ACADEMY OF SCIENCES OF THE CZECH REPUBLIC

INSTITUTE OF VERTEBRATE BIOLOGY

BIENNIAL REPORT

2011–2012

BRNO 2013

INSTITUTE OF VERTEBRATE BIOLOGY

THE INSTITUTE OF VERTEBRATE BIOLOGY WAS FOUNDED 60 YEARS AGO

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BIENNIAL REPORT 2011–2012

A periodical continuation of the Institute's previous bulletins: Vertebratologické Zprávy (1969–1987), Zprávy ÚSEB (1988–1991) and the ILE Biennial Report (1993–1994).

Edited by Josef Bryja, Hana Slabáková, Jana Komárková and Marcel Honza
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Front cover: A monstrous outrage of maternal affection: a great reed warbler feeding a common cuckoo chick (Photo by M. Honza).
Back cover: In 2012, the 'cuckoo' group celebrated already twenty years of research in South Moravian reed beds (Photo by P. Procházka)

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PREFACE

Dear reader,
The "Biennial Report" you are now reading is already the tenth in a series; indeed, the report has now become a traditional publication of the Institute of Vertebrate Biology (IVB). We hope you find the contents both informative and useful.

The intent of this report is to advertise our achievements to the wider research community, attract new students and post-doctoral researchers, and provide a baseline against which to measure future progress. As such, the report provides a representative overview of the extensive range of research activities carried out over 2011–2012, written in a style that is also accessible to the interested layperson.

At IVB, we focus on ground-breaking research in fields such as evolutionary ecology, biodiversity and medical zoology. These activities are of both an applied and fundamental nature, and are focused on observations, experiments and gaining an understanding of the processes that affect the fascinating world of the animal kingdom. The results lead to around 100 scientific publications per year in peer-reviewed journals. It is my wish here to express a vote of heartfelt thanks to the research teams that, for the past two years, have achieved such excellent results.

Despite the difficult funding environment for science in general, scientists at IVB have won many research grants and various other contracts, and these funds have contributed significantly to the institutional budget. Clearly, this is strong evidence that we are a highly competitive organisation. On the other hand, the fact that our budget is made up to a great degree by money from such sources is undesirable in terms of strategic planning for institutional development.

In the preface of the preceding Biennial Report, written in May 2011, I expressed a strong belief that the institutional budget would increase as a reflection of the positive results from an international evaluation. Recent history has shown, however, that I was too optimistic at this time as the institutional budget has decreased slightly over the last two years. Interestingly, despite this far-from-ideal financial climate, we were able to obtain financial resources from various sources allowing us to rebuild our field station, and we began the building of a modern pavilion at the Studenec research site in summer 2012.

In conclusion, I would like to add that I sincerely hope our work will continue to be guided by a spirit of mutual understanding and collaboration, allowing us to reach even greater achievements over the coming years.

Dear reader,
I wish you pleasant reading.

March, 2013 Marcel Honza, Director of IVB

THE INSTITUTE OF VERTEBRATE BIOLOGY WAS FOUNDED 60 YEARS AGO

The Institute of Vertebrate Biology of the Academy of Sciences of the Czech Republic now looks back on the 60 years that have passed since its foundation. The origin of the Institute dates back to the beginning of 1953, when the Laboratory of Vertebrate Zoology of the newly formed Czechoslovak Academy of Sciences was established in Brno. From the very beginning the institution was rather small, but active and efficient.

In the first decades of its existence, basic research on the biology of fishes, birds and mammals developed and, in the 1960s and 70s, the Institute was among the leading institutions in this field, both in former Czechoslovakia and abroad. Over this period, an array of outstanding vertebrate zoologists appeared that gained high international recognition and repute. In the 1980s and 90s, the Institute passed through a series of administrative reorganisations, changing its name and structure several times. A new Department of Medical Zoology was associated to the Institute in 1984. Later, the vertebrate biology team worked within various institutions exhibiting broader scope and orientation of research (e.g. the Institute of Systematic and Ecological Biology and the Institute of Landscape Ecology). During this difficult period, however, the continuity of vertebrate zoology research design was not interrupted. The present name of the Institute came into being in 1998, following the last reorganisation.

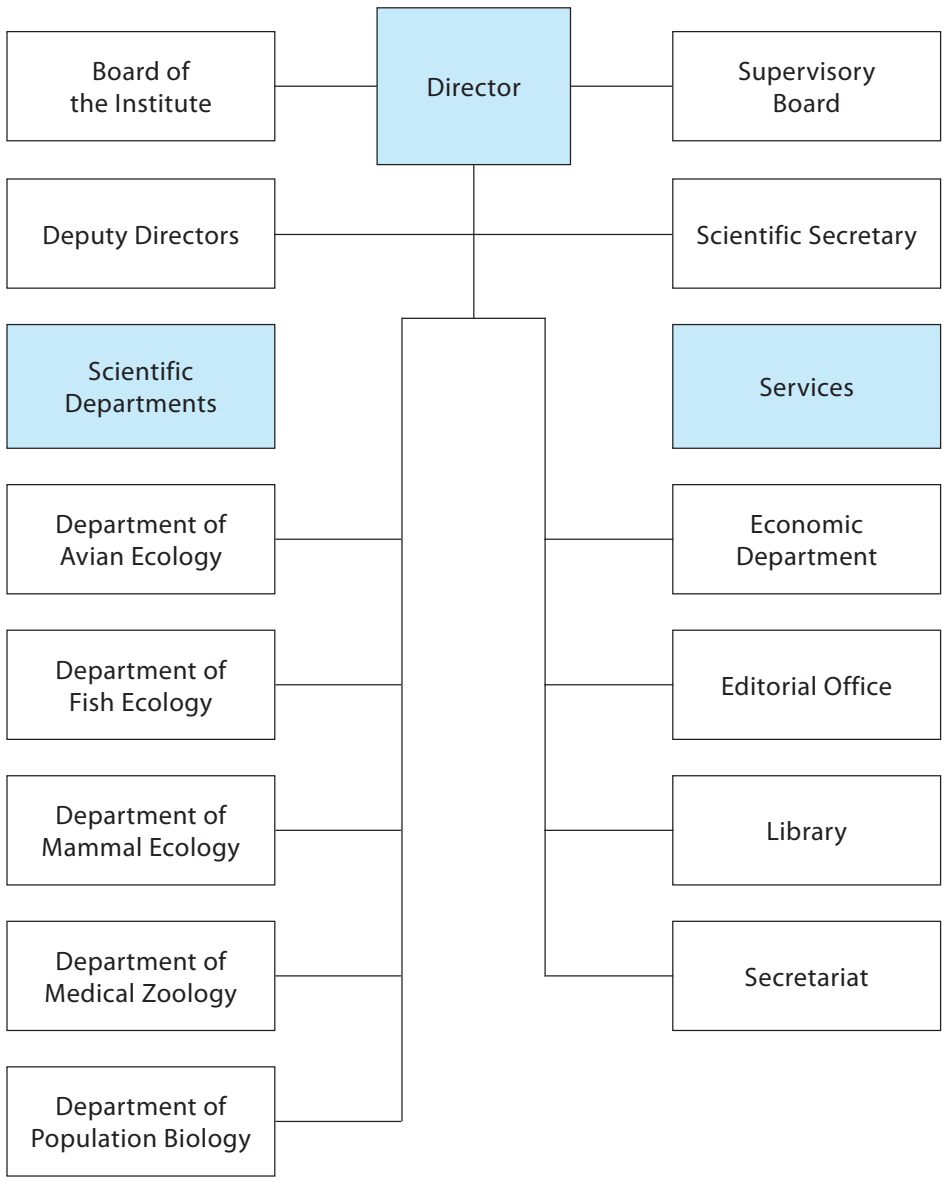
The Institute of Vertebrate Biology of the Academy of Sciences has now developed into a modern research institution with an ambitious scientific programme in line with current scientific challenges. The publication activity of the Institute shows a steadily increasing trend in both scientometric and other criteria, and the range of international collaboration has been considerably extended through joint research efforts with many foreign institutions and research organisations spread over most continents. The scientists employed at the Institute have participated in various international projects, particularly those funded by the European Union. In addition, the Institute is extensively involved in higher education, an activity that is considered a highly important aspect of its mission. Primary attention is paid to the training and supervision of PhD students, which forms part of the accreditation of doctoral study programmes at several universities. Our employees also participate in higher education instruction and ensure many individual cycles of lectures, exercises or seminars at universities. Education activities focused on secondary schools make use of subsidies from programmes of the European Social Fund.

The Institute has offered employment and support to hundreds of zoologists with a deep interest in the study of animals, their lives and their natural history. Some of our fellows work at the Institute only temporarily, others have spent almost their whole working lives here. At various times, the Institute has employed a number of outstanding Czech scientists who otherwise have worked mainly at Czech universities. Some fellows have emigrated abroad and gone on to become leading scientists in their adopted countries. The Institute's past can be looked back upon with nostalgia and pride, the remarkable achievements of our predecessors setting the Institute in motion toward excellent research and wide appreciation. The current staff face a great challenge in taking forward the previous successful development.

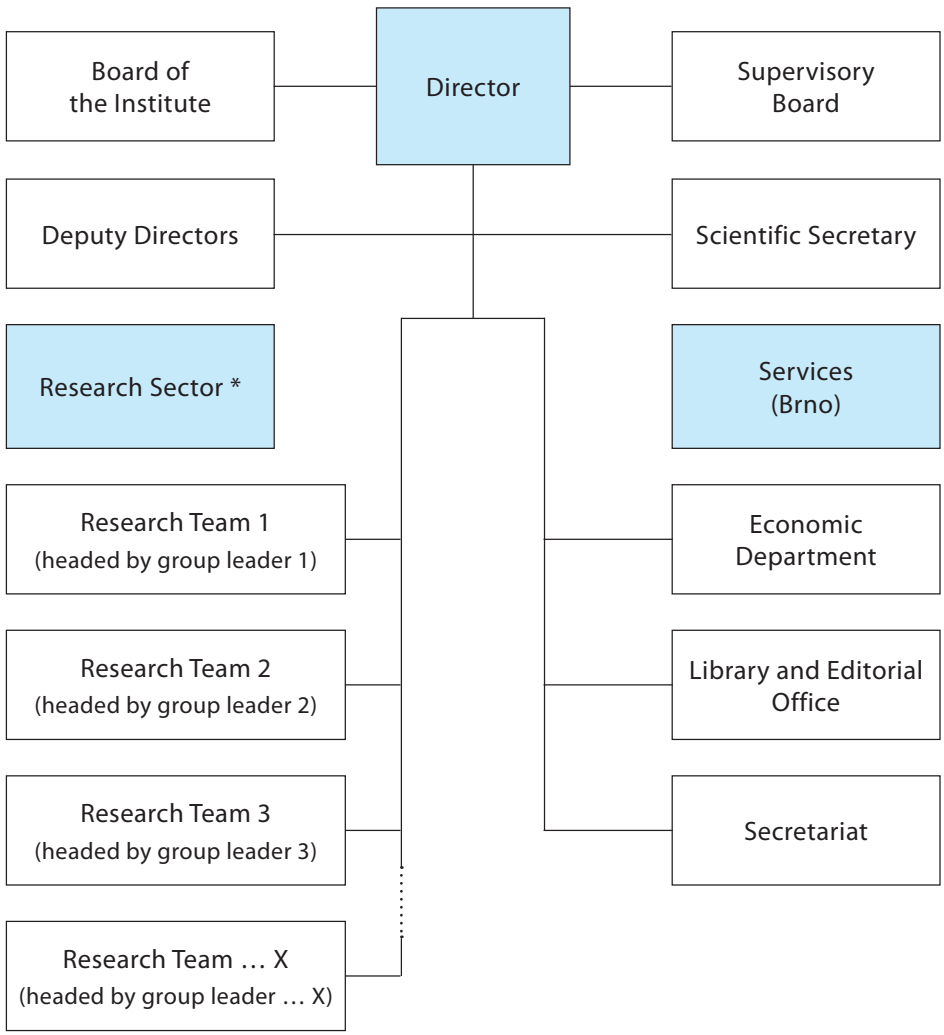
Jan Zima

1. BASIC FACTS

| STRUCTURE OF THE INSTITUTE OF VERTEBRATE BIOLOGY AS CR UP TO DECEMBER 2012



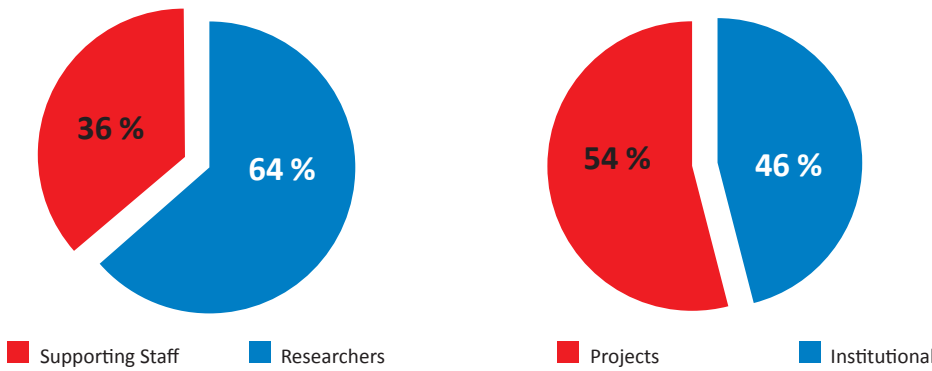
| STRUCTURE OF THE INSTITUTE OF VERTEBRATE BIOLOGY AS CR FROM JANUARY 2013



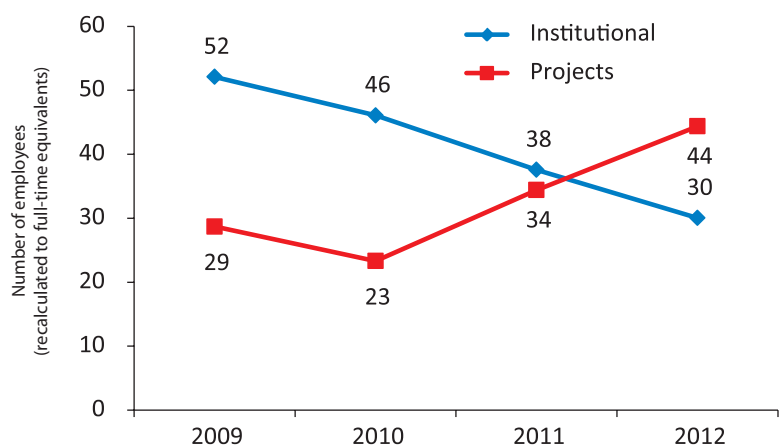
* dispersed at three research facilities – Brno, Studenec, Valtice

| STAFF AND BUDGET

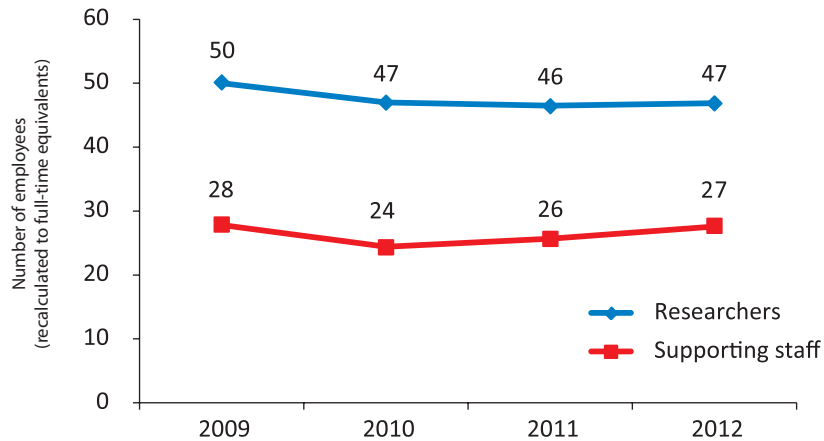
The Insitute of Vertebrate Biology is relatively small based on number of employees and its budget, but is important in scientific output and other activities. Seventy-two people were employed full-time in 2011, a number that rose to 74 in 2012. Staff structure was similar in both years. Overall, there has been a significant decreasing trend in the number of institutional employees, while the number of workers (mainly post-doctorate students, PhD students and technicians) employed on the basis of (unpredictable) external project funding has increased, reaching 60% in 2012.



Structure of employees the IVB in 2011–2012 (mean values for both years are presented).

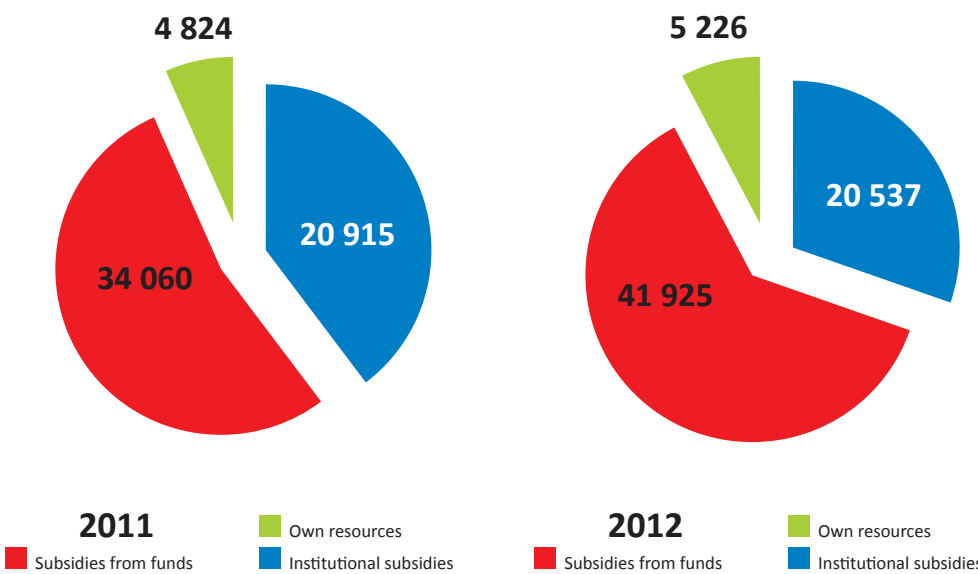


There is a clear and strong decreasing trend in institutional employees, which could have consequences for the long-term stability of the research environment due to the unpredictability of success in grant competitions.



Staff structure is relatively stable, with researchers forming ca. 65% of employees.

The Institute's budget was 61 and 70 million Czech crowns in 2011 and 2012, respectively. However, there is also a visible decreasing trend in institutional funding from the Academy of Sciences, with institutional subsidies representing just 33% of the budget in 2012 (project funding was ca. 60%).



Budget structure of the Institute of Vertebrate Biology AS CR over 2011–2012.
Numbers are in thousands of Czech crowns.

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Vice-chairman:
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Assoc. Prof. RNDr. Jan Kirschner, PhD
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(Hamé a.s., Kunovice)

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Assoc. Prof. RNDr. Jan Kirschner, PhD
(Institute of Botany AS CR, v. v. i., Průhonice)

PhDr. Mgr. Martin Reissner, PhD
(Moravian Museum, Brno)

| RESEARCH STAFF

Only people with an employment contract are shown, i.e. not all PhD students are shown - for a complete list of PhD students see below. Numerous fellows contracted on the basis of external grant funding have only part-time jobs (not shown here).

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Behavioural ecology and migration of birds

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Ecology and behaviour of birds, bird parasites

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Post-doc

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PhD students

Mgr. Václav Jelínek,
Mgr. Marek Mihai Abraham,
Mgr. Michal Šulc

Research priorities

Our research focuses on understanding the ecological and evolutionary basis of avian reproductive strategies. Important goals of this research are to identify the ecological factors that promote parasitic reproductive behaviour, predator avoidance and nest predation. Main research topics include:

- avian brood parasitism as a model system for co-evolution
- sexual selection and evolution of male ornament in birds
- migratory connectivity, population differentiation and seasonal interactions in long distance migrants
- factors affecting nest predation and nest defence
- ectoparasites associated with birds
- ecology of birds and mammals in fragmented agricultural landscapes

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Fish ecology

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Mgr. Zdenka Jurajdová, PhD
Mgr. Markéta Konečná, PhD
Mgr. Matěj Polačik, PhD
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Mgr. Veronika Michálková
Mgr. Kateřina Francová
Mgr. Milan Vrtílek
Mgr. Radomil Řežucha
Mgr. Eva Marešová
Mgr. Eva Kašparová
Ing. Lucie Všetičková

Technicians

Jiří Farkač
Gabriela Konečná

Research priorities

Fishes are used to investigate both ecological and evolutionary issues, as well as applied issues in fisheries management, conservation of aquatic habitats and floodplain restoration. Research is performed at various levels of spatial and biological organisation (i.e. individual, population and community). Our field- and experimental studies are conducted in Europe, Asia and Africa. Current topics investigated at the department include:

- behavioural and evolutionary ecology of bitterlings
- adaptation and coevolution of bitterling and their mussel hosts
- ecology, distribution and parasites of invasive fishes and their impact on native fish biodiversity
- 0+ juvenile fish community structure and optimisation of sampling methods in lowland rivers and their flood plains
- impacts of metazoan parasites on 0+ juvenile fish development
- evolutionary ecology of the African annual fishes *Nothobranchius* spp.
- taxonomy, phylogeny and genetic diversity of fish populations
- indicative value of fish communities for aquatic environment rehabilitation and fish biodiversity conservation

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Mgr. Peter Vallo, PhD

PhD student

Mgr. Ilona Profousová

Research priorities

Our research is focused on the ecology of selected mammalian groups in various habitats of the temperate and tropical zones. Feeding behaviour and interactions between mammals and the environment is a leading topic of the research. Recent projects also make use of population molecular genetics and molecular phylogenetics in ecological studies. The results of investigations aim to improve management of forest stands, game management, rodent pest control, and protect biodiversity. Main research topics include:

- feeding ecology of large herbivores and their impact on vegetation

- foraging ecology and anti-predator strategies of bats and other features of their behaviour
- ecology and behaviour of large carnivores, and foraging ecology and distribution of mustelids
- synecology of small terrestrial mammals
- diet, feeding behaviour and digestion of great apes
- molecular ecology and phylogeny

DEPARTMENT OF MEDICAL ZOOLOGY

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Research priorities

Our research is focused on the ecology of selected microbial pathogens that are causative agents of human and animal diseases, including emerging infectious diseases. The natural focality of zoonotic diseases is investigated in relation to the role played by wild vertebrates (hosts or reservoirs of infections) and their haematophagous ectoparasites (arthropod vectors of infections), and the effects of recent changes in environmental conditions. Main research topics include:

- arboviruses (i.e. viruses transmitted by ticks, mosquitoes and other haematophagous arthropods), such as West Nile, Ťahyňa and tick-borne encephalitis
- selected bacterial (e.g. *Borrelia burgdorferi* sensu lato, *Anaplasma phagocytophilum*, *Francisella tularensis*, *Brucella microti*) and tick-borne protozoan (*Babesia* spp.) zoonotic pathogens
- circulation of vector-borne and zoonotic pathogens in terrestrial and aquatic ecosystems under changing environmental conditions, also involving enhanced anthropogenic impacts
- surveillance of free-living and domestic vertebrates and humans for selected zoonotic pathogens, using serological surveys and epidemiological methods, in relation to preventive medicine (human and veterinary), environmental protection, and nature conservation

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Research Priorities

Studies are performed on both laboratory and natural populations using the most advanced methods of molecular genetics and genomics, physiology, behavioural ecology, bioinformatics, etc. Empirical data from observations and experiments, supplemented by simulation modelling, are used to discuss important questions of evolutionary biology, such as:

- hybrid zones as barriers against gene flow and their role in speciation
- wildlife immunology and immunogenetics, host-parasite interactions, wildlife diseases
- study of factors affecting population structure, conservation genetics of endangered vertebrate species, development of non-invasive techniques of DNA sampling and new molecular markers
- phylogeography and reconstruction of historical colonisation of western Palaearctic and African tropics
- analysis of reproductive success and social systems using DNA markers
- mechanisms and evolution of thermal physiology traits in ectotherms, predator-prey interaction in the context of thermal biology

Results are used in preparing recommendations for nature conservation in Europe and the tropics, rodent pest control, and lecturing at universities.

2. RESEARCH PROJECTS

Institutional Research Plan

AV0Z60930519 Biodiversity and ecology of vertebrates: implications in conservation and sustainable management of natural populations – Marcel Honza, 2009–2011.

Projects supported by the Grant Agency of the Academy of Sciences of the Czech Republic (GA AV ČR)

IAA600930903 Cues, recognition and responses in a coevolutionary arms race between brood parasites and their hosts. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Marcel Honza. ***Research years:*** 2009–2013.

IAA601410802 Biology of African mole-rats from mesic tropic areas. ***Recipient:*** Faculty of Biological Sciences, University of South Bohemia, České Budějovice. ***Head Investigator:*** Radim Šumbera. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Josef Bryja. ***Research years:*** 2008–2011.

IAA601690901 Ectoparasites associated with mountain birds in Costa Rica: linking ecology, biodiversity and genetics. ***Recipient:*** Faculty of Veterinary Hygiene and Ecology, University of Veterinary and Pharmaceutical Sciences, Brno. ***Head Investigator:*** Ivan Literák. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Miroslav Čapek. ***Research years:*** 2009–2011.

KJB600930804 Genetic consequences of population decline in Eurasian otter (*Lutra lutra)* populations in the Czech and Slovak Republics ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Petra Hájková. ***Research years:*** 2008–2011.

Projects supported by the Czech Science Foundation (GA ČR)

GAP505/10/1871 Toll-like receptors in passerine birds: description, characterisation of polymorphism and evolutionary consequences of allelic variation. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Josef Bryja. ***Research years:*** 2010–2014.

GAP506/10/0983 Comparative phylogeography of the Zambezian region in Southeastern Africa using small mammals as a model. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Josef Bryja. ***Research years:*** 2010–2014.

GAP506/10/2170 The role of predator-prey interactions in the coadaptation of thermal biology. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Lumír Gvoždík. ***Research years:*** 2010–2013.

GA206/08/0640 Immunogenetic study of a house mouse hybrid zone. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Jaroslav Piálek. ***Research years:*** 2008–2012.

GA206/08/1281 Components of sexual selection in the monogamous grey partridge. ***Recipient:*** Faculty of Forestry, Wildlife and Wood Sciences, Czech University of Agriculture, Prague. ***Head Investigator:*** Miroslav Šálek. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Tomáš Albrecht. ***Research years:*** 2008–2012.

GA206/09/0589 The diachronic changes of long bone cross-sectional geometry in human prehistoric populations in Central Europe: The biomechanical analysis. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Vladimír Sládek. ***Research years:*** 2009–2011.

GA206/09/0815 Demography, metapopulation dynamics and ecology of *Nothobranchius* fishes in Mozambique. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Martin Reichard. ***Research years:*** 2009–2012.

GA206/09/0927 Impact of increased contact with humans on diversity and ecology of protozoan parasites of African great apes. ***Recipient:*** Faculty of Veterinary Medicine, University of Veterinary and Pharmaceutical Sciences, Brno. ***Head Investigator:*** David Modrý. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Klára Petrželková. ***Research years:*** 2009–2011.

GA206/09/1163 Personalities, male mating tactics and role of females in sexual selection: studies on fish model systems. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Martin Reichard. ***Research years:*** 2009–2013.

GA524/09/1569 Genetic structure of sika deer populations in the Czech Republic. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Petr Koubek. ***Research years:*** 2009–2011.

GP206/09/P608 Revision of the species structure of the genera *Gobio* and *Romanogobio* in the Eurasian context. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Jan Mendel. ***Research years:*** 2009–2011.

GP206/09/P624 Genetic diversity and phylogeography of the genus *Scotophilus*. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Peter Vallo. ***Research years:*** 2009–2011.

GP524/09/P620 The analysis of the selected immune and physiological parameters in *Carassius gibelio*, species with different ploidy and atypical reproductive strategy. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Lukáš Vetešník. ***Research years:*** 2009–2011.

GA506/11/0112 The evolution and life-history consequences of rapid ageing. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Martin Reichard. ***Research years:*** 2011–2015.

GA505/11/646 Adaptive coexistence of distinct life history strategies in fish of the genus *Nothobranchius*. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Matej Polačik. ***Research years:*** 2011–2013.

GAP506/11/1792 Population structure, dispersal, and explorative behaviour in the zone of secondary contact of house mice. ***Recipient:*** Institute of Animal Physiology and Genetics AS CR, v.v.i., Liběchov. ***Head Investigator:*** Miloš Macholán. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Barbora Vošlajerová. ***Research years:*** 2011–2014.

GAP505/11/1617 Functional determinants of geographical gradients in avian diversity in sub-Saharan Africa. ***Recipient:*** Charles University in Prague, ***Head Investigator:*** David Hořák. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Petr Procházka. ***Research years:*** 2011–2015.

GCP502/11/J070 Biogeography and evolutionary history of two RNA viruses in Africa. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Joëlle Goüy de Bellocq. ***Research years:*** 2011–2013.

GAP505/11/1768 Non-native goby fishes: exploitation of a free niche or a threat to Central European fishes? ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Pavel Jurajda. ***Research years:*** 2011–2015.

GAP505/12/G112 ECIP – European Centre of Ichtyoparasitology. ***Recipient:*** Masaryk University in Brno. ***Head Investigator:*** Milan Gelnar. ***Subrecipient:*** Institute of Vertebrate Biology AS CR, v. v. i., Brno. ***Head Investigator:*** Pavel Jurajda. ***Research years:*** 2012–2018.

GAP506/12/2472 Post-copulatory sexual selection and the biology of sperm: within population processes and interspecific patterns in passerine birds. ***Recipient:*** Institute of Vertebrate Biology AS CR, v. v. i., Brno. ***Head Investigator:*** Tomáš Albrecht. ***Research years:*** 2012–2016.

GAP506/12/2404 Host-parasite interaction as an extreme form of parent-offspring conflict. ***Recipient:*** Institute of Vertebrate Biology AS CR, v. v. i., Brno. ***Head Investigator:*** Marcel Honza. ***Research years:*** 2012–2016.

GAP506/12/1064 Bat adaptations to the fungal disease geomycosis. ***Recipient:*** Institute of Vertebrate Biology AS CR, v. v. i., Brno. ***Head Investigator:*** Natália Martínková. ***Research years:*** 2012–2015.

GAP505/12/2569 The role of parasites during the invasion process of Ponto-Caspian gobies into artificially interconnected European rivers. ***Recipient:*** Institute of Vertebrate Biology AS CR, v. v. i., Brno. ***Head Investigator:*** Markéta Ondračková. ***Research years:*** 2012–2014.

GAP505/12/0375 Evolutionary-immunological and ecological aspects of parasitism in hybrid and polyploid cyprinid fish. ***Recipient:*** Masaryk University in Brno. ***Head Investigator:*** Andrea Vetešníková Šimková. ***Subrecipient:*** Institute of Vertebrate Biology AS CR, v. v. i., Brno. ***Head Investigator:*** Lukáš Vetešník. ***Research years:*** 2012–2016.

Projects supported by the Ministry of Agriculture

QH71305 Development of new methods of rearing selected promising species for aquaculture using non-traditional technologies. ***Recipient:*** Faculty of Fisheries and Protection of Waters, University of South Bohemia, České Budějovice. ***Head Investigator:*** Pavel Kozák. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Miroslav Prokeš. ***Research years:*** 2007–2011.

QH72075 Rodents as an important factor influencing forest regeneration. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Miloslav Homolka. ***Research years:*** 2007–2011.

Projects supported by the Ministry of Environment

11560/SOPK/2010 Monitoring of the large carnivores at the Beskydy Mountains. ***Recipient:*** Institute of Vetebrate Biology, AS CR, Brno. ***Head Investigator:*** Petr Koubek. ***Research years:*** 2011–2014.

CZ.1.02/6.1.00/10.06482 Monitoring and full-area mapping of important European species as a basis of Natura 2000 in Czech Republic. ***Recipient:*** Institute of Vetebrate Biology, AS CR, Brno. ***Head Investigator:*** Karel Halačka. ***Research years:*** 2012–2015.

Projects supported by the Ministry of Education, Youth and Sport

LC06073 Biodiversity Research Centre. ***Recipient:*** Institute of Systems Biology and Ecology ASCR, v. v. i., České Budějovice. ***Head Investigator:*** Pavel Kindlmann. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Jan Zima. ***Research years:*** 2006–2011.

LC522 Ichthyoparasitology Research Centre. ***Recipient:*** Faculty of Science, Masaryk University. ***Head Investigator:*** Milan Gelnar. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Pavel Jurajda. ***Research years:*** 2005–2011.

2B08003 Changes of mosquito biodiversity - vectors of pathogenic agents in relationship with weather changeability. ***Recipient:*** Biology Centre ASCR, v. v. i., České Budějovice. ***Head Investigator:*** Ivan Gelbič. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Jiří Halouzka/ Oldřich Šebesta. ***Research years:*** 2008–2011.

CZ.1.07/2.4.00/12 Knowledge and Technology Transfer in Selected Regions based on European educational model "Technology Transfer Manager". ***Recipient:*** Biology Centre ASCR, v. v. i., České Budějovice. ***Head Investigator:*** František Sehnal. ***Subrecipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Miroslav Čapek. ***Research years:*** 2010–2012.

MEB021130 Molecular epidemiology of emerging infectious diseases. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Josef Bryja. ***Research years:*** 2011.

CZ.1.07/2.4.00/17.0138 Connecting education and new approaches in zoological and ecological research. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Josef Bryja. ***Research years:*** 2011–2014.

CZ.1.07/2.3.00/35.0026 Science for all senses. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Anna Bryjová. ***Research years:*** 2012–2014.

CZ.1.07/2.3.00/20.0303 Next-generation technologies in evolutionary genetics. ***Recipient:*** Institute of Vertebrate Biology ASCR, v. v. i., Brno. ***Head Investigator:*** Josef Bryja. ***Research years:*** 2011–2014.

International projects

European Union - 7th Framework Programme

EDENext – Biology and control of vector-borne diseases in Europe (coordinated by Renaud Lancelot, CIRAD-Département Systèmes Biologiques, Campus de Baillarguet, Montpellier, France). ***Head Investigator for Czech Republic:*** Zdeněk Hubálek. ***Research years:*** 2011–2015.

ConGRESS – Conservation genetic resources for effective species survival (coordinated by Mike Brufford, School of Biosciences, Cardiff University, UK). ***Head Investigator for Czech Republic:*** Josef Bryja. ***Research years:*** 2010–2013.

FP7 EuroWestNile – European West Nile Collaborative Research Project (coordinated by Carlos Curia Martinez, Instituto de Salud Carlos III, Majadahonda-Madrid, Spain). ***Head Investigator for Czech Republic:*** Zdeněk Hubálek. ***Research years:*** 2011–2014.

Other EU projects

European Science Foundation Research Networking Programme – Thermal adaptation in ectotherms: Linking life history, physiology, behaviour and genetics (ThermAdapt). ***Head Investigator:*** Lumír Gvoždík (member of the steering committee). ***Research years:*** 2006–2011.

VBORNET – European Network for Arthropod Vector Surveillance for Human Public Health (coordinated by Avia GIS Zoersel, Belgium). ***Head Investigator:*** Zdeněk Hubálek. ***Research years:*** 2009–2013.

Bilateral projects

National Science Foundation (no. DEB0746560) – Collaborative research: Dynamics of genes in mouse hybrid zones (co-ordinated by P. K. Tucker, University of Michigan, USA). ***Head Investigator:*** Jaroslav Piálek. ***Research years:*** 2008–2011.

Individual projects

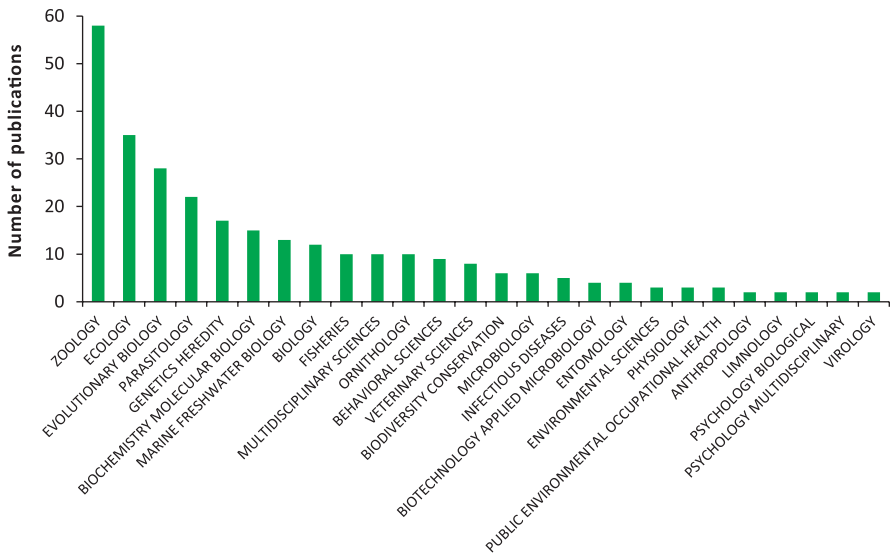
M200930901 – Molecular biodiversity inventory of the ichthyofauna of the Czech Republic Program of Internal Support of the AS CR – International Collaboration Projects (coordinated by Biodiversity Institute of Ontario, Canada): ***Head Investigator:*** Jan Mendel. ***Research years:*** 2009–2011.

M200931201 – The importance of migratory connectivity for the population ecology of long-distance migrants: a model study on the Reed Warbler (*Acrocephalus scirpaceus*). ***Head Investigator:*** Petr Procházka. ***Research years:*** 2012–2015.

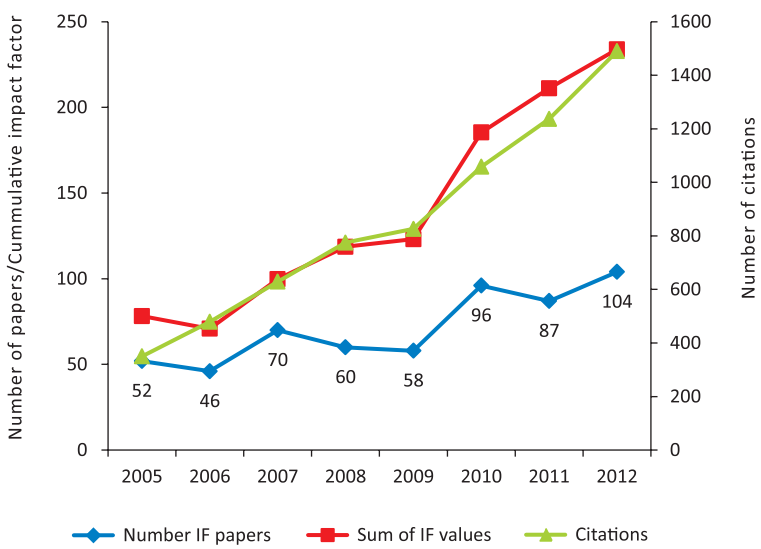
National Speleology Society U.S. – Utilisation of genetic resources for effective conservation of endangered species. ***Head Investigator:*** Natália Martínková. ***Research years:*** 2012–2013.

3. SCIENTIFIC RESULTS

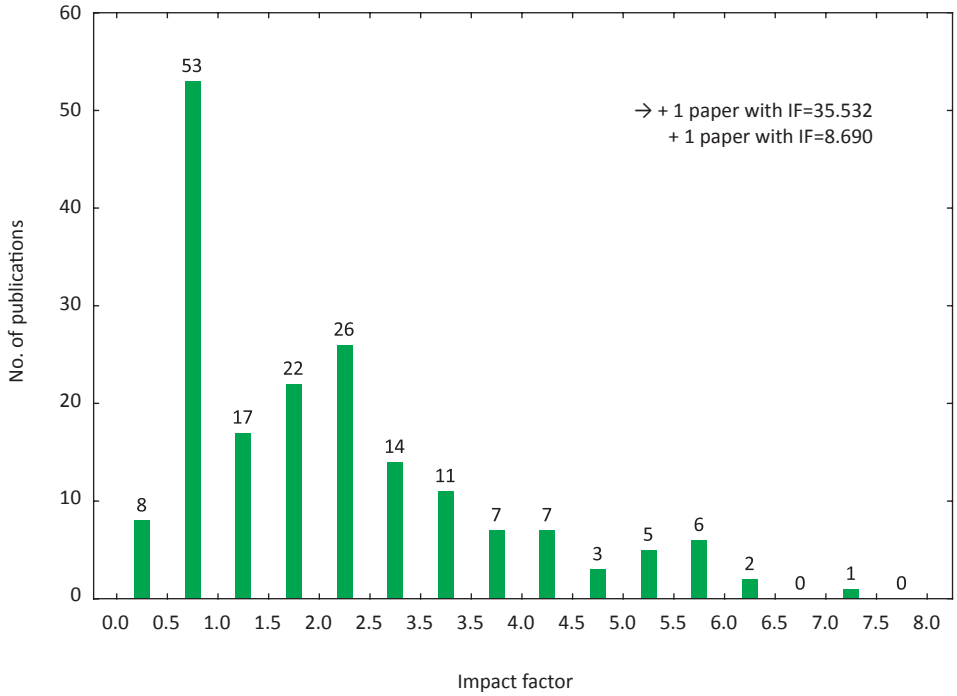
| SUMMARY OF PUBLICATION OUTPUT



IVB publication profile over 2011–2012. Categories follow the Web of Science database (a total of 87 papers were published in 2011, and 104 in 2012, assigned to 36 scientific categories). Only categories with at least 2 papers are shown.



The publication activity of IVB shows a continuously increasing trend in most scientometric criteria over recent years (source: Database ASEP, Academy of Sciences of the Czech Republic and Web of Science).



The distribution of impact factor values resembles those from leading European institutions of similar size and specialisation.

Geographical distribution of selected research activities

GERMANY

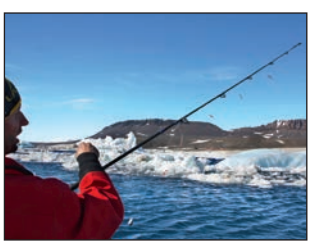
CZECH REPUBLIC

AUSTRIA

TURKEY

CAMEROON

ETHIOPIA



ANTARTICA

CHINA

MOSAMBIQUE

Complete list of publications

Books, textbooks, edited proceedings

AULAGNIER S, HAFFNER P, MITCHELL-JONES AJ, MOUTOU F, ZIMA J, 2011. *Guida dei mammiferi d'Europa, Nord Africa e Vicino Oriente*. Emmebi Edizioni Firenze, Firenze, 272 pp. (Scienze e Natura). ISBN 978-88-89999-70-7.

BRYJA J, ALBRECHTOVÁ J, TKADLEC E (eds), 2012. *Zoologické dny Olomouc 2012*. ÚBO AV ČR, Brno. 242 pp. ISBN 978-80-87189-11-5.

BRYJA J, ŘEHÁK Z, ZUKAL J (eds), 2011. *Zoologické dny Brno 2011*. ÚBO AV ČR, Brno. 282 pp. ISBN 978-80-87189-09-2.

HUBÁLEK Z, RUDOLF I, 2011. *Microbial zoonoses and sapronoses*. Springer, Dordrecht, 457 pp. ISBN 978-90-481-9656-2.

LUSK S, LUSKOVÁ V (eds), 2011. *Biodiverzita ichtyofauny České republiky VIII*. ÚBO AV ČR, Brno. 109 pp. ISBN 978-80-87189-08-5.

MACHOLÁN M, BAIRD SJE, MUNCLINGER P, PIÁLEK J (eds), 2012. *Evolution of the house mouse*. Cambridge University Press, New York, 526 pp. (Cambridge studies in morphology and molecules 3). ISBN 978-0-521-76066-9.

ŠŤASTNÝ K, HUDEC K, ALBRECHT T, BEJČEK V, BUREŠ S, CEPÁK J, ČAPEK M, ČIHÁK K, FLOUSEK J, HOLÁŇ V, HONZA M, HROMÁDKO M, KLÁPŠTĚ J, KLOUBEC B, KRÁL M, KLVAŇA P, KLVAŇOVÁ A, LUMPE P, PROCHÁZKA P, SEDLÁČEK O, SCHRÖPFER L, SITKO J, ŠKOPEK J, VIKTORA L, WEIDINGER K, 2011. *Ptáci - Aves*. 2. přeprac. a dopl. vyd. Academia, Praha, 1190 pp. (Fauna ČR 30). ISBN 978-80-200-1834-2.

TKADLEC E, 2011. *Strategie a metody vědecké práce v přírodních vědách: filozofické názory a komunikační dovednosti*. Univerzita Palackého, Olomouc, 195 pp. ISBN 978-80-244-2675-4.

Chapters in books

FOREJT J, PIÁLEK J, TRACHTULEC Z, 2012. Hybrid male sterility genes in the mouse subspecific crosses. In Macholán M, Baird SJE, Munclinger P, Piálek J (eds), *Evolution of the house mouse*. Cambridge University Press, New York: 482–503. ISBN 9780521760669.

LUSK S, LUSKOVÁ V, HANEL L, 2011. Černý seznam nepůvodních invazivních druhů ryb České republiky. In Lusk S, Lusková V (ed.), *Biodiverzita ichtyofauny České republiky VIII*. ÚBO AV ČR, Brno: 79–97. ISBN 978-80-87189-08-5.

LUSK S, LUSKOVÁ V, HANEL L, LOJKÁSEK B, HARTVICH P, 2011. Červený seznam mihulí a ryb České republiky – verze 2010. In Lusk S, Lusková V (ed.), *Biodiverzita ichtyofauny České republiky VIII*. ÚBO AV ČR, Brno: 68-78. ISBN 978-80-87189-08-5.

LUSK S, HARTVICH P, LOJKÁSEK B, LUSKOVÁ V, 2011. Migrace ryb a migrační prostupnost vodních toků. In Lusk S, Lusková V (ed.), *Biodiverzita ichtyofauny České republiky VIII*. ÚBO AV ČR, Brno: 5–67. ISBN 978-80-87189-08-5.

LUSK S, LUSKOVÁ V, BARTOŇOVÁ E, HAVELKA J, 2011. Ryby a mihule v horní části řeky Svratky In Lusk S, Lusková V (ed.), *Biodiverzita ichtyofauny České republiky VIII*. ÚBO AV ČR, Brno: 98–108. ISBN 978-80-87189-08-5.

MENDEL J, MAREŠOVÁ E, PAPOUŠEK I, HALAČKA K, VETEŠNÍK L, ŠANDA R, KONÍČKOVÁ M, URBÁNKOVÁ S, 2012. Molecular biodiversity inventory of the ichthyofauna of the Czech Republic. In Caliskan M (ed.), *Analysis of genetic variation in animals*. *In* Tech, Rijeka: 287–314. ISBN 978-953-51-0093-5.

PETERKA J, ADÁMEK Z, BLABOLIL P, BOUŠE E, ČECH M, DRAŠTÍK V, FROUZOVÁ J, HAVEL L, HOHAUSOVÁ E, JÁNSKÝ M, JAROLÍM O, JURAJDA P, JŮZA T, KOČVARA L, KRATOCHVÍL M, KUBEČKA J, MUŠKA M, PRCHALOVÁ M, RICHTA J, ŘÍHA M, SAJDLOVÁ Z, SOUKALOVÁ K, TUŠER M, UHLÍŘOVÁ A, UHLÍŘ F, VAŠEK M, VEJŘÍK L, VESELÝ L, VLASÁK P, 2012. Ryby nádrže Milada. In Šutera V (ed.), *Příroda nádrže Milada - území po zatopení lomu Chabařovice*. Lesnická práce, s. r. o., Kostelec n. Č. L.: 92–111. ISBN 978-80-7458-024-6.

VINKLER M, SVOBODOVÁ J, MARŠÍK P, ALBRECHT T, 2011. Carotenoids and health signalling in animals. *In* Yamaguchi M (ed.). *Carotenoids: properties, effects and diseases*. Nova Science Publishers, Hauppauge: 189–234. ISBN 978-1-61209-713-8.

Papers in journals included in the databases ISI Web of Knowledge

AGUILAR-ALBEROLA JA, MESQUITA-JOANES F, LÓPEZ S, MESTRE A, CASANOVA JC, RUEDA J, RIBAS A, 2012. An invaded invader: high prevalence of entocytherid ostracods on the red swamp crayfish *Procambarus clarkii* (Girard, 1852) in the Eastern Iberian Peninsula. *Hydrobiologia* 688: 63–73.

ALBRECHTOVÁ J, ALBRECHT T, BAIRD SJE, MACHOLÁN M, RUDOLFSEN G, MUNCLINGER P, TUCKER PK, PIÁLEK J, 2012. Sperm-related phenotypes implicated in both maintenance and breakdown of a natural species barrier in the house mouse. *Proceedings of the Royal Society of London B - Biological Sciences* 279: 4803–4810.

ALBRECHTOVÁ K, SEDLÁK K, PETRŽELKOVÁ KJ, HLAVÁČ J, MIHALCA AD, LESINGIRIAN A, KANYARI PWN, MODRÝ D, 2011. Occurrence of filaria in domestic dogs of Samburu pastoralists in Northern Kenya and its associations with canine distemper. *Veterinary Parasitology* 182: 230–238.

ALIOTA MT, JONES SA, DUPUIS AP, CIOTA AT, HUBÁLEK Z, KRAMER LD, 2012. Characterization of Rabensburg virus, a flavivirus closely related to West Nile virus of the Japanese encephalitis antigenic group. *PLoS ONE* 7: e39387.

ARSLAN A, ZIMA J, 2011. Banded karyotype of the Konya wild sheep (*Ovis orientalis anatolica* Valenciennes, 1856) from Turkey. *Comparative Cytogenetics* 5: 81–89.

ARSLAN A, ZIMA J, 2012. Cytogenetic investigations in *Sciurus anomalus* from Turkish Thrace (Rodentia: Sciuridae). *Acta Zoologica Bulgarica* 64: 421–426.

ARSLAN A, YORULMAZ T, TOYRAN K, GÖZÜTOK S, ZIMA J, 2011. C-heterochromatin variation and NOR distribution in the karyotype of water vole, *Arvicola terrestris* (Mammalia, Rodentia). *Caryologia* 64: 215–222.

ARSLAN A, YORULMAZ T, TOYRAN K, ALBAYRAK I, ZIMA J, 2012. C-banding and Ag-NOR distribution patterns in Euphrates jerboa, *Allactaga euphratica* (Mammalia: Rodentia), from Turkey. *Mammalia* 76: 435–439.

ARSLAN A, SÜKRÜYE A, ZIMA J, 2011. Variation in C-heterochromatin and NOR distribution among chromosomal races of mole rats (Spalacidae) from Central Anatolia, Turkey. *Mammalian Biology* 76: 28–35.

AVILÉS JM, VIKAN JR, FOSSOY F, ANTONOV A, MOKSNES A, ROSKAFT E, SHYKOFF JA, MOLLER AP, JENSEN H, PROCHÁZKA P, STOKKE BG, 2011. The common cuckoo *Cuculus canorus* is not locally adapted to its reed warbler *Acrocephalus scirpaceus* host. *Journal of Evolutionary Biology* 24: 314–325.

BAIRD SJE, RIBAS A, MACHOLÁN M, ALBRECHT T, PIÁLEK J, GOÜY DE BELLOCQ J, 2012. Where are the wormy mice? A re-examination of hybrid parasitism in the European house mouse hybrid zone. *Evolution* 66: 2757–2772.

BARANČEKOVÁ M, KROJEROVÁ-PROKEŠOVÁ J, VOLOSHINA IV, MYSLENKOV AI, KAWATA Y, OSHIDA T, LAMKA J, KOUBEK P, 2012. The origin and genetic variability of the Czech sika deer population. *Ecological Research* 27: 991–1003.

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BENDA P, VALLO P, REITER A, 2011. Taxonomic revision of the genus *Asellia* (Chiroptera: Hipposideridae) with description of a new species from southern Arabia. *Acta Chiropterologica* 13: 245–270.

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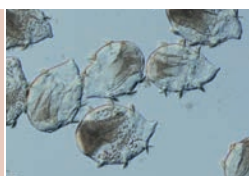
Evolutionary Ecology

Biodiversity



Pathogens and diseases

Applied Ecology

Evolutionary Ecology

Photo by C. Smith.

EVOLUTIONARY ECOLOGY

Reproductive behaviour in bitterling fish

Bitterling fish are used as a model system in sexual selection studies and a detailed understanding of their reproductive biology represents a crucial step in appreciating the complexity of their behaviour. The European bitterling (*Rhodeus amarus*), the only representative of the bitterling clade found in Europe, is abundant throughout lowland streams, rivers and lakes. We followed a bitterling population from the River Kyjovka (used in most of our behavioural experiments) over an entire year to determine important population characteristics and their seasonal dynamics. We found that the reproductive season lasted from early April to mid-June (a long period for fish in a temperate zone), with a peak in late April. Sex ratio was female biased and this was especially pronounced after the peak of the reproductive season. This suggests high male mortality during the breeding season. Adult mortality in general was high after the reproductive season and most fish did not survive to reproduce the following spring. We also assessed fish condition and histological parameters throughout the year, and demonstrated that fish allocated a disproportionally high level of resources to reproduction. In males, we compared traits associated with sperm production and reproductive success among three bitterling species. The European bitterling displayed the most developed reproductive apparatus with many traits associated with high levels of sperm production and fertilisation efficiency. This indicated that levels of sperm competition in the European bitterling are much higher than in Asian bitterling species. We believe that this is a consequence of the relatively short reproductive season for European bitterling (2–3 months) compared to Asian bitterling species (3–6 months). Finally, we also tested how individual male personality traits were associated with reproductive behaviour. While we demonstrated a close relationship between number of breeding tubercles (pearl organs) and a male's propensity to guard a territory, there was no association between male personality traits and his reproductive role as a guarder or sneaker.

There is no association in European bitterling between male personality traits and their reproductive strategy. (*Photo by M. Reichard*)

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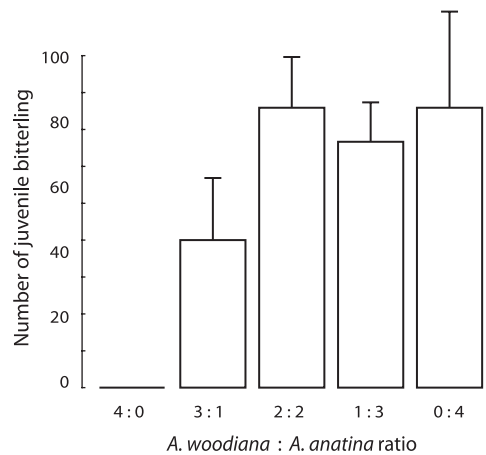
Biological invasions and coevolved host-parasite relationships

Coevolutionary relationships between parasites and hosts can elevate the rate of evolutionary change due to rapid reciprocal adaptations between coevolving partners. Such relationships can result in the evolution of host specificity. When host specificity is not associated with marked phenotypic difference, it often remains undetected. We used the European bitterling (*Rhodeus amarus*), a freshwater fish that parasitises a wide range of unionid mussels, to investigate host specialisation in regions of recent and ancient sympatry with freshwater mussels. We used genetic markers and experimental behavioural data to test possible mechanisms of host species recognition, finding no strong evidence for host specific lineages in either region. Then we used this model system to investigate the role of biological invasions on coevolved relationships, illustrating how intricate the effects of invasive species may be by showing that an invading Asian mussel (*Anodonta woodiana*) caused a complete ecological reversal by turning a host into a parasite and vice versa. We further demonstrated that the generalist strategy displayed by the *A. woodiana* larval stage can enable rapid expansion in new ranges. Glochidia are an obligatory parasitic stage of unionid mussels, typically specialising in just a few fish host species. *A. woodiana* glochidia, however, are able to complete their development in a very wide range of fish hosts, which has probably contributed significantly to their successful establishment in Europe and other parts of the world where the species is not native. The impact of multiple invading species can be magnified due to positive feedback (termed 'invasional meltdown'). Invasive species however, can also be adversely affected by interactions with other invaders. We identified several potential indirect effects of zebra mussel (*Dreissena polymorpha*), another non-native mussel species recently expanded into Central Europe, on the bitterling-mussel relationship. Zebra mussels foul the shells of unionid mussels and compete with them for food. At the same time, zebra mussels alter the ability of the bitterling to use the unionid mussel as a host for their embryos, creating a mosaic of potential outcomes in this complex interaction.



Bitterling reproductive success, measured as the total number of juveniles leaving mussels in experimental pools across five experimental treatments simulating differential proportions of invasive *Anodonta woodiana* on native *Anodonta anatina* mussels.

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Biology of *Nothobranchius* fishes – a new model species in evolutionary studies

African annual fishes of the genus *Nothobranchius* (Cyprinodontiformes) have an extraordinary life history. They inhabit temporary pools in the African savanna which flood just for a few months, surviving the dry season as eggs buried in the sediment. The embryos hatch at the onset of the rainy season, grow rapidly and can become sexually mature in less than three weeks. This makes them ideal for laboratory-based research and the taxon is emerging as an important model species in ageing and cancer research. We have a long-term interest in evolutionary ecology studies using this taxon, concentrating on species inhabiting a particularly dry part of the genus' range in southern Mozambique. In 2011 and 2012, we completed a study aimed at clarifying the phylogenetic position of co-occurring *Nothobranchius* species in Mozambique, demonstrating that they form three separate clades. The males of most species occur in two or more colour forms and we found that male colour has no phylogenetic signal in *N. furzeri*, where morphs are sympatric, but is associated with two reciprocally monophyletic groups in the *N. rachovii* clade, where colour morphs are parapatric. We also associated polymorphism in the *Melanocortin1 receptor* gene (controlling pigmentation in vertebrates) with male colour polymorphism and showed that it is not related to colour phenotypes of the study species. In a further study, we found that two sympatric *Nothobranchius* species displayed largely incomplete and asymmetric reproductive isolation and frequently hybridised under laboratory conditions. We also observed interspecific mating in the field, which we attribute to male coercion, highlighting the fact that males of rarer species may often coercively mate with females of a related, more abundant species. Finally, we investigated age structure and hatching synchrony in wild *Nothobranchius* populations, revealing variability in the degree of hatching date synchronisation within a population. Hatching dates were relatively uniform in some populations, and varied considerably in others. *Nothobranchius* fish hatch between mid-December and mid-January, hatching being associated with cyclone-based, intensive precipitation. Given that cyclone-associated rains cover large areas, hatching across southern Mozambique is relatively synchronous.

This short-lived annual fish (*Nothobranchius furzeri*) from southern Mozambique has become a new model species for numerous evolutionary and biomedical studies. *(Photo by O. Sedláček)*

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Nest predation and antipredation strategies in birds

While avian nests are vulnerable to predation, incubating parents are also exposed to predators. Nest predation, therefore, may not only represent an important selective force shaping the evolution of avian life-histories but also lead to the emergence of sophisticated antipredator strategies. We studied links between breeding biology, antipredator strategies and nest predation in birds. First of all, we studied patterns in clutch sizes and nest predation (using artificial nests) along a large-scale geographic gradient in South Africa, characterised by increasing productivity from desert in the west to humid savanna in the east, and calculated the mean clutch size of birds occurring in atlas quadrates surrounding our study sites. Clutch size generally increased with increasing productivity and seasonality. We found no evidence, however, for a relationship between nest predation rate and clutch size in ground-nesting birds, indicating that food availability is the major factor responsible for geographical variation in clutch size across South Africa. In Mallards (*Anas platyrhynchos*), we evaluated how miscellaneous environmental factors affect risk perception, corresponding antipredator vigilance level and escape decisions in incubating females. We found that incubating females increased their vigilance with increasing nest vegetation cover. Nest vegetation concealment may thus play an underlying role in antipredator vigilance during sleep in this species. In a further study, we proposed a mathematical model that used intensity of predator-mediated visual stimuli as a basic cue for the escape response. We considered looming stimuli (i.e. expanding retinal image of the moving predator) as a cue to flight initiation distance (FID) and then examined the relationship between FID, vegetation cover and directness of predator trajectory, fitting the resultant model to experimental data. As predicted by the model, vegetation concealment and directness of predator trajectory interact, with FID decreasing with increased concealment during a direct approach toward prey, but not during a tangential approach. Our results show that a simple proximate expectation, which involves only visual processing of a moving predator, may explain interactive effects of environmental and predator-induced variables on an escape response.

Incubating Mallard (*Anas platyrhynchos*) females increased their vigilance with increasing nest vegetation cover. *(Photo by V. Javůrková)*

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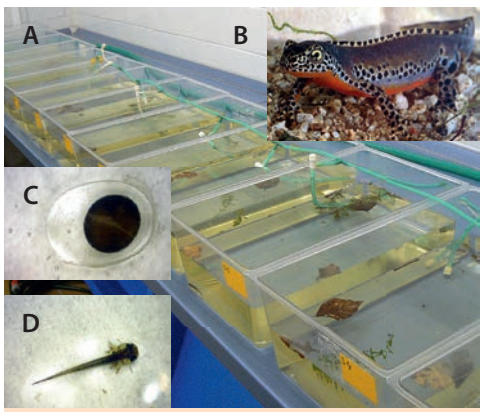
Role of behavior and acclimation in ectotherm thermal strategies

Ectotherms cope with heterogeneity in the thermal environment using the unique combination of behavioral thermoregulation, thermal acclimation, and evolutionary adaptation. Due to its immediate and reversible response, behavioural thermoregulation has been considered as a filter reducing variation in body temperature, and thus selection pressure on thermal physiology traits. We examined this issue using a non-traditional model in thermal biology, the Alpine newt (*Ichthyosaura alpestris*). Our results indicate that newts combine various behavioural and physiological components in their thermal strategy (confirming their suitability for testing predictions of current theory). The relative effectiveness of both components as a buffer is determined by their costs under a given combination of biotic and abiotic factors. While seasonal and developmental acclimation are mutually-exclusive components of thermal strategy, they occur jointly in newts from one population. These facts change a widely held view on ectotherms' responses to heterogeneity in the thermal environment, and thus they should be incorporated into future coadaptation models of thermal biology. Our results clearly demonstrate the importance of studies on non-traditional model species, thereby reducing widespread taxonomic bias across biological disciplines.



(*A*) Newt breeding colony at the Studenec research facility, with the Alpine newt (*Ichthyosaura alpestris*) model species: (*B*) adult, (*C*) egg, and (*D*) hatched larva. *(Photo by L. Gvoždík)*

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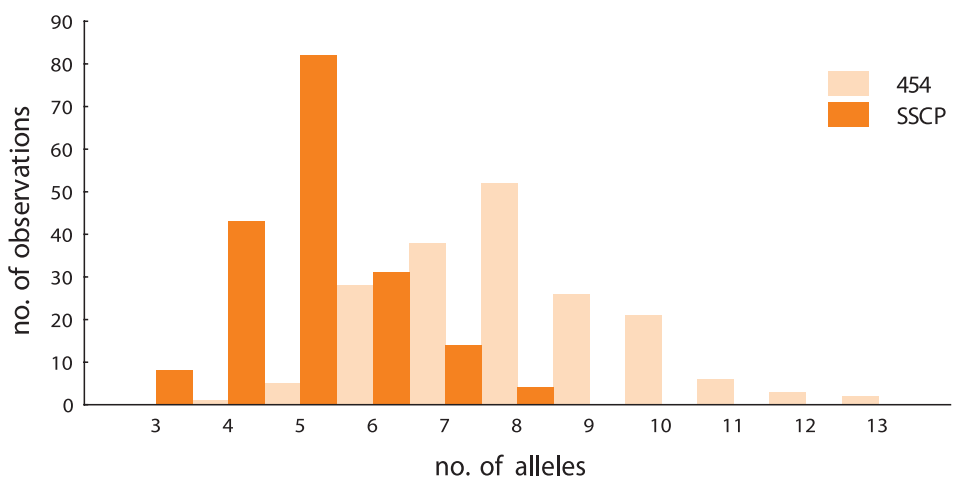
Major histocompatibility complex genes: pathogen-mediated selection and their role in mate choice

Major histocompatibility complex (MHC) has become a model system for studies of natural selection, host-parasite interactions and mate choice. Results of such studies, however, are often ambiguous. There is probably no unified pattern in MHC functioning among all taxa and more empirical data from various animal groups are required for better understanding of MHCs role in vertebrate evolution. We analysed the evolutionary mechanisms influencing genetic variability in MHC over a wide spectrum of vertebrate species. In the first study, we found that MHC variation does not copy phylogeographic structure in bank voles (*Myodes glareolus*) and that positive (probably pathogen-mediated) selection is more important than historical effects for the spatial genetic architecture of MHC. High intrapopulation diversity of MHC is usually explained by (1) heterozygote advantage and/or (2) fluctuating frequency dependent selection. In a wild population of zebrafish (*Danio rerio*) from Bangladesh, no evidence for heterozygote advantage was found, while combined parasitological and genetic results suggest that MHC variability in zebrafish is maintained by pathogen-mediated selection fluctuating in time and space. In the context of mate choice, MHC genes are considered as either "good genes" (where all females in a population prefer the same male with a specific MHC genotype) or as "complementary genes" (where the female chooses a male according to her own genotype). In the scarlet rosefinch (*Carpodacus erythrinus*) we found some support for the 'good-genes-as heterozygosity model', as social males of high MHC-heterozygosity were cheated on by their females less frequently than less MHC-heterozygous males. On the other hand, direct experimental evidence using rose bitterling strongly supports the MHC-complementarity hypothesis. By sequentially pairing females with MHC similar and dissimilar males, based on *a priori* known MHC profiles, it was shown that females discriminated between similar and dissimilar males and deposited significantly more eggs with MHC dissimilar males. We also identified two possible sources of inconsistency in previous MHC studies of wild vertebrates. Firstly, in the analysis of two house mouse (*Mus musculus*) MHC Class II genes (first MHC study on wild populations of this model species), we detected disparate evolutionary patterns, despite the two genes being only 0.01cM apart. H-2Aa showed higher allel-



Distribution of MHC Class I variants per individual scarlet rosefinch, identified using two genotyping methods: the classic CE-SSCP (*single strand conformation polymorphism analysis by capillary electrophoresis*) and the newly optimised 454 pyrosequencing. CE-SSCP significantly underestimates HMC diversity.

ic polymorphism, faster allelic turnover due to higher mutation rates, stronger positive selection at antigen-binding sites and higher population structuring than H-2Eb. Secondly, traditional methods of MHC genotyping can substantially underestimate actual MHC variation. In the scarlet rosefinch, the number of MHC variants detected by Single-Strand Conformation Polymorphism analysis is significantly lower than that detected by next-generation sequencing (454 technology). Future studies on MHC genes in wild-living vertebrates, therefore, should use more complete genotyping data (with combination of all Class I and II genes best) collected by appropriate techniques in order to obtain unbiased results.

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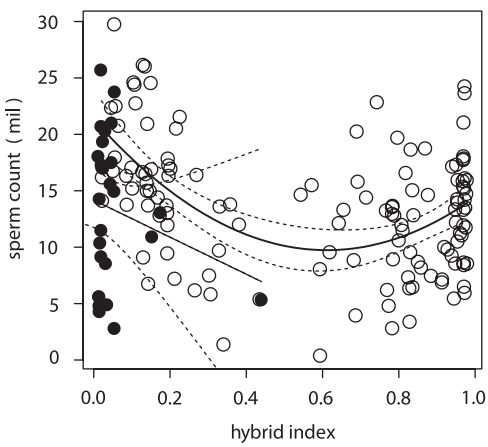
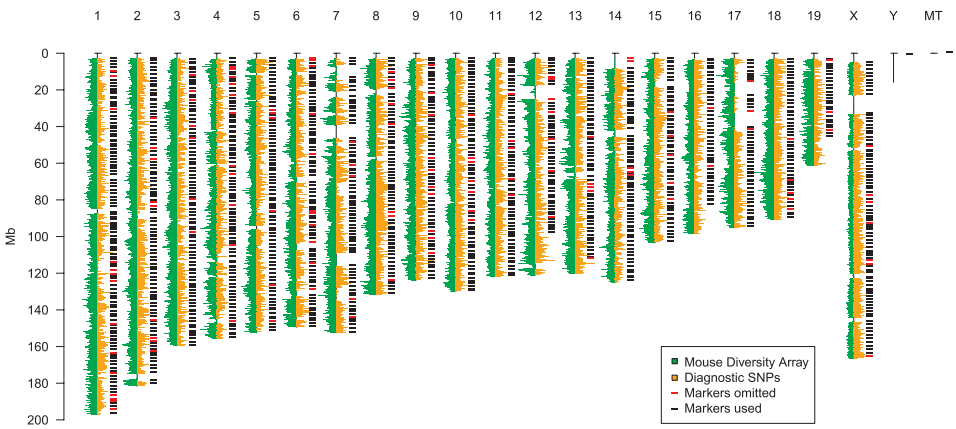
Study of selection in the house mouse hybrid zone

Two house mouse subspecies are present in Europe: *Mus musculus musculus*, with its range in the east of the continent, and *M. m. domesticus,* in the west. At the limits of their ranges, both subspecies interbreed and form a narrow hybrid zone (HZ) in which processes related to speciation can be studied. Analysis of 600,000 single nucleotide polymorphisms (SNPs) in allopatric mice revealed that the proportion of amino acid substitutions fixed by positive selection reaches 12–13% in the mouse genome. We constructed a panel of 1401 SNPs for whole-genome based mapping of chromosomal regions under selection in the HZ; detecting chromosomal blocks experiencing identical selection in two HZ transects (5% at autosomal and 23% at X-linked markers). A targeted selection of 24 X-linked markers showed that even markers in tight linkage can recombine away from their parental genome and introgress in different ways across the HZ. On the contrary, some genes have low potential to form barriers to gene flow. This can be exemplified either by our analysis of MHC Class II genes from a family of genes coding for adaptive immunity response, or from Y-linked genes. In subsequent studies, we fo-



Association between hybrid index (i.e. proportion of the *musculus* genome) and sperm count across the house mouse hybrid zone in the Czech transect. Open circles depict individuals with the *M. m. musculus* Y chromosome, and black circles indicate individuals with the *M. m. domesticus* Y chromosome. Thick and thin solid lines display fits of data for males bearing the *musculus* and *domesticus* Y chromosomes, respectively. The dashed lines represent 95% confidence intervals.

cused on phenotype traits that presumably affect fitness of individuals and are thereby associated with barriers preventing gene flow across the HZ. The traits were related to a hybrid index calculated from 1401 SNPs and which characterised the level of individual hybridity (ranging from 0 (*M. m. domesticus*) to 1 (*M. m. musculus*)). Males from central parts of the HZ had less motile sperm and lower sperm number in comparison to parental counterparts. In addition, sperm number was shown to be associated with an extensive Y chromosome introgression documented along the mouse HZ in Central Europe. Males with *M. m. domesticus* background bearing the Y chromosome from *M. m. musculus* displayed significantly higher numbers of sperm than the same males with the native Y chromosome. Using a likelihood model, we were able to demonstrate the presence of reinforcement in the HZ for first time.



Location of 1401 genetic markers diagnostic for *Mus musculus musculus* and *M. m. domesticus* in the house mouse genome.

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Eggshell appearance and the signalling function of egg colour

The impressive array of avian egg colours and patterns has fascinated many biologists, encouraging them to investigate its origin and function. Since little is known about variation in eggshell colouration within individuals, we explored within- and between-season repeatability in eggshell appearance for the great reed warbler (*Acrocephalus arundinaceus*). Eggshell appearance within clutches measured by reflectance spectrophotometry showed moderate repeatability, while both within- and between-season repeatability in clutch colouration for individual females were low. This could represent a significant constraint for host egg-discrimination abilities as, with variable eggs between successive clutches, host females may need to relearn the appearance of their eggs with every clutch they lay. Furthermore, we were interested in whether environmental factors, such as temperature and rainfall, affect egg colouration in the great reed warbler. We failed to find strong support for this hypothesis; nevertheless, our results indicate that temperature has an effect on some egg colour characteristics, such as brightness and UV-blue colouration. At the ultimate level, egg appearance serves a variety of tasks, including protection and signalling. It has recently been proposed that blue-green colours have evolved as a post-mating signal of female quality, selected by males allocating their parental effort in response to the strength of this signal. However, we found no association between variation in blue-green eggshell chroma and measures of female quality in the great reed warbler (i.e. body condition, mean egg volume and age). Moreover, males did not adjust their investment (in terms of nest defence against a brood parasite) in relation to blue-green eggshell chroma. In light of the above findings, we conclude that blue-green colouration in this open nesting passerine is unlikely to have a signalling function for female quality.

Impressive egg colour variation is an important trait for evolutionary studies. *(Photo by M. Honza)*

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Adaptations and counter-adaptations in the co-evolutionary struggle between avian brood parasites and their hosts

Interactions between avian brood parasites and their hosts provide a textbook example of the co-evolutionary arms race in action. As brood parasites significantly reduce host fitness, and hosts often defend themselves, both participants have developed various adaptations and counter-adaptations. By integrating comparative and experimental approaches, we tested why *Turdus* thrushes are extremely rarely parasitised by the common cuckoo *Cuculus canorus*. Surprisingly, in this phylogenetically homogeneous group, there were interspecific differences in factors responsible for the absence of cuckoo parasitism. We also revealed that cuckoos were not locally adapted to match host egg phenotypes in a geographical mosaic of reed warbler *Acrocephalus scirpaceus* populations. Our results suggest that cuckoo local adaptation might be prevented when different cuckoo populations exploit different host species, with gene flow or frequent host switches breaking down local adaptation where many cuckoo host races co-occur. It is well known that one of the most effective host defences against brood parasitism is recognition and rejection of a parasitic egg. We demonstrated that eggshell colouration confined to the blunt egg pole serves as an important recognition cue in this respect. Furthermore, it has been suggested that another important factor for egg discrimination is the nest light environment. Although one would expect that the amount of ambient light near host nests should play a significant role, we did not confirm a direct effect of this parameter, though it was important in interaction with mimicry of the cuckoo egg. In a further study, we were interested in timing host responses toward parasitic eggs. We found that the proportion of time a host female spends in clutch inspection behaviour is decisive as regards speed of egg ejection. Finally, we investigated whether host social mating system affected reproductive success of the brood parasite. We found higher cuckoo fledging success in nests of monogamous compared to polygynous males, monogamous nests being more than twice as successful as secondary nests. This suggests that the actual level of social polygyny in a host population may considerably influence the overall reproductive success of a local cuckoo population.

Survival of a parasitic chick depends on the mating system of the host. *(Photo by P. Procházka)*

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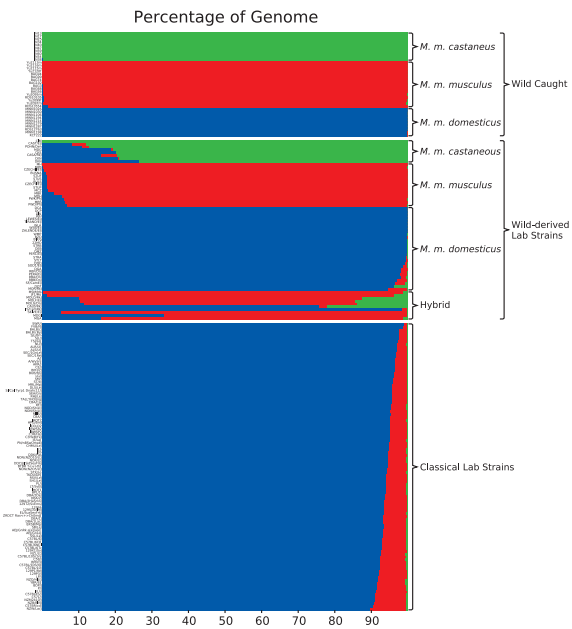
Biodiversity

Photo by M. Havlíček.

BIODIVERSITY

Origin of laboratory mice

House mice have actively and passively colonised new territory in the Old and New World via shipping. A second group of migrants, including the so-called dancing mice, were carried by sailors to their homes in Europe as pets from China and Japan. From a scientific point of view, this latter group of mice played a key role in the derivation of the classical laboratory strains that have become an irreplaceable part of biomedical studies on cancer, immunity and obesity. The first strain of mice derived from a cross between a brother and sister in order to achieve genetic homogeneity (inbred strain) was the DBA *(Dilute Brown Non-Agouti*). Its creation was first publicised in 1909 and, since then, researchers have produced more than 200 inbred strains. Unfortunately, the origin of the classical strains has not been well documented. We present data on 198 samples, consisting of 36 mice caught in the wild, 62 strains recently derived from natural populations (with known genealogy), and 100 classical mouse strains. The first group of mice was used to define genetic markers diagnostic for three forms of mice, i.e. Eastern-European *Mus musculus musculus*, Western-European *M. m. domesticus*, and Southeast Asian *Mus musculus castaneus* house mice. Each sample was genotyped for 549 599 single nucleotide polymorphisms (SNPs) and 117 203 oligonucleotides with variable signal intensity for SNP detection. The results demonstrated that classical laboratory strains are derived from a small number of "dancing mice" and, therefore, have a limited number of genetic variants (haplotypes). Their genomes represent mosaics of all three mouse forms, though the three forms contribute at different rates, i.e. *M. m. domesticus* 94.4%, *M. m. musculus* 5.4% and *M. m. castaneus* 0.2%. In contrast, strains derived from mice caught in the wild display higher genetic variability, more close to that observed in natural populations. Given that laboratory strains are still the dominant model in biomedical studies; our work allows immediate targeted planning of experiments that use association studies for mapping genes negatively influencing human health.



Proportion of diagnostic markers in the genome of three house mouse subspecies in a) wild populations (*upper panel*), b) wild-derived strains (*middle panel*), and c) classical laboratory strains (*lower panel*). Green is diagnostic for the Southeast Asian house mouse (*Mus musculus castaneus*), red for the Eastern-European house mouse (*M. m. musculus*) and blue for the Western-European house mouse (*M. m. domesticus*).

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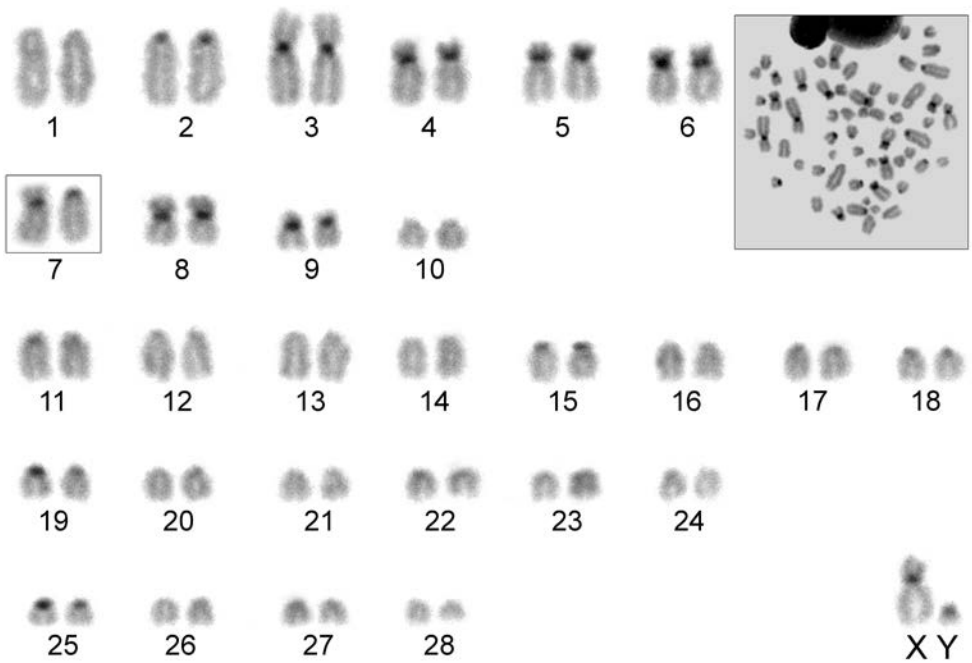
The role of chromosomal changes in speciation and systematics

The role of chromosomal rearrangements in evolution and systematics is much debated. Karyotypic changes have been proposed as enhancing differentiation between chromosomally differentiated taxa and, therefore, in promoting speciation. Our long-term research efforts have focused on investigating western Palaearctic mammal karyotype constitution in order to reveal patterns of inter- and intraspecific chromosomal variation and to obtain new data relevant to the taxonomy and phylogeny of a range of taxa. Special attention has been paid to model species that exhibit exceptionally extensive karyotypic variation and include many diversified chromosomal races, such as mole rats of the genus *Nannospalax* and the common shrew (*Sorex araneus*). We supplemented data on the karyotype characteristics of various mole rat populations through comparative banding studies, and conducted a molecular study showing the pattern of genetic differentiation between mole rat populations with different karyotypes. No hybrids were found between frequently occurring parapatric chromosomal races (cytotypes) of these strictly subterranean rodents, and genetic distances between the races were considerable, which supports the importance of karyotype change in the origin of new species. In the common shrew, five chromosomal hybrid zones, characterised by different levels of karyotype complexity, were studied using microsatellite markers. We observed low levels of genetic differentiation, even in hybrid zones with the highest karyotype complexity. No evidence of restricted gene flow was observed between differently rearranged chromosomes. We were unable to detect any effect of chromosomal rearrangement on gene flow, in the common shrew. These data indicate that the role played by chromosomal change in speciation and evolution remains a topical but largely unresolved problem.



The C-banded chromosomal complement of the 2n=58 cytotype for the Anatolian Mole Rat (*Nannospalax xanthodon*) from Turkey.

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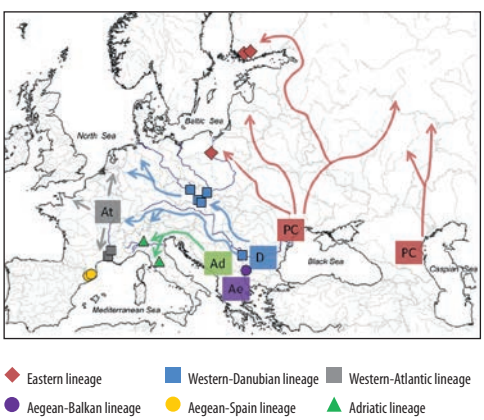
Phylogeography of Palaearctic vertebrates – new questions, new models

Genetic approaches were used on various non-model vertebrate taxa to answer challenging evolutionary and ecological questions related to their intraspecific phylogeographic history. Large-scale analysis of the European chub (*Squalius cephalus*) revealed multiple refugia and subsequent post-glacial colonisation of Europe via different routes. Investigation of three great crested newts (*Triturus cristatus* superspecies) revealed a complex genetic structure in Central European populations, influenced by both historical and contemporary hybridisation and introgression in zones where parapatric populations meet. We also investigated two reedbed passerines the reed warbler (*acrocephalis scirpaceus*) and savis warbler (*Locustella luscinioides*) that differ in migration pattern. Irrespective of difference in migratory pathway, the most pronounced genetic differences were found between Iberian populations and the rest of the breeding range, indicating that the Iberian Peninsula harbours higher levels of genetic diversity, caused by historical differentiation of local populations. Two subspecies have traditionally been recognised in the Egyptian fruit bat (*Rousettus aegyptiacus*); genetic studies, however, demonstrate that all Palaearctic populations represent one form with plastic morphometric traits. Our studies exemplify the power of phylogeography in revealing hidden genetic diversity, delineating manageable units for conservation and resolving taxonomic questions.



Geographical location of sampling sites and schematic overview of refugia suggested for European chub (*Squalius cephalus*). Arrows indicate possible colonisation pathways.

PC = Ponto-Caspian refugium; D = Danubian refugium; Ad = Adriatic refugium; Ae = Aegean refugium; At = secondary Atlantic refugium. The presence of a possible Iberian refugium is indicated by a question mark.

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Taxonomic diversity of small mammals in Africa and the Middle East

To a large extent, small mammal diversity in Africa and adjacent regions of the Arabian Peninsula is still underestimated. Many currently accepted taxonomic divisions depend mainly on decades-old work relying on traditional morphological approaches and intuitive identification of species. Only recently has the combination of both traditional methods and new genetic methods allowed an understanding of the true biodiversity present in these regions of the world. Analysis of an extensive dataset covering the whole distributon range of a desert bat species, Geoffroy's trident leaf-nosed bat (*Asellia tridens*), provided both molecular and morphological evidence for two additional species occurring in hotspots of the Afro-Arabian area. One is now described as a species new to science, the Yemeni trident leaf-nosed bat (*A. arabica* sp.n.), while the other, the Somalian trident leaf-nosed bat (*A. italosomalica*), is elevated to full species rank. The wide distribution of *A. tridens* throughout Africa, as well as the mechanisms of origin in current taxa, was estimated with regard to Plio-Pleistocene climate changes. A further study affecting Middle Eastern bat species diversity revised the status of the only species of house bats (genus *Scotophilus*) living outside Africa. Two separate species are now shown to occur in southeastern Yemen, both with close relationships to African taxa, the yellow-bellied house bat (*S. dinganii*) and the white-bellied house bat (*S. leucogaster*). Moreover, molecular evidence allowed recognition of one as a separate species distinct from *S. dinganii* (the Ethiopian house bat (*S. colias*)). A third bat study examined a separate evolutionary lineage within the Sundevall's leaf-nosed bat (*Hipposideros caffer*) complex in West Africa, morphologically similar to, but independent from, the recognised cryptic species Noack's leaf-nosed bat (*H. ruber*). Sequence variation pointed to the existence of two internal sublineages. In the study, we challenge their present taxonomic status and provide evidence for their distinction through echolocation and morphology.

The Yemeni trident leaf-nosed bat (*Asellia arabica sp.n.*), a newly described species from the Dhofar region of southern Arabia. *(Photo by A. Reiter)*

Rodents are another African mammal group with underestimated species diversity. Genetic revision of the speciose group Praomyini in Zambia provided significant new data on distri-

bution and taxonomy of these murine rodents. One species from the genus *Praomys* was new to science (awaiting taxonomic description), two were recorded for the first time in Zambia (these records of least soft-furred mouse (*P. minor*) enlarge its distribution area by more than 1300 km to the south), and one species was excluded from the list of Zambian rodents. Comparison of individual species' distribution patterns allowed identification of cryptic centres of biodiversity where habitat protection is urgently required. Not only do our studies (which infer evolutionary relationships based on molecular data) amend our knowledge of African and Arabian diversity, they also provide an important basis for furthering our understanding of evolutionary mechanisms and biogeographical history, with direct implications for conservation.

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Rodent phylogeny in the throes of geological change

Large-scale geological events that enable or prevent contact of landmasses and habitats have profound effects on biodiversity. Not only can populations spread to newly accessible regions or become isolated from other conspecifics, but population sizes can also change over several orders of magnitude. Populations with changing size are particularly susceptible to genetic diversification, which often co-occurs with dispersal across continents. Beringia has provided contact between Eurasia and North America multiple times throughout history, whereas the Panama Isthmus only connected North and South America as recently as three million years ago. We studied how land connection dynamics between Eurasia and the Americas have facilitated divergence in rodents.

The grey squirrel (*Sciurus carolinensis*) was included in the reconstruction of phylogenetic relationships among tree squirrels. *(Photo by P. Pečnerová)*

Tree squirrels (Rodentia, Sciuridae) have crossed the Bering land bridge independently at least twice. Phylogeny based on comprehensive DNA sequencing data has shown that tree squirrels in Eurasia represent old lineages that have remained stable. In the Americas, tree squirrels have diversified dramatically, with the youngest lineages harbouring the greatest contemporary diversity. Voles (Rodentia, Arvicolidae) also display rapid diversification following the arrival of their ancestors to North America. Their phylogeny shows multiple lineage differentiation events, not only in relation to dispersal to other continents but also in response to landscape change during glacial cycles. Over the last two million years, Pleistocene glaciations have shaped biodiversity in temperate zones through dramatic changes in regional climate and accompanying vegetation dynamics, resulting in some areas that were temporarily uninhabitable for specific rodent species. However, we also found that Pleistocene vicariance dynamics influenced gerbils (Rodentia, Gerbilidae) in northwestern Sahara. During cold phases of climatic change, this region was moister and unsuitable for sand dune species. Isolated gerbil populations diversified, resulting in the dramatic chromosomal rearrangements exhibited by today's populations, which probably resulted in further reproductive isolation and speciation. These same processes accompany diversification in Turkish mole rats (Rodentia, Spalacidae). While karyotype variation is well defined, in accordance with the phylogenetic lineage of DNA sequences, other cytotypes share closely related genetic information, hinting at recent emergence of the trait.

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Hidden components of biodiversity in tropical ecosystems: Undescribed genera and species of bird parasites

As an integral part of the natural history of animals, parasites are an important, though usually overlooked, component of ecosystem biodiversity. At the individual level, they can cause disease and death of the host; their effects, however, are usually density dependent. At the population and community levels, parasites may regulate host populations and influence host community structure. Paradoxically, while parasites may be detrimental to biodiversity in some instances, they may actually preserve it in others. They have recently become a concern in conservation issues. We studied host-parasite associations in the Neotropical (Central and South America), Afrotropical (Western Africa) and Indomalayan (Southeast Asia) regions. Examination of 3,301 birds belonging to 460 species revealed two genera and 29 species of parasite new to science, as well as new host-specific associations. Moreover, a number of parasite species were recorded for the first time in the study areas. Discoveries included new genera of the feather mites *Picipterodectes* and *Vireodectes* (Acari: Proctophyllodidae) belonging to the *Proterothrix* generic group and uniting archaic genera in the tribe Pterodectini. The new species were found on woodpeckers (Picidae) and erpornises (Vireonidae) from the Indomalayan Region. Species new to science included chewing lice of the genus *Myrsidea* (Phthiraptera: Menoponidae) and a feather mite of the genus *Picalgoides* (Astigmata: Psoroptoididae), 10 different species being found on leaftossers (Furnariidae), phainoptilas (Bombycillidae), New World warblers (Parulidae), cardinals (Cardinalidae), New World sparrows (Emberizidae), euphonias (Fringillidae) and tana-

The chestnut-capped brush-finch (*Arremon brunneinucha*), in which *Myrsidea dolejskae*, a chewing louse new to science was first discovered.

(Photo by M. Čapek)

gers (Thraupidae) from the Neotropical Region. In the Afrotropical Region, four new species included chewing lice of the genera *Brueelia* and *Philopteroides* and a mite of the genus *Lasioseius* (Acarina: Blattisociidae) found on monarchs (Monarchidae), prinias (Cisticolidae) and sunbirds (Nectariniidae). Studies in the Indomalayan Region revealed 15 new species of chewing lice of the genera *Myrsidea*, *Brueelia* and *Philopteroides* (Phthiraptera: Menoponidae) and feather mites of the genera *Montesauria*, *Dolichodectes*, *Proterothrix*, *Picipterodectes* and *Vireodectes* (Acari: Proctophyllodidae), found on woodpeckers (Picidae), erpornises (Vireonidae), bulbuls (Pycnonotidae), cettia bush warblers (Cettiidae), leaf warblers (Phylloscopidae), babblers (Timaliidae), fulvettas and ground babblers (Pellorneidae), thrushes (Turdidae) and Old World flycatchers (Muscicapidae).

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Pathogens and diseases

Photo by I. Profousová

PATHOGENS AND DISEASES

Tick-borne vertebrate viruses of Europe

Tick-borne viruses (or "tiboviruses") belong to an ecological group characterised by their specific mode of biological transmission, i.e. passed to endotherm vertebrates via competent haematophagous hard (ixodid) or soft (argasid) ticks (*Ixodidae* and *Argasidae*, respectively). Only those vertebrate species that produce at least moderate viraemia have been regarded as competent, 'true' or 'amplifying' hosts of particular arboviruses. However, co-feeding ixodid ticks on a viremia-free host can sometimes also contribute to infection of non-infected ticks. Some tiboviruses are transmitted from larvae to nymphs and imagoes during metamorphosis (transstadial transmission), from infected female to offspring (transovarial transmission, TOT), and from male to female tick during copulation (venereal or horizontal transmission). These modes are extremely important ecologically, e.g. under conditions of TOT, the tick vector also plays the role of a long-term reservoir of the virus. The aim of our review was to present background information on 25 tiboviruses that have been detected in Europe, *viz* flaviviruses - tick-borne encephalitis, louping-ill, Tyuleniy, and Meaban; phleboviruses - Grand Arbaud, Ponteves, Uukuniemi, Zaliv Terpeniya, and St. Abb's Head; nairoviruses - Soldado, Puffin Island, Avalon, Clo Mor, Crimean-Congo hemorrhagic fever; bunyavirus Bhanja; coltivirus Eyach; orbiviruses Tribeč, Okhotskiy, Cape Wrath, Mykines, Tindholmur, and Bauline; two thogotoviruses - Thogoto, Dhori; and one asfivirus - African swine fever. Emphasis was laid on the taxonomic status of these viruses; range of their ixodid or argasid vectors and vertebrate hosts; pathogenicity for vertebrates, including humans; and relevance to veterinary medicine and public health. The review also highlighted the potential emergence of a number of generally 'neglected' tiboviruses and infections in Europe.

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The Japanese encephalitis group of mosquito-borne viruses in vertebrates

Usutu flavivirus (USUV: *Flaviviridae*) is endemic to Africa. Its amplifying vertebrate hosts are free-living birds, with bird-feeding mosquitoes as the main arthropod vectors. The virus is highly pathogenic for certain passeriform birds. Unexpectedly, this virus emerged in Austria in 2001, causing significant wild bird mortality in Vienna and its environs, with blackbirds (*Turdus merula*) the species predominantly affected. This epornitic also occurred in Hungary, Italy, Switzerland, Germany and Spain. Vigilance was increased in the monitoring of dead birds in the Czech Republic, and especially dead blackbirds. We isolated one USUV strain from a dead blackbird from Brno in May 2011, and USUV RNA was later detected in two other dead blackbirds. As USUV can significantly reduce blackbird populations, as has been observed in Austria, we recommend that surveil-

Common Blackbird (*Turdus merula*) populations in Central Europe are now endangered by a new invader from Africa - Usutu Flavivirus.
(Photo by M. Čapek)

lance for USUV in both free-living and captive birds is increased.

West Nile flavivirus (WNV) circulates through natural foci between wild birds and bird-feeding mosquitoes. Equids are susceptible to WNV infection, which can cause fatal encephalomyelitis. WNV activity involving cases in horses and birds of prey has recently been demonstrated in Hungary and Austria. Using a serosurvey, we investigated whether WNV was also in circulation in horses in the Czech Republic and Slovakia. Samples were obtained from 395 horses (Czech Republic = 163, Slovakia = 232) between 2008 and 2012. Antibodies neutralising WNV were detected in 19 non-vaccinated horses from lowlands in southern Slovakia (8%), with local autochthonous WNV infection occurring in 11 animals (5%), indicating recent WNV activity in Slovakia.

WNV is grouped into two major genetic lineages. Recently, a third WNV lineage, Rabensburg virus (RABV), has been proposed based on isolations from mosquitoes in South Moravia. RABV has 75–77% nucleotide identity, and 89–90% amino acid identity, with representative members of WNV lineages 1 and 2. The extent to which RABV utilises the typical WNV transmission cycle (i.e. wild birds as virus hosts) is unclear. Experiments to assess its biological characteristics (e.g. vector competence; in vitro growth on mosquito, avian and mammalian cell lines; infectivity and viremia in birds) have suggested that RABV might be considered as intermediate between the mosquito-specific flaviviruses and the horizontally transmitted flaviviruses. Theoretically, these findings could indicate the means by which new vertebrate pathogens emerge.

The common house mosquito (*Culex pipiens*), a vector of the Usutu and West Nile flaviviruses, overwintering in a cellar. *(Photo by Z. Hubálek)*

Sampling blood from a horse for examination of antibodies to West Nile Virus. *(Photo by Z. Hubálek)*

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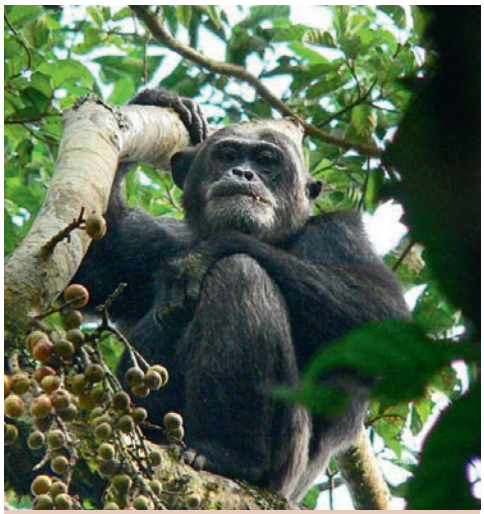
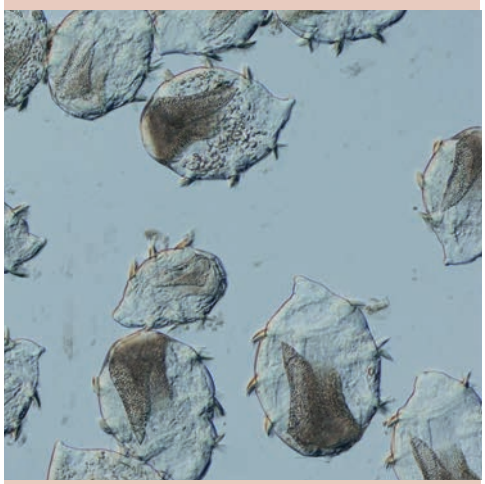
Pathogens of non-human primates

Entodiniomorphid ciliates are intestinal protists that inhabit the colons of African great apes of the genera *Pan* and *Gorilla*. Previous authors have considered entodiniomorphids as potential pathogens; though they have also been proposed having a mutualistic function in the intestinal ecosystem, as well as participating in fibre fermentation. We first addressed two problem areas: methodological problems involving ciliate isolation from ape faeces and insufficient identification using coproscopic examination methods. Next, we evaluated the basic metabolic activity of *Troglodytella abrassarti*, concluding that it actively participates in the digestion and storage of polysaccharides. The overall contribution of *T. abrassarti* to carboxymethyl cellulase, xylanase and α-amylase activity in faeces is, however, low and intestinal bacteria evidently play a more important role in hindgut digestion processes in chimpanzees, though entodiniomorphid ciliates may still have an impact on metabolites and the colon environment. Our results point to *T. abrassarti* having a commensal role in the colon of the host. In captive chimpanzees, *T. abrassarti* infection intensities were less influenced by the amount of fibre in the diet than by the concentration of dietary starch. We explored *T. abrassarti* molecular diversity with regards to its large geographical distribution and the taxonomic diversity of its most common host, the chimpanzee *Pan troglodytes*. We found very low *T. abrassarti* diversification in chimpanzees across Africa. Distribution of two *T. abrassarti* types supports evolutionary separation of the Western chimpanzee, *P. t. verus*, from populations in Central and East Africa. Type I *T. abrassarti* is probably a derived form, corresponding with the Central African origin of chimpanzees and a founder event leading to *P. t. verus*. The identification of *T. abrassarti* from Nigerian *P. t. ellioti* and Central African chimpanzees corroborates current opinion on the exclusive position of *P. t. verus* within chimpanzee phylogeny.



Eastern chimpanzees (*Pan troglodytes schweinfurthii*) harbour *Troglodytella abrassarti* type II – male Buru, Kalinzu Forest Reserve, Uganda.
(Photo by K. Petrželková)



Trophozoites of *Troglodytella abrassarti* isolated from chimpanzee faeces.
(Photo by I. Profousová)

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Wildlife immunology

Over the past decade, many researchers interested in ecological and evolutionary immunology have focused their studies on free-living animals. Due to certain technical aspects of their immunological field-research, 'wildlife immunology' has emerged as a distinct branch of ecological, as well as immunological, investigation. Unfortunately, only rarely have both immunologists and ecologists been involved in the same research project, which has led to misunderstandings in terminology. 'Immunocompetence', for example, is a pivotal term in wildlife immunology; and yet our literature survey has indicated that the term is used differentially by ecologists and immunologists, which may result in much confusion. In order to avoid future misunderstanding, we attempted to clarify both views (ecological and immunological) and to propose suitable new terminology. As recent research has shown that confusion may also arise with the term 'adaptive immunity', we also discussed this term in a similar fashion.

Injection of phytohaemagglutinin (*PHA*) into the wing of a scarlet rosefinch (*Carpodacus erythrinus*). *(Photo by J. Schnitzer)*

We examined pro-inflammatory responsiveness (an innate immunity trait) in male scarlet rosefinches (*Carpodacus erythrinus*) and its association to carotenoid-based ornamentation. Carotenoid-pigmented ornamentation is well known as an indicator of health and condition. Surprisingly, and contrary to most of current evidence, we found that low-quality paler birds responded more strongly to phytohaemagglutinin (PHA) than high-quality brighter individuals. We assume, therefore, that magnitude of the PHA swelling response may be an indication of current stress or disease, rather than evidence for level of investment into immune defence. These results suggest that results of the PHA skin-swelling test may previously have been misinterpretated and that more rigorous comprehension of the immunological mechanisms behind the test are clearly needed in future wildlife immunology studies.

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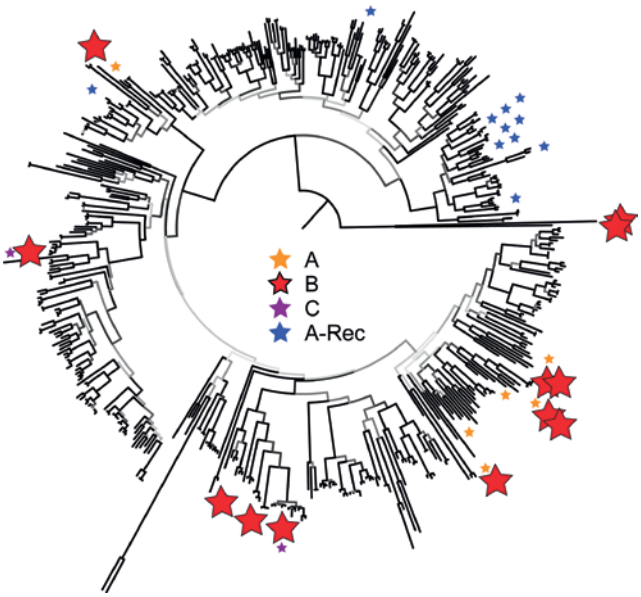
Legacy of host-switching in evolution of mammalian viruses



A phylogenetic tree DNA sequence data for all available Sigmodontinae and Neotominae rodents with hosts of each New World arenavirus indicated by different symbols. The pathogenic group B is radomly distributed across rodent hosts.

Infectious diseases caused by viruses pose an intensive challenge for public health initiatives. Despite intensive focus and effort, no more than two viral infections have been eradicated from the wild. The causative agent of smallpox, the only eradicated infectious disease affecting humans, is host-specific; but the rinderpest virus infects both domestic cattle and a range of other large ungulates. Given the range of hosts, eradication of rinderpest is an outstanding achievement.

Other infectious diseases often spill over from wildlife hosts, evading eradication through persistence in reservoirs. Increasing our understanding of host-viral relationships and dynamics, therefore, is the key to increasing the effectiveness of disease management and landscape development with respect to encroachment. We found that New World arenaviruses readily switch to different hosts within their distribution area. Once the switch to a novel host occurs, the viruses quickly diverge to related species. A facsimile of this process was also observed, on a greater scale, in a study of paramyxoviruses across the world. Lineage after lineage, the viruses spread from bats to

Yonas Meheretu and Josef Bryja capturing rodents near human habitations in the Bale Mts., Ethiopia. The most abundant rodent species in such habitats is *Stenocephalemys albipes*, the host of newly discovered Hantavirus Tigray. *(Photo by J. Hošek)*

a different mammalian group and diversified further among related hosts.

Today, we recognise such an ancestral host-switch as leading to infectious diseases in humans and domesticated animals such as measles, mumps, and canine and feline distemper; or the recent emergence of lethal infections of Nipah and Hendra viruses. Whether subsequent diversification, is a characteristic phenomenon across viral evolution remains to be ascertained. Indications from Hantaviruses found in Europe and Africa that testing for the presence of viruses in a range of mammals across continents using modern molecular genetic methods enhances our chances of pathogen detection in a range of hosts, while furthering our understanding of the diversity of viral genetic material in relation to host evolution.

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Advances in freshwater ichthyoparasitology

One of the key determinants affecting the composition and diversity of parasite communities in freshwater fishes is the environmental conditions experienced by the host species. In our research, we focus primarily on how the entry of a host species into a new environment, e.g. during species introductions or through range expansion, influences the diversity and structure of its parasite community. An investigation into the susceptibility of allopatric and sympatric populations of native species of European bitterling (*Rhodeus amarus*) to local parasite fauna indicated higher parasite abundance in allopatric hosts, suggesting a maladaptation of the parasites to their sympatric host. The increase in abundance was particularly strong shortly after introduction into the new environment, though parasite diversity was not affected. In non-native species, effects on the parasite community reflected distance from the source population and level of habitat dissimilarity. Whilst fish hosts introduced into the same river system showed comparable, or even higher, parasite diversity compared to their native area of occurence (Ponto-Caspian gobies along the River Danube), a reduction in parasite species richness was observed in hosts introduced to distant and disconnected river systems, e.g. in pumpkinseed (*Lepomis gibbosus*) introduced from North America to Europe and monkey goby (*Neogobius fluviatilis*) and racer goby (*N. gymnotrachelus*) introduced from the River Dnieper to the Vistula), and also in hosts expanding from marine/brackish waters to stretches with very low salinity, such as the black-striped pipefish (*Syngnathus abaster*).

In addition, we tested for effects of anthropogenic habitat alteration on parasite communities. We found that the extensive modification of natural riverine environments caused by reservoir construction led to an increase in parasite species richness, both at the individual and population level, and especially for endoparasitic species. Larger reservoirs are believed to be attractive to a higher diversity of aquatic animals that serve as intermediate or final hosts for many of the endoparasites exploiting fish in their life cycles. On the other hand, a reduction in endoparasite diversity was observed in farmed carp (*Cyprinus carpio*) resulting from pond control measures.

Typical triangular injury caused by a cormorant's (*Phalacrocorax carbo sinensis*) upper beak (*left*) and skin contusions (*scars*) on the underside of the fish caused by compression from the lower beak (*right*). *(Photo by Z. Adámek.)*

Experimental cages containing four populations of 0+ juvenile European bitterling (*Rhodeus amarus*) exposed to local parasites under natural conditions.
(Photo by M. Ondračková)

An increased susceptibility to ectoparasites was found in individuals damaged through cormorant attack, commonly observed in Central European aquacultural facilities during the bird's migration period. We also studied viviparous monogenean diversity in African catfishes, recording eight species (of which five were newly described), thereby highlighting the hitherto understudied diversity of monogenean parasites throughout the African continent.

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White-nose syndrome in Europe

White-nose syndrome is an infectious disease that is lethal to bats in North America. The fungus that causes the disease grows at low temperatures and bats are susceptible to it during hibernation, when their body temperature drops to the ambient temperature of their environment and their metabolism slows. The infected bat dies before the end of hibernating season through a range of physiological challenges. Within just a few years, the death toll has approached complete population devastation in north-eastern USA and adjoining regions in Canada. The fungus causing white-nose syndrome is widespread in Europe and infection has been found in as many bat species as in North America. Our research has confirmed unequivocally that at least one bat species in Europe suffers the full range of skin tissue damage diagnostic of white-nose syndrome in North America. Surprisingly, however, none of the infected bat species in Europe suffer mortality attributable to the infection on a scale similar to that across the Atlantic. The contrast between the disease's impact in North America and Europe, coupled with the fact that animals on both continents exhibit diagnostic features of white-nose syndrome histopathology, provides hope for bat conservation and recovery in North America, pending intensive research into adaptation of bats in Europe to white-nose syndrome.

Natália Martínková checking hibernating bats for symptoms of white-nose syndrome.
(Photo by S. Martínek)

VIŠŇOVSKÁ Z, **MARTÍNKOVÁ N**, 2011. Syndróm bieleho nosa – vážna hrozba pre zimujúce netopiere. *Aragonit, časopis správy slovenských jaskýň*: 26–31.

PIKULA J, BANDOUCHOVÁ H, NOVOTNÝ L, METEYER C, **ZUKAL J**, IRWIN N, **ZIMA J**, **MARTÍNKOVÁ N**, 2012. Histopathology confirms white-nose syndrome in bats in Europe. *Journal of Wildlife Diseases* 48: 207–211.

Applied Ecology

Photo by J. Červený.

APPLIED ECOLOGY

Non-native gobiid fishes – an emerging model in invasion biology

Since the 1990s, several Ponto-Caspian gobiid species appear to have expanded their ranges in Europe and North America. These species have become a subject of interest for fish biologists, mostly due to the detrimental impact of round goby (*Neogobius melanostomus*) in the Laurentian Great Lakes. The aim of this project has been to follow the spread of invasive gobiid species in Europe, focusing particularly on those species that threaten Czech rivers (two species have recently expanded into Czech waters: *N. melanostomus* and tubenose goby (*Proterorhinus semilunaris*)), and to evaluate their pattern of spreading, their ecological demands and their effect on native biota. The project has documeted the recent spread of several gobiid species (i.e. bighead goby (*N. kessleri*), *N. melanostomus,* monkey goby (*N. fluviatilis*) and *P. semilunaris*) from the River Danube into the lower Rhine (Germany), supporting the hypothesis that such "discontinuous" spreading through Europe is facilitated by shipping. Further support for the "ship transport" hypothesis arises from sudies comparing the external morphology of non-native (middle Danubian) and native (lower Danubian) *N. melanostomus* populations, where significant differences indicate differing environmental influences and/or a possible founder effect. These findings also indicate that invasive gobies are characterised by high morphological plasticity.

A pilot study on the biological characteristics of native *N. fluviatilis* populations, a species introduced to Croatian, Hungarian and Slovakian waters and, more recently, into the lower Rhine, provides the basis for future comparative studies in non-native regions and will help to evaluate the future invasive potential of this species.

A study on the habitat preferences of *P. semilunaris* indicates that, as with other gobiid species, adult fish occur most frequently along boulder banks and avoid more "natural" sections (e.g. beaches and eroded banks). As channelised rivers with boulder banks are common in European waters, such habitats are predicted to facilitate further expansion of the species. A preference of early life stages for small rocks and low flow, however, suggests that expansion may be limited in systems that lack such habitats.

Littoral fish sampling along the Rhine.
(Photo by M. Ondračková)

Monkey goby (*Neogobius fluviatilis*).
(Photo by K. Halačka)

P. semilunaris, which colonised and began expansion in two adjacent rivers at around the same time (differing only in direction of expansion, i.e. up- or downstream movement), showed significantly different expansion patterns, with downstream colonisation far more rapid and intense than upstream colonisation. Drift of earliest life stages was suggested as supporting this phenomenon.

BORCHERDING J, STAAS S, KRÜGER S, **ONDRAČKOVÁ M**, **ŠLAPANSKÝ L**, **JURAJDA P**, 2011: Non-native Gobiid species in the lower River Rhine (Germany): recent range extensions and densities. *Journal of Applied Ichthyology* 27: 153–155.

JANÁČ M, **VALOVÁ Z**, **JURAJDA P**, 2011: Range expansion and habitat preferences of nonnative 0+ tubenose goby (*Proterorhinus semilunaris*) in two lowland rivers in the Danube basin. *Fundamental and Applied Limnology / Archiv für Hydrobiologie* 181: 73–85.

KONEČNÁ M, JURAJDA P, 2012: Population structure, condition, and reproduction characteristics of native monkey goby, Neogobius fluviatilis (Actinopterygii: Perciformes Gobiidae), in the Bulgarian Danube, *Acta Ichthyologica et Piscatoria* 42: 321–327.

POLAČIK M, **JANÁČ M**, VASSILEV M, TRICHKOVA T, 2012: Morphometric comparison of native and non-native populations of round goby *Neogobius melanostomus* from the River Danube. *Folia Zoologica* 61: 1–8.

Voles are important pests in forest management

In the past, economical interests were the priority in forestry management, which led to the cultivation of coniferous monoculture forests over the majority of areas planted. Present management methods; however, reflect the need to increase environmental diversity and the ecological stability of forest stands through increasing the proportion of broad-leaved trees planted. One factor that has negatively affected this process, however, is the impact of voles, which damage the bark of young broad-leaved trees. The aim of our study was to collect information on vole damage from Czech forest plantations and determine the main factors influencing the extent of damage. Two vole species cause the majority of bark damage in forest clearings, the bank vole (*Clethrionomys glareolus*) and field vole (*Microtus agrestis*), with the common vole (*Microtus arvalis*) also important in some areas. Bark consumption mainly took place in winter due to an absence of higher quality food. In addition, an increased density of vole species could also result in an increase in bark damage. In general, lowland forests (up to 400 m a.s.l.) suffered little vole damage due to improved food supply and lower snow cover. In highland forests, a relationship was noted between vole damage and a good tree-seed harvest in combination with snow cover. In mountainous regions, tree bark consumption was mainly related to increases in the abundance of the vole population. Preventing damage to young trees is difficult as it relies on the reliable prediction of all risk factors in any forest environment. In contrast to agriculture, there is no service for predicting vole damage in Forestry. If a synchronous common vole population dynamic was to be confirmed in agricultural and forest environments, warnings provided by the plant protection administration could prove effective. The most effective means of preventing vole damage to young tree saplings, however, is to avoid planting on grassy clearings and to make use of known forest regeneration strategies, e.g. shelter wood regeneration.

A young beech tree with bark damaged by voles (*on left*) sends out adventitious roots to bridge the damaged part of the stem (*on right*). Trees with such levels of damage usually die within two years. *(Photo by M. Homolka)*

BAŇAŘ P, **HEROLDOVÁ M, HOMOLKA M, KAMLER J**, 2011. Aktuální situace ve vývoji poškození lesní výsadby hlodavci. *Lesnická práce* 90: 38–39.

ČEPELKA L, SUCHOMEL J, PURCHART L, **HEROLDOVÁ M**, 2011. Small mammal diversity in the Beskydy Mts forest ecosystems subject to different forms of management. *Beskydy* 4: 101–108.

HEROLDOVÁ M, HOMOLKA M, TKADLEC E, KAMLER J, SUCHOMEL J, PURCHART L, **KROJEROVÁ J, BARANČEKOVÁ M**, TUREK K, BAŇAŘ P, 2011. Vole impact on tree regeneration: insights into forest management. *Julius-Kühn-Archiv* 432: 101–102.

HOMOLKA M, HEROLDOVÁ M, KAMLER M, 2011. Plant biomass and prediction of debarking caused by rodents in artificial regeneration of forest stands. *Julius-Kühn-Archiv* 432: 99–100.

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TKADLEC E, SUCHOMEL J, PURCHART L, **HEROLDOVÁ M**, ČEPELKA L, **HOMOLKA M**, 2011. Synchronous population fluctuations of forest and field voles: implications for population management. *Julius-Kühn-Archiv* 432: 97–98.

TKADLEC E, LISICKÁ-LACHNITOVÁ L, LOSÍK J, **HEROLDOVÁ M**, 2011. Systematic error is of minor importance to feedback structure estimates derived from time series of nonlinear population indices. *Population Ecology* 53: 495–500.

ČEPELKA L, SUCHOMEL J, PURCHART L, **HEROLDOVÁ M**, 2012: Diversity of small mammals synusias of the open forest sites of the Beskydy and Jeseníky Mts. *Beskydy* 5: 121–134.

HEROLDOVÁ M, **BRYJA J**, **JÁNOVÁ E**, SUCHOMEL J, **HOMOLKA M**, 2012. Rodent damage to natural and replanted mountain forest regeneration. *TheScientific World JOURNAL*: 872536.

SUCHOMEL J, PURCHART L, **HEROLDOVÁ M, HOMOLKA M, KAMLER J, TKADLEC E**, 2012. Vole damage to planted tree regeneration conditioned by some environmental factors. *Austrian Journal of Forest Science* 129: 56–65.

Carnivores and birds of prey in Central European farmland

The study of top predator spatio-temporal ecology in human-dominated landscapes is a challenging issue for understanding species-specific adaptations to highly dynamic ecosystems and has a number of consequences for prey abundance and distribution. Moreover, a detailed knowledge of top predator spatial ecology and habitat preferences may contribute greatly to successful conservation strategies and management. In particular, our studies have focused on (a) fine-scale habitat utilisation of different carnivore species, and (b) spatial activity of highly endangered owl predators in Central European farmland.

Carnivores are considered fundamental elements of ecosystem structure, function and diversity, despite their low densities. Nevertheless, little is known about their responses to landscape fragmentation. We evaluated how habitat fragmentation at different spatial scales affects the distribution of carnivore species. In particular, we tested whether distribution of carnivores is related to fragment size and distance to habitat edge. Our

The little owl (*Athene noctua*) is a small, farmland owl species whose populations have decreased significantly over recent decades. *(Photo by M. Šálek)*

findings confirm that carnivores strongly prefer habitat edges and small forest fragments. We also demonstrated that increased carnivore activity at habitat edges arises as a consequence of predator overflow from higher quality habitat into lower quality habitat, but also showed that most predator species focused their activity on the edge structure. Moreover, our study showed that carnivores preferred edges only in years with high prey abundance. In years of low prey abundance, they used the various landscape elements with similar frequency. Our results on habitat utilization by important nest predators are crucial for understanding further predator-prey interactions and have conservation potential for various prey populations.

The little owl (*Athene noctua*) is a small farmland owl species whose populations have significantly decreased, or are locally extinct, in many European countries. The goals of our study were to gain knowledge of the owl's spatial ecology and habitat selection during the breeding season and to determine major management options that would assure its successful conservation. The mean home range size of Little Owls, determined using the kernel method, was very small (0.94 ha and 4.30 ha for 50% and 95% home range, respectively). The most important foraging habitat throughout the breeding season was grassland (especially pasture). Vegetation height and cover were the main factors determining habitat selection, with Little Owls showing a significant preference for sparse and short sward vegetation patches that enabled the hunting of ground-dwelling prey. We propose that conservation efforts for Little Owls should focus on active management of prey-rich grassland habitats in the vicinity of breeding sites.

ČERVINKA J, **ŠÁLEK M**, PAVLUVČÍK P, **KREISINGER J**, 2011. The fine-scale utilization of forest edges by mammalian mesopredators related to patch size and conservation issues in Central European farmland. *Biodiversity and Conservation* 20: 3459–3475.

SVOBODOVÁ J, **KREISINGER J**, **ŠÁLEK M**, KOUBOVÁ M, **ALBRECHT T**, 2011. Testing mechanistic explanations for mammalian predator responses to habitat edges. *European Journal of Wildlife Research* 57: 467–474.

ŠÁLEK M, LÖVY M, 2012. Spatial ecology and habitat utilization of the Little Owl (*Athene noctua*) in Central European farmland. *Bird Conservation International* 22: 328–338.

Population genetics as an important tool for species conservation

Genetic approaches are increasingly used in conservation biology and are also starting to be implemented in endangered species surveys or population management. In free-living vertebrates, however, there are often problems with availability of genetic markers for such surveys. Fortunately, technological developments over recent years allow for simple screening of even those genomes that have not previously been genetically characterised. The cross-species application of commercially available SNP (single-nucleotide polymorphism) chips and genomic screening for microsatellite repetitions has led to the description of highly variable sets of genetic markers for various vertebrates, allowing future studies focused on conservation issues. Such topics have recently included, for example, mapping the origin and colonisation routes of non-indigenous ungulates (sika deer *Cervus nippon* and Alpine chamois *Rupicapra rupicapra*) or detailed analysis of the population genetic structure for endangered species using landscape genetic approaches. In marsh frogs (*Pelophylax ridibundus*) and European ground squirrels (*Spermophilus citellus*), for example, microsatellites provide evidence of local inbreeding, strong anthropogenic barriers to gene flow and have identified populations worthy future conservation management. A similar situation was observed in fragmented populations of the black grouse (*Tetrao tetrix*), where type of mating system was related to genetic diversity. Given that lekking behaviour may be related to population density, it was suggested that a shift from lekking to solitary displaying males is an alarming sign indicating decreasing effective population size and declining population. An important conservation issue is also the hybridisation of indigenous populations with captive-bred stocks (supported especially by hunters for game species). A recent study found that released captive-bred mallards (*Anas platyrhynchos*) were successfully integrating into

breeding wild populations through hybridisation mediated by high frequency nesting. These results, based on the combination of neutral markers (both nuclear and mitochondrial) with markers on immune genes, suggest that release of captive-bred individuals may threaten the genetic integrity of wild populations.

Tatra chamois (*Rupicapra rupicapra tatrica*), sika deer (*Cervus nippon*); European ground squirrel (*Spermophilus citellus*), black grouse (*Lyrurus tetrix*), mallard (*Anas platyrhynchos*) and marsh frog (*Pelophylax ridibundus*); all vertebrates of special conservation concern whose populations have recently been studied at the IVB using genetic approaches. *(Photos by J. Ksiažek, J. Červený, Š. Říčanová, R. Stach (www.fotolovy.cz) – 2 ×, J. Kautman)*

DEMONTIS D, CZARNOMSKA SD, **HÁJKOVÁ P**, **ZEMANOVÁ B**, **BRYJA J**, LOESCHCKE V, PERTOLDI C, 2011. Characterization of 151 SNPs for population structure analysis of the endangered Tatra chamois (*Rupicapra rupicapra tatrica*) and its relative, the Alpine chamois (*R. r. rupicapra*). *Mammalian Biology* 76: 644–645.

ŠŤOVÍČEK O, **ČÍŽKOVÁ D**, YANG L, **ALBRECHT T**, HECKEL G, VYSKOČILOVÁ M, KREISINGER J, 2011. Development of microsatellite markers for a diving duck, the common pochard (*Aythya ferina*). *Conservation Genetics Resources* 3: 573–576.

TEREBA A, **ČÍŽKOVÁ D**, SUNDARI AA, RAJAN KE, BOGDANOWICZ W, 2011. New polymorphic microsatellite markers in the greater false vampire bat *Megaderma lyra* (Chiroptera: Megadermatidae). *Conservation Genetics Resources* 3: 749–751.

ZEMANOVÁ B, **HÁJKOVÁ P**, **BRYJA J**, **ZIMA J Jr**, **HÁJKOVÁ A**, **ZIMA J**, 2011. Development of multiplex microsatellite sets for noninvasive population genetic study of the endangered Tatra chamois. *Folia Zoologica* 60: 70–80.

BARANČEKOVÁ M, **KROJEROVÁ-PROKEŠOVÁ J**, VOLOSHINA IV, MYSLENKOV AI, KAWATA Y, OSHIDA T, LAMKA J, **KOUBEK P**, 2012. The origin and genetic variability of the Czech sika deer population. *Ecological Research* 27: 991–1003.

MARTÍNKOVÁ N, **ZEMANOVÁ B**, KRANZ A, GIMÉNEZ MD, **HÁJKOVÁ P**, 2012. Chamois introductions to Central Europe and New Zealand. *Folia Zoologica* 61: 239–245.

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SVOBODOVÁ J, SEGELBACHER G, HÖGLUND J, 2011. Genetic variation in Black Grouse populations with different lekking systems in the Czech Republic. *Journal of Ornithology* 152: 37–44.

ČÍŽKOVÁ D, JAVŮRKOVÁ V, CHAMPAGNON J, KREISINGER J, 2012. Duck's not dead: Does restocking with captive bred individuals affect the genetic integrity of wild mallard (*Anas platyrhynchos*) population? *Biological Conservation* 152: 231–240.

Genetic diversity of European fishes

Genetic diversity, often termed the third level of biodiversity, refers to the total number of genetic characteristics in the genetic makeup of a species. Correct evaluation of diversity within species is indispensable for conservation of genetic resources. We have studied species richness and genetic diversity using three different methods (morphological, biochemical and molecular genetic) in various parts of Europe. We concentrated on species identification of three endangered loaches within a complicated hybrid diploid-polyploid complex. PCR-RFLP typing of the nuclear 5S rDNA marker was identified as a reliable discriminating tool for the goldside loach *Sabanejewia aurata*, and for *Cobitis* spp. in general. Moreover, we attempted to identify the genetic diversity of the species *Sabanejewia balcanica* in the western Balkans using a comparative approach. Finally, we analysed the influence of stock management on European populations of brown trout *Salmo trutta* by means of a two-genome multilocus approach. We demonstrated that differences in stocking management and the origin of breeding stock appear to be crucial factors for spatial variability in the genetic structure of brown trout. We also focused on the important question of hybridisation in freshwater

A new gudgeon species from Turkey: *Gobio sakaryaensis*, sp. n., holotype, FFR 2504, 82 mm SL, male; Turkey: Tozman Stream, Black Sea basin. *(Photo by D. Turan)*

fishes; our results allowing us to recognise backcross breeding in *Cottus poecilopus* and *C. gobio*. We developed the first microsatellite markers for population studies of 7 species of the genus *Romanogobio* and 5 species of the genus *Gobio*. The former genus is characterised by increased presence of critically endangered species, including some rare endemic species. We also participated in the description of a new species, *Gobio sakaryaensis*, in Turkey. We contributed to recognition of the first finding of the non-indigenous species *Carassius gibelio* in Swedish waters, highlighting a probable advance of this species through cryptic invasion in the form of an inter-species hybrid with *Carassius carassius*. We are the first team in Europe to complete an exhaustive inventory of the molecular biodiversity of the national ichthyofauna. We presented a new complete reference collection, amounting to about 1500 morphologically and genetically verified individuals from more than 200 localities, to the National Museum in Prague. This biodiversity project contributed to the updating of basic data for Natura 2000 biomonitoring and provided vital information for conservation programmes in the Czech Republic. Through this study, the Czech Republic became engaged in the International Barcode of Life project (iBOL), the largest biodiversity genomics initiative in history.

KIRTIKLIS L, BORON A, PTASZNIK P, **LUSKOVÁ V**, **LUSK S**, 2011. Molecular differentiation of three loach species (Pisces, Cobitidae) based on the nuclear 5S rDNA marker. *Folia Biologica-Krakow* 59: 141–145.

MAREŠOVÁ E, DELIĆ A, KOSTOV V, MARIĆ S, **MENDEL J,** ŠANDA R, 2011. Genetic diversity of *Sabanejewia balcanica* (Actinopterygii: Cobitidae) in the western Balkans and comparison with other regions. *Folia Zoologica* 60: 335–342.

KOHOUT J, JAŠKOVÁ I, **PAPOUŠEK I**, ŠEDIVÁ A, ŠLECHTA V, 2012. Effects of stocking on the genetic structure of brown trout, *Salmo trutta*, in Central Europe inferred from mitochondrial and nuclear DNA markers. *Fisheries Management and Ecology* 19(3): 252–263.

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TURAN D, EKMEKCI FG, **LUSKOVÁ V**, **MENDEL J**, 2012. Description of a new species of genus *Gobio* from Turkey (Teleostei: Cyprinidae). *Zootaxa* 3257: 56–65.

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MENDEL J, **PAPOUŠEK I**, **MAREŠOVÁ E**, **HALAČKA K**, **VETEŠNÍK L**, ŠANDA R, **KONÍČKOVÁ M**, **URBÁNKOVÁ S**, 2012. Molecular biodiversity inventory of the ichthyofauna of the Czech Republic. In Caliskan M (ed.), *Analysis of Genetic Variation in Animals*. In Tech, Rijeka: 287–314. ISBN 978-953-51-0093-5..

4. OTHER ACTIVITIES

| MEETINGS ORGANISED BY THE INSTITUTE

"Zoological Days" conference 2011 [Zoologické dny 2011] – Brno. February 17–18, 2011
"Zoological Days" Conference 2012 [Zoologické dny 2012] – Olomouc. February 9–10, 2012

The "Zoological days" (Zoologické dny) conference is now a traditional and very popular meeting of Czech and Slovak zoologists, organised almost every year by the Institute of Vertebrate Biology (IVB) AS CR (and its ancestors) in Brno since 1969. New pages of the conference's history started to be written in 2008. Following a vote by conference participants in 2007, it was decided to hold the conference in Brno in every year with an odd date, and in other Czech and Slovak towns in co-operation with partner academic institutions in every even year. This has proved a good decision as both the number of participants and quality of presentations has increased dramatically since 2008.

In 2011 and 2012, we welcomed 490 zoologists to Brno and 470 to Olomouc. In 2011, the conference was organised once again in collaboration with Masaryk University's Institutes of Botany and Zoology (Faculty of Science) and, for the first time, it was located at Masaryk University's Faculty of Economics and Administration. This is an ideal site as it is situated just next to the IVB headquarters and provides a very representative location for such a large and important conference. In 2012, organisational partnership with Palacký University in Olomouc helped to increase once more the overall quality of the conference, which has now become a serious scientific event of importance to the whole zoological community of the Czech and Slovak Republics.

For more information, please see http://zoo.ivb.cz/

Students of IVB helping with the registration of participants at Zoological Days 2011.
(*Photo by M. Promerová*)

Tomáš Albrecht during the plenary lecture at Zoological Days 2011 in Brno.
(*Photo by M. Promerová*)

More than 170 posters were presented in Brno.
(*Photo by M. Promerová*)

The lecture rooms at the Zoological days are always full of young zoologists (*Olomouc 2012*) (*Photo by H. Bainová*)

In past years, the IVB has organised a one-day pre-conference workshop for students focused on zoological research methodology (*supported by the PROVAZ project, of the Operation Programme 'Education for competitiveness'*) (*Photo by H. Bainová*).

WINTERSCHOOL: Contemporary molecular-genetic approaches in zoology and conservation genetics, Brno, December 5–9 2011

A 5-day workshop for Czech Masters and PhD students was organised in the newly rebuilt lecture room at the IVB headquater. Theoretical talks in the morning were combined with practical demonstrations of work with data in the afternoon. Students were encouraged to bring their own data and were trained by outstanding experienced lecturers from the Czech Republic and from abroad. The Winterschool was supported by the PROVAZ project (see below) and provided an opportunity for students to learn new data analysis methods and to discuss their own projects with the authors of population genetics software and researchers regularly publishing in Nature and Science journals. The main topics covered during the meeting were: use of molecular markers in zoology, working with online databases, modern phylogeography based on coalescence, Bayesian analysis, molecular dating, the use of next-generation sequencing for conservation and evolutionary studies and spatial genetics or speciation research using genomic approaches.

Professor Gilles Guillot, author of the program Geneland, which is increasingly used for analysis of spatial genetic data. (*Photo by H. Bainová*)

Professor Tom Gilbert presented fascinating results from his research using next-generation sequencing, e.g. Neanderthal genomics, mammoth phylogeography or the use of leaches for monitoring elusive tropical vertebrates. (*Photo by H. Bainová*)

ConGRESS regional workshops;
Zvolen, Slovakia, January 25–27, 2012;
Debrecen, Hungary, March 14–16, 2012

ConGRESS
Conservation Genetic Resources for Effective Species Survival

IVB is the only partner of the project ConGRESS (acronym for Conservation Genetic Resources for Effective Species Survival) from "new" EU countries. ConGRESS is a support action within 7FP of European Commission that provides a community web portal, comprising databases on experts including scientists and professional end-users, scientific publications, simulation and decision tools and genetic data for important European species of conservation concern. The project aims to operate at a regional level with special emphasis on improving capacity and awareness in regions of Europe where it may be particularly lacking today. By building a network of scientists, management and policy professionals, it is intended to establish a forum for the communication of ideas, experiences and to provide support which will enhance the conservation of European biodiversity and its evolutionary capacity for the future.

Within ConGRESS, a series of dissemination and exchange workshops across the European Union has been organised and IVB (co-)organized two of them. Josef Bryja (IVB) and Ladislav Paule (Technical University in Zvolen) organized a workshop in Zvolen that brought together 65 researchers, conservation managers and policy makers from the Czech Republic, Slovakia and Poland. Similar three-days meeting was organized in Debrecen (Hungary) by Josef Bryja and Katalin Pecsenye (University of Debrecen) for researchers and conservationists from Hungary, Romania, Bulgaria and Slovenia. Both workshops were very successful because they specified what the needs of practical conservation managers are and at the same time they showed how conservation genetics can help the biodiversity conservation and how it cannot.

See more at *www.congressgenetics.eu*

The workshop in Zvolen was attended by 65 participants in all three days.
(*Photo by B. Zemanová*)

Nuria Selva (*speaking*) and Agniezska Sergiel are among authors of the management plan of the brown bear in Poland and in their talk they emphasized the need of transboundary collaboration in estimating realistic parameters of bear population.
(*Photo by B. Zemanová*)

| POPULARISATION ACTIVITIES AND COLLABORATION WITH UNIVERSITIES AND HIGH SCHOOLS

Recently, two projects were organised aimed at facilitating more intense collaboration between the IVB and universities, high schools, the public, and nature conservation management. Supported through the European social fund via the Education for Competitiveness Operational Programme (ECOP) and the Ministry of Education of the Czech Republic, both projects also helped partial reconstruction of the Mohelno field station, where some of the activities took place.

Project **PROVAZ** (the Czech acronym for the networking project "Connecting education and new approaches in zoological and ecological research [*PROpojení Vzdělávání A nových přístupů v Zoologicko-ekologickém výzkumu - od teorie k praxi*]") resulted from the enthusiasm of young IVB researchers for increasing connections between the fundamental research performed at the IVB with education at Czech universities and with practical applications in nature conservation management. One of the most important activities within the project is the organisation of conferences and practical workshops related to ecology and environmental management. Students and researchers are encouraged to ask for financial support for participating at international conferences and research fellowships.

Since July 2011, when the project started, numerous workshops have been successfully organised. For example, in December 2011 a very succesful Winterschool took place in Brno aimed at contemporary molecular-genetic approaches in zoology and conservation genetics (see above). The next Winterschool will be organised in December 2013, this time focused on statistical analysis of molecular data.

Numerous activities within PROVAZ are located at the newly reconstructed IVB field station in Mohelno [Mohelský mlýn]. This station is situated close to unique protected habitats in the Mohelno Serpentine Steppe National Nature Reserve and, therefore, offers an excellent starting point for diverse biological expeditions and field training. The accomodation capacity of the field station was increased to 35 people, thereby providing a comfortable base not only for researchers but also for primary and secondary school educational activities or for other organisations interested in ecology. In September 2012, amongst many other activities the station's facilities were used as a summer school for university students in zoology and ecology and for the field course "Advances in arachnology" organised by Masaryk University.

Excursions related to environmental management and biodiversity protection are organised for the public twice a year as part of the project, in collaboration with the "Institute of applied ecology Daphne CR" NGO. A complete list of activities and the actual programme can be found at *http://provaz.ivb.cz*.

Field training for the Department of Zoology (*Faculty of Science*) of Palacký University in Olomouc, held at Mohelno field station in April 2012

An excursion covering the "Theory and practice of forest management", held at the Mohelno field station in October 2012.

The "Mus Studenticus" conference held at Český Šternberk, co-organised by PROVAZ in June 2012.

The "Behavioural structure of populations" workshop, held at the Mohelno field station in October 2012.

A second project supported by ECOP is entitled **"Science for all senses"** [*Věda všemi smysly*] and is primarily focused on popularisation of the IVBs research activities and on collaborating with high schools in identifying motivated biology students. Over the two years of the project, 20 popularisation lectures will be held in public buildings, primarily libraries, and further 20 lectures will be aimed specifically at high school students. Young researchers are also asked to write popular articles for publication in magazines and newspapers. A series of documentaries, presently being shot by experienced movie-makers, will be a further important contribution to the popularisation of the fundamental zoological research undertaken by the IVB.

Two summer schools for biology teachers will be organised as part of the project. The first, focused on modern ecological research, was held in summer 2012. From autumn 2012, experienced senior researchers will present a series of lectures on "novelties in biology", aimed at both the general public and teachers. Freely accessible presentations will be available from the project's website. Collaboration with high schools takes a number of additional forms. Under the supervision of junior researchers, students can work on their own small projects (5 students started in 2012). Regular educational excursions to the Studenec external research facility (entitled "Science with your own eyes") allow students and teachers to see the process of scientific work. In 2012, five schools made use of this opportunity. More detailed information about the project is available at the website: *www.zivaveda.ivb.cz*.

VĚDA všemi smysly

The logo of the Science for all senses project

Novelties in biology – a series of lectures and summer schools for biology teachers are organised.

Science with your own eyes – a series of lectures and excursions for secondary schools at the Institute was attended by 159 students in 2012.

Events for public – field excursions and popularisation lectures .

Training university students at Cascay (*Huánuco, Peru*).
(*Photo by J. Cárdenas-Callirgos*)

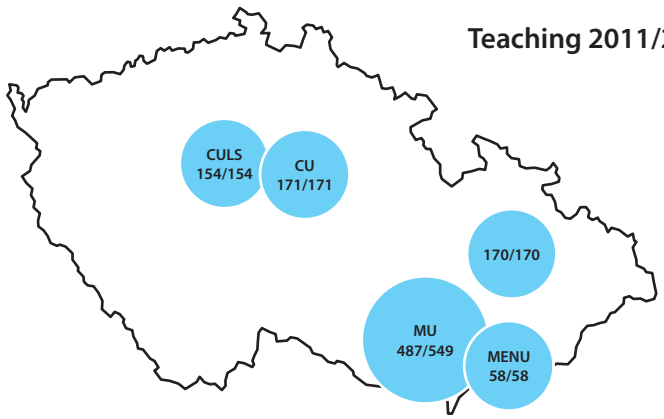
IVB researchers are also involved in numerous additional popularisation activities. For example, the University of Veterinary and Pharmaceutical Sciences (Brno) and the IVB organised a field workshop on bird parasites and bird ecology at Cascay (Huánuco, Peru) from 20 to 23 August 2011, in order to provide training to Peruvian students from the Hermilio Valdizán National University in Huánuco.

| MEMBERSHIP IN EDITORIAL BOARDS

Scientist	Journal
Baruš V.	Transactions of the Zoological Society of India
	Helminthologia
Čapek M.	International Studies on Sparrows
Glosová L.	Folia Zoologica (managing editor)
Gvoždík L.	Folia Zoologica
Honza M.	Folia Zoologica
Hubálek Z.	Cryobiology
	Folia Parasitologica
Reichard M.	Evolutionary Ecology
Jurajda P.	Folia Zoologica
Koubek P.	Folia Zoologica
Slabáková H.	Folia Zoologica
Zima J.	Hystrix - Italian Journal of Mammalogy
	Folia Zoologica (editor-in-chief)
	Acta Theriologica
	Scopolia
	ISRN Zoology
	Comparative Cytogenetics
Total 9	**16**

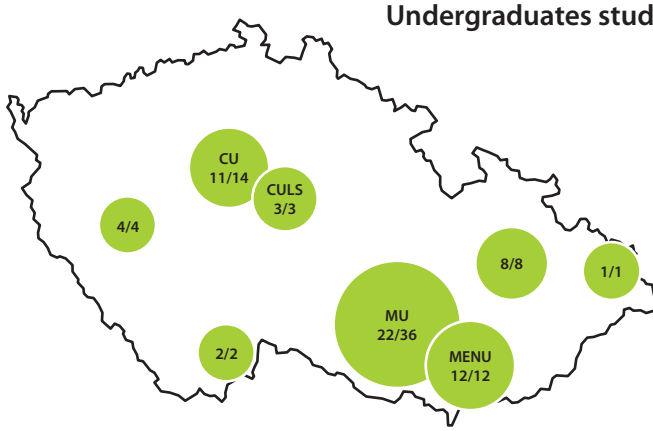
| EDUCATION AND TEACHING ACTIVITIES

Teaching at universities



IVB employees are very active in lecturing at five universities. In total, they provided 1 040 hours of lectures in 2011, and 1 102 hours in 2012. MU = Masaryk University, Brno; MENU = Mendel University in Brno; CU = Charles University, Prague; CULS = Czech University of Life Sciences, Prague. Numbers in the circles indicate hours of lecturing in 2011/2012, respectively.

Supervising of university students



In total, IVB researchers supervised 45 Bachelor and 46 Masters students over 2011–2012. Thirty-nine students graduated in 2011 (22 Bachelor and 17 Masters) and 12 students graduated in 2012 (9 Bachelor and 3 Masters). MU = Masaryk University, Brno; MENU = Mendel University in Brno; CU = Charles University, Prague; CULS = Czech University of Life Sciences, Prague. Numbers in the circles indicate numbers of undergraduate students in 2011/2012, respectively.

PhD students working at the Institute and/or supervised by the Institute's fellows over 2011–2012

Over 2011–2012, the Institute's fellows supervised 61 PhD students, 11 of them succesfully defended their theses at that time.

Student	Supervisor or Consultant	Start of the study	Defended the thesis	Faculty
ABRAHAM Marek Mihai	Honza	2011		1
AGHOVÁ Tatiana	Bryja	2012		1
ALBRECHTOVÁ Jana	Piálek	2007		2
BAINOVÁ Hana	Vinkler/Albrecht	2011		2
BARTOŇOVÁ Eva	Lusková	2007		1
BEDNÁŘOVÁ Jana	Zukal	2005		1
BRUNNER Harald	Zima	2009		2
ČEPELKA Ladislav	Heroldová	2010		6
ČÍŽKOVÁ Dagmar	Bryja	2006		1
DUFKOVÁ Petra	Piálek	2006	2011	5
ĎUREJE Ľudovít	Piálek	2005	2012	1
FORNŮSKOVÁ Alena	Bryja/Vinkler	2009		1, 4
FRANCOVÁ Kateřina	Ondračková	2007		1
HIADLOVSKÁ Zuzana	Vošlajerová	2008		1
HÖNIG Václav	Hubálek	2007		5
HORA Martin	Sládek	2009		2
JAVŮRKOVÁ Veronika	Albrecht	2007	2011	2
JELÍNEK Václav	Procházka	2010		2
KLITSCH Marek	Koubek	2011		8
KOUBÍNOVÁ Darina	Zima/Bryja	2010		2
KRÁLOVÁ Tereza	Bryja/Albrecht	2012		1
KRISTIN Peter	Gvoždík	2011		1
KUBĚNOVÁ Barbora	Sládek	2009		2
LITRÁKOVÁ Petra	Kamler	2010		6
MARTINCOVÁ IVA	Piálek	2012		1
MARTÍNKOVÁ Dita	Albrecht	2006		2
MAPUA Mwanahamissi Issa	Petrželková	2011		7
MAŠOVÁ Šárka	Baruš	2009		1
MAZOCH Vladimír	Bryja	2009		5
MIKL Libor	Adámek	2012		1
MICHÁLKOVÁ Veronika	Ondračková/Reichard	2012		1

Student	Supervisor or Consultant	Start of the study	Defended the thesis	Faculty
PÁNIK Michal	Kamler	2010		6
KONVIČKOVÁ Hana	Bryja	2007		1
PETRÁŠOVÁ Jana	Petrželková	2006	2012	7
PLHAL Radim	Kamler	2008		6
POLÁKOVÁ Radka	Bryja/Albrecht	2006	2011	1
POMAJBÍKOVÁ Kateřina	Petrželková	2008		7
PROFOUSOVÁ Ilona	Petrželková	2007		7
PROMEROVÁ Marta	Bryja/Albrecht	2007	2011	1
RYBNIKÁR Juraj	Prokeš	2010		3
ŘEŽUCHA Radomil	Reichard	2010		1
ŘÍČANOVÁ Štěpánka	Bryja	2006	2011	5
SCHNITZER Jan	Albrecht	2003	2011	2
SMOLINSKÝ Radovan	Gvoždík	2008	2012	1
SMUTNÝ Petr	Kamler	2009		6
SOUDKOVÁ Martina	Albrecht	2011		2
SVOBODOVÁ Petra	Hubálek	2009		1
SYCHRA Jan	Adámek	2004	2011	1
ŠLAPANSKÝ Luděk	Jurajda	2012		1
TOMÁŠEK Oldřich	Albrecht/Bryja	2009		2
TŮMA Jan	Sládek	2009		2
TUREK Kamil	Kamler	2006		6
URBÁNKOVÁ Soňa	Bryja/Mendel	2010		1
VACEK Jaroslav	Koubek	2010		8
VENCLÍKOVÁ Kristýna	Rudolf	2011		1
VINKLER Michal	Albrecht	2007	2011	2
VLČKOVÁ Klára	Petrželková	2012		7
VRTÍLEK Milan	Reichard	2010		1
VŠETIČKOVÁ Lucie	Adámek	2008		1
WASIMUDDIN	Bryja	2010		1
ZEMANOVÁ Barbora	Bryja	2006		1
Total 61			**11**	

(1) Faculty of Science, Masaryk University, Brno; (2) Faculty of Science, Charles University, Prague; (3) Faculty of Agronomy, Mendel University in Brno; (4) Université Montpellier II, France; (5) Faculty of Science, University of South Bohemia; (6) Faculty of Forestry and Wood Technology, Mendel University in Brno; (7) Faculty of Veterinary Medicine, University of Veterinary and Pharmaceutical Sciences, Brno; (8) Faculty of Forestry, Wildlife and Wood Sciences, Czech University of Life Sciences, Prague.

PhD theses defended over 2011–2012 and supervised by the Institute's fellows:

DUFKOVÁ Petra, 2011: *Sex chromosomes in the house mouse hybrid zone* [in Czech; Pohlavní chromozomy v hybridní zóně myši domácí]. Faculty of Science, University of South Bohemia, České Budějovice; supervised by J. Piálek.

ĎUREJE Ľudovít, 2012: *The effect of aggressive behaviour on the dynamics of the house mouse hybrid zone* [in Slovak; Vplyv agresívneho správania na dynamiku hybridnej zóny myši domovej]. Faculty of Science, Masaryk University, Brno; supervised by J. Piálek.

JAVŮRKOVÁ Veronika, 2011: *Investment in reproduction and nest defense in waterfowl* [in Czech; Investice do reprodukce a obrany hnízda u vrubozobých]. Faculty of Science, Charles University, Prague; supervised by T. Albrecht

PETRÁŠOVÁ Jana, 2012: *Parasites with zoonotic potential in primates* [in Czech; Zoonotické parazitózy u lidoopů]. University of Veterinary and Pharmaceutical Sciences, Brno; co-supervised by K. Petrželková.

POLÁKOVÁ Radka, 2011: *The effect of genetic factors on reproductive success in a socially monogamous songbird*. Faculty of Science, Masaryk University, Brno; supervised by J. Bryja and T. Albrecht.

PROMEROVÁ Marta, 2011: *Major histocompatibility complex genes: their variation and impact on fitness in a socially monogamous passerine*. Faculty of Science, Masaryk University, Brno; supervised by J. Bryja and T. Albrecht.

ŘÍČANOVÁ Štěpánka, 2011: *Phylogeography and conservation genetics of the European ground squirrel*. Faculty of Science, University of South Bohemia, České Budějovice; co-supervised by J. Bryja.

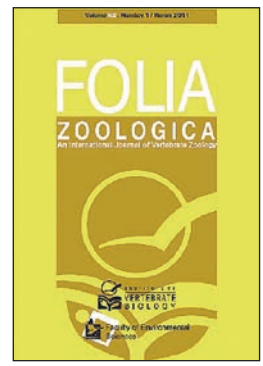
SCHNITZER Jan, 2011: *Male quality, extrapair paternity and parental investments in scarlet rosefinches* [in Czech; Kvalita samce, mimopárové paternity a rodičovské investice u hýla rudého *Carpodacus erythrinus*]. Faculty of Science, Charles University, Prague; supervised by T. Albrecht.

SMOLINSKÝ Radovan, 2012: *The role of predator-prey interactions in the coadaptation of thermal biology in newts* [in Czech; Úloha interakcí mezi predátorem a kořistí pro koadaptaci termální biologie u čolků]. Faculty of Science, Masaryk University, Brno; supervised by L. Gvoždík.

SYCHRA Jan, 2011: *The distribution and taxonomic composition of aquatic macroinvertebrate assemblages of fishponds in relation to local environmental conditions* [in Czech; Distribuce a složení společenstva vodních bezobratlých na rybnících ve vztahu k lokálním podmínkám prostředí]. Faculty of Science, Masaryk University, Brno; supervised by Z. Adámek.

VINKLER Michal, 2011: *The effect of immune system state and function on the sexual selection in birds*. Faculty of Science, Charles University, Prague; supervised by T. Albrecht.

| EDITORIAL ACTIVITIES – FOLIA ZOOLOGICA



The Institute publishes the international journal *Folia Zoologica* jointly with the Faculty of Environmental Sciences, Czech University of Life Sciences in Prague. The journal has a publishing tradition going back more than 80 years and is currently covered by many reference journals, including the Elsevier Bibliographic Database (Scopus) and the ISI Web of Knowledge by Thomson Reuters.

Six regular issues and a special double issue celebrating the 60th birthday of Prof. Jan Zima were published over 2011 and 2012. Altogether, 83 full papers appeared in the two previous volumes of Folia Zoologica, covering various areas of mammalogy, ornithology, herpetology and ichthyology.

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Aim & Scope

Folia Zoologica publishes articles containing original insights into various aspects of vertebrate zoology that have not previously been published and are not presently under consideration for publication elsewhere. The journal welcomes significant papers presenting new and original data of more than regional significance. Studies testing explicitly formulated hypotheses are preferred to those presenting primarily descriptive results. Review papers are particularly welcomed and should deal with topics of general interest or of current importance, being synthetic rather than comprehensive in emphasis. Authors should consult with the editors before submitting reviews.

The journal is published quarterly and one volume usually consists of four issues. However, additional issues may be published occasionally. There is no page charge except for colour pages and other extras. Full papers published in Folia Zoologica are available on *http://www.ivb.cz/pubser_en.htm* one year after publishing. Folia Zoologica is indexed by CAB Abstracts, Elsevier Bibliographic Databases incl. Scopus, the ISI Web of Knowledge by Thomson Reuters, and NISC Bibliographic databases. The Journal is distributed by EBSCO Publishing.

Submission of manuscripts

All manuscripts should be submitted online at *http://mc.manuscriptcentral.com/folia_zool*. Correspondence concerning editorial matters should be addressed to the Editorial Office. A comprehensive version of the 'Instructions to Authors' is available on *www.ivb.cz/pubser_en.htm*.

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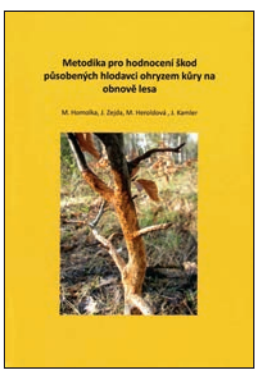
| BOOKS CO-AUTHORED OR CO-EDITED BY THE INSTITUTE'S FELLOWS

AULAGNIER S, HAFFNER P, MITCHELL-JONES AJ, MOUTOU F, **ZIMA J**, 2011. *Guida dei mammiferi d'Europa, Nord Africa e Vicino Oriente*. Emmebi Edizioni Firenze, Firenze, 272 pp. (Scienze e Natura). ISBN 978-88-89999-70-7.

This book contains a complete account of mammalian species (excluding cetaceans) distributed over the western Palaearctic. The region covered includes Europe, North Africa, the Middle East, and a major part of Asia Minor. The book presents brief characteristics of each species along with colour paintings and black and white figures of discriminant traits. The book is aimed at both professional zoologists and amateurs.

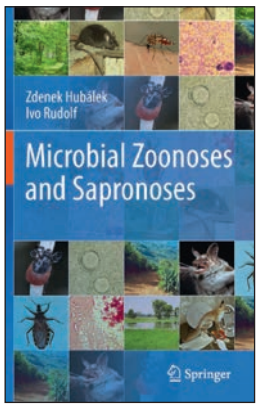
HOMOLKA M, ZEJDA J, HEROLDOVÁ M, KAMLER J, 2012. *Metodika pro hodnocení škod působených hlodavci ohryzem kůry na obnově lesa*. ISBN 978-80-87189-13-9.



This methodology provides simple criteria for estimating the extent of bark damage on forest plantings caused by gnawing rodents. The data obtained may be used for objective assessment of the extent of rodent tree damage and a calculation of total damage value. Exact data on tree damage can be used as back coupling for damage prevention effectiveness. The relationship between rodent damage prevention costs and damaged area replanting costs may also be considered retrospectively.

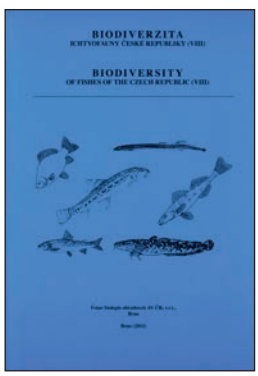
HOMOLKA M, ZEJDA J, HEROLDOVÁ M, KAMLER J, 2012. *Metodika pro zjišťování početnosti hlodavců v lesním prostředí*. ISBN 978-80-87189-12-2.

This methodology provides instruction on how to monitor rodent density in forest environments, concentrating on those species causing damage to broad-leaved forest plantings. Rodent population density is a principle requirement for the effective control of tree damage. The book also includes basic ecological information on the target species. This methodological book contributes to our better understanding of the origin of sapling damage in the wider sense, and contributes to more effective input on damage prevention. The methodology is aimed primarily at forestry workers.



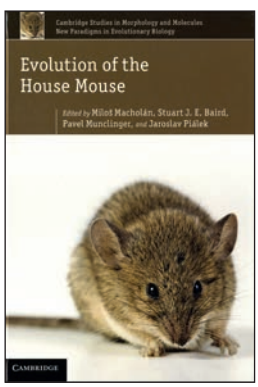
HUBÁLEK Z, RUDOLF I, 2011. *Microbial zoonoses and sapronoses*. Springer, Dordrecht, 457 pp. ISBN 978-90-481-9656-2.

This book presents a state-of-the-art overview in the field of microbial zoonoses and sapronoses. It can be used as either a textbook or a microbiology and medical zoology manual for students (including Ph.D. students) of human and veterinary medicine, biomedical scientists, and medical practitioners and specialists. In the introduction, a short synopsis is provided of the infection and epidemic process, including the role of environmental factors and possibilities for epidemiological surveillance and control. Much emphasis is laid on ecological aspects of these diseases (i.e. haematophagous vectors and their life history; vertebrate hosts of zoonoses; habitats of the agents and their geographic distribution; natural focality of diseases). Particular zoonoses and sapronoses are then characterised in brief paragraphs covering the source of human infection, animal disease, transmission mode, human disease, epidemiology, diagnostics; therapy, and geographic distribution.



LUSK S, LUSKOVÁ V (eds), 2011. *Biodiverzita ichtyofauny České republiky VIII*. ÚBO AV ČR, Brno, 109 pp. ISBN 978-80-87189-08-5.

This eight-volume publication comprises studies directly or indirectly connected with the diversity of fish fauna in the Czech Republic. The publications are based on results obtained under Research Project V&V–SPIIdI/9/07, "Biological and ecological requirements of fishes: Factors determining the function of fish ladders". Between 2007 and 2010, research work within this project was undertaken by the Department of Ichthyology, Institute of Vertebrate Biology of the Academy of Sciences of the Czech Republic in Brno, along with a number of co-operating institutions, i.e. the Faculty of Fisheries, South Bohemian University in České Budějovice, and the Faculty of Biology and Ecology, Ostrava University.



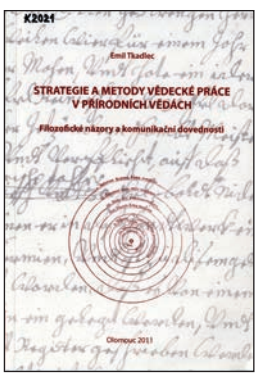
MACHOLÁN M, **BAIRD SJE**, MUNCLINGER P, **PIÁLEK J** (eds), 2012. *Evolution of the house mouse*. Cambridge University Press, New York, 526 pp. (Cambridge studies in morphology and molecules 3). ISBN 978-0-521-76066-9.

The house mouse is the source of almost all genetic variation in laboratory mice. The house mouse genome was sequenced alongside that of humans, and it has become the model for mammalian speciation. Featuring contributions from leaders in the field, this volume provides the evolutionary context necessary to interpret patterns and processes in the age of genomics. The topics reviewed include mouse phylogeny, phylogeography, origins of commensalism, adaptation, and dynamics of secondary contacts between subspecies. Explorations of mouse behaviour cover the nature of chemical and ultrasonic signalling, recognition and social environment. The importance of the mouse as an evolutionary model is highlighted in reviews of the first described example of meiotic drive (t-haplotype) and the first identified mammalian speciation gene (Prdm9). This detailed overview of house mouse evolution is a valuable resource for researchers of mouse biology as well as those interested in mouse genetics, evolutionary biology, behaviour, parasitology, and archaeozoology.

ŠŤASTNÝ K, HUDEC K, **ALBRECHT T**, BEJČEK V, BUREŠ S, CEPÁK J, **ČAPEK M**, ČIHÁK K, FLOUSEK J, HOLÁŇ V, **HONZA M**, HROMÁDKO M, KLÁPŠTĚ J, KLOUBEC B, KRÁL M, KLVAŇA P, KLVAŇOVÁ A, LUMPE P, **PROCHÁZKA P**, SEDLÁČEK O, SCHRÖPFER L, SITKO J, ŠKOPEK J, VIKTORA L, WEIDINGER K, 2011. *Ptáci - Aves*. 2. přeprac. a dopl. vyd. Academia, Praha, 1190 pp. (Fauna ČR 30). ISBN 978-80-200-1834-2.

This new two-volume set contains a lot of significant new material, including 150 extensively revised species accounts. The text has been substantially updated by both new authors and members of the original editorial team. Many sections have been completely rewritten to take into account new scientific information that has become available since the first edition of the monograph was published. New material for split species, such as Iberian Chiffchaff and Hooded Crow, has also been added. Each breeding passerine species is described in full, with entries on distribution, taxonomy, description, measurements, field identification, species distribution in the Czech Republic, movements, habitat, breeding, importance of species to man and parasites.

TKADLEC E, 2011. *Strategie a metody vědecké práce v přírodních vědách: filozofické názory a komunikační dovednosti*. Univerzita Palackého, Olomouc, 195 pp. ISBN 978-80-244-2675-4.



This scientific monograph reviews philosophical ideas about research strategies in the natural sciences. In addition to the author's own ideas, it provides overviews from two giants among philosophers, K. Popper and T. Kuhn. All the ideas in the book refer to orginal sources. In the second part, the book summarises modern requirements for scientific text writing.

| AWARDS

Three Otto Wichterle Awards in 2011-2012

In 2011, two young IVB researchers, **Natália Martínková** and **Petr Procházka**, received the Otto Wichterle Award, while **Ivo Rudolf** received the same award in 2012. The Otto Wichterle Award is an honour given by the Academy of Sciences of the Czech Republic to stimulate and encourage selected, exceptionally outstanding and promising young scientists (not older than 35) at the Academy of Sciences of the Czech Republic for their remarkable contribution to the advancement of knowledge in a given area of science. The main current interests of N. Martínková are phylogenetics, reconstruction of relationships in vertebrates and pathogens, modelling changes in DNA sequences over time and evolution of infectious diseases. P. Procházka adopts different approaches for investigating various aspects of brood parasitism and migratory connectivity in birds, as well as their their consequences for reproductive performance and population ecology. I. Rudolf works on isolation and identification of microorganisms, especially those causing emerging infections, and develops molecular diagnostic tools for zoonotic pathogens in haematophagous arthropods and vertebrate hosts.

From top to bottom: N. Martínková, P. Procházka and I. Rudolf. (*Photos on this page by Akademický Bulletin*)

L´Oreal Fellowship for Natália Martínková

In 2012, **Natália Martínková** received the l´Oréal fellowship for women in science. Every year, three women are awarded this stipendium for undertaking high-quality reseach in the Czech Republic. N. Martínková won against high competition with a project on the fungal pathogens causing white-nose syndrome in bats. This disease may have important consequences, not only for bat populations but also for stability of ecosystems in general.

The ASCR Award for Popularisation of Science

In 2011, Karel Hudec received The Award of the President of the Academy of Sciences of the Czech Republic for Promotion or Popularization of research, experimental development and innovation. Karel Hudec has published many significant papers and books, the most imporatant being "Fauna – Birds".

President of ASCR, Jiří Drahoš (*on the left*), awarded Karel Hudec (*second from the right*) for his invaluable contribution to the popularization of zoological research. (*Photo by Akademický Bulletin*)

A memorial tablet reminding readers that Josef Kratochvíl was one of the outstanding animal researchers in the Slovakian Tatra Mountains. (*Photo by J. Černická*)

The Tatra pine vole, *Microtus tatricus* (*Kratochvíl, 1952*) - just one of the animal species first described by Josef Kratochvíl. (*Photo by M. Rudá*)

A tribute to Josef Kratochvíl of Slovakia

The late Professor **Josef Kratochvíl** is counted among the most significant of zoologists contributing to research on fauna of the Slovakian Tatra Mountains. A meeting commemorating great Tatra zoologists was held at the High Tatra National Park Research Station and Museum at Tatranská Lomnica on December 7, 2012. A conference was organised at this event, which concluded by unveiling a memorial tablet commemorating the names of outstanding researchers of animals inhabiting this magnificent mountain range. All the scientists remembered in this way worked in the Tatras in the 19th and 20th centuries, and originated from Slovakia (Anton Kocyan, Milan Bališ, Milíč Blahout), Poland (Maksymilian Nowicki), Germany (Helmuth Schaeffer) and the present Czech Republic (Josef Kratochvíl). The tablet is situated in the Botanical Gardens of the Tatra National Park in Tatranská Lomnica.

Josef Kratochvíl, who founded the Institute in 1953, always showed great interest in the mammalian fauna of Slovakia, and the grand mountains of the High Tatras in particular. He published an array of papers dealing with the faunistics, systematics and ecology of mammals from this geographic region and his work contributed substantially to scientific knowledge of this animal group in the Tatras. Descriptions of several new taxa from the High Tatras are among the most important achievements of Josef Kratochvíl in this respect. In particular, he identified a new vole species, *Microtus tatricus* (Kratochvíl, 1952), which is the only endemic mammal of the Tatra Mountains, and in fact the only endemic mammalian species in the whole Carpathians.

Both the conference and the unveiling of the memorial tablet were organised by Dr. Barbara Chovancová and the Civil Association for the Protection of Chamois in the High Tatras. It was an extraordinarily pleasant event, attended by friends and colleagues who have not only witnessed the recent history of zoological research in the Tatras but are best able to appreciate the merits of their great predecessors and the benefits of international collaboration in this field.

Radoslav Obrtel

(1925–2011)

Ing. RNDr. Radoslav Obrtel CSc. was born in Brno on February 2, 1925. There, he attended high school and later the Agricultural University, where he met his future life-friends František Gregor, Jaroslav Pelikán and Dalibor Povolný. The four young men, students of Professor Josef Kratochvíl, were endowed with a great interest in zoology, and particularly entomology. Radek, as he was called by almost everybody, kept faithful to entomology all his life, but this was certainly not his only interest. His personality can be characterised as exceptionally talented, educated and solid, a man who was always ready to assist. In addition to his own research, he was engaged in translating both scientific and popular papers and books and in editorial work for scientific journals. He served as an excellent interpreter at various zoological symposia and conferences. Radek also translated commentaries to natural history films at the request of television companies; this resulted in scripts using correct terminology, a fact often disregarded by other translators. English was his number one foreign language, but he also spoke excellent German. He took and published many high-quality photographs of insects and spiders, and participated in various social activities beyond science (e.g. theatre, music, funny stories).

After his engagement in applied entomology at the Fodder Research Institute at Troubsko (1953–1969), he was employed as a research fellow at the Institute of Vertebrate Zoology, Czechoslovak Academy of Sciences in Brno (1969–1986). Among his many expert activities, numerous studies on food of rodents, including trophic niche and dietary overlap among different species (in part with Věra Holišová); synecological studies of invertebrate communities in different ecosystems; participation in research and resulting publications on the life of mammals in towns and cities; and a study on vertebrate casualties due to road traffic particularly strand out. In total, Radek Obrtel published some 70 scientific papers and monographs. Independent of his scientific work, he translated such essential books as 'Fundamentals of Ecology' by E. P. Odum (1977) and 'Animal Life' by Ch. Uhlenbroek (2009). Together with Steve Ridgill, he translated and/or took linguistic control of the book 'A tribute to Bats' by I. Horáček and M. Uhrin (2010). His last expert translation was of a summary of the book 'Mammals of the Czech Republic' by M. Anděra and J. Gaisler, but unfortunately he did not live to see its publication (2012).

Radek Obrtel died on August 11, 2011. We have missed and will miss him very much.

Jiří Gaisler

Dana Havelková

(1951–2013)

On January 5, 2013, Dana Havelková, technician in the Department of Population Biology in Studenec, lost her long-term battle with disease at 61. It was a complete shock for me as I firmly believed, based on her personality, that only a happy end was conceivable for her. I spent 15 years working in close collaboration with Dana; and I particularly remember walking together through the uneasy times following the 'velvet revolution', when the very foundation of our Institute was strongly shaken. At these times, we were left alone in Studenec supported by just a small research project, the budget of which had to cover all expenses, including rental of the garbage bin, the electricity metre and the phone. We checked our electricity consumption daily to avoid exceeding the fixed limit. Only the rooms with our captive voles were heated in those times. During such hard times, two people learn much about each other. Now, looking back, I increasingly realise that I could hardly have managed that situation without her. It is my feeling that fewer and fewer people are being born who are not only enthusiastic, dutiful and hardworking but who show such scientific curiosity. Even in former times, there were not many as great as Dana. When I see now how the department in Studenec has bloomed, becoming an extremely productive part of the Institute, I cannot but rejoice. Dana lived there for most of her life and I am convinced that without her personal contribution, this would never have happened.

Emil Tkadlec

When Emil Tkadlec left our Department, Dana passed on all her knowledge of animal management to me. It was only through her passion for each living creature that we were able to replace colonies of common voles for house mice and, later on, start to develop unique genetic resources of wild-derived strains. During that time, it was a pleasure to go to work as I was always sure that the mice were being well cared for. Her limitless patience and creativity was indispensable in breaking Murphy's Law of animal breeders, i.e. "Whenever a stock of animals is needed for experiments, it will stop breeding and go extinct". Now Dana's soul has passed away, yet part of her soul will always remain here in the mouse strains. I will always see her standing in the doorway of an animal room, telling me with her delighted smile that the long-expected babies of a nearly extinct strain are finally on their way.

Jaroslav Piálek

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