results indicate that the bats used various strategies of hibernation (level of movement activity, preference of different types of shelters) in caves with different microclimatic profile (dynamic vs. stable). Additionally, the level of clustering behaviour is different (number, stability and size of clusters of hibernating bats). Used strategies always tended to the same target i.e. use of roost place with maximum stable microclimate during the late part of hibernation period. High fidelity of bats to the particular underground shelter also suggests that selected strategy of hibernation limits the bats in consecutive use of wintering sites.

STANĚK, D., 2005: Ecological aspects of bat hibernation in caves of the Moravian Karst. MSc. Thesis, Masaryk University, Brno, 97 pp.

ZUKAL, J., BERKOVÁ, H., ŘEHÁK, Z., 2005: Activity and shelter selection by *Myotis myotis* and *Rhinolophus hipposideros* in the Kateřinská cave (Czech Republic). Mamm. Biol.

ZUKAL, J., ŘEHÁK, Z., KOVAŘÍK, M., 2003: Netopyři Sloupsko - šošůvských jeskyní (Moravský kras). Lynx (Praha) n.s., 34: 205-220.



Changes in the level of movement activity in the lesser horseshoe bat (*Rhinolophus hipposideros*) and the larger mouse-eared bat (*Myotis myotis*).



A cluster of hibernating *Myotis myotis*

Applications of Research Results

Management plan of large carnivores (brown bear, wolf, lynx) in the Czech Republic

Populations of large carnivores were totally eradicated in the territory of the Czech Republic during the 18th a 19th century owing to human activities. Recolonization started by the migration from Slovak and Polish Carpathian mountains after the Second World War and lynx was reintroduced in 1980–1989 in the Šumava Mts. (southwestern Bohemia). Growing populations of all three species (*Ursus arctos*, *Canis lupus*, *Lynx lynx*) brings many problems in coexisting with a man. New situation calls for modern solution of management of large carnivores.

The Institute of Vertebrate Biology was asked by the Agency of Nature Protection of the Czech Republic to prepare, together with collaborators from other institutions, the main part of Management plan for the brown bear, wolf and lynx. This document will be published in 2005. The Management plan is divided into general and applied part and consist of taxonomy, description of species, historical and recent distribution in Europe and the Czech Republic, population development, habitat, reproduction, behaviour, feeding ecology, impact on population of ungulates, migrations, economy importance, human accidents, causes of threat, illegal hunting and overhunting, genetic isolation, hybridization, traffic and fragmentation of landscape, forestry, urbanisation and human recolonization of forest and mountain habitats, negative public meaning, legal and protection status, implementation of international conventions, Natura 2000, special and other protection, monitoring and research, public relations.

Management of the large carnivores in the Czech Republic is the most important document for the protection and wise sustainable use of natural resources.

KOUBEK P., ČERVENÝ J., BUFKA L., BARTOŠOVÁ D., 2004: Management plan of large carnivores (brown bear, wolf, lynx) in the Czech Republic 53 pp.



Wolf *Canis lupus*, a critically endangered species of the Czech Republic, rarely occurs in the Northeast part of the country.

International Cooperation

Domestic and wild ungulates: feeding interactions in Val Fontana (Italian Alps)

A study on feeding relations among different large ungulate species was carried out in a valley located in the Central Italian Alps (Val Fontana), covering an area of about 10 km² at 1500–2200 m a. s. l. Domestic ungulates (cattle, goat, sheep and donkey) and wild ungulates (chamois, red deer and roe deer) have been foraging in the studied biotope. The aim of the study was to get basic data on feeding ecology of domestic and wild herbivores, in order to contribute to understanding of sustainable pasture management in relation to the wildlife. Ungulates utilization of particular types of biotopes and their relative density were determined by evaluation of faeces distribution. Diet of individual species was studied by microscopical analysis of plant fragments in faecal samples. To estimate the impact of ungulates on forest regeneration, browsing intensity on some of the most common vegetal species was evaluated.

Analysis of individual ungulate species distribution showed that domestic ungulates utilized only a small part of the study area (< 10%), close to the bottom of the valley. In contrast to this, red deer and chamois used the whole valley relatively uniformly, from its bottom up to high alpine meadows. Herbivore diets can be divided into two groups. Roe deer and goat feed as browsers and the shoots of woody and semi-woody species prevail in their diet (> 70% of volume). Other species consumed mainly grasses (> 75% of volume). Within both groups the diets strongly overlapped (80%), but overlap between these groups was low (< 25%). Browsing of tree species within the area ranged by domestic species was very intensive in comparison to browsing in the area of upper tree line.

Feeding interactions between domestic and wild ungulates in the study area can be classified as an example of coexistence. In this situation, wild ungulates can avoid competition for food supply by using localities which are not accessible to domestic stock. Therefore we can presume that, in this situation, from the point of view of feeding interactions, domestic ungulates have no significant impact on wild ungulates.

This study was conducted within a bilateral collaboration with the University of Milan.

Homolka, M., Heroldová, M., Kamler, J. and Mattiello, S.



Summer range in Fontana Valley (Central Italian Alps) at an altitude of 1500 m a.s.l.
Domestic and wild ungulates are able to avoid competition for food resources in this area.

An introduced chimpanzee population in the Rubondo Island National Park, Tanzania

Forty years ago four groups of chimpanzees (*Pan troglodytes*) were introduced to Rubondo Island in Lake Victoria, Tanzania. Released ten females and seven males were wild born, originating from several western African countries. Contrary to other chimpanzee releases, there was no attempt to make social groups before the release, no pre-release rehabilitation, no post-release support apart from a small amount of initial provisioning and almost no monitoring in the following years. Despite these unfavourable factors, chimpanzees surprisingly survived and adapted to novel environment and they represent the only self-sustaining introduced chimpanzee population.

On-going research has showed that the chimpanzee population is totally reliant upon the islands natural vegetation for their subsistence and at least doubled in number over the last

30 years. Preliminary results indicated that chimpanzees have extremely wide ranging areas varying in overlapping home ranges of the two distinct groups. We measured the availability of potential chimpanzee foods. Chimpanzee food preferences were studied using direct observations and faecal analyses. Overall 38.7% of chimpanzee foods were lianas or climbing shrubs. Three of the five most frequently consumed foods were liana fruits. We suggest that liana food sources may have contributed to the self-sustaining nature of introduced chimpanzees. Distribution of lianas on the island can contribute to the atypically large ranging areas of these chimpanzees.

A pilot study indicated that parasite spectrum of Rubondo chimpanzees is different from other wild populations. We reported three new nematodes recorded for chimpanzees: *Protospirura muricola*, *Subulura* sp. and *Anatrichosoma* sp. It is surmised that *P. muricola* and *Subulura* sp. might be maintained by indigenous vervet monkeys (*Cercopithecus aethiops pygerythrus*), rodents and intermediate insect hosts; and *Anatrichosoma* sp. might also be maintained by vervets on the island. Low prevalence of *Subulura* sp. and *Anatrichosoma* sp. suggests a possibility that they were pseudoparasites obtained by ingesting contaminated food. The chimpanzee pinworm, *Enterobius (Enterobius) anthropopithecii* has been redescribed based on light and scanning electron microscopy of both sexes collected from the faeces of Rubondo chimpanzees.

MOSCOVICE L.R., PETRŽELKOVÁ K.J., ISSA M.H., HUFFMAN M.A., SNOWDON C.T., MBAGO F., KAUR T., SINGH J., GRAZIANI G. 2004: Role of lianas for introduced chimpanzees (*Pan troglodytes*) on Rubondo Island, Tanzania. *Folia Primatologica*, 75 (suppl 1): 308.

HASEGAWA, H., IKEDA, Y., FUJISAKI, A., MOSCOVICE, L.R., PETRZELKOVA, K.J., KAUR, T. & HUFFMAN, M.A. (in press): Morphology of chimpanzee pinworms, *Enterobius (Enterobius) anthropopithecii* (Gedoelst, 1916) (Nematoda: Oxyuridae), collected from chimpanzees, *Pan troglodytes*, on Rubondo Island, Tanzania. *Journal of Parasitology*.



Chimpanzee tracker Branaba and chimpanzee food, *Deinbollia fulvo-tomentella*.

INTERNATIONAL ACTIVITIES

The Institute's international collaboration is a very important part of its all research activities. Our scientists work in close collaboration and exchange their views with scholars from various institutions in many countries. In 2004, the Czech Republic became a member of the European Union. The membership enables us to find new research opportunities within the European Research Area, such as the Sixth Framework Programme. Each department is involved in various forms of international co-operation and we are currently participating in 18 international projects. We have been deriving much benefit from established links with foreign laboratories, however, we use any opportunity to find new contacts. The Institute organizes scientific meetings, offers study visits to foreign students and supports participation of our specialists in major scientific events abroad. Great emphasis is placed on young scientist-centred educational stays.

International scientific meetings organized by the Institute

- 4th European Congress of Mammalogy, Brno, Czech Republic, July 27–August 1, 2003

The 4th European Congress of Mammalogy was organized jointly by the Institute of Vertebrate Biology and the Faculty of Science of Masaryk University. This international congress of mammalogists from Europe and other continents continued the successful tradition of previous meetings organized under supervision of Societas Europaea Mammalogica and held in Lisbon, Southampton, and Jyväskylä.

The scientific programme of the congress was structured into 12 specialized symposia and four general sections. An important symposium was focused to evolutionary biology of populations of the house mouse, and its conclusions reflected the extraordinary significance of this model species in speciation and other evolutionary studies. The symposium was held in honour of the late French biologist, Louis Thaler, who contributed enormously to this research field, and it was supported financially by the OECD. Rich new data were presented in the symposium dealing with mammalian phylogeography, with special respect to evolutionary history and postglacial colonization in Europe. This theme was further investigated during a subsequent symposium of biogeographers and paleontologists, which addressed similar questions perceived from an independent approach. Much attention was paid to conservation of rare and endangered species at several other symposia held in the frame of the congress. A large symposium in this particular area dealt with conservation biology of the European otter, and it was combined with a meeting of members of the otter specialists group of the Species Survival Commission IUCN. Elaboration of action plans aimed at improving of conservation measures in various endangered mammalian species in Europe was the subject of another symposium.

A couple of symposia introduced various kinds of ecological studies into mammals. The major themes of these sessions included general problems of population dynamics,



reproduction tactics, and interspecific competition. The results presented in these symposia concerned both the theoretical aspects of ecology and practical implications of findings in the management of pest and/or game species. A separate symposium investigated the epidemiological significance of wild mammals in transmission of infectious diseases.

The daily programme of the congress was introduced by five invited plenary lectures that received much attention and vivid response. Luděk Bartoš from the Czech Republic spoke about fluctuation asymmetry and its role in sexual selection in deer. Bogumila Jędrzejewska from Poland provided new insights into evolutionary adaptation of species through biogeographical evaluation of environmental requirements of certain carnivores. The results of dispersal studies in populations of small mammals were the topic of the lecture presented by Xavier Lambin from Belgium. Jeremy B. Searle from Great Britain summarized the main findings achieved in studies of chromosomes and other molecular markers in relation to evolutionary history of the common shrew. The last plenary lecture was presented by Niels Christian Stenseth from Norway and reported on new data and concepts in studying variation in numbers of prey and predator.

The congress was attended by more than 400 participants from 38 countries. The participants enjoyed also the social programme that included a banquet held in the area of historical place of work of Gregor Mendel, the Augustinian monastery in Brno. A half-day excursion was guided to remarkable regions of southern Moravia and provided also the possibility to taste local Moravian wines.

The next European Congress of Mammalogy will take place in Italy in 2007.



Participants of a symposium dealing with biology and evolution of the house mouse.

- Zoological Days 2003, Brno, February 13–14 2003
- International Conference on the „Distribution, taxonomic and genetic status of the European species of the genus *Gobio*“, Brno, September 7–11, 2003 (co-organized with the Institute of Animal Physiology and Genetics AS CR Liběchov).
- Symposium „Biodiversity of fishes (IV)“, Brno, November 3, 2003
- Zoological Days 2004, Brno, February 12–13 2004

Participation in international conferences

- 9th International Helminthological Symposium, Stará Lesná, Slovak Republic, 9–13 June 2003
- European Otter Conference, Isle of Skye, Scotland, June 30–July 5, 2003
- Annual Meeting of the Fisheries Society of the British Isles, Norwich, United Kingdom, 30 June – 4 July 2003
- 4th European Congress of Mammalogy, Brno, Czech Republic, July 27–August 1, 2003
- 4th Conference of the European Ornithologist Union (EOU), Chemnitz, Germany, August 16–21, 2003
- ESEB IX, The Ninth Congress of the European Society for Evolutionary Biology, Leeds, United Kingdom, 18–24 August 2003
- International Workshop: Population genetics for animal conservation. Monte Bondone, Trento, Italy, September 4–6, 2003
- 6th International Symposium on Fish Parasites, Bloemfontein, South Africa, 22–26 September 2003
- Fauna Carpathica Meeting 2004, Smolenice, Slovakia, March 17–19, 2004
- XI European Congress of Ichthyology, Tallinn, Estonia, September 6–10, 2004
- Symposium on “Mechanisms of adaptation, genetic differentiation and speciation”. Tutzing, Germany, March 17–19, 2004
- 4th World Fisheries Congress, Vancouver, Canada, 2–6 May 2004.
- 9th International Otter Colloquium, Frostburg, Maryland, USA, June 4–10, 2004
- 9th International Conference on Rodent Biology Rodens et Spatium, Lublin, Poland, July 12–16, 2004
- 10th International Behavioral Ecology Congress, Jyväskylä, Finland, 10–15 July 2004
- XI. European Congress of Ichthyology, Tallin, Estonia, 6–10 September 2004

Membership in international organizations

ALBRECHT T.:	International Society for Behavioral Ecology (ISBE)
BARUŠ V.:	Sociedad Cubana de Parasitología Animal, honorary chairman
BRYJA J.:	Steering Committee of European Science Foundation
ČAPEK M.:	IOC Standing Committee on Ornithological Nomenclature
ČERVENÝ J.:	Ad Hoc Group for Environmental Problems of COST (Council for Research and Development, EU)
	Czech National Committee of the MAB Programme
	Working group for Large Carnivores Initiative for Europe
GVOŽDÍK L.:	American Society of Ichthyologists and Herpetologists
	American Society of Naturalists

British Herpetological Society
 Society for the Study of Amphibians and Reptiles
 Society for the Study of Evolution
 HONZA M.: Steering Committee of European Science Foundation
 JURAJDA P.: Fisheries Society of British Isles
 MRLÍK V.: Peregrine Fund, World Center for Birds of Prey
 Working Group for Montagu's Harrier
 World Working Groups on Birds of Prey and Owls
 KOUBEK P.: Working Group for Large Carnivores Initiative for Europe
 PIÁLEK J.: European Society for Evolutionary Biology
 International Mammalian Genome Society
 Societas Europaea Herpetologica
 Society for the Study of Amphibians and Reptiles
 Society for the Study of Evolution
 REICHARD M.: Association for the Study of Animal Behaviour
 British Ecological Society
 Fisheries Society of the British Isles,
 Neotropical Ichthyological Association,
 SLÁDEK V.: Paleoanthropology Society (USA)
 ZIMA J.: Czech National Committee of the IUBS
 International Advisory Board, BIOTER Centre of Excellence (EU)
 Insectivores Specialits Group SSC IUCN
 International Sorex araneus Cytogenetics Committee
 Rodents Specialists Group SSC IUCN,
 Societas Europaea Mammalogica

Membership in editorial boards

BARUŠ V.: Transactions of the Zoological Society of India
 Helminthologia
 BLAHÁK, P.: Folia Zoologica (managing editor)
 HONZA M.: Folia Zoologica
 HUBÁLEK Z.: Cryobiology
 Folia Parasitologica
 KOUBEK, P.: Folia Zoologica
 LUSK S.: Folia Zoologica
 PEŇÁZ M.: Folia Zoologica (editor-in-chief)
 Quaderni E.T.P. – Journal of Freshwater Biology
 Polskie Archiwum Hydrobiologii
 PIÁLEK J.: Folia Zoologica
 SLABÁKOVÁ H.: Folia Zoologica
 ZIMA J.: Hystrix – Italian Journal of Mammalogy
 Folia Zoologica
 Acta Societatis Zoologicae Bohemicae

EDUCATION AND TEACHING ACTIVITIES

The Institute lays great emphasis on education and teaching activities. In 2003–2004, we gave lectures at six universities and supervised 57 undergraduates and 47 postgraduates from ten universities. Another important fact is that 22 and 6 students supervised by the staff succeeded in obtaining their MSc and PhD degrees, respectively. We have accreditation from the Ministry of Education, Youth and Sports to perform post-gradual studies in zoology at the Faculty of Science, Masaryk University in Brno, and the Faculty of Biological Sciences, South Bohemian University in České Budějovice. We participate in research projects carried out in two joint laboratories, "Evolutionary Genetics of Animals" (established by the Department of Zoology, Faculty of Science, Charles University in Prague, the Institute of Animal Physiology and Genetics AS CR in Liběchov and the Institute of Vertebrate Biology in Brno) and "Ichthyoparasitology - The Centre of Basic Research" (established by the Faculty of Science, Masaryk University in Brno and the Institute of Vertebrate Biology in Brno). These laboratories provide a firm basis for better interaction between the Academy of Sciences ASCR and universities, which helps to make the institute attractive to students. Moreover, the scientists of the Institute are members of scientific councils and boards at universities.

Teaching at universities

Lecturer	Subject	2003 hours	2004 hours	Faculty/ University
J. Bryja	Population ecology	24	14	1
	Molecular ecology		24	1
M. Čapek	Ornithology	43	59	1
J. Červený	Field course in zoology	60	60	2
J. Halouzka	Animal physiology and general zoology	8	8	1
M. Honza	Ecology of birds		26	1
Z. Hubálek	Microbial zoonoses and sapronoses	30	30	1
	Fundamentals of microbiology	30	30	1
	Tutorials in microbiology	60	60	1
P. Jurajda	Ecology of fish		26	1
P. Koubek	Game biology		22	1
S. Lusk	Ichthyology	36	36	1
J. Mendel	Tutorials in general genetics	24	30	1
	Genetic ecotoxicology	6	20	1
M. Prokeš	Ichthyology	2	2	1
V. Sládek	Biological anthropology 2	54	54	4
	Biological anthropology for archeologists 1	65	65	4
	Biological anthropology for archeologists 2	65	65	4
	Human variability and adaptability	54	54	4
	Locomotor system 1		65	4
	Tutorials in anthropology	13	13	4
E. Tkadlec	Population ecology	45	45	5
	Scientific methodology	30	30	5
	Life history	30	30	5
	Tutorials (MSc and PhD students)	50	50	5
	Time series in ecology	15	15	5
L. Vetešník	Tutorials in ichthyology	56		3
J. Zima	Biodiversity	26+26	26+26	1,6
	Systematics and phylogeny of vertebrates	20	13	6

	Genetical methods in zoology	12	12	6
	Field course in zoology	42	42	6
J. Zukal	Behavioral ecology	45	45	1
	Chiropterology	22	22	1
Total 16	33	993	1119	7

¹ Faculty of Science, Masaryk University, Brno

² Department of General Zoology, University of Essen

³ Faculty of Agronomy, Mendel University of Agriculture and Forestry, Brno

⁴ Faculty of Humanities, University of West Bohemia, Plzeň

⁵ Faculty of Science, Palacký University, Olomouc

⁶ Faculty of Science, Charles University, Praha

Undergraduate students working in the Institute and/or supervised by the Institute's fellows in 2003–2004

Supervisor	Student	2003	2004	Defended the theses	Faculty/University
T. Albrecht	Javůrková V.		+		7
	Rozkošná P.		+		7
	Suvorov P.		+		7
	Vinkler M.		+		7
J. Bryja	Bémová P.	+	+		8
	Bencová V.	+	+		1
	Dařenová E.	+	+		1
	Konečný, A.	+	+		1
	Patzenhauerová H.	+	+		1
	Zemanová, B.	+	+		1
M. Čapek	Promerová M.		+		1
	Šašínková, R.	+	+	2004	1
J. Červený	Daniszová K.		+		7
	Kocurová, M.	+	+	2004	7
	Mrstný L.	+	+		9
L. Gvoždík	Nentvichová M.	+	+		9
	Dvořák, J.	+		2003	1
	Jambrich A.	+	+		10
J. Halouzka	Dančáková H.	+		2003	1
M. Homolka	Mafátková, K.	+	+	2004	6
M. Honza	Požgvaová M	+	+		1
	Rybaříková, J.	+	+		1
	Tlustá, Š.	+	+		1
Z. Hubálek	Janková J.		+		1
	Jrošová V.		+		1
P. Jurajda	Bendová, P.	+	+		6
	Kružiková, L.	+	+	2004	4
	Mazurová E.	+	+		1
	Polačík M.		+		1
J. Kamler	Babišová J.	+	+	2004	3
	Hrabec M.	+	+		3
P. Koubek	Cíhová, D.	+		2003	1
	Kajfosz, R.	+	+	2004	3
V. Mrlik	Habartová, J.	+		2003	1

	Chadim, M.	+		2003	1
	Kučírek, J.	+	+	2004	1
	Sychra, J.	+	+	2004	1
J. Piálek	Božíková E.	+		2003	
	Dufková, P.		+		8
M. Prokeš	Baránek, V.	+	+	2004	4
	Šovčík, P.	+	+		4
V. Sládek	Ernestová, B.	+		2003	5
	Křížová, P.	+		2003	5
	Průchová, E.	+	+		5
E. Tkadlec	Adamík P.	+	+	2004	6
	Hladíková B.	+	+	2004	6
	Kubošová, K.	+	+	2004	1
	Lisická, L.	+	+	2004	6
	Michálek B.	+	+		6
	Paták, L.	+	+		6
	Thelenová, J.	+		2003	6
	Tkadlčíková, R.	+	+		6
	Vávra F.	+	+		6
	Zbořil, J.	+	+	2004	6
	Zifčák, P.	+	+		6
J. Zukal	Bednářová J.	+	+		1
	Franek J.	+	+		1
	Gryc L.	+	+		1
	Staněk D.	+	+		1
Total 18	59	48	50	23	10

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¹⁰ Faculty of Science, Komenský University, Bratislava, Slovakia

PhD students working in the Institute and/or supervised by the Institute's or other fellows in 2003–2004

Supervisor	Student	2003	2004	Defended the theses	Faculty/ University
J. Červený	Fejková P.	+	+		7
	Kocurová M.		+		7
	Městková L.		+		7
	Zachařová, J.	+	+		7
L. Gvoždík	Dvořák J.		+		1
	Hejtmánková M.		+		6
J. Halouzka	Šikutová, S.	+	+		1

M. Homolka	Prokešová, J.	+	+		1
M. Honza	Ležalová, R.	+	+		8
	Procházka P.	+	+	2004	7
	Šicha, V.	+	+		1
Z. Hubálek	Rudolf, I.	+	+	2004	1
P. Jurajda	Hájková, P.	+	+		1
	Janáč M.	+	+		1
	Polačík M.	+	+		1
	Valová, Z.	+	+		1
J. Koubek	Šuláková H.	+	+		4
	Barančeková, M.	+	+		1
	Honzírek J.	+	+		3
	Nováková M.	+	+		1
	Šuláková H.	+	+	2004	4
	Vallo P.	+	+		1
S. Lusk	Vetešník, L.	+	+		4
	Horák, V.	+	+		1
V. Lusková	Mendel, J.	+	+		1
V. Mrlík	Němečková, I.	+	+		1
P. Musil	Albrecht T.	+	+	2004	7
M. Peňáz	Bartošová Š.	+	+		1
J. Piálek	Bímová, B.	+	+		7
	Božíková E.	+	+		7
	Horák, A.	+	+		8
	Mikulíček, P.	+	+		7
	Vyskočilová, M.	+	+		1
E. Tkadlec	Ďaďourek, M.	+	+		6
	Gregor P.		+		6
	Jánová, E.	+	+		1
	Lisická L.		+		6
	Losik, J.	+	+		6
	Pluhařová A.	+	+		6
	Thelenová J.	+	+		6
	Třebatická L.	+	+		6
	Varfalvyová, D.	+	+		6
	Wolf, P.	+	+	2003	6
J. Zima	Bellinvia E.	+	+	2004	7
	Lazarová J.	+	+		7
	Martínková, N.	+	+	2004	7
	Nová P.	+	+		7
	Schwarzová, L.	+	+		7
J. Zukal	Berková, H.	+	+		1
	Novák V.	+	+		1
	Petrželková, K.	+	+	2003	1
	Pokorný, M.	+	+		1
Total 17	52	45	50	8	7

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EDITORIAL ACTIVITIES

The „Institute“ publishes the international journal „*Folia Zoologica*“. The journal is covered by many reference journal, including the Current Contents. The current value of the impact factor for 2003 amounts 0.494.

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Aims & Scopes

Folia Zoologica publishes articles in English containing original insight into any aspects of vertebrate zoology that are not published and not under consideration for publication elsewhere. The journal welcomes significant papers related mainly to vertebrates of the Holarctic region, and papers of more than regional significance are preferred. The review papers should deal with topics of general interest or current importance and should be synthetic rather than comprehensive in emphasis. Occasional commemorative articles, book reviews and announcements are also accepted.

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PUBLICITY AND POPULARIZATION ACTIVITIES

We pay special attention to publicity of the institute's scientific output. Our scientists are involved in various activities within many national scientific societies and special-interest groups, they are members of scientific councils of Czech National Parks and advisory boards of Landscape Protected Areas. In 2003–2004, they published 61 popular books and articles and participated in various TV and radio programmes. “Open Days” were organised every year to give an opportunity to the public to visit the institute and meet with its staff. These days were attended by around 100 visitors annually representing pupils from primary schools, high school and university students as well as general public.

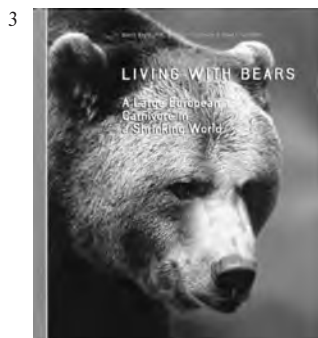
Members of the Departments of Avian and Mammalian Ecology collaborated on four monographs:

1 - DANKO, Š., DAROLOVÁ, A. & KRIŠTÍN, A (eds.), 2002: Birds Distribution in Slovakia. Veda, Bratislava, received the Prize for Scientific and Specialized Literature awarded by the Slovak Publishing Fund in 2003 and the first prize within the survey of the most popular book of the Bibliotheca Incheba Expo Bratislava in 2003

2 - TRNKA, A., ČAPEK, M., Jr. & KLOUBEC, B., 2003: Birds of the National Nature Reserve Parižske močiare Marsh. Veda, Bratislava, received the Prize for Scientific and Specialized Literature awarded by the Slovak Publishing Fund in 2004

3 - KRYŠTUFEK B., FLAJŠMAN B., GRIFFITHS H. I. (eds.), 2003: Living with Bears: A Large European carnivore in a shrinking world. Ecological forum of the liberal democracy of Slovenia, Ljubljana, received the Main prize for Literature awarded by the Conceille Internationale de la Chase in 2004.

4 - ČERVENÝ, J. and collaborators, 2004: The Encyclopedia of Game Management. Ottovo Nakladatelství, Praha, represents the most comprehensive Czech encyclopedia of game management



Biennial Report 2003-2004

Periodical continuation of the former Institute's bulletins *Vertebratologické Zprávy* (1969-1987), *Zprávy ÚSEB* (1988-1991) and the *ILE Biennial Report* (1993-1994).

Edited by Miroslav Čapek, Hana Slabáková and Jan Zima

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PREFACE

The main mission of the Institute of Vertebrate Biology is to perform basic research in particular fields of biology. In the organization scheme of the Academy of Sciences of the Czech Republic, the Institute is included in the Section of Ecological Biology within the Department of Life Sciences and Chemistry. I am pleased to introduce this traditional report summarizing the main results of the Institute's activities in the last two years. This biennial report is addressed to colleagues from collaborating institutions as well as to broad public with the aim to describe the current state of the Institute and to present our important scientific achievements and their possible practical implications.



The financial funding of the Institute has originated primarily from the state budget. However, we look also for other sources of funding both within domestic and foreign agencies and institutions, and the proportion of this research money has been steadily increasing. The institutional budget assigned from the state contribution in the frame of the Institutional Research Plan achieved recently around 23 million of Czech crowns per year. Research grants and diverse contracting funding contributed to the budget with additional 10–13 millions of Czech crowns annually.

In 2003–2004, the Institute employed 28 research scientists and 16 technicians and administration fellows. On the basis of research grant funding, additional 20 researchers were contracted in this period. An important component of the Institute's research activities was more than 100 gradual and postgradual students. These students were coming from various universities and they elaborated their diploma and doctoral thesis in our laboratories under supervision of the researchers of the Institute. Most of these students have actually become an inherent part of our research teams.

The Institute has supported the research activities through building efforts and reconstructions of rooms and buildings. Building was concentrated mainly on detached departments in Studenec and Valtice. The dwelling bungalows in Studenec were completely reconstructed, and a new molecular laboratory was established within the Department of Ichthyology in Brno. New pieces of equipments were purchased, e.g. an automated sequencer for DNA analysis.

In the last two years, all the Czech research institutions supported from the state budget were subjected to evaluation of results of the Institutional Research Plan in the period 1999–2004. Within the Academy of Sciences, this evaluation acquired the shape of complex screening of activity and efficiency of individual institutions based on peer-review, scientometric analysis, and immediate experience of members of the expert commission. I am much delighted to be able to say that the Institute received high rating and ranked among the best institutes of the Academy of Science of the Czech Republic. This success enabled to improve significantly the position of the Institute within the Czech research area, and we expect that the high rating will also be reflected in the increase of the institutional budget in the next six years. I suppose that the successful evaluation of the Institute was influenced, besides the significant research findings and the extensive publication record, particularly by the promising age structure of the research staff (an average age of 42 years), and the fruitful cooperation with universities that was manifested in the high numbers of students attracted by our research programmes. We also provided extensive lecturing at universities, and we achieved important findings with a potential for implications in environmental policy and management. The staff of the Institute also offered varied popularization efforts addressed to general public.

We further succeeded to enrich notably both the extent and the intensity of international collaboration. An important impulse in this respect was the 4th European Congress of Mammalogy in 2003, as well as organizing of other international meetings held in the Institute. The Institute was the main organizer of the joint national conference of Czech and Slovak zoologists (“Zoological Days”) held annually in the recent years.

We succeeded for success in the competition for projects within the 6th Framework Programme of European Union, and four grants have recently been awarded to the fellows of the Institute. We further continued research proposed within various other bilateral and individual grant projects with international participation. Within the domestic funding competition, the researchers of the Institute obtained a grant enabling to establish a national research centre focused on biology and parasitology of fishes, and a postgradual research unit for PhD students.

The scientific results of the Institute achieved in the last two years are most appropriately summarized in the publication list. Altogether, 276 scientific publications authored by the fellows of the Institute appeared in 2003–2004. Most of the publications were papers published in international journals included in databases of the Web of Science (99 titles with the total impact factor of 87.3). Another important part of the publication output represented books and university textbooks. Some of the popular books obtained even international awards. The results achieved demonstrated also a significant contribution of findings to applied problems in the areas of nature conservation, fisheries, forestry, agriculture, game management, and epidemiological surveillance. We elaborated two studies aimed at evaluating the consequences of the catastrophic floods in the Czech Republic in 2002, with special respect to changes in natural fish communities and an assessment of epidemiological threats in the flooded areas.

I can highlight several particular examples of the successful studies performed. The staff of the Department of Medical Zoology took up research of biology and ecology of pathogens responsible for various emerging infectious diseases. The sequence analysis of the genome enabled to identify a new lineage of West Nile virus in central Europe, and this discovery is obviously of much epidemiological importance. The traditional research area of the Department of Population Biology is complex investigation of the hybrid zone of house mouse in western Bohemia and Bavaria. This research is relevant to various general problems of mechanisms in evolution and speciation, and the model studies in the house mouse brought new original data on pre-mating and post-mating barriers evolving in the process of origin of species. The studies of the ecological role of fishes as indicators of the quality of freshwater habitats are the traditional task of the Department of Ichthyology. This research has produced numerous useful applications, and the findings found their implication particularly in the European programme Natura 2000 in the Czech Republic. Other ichthyological studies, performed in the Department of Fish Ecology, provided remarkable results related to sociobiology of a model species – the bitterling. The conclusions of this research contributed significantly to understanding of the behavioural patterns and reproductive strategies applied in evolutionary events. A long-term research programme of the Department of Avian Ecology has concerned another interesting topic of sociobiology, the brood parasitism, and was exemplified in numerous case studies of common cuckoo and its hosts. Recently, the scientists of this department initiated other ambitious projects investigating the reproductive success in passerines or behavioural ecology of waterfowl. A broad international scale of our research can be demonstrated in a project running in the Department of Mammalian Ecology. This project is aimed to complex description of vertebrate diversity in the Niokolo National Park in

Senegal. Another project of this department investigated conservation biology of a population of chimpanzees in the Rubondo Island National Park in Tanzania.

The everyday work and problems should not prevent us from serious considering the future perspectives of the Institute. The sphere of research and development is still far to be stabilized in the Czech Republic, and the current turbulent developments in the domestic political scene suggest various possible scenarios of the final arrangement. In these days, the Parliament of the Czech Republic discusses a new act related to the establishment of public research institutions. The approving of this act will certainly initiate deep changes in the life of the institutes of the Academy of Sciences. Therefore, we should be prepared to respond appropriately such changes, and to propose an adequate scheme of re-structuring measures within the Institute as well as in respect to our external relationships.

I am quite sure that the Institute of Vertebrate Biology will be able to adapt successfully to diverse selection and competition pressures that can be predicted to occur in our environment in the future years. We should be able to follow the already introduced trend of scientific excellence and social usefulness.

Jan Zima



Dwelling bungalows at Studenec after reconstruction.

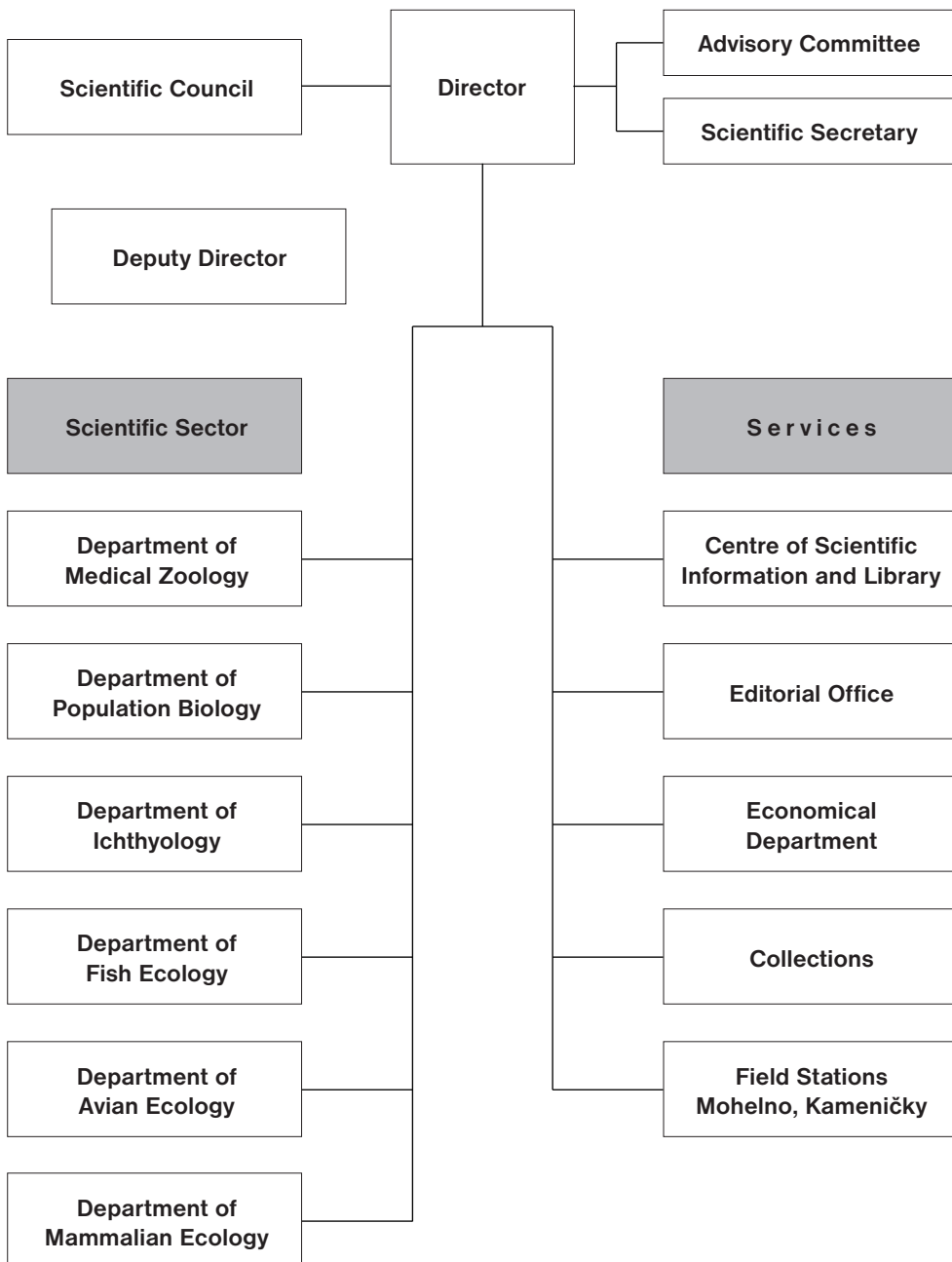


A new laboratory in Valtice.

CONTENTS

Preface	3
Contents	6
Organization structure of the Institute of Vertebrate Biology	7
Addresses	8
Management and Services	9
Scientific Council	10
Research projects	11
Institutional Research Plan	11
Program of Development of Basic Science Research in the Key Areas of Science	11
Projects supported by the Grant Agency of the Academy of Sciences	11
Projects supported by the Grant Agency of the Czech Republic	11
A project supported by the Ministry of Foreign Affairs	12
Projects supported by the Ministry of Agriculture	13
Projects supported by the Ministry of Environment	13
Projects supported by the Agency for Nature and Landcape Conservancy	13
International projects	13
List of publications	16
Books, textbooks, edited proceedings	16
Chapters in books	16
Papers in journals included in the databases of the Web of Science	16
Papers in other refereed journals	21
Papers in proceedings	22
Book reviews	25
Popularization books and articles	25
Scientific departments	27
Department of Medical Zoology	27
Department of Population Biology	32
Department of Ichthyology	38
Department of Fish Ecology	48
Department of Avian Ecology	53
Department of Mammalian Ecology	58
International activities	67
International scientific meetings organized by the Institute	67
Participation in international conferences	69
Membership in international organizations	69
Membership in editorial boards	70
Education and teaching activities	71
Teaching at universities	71
Undergraduate students working in the Institute and/or supervised by the Institute's fellows in 2003-2004	72
PhD students working in the Institute and/or supervised by the Institute's fellows in 2003-2004	73
Editorial activities	75
Publicity and popularization activities	76

ORGANIZATION STRUCTURE OF THE INSTITUTE OF VERTEBRATE BIOLOGY



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Z. Hubálek (deputy director)



M. Čapek (scientific secretary)



M. Homolka (chair of the scientific council)

RESEARCH PROJECTS

Institutional Research Plan

- **A67/98:Z6-093-9-17** Diversity and life history of free-living vertebrates: implications in the strategy of conservation and sustainable management of natural resources, 1999–2004

Program of Development of Basic Science Research in the Key Areas of Science of the Academy of Sciences of the Czech Republic

- KSK6005114 Biodiversity and functions of ecological systems, 2001–2004

Projects supported by the Grant Agency of the Academy of Sciences

- **IAA6045005** Characteristics and genetic differences of populations and species of genus *Gobio* and *Romanogobio* – contribution to description of their biodiversity – S. Lusk (coordinated by the Institute of Animal Physiology and Genetics AS CR), 2000–2003
- **IAA6093104** Ecological parameters of the stone loach (*Barbatula barbatula*) as determinants of its metazoan parasites communities – M. Prokeš, 2001–2003
- **IAA6093105** Standards of ichthyocoenoses and biotic integrity of streams in relation to the „health“ of river systems in the Czech Republic – S. Lusk, 2001–2004
- **IAA6093201** Behavioural genetic study of fitness components in a mammal hybrid zone – J. Piálek, 2002–2004
- **IAA6093203** Coevolution between common cuckoo *Cuculus canorus* and its hosts: adaptations of the cuckoo chick – M. Honza, 2002–2004
- **IAA6093403** Evolutionary determinants of brood parasitism in ducks – M. Honza (coordinated by Charles University), 2004–2008
- **IAA6093404** Species diversity and ecology of selected West African vertebrates – P. Koubeek, 2004–2008
- **IAB6093106** Spatial and temporal distribution of 0+ juvenile fish in a floodplain river system – P. Jurajda, 2000–2003
- **IBS6093003** Management optimisation of big game in the Czech Republic – P. Koubeek, 2000–2004
- **IBS6093007** Biological principles of the rehabilitation of natural character, function and biodiversity of riverine ecosystems of the rivers Dyje and Morava – S. Lusk, 2000–2003
- **IBS5045111** Molecular and other genetic markers applied in conservation of populations of endangered, rare and vanishing fish species in the Czech Republic – V. Lusková (coordinated by the Institute of Animal Physiology and Genetics AS CR), 2001–2005
- **KJB6005301** What happens when *Reynoutria* taxa reproduce by means other than vegetative? – J. Piálek (coordinated by the Institute of Botany AS CR), 2003–2005

Projects supported by the Grant Agency of the Czech Republic

- **GP206/00/D046** Thermal biology of newts *Triturus cristatus* superspecies (Amphibia: Salamandridae) – L. Gvoždík, 2000–2003

- **GA206/01/0562** Evolutionary and conservation genetics of two species of mammals endemic to the Tatra Mts.: the Tatra chamois and the Tatra pine vole - J. Zima, 2001-2003
- **GA206/01/0695** Why are species separated? Barriers to gene flow between species of the *Triturus cristatus* superspecies - J. Piálek, 2001-2003
- **GA206/01/1555** Habitat selection and short-time shifts of mouse-eared bat (*Myotis myotis*) in the Moravian Karst region - J. Zúkal, 2001-2003
- **GA206/03/0726** Ecology of emerging arthropod-borne microorganisms - Z. Hubálek, 2003-2005
- **GA206/03/0757** Assessment of population size and population structure of Eurasian otter (*Lutra lutra*) in different habitats by a non-invasive genetic method - J. Zima, 2003-2005
- **GA206/03/Z022** Impact of extreme floods on fish communities in streams - S. Lusk, 2003
- **GA206/04/2003** Ecological interactions in populations of small rodents - M. Heroldová (coordinated by Palacký University), 2004-2006
- **GA310/03/Z033** Serological survey of Central-Bohemian population for antibodies against mosquito-borne viruses after the 2002 flood - Z. Hubálek, 2003
- **GA524/01/1314** A multidisciplinary study of larval stages (metacestodes) of tapeworms, parasites of freshwater fishes - V. Baruš (coordinated by the Institute of Parasitology AS CR), 2001-2003
- **GA524/01/1316** Population dynamics of the common vole and a new practical method to forecast its abundance - M. Heroldová (coordinated by Palacký University), 2001-2003
- **GA524/02/0924** Diversity of parasites of early stages of fish development under conditions of fragmented habitats - P. Jurajda (coordinated by Masaryk University), 2002-2004
- **GA524/03/0061** Comparative studies on dracunculoid nematodes, with special reference to agents of serious diseases of fish - V. Baruš (coordinated by the Institute of Parasitology AS CR), 2003-2005
- **GA524/04/1115** Fluctuating asymmetry in fish parasites: a new approach to assess environmental stress of aquatic ecosystem? - P. Jurajda (coordinated by Masaryk University), 2004-2006
- **GA524/04/1128** MHC class IIB genes of European cyprinid fish: their genetic variability and evolution in relation to the host life-history traits and parasitism - P. Jurajda (coordinated by Masaryk university), 2004-2006
- **GP206/01/D018** Mobility pattern among human populations of the late eneolithic: biomechanics and morphometrics comparison of diaphyseal cross-section properties - V. Sládek, 2001-2004
- **GP206/02/P068** Sex ratio in voles - can mothers manipulate sex of their offspring? - J. Bryja, 2002-2004
- **GP206/03/P134** Feeding strategy of large herbivore mammals between forest and field habitats - J. Kamler, 2003-2005

A project supported by the Ministry of Foreign Affairs

- **30/00-04/MZV/B** Protection et l'élevage de l'éland de Derby au Sénégal - P. Koubek (coordinated by the Institute of Tropical and Subtropical Agriculture, Czech Agricultural University), 2000-2004

Projects supported by the Ministry of Agriculture

- **QF3028** Development of new technologies of rearing commercially important riverine species of fish and crayfish endangered by environment degradation – M. Prokeš, (coordinated by University of South Bohemia), 2003–2007
- **QF3029** Harmonisation with the EU in application of the principles of pharmacovigilancy in aquaculture in the Czech Republic – M. Prokeš, (coordinated by University of South Bohemia), 2004–2006
- **QF4192** Methods for evaluating the game damage on the agricultural plants – J. Kamler (coordinated by Mendel Agriculture and Forestry University), 2004–2006

Projects supported by the Ministry of Environment

- Morava IV – Long-term monitoring of pollutants in the muscle tissue of the model fish species, chub (*Leuciscus cephalus*) in the net of water quality program in the Czech Republic – P. Jurajda (coordinated by the Water Research Institute TGM Brno), 2003–2005
- Long-term monitoring of young-of-the-year fish in profiles of the net of water quality program in the Czech Republic – P. Jurajda (coordinated by the Water Research Institute TGM Praha) 1999–2005

Projects supported by the Agency for Nature and Landscape Conservancy

- Methods used in monitoring fish species of importance according to EU legislation (Natura 2000) – S. Lusk, 2003–2005
- Research on fish populations in the hydrological network in the Beskydy Mts. Protected Landscape Area – S. Lusk, 2002–2004
- Ichthyofauna in streams of the Broumovsko Protected Landscape Area – K. Halačka, 2002–2004
- Analysis of distribution and density of large herbivores in relation to natural tree regeneration in the protected area of Králický Sněžník – J. Kamler, 2004
- Management plan of large carnivores (brown bear, wolf, lynx) in the Czech Republic – P. Koubek, 2003–2005

International projects

European Union – 5th Framework program

- QLRT-2000-01995 Risk assessment and prevention of alveolar echinococcosis – J. Červený (coordinated by the Faculty of Medicine of Charles University, Plzeň), 2002–2004

European Union – 6th Framework program

- Integrated project, contract no. 010284-2 Emerging diseases in a changing European environment – EDEN (coordinated by CIRAD Montpellier, France) – Z. Hubálek, 2004–2008

- Integrated project, contract no. 511237-1 Models for assessing and forecasting the impact of environmental key pollutants on marine and freshwater ecosystems and biodiversity – MODELKEY (coordinated by UFZ – Umweltforschungszentrum Leipzig – Halle GmbH, Germany) – P. Jurajda, 2005–2010
- Marie Curie Research Training Network, contract no. MRTN-CT-2004-512492 Sex to asex: a case study on transitions and coexistence between sexual and asexual reproduction – SEXASEX (coordinated by the Royal Belgian Institute of Natural Sciences, Belgium), J. Zima, 2004–2009
- INTAS programme, project no. 03-51-4030 A multidisciplinary study of hybrid zones in the common shrew (coordinated by the University of York, UK), J. Zima, 2004–2007
- INCO programme (International Cooperation Program of the European Commission) Coordination Action no. PL 510561 Integrated consortium on ticks and tick-borne diseases – ICTTD-3 – Z. Hubálek, 2004–2008

Bilateral Projects

- Royal Society, London
Population consequences of alternative mating tactics in the bitterling – P. Jurajda (cooperation with Queen Mary, University of London), 2001–2003
- Programme KONTAKT (project no. 18)
Evaluation of the impact of extensive animal husbandry and introduced large herbivores on the landscape and the native wild ungulates – M. Heroldová, M. Homolka, J. Kamler (cooperation with University of Milan), 2002–2004
- Programme KONTAKT (project no. 144)
Variability of social system in *Apodemus* mice (Rodentia) – J. Bryja (cooperation with Institute of Zoology, Academy of Sciences of the Slovak Republic), 2004–2005
- DAAD – AS CR, PPP program, project no. D2-CZ30/04-05 Mechanisms of speciation in rodents (collaboration with University of Essen-Duisburg, BRD) – J. Zima, 2004–2005

Individual Projects

- NATO-Royal Society Postdoctoral Fellowship
Alternative mating tactics in the European bitterling – M. Reichard (cooperation with Queen Mary, University of London), 2002–2003
- Leverhulme Trust (UK)
Adaptation and coevolution in an unusual symbiosis – M. Reichard (cooperation with University of Leicester), 2003–2005
- Institut Nationale de la Recherche Agronomique (INRA)
Evolution of the major histocompatibility complex (MHC) markers during population cycles of voles – J. Bryja (post-doc project supported by INRA, France), 2004
- EU – Large Scale Facility Project
Intraspecific diversity in selected cyprinid fish species in the conditions of Central Europe – J. Mendel (coordinated by the Institute of Aquaculture, University of Stirling, UK), 2005

Other projects

- Fisheries Society of the British Isles
Adaptation and co-evolution in an unusual symbiosis – M. Reichard (cooperation with Queen Mary, University of London), 2003
- National Research Council, USA (COBASE Programme)
Behavioral and genetic analysis of a prezygotic isolation mechanism in house mice – J. Piálek (cooperation with Butler University, Indianapolis, IN, USA), 2002–2004
- Istituto Zooprofilattico e Sperimentale, Teramo, Italia (Integrated Project)
Development of a new methods for the laboratory diagnostics of West Nile Virus disease in human and some other animals – Z. Hubálek, 2004–2005
- European Science Foundation
Integrating population genetics and conservation biology: Merging theoretical, experimental and applied approaches – J. Bryja, member of the steering committee, 2004–2009

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Research priorities

Research is focused on the ecology of selected microbial pathogens (including new emerging diseases), the causative agents of human and animal infections. The phenomenon of natural focality is studied in respect of the role of wild endotherm vertebrates (hosts or reservoirs) and hematophagous arthropods (vectors) and under effects of the recently globally changing natural conditions.

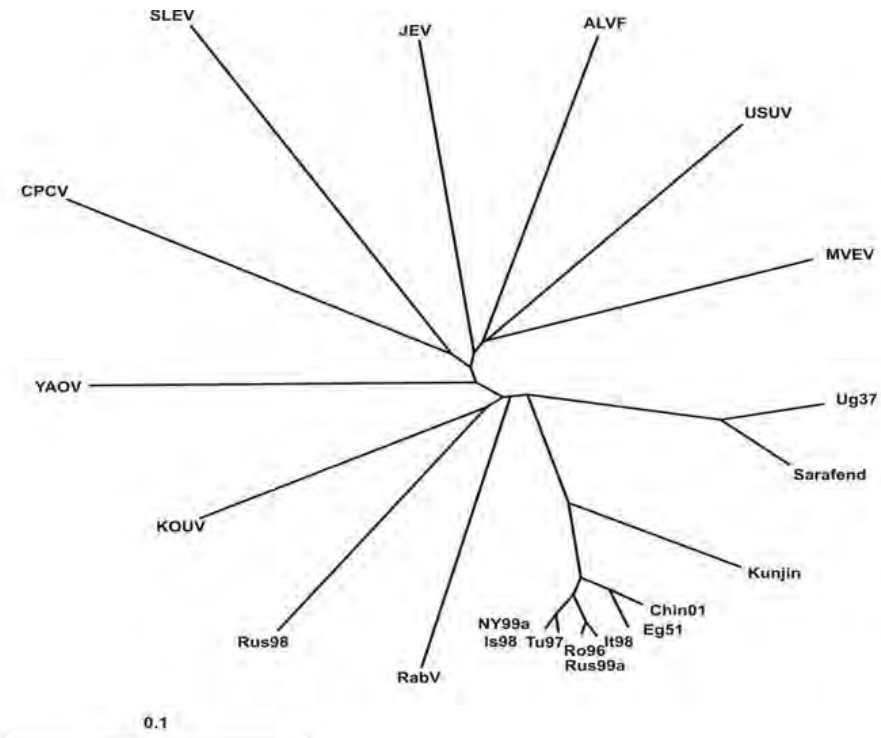
Main research topics:

- arboviruses (i.e. viruses transmitted by ticks, mosquitoes and other hematophagous arthropods, such as the West Nile, Sindbis, Tšahyňa, and tick-borne encephalitis viruses)
- spirochetes (*Borrelia burgdorferi*, the agent of Lyme borreliosis) and some other bacterial agents
- circulation of these pathogens in terrestrial and aquatic ecosystems under changing natural conditions including human impact
- application and optimization of a new molecular-biological methods for the detection and characterization of the pathogens studied
- free-living vertebrates and humans in relation to preventive medicine (human and veterinary), environmental protection, and nature conservation

Selected research results

Rabensburg virus: a new lineage of West Nile virus in central Europe

A flavivirus (strain 97-103) was isolated from *Culex pipiens* mosquitoes in 1997 following the flood in South Moravia, Czech Republic. The collection site was very close to the Czech-Austrian border, about 2 km away from the small Austrian town of Rabensburg. Consequently, the isolate 97-103 was tentatively called Rabensburg virus (RabV). The strain exhibited close antigenic relationship to West Nile virus (WNV) topotype Egyptian strain Eg-101 in cross-neutralization test. Experimental infection of laboratory mice showed a decreased peripheral pathogenicity of this isolate in comparison to the topotype strain. The complete nucleotide and putative amino acid sequences of isolate 97-103 were determined: it shares 75-77% nucleotide- and 89-90% amino acid identities with representative strains of WNV lineages 1 and 2. Another RabV strain (99-222) was isolated in the same location two years later; it revealed >99% nucleotide identity to strain 97-103 and similar characteristics of mouse pathogenicity. Phylogenetic analyses of these strains and other members of the Japanese encephalitis (JE) group demonstrated that RabV has to be considered either a new (third) lineage of WNV or even a novel flavivirus of the JE group. The complete genome sequence of RabV (flavivirus strain 97-103) has been deposited in the GenBank database under accession number AY765264.



Dendrogram of genomic relationships among representatives of the Japanese encephalitis virus group, including selected WNV strains, based on nucleotide sequences of the NS5 protein gene. Abbreviations of the viruses: JEV, Japanese encephalitis; ALFV, Alfuy; USUV, Usutu; MVEV, Murray Valley; UG37 and Sarafend, lineage 2 WNV strains; Kunjin, Chin01, Eg51, It98, Ro96, Rus99a, Tu97, Is98 and NY 99a, lineage 1 WNV viruses; RabV, our 97-103 strain of WNV; Rus98, a WNV-like strain isolated from from ixodid ticks in Russia; KOUV, Koutango; YAOV, Yaounde; CPCV, Cacipacore, SLEV, St. Louis encephalitis.

This study was funded by a grant of the Austrian Federal Ministry for Health and Women's Issues, and it was also supported by the Czech Science Foundation (206/03/0726).

- BAKONYI T., HUBÁLEK Z., RUDOLF I., NOWOTNY N., 2005: Novel flavivirus or new lineage of West Nile virus, Central Europe. *Emerging Infectious Diseases* 11: 225-231. Accessible at URL <http://www.cdc.gov/ncidod/EID/vol11no02/04-1028.htm>
- HUBÁLEK Z., HALOUZKA J., JUŘICOVÁ Z., ŠEBESTA O., 1998: First isolation of mosquito-borne West Nile virus in the Czech Republic. *Acta Virologica* 42: 119-120.
- HUBÁLEK Z., SAVAGE H.M., HALOUZKA J., JUŘICOVÁ Z., SANOGO Y.O., LUSK S., 2000: West Nile virus investigations in South Moravia, Czechland. *Viral Immunology* 13: 427-433.

The first evidence of Babesia microti (Piroplasmida: Babesiidae) in ixodid ticks in the Czech Republic

Babesiosis is an emerging, tick-transmitted zoonotic disease caused by intraerythrocytic parasites of the genus *Babesia*. These piroplasmas are transmitted by ixodid ticks and are capable of infecting a wide variety of vertebrate hosts which are competent in maintaining the transmission cycle. Babesiae include also at least three species pathogenic for humans (*Babesia bovis*, *B. divergens* and *B. microti*). *B. microti* is documented in several European countries in some species of small vertebrates (murine rodents). The occurrence of *B. microti* in *Ixodes ricinus* ticks has not yet been investigated in the Czech Republic. The purpose of our study was to determine the prevalence of *B. microti* in *I. ricinus* ticks in a selected area of South Moravia (Czech Republic), where Lyme disease is endemic. A total of 350 host-seeking nymphs of *I. ricinus* were collected during 2003 by flagging the vegetation. All tick specimens were frozen at -60°C until further processing. Immediately before DNA isolation, nymphs were pooled. All ticks were surface sterilized with 70% ethanol and mechanically disrupted using a glass microblender. The total genomic DNA was extracted with QIAamp DNA Tissue Kit. Polymerase chain reaction was processed using primers specific for the *B. microti* gene encoding small subunit rRNA. The assay revealed five positive pools (out of 70 pools examined), corresponding prevalence rate was 1.5%. Sequence analysis of the PCR products confirmed their 100% homology with that of *B. microti*. The prevalence of *B. microti* in *I. ricinus* found in this study is close to the infection rates reported in other European countries like Germany, Switzerland and Hungary. The study represents the first evidence of *B. microti* in ixodid ticks in the Czech Republic.

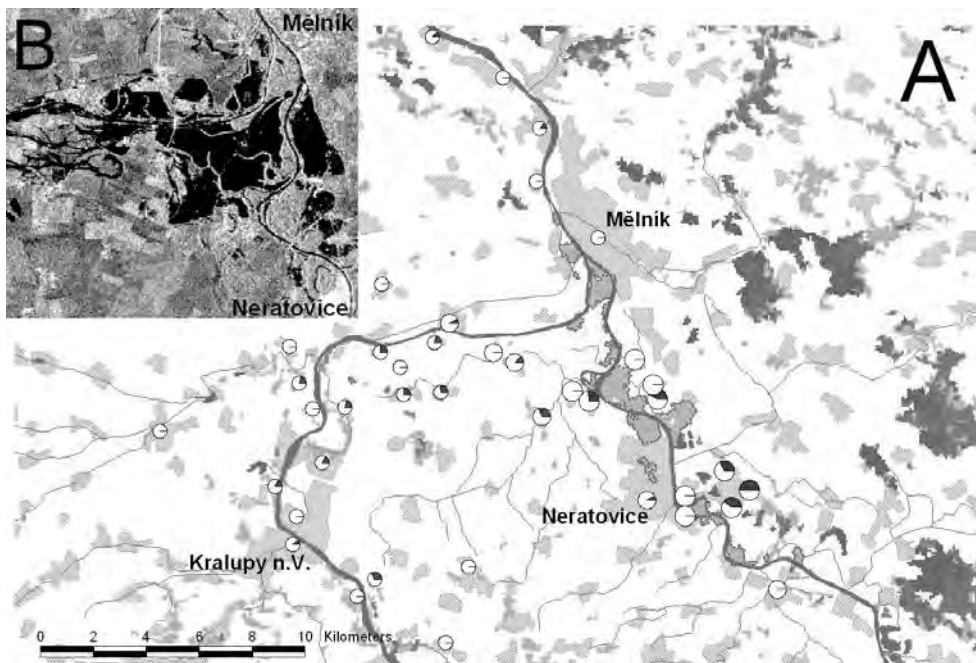
- RUDOLF I., GOLOVCHENKO M., ŠIKUTOVÁ S., RUCHENKO N., GRUBHOFFER L., HUBÁLEK Z., 2005: *Babesia microti* (Piroplasmida) in nymphal *Ixodes ricinus* (Acari: Ixodidae) in the Czech Republic. *Folia Parasitologica* (in press).

Applications of research results

Antibodies to mosquito-borne viruses in Central Bohemian human population in the area affected by the flood in the year 2002

In the Central Bohemia area affected by the flood of 2002, we screened 497 residents for antibodies against the mosquito-borne viruses Třahyňa (TAHV), West Nile (WNV), Sindbis (SINV) and Batai (BATV) using the haemagglutination-inhibition (HIT) and plaque-reduction neutralization (PRNT) tests. Blood samples were collected in September 2002 when the

mosquito populations showed the maximum density following the flood. We detected antibodies against TAHV (16.5% persons), SINV (1.4%) and BATV (1.4%). The seroprevalence of TAHV showed no association with gender, increased with age and correlated with the mosquito peri-residential challenge (5.0% residents seropositive in a mosquito-free control zone (mostly from the area of Prague), 14.7% in a mild risk zone, 20.5% in a moderate-risk zone, and 28.0% in the most heavily mosquito-infested risk zone). The highest TAHV seropositivity rate (>25%) we found amongst the inhabitants of the villages Obříství, Kozly, Tuhaň, Chrást, Chlumín and Hostín. Paired blood samples we obtained from 150 persons at a 6-month interval: an infection episode with TAHV during or after the flood was clearly evidenced in one person living in Obříství, and less convincing findings of recent TAHV infections we found in three residents of Chlumín and Obříství (seroconversion and/or significant antibody titres increase detected in HIT only). This serosurvey indicated the existence of an active natural focus of TAHV infection stretched along the Labe river nearby Neratovice, and a low TAHV activity area along the lower reaches of the Vltava river. An increased population density of mosquitoes after the flood may have boosted the incidence of mosquito-borne virus diseases, particularly TAHV fever in Central Bohemia. An optimum prophylactic strategy to control these diseases would be epidemiological surveillance (including monitoring of both the density of mosquitoes and the rate of infection with viruses in natural foci) with following antiepidemic measures such as integrated mosquito control.



Potential foci of mosquito-borne virus diseases in the Mělník area – floodplain forests identified on Landsat MSS satellite images (red dotted line) – with hydrology and settlement in background, and the proportion of TAHV-seropositive residents at particular localities (large, medium and small circles indicate sites placed to the risk zone A, B and C, respectively). Insert B: a radar satellite image of the confluence of the rivers Labe and Vltava on August 17, 2002 shows the extent of floodwater (dark areas) two days after the flood culmination; inundated forests with subsequent massive occurrence of *Aedes* mosquitoes are visible as light areas surrounding the river Labe upstream of the conflux, and scattered lagoons seen in fields along both rivers far left and right turned to breeding sites of predominantly *Culex* mosquitoes.

- HUBÁLEK Z., ZEMAN P., HALOUZKA J., JUŘICOVÁ Z., ŠTOVÍČKOVÁ E., BÁLKOVÁ H., ŠIKUTOVÁ S., RUDOLF I., 2004: Antibodies against mosquito-borne viruses in human population of an area of Central Bohemia affected by the flood of 2002. *Epidemiologie, Mikrobiologie, Imunologie*. 53: 112–120.
- HUBÁLEK Z., ZEMAN P., HALOUZKA J., JUŘICOVÁ Z., ŠTOVÍČKOVÁ E., BÁLKOVÁ H., ŠIKUTOVÁ S., RUDOLF I., (in press): Mosquitoborne viruses, Czech Republic 2002. *Emerging Infectious Diseases*.

International cooperation

Emmonsiosis in subterranean mole rats

Subterranean rodents are burrowing mammals that find their food and spend most of their life underground. These remarkable rodents have sporadically (Spalacidae) or never (Bathyergidae) been examined for emmonsiosis (adiasporomycosis), a typical sapronosis occurring in rodents and less often in other animals, including man. The disease is caused by soil fungi of the genus *Emmonsia*, anamorphs of the genus *Ajellomyces* belonging to the family Ajellomycetaceae of the ascomycetaceous order Onygenales. The presence of adiaspores of the fungal genus *Emmonsia* was examined in the lungs of 85 mole rats representing three subterranean genera: blind mole rats (*Spalax galili* and *S. golani*) from Israel, Ansell's mole rats (*Cryptomys anseli*) from Zambia, and silvery mole rats (*Heliophobius argenteocinereus*) from Malawi and Zambia. Emmonsiosis (caused by *E. crescens* and *E. parva*) was found in 28% of the blind mole rats. All the Ansell's mole rats showed emmonsiosis (*E. parva*), whereas none of the silvery mole rats was infected. The study indicates that the perennial burrow system of the Ansell's mole rat forms an appropriate microhabitat for the saprophytic growth of *E. parva* and a potential source of emmonsiosis in the Lusaka region, Zambia. The striking difference between the two African mole rat genera (*Cryptomys*, *Heliophobius*) in prevalence of emmonsiosis can be explained by their diverse types and longevity of burrows (proximate cause) and differing social life strategies (ultimate cause).

This study was supported by a joint project of the DAAD - Academy of Sciences CR Programme.

- HUBÁLEK Z., BURDA H., SCHARFF A., HETH G., NEVO E., ŠUMBERA R., PEŠKO J., ZIMA J. (in press): Emmonsiosis in subterranean mole rats from the Spalacidae and Bathyergidae families. *Medical Mycology*.

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Research priorities

The studies are performed on both laboratory and natural populations. Empirical data supplemented by simulation modelling are used to discuss important questions of evolutionary biology, such as (model organisms given in parentheses):

- hybrid zones as barriers against gene flow and their role in speciation (*Mus*, *Sorex*, *Triturus*)
- study of factors affecting population dynamics (*Sorex*, *Microtus*, *Clethrionomys*)
- links between life history traits and population dynamics in small mammals (Arvicolinae)
- locomotion pattern differences in long bone biomechanics among past human populations (*Homo*)
- analysis of reproductive success by using DNA markers (paternity analyses), population dynamics and sex ratio problems in mammals, population genetics of endangered vertebrate species
- mechanisms and evolution of thermal physiology traits in ectotherms (*Triturus*)
- functional approaches in studying morphological adaptations (*Zootoca*, *Triturus*)

The results of these studies are used in preparing recommendations for nature conservation, rodent pest control, lecturing at universities in Prague, Brno, Olomouc and Plzeň.

Department has its own website, which can be accessed at <http://www.studenec.ivb.cz/>.

Selected research results

Sexual head size dimorphism in lizards: test of two alternative hypotheses

Zootoca vivipara is a small viviparous lizard with sexual dimorphism in head size. As ultimate causes of sexual differences in head size are considered either non-sexual selection (intersexual food competition) or sexual selection (competition over mates). We tested whether bigger head in males affects results of male-male contests and duration of mate searching, handling and copulation under laboratory conditions. Winners of male-male interactions had larger heads than losers. Males with larger heads successfully grasped a female faster than those with smaller heads. It follows that head size in males may affect reproductive success through direct and indirect intrasexual competition over mates. This suggests that sexual selection maintains the extent of sexual head size dimorphism in this species.

GVOŽDÍK L., VAN DAMME R., 2003: Evolutionary maintenance of sexual dimorphism in head size in the lizard *Zootoca vivipara*: a test of two hypotheses. *Journal of Zoology* 259: 7–13.

Postprandial thermophily in the Danube crested newt, Triturus dobrogicus

As a part of a wider study on thermal physiology of newts, preferred temperatures were compared between fed and fasted newts with respect to their locomotor activity in an aquatic thermal gradient (5–32.5°C). Locations and locomotor activity of 17 newts in postabsorptive phase were recorded over 24 h. Nine randomly chosen newts were fed (10% of their body mass) and behaviour of all newts was recorded over the next 24 h. Fasted newts preferred similar water temperatures during periods of both locomotor activity and inactivity. Newts preferred 2–3°C higher water temperatures after feeding irrespective of the behavioural state.

This provides (i) some evidence for coadaptation between thermoregulatory behaviour and thermal physiology in these species and (ii) important data for comparative analyses of this phenomenon from a little studied lineage of ectotherms.

GVOŽDÍK L., 2003: Postprandial thermophily in the Danube crested newt, *Triturus dobrogicus*. *Journal of Thermal Biology* 28: 545-550.



Horizontal thermal gradient (5 - 32.5°C) for measuring temperature preferences in aquatic animals.

B* chromosomes in wood mice, genus *Apodemus

The genus *Apodemus* is well known for the presence of B chromosomes which are supernumerary to the standard karyotype. Bs were reported in six species, *A. peninsulae*, *A. agrarius*, *A. sylvaticus*, *A. flavicollis*, *A. mystacinus*, *A. argenteus*, with high frequencies of Bs particularly in *A. peninsulae* and *A. flavicollis*. In the latter species, we found a significant relationship between the mean number of B chromosomes and body mass in males but not in females in a population from northern Bohemia. This is the first study indicating a heterotic effect of Bs on fitness, possibly in relation to survival during winter. However, this relationship could not be confirmed in a Polish population of the same species, in which also no measurable effect of Bs on overall genetic variability was revealed. Thus, it seems that the pattern of evolutionary dynamics of Bs can be distinctly different between geographical populations, and both the parasitic and the heterotic models can be applied to explain the maintenance of Bs in different populations.

ZIMA J., MACHOLÁN M., PIÁLEK J., 2003. Possible heterotic effects of B chromosomes on body mass in a population of *Apodemus flavicollis*. *Canadian Journal of Zoology* 81: 1312-1317.

WÓJCIK J.M., WÓJCIK A.M., MACHOLÁN M., PIÁLEK J., ZIMA J. 2004. The mammalian model for population studies of B chromosomes: the wood mice (*Apodemus*). *Cytogenetic and Genome Research* 106: 264-270.



C-banded karyotype of a specimen of *Apodemus flavicollis* with two B chromosomes.

Variability of mating systems in Apodemus mice

Promiscuity and monogamy are two extremes of fitness optimisation. Direct evidence for both extremes is documented in numerous studies where a measure of promiscuity / monogamy is often the number of fathers in individual litters using, for example, fragment analysis of highly polymorphic microsatellite loci. In this study, five known polymorphic microsatellite loci were used to assess biological parentage of 174 embryos of 24 pregnant females from a natural Czech population of pygmy field-mice *Apodemus microps* Kratochvíl et Rosický, 1952. The results revealed that the majority (67%) of litters were fathered by single males. However, there was a trend showing that the number of males successively (but not significantly) increased during the season, thus suggesting that monogamy in the pygmy field mouse is not obligatory but may depend on a population density and habitat type.

BRYJA J., STOPKA P., (in press): Facultative promiscuity in a presumably monogamous mouse *Apodemus microps*. *Acta Theriologica*.



H. Patzenhauerová, an undergraduate of Masaryk University studying inter- and intraspecific variation in mating systems of wood mice (genus *Apodemus*) in the molecular laboratory at Studenec.

Human Mobility in Central European Late Eneolithic and Early Bronze Age: Cross-sectional Geometry

Some scholars explain the absence of settlements in the Bohemian and Moravian Late Eneolithic (Corded Ware archaeological culture) as a consequence of pastoral subsistence with a high degree of mobility. However, recent archaeological studies argue that the archaeological record of the Late Eneolithic in Central Europe exhibits evidence for the sedentary subsistence with mixed agriculture similar to the subsequent Early Bronze Age. Since the archaeological data do not allow us to address unambiguously the mobility pattern in these periods, we used cross-sectional analysis of the femoral midshaft to test mobility directly on the human skeletal record. The results of the femoral midshaft geometry do not support a high degree of mobility in the Late Eneolithic in Central Europe. The conclusion is supported mainly by no significant differences in male groups between the Late Eneolithic and Early Bronze Age in mechanical robusticity and shape of the femoral midshaft. However, the Late Eneolithic females have significantly higher torsional and overall bending rigidity in the femoral midshaft because of a significantly higher medio-lateral second moment of area. This finding cannot be directly linked with the higher degree of long distance mobility for these females. A significant difference was also found in overall decrease of size parameters of the femoral midshaft cross-section for one of the Early Bronze Age sample, the Wieselburger females. Since the decrease of size and mechanical robusticity for Wieselburger females does not correspond with the parameters of the Early Bronze Age females, we can expect a mosaic pattern of changes during the Late Eneolithic and Early Bronze Age period instead of a simple unidirectional (diachronic) change of the mechanical environment.

SLÁDEK V., BERNER M., SAILER, R., (in press). Mobility in Central European Late Eneolithic and Early Bronze Age: Femoral Cross-sectional Geometry. *American Journal of Physical Anthropology*.

Applications of research results

Optimisation of a capillary electrophoresis single-strand conformation polymorphism (SSCP) analysis for MHC (major histocompatibility complex) genotyping

Analysis of a single strand conformation polymorphism (SSCP) using capillary electrophoresis (CE) is a novel method to study polymorphism of DNA sequences in large scale population studies. We optimised CE-SSCP analysis to study the major histocompatibility complex (MHC) Class II DQA gene polymorphism. Short-chain linear polyacrylamid (6%) as sieving matrix, TrisCl (pH 8.5) as buffer for sample dilution, and 27°C, 9 kV as electrophoresis parameters were suitable for sufficient resolution of all alleles using high throughput MegaBACE genetic analyser. By comparing results obtained by cloning-sequencing methodology and by CE-SSCP we found that almost 28% of clones contained a PCR artefact and strict criteria have to be applied when using cloning and sequencing to analyse the allelic diversity of MHC genes.

BRYJA J., GALAN M., CHARBONNEL N., COSSON J.F., 2005: Analysis of major histocompatibility class II gene in water voles using capillary electrophoresis-single strand conformation polymorphism. *Molecular Ecology Notes* 5: 173–176.

International cooperation

Behavioural and genetic analysis of a prezygotic isolation mechanism in house mice

Previous behavioural studies using inbred lines have suggested that the gene (*Abpa*) for the alpha subunit of salivary androgen-binding protein (ABP) plays a role in prezygotic isolation between house mouse (*Mus musculus*) subspecies. We tested this hypothesis in animals from wild allopatric (121 individuals from four samples) and parapatric (320 animals from 15 samples) populations sampled on the Czech–Bavarian transect across the hybrid zone between *M. m. domesticus* and *M. m. musculus*. The study did not reveal a consistent significant trend of homosubspecific preferences in individual allopatric and parapatric populations. Nonetheless, the whole pattern of preference was skewed toward homosubspecific preference mostly on the *M. m. musculus* side of the hybrid zone. The pattern of homosubspecific preferences was stronger for the time spent sniffing than it was for the first choice of the signal (the ratio of homosubspecific vs. heterosubspecific preferences for both sexes was 6 : 2 in allopatric and 21 : 9 in parapatric populations, while the same rates were 4 : 4 and 16 : 14 for the first choice). To the extent that Y-maze tests reflect preference under wild conditions, we suggest that this slight preference may not in itself be sufficient to impede gene flow between the two subspecies and thus act as a reproductive barrier. ABP most probably participates in a complex system of subspecies-specific recognition in the hybrid zone, but the picture is far too complex at this time to allow a conclusive evaluation of the importance of this role.

This study was supported by the National Research Council, USA, within the programme Collaboration in basic science and engineering (COBASE).

BÍMOVÁ B., KARN R.C., PIÁLEK J., 2005: The role of ABP in reproductive isolation between two subspecies of house mouse: *Mus musculus musculus* and *Mus musculus domesticus*. *Biological Journal of the Linnean Society* 84: 349–361.

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Research Priorities

The research of fishes is performed at various levels of spatial and biological organization (individual, population, and community), in relation to distribution, biology, ecology and diversity. The study reflects the heterogeneity of aquatic environment, both in term of habitats and microhabitats, and the biodiversity between and within species. Fishes are considered to be complex bioindicators of degradation as well as regeneration of aquatic habitats. Accordingly, a number of activities is aimed at restoring and revitalizing of aquatic ecosystems.

Main research topics:

- diversity of fish communities and population parameters of key species in various types of aquatic habitats
- genetic diversity of fish populations

- rehabilitation of aquatic habitats and ecosystems for restoration and conservation of fish biodiversity
- biology and conservation management of threatened species
- alien invasive species and their impact on native fish biodiversity

Selected research results

Distribution and genetic characteristics of gudgeon species in the Czech Republic and Slovakia

Although of no economic importance, gudgeons are an important component of fish communities in streams. The goal of our investigations was to review data on the distribution of *Gobio* spp. in the Czech Republic and Slovakia, to assess their intraspecific diversity and interspecific relationships. We used standard karyological methods, allozyme analysis by means of starch electrophoresis, the RAPD method, and direct sequencing of DNA markers (mtDNA D-loop, 726 bp, and nDNA S7 ribosomal protein gene, 521 bp).

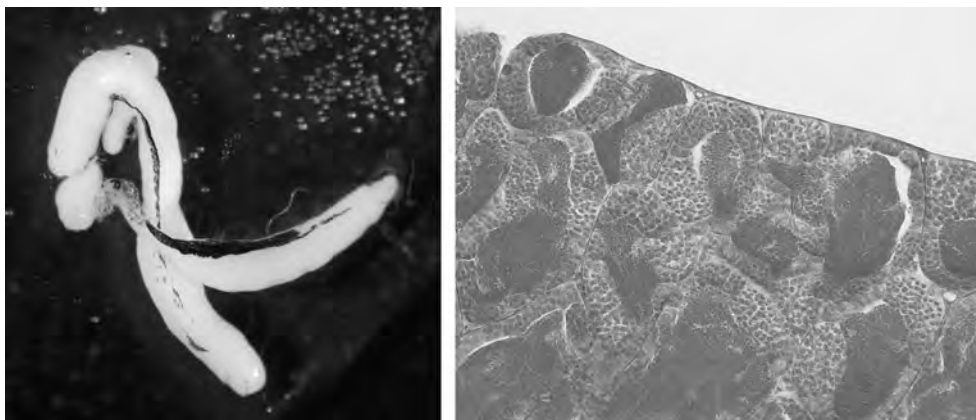
In the course of the past 50 years, the original ranges of *G. kesslerii* and *G. uranoscopus* and, to a smaller extent, *G. albipinnatus* decreased dramatically. Except for *G. gobio*, the remaining three species enjoy national and European protection. Their occurrence was thoroughly studied within the NATURA 2000 Programme and the so-called pSCI territories were proposed.

Karyological analyses confirmed $2n=50$ chromosomes in all the gudgeon species studied. Minor interspecific differences in the centromeric position in certain chromosomes corroborated the previously published data. Using specific enzyme staining, we evaluated allozyme paternity in 14 enzyme systems comprising 20 loci. The greatest polymorphism was found in *G. gobio*. The intraspecific diversity of *G. gobio*, determined on the basis of allozymes, was the highest in populations inhabiting the Black Sea hydrological system. We have ascertained diagnostic alleles that can reliably identify the four species under study and their hybrids. Factorial and cluster analyses of allozyme paternity enabled to identify the species status in all specimens examined, and the geographical origin from particular hydrological systems in specimens of *G. gobio*. In populations of *G. gobio*, the same results were obtained from dendrograms derived from D-loop sequences. The study of seven RAPD primers yielded eight characteristic fingerprints and 40 diagnostic markers that reliably identified the populations under study. Intrapopulation variability detected by the mtDNA marker was higher than the nucleic one; the highest variation was found in *G. gobio*. Phylogenetic dendrograms expressing the relationships within the genus *Gobio*, obtained from D-loop and S7 analyses, define three basic species groups, viz. (I) *G. gobio*, (II) *G. kesslerii*, and (III) *G. albipinnatus* + *G. uranoscopus*.

The values of interpopulation variability, detected by means of mean interspecific divergences of D-loop and S7 sequences, did not support the inclusion of *G. albipinnatus* and *G. kesslerii* in a separate genus *Romanogobio*.

- CALLEJAS C., LUSKOVÁ V., OCHANDO M.D., 2004: A contribution to the genetic characterisation of some species of the genus *Gobio*. *Folia Zoologica* 53: 433–436.
- KOŠČO J., LUSK S., HALAČKA K., LUSKOVÁ V., KOŠUTH P., (in press): Distribution of species of the genus *Gobio* in the Tisza River drainage area, Slovakia. *Folia Zoologica*.
- LUSK S., HALAČKA K., LUSKOVÁ V., HORÁK V., MENDEL J. (in press): Distribution of *Gobio* species in the Czech Republic. *Folia Zoologica*.

- MENDEL J., LUSKOVÁ V., HALAČKA K., LUSK S., VETEŠNÍK L., (in press): Genetic diversity of *Gobio gobio* populations in the Czech Republic and Slovakia, based on RAPD markers. *Folia Zoologica*.
- ŠANDA E., LUSKOVÁ V., VUKIČ J., (in press): Notes on the distribution and taxonomic status of *Gobio gobio* from the Morača River basin (Montenegro). *Folia Zoologica*.
- ŠLECHTOVÁ V., LUSKOVÁ V., ŠLECHTA V., LUSK S., HALAČKA K., (in press): Intraspecific allozyme diversity of *Gobio gobio* in Czech nad Slovak rivers. *Folia Zoologica*.



The gonad (total view and microscopic section) of a triploid male *C. auratus*.

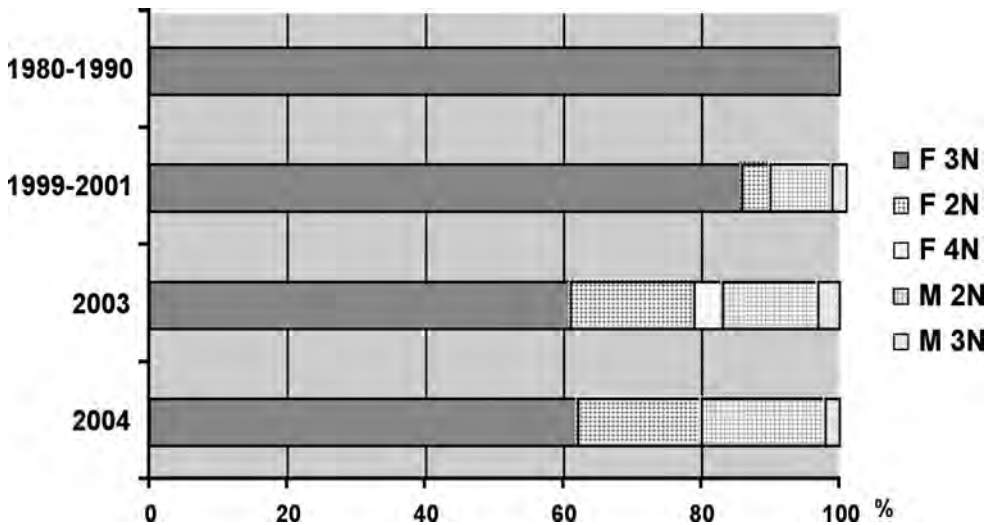
Transformation of the sexual and ploidy status of Carassius auratus populations in the Czech Republic

In recent years, radical changes have appeared in Czech populations of *Carassius auratus*. The initial populations which invasively occupied the waters of this country consisted of triploid females that reproduced gynogenetically. In the course of the past 10–15 years the original character of the populations changed into mixed bisexual populations consisting of individuals showing various ploidies. In the area of confluence of the Morava and Dyje rivers, invaded by *C. auratus* in the 1970s, the first males occurred in the late 1990s. Since that time the populations have been dynamically changing to the mixed type, characterised by a diploid-polyploid complex. The initially absolute prevalence of triploid females is gradually decreasing in favour of diploid individuals of both genders. Metapopulations inhabiting individual localities show considerable differences, however.

At the same time, the reproduction strategy is changing and besides gynogeny bisexual reproduction also appears. The complicated transformation process has been studied through artificial reproduction experiments since 2002. The results obtained suggest different reproduction strategies of certain groups of individuals within the given diploid-polyploid complex, and even within one ploidy group. Besides diploid females giving progeny with conspecific males, there also were females capable of producing interspecific hybrids or even reproduce gynogenetically. Deviation have been demonstrated in triploid females with presumably gynogenetic reproduction, giving only male triploid progeny: the progenies of some of the triploid females contained large percentage of triploid males; other females, having spawned with a diploid conspecific male, produced diploid progeny containing both sexes.

Division of individual *C. auratus*, based on ploidy alone, is too rough and does not reveal the actual conditions within a population. The use of new genetic-molecular methods will probably permit to differentiate individuals more precisely, e.g. on the haplotype level. This should explain the changes in the sexual and ploidy status within the diploid-polyploid complex in *C. auratus*. This part of the biology of *C. auratus* is immediately connected with its reproduction strategy, and it may be among the important causes of the successful expansion of its range.

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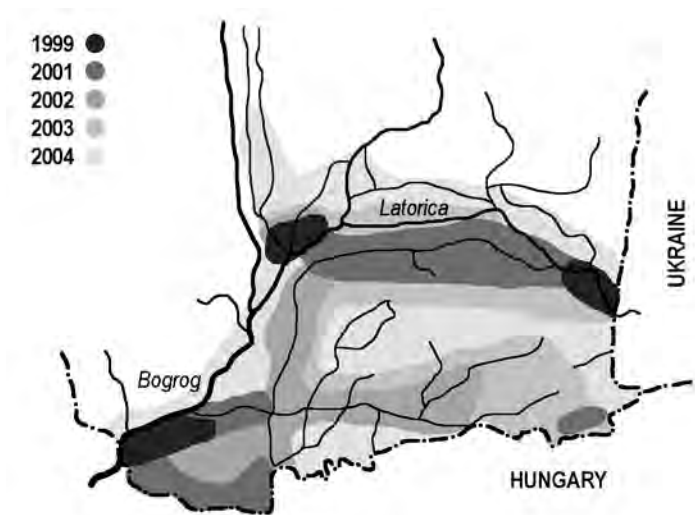
Development of sexual and ploidy composition of the *C. auratus* population in the area of confluence of the Morava and Dyje rivers. N - haploid chromosome number, F - females, M - males.

Alien fish species and native ichthyofauna

Non-native fish species are considered to present a significant risk for the native ichthyofauna. The period of headlong introductions of novel species in the 20th century is followed by a period of recognising the risks of such introductions for the native taxa. In the Czech Republic, around 35 cases of intentional introductions of non-indigenous species were recorded. Most of them, however, were unsuccessful due to various circumstances. Full naturalisation, i.e. the establishment of permanent populations maintained by natural reproduction, was only successful in *Carassius auratus*, *Ameiurus nebulosus*, and *Pseudorasbora parva*. *C. auratus*, a typical invasive species, occupied all suitable habitats and abundant populations occurred in the major rivers (the Morava, Dyje, Labe, and Odra). The occurrence of another seven non-native species depends on artificial reproduction and stocking in natural habitats. Most of these species are reared for fishery production. The recent occurrence of novel, non-indigenous fish species in Slovakia (*Perccottus glenii*, *Ameiurus melas*, etc.) through

natural migration indicates that the invasion of the Czech territory by such alien species can be expected later. This is confirmed by the occurrence of *Carassius auratus*, which invaded our parts of the drainage areas of the Morava and Dyje rivers through natural migration from the Danube via the Slovakian-Austrian section of the Morava River in 1975. This species distinctly devastated the indigenous *Carassius carassius* populations and negatively affected those of *Tinca tinca*. In most cases, man plays an intentional or unintentional role in the dispersion of such species, above all, helping them overcome barriers between drainage areas.

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 KOŠČO J., LUSK S., HALAČKA K., LUSKOVÁ V., 2003: The expansion and occurrence of the Amur sleeper (*Percottus glenii*) in eastern Slovakia. Folia Zoologica 52: 329–336.
 LUSK S., KOŠČO J., LUSKOVÁ V., HALAČKA K., KOŠUTH P., 2004: Alien fish species in the floodplains of the Dyje and the Bodrog rivers. Ecohydrology & Hydrobiology, 4: 199–205.



Invasive dispersal of *Percottus glenii* over the Latorica, Bodrog and Tisza river basins, eastern Slovakia.

Red list of lampreys and fishes of the Czech Republic

At present, the ichthyofauna of the Czech Republic includes 4 species of lampreys and 55 species of fishes. In recent years, the number of native species increased by three more species, viz., *Sander volgensis*, *Gymnocephalus baloni*, and *Proterorhinus marmoratus*, which penetrated the drainage areas of the Morava and Dyje rivers through natural migration from the Danube. These species are autochthonous in central Europe and therefore we consider them native even in the Czech Republic.

At present, according to the criteria of the IUCN, version 3.1, two lamprey species and six fish species are evaluated as „regionally extinct“. Most of these taxa are denoted as anadromous. One species has been classified in the category as „Extinct in the wild“. Two lampreys species and 25 fish species are considered to be endangered to various extent: one lamprey and 10 fish species are classified as „Critically endangered“; one lamprey and five fish species as „Endangered“; ten species as „Vulnerable“.

In the course of the past two centuries, attempts have been made at introducing about 35 fish species, of these, the introduction of 11 species can be evaluated as successful. Only four non-native species have established stable and naturally reproducing populations in natural conditions.

LUSK S., HANEL L., LUSKOVÁ V., 2004: Red List of the ichthyofauna of the Czech Republic: Development and present status. *Folia Zoologica* 53: 215–226.



Electrofishing at Svätá Mária in eastern Slovakia.

Associations between fish reproductive cycle and the dynamics of metazoan parasite infection

The seasonal cycle of the cestode *Proteocephalus sagittus* (Cestoda: Proteocephalidae) was studied for the first time in the stone loach *Barbatula barbatula*. The parasite occurred in loaches throughout the year but infection parameters differed significantly among seasons, with the highest values of prevalence and abundance from the late winter to the early summer. The rate of infection of loach with *P. sagittus* was neither dependent on the sex nor on the size of its fish host.

The prevalence of infection of *Raphidascaris acus* in *B. barbatula* ranged from 73.3 to 100% throughout the year. The abundance and the mean intensity of infection also varied with a peak in September. Larvae were located mainly in the liver parenchyma. High numbers of larvae and their migration through the tissue caused cyst- or abscess-like formations in the host parenchyma. The severity of the disease condition ranged from mild to severe.

The potential effect of the reproductive investment of the host, measured by gonad mass and gonado-somatic index (GSI), on the parasite infection was tested against the prediction that, during periods of high reproductive investment, the fish are more susceptible to parasite infection. The values of GSI showed a pattern of energy accumulation in the pre-reproductive period and at the beginning of breeding, a decrease during breeding and an increase in the post-breeding period. A similar pattern was observed for parasite abundance, a strong or weak increase in spring and/or autumn and a decrease during summer (July and August). Our results suggest that stone loach females are more susceptible to parasite infection in periods of higher reproductive investment. The parasite life cycle could be synchronized with the beginning of host reproduction, probably induced by increasing fish hormone levels in spring.

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Characteristics of population biology of the barbel, Barbus barbus, in Europe

An experiment with individually-tagged barbel, *Barbus barbus*, from the Jihlava river resulted in the assessment of survival and abundance. On the basis of known survival rate, the abundance was subsequently estimated. Using the Petersen capture-recapture method the mean value reached 303 110 individuals per hectare (minimum 195, maximum 498 ind.ha⁻¹). The Jolly-Seber method gave a mean 425 120 ind.ha⁻¹ and a range 233–563 ind.ha⁻¹. The abundance showed a significant tendency to increase during the four-year survey, which is in an accordance with the long-term changes observed in the dynamics of the fish community in this stream.

From the individually tagged and recaptured barbel from the same river stretch, 70,47% were considered as „resident“ because they were always recaptured in the same, relatively restricted (250–780 m) stream section, which always contained a pool and was demarcated naturally by riffles on both edges. The remaining 44 recaptured specimen (29.53%) belonged to the „mobile“ part of population, their movements encompassing two (or exceptionally more) adjacent stream sections and at maximum distance of 1680 m downstream or 2020 m upstream. The proportion of mobile barbel, relatively low in smaller and middle size classes, increased in the largest size classes (451–550 mm of SL). In the river stretch studied, with a rich patchy heterogenous habitat and well developed rifle-pool-raceway structure, each section (pool) can be considered as a more or less isolated spatial unit containing its own, and in a certain degree, isolated component of a metapopulation.

The similar results of mainly sedentary life of barbel, as recorded in submountain stretches of the Jihlava river, were also observed in the mesotrophic chalkstream in England.

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- PEŇÁZ M., SVOBODOVÁ Z., BARUŠ V., PROKEŠ M., DRASTICHOVÁ J., (in press): Endocrine disruption in a barbel, *Barbus barbus* population from the River Jihlava, Czech Republic. *Journal of Applied Ichthyology*.
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Applications of Research Results

Impact of extreme floods on fishes in rivers

The catastrophic floods that affected extensive regions of the Czech Republic in 1997, 1998, and 2002 revived the nearly forgotten natural phenomenon closely connected with streams. Floods do not appreciably affect native riverine fish species; they are rather beneficial for them. We observed the significantly decreased numbers only in benthic species confined to the river bottom (*Barbatula barbatula*, *Cottus gobio*) or of those living directly inside bottom sediments (*Lampetra planeri*, *Cobitis* spp.). Flood water discharges cause marked movements of bottom sediments and materials. Where the flood water could cover the adjacent floodplains,

we recorded only minimum damage to the river bed as well as minimum changes of the local fish stocks.

The floods caused subsequent losses and mortality of fish in places from which the fish were unable to return to streams with the retreating water. The greatest losses affected fish washed out of fishponds and reservoirs. Fishes washed out of the fishponds in southern Bohemia (above all, carp) largely accumulated in the lower lying valley reservoirs on the Vltava river, and this was subsequently reflected in the increase of their bags.



Flood on the Dyje River.

Flood water discharges also increased the diversity in most canalised streams. In a number of sections the streams returned to their original beds; numerous sections distinctly resumed their previous natural conditions. In such “revitalised” sections, the initial species composition of the fish stocks was restored within 2–3 years. The flood water discharges also caused a significant “recovery” of river bottoms by removing organic and silt sediments, rinsed the sand and gravel banks, and washed away noxious alien materials. New gravel and sand banks and dunes formed in the river beds gave rise to rapid sections showing specific streaming. This created conditions favouring successful reproduction of bottom-spawning fish species, as well as favourable conditions for species selecting habitats in such rapid stream sections (*Zingel streber*, *Gobio albipinnatus*, *Gobio kesslerii*, etc.).

In view of the native fish stocks in streams, floods cannot be considered as strictly negative phenomenon, as their positive consequences are distinctly predominant.

LUSK S., HARTVICH P., HALAČKA K., LUSKOVÁ V., HOLUB M., 2004: Impact of extreme floods on fishes in rivers and their floodplains. *Ecohydrology & Hydrobiology* 4: 173–181.

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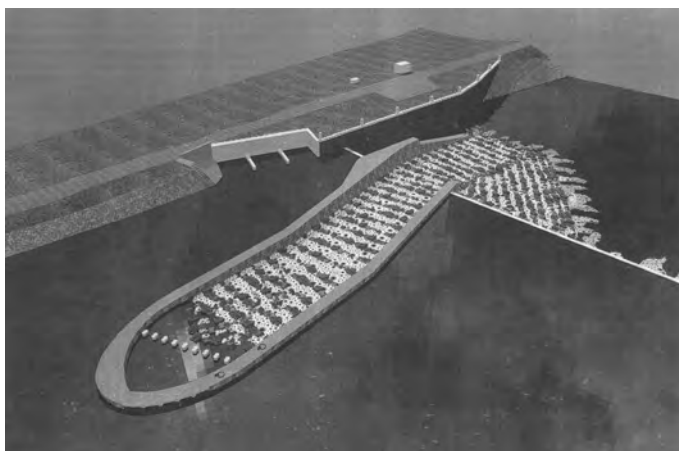
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Permeability of barriers on streams for migrating fish

In the Czech Republic, the river network, initially permeable for migrating fish, has been fragmented by various types of dams, weirs, and chutes to the extent that these constructions have become a serious obstacle preventing the renewal of the natural function of streams. Making migration barriers permeable for fish is an important political aspect in EU countries. It has become a part of the government resolution underlying the “Action plan for the construction of fish ladders” on the major streams in this country. At present, this

construction has become one of the major topics of revitalisation activities. The costs of the construction of fish ladders are ever increasing, now attaining around 30–60 million CZK annually. It is inevitable that these objects are functional, permitting free migration of fish along the longitudinal profile of the streams. Their projection must respect the biological requirements of fishes. Defining and including this aspect in the projection system of the fish ladders is one of the practical outputs of ichthyological research. It enjoys eminent interest of the Ministry of Environment of the Czech Republic (Agency for Nature and Landscape Protection) as well as the Ministry of Agriculture of the Czech Republic (the “River Authority” enterprises). In the case of small streams, we have taken part in elaborating a technical norm for the projection and construction of implements that will enable the fish to overcome such obstacles. Investigations carried out on concrete fish ladders make it possible to specify the drawbacks that limit their functionality. The results obtained are applied in implementation of projects within the “Fish Ladders Commission” at the Agency for Nature and Landscape Protection in Prague.

ERLICH P., LUSK S., FREMROVÁ L., PALSER J., 2003: Implement permitting migration of fishes and other aquatic animals over the obstacles on small streams. Technical norms of water management, No. TNV 75 2322.



A model of the fish ladder on the Dyje river in Břeclav.

Growth of Siberian sturgeon *Acipenser baerii*; morphometry and growth of sterlet *A. ruthenus*

In the five-year culture of the Siberian sturgeon and sterlet in Czech fish farms, the greatest increase in total length and mass growth rates was observed to occur in the first year (means 310–420 mm of total length and 120–257 g of mass by *A. baerii*; 295 mm and 147 g by *A. ruthenus*). A lower growth rate was found during subsequent years of life (reaching the means 800–1200 mm and 2500–3000 g in the fifth year of life by *A. baerii*; 505 mm and 530 g by *A. ruthenus*, respectively). On the basis of summarised growth, condition and production results, both sturgeon species can be considered to be appropriate for intensive aquaculture. However, the Siberian sturgeon is, due to its high resistance and higher growth rate, a more productive species. Sterlet, our native species, can be applied as material for stocking into running waters of the Czech Republic. A comparative analysis of sixteen morphometric characters between

the three different juvenile population of sterlet (Serbian wild population of the Danube River, and from two aquaculture stocks in the Czech Republic originating from Slovakian part of Danube River and from Russia) lead to conclusion that significant differences exist in seven morphometric characters. The two populations reared in aquaculture consistently showed lower morphological variability than the wild population.

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- PROKEŠ, M., BARUŠ, V., PEŇÁZ, M., BARÁNEK, V., OŠANEC, J., ŠUTOVSKÝ, I., 2003: Biomorphometry and growth rate of the sterlet (*Acipenser ruthenus*) in the Czech Republic. In: Švátora, M. (ed.), Sb. VI. česká ichtyologická konference. UK Praha, pp. 81-86.
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International Cooperation

Status of populations of the genus Cobitis in Slovakia

We investigated the species status of populations of *Cobitis* sp. in Slovakian waters. Until recently, the populations of this species were classified as *Cobitis taenia*. Genetic and karyological analyses of 15 populations have shown that *C. taenia* does not occur in the hydrological system of Slovakia. Five populations in the Danube drainage area were identified as hybrid diploid-polyploid complex *Cobitis elongatoides* x *C. tanaitica*. Five populations in the Slaná river drainage area were found belonging to the diploid species *Cobitis elongatoides*. Specimens of four populations of the Bodrog river drainage area were analyzed and assessed as hybrid diploid-polyploid complex *C. elongatoides* x *C. tanaitica*. Similarly, a hybrid complex of analogical karyological characteristics was recorded in the Tisza river drainage area.

These studies are based upon international bilateral cooperation with the Department of Ecology, University of Prešov, Slovakia.

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Research Priorities

The principal aim of the department is to investigate the biology and ecology of fishes. Research is conducted to evaluate and develop appropriate sampling and censusing techniques for fishes, perform behavioural studies and identify the ecological requirements of fishes in a variety of aquatic habitats. Research combines field studies, laboratory experiments and modelling to understand and predict the effects of environmental effects (river channelisation, habitat enhancement, artificial flooding, natural variation in river discharge) and biotic interactions (competition, predation, parasitism) on reproduction and recruitment in fishes. The results of many of our studies have wide implications for fisheries and wildlife management and conservation.

Thus, there are seven main programmes of research for the department:

- 0+ juvenile fish community structure in lowland rivers and their flood plains
- optimisation of methods for 0+ juvenile fish sampling
- impacts of metazoan parasites on 0+ juvenile fish development
- relationships between fish and their predators (otters)
- behavioural and evolutionary ecology of bitterling
- adaptation and coevolution of bitterling and their mussel hosts

Selected Research Results

The role of larval trematodes in the biology of fish host

In parasites with complex life cycles, especially trematodes and cestodes, fish often serve as the intermediate hosts. Completing of parasite life cycle also includes consuming of these infected fish by definitive host, which can be predatory fish, fish eating birds or mammals. Generally in the case of intermediate hosts, changes in host biology and behaviour associated with the parasite infection have been suggested as adaptive to facilitate transmission of parasite with complex life cycle to a definitive host.

As a model parasite organism, we investigated metacercariae of trematode *Posthodiplostomum cuticola* (family Diplostomatidae) and their effect on fish intermediate host. In our study area, *P. cuticola* is a common parasite of freshwater fish known as the agent of black-spot disease. This parasite has been considered as a pathogenic agent especially for early juvenile fish hosts. Although *P. cuticola* is known as a parasite infecting wide range of cyprinid fish, we found its tendency to infect primarily fish of the subfamily Leuciscinae. In selected leuciscine species we investigated the effect of parasite infection on the growth of juvenile fishes. Higher values of standard length and body weight of parasitized individuals than those of non-parasitized fish were obvious in fish before wintering, while in overwintered fish these differences disappeared. In addition, maximum enhanced growth of parasitized fish was found in months with low zooplankton densities, whilst the difference in growth between parasitized and non-parasitized fish was lower when zooplankton was abundant.

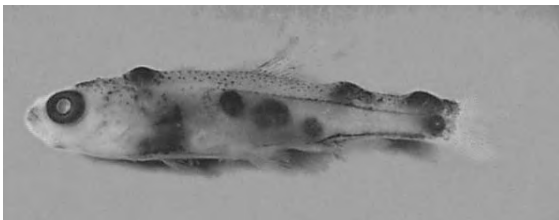
Then we studied the role of *P. cuticola* in regulation of fish population. During the years with low fish reproduction, high infection parameters of the *P. cuticola* infection could affect the survival of the 0+ fish indirectly by increased predation. Furthermore, in years with suitable conditions for fish reproduction (i.e. spring flood); the density of aquatic snails and wading birds (first and definitive hosts of *P. cuticola*) also increases. In spite of high infection parameters, the 0+ fish abundance at the end of the first growing season remained still high. Thus, in years with high fish reproduction, the infection of *P. cuticola* has a negligible direct or indirect effect on the fish population dynamics.

ONDRAČKOVÁ M., REICHARD M., JURAJDA P., GELNAR M., 2004: Seasonal dynamics of *Posthodiplostomum cuticola* (Digenea, Diplostomatidae) metacercariae and parasite-enhanced growth of juvenile host fish. *Parasitology Research* 93: 131-136.

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JURAJDA P., ONDRAČKOVÁ M., REICHARD M., 2004: Managed flooding as a tool for supporting natural fish reproduction in man-made lentic waterbodies. *Fisheries Management and Ecology* 11: 237-242.



Juvenile roach *Rutilus rutilus* infected with metacercariae of *Posthodiplostomum cuticola*.

Efficiency of electrofishing techniques on river beaches

Point abundance sampling (PAS) by electrofishing has become a widespread method for 0+ juvenile fish sampling. Its efficiency, however, appears to be reduced on river beaches as fish are easily startled while using common PAS electrofishing on this type of the habitat. We compared efficiency of three PAS electrofishing techniques on river beaches: direct electrofishing (DE, the common technique of PAS electrofishing), thrown anode electrofishing (TE) and remote electrofishing (RE). During DE, the operator immerses an anode fastened on an extension pole. During TE, the anode is thrown at a distance from the bank. During RE, a prepositioned anode is activated after allowing sufficient time for fish to recolonize the area.

We found that both DE and TE disturbed fish and that fish tended to escape, thereby reducing efficiency of these techniques (they were only 30% as efficient as RE). As a consequence, RE caught more species per locality. All three techniques yielded significantly different estimates of the assemblage structures (in terms of relative abundances of most abundant species). These differences were probably caused by disturbing the fish during DE and TE. No significant difference was found in size structures of assemblages obtained by the three techniques. RE seems to be the most suitable PAS electrofishing technique for sampling 0+ fish assemblages on sandy river beaches and if its time consumption could be reduced, it would be also the most suitable for monitoring surveys.



PAS electrofishing techniques: direct, thrown anode and remote electrofishing.

JANÁČ M., JURAJDA P., (in press): Inter-calibration of three electric fishing techniques to estimate 0+ juvenile fish densities on sandy river beaches. *Fisheries Management and Ecology*.

JANÁČ M., JURAJDA P., 2004: Comparison of efficiency of different electrofishing techniques for juvenile fish estimates on river beaches. In: XI European Congress of Ichthyology. Abstract volume, p 52.

Applications of Research Results

Monitoring of 0+ juvenile fish in the Czech Republic

Since 1999, a monitoring program of young-of-the-year fish in selected profiles of the river network of water quality program in the Czech Republic is provided under the coordination by Water Research Institute TGM Praha. Central database is operated by the Czech Hydrometeorological Institute. Monitoring of the fish populations including the young-of-the-years age category were provided in the Elbe River basin, in a case of implementation of the Water Framework Directive by Ministry of Environment of the Czech Republic.

P. JURAJDA, M. JANÁČ, Z. VALOVÁ AND M. ONDRAČKOVÁ



Common electrofishing technique.

*Non-invasive genetic sampling in Eurasian otter (*Lutra lutra*)*

Within the study of the relationship between otter numbers and fish productivity, a new non-invasive genetic method was used to estimate numbers and population structure of otters in two different habitats. The method is based on DNA typing of otter faeces using microsatellite and SRY markers, and can provide identification of individuals, their sex and relatedness, estimates of population size and the level of genetic polymorphism, all without direct contact with the animals. The project is conducted in cooperation with the Czech Otter Foundation Fund, Czech Republic and the Administration of the Slovenský Raj National Park, State Nature Conservancy of the Slovak Republic. The results are being used by the Agency for Nature Conservation and Landscape Protection of the Czech Republic and State Nature Conservancy of the Slovak Republic. The method is proposed as one of research and monitoring methods for otter populations within a prepared Otter Action Plan for the Czech Republic.

HÁJKOVÁ P., BRYJA J., ZEMANOVÁ B. & ZIMA J., (in press): Testing the methodology of microsatellite DNA typing of spraints for studying otters in the Czech and Slovak Republics. Proceedings of European Otter Conference, Isle of Skye, Scotland, UK, 30. 6.-5. 7. 2003.

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International Cooperation

Sexual selection and mating tactics in the European bitterling

Bitterlings (Acheilognathinae) are freshwater cyprinid fishes that evolved an unusual spawning symbiosis with living freshwater mussels. During the spawning season, male bitterling establish small territories around mussels and court females. Females inspect the mussel and, if they decide to spawn, they insert their long ovipositor deep inside the mussel gill cavity through the mussel's exhalant siphon and lay a small batch of eggs. Males fertilize eggs by releasing the

sperm over the inhalant siphon of the mussel, so that water filtered by the mussel carries the sperm to the eggs and they are fertilized inside the mussel's gill.

Sperm competition in the European bitterling is very high and many males engage in sneaking fertilization, when one male releases sperm into a mussel guarded by another male. Some males do not establish their own territory and instead mate by sneaking fertilizations. However, territorial males often also engage in sneaking in adjacent territories and the chosen tactic is largely opportunistic, with no distinction between territorials and sneakers. We studied individual and population consequences of those male mating tactics and found that male-male interference competition over the access to mussel and sperm competition may considerably decrease female spawning rate. The effects increased with male density, but – at the highest male density we investigated – territoriality broke down, fish switched from pair to group spawnings, and this stabilized spawning rate.

We then investigated the effects of male density on relative success of male mating behaviours and found that the reproductive success of territorial males (measured as proportion of offspring they fathered) decreased with male density, being equal to the success of intruding sneaker males at the highest density. Notably, this corresponded with a switch from pair to group spawning. Both territorial and sneaking males often release their sperm before a female lays her eggs and the capacity to outcompete other males before a female spawns was the best predictor of male reproductive success.

In other studies, we also compared sperm quality of territorial and sneaker males; and attempted to untangle the relative roles of male-male interference competition and female choice in the reproductive success of male European bitterling, using paternity assignment by microsatellite markers.

REICHARD M., BRYJA J., ONDRAČKOVÁ M., DÁVIDOVÁ M., KANIEWSKA P., SMITH, C., 2005: Sexual selection for male dominance reduces opportunities for female mate choice in the European bitterling (*Rhodeus sericeus*). *Molecular Ecology* 14: 1533–1542.

REICHARD M., SMITH C., JORDAN W.C., 2004: Genetic evidence reveals density-dependent mediated success of alternative mating behaviours in the European bitterling (*Rhodeus sericeus*). *Molecular Ecology* 13: 1569–1578.

REICHARD M., JURAJDA P., SMITH C., 2004: Male-male interference competition decreases spawning rate in the European bitterling (*Rhodeus sericeus*). *Behavioral Ecology and Sociobiology* 56: 34–41.

SMITH C., REICHARD M., JURAJDA P., PRZYBYLSKI M., 2004: The reproductive ecology of the European bitterling (*Rhodeus sericeus*). *Journal of Zoology* 262: 107–124.

SMITH C., REICHARD M., JURAJDA P., 2003: Assessment of sperm competition by the bitterling (*Rhodeus sericeus*). *Behavioral Ecology and Sociobiology* 53: 206–213.



A pair of European bitterling *Rhodeus sericeus* at spawning.

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Research priorities

Our research focuses on understanding the ecological and evolutionary basis of reproductive strategies. Important goals of our research are to identify the ecological factors that promote parasitic reproductive behavior, predator avoidance and nest predation. We conducted studies adopting the adaptationist and optimality approach of behavioural ecology to examine fitness costs and benefits of various characters in bird populations. We are also studying differentiation of selected European passerines using ringing recoveries and stable isotopes for identifying the migratory divide within species and analysis of mtDNA sequences for a phylogeographic population structure. Further we aim at understanding the evolution and signalling function of secondary male ornaments in birds.

Selected research results

Edge effect on nest predation and viability of avian populations in mosaic landscapes

Habitat fragmentation may have a negative impact on bird populations by increasing nest predation along disruptive habitat edges. We evaluated the generality of the "edge effect on nest predation" hypothesis using artificial and natural nests of model species (*Carpodacus erythrinus*, *Tetrao tetrix*) in various habitat discontinuities in the Šumava Mts. National Park and in the Krušné Hory Mts. plateau. Predation rate on dummy nests (resembling black grouse nests) was low (17.7%) in the Krušné Hory Mts., and was similar among the three habitat types (young forest, mature forest, open habitats) and for edge and interior areas. This suggests that edge effect do not contribute to elevated predation on grouse nests. The resulting spatial pattern of artificial nest predation was further compared with the grouse occurrence. Predation pressure was lower in areas occupied by the grouse than elsewhere and our results thus do not support the ecological trap hypothesis for black grouse. Predation was the major cause of nest failure for scarlet rosefinches inhabiting wetland patches in the Vltava river valley, Šumava Mts. (92.3% of total nest losses). The most parsimonious model to explain variation in daily nest-survival rates (DSR) included nest concealment and distance to agricultural edge (nest survivorship: 41% for edge nests; 80% for interior nests, respectively). DSR were also consistently higher in large than in small wetland patches. Using habitat-specific demographic parameters, we found that mean per-capita annual productivity was 66.3% higher in core areas than in edge areas (≥ 100 m and < 100 m from an edge; 4.14 and 2.49 fledglings, respectively). Our results indicate that extensive and undisturbed interiors of wetland patches may provide surplus young to support the local rosefinch population ($\lambda > 1.0$), and perhaps act as a source area for other bird populations nesting here.

ALBRECHT T., 2004: Edge effect in wetland-arable land boundary determines nesting success of scarlet rosefinches, *Carpodacus erythrinus*, in the Czech Republic. *Auk* 121: 361–371.

SVOBODOVÁ J., ALBRECHT T., ŠÁLEK M., 2004: The relationship between predation risk and occurrence of black grouse (*Tetrao tetrix*) in a highly fragmented landscape: An experiment based on artificial nests. *Ecoscience* 11: 421–427.

ŠÁLEK M., SVOBODOVÁ J., BEJČEK V., ALBRECHT T., 2004: Predation on artificial nests in relation to the numbers of small mammals in the Krušné Hory Mts., the Czech Republic. *Folia Zoologica* 53: 312–318.

Escape decisions in incubating female mallards

In cryptically coloured birds, remaining on the nest despite predator approach (risk-taking), the likelihood that the nest will be detected and current reproductive attempt lost may decrease. By contrast, flushing may immediately reveal the nest location to the predator. Escape decisions of incubating parents should therefore be optimized based on the risk-to-parent / cost-of-escape equilibrium. Animal prey may assess predation risk depending on a variety of cues, including the camouflage that vegetation provides against the predator. We examined interactive effects of nest crypsis and the current reproductive value of a clutch on flushing distances in incubating mallards (*Anas platyrhynchos*) approached by a human. Our results were consistent with predictions of parental investment theory: flushing distances were inversely correlated with measures of the reproductive value of the current clutch, namely with clutch size, stage of incubation and mean egg volume. Independently of a reproductive value of a clutch, nest concealment explained a significant portion of the variation in flushing

distance among females; individual females tended to increase/decrease flushing distances according to change in nest cover. The results further suggest that vegetation concealment greatly influenced the risk of nest detection by local predators, suggesting that vegetation may act as a protective cover for incubating female. A female's ability to delay flushes according to the actual vegetation cover might thus be viewed as an antipredator strategy that reduces premature nest advertising to visually oriented predators. We argue, however, that shorter flying distances from densely covered sites might be maladaptive in areas where a predator's ability to detect incubating female does not rely on visual cues of nests.

ALBRECHT T., KLVANA P., 2004: Nest crypsis, reproductive value of a clutch, and escape decisions in incubating female mallards *Anas platyrhynchos*. *Ethology* 110: 603-613.



Monitoring of the eviction of the cuckoo chicks - installation of a video camera.

Coevolution between hosts and their brood parasites

Successive adaptations and counteradaptations by avian brood parasites and their hosts provide some of the best examples of direct coevolution observed in nature. Among cuckoos successfully parasitized hosts often raise only the cuckoo young and have zero reproductive success. This creates conditions for coevolutionary arms race between hosts and parasites. Since there is strong selection for host discrimination of parasitic egg, we studied egg recognition ability of three passerines. Low variation within clutches facilitates discrimination of parasitic eggs, whereas high variation among clutches makes it harder for the cuckoo to mimic the eggs of a certain host species. Furthermore, the high and consistent rejection frequency of parasitic egg found for this species supports the spatial habitat structure hypothesis, which claims that woodland-nesting species breeding near trees, presumably experienced a high level of parasitism throughout their range in the past and, therefore, their rejection behaviour, once evolved, spread rapidly to all populations. On the other hand an intermediate rejecter of parasitic eggs as the reed warbler exhibited low aggression and non-specificity of host responses.

In brood parasites, knowledge of spacing behaviour, habitat use and territoriality may reveal cues about how parasites find and use their hosts. To study the use of space and habitat of European cuckoos, *Cuculus canorus*, we radio-tagged 16 females during four consecutive reproductive seasons. We hypothesized that during the laying period cuckoo females should (1) use habitats selectively, and (2) attempt to monopolize potential egg laying areas to reduce competition for host nests. Our data are consistent with the first hypothesis: the use of pond edges compared to forest and transitional habitats was significantly greater than expected from the habitat availability in the total area and within individual female home ranges. This results has been supported by microsatellite DNA markers which were used to investigate parentage relationships in a population of common cuckoo *Cuculus canorus*. Thirty adults and 55 nestlings were genotyped at six loci from blood samples collected over a four-year period. To test whether each cuckoo female specialises in parasitising one single host species (Host Preference Hypothesis), the maternal relationships were used to record each female's host choice. The results supported the Host Preference Hypothesis since no female (N = 3) was recorded to have parasitised more than one of four congeneric host species breeding in the area. In contrast, the males (N = 4) did not show such specialisation since two of them sired offspring reared by different host species.

- HONZA M., GRIM T., ČAPEK M., Jr., MOKSNES A., ROSKAFT E., 2004: Nest defence, enemy recognition and nest inspection behaviour of experimentally parasitized reed warblers *Acrocephalus scirpaceus*. *Bird Study* 51: 256-263.
- HONZA M., PROCHÁZKA P., STOKKE BG., MOKSNES A., ROSKAFT E., ČAPEK M., Jr., MRLÍK V., 2004: Are blackcaps current winners in the evolutionary struggle against the common cuckoo? *Journal of Ethology* 22: 175-180.
- KLEVEN O., MOKSNES A., ROSKAFT E., RUDOLFSEN G., STOKKE R. G., HONZA M., 2004: Breeding success of common cuckoos *Cuculus canorus* parasitising four sympatric species of *Acrocephalus* warblers. *Journal of Avian Biology* 35: 394-398.
- PROCHÁZKA P., HONZA M., 2003: Do common whitethroats (*Sylvia communis*) discriminate against alien eggs. *Journal of Ornithology* 144: 354-363
- PROCHÁZKA P., HONZA M., 2004: Egg discrimination in the yellowhammer (*Emberiza citrinella*). *Condor* 106: 405-410.
- SKJELSETH S., MOKSNES A., ROSKAFT E., GIBBS H. L., TABORSKY M., TABORSKY B., HONZA M., KLEVEN O., 2004: Parentage and host preference in the common cuckoo *Cuculus canorus*. *Journal of Avian Biology* 35: 21-24.
- VOGL W., TABORSKY B., TABORSKY M., HONZA M., 2004: Habitat and space use of European cuckoo females during the egg laying period. *Behaviour* 141: 881-898



A clutch of the reed warbler (top) parasitized by the common cuckoo egg (bottom).

International cooperation

Avifauna of the Parížske močiare Marsh

Ornithologists from the University of Trnava (Slovakia), Institute of Vertebrate Biology AS CR Brno and Třeboň Basin Protected Landscape Area and Biosphere Reserve Administration worked in close collaboration on the monograph on birds of the National Nature Reserve Parížske močiare Marsh. The reserve is located in SW Slovakia and it is one of the country's largest wetlands. Many rare and protected plant and animal species can be found there. For example, it is the only known breeding place of moustached warbler *Acrocephalus melanopogon* in Slovakia, and compared with other wetlands, much larger populations of some marsh bird species occur there. The marsh is not only an important nesting but also wintering and roosting place for birds and a foraging or resting stop during their spring and fall migration as well.

The book is the first ever work to cover all the breeding, wintering and migrating bird species occurring in the reserve. It is based upon original results obtained during the field research in 1982–2002. Besides we also tried to utilise published articles on birds of the marsh as well as unpublished data from the very beginning of ornithological research in the locality since 1954. In this way, we present as complete data on individual bird species and bird communities as possible and cover the whole period of ornithological studies of the marsh.

The results obtained revealed both national and international significance of the marsh as a unique ornithological locality and necessity of its protection. The complex propositions of management submitted in this work should at least partially mitigate the impact of negative factors on the marsh, and thus to contribute to the improvement of conditions for a majority of bird species.

TRNKA A., ČAPEK M., Jr., KLOUBEC B., 2003: Birds of the National Nature Reserve Parížske močiare Marsh. Veda, Bratislava.



National Nature Reserve Parížske močiare Marsh (SW Slovakia).

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Research priorities

Research is focused on the ecology of selected mammalian groups. The results of investigations can improve management of forest stands, game management, rodent pest control, and protection of biodiversity.

Main research topics:

- feeding ecology of large herbivores and their impact on vegetation
- foraging ecology and anti-predator strategies of bats
- ecology and behaviour of large carnivores, and foraging ecology and distribution of mustelids
- synecology of small terrestrial mammals
- diversity and ecology of small mammals and ungulates of West Africa

Selected research results

Food ecology of large herbivores in the floodplain forest

The floodplain forests around the Morava River are remarkable from the point of view of forestry and nature conservation. The interests of ecologists, foresters, hunters and farmers interfere in this area, so it is desirable to study the relationships between deer and their habitat and consequently propose correct decisions in the game management. Food ecology of ungulates, red and roe deer, was not yet studied in the floodplain forest even though both species exert a substantial impact on vegetation structure, natural and artificial forest regeneration, and can cause considerable damage. The research was carried out to specify the role of deer in this habitat type. We analysed the annual diet composition of deer, their density and distribution in dependence to food supply in the forest and on the adjacent cultivated fields, and their browsing impact on woody plants in the shrub layer. We found that the deer density in this area is relatively high in comparison to other localities in the Czech Republic where similar research was carried out before. The browse of broad-leaved trees dominated in the diet of both species during whole year. The food sources on the arable fields were utilised only at the end of summer and formed only small part of the deer diet. The extent of their browsing impact was acceptable with regards to variable and nutritional food supply, and this conclusion suggests that the reduction of the game population is not currently required.

BARANČEKOVÁ M., 2004. The roe deer diet: is floodplain forest optimal habitat? *Folia Zoologica* 53: 285–292.
PROKEŠOVÁ J., 2004. Red deer in the floodplain forest: the browse specialist? *Folia Zoologica* 53: 293–302.



Data collecting in the floodplain forest.

Development of mountain forest habitats under ruminant influence

Mountain forests are very important type of habitat which contributes to maintain the biodiversity and ecological stability of landscape. Large herbivorous mammals are among the factors which influence regeneration of woody stands. Impact of deer species on the mountain forest stands was investigated in upper part of the Moravskoslezské Beskydy Mountains. Impact on vegetation was low and not dependent only on the herbivore density but also on other general environmental conditions as food supply. Forest conditions in the study area indicated the possibility to harmonize activity of foresters and game keepers in system of sustainable development of both the economic branches. Applying the progressive method of the diet quality analyses in ruminants contributed to better understanding of the intensity of impact on vegetation.

HEROLDOVÁ M., HOMOLKA M., KAMLER J., 2003: Breakage of rowan caused by red deer – an important factor for *Sorbeto-Piceetum* stand regeneration? *Forest Ecology and Management* 181: 131–138.

HOMOLKA M., HEROLDOVÁ M., 2003: Impact of large herbivores on mountain forest stands in the Beskydy Mountains. *Forest Ecology and Management* 181: 119–129.

KAMLER J., HOMOLKA M., KRÁČMAR S., 2003: Nitrogen characteristics of ungulates faeces: effect of time of exposure and storage. *Folia Zoologica* 52: 31–35.

KAMLER J., HOMOLKA M., PROKEŠOVÁ J., BARANČEKOVÁ M., 2002: Homogeneity of individual pellets in pellet groups: an important condition in herbivores' diet analyses. *Folia Zoologica* 52: 36–38.

KAMLER J., HOMOLKA M., ČIŽMÁR D., 2004: The suitability of NIRS analysis for estimating diet quality of free-ranging deer. *Wildlife Biology* 10: 235–240.

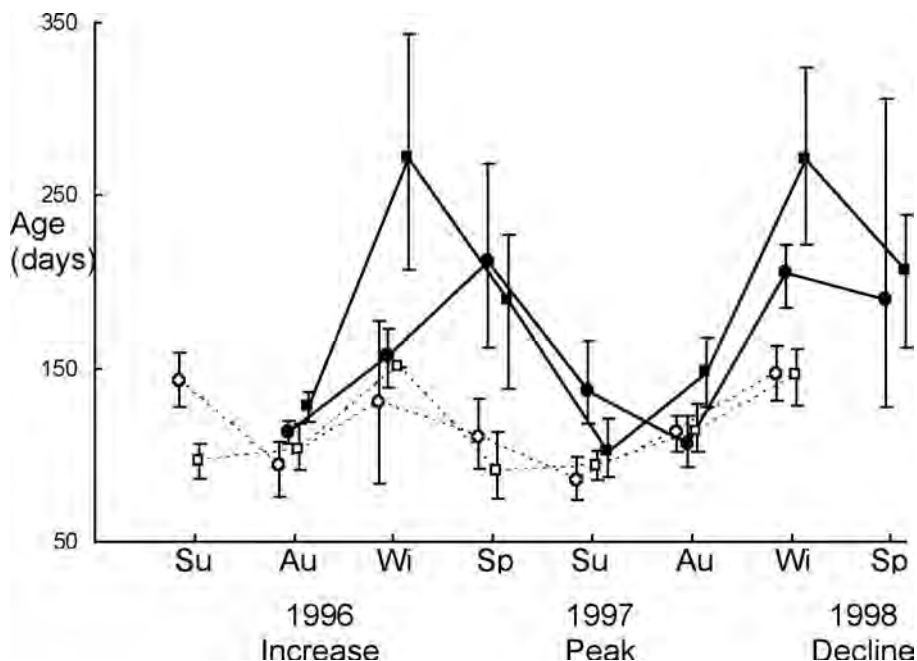


Breakage of rowan by red deer in the Moravskoslezské Beskydy Mts.

Age variation in a fluctuating population of the common vole

We analysed variation in age in a fluctuating population of the common vole (*Microtus arvalis*) in southern Moravia, to test the assumption of the senescence hypothesis that the age of voles increases with population density. Between 1996 and 1998, we monitored the demographic changes in a field population passing through the increase, peak and decline phase of the population cycle. We used eye lens mass method to determine the age in snap-trapped animals and those that died in live-traps. Winter males are clearly older after the peak breeding season than before it. No such phase-dependent shift in age, however, is observed in the female component. Males continue to grow old from autumn to spring over the pre-peak winter to achieve the oldest age in spring of the peak year. However, after the peak breeding season, the same age is already achieved in winter, with the decline males during the next spring tending to be younger. Females in spring populations are always younger than those in winter populations. Voles from livetraps are always older than voles from snaptraps, particularly in winter and spring populations, suggesting the presence of senescent animals. Although the density-dependent changes in age are consistent with those observed for other voles, they provide only weak evidence that population cycles in the common vole are accompanied by pronounced shifts in individual age, particularly in female voles. Besides age, the onset of senescence still has to be a function of other variables if senescence is to be of importance to vole population cycles.

Jánová E., Heroldová M., Nesvadbová J., Bryja J., Tkadlec E., 2003: Age variation in a fluctuating population of the common vole. *Oecologia* 442: 527–532.



Variation in pseudomedian age as revealed in male (circles) and female (squares) common voles by snap-trapping (open symbols, dashed line) and live-trapping (filled symbols, solid line). The pseudomedian (location parameter) for each sample is based on the ages re-calculated to the last day of a 3-month period. The bars indicate nonparametric 95% confidence intervals for the estimated pseudomedian.

Activity and ecology of bat hibernation in caves of the Moravian karst

The most of European bat species do not migrate during winter months but they stay near their summer roosts and hibernate in specific shelters. These shelters are mainly natural underground spaces (caves) and/or the localities with similar microclimatic conditions (abandoned mines, tunnels, large cellars etc.).

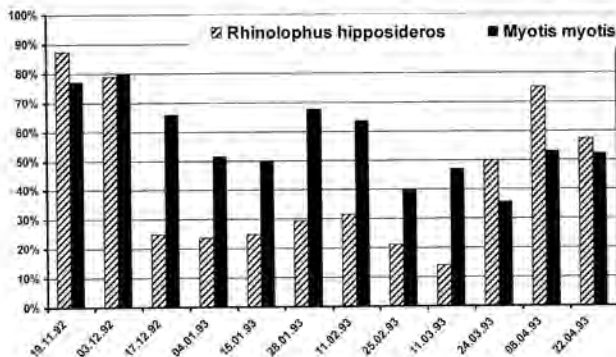
The movement activity during the hibernation period was studied in two bat species. The activity fluctuated in different ways and the hibernation period of *Rhinolophus hipposideros* could be divided into three different parts, while the level of *Myotis myotis* movement activity was relatively high during the whole season. The shelter selection of *R. hipposideros* was not dependent on the part of cave where the bats were hibernating, and it did not change during the season. Hibernating specimens of *R. hipposideros* used most frequently exposed places, in which they were always hanging free. *M. myotis* was recorded in all types of shelter. *R. hipposideros* is a highly specialized species which prefers parts of the cave with very stable conditions and, on the contrary, *M. myotis* appears to be indifferent to all parameters studied.

Second part of the research was aimed to assess the ecological (level of visits) and microclimatic parameters (temperature, humidity) of two natural caves in the Moravian Karst and their influence on hibernation of bats. *M. myotis* was selected as a model species. The results indicate that the bats used various strategies of hibernation (level of movement activity, preference of different types of shelters) in caves with different microclimatic profile (dynamic vs. stable). Additionally, the level of clustering behaviour is different (number, stability and size of clusters of hibernating bats). Used strategies always tended to the same target i.e. use of roost place with maximum stable microclimate during the late part of hibernation period. High fidelity of bats to the particular underground shelter also suggests that selected strategy of hibernation limits the bats in consecutive use of wintering sites.

STANĚK, D., 2005: Ecological aspects of bat hibernation in caves of the Moravian Karst. MSc. Thesis, Masaryk University, Brno, 97 pp.

ZUKAL, J., BERKOVÁ, H., ŘEHÁK, Z., 2005: Activity and shelter selection by *Myotis myotis* and *Rhinolophus hipposideros* in the Kateřinská cave (Czech Republic). Mamm. Biol.

ZUKAL, J., ŘEHÁK, Z., KOVAŘÍK, M., 2003: Netopyři Sloupsko - šošůvských jeskyní (Moravský kras). Lynx (Praha) n.s., 34: 205-220.



Changes in the level of movement activity in the lesser horseshoe bat (*Rhinolophus hipposideros*) and the larger mouse-eared bat (*Myotis myotis*).



A cluster of hibernating *Myotis myotis*

Applications of Research Results

Management plan of large carnivores (brown bear, wolf, lynx) in the Czech Republic

Populations of large carnivores were totally eradicated in the territory of the Czech Republic during the 18th a 19th century owing to human activities. Recolonization started by the migration from Slovak and Polish Carpathian mountains after the Second World War and lynx was reintroduced in 1980–1989 in the Šumava Mts. (southwestern Bohemia). Growing populations of all three species (*Ursus arctos*, *Canis lupus*, *Lynx lynx*) brings many problems in coexisting with a man. New situation calls for modern solution of management of large carnivores.

The Institute of Vertebrate Biology was asked by the Agency of Nature Protection of the Czech Republic to prepare, together with collaborators from other institutions, the main part of Management plan for the brown bear, wolf and lynx. This document will be published in 2005. The Management plan is divided into general and applied part and consist of taxonomy, description of species, historical and recent distribution in Europe and the Czech Republic, population development, habitat, reproduction, behaviour, feeding ecology, impact on population of ungulates, migrations, economy importance, human accidents, causes of threat, illegal hunting and overhunting, genetic isolation, hybridization, traffic and fragmentation of landscape, forestry, urbanisation and human recolonization of forest and mountain habitats, negative public meaning, legal and protection status, implementation of international conventions, Natura 2000, special and other protection, monitoring and research, public relations.

Management of the large carnivores in the Czech Republic is the most important document for the protection and wise sustainable use of natural resources.

KOUBEK P., ČERVENÝ J., BUFKA L., BARTOŠOVÁ D., 2004: Management plan of large carnivores (brown bear, wolf, lynx) in the Czech Republic 53 pp.



Wolf *Canis lupus*, a critically endangered species of the Czech Republic, rarely occurs in the Northeast part of the country.

International Cooperation

Domestic and wild ungulates: feeding interactions in Val Fontana (Italian Alps)

A study on feeding relations among different large ungulate species was carried out in a valley located in the Central Italian Alps (Val Fontana), covering an area of about 10 km² at 1500–2200 m a. s. l. Domestic ungulates (cattle, goat, sheep and donkey) and wild ungulates (chamois, red deer and roe deer) have been foraging in the studied biotope. The aim of the study was to get basic data on feeding ecology of domestic and wild herbivores, in order to contribute to understanding of sustainable pasture management in relation to the wildlife. Ungulates utilization of particular types of biotopes and their relative density were determined by evaluation of faeces distribution. Diet of individual species was studied by microscopical analysis of plant fragments in faecal samples. To estimate the impact of ungulates on forest regeneration, browsing intensity on some of the most common vegetal species was evaluated.

Analysis of individual ungulate species distribution showed that domestic ungulates utilized only a small part of the study area (< 10%), close to the bottom of the valley. In contrast to this, red deer and chamois used the whole valley relatively uniformly, from its bottom up to high alpine meadows. Herbivore diets can be divided into two groups. Roe deer and goat feed as browsers and the shoots of woody and semi-woody species prevail in their diet (> 70% of volume). Other species consumed mainly grasses (> 75% of volume). Within both groups the diets strongly overlapped (80%), but overlap between these groups was low (< 25%). Browsing of tree species within the area ranged by domestic species was very intensive in comparison to browsing in the area of upper tree line.

Feeding interactions between domestic and wild ungulates in the study area can be classified as an example of coexistence. In this situation, wild ungulates can avoid competition for food supply by using localities which are not accessible to domestic stock. Therefore we can presume that, in this situation, from the point of view of feeding interactions, domestic ungulates have no significant impact on wild ungulates.

This study was conducted within a bilateral collaboration with the University of Milan.

Homolka, M., Heroldová, M., Kamler, J. and Mattiello, S.



Summer range in Fontana Valley (Central Italian Alps) at an altitude of 1500 m a.s.l.
Domestic and wild ungulates are able to avoid competition for food resources in this area.

An introduced chimpanzee population in the Rubondo Island National Park, Tanzania

Forty years ago four groups of chimpanzees (*Pan troglodytes*) were introduced to Rubondo Island in Lake Victoria, Tanzania. Released ten females and seven males were wild born, originating from several western African countries. Contrary to other chimpanzee releases, there was no attempt to make social groups before the release, no pre-release rehabilitation, no post-release support apart from a small amount of initial provisioning and almost no monitoring in the following years. Despite these unfavourable factors, chimpanzees surprisingly survived and adapted to novel environment and they represent the only self-sustaining introduced chimpanzee population.

On-going research has showed that the chimpanzee population is totally reliant upon the islands natural vegetation for their subsistence and at least doubled in number over the last

30 years. Preliminary results indicated that chimpanzees have extremely wide ranging areas varying in overlapping home ranges of the two distinct groups. We measured the availability of potential chimpanzee foods. Chimpanzee food preferences were studied using direct observations and faecal analyses. Overall 38.7% of chimpanzee foods were lianas or climbing shrubs. Three of the five most frequently consumed foods were liana fruits. We suggest that liana food sources may have contributed to the self-sustaining nature of introduced chimpanzees. Distribution of lianas on the island can contribute to the atypically large ranging areas of these chimpanzees.

A pilot study indicated that parasite spectrum of Rubondo chimpanzees is different from other wild populations. We reported three new nematodes recorded for chimpanzees: *Protopirura muricola*, *Subulura* sp. and *Anatrichosoma* sp. It is surmised that *P. muricola* and *Subulura* sp. might be maintained by indigenous vervet monkeys (*Cercopithecus aethiops pygerythrus*), rodents and intermediate insect hosts; and *Anatrichosoma* sp. might also be maintained by vervets on the island. Low prevalence of *Subulura* sp. and *Anatrichosoma* sp. suggests a possibility that they were pseudoparasites obtained by ingesting contaminated food. The chimpanzee pinworm, *Enterobius (Enterobius) anthropopithecii* has been redescribed based on light and scanning electron microscopy of both sexes collected from the faeces of Rubondo chimpanzees.

MOSCOVICE L.R., PETRŽELKOVÁ K.J., ISSA M.H., HUFFMAN M.A., SNOWDON C.T., MBAGO F., KAUR T., SINGH J., GRAZIANI G. 2004: Role of lianas for introduced chimpanzees (*Pan troglodytes*) on Rubondo Island, Tanzania. *Folia Primatologica*, 75 (suppl 1): 308.

HASEGAWA, H., IKEDA, Y., FUJISAKI, A., MOSCOVICE, L.R., PETRZELKOVA, K.J., KAUR, T. & HUFFMAN, M.A. (in press): Morphology of chimpanzee pinworms, *Enterobius (Enterobius) anthropopithecii* (Gedoelst, 1916) (Nematoda: Oxyuridae), collected from chimpanzees, *Pan troglodytes*, on Rubondo Island, Tanzania. *Journal of Parasitology*.



Chimpanzee tracker Branaba and chimpanzee food, *Deinbollia fulvo-tomentella*.

INTERNATIONAL ACTIVITIES

The Institute's international collaboration is a very important part of its all research activities. Our scientists work in close collaboration and exchange their views with scholars from various institutions in many countries. In 2004, the Czech Republic became a member of the European Union. The membership enables us to find new research opportunities within the European Research Area, such as the Sixth Framework Programme. Each department is involved in various forms of international co-operation and we are currently participating in 18 international projects. We have been deriving much benefit from established links with foreign laboratories, however, we use any opportunity to find new contacts. The Institute organizes scientific meetings, offers study visits to foreign students and supports participation of our specialists in major scientific events abroad. Great emphasis is placed on young scientist-centred educational stays.

International scientific meetings organized by the Institute

- 4th European Congress of Mammalogy, Brno, Czech Republic, July 27–August 1, 2003

The 4th European Congress of Mammalogy was organized jointly by the Institute of Vertebrate Biology and the Faculty of Science of Masaryk University. This international congress of mammalogists from Europe and other continents continued the successful tradition of previous meetings organized under supervision of Societas Europaea Mammalogica and held in Lisbon, Southampton, and Jyväskylä.

The scientific programme of the congress was structured into 12 specialized symposia and four general sections. An important symposium was focused to evolutionary biology of populations of the house mouse, and its conclusions reflected the extraordinary significance of this model species in speciation and other evolutionary studies. The symposium was held in honour of the late French biologist, Louis Thaler, who contributed enormously to this research field, and it was supported financially by the OECD. Rich new data were presented in the symposium dealing with mammalian phylogeography, with special respect to evolutionary history and postglacial colonization in Europe. This theme was further investigated during a subsequent symposium of biogeographers and paleontologists, which addressed similar questions perceived from an independent approach. Much attention was paid to conservation of rare and endangered species at several other symposia held in the frame of the congress. A large symposium in this particular area dealt with conservation biology of the European otter, and it was combined with a meeting of members of the otter specialists group of the Species Survival Commission IUCN. Elaboration of action plans aimed at improving of conservation measures in various endangered mammalian species in Europe was the subject of another symposium.

A couple of symposia introduced various kinds of ecological studies into mammals. The major themes of these sessions included general problems of population dynamics,



reproduction tactics, and interspecific competition. The results presented in these symposia concerned both the theoretical aspects of ecology and practical implications of findings in the management of pest and/or game species. A separate symposium investigated the epidemiological significance of wild mammals in transmission of infectious diseases.

The daily programme of the congress was introduced by five invited plenary lectures that received much attention and vivid response. Luděk Bartoš from the Czech Republic spoke about fluctuation asymmetry and its role in sexual selection in deer. Bogumila Jędrzejewska from Poland provided new insights into evolutionary adaptation of species through biogeographical evaluation of environmental requirements of certain carnivores. The results of dispersal studies in populations of small mammals were the topic of the lecture presented by Xavier Lambin from Belgium. Jeremy B. Searle from Great Britain summarized the main findings achieved in studies of chromosomes and other molecular markers in relation to evolutionary history of the common shrew. The last plenary lecture was presented by Niels Christian Stenseth from Norway and reported on new data and concepts in studying variation in numbers of prey and predator.

The congress was attended by more than 400 participants from 38 countries. The participants enjoyed also the social programme that included a banquet held in the area of historical place of work of Gregor Mendel, the Augustinian monastery in Brno. A half-day excursion was guided to remarkable regions of southern Moravia and provided also the possibility to taste local Moravian wines.

The next European Congress of Mammalogy will take place in Italy in 2007.



Participants of a symposium dealing with biology and evolution of the house mouse.

- Zoological Days 2003, Brno, February 13–14 2003
- International Conference on the „Distribution, taxonomic and genetic status of the European species of the genus *Gobio*“, Brno, September 7–11, 2003 (co-organized with the Institute of Animal Physiology and Genetics AS CR Liběchov).
- Symposium „Biodiversity of fishes (IV)“, Brno, November 3, 2003
- Zoological Days 2004, Brno, February 12–13 2004

Participation in international conferences

- 9th International Helminthological Symposium, Stará Lesná, Slovak Republic, 9–13 June 2003
- European Otter Conference, Isle of Skye, Scotland, June 30–July 5, 2003
- Annual Meeting of the Fisheries Society of the British Isles, Norwich, United Kingdom, 30 June – 4 July 2003
- 4th European Congress of Mammalogy, Brno, Czech Republic, July 27–August 1, 2003
- 4th Conference of the European Ornithologist Union (EOU), Chemnitz, Germany, August 16–21, 2003
- ESEB IX, The Ninth Congress of the European Society for Evolutionary Biology, Leeds, United Kingdom, 18–24 August 2003
- International Workshop: Population genetics for animal conservation. Monte Bondone, Trento, Italy, September 4–6, 2003
- 6th International Symposium on Fish Parasites, Bloemfontein, South Africa, 22–26 September 2003
- Fauna Carpathica Meeting 2004, Smolenice, Slovakia, March 17–19, 2004
- XI European Congress of Ichthyology, Tallinn, Estonia, September 6–10, 2004
- Symposium on “Mechanisms of adaptation, genetic differentiation and speciation”. Tutzing, Germany, March 17–19, 2004
- 4th World Fisheries Congress, Vancouver, Canada, 2–6 May 2004.
- 9th International Otter Colloquium, Frostburg, Maryland, USA, June 4–10, 2004
- 9th International Conference on Rodent Biology Rodens et Spatium, Lublin, Poland, July 12–16, 2004
- 10th International Behavioral Ecology Congress, Jyväskylä, Finland, 10–15 July 2004
- XI. European Congress of Ichthyology, Tallin, Estonia, 6–10 September 2004

Membership in international organizations

ALBRECHT T.:	International Society for Behavioral Ecology (ISBE)
BARUŠ V.:	Sociedad Cubana de Parasitología Animal, honorary chairman
BRYJA J.:	Steering Committee of European Science Foundation
ČAPEK M.:	IOC Standing Committee on Ornithological Nomenclature
ČERVENÝ J.:	Ad Hoc Group for Environmental Problems of COST (Council for Research and Development, EU)
	Czech National Committee of the MAB Programme
	Working group for Large Carnivores Initiative for Europe
GVOŽDÍK L.:	American Society of Ichthyologists and Herpetologists
	American Society of Naturalists

British Herpetological Society
 Society for the Study of Amphibians and Reptiles
 Society for the Study of Evolution
 HONZA M.: Steering Committee of European Science Foundation
 JURAJDA P.: Fisheries Society of British Isles
 MRLÍK V.: Peregrine Fund, World Center for Birds of Prey
 Working Group for Montagu's Harrier
 World Working Groups on Birds of Prey and Owls
 KOUBEK P.: Working Group for Large Carnivores Initiative for Europe
 PIÁLEK J.: European Society for Evolutionary Biology
 International Mammalian Genome Society
 Societas Europaea Herpetologica
 Society for the Study of Amphibians and Reptiles
 Society for the Study of Evolution
 REICHARD M.: Association for the Study of Animal Behaviour
 British Ecological Society
 Fisheries Society of the British Isles,
 Neotropical Ichthyological Association,
 SLÁDEK V.: Paleoanthropology Society (USA)
 ZIMA J.: Czech National Committee of the IUBS
 International Advisory Board, BIOTER Centre of Excellence (EU)
 Insectivores Specialits Group SSC IUCN
 International Sorex araneus Cytogenetics Committee
 Rodents Specialists Group SSC IUCN,
 Societas Europaea Mammalogica

Membership in editorial boards

BARUŠ V.: Transactions of the Zoological Society of India
 Helminthologia
 BLAHÁK, P.: Folia Zoologica (managing editor)
 HONZA M.: Folia Zoologica
 HUBÁLEK Z.: Cryobiology
 Folia Parasitologica
 KOUBEK, P.: Folia Zoologica
 LUSK S.: Folia Zoologica
 PEŇÁZ M.: Folia Zoologica (editor-in-chief)
 Quaderni E.T.P. – Journal of Freshwater Biology
 Polskie Archiwum Hydrobiologii
 PIÁLEK J.: Folia Zoologica
 SLABÁKOVÁ H.: Folia Zoologica
 ZIMA J.: Hystrix – Italian Journal of Mammalogy
 Folia Zoologica
 Acta Societatis Zoologicae Bohemicae

EDUCATION AND TEACHING ACTIVITIES

The Institute lays great emphasis on education and teaching activities. In 2003–2004, we gave lectures at six universities and supervised 57 undergraduates and 47 postgraduates from ten universities. Another important fact is that 22 and 6 students supervised by the staff succeeded in obtaining their MSc and PhD degrees, respectively. We have accreditation from the Ministry of Education, Youth and Sports to perform post-gradual studies in zoology at the Faculty of Science, Masaryk University in Brno, and the Faculty of Biological Sciences, South Bohemian University in České Budějovice. We participate in research projects carried out in two joint laboratories, "Evolutionary Genetics of Animals" (established by the Department of Zoology, Faculty of Science, Charles University in Prague, the Institute of Animal Physiology and Genetics AS CR in Liběchov and the Institute of Vertebrate Biology in Brno) and "Ichthyoparasitology - The Centre of Basic Research" (established by the Faculty of Science, Masaryk University in Brno and the Institute of Vertebrate Biology in Brno). These laboratories provide a firm basis for better interaction between the Academy of Sciences ASCR and universities, which helps to make the institute attractive to students. Moreover, the scientists of the Institute are members of scientific councils and boards at universities.

Teaching at universities

Lecturer	Subject	2003 hours	2004 hours	Faculty/ University
J. Bryja	Population ecology	24	14	1
	Molecular ecology		24	1
M. Čapek	Ornithology	43	59	1
J. Červený	Field course in zoology	60	60	2
J. Halouzka	Animal physiology and general zoology	8	8	1
M. Honza	Ecology of birds		26	1
Z. Hubálek	Microbial zoonoses and sapronoses	30	30	1
	Fundamentals of microbiology	30	30	1
	Tutorials in microbiology	60	60	1
P. Jurajda	Ecology of fish		26	1
P. Koubek	Game biology		22	1
S. Lusk	Ichthyology	36	36	1
J. Mendel	Tutorials in general genetics	24	30	1
	Genetic ecotoxicology	6	20	1
M. Prokeš	Ichthyology	2	2	1
V. Sládek	Biological anthropology 2	54	54	4
	Biological anthropology for archeologists 1	65	65	4
	Biological anthropology for archeologists 2	65	65	4
	Human variability and adaptability	54	54	4
	Locomotor system 1		65	4
	Tutorials in anthropology	13	13	4
E. Tkadlec	Population ecology	45	45	5
	Scientific methodology	30	30	5
	Life history	30	30	5
	Tutorials (MSc and PhD students)	50	50	5
	Time series in ecology	15	15	5
L. Vetešník	Tutorials in ichthyology	56		3
J. Zima	Biodiversity	26+26	26+26	1,6
	Systematics and phylogeny of vertebrates	20	13	6

	Genetical methods in zoology	12	12	6
	Field course in zoology	42	42	6
J. Zukal	Behavioral ecology	45	45	1
	Chiropterology	22	22	1
Total 16	33	993	1119	7

¹ Faculty of Science, Masaryk University, Brno

² Department of General Zoology, University of Essen

³ Faculty of Agronomy, Mendel University of Agriculture and Forestry, Brno

⁴ Faculty of Humanities, University of West Bohemia, Plzeň

⁵ Faculty of Science, Palacký University, Olomouc

⁶ Faculty of Science, Charles University, Praha

Undergraduate students working in the Institute and/or supervised by the Institute's fellows in 2003–2004

Supervisor	Student	2003	2004	Defended the theses	Faculty/University
T. Albrecht	Javůrková V.		+		7
	Rozkošná P.		+		7
	Suvorov P.		+		7
	Vinkler M.		+		7
J. Bryja	Bémová P.	+	+		8
	Bencová V.	+	+		1
	Dařenová E.	+	+		1
	Konečný, A.	+	+		1
	Patzenhauerová H.	+	+		1
	Zemanová, B.	+	+		1
M. Čapek	Promerová M.		+		1
	Šašínková, R.	+	+	2004	1
J. Červený	Daniszová K.		+		7
	Kocurová, M.	+	+	2004	7
	Mrstný L.	+	+		9
L. Gvoždík	Nentvichová M.	+	+		9
	Dvořák, J.	+		2003	1
	Jambrich A.	+	+		10
J. Halouzka	Dančáková H.	+		2003	1
M. Homolka	Mařátková, K.	+	+	2004	6
M. Honza	Požgvaová M	+	+		1
	Rybaříková, J.	+	+		1
	Tlustá, Š.	+	+		1
Z. Hubálek	Janková J.		+		1
	Jrošová V.		+		1
P. Jurajda	Bendová, P.	+	+		6
	Kružiková, L.	+	+	2004	4
	Mazurová E.	+	+		1
	Polačík M.		+		1
J. Kamler	Babišová J.	+	+	2004	3
	Hrabec M.	+	+		3
P. Koubek	Cichová, D.	+		2003	1
	Kajfosz, R.	+	+	2004	3
V. Mrlik	Habartová, J.	+		2003	1

	Chadim, M.	+		2003	1
	Kučírek, J.	+	+	2004	1
	Sychra, J.	+	+	2004	1
J. Piálek	Božíková E.	+		2003	
	Dufková, P.		+		8
M. Prokeš	Baránek, V.	+	+	2004	4
	Šovčík, P.	+	+		4
V. Sládek	Ernestová, B.	+		2003	5
	Křížová, P.	+		2003	5
	Průchová, E.	+	+		5
E. Tkadlec	Adamík P.	+	+	2004	6
	Hladíková B.	+	+	2004	6
	Kubošová, K.	+	+	2004	1
	Lisická, L.	+	+	2004	6
	Michálek B.	+	+		6
	Paták, L.	+	+		6
	Thelenová, J.	+		2003	6
	Tkadlčíková, R.	+	+		6
	Vávra F.	+	+		6
	Zbořil, J.	+	+	2004	6
	Zifčák, P.	+	+		6
J. Zukal	Bednářová J.	+	+		1
	Franek J.	+	+		1
	Gryc L.	+	+		1
	Staněk D.	+	+		1
Total 18	59	48	50	23	10

¹ Faculty of Science, Masaryk University, Brno

² University of Essen

³ Faculty of Forestry and Wood Technology, Mendel University of Agriculture and Forestry, Brno

⁴ Faculty of Agronomy, Mendel University of Agriculture and Forestry, Brno

⁵ Faculty of Humanities, University of West Bohemia, Plzeň

⁶ Faculty of Science, Palacký University, Olomouc

⁷ Faculty of Science, Charles University, Prague

⁸ Faculty of Biological Sciences, University of South Bohemia, České Budějovice

⁹ Faculty of Forestry, Czech University of Agriculture, Prague

¹⁰ Faculty of Science, Komenský University, Bratislava, Slovakia

PhD students working in the Institute and/or supervised by the Institute's or other fellows in 2003–2004

Supervisor	Student	2003	2004	Defended the theses	Faculty/ University
J. Červený	Fejková P.	+	+		7
	Kocurová M.		+		7
	Městková L.		+		7
	Zachařová, J.	+	+		7
L. Gvoždík	Dvořák J.		+		1
	Hejtmánková M.		+		6
J. Halouzka	Šikutová, S.	+	+		1

M. Homolka	Prokešová, J.	+	+		1
M. Honza	Ležalová, R.	+	+		8
	Procházka P.	+	+	2004	7
	Šicha, V.	+	+		1
Z. Hubálek	Rudolf, I.	+	+	2004	1
P. Jurajda	Hájková, P.	+	+		1
	Janáč M.	+	+		1
	Polačík M.	+	+		1
	Valová, Z.	+	+		1
J. Koubek	Šuláková H.	+	+		4
	Barančeková, M.	+	+		1
	Honzírek J.	+	+		3
	Nováková M.	+	+		1
	Šuláková H.	+	+	2004	4
	Vallo P.	+	+		1
S. Lusk	Vetešník, L.	+	+		4
	Horák, V.	+	+		1
V. Lusková	Mendel, J.	+	+		1
V. Mrlík	Němečková, I.	+	+		1
P. Musil	Albrecht T.	+	+	2004	7
M. Peňáz	Bartošová Š.	+	+		1
J. Piálek	Bímová, B.	+	+		7
	Božíková E.	+	+		7
	Horák, A.	+	+		8
	Mikulíček, P.	+	+		7
	Vyskočilová, M.	+	+		1
E. Tkadlec	Ďaďourek, M.	+	+		6
	Gregor P.		+		6
	Jánová, E.	+	+		1
	Lisická L.		+		6
	Losik, J.	+	+		6
	Pluhařová A.	+	+		6
	Thelenová J.	+	+		6
	Třebatická L.	+	+		6
	Varfalvyová, D.	+	+		6
	Wolf, P.	+		2003	6
J. Zima	Bellinvia E.	+	+	2004	7
	Lazarová J.	+	+		7
	Martínková, N.	+	+	2004	7
	Nová P.	+	+		7
	Schwarzová, L.	+	+		7
J. Zukal	Berková, H.	+	+		1
	Novák V.	+	+		1
	Petrželková, K.	+		2003	1
	Pokorný, M.	+	+		1
Total 17	52	45	50	8	7

¹ Faculty of Science, Masaryk University, Brno

³ Faculty of Forestry and Wood Technology, Mendel University of Agriculture and Forestry, Brno

⁴ Faculty of Agronomy, Mendel University of Agriculture and Forestry, Brno

⁶ Faculty of Science, Palacký University, Olomouc

⁷ Natural Science Faculty, Charles University, Prague

⁸ Faculty of Biological Sciences, University of South Bohemia, České Budějovice

EDITORIAL ACTIVITIES

The „Institute“ publishes the international journal „*Folia Zoologica*“. The journal is covered by many reference journal, including the Current Contents. The current value of the impact factor for 2003 amounts 0.494.

Publisher and address of Editorial Office:

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monographs: Petr K O U B E K
book reviews: Hana S L A B Á K O V Á

Aims & Scopes

Folia Zoologica publishes articles in English containing original insight into any aspects of vertebrate zoology that are not published and not under consideration for publication elsewhere. The journal welcomes significant papers related mainly to vertebrates of the Holarctic region, and papers of more than regional significance are preferred. The review papers should deal with topics of general interest or current importance and should be synthetic rather than comprehensive in emphasis. Occasional commemorative articles, book reviews and announcements are also accepted.

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PUBLICITY AND POPULARIZATION ACTIVITIES

We pay special attention to publicity of the institute's scientific output. Our scientists are involved in various activities within many national scientific societies and special-interest groups, they are members of scientific councils of Czech National Parks and advisory boards of Landscape Protected Areas. In 2003–2004, they published 61 popular books and articles and participated in various TV and radio programmes. "Open Days" were organised every year to give an opportunity to the public to visit the institute and meet with its staff. These days were attended by around 100 visitors annually representing pupils from primary schools, high school and university students as well as general public.

Members of the Departments of Avian and Mammalian Ecology collaborated on four monographs:

1 - DANKO, Š., DAROLOVÁ, A. & KRIŠTÍN, A (eds.), 2002: Birds Distribution in Slovakia. Veda, Bratislava, received the Prize for Scientific and Specialized Literature awarded by the Slovak Publishing Fund in 2003 and the first prize within the survey of the most popular book of the Bibliotheca Incheba Expo Bratislava in 2003

2 - TRNKA, A., ČAPEK, M., Jr. & KLOUBEC, B., 2003: Birds of the National Nature Reserve Parižske močiare Marsh. Veda, Bratislava, received the Prize for Scientific and Specialized Literature awarded by the Slovak Publishing Fund in 2004

3 - KRYŠTUFEK B., FLAJŠMAN B., GRIFFITHS H. I. (eds.), 2003: Living with Bears: A Large European carnivore in a shrinking world. Ecological forum of the liberal democracy of Slovenia, Ljubljana, received the Main prize for Literature awarded by the Conceille Internationale de la Chase in 2004.

4 - ČERVENÝ, J. and collaborators, 2004: The Encyclopedia of Game Management. Ottovo Nakladatelství, Praha, represents the most comprehensive Czech encyclopedia of game management

