

**WORLD BIODIVERSITY AND THE EUROPEAN TAXONOMY  
STRATEGIES IN TAXONOMY:  
RESEARCH IN A CHANGING WORLD**

**Hungarian review**

**edited by Edit Kovács-Láng and Katalin Török**

*Institute of Ecology and Botany, Hungarian Academy of Sciences,  
Partner in Biostrat*

**Technical edition: Eszter Székely-Bognár**

15. April, 2009.

## WORLD BIODIVERSITY AND THE EUROPEAN TAXONOMY STRATEGIES IN TAXONOMY: RESEARCH IN A CHANGING WORLD

### Hungarian review

The aim of national reports and e-conference is to bring together taxonomists and potential users of taxonomy in Europe. The EPBRS meeting under the Czech Presidency is designed to investigate what taxonomists and the users of taxonomic information see as the main issues that taxonomists should focus on. Encouraging experts to participate actively in the e-conference and the meeting itself might also help to strengthen the policy bit of the science-policy interface.

The following headings will be used to structure the work of the EPBRS in the e-conference and during the meeting.

### *1. Taxonomic Information: Strategy and Methods*

#### **Inventory and Identification: “What is it, and how does it fit among its relatives?”**

1.1 Does your country use taxonomy-based tools for biodiversity assessments and policy making? What are these tools?
--

Yes. The main tools are, the Hungarian Biodiversity Monitoring System; the Water Framework Directive Monitoring System; the Hungarian Light Trap Network for Forestry and Agriculture; the Hungarian Nature Conservation Information System /NCIS/; the Hungarian Bird Monitoring System; the Fauna Hungariae series; Species lists at each National Park Directorate; UTM grid maps for different plant and animal groups; contribution to the development of methods for estimating biodiversity of lichens at European scale /EU-Bioassess project/.

1.2 Does your country have a national checklists? When were they last revised and updated? Is there any national assessment of which taxa in particular lack taxonomic information? Did you submit a response to the Global Taxonomy Initiative (GTI) questionnaire on these issues?
--

Yes, The original and traditional checklists were published in the last century as the 7 volumes of the Handbook of Hungarian Flora and the 150 volumes of Fauna Hungariae. The plant and animal groups of great conservation importance have checklists as a base information in the Hungarian Nature Conservation Information System /NCIS/. These checklists were compiled in consensus with experts. For certain groups, e.g. for the large insect groups (Coleoptera, Lepidoptera, Odonata, Diptera, Trichoptera, Homoptera, etc.), Mollusca, aquatic invertebrates, all vertebrates, etc. have checklists for expert use, some of them are recently revised (after 2000), many other revisions are in progress. The revised checklist from 2009 of lichens and lichen forming fungi (918 species) is available at the homepage of the Hungarian Natural History Museum.

The problem is however, that there are numerous animal groups having no expert and, therefore, detailed studies and checklists are missing in Hungary. Such groups are: dozens of

families of the large insect groups (in particular the orders Diptera, Hymenoptera, Coleoptera, and Lepidoptera); helminth groups, Acari.

Response to GTI questionnaire has not been submitted yet.

1.3 Describe 1-2 flagship projects related to bullet points below and suggest some recommendations useful for meeting as a result from these projects: Please outline any national taxonomy-based monitoring or surveys designed to establish the distribution, status and trends of any taxonomic group.

### **The Hungarian Biodiversity Monitoring System**

The Hungarian Biodiversity Monitoring System /HBMS/ is a national programme governed by the State Secretariat for Nature and Environment Protection, Ministry of Environment and Water. Its mission is the long-term surveillance of the status and trends of biological diversity in Hungary. The programme has more than ten years of experience of monitoring for conservation. Its international recognition is shown by the fact that experts from numerous European countries have expressed their interest for the experience gathered during the years of operation, and used it to develop their own national monitoring systems.

Biodiversity monitoring implies the long-term standardized observation and registration of certain characteristics of selected species and communities.

The following principles were taken into consideration when designing the monitoring activities:

- monitoring the status of protected and threatened natural values,
- observation of indicators of the general status of ecosystems in the country,
- study of direct or indirect effects of certain human activities or environmental factors.

As a result of several years of preparatory work the programme of HBMS was published in a series of manuals of 11 volumes.

Building on the expert knowledge of many ecologists and taxonomists, the manuals provide the theoretical background of wildlife monitoring, the selection process and sampling methods of species, communities and habitats. As a major novelty in this field, the experts elaborated the comprehensive habitat classification system of Hungary which serves as the basis for habitat mapping.

In the period 2003-2005 a comprehensive review was carried out for NBMS. For some taxa it resulted in refining and improving sampling methods, while in other taxa the datasets from several years were evaluated. The results were published in the first volume of a series. Efficiency of the system and use of data were also studied, and the results verified that biotic data provided by the programme are useful in the daily work of both professional researchers and nature conservationists.

The HBMS has a hierarchical structure:

Monitoring activity is governed and coordinated by the Central Coordination Unit at the Ministry of Environment and Water. The work here is supported by a Scientific Advisory Committee and different Expert groups. Links to international programmes are also realized at this level.

The basic monitoring activities are canalized and performed by the 10 National Park Directorates as regional coordinators, with the support of cooperating organizations and researchers.

Components monitored by the HBMS are habitats, plant associations, protected and invasive plant and animal species, mosses, fungi, mammals (small mammals, root vole, bats, souslik, steppe mouse, dormice), amphibians, reptiles, fishes, aquatic macrovertebrates, dragonflies,

butterflies, larger moths, terrestrial arthropods and orthopterans. This needs the substantial contribution and cooperation of taxonomists and ecologists with the experts of nature conservation.

The components monitored are organized into the following projects:

- I. Monitoring of protected and threatened species
- II. Monitoring of wetland habitats and their communities
- III. Surveying, mapping and monitoring of habitat types in Hungary
- IV. Monitoring of invasive species
- V. Monitoring of forest reserves and managed deciduous woodlands
- VI. Monitoring of plant and animal species in the Kis-Balaton Area
- VII. Monitoring of wildlife communities of the River Dráva
- VIII. Monitoring of saline habitats
- IX. Monitoring of dry grasslands
- X. Monitoring of montane meadows
- XI. Monitoring of species and habitats of community importance (Natura 2000)

Within each project, appropriate components (such as habitats, communities, populations of species) have been carefully selected to achieve the objectives set out.

For the sake of standardization of monitoring activities, detailed guidance (termed as protocols) has been developed for each component with the contribution of specialist teams. The protocols contain detailed guidelines for the selection of sample plots, the studied parameters, sampling methods, frequency and timing of sampling and the derived parameters that are able to show correlations and trends.

Monitoring is carried out by a large number of contributors, mainly experts in taxonomy and ecology of different plant and animal groups. There are several projects that also involve volunteers (students, undergraduates, teachers, NGO-s), that makes countrywide monitoring possible. Besides, they play educational and awareness raising role by actively involving the public into the protection of natural values.

Precise data collection and standardized data sets can only be ensured if tasks are unambiguously determined. Therefore, proper training and data quality control is a basic precondition for successful operation of the HBM System.

In plant monitoring the surveillance of invasive species is outstandingly important as one of the greatest threats to biodiversity is posed by the spreading of invasive species. Five terrestrial and one water plant species are included into the invasive plant monitoring programme.

Special and complex task is to monitor ecosystem diversity and its changes at the landscape level by regular habitat mapping of selected 124 quadrats of 5x5 km. For this purpose a comprehensive National Habitat Classification System (NHCS) and the methodology of mapping has been newly developed. The selected areas represent nature conservation priorities, regional problems and general landscape features. Maps are produced at a scale of 1:25 000. Habitat mapping is repeated every ten years for each quadrat. [http://www.termesztvedelem.hu/user/downloads/biomon\\_eng/Takacs\\_Molnar\\_NBS.pdf](http://www.termesztvedelem.hu/user/downloads/biomon_eng/Takacs_Molnar_NBS.pdf)

Other environmental monitoring systems such as Water Framework Directive Monitoring, Forest Reserve Monitoring, Insect Light Trap Network and Monitoring Centre of BirdLife Hungary substantially contribute to data gathering and analyzing.

From the material coming from the light-trap network of the National Forestry Service, besides surveying pest species, the large moth material is constantly sorted out and identified. Other valuable groups, in the lack of taxonomist capacity and the financials, however remained unidentified.

The experts of HBMS continuously contributed to the development of the National Conservation Information System, which provides the systematization of data and gives opportunity the analyses of data on GIS bases /see 3.2/.

### **The Hungarian Light Trap Network for Forestry and Agriculture**

The Hungarian light trap network has produced long-term biodiversity time series of various taxonomic groups of insects such as macro-moths (Lepidoptera), Neuroptera, Coleoptera: Carabidae.

The system has two parts: (1) the agricultural light trap network was settled with approximately 40 stations in 1958-1959; (2) the forestry light trap network has been operating since 1961 with 10 stations (recently 25 traps are in operation). The whole monitoring system serves for forecasting of agricultural and forest pests, mainly moths. The forestry light trap network has produced long-term data sets of species richness and diversity of macro-moth assemblages since 1961. The assemblages of lacewings, ant-lions (Neuroptera), and ground beetles (Carabidae) has been identified at species level from collections of agricultural trap network since 1981 till nowadays. Many analyses of data sets are running at the Department of Zoology, of the Plant Protection Research Institute of HAS and at the Department of Forestry Protection of the Forestry Research Institute Hungary. The main purpose of the monitoring is to analyse the changes of insect assemblages, describing the spatio-temporal transitions in structural characteristics and to detect the transformations in diversity patterns depending on habitat/climatic variability. According to these analyses the macrolepidopteran and lacewing assemblages showed significant decreasing trends in their species richness and diversity patterns at many sites of the network. Recently the whole Hungarian light trap network is strongly threatened by the lack of financial sources and taxonomists.

**The Biodiversity Inventories of the Hungarian National Parks.** Natural History of the National Parks of Hungary comprise a collection of books written by Hungarian and foreign experts which are the followings:

- The Fauna of the Hortobágy National Park. Vol. I. , II.,
- The Flora of the Hortobágy National Park,
- The Fauna of the Kiskunság National Park Vol. I, II.
- The Flora of the Kiskunság National Park.Vol. I, II,
- The Fauna of the Bükk National Park. Vol. I., II.
- The Fauna of the Aggtelek National Park. Vol. I.. II.
- The Fauna of the Fertő-Hanság National Park. Vol. I.. II.

Number of species detected from the Hungarian National Parks:

Taxon	Hortobágy NP	Kiskunság NP	Bükk NP	Aggtelek NP	Fertő- Hanság NP
	N.P.	N.P.	N.P.	N.P.	N.P.
Cestoda	101	125	42	31	32
Nematoda (libera)	105	63	147	–	143
Rotatoria	65	–	–	–	–
Oligocheta	12	1	–	22	26
Gastropoda	52	72	101	–	117
Crustacea (vízi)	–	65	25	24	146
Diplopoda	6	9	–	–	17

Chilopoda	13	9	–	–	14
Collembola	63	33	–	150	187
Odonata	39	45	–	51	63
Orthoptera	53	63	80	92	58
Dermaptera	2	–	–	5	6
Thysanoptera	33	47	101	78	–
Heteroptera	202	377	–	145	350
Homoptera	231	132	206	238	265
Neuroptera	19	31	53	63	40
Coleoptera	1906	2063	2875	1856	1564
Trichoptera	23	23	109	109	73
Lepidoptera	866	1897	1854	1954	1573
Diptera	1266	1047	1358	497	503
Hymenoptera	964	1345	1067	1566	968
Pseudoscorp.	11	–	–	–	9
Araneae	221	174	–	136	184
Acari	329	307	277	181	179
Pisces	22	32	–	–	32
Amphibia	10	11	13	15	16
Reptilia	4	10	10	9	11
Aves	215	246	137	174	293
Mammalia	38	48	23	–	47
Total	6860	8175	9436	7394	6916

### The development and maintenance of the National Plant Reference List & Ecological Flora Database of Hungary (FLORA 1.2)

The database enumerates and characterises all higher plant taxa (species, subspecies) of Hungary according to Soó, R. (1964-1980), Simon, T. (1992), Borhidi (1993), and contains life form, plant geography, ecological indicator values, nature conservation values and other attributes of plant species of Hungary (about 2300 records). REF: Horváth, F., Z.K. Dobolyi, T. Morschhauser, L. Lőkös, L. Karas & T. Szerdahelyi (1995): FLÓRA adatbázis 1.2, Taxonlista és attribútum-állomány (taxon list and stock of attributes) (in Hungarian). MTA Ökológiai és Botanikai Kutatóintézete (IEB HAS) - MTM Növénytára (Bot. Dept. of Hung. Nat. Hist Mus.), Vácrátót - Budapest. ISBN 963 8391 19 7., pp. 267.

The database is maintained by the Institute of Ecology and Botany of HAS and the Botanical Dept. Of the Hungarian Nat. Hist Mus.

### The development and maintenance of the CoenoDatRef Database of Hungary

CoenoDat Reference Database is a Hungarian reference phytocoenological databank for the natural and semi-natural vegetation types of the Pannonian Biogeographical Region. The TurboVeg for Windows (Hennekens 2001) was applied to manage the records of about 9,000 relevés from approximately 400 plant associations. The CoenoDat Working Team is responsible for the maintenance and management of the database and CoenoDAT Archive (collected papers and manuscripts in IEB HAS). The National Plant Reference List (Horváth et al. 1995) was adapted by Dobolyi (2002) as taxonomic reference. REF: Lájér, K., Z. Botta-Dukát, J. Csiky, F. Horváth, F. Szmorad, I. Bagi, Z.K. Dobolyi, I. Hahn, J.A. Kovács & T. Rédei (2007): Hungarian Phytosociological Database (CoenoDatRef): Sampling methodology, nomenclature and its actual stage. *Annali di Botanica nuova serie* 7:27-40.

## **The Water Framework Directive Monitoring System**

### Monitoring using benthic diatoms

The Hungarian Danube Research Station at the Institute of Ecology and Botany HAS contributed to the elaboration of the national fitobenthon monitoring methods to assess the ecological status of surface waters according to the WFD requirements. For evaluate the water quality we identify the diatoms and their relative abundances in the samples and calculate diatom indices using OMNIDIA software. The surveillance monitoring started in 2007 in Hungary, so we have a checklist of the diatoms found in Hungary. The last update was in 2008. The algologists of the Hungarian Danube Research Station take part in the audit of the incoming monitoring data of fitobenthon in Hungary.

### Monitoring of fishes

In Hungary we use the European Fish Index (EFI+) methodology. It requires three types of data: 1) data from single-pass electric fishing catches to calculate the assessment metrics, 2) data describing environmental conditions at the site scale or at the river segment scale as well as the sampling method, 3) data on the present and historical occurrence of diadromous species.

According to the WFD requirement an ichthyological database of 50 investigated water bodies was set up for the further development of ecological status. In accordance with the Habitats Directive a national monitoring method for Natura 2000 fish species has been developed. The Hungarian Danube Research Station was involved into the Joint Danube Survey 2 of the ICPDR in 2007. It was the world's largest international scientific program of river monitoring. Based on the EU WFD-, and the European standard for electric fishing (CEN 2003) a survey was evaluated of 42 sites on River Danube from Regensburg to the Danube Delta and 21 sites from it tributaries. More than 64,000 specimens of 71 species were identified. Most sampling sites were in moderate ecological status.

## **The Development of the Natura 2000 monitoring project:**

The Hungarian Biodiversity Monitoring System (NBmR) has been operated for ten years. This system has accumulated a large database on habitats, communities, plant and animal species, but it has also deficiencies regarding reporting obligations under the Birds and the Habitat Directives. Concerning the Natura 2000 Monitoring projects research work was launched. The aims are: 1) to fill these gaps by elaborating uniform methodology for 44 selected species; 2) to produce good quality collection data of birds for less explored SPAs; 3) to carry out survey and mapping of habitats of community importance on certain, selected Natura 2000 sites; 4) to develop methodology for the conservation status assessment (classification according to EU criteria) for habitats of community importance and monitoring methodology of conservation status change. For this purpose, protocols for monitoring distribution, range, structure and function of habitats were developed. A completely new methodology was elaborated for the monitoring of structure and function on the so-called intensive and extensive sampling sites. Additional impacts of the project were: 1) providing improved information about selected species and habitats; 2) calculating or estimating the size of stable and/or well-known populations; 3) identification and investigation of poorly known populations, refinement of species distribution maps; 4) New information about bionomics of studied species. The Project was implemented by the Hungarian Natural History Museum, the Institute of Ecology and Botany HAS, the BirdLife Hungary and Hungarian Bird Monitoring Centre and the BIOAQUA Pro Expert Group.

## **Szigetköz project: Impact of the Water Damming of the Danube**

Szigetköz is a wetland area along the River Danube. The zoological monitoring of the Szigetköz has been started in 1989, based on recording of the presence/absence data. First

step of it was completed only in 1990-1992. Afterwards – because of the construction of the hydroelectric power station at Gabčíkovo and Čučovo reservoir – the aim of the biomonitoring project in the Szigetköz area was to reveal the effects on the biota. Parallel with these facts from the mid of 90s quantitative and semi quantitative data has also been collected. The animal groups investigated in the monitoring hardly changed during the investigated period. The following groups were studied: soil-dwelling nematodes, molluscs, crustaceans, dragonflies, orthopteran, neuropterans, lepidopterans, coleopterans, mayflies, fishes, water frogs, birds, small mammals. During the more than ten years long research period about 800 localities were investigated. Approximately data of 500,000 identified specimens belonging to 48 orders, 298 families and 2,746 species have been stored electronically in the BioData programme package, developed for the zoological monitoring. We analysed the changes in species richness during the monitoring periods by years using species number and species turn-over estimators. We tested the accuracy of the monitoring dataset and evaluated the spatial heterogeneity of the area.

**Faunagenesis project: The origin and genesis of the fauna of the Carpathian Basin: diversity, biogeographical hotspots and nature conservation significance.**

The main objectives of the project were the detailed zoological studies on the fauna of the characteristic, endangered habitat types of the Carpathian Basin (saline, loess, sandy, calcareous and dolomite grasslands and steppes; forest steppe, astatic water bodies and montane brooks) and the endemic, relic or biogeographically significant animal species of the Habitats Directive (Annex II). The investigations were structured at the following levels: 1) the classical and modern taxonomic studies on the rich and diverse animal groups displaying a high rate of endemism in the Pannonian Region, including the molecular taxonomy and genetic diversity of selected „hungaricum” species; 2) study of the population biology and population genetics of selected species; 3) the analysis of the phylogeography of the Carpathian Basin and the characterisation of the main biogeographic components and features of the Pannonian fauna; 4) the composition and diversity pattern of the fauna of the characteristic habitat types of the Pannonian Region and, based on these investigations, 5) elaboration of nature conservation treatments and methods and action plans.

1.4 Is there any coordinated effort in your country regarding bar-coding for identification or the assessment of biodiversity?

An effort was made in the frame of the Project „Faunagenesis“: The origin and genesis of the fauna of the Carpathian Basin: diversity, biogeographical hotspots and nature conservation significance (NKFP B/023/2004).

Theoretical and practical basis for bar-coding of specimens in the Lichen Herbarium was studied. Bar-coding was planned to use for identification of specimens.

1.5 Are you aware of any major efforts (or projects) in your country to integrate morphological and molecular taxonomy?

There are several projects integrating morphological and molecular taxonomy aiming at population genetic and biogeography studies using molecular taxonomy for identifying possibly new subspecies, identifying population genetic differences for phylogeographic pattern and nature conservation. The studies are carried out mainly at Hungarian laboratories, but sometimes international cooperation is also involved.

Some examples of projects performing the integration of traditional and contemporary methods are:

The Natura 2000 Monitoring Project; „The origin and genesis of the fauna of the Carpathian Basin: diversity, biogeographical hotspots and nature conservation significance“ Project: the „Reptilia-projects“ (Bombina, Triturus, Rana; Podarcis, Vipera, etc.), Projects for different species of conservation importance, such as : Aquila heliaca, Otis tarda, Sicista subtilis, Nannospalax, Microtus oeconomus, etc., Mollusca: Kovacsia, Theodoxus; Coleoptera: Carabus, Dorcadion, etc.

There are several laboratories in Hungary with the scientific and technical capacity for carrying out molecular taxonomy, for example : Molecular Taxonomical Laboratory of the Hungarian Natural History Museum, Budapest; Molecular Laboratorty of the Budapest ZOO; Laboratory of the Biological Research Center of the Hungarian Academy of Sciences, Szeged; Molecular Taxonomy Laboratory of Szent István University, Biological Institute, Gödöllő; Laboratory of the Research Institute for Fisheries, Aquaculture and Irrigation, Szarvas;

Partner in cooperation: the Joint Molecular Experimental Unit, Royal Belgian Institute of Natural Sciences, Brussels, Belgium

## ***2. Taxonomy as a basis for ecological research and sustainable management of biodiversity***

### **Ecological functions and services: “What does it do, and what does it interact with?”**

*How does taxonomic research contribute to better understanding of the functions and attributes of species, and to the management of biodiversity?*

2.1 Do you know projects involving taxonomists in the understanding of ecological functioning, or the assessment of ecosystem services?
---

Taxonomic surveys and biodiversity studies form the basis for the research work on ecosystem structure and functions in the frame of the Long Term Ecological Research /LTER/ Network. In Hungary there are 3 functioning LTER sites, SIKFÓKUT LTER site, KISKUN LTSER site and BALATON LTSER site, representing the main biomes of the country. The research is more and more focused on the socio-ecological relations linking ecosystem services to human well-being. Special emphasis is given to biodiversity assessments performed by the Plant Protection Institute of the Hungarian Academy that support ecosystem services and development of sustainable agriculture. Taxonomists are involved into different Hungarian and international projects aiming at the understanding of ecological functioning or the assessment of ecosystem services, such as:

**EASY** (Evaluating current European Agri-environment Schemes to quantify and improve nature conservation efforts in agricultural landscapes).

**FAUNAGENESIS** (The origin and genesis of the fauna of the Carpathian Basin: diversity, biogeographical hotspots and nature conservation significance).

**The Biodiversity Assessment Tools (BioAssess)**– EU 5<sup>th</sup> Framework -The purpose of the project was the development of biodiversity assessment tools for inland terrestrial ecosystems, comprising sets of indicators of biodiversity, to assess the impact of policies on the changes in biodiversity in Europe.

**Maculinea butterflies of the Habitat Directives and European Red List** as indicator and tools for habitat conservation and management (MacMan) - EU 5<sup>th</sup> Framework. - The main purpose is to investigate the ecology of *Maculinea* butterflies, to develop standard methods for biological monitoring, to test indicator value of *Maculinea* species, to investigate the population dynamics and structures of different populations, to collect substantial data for modeling population changes year by year, to compare genetical structure of the populations using DNA and enzyme polymorphism.

**Fauna Europe – NAS extension (FaEu-NAS)** - The main purpose is to accomplish the database of the terrestrial and aquatic invertebrate and vertebrate species which inhabit Europe. The Catalogue will contain the following fields per species: Scientific name, systematical position, author(s), year of description, synonyms. An annotated bibliography of the important publications by countries will also be joined the international database, which will be published on CDROM and will be accessed on WEB.

**A Biological Collection Access for Europe – (BioCase)** – The main purpose is to develop computer software packages and data management (taxonomical, ecological, geographical thesaurus) tools for accessing the Biological Collections with the help of Internet.

2.2 What is the contribution of taxonomy in your country to the management of biological invasions?
---

Reference Collections, the Nature Conservation Information System ( NCIS ) database, the information coming from the datasets of the Hungarian Light Trap Network and the regular floristic and faunistic surveys following weed and insect dispersal and invasion patterns are the main tools in Hungary for detecting biological invasions.

The reference collections of the Hungarian Natural History Museum (HNHM) represent the startpoint data-sets of the studies; the analysis of the yearly changes of the invasive populations and their distribution patterns can be referred to and compared with these data.

The mentioned reference collections were satisfactorily used in the study of the rapid invasions of *Helicoverpa armigera* (Noctuidae), *Cameraria ochridella* (Gracillariidae) and *Colias erate* (Pieridae). Similarly, the long-distance distribution-changes of certain protected species (e.g. *Pandoriana pandora*, *Nymphalis xanthomelas*, *N. Antiopa*, *Colias myrmidone*) could be monitorized using the almost two-hundred year long reference data.

There is also a checklist of neophytes (alien plants introduced after 1500; Balogh et al. 2004) that summarizes the taxonomic knowledge of these plant species. However, there are problems with the identification of newly appearing invasive species, especially with subtropical-tropical sea-grasses in the thermal waters.

Recently there are no regulation of the introduction of new species (e.g. for ornamental plant), although it was recommended by the researchers. Anyway, the elaboration of such a regulation would need risk analysis that needs correct taxonomic identification for collecting data on the properties of the species ,including their invasive behavior in other parts of the world.

Balogh L., Dancza I., Király G. 2004. A magyarországi neofitonok időszerű jegyzéke, és besorolásuk inváziós szempontból.(Recent checklist of invasive neophytes in Hungary) In: Mihály B.& Botta-Dukát Z. (eds.) *Biológiai inváziók Magyarországon. Özönnövények* (Biological invasions in Hungary, Mass invasive plant species). A KvVM Természetvédelmi Hivatalának tanulmánykötetei 9. TermészetBÚVÁR Alapítvány Kiadó, Budapest. pp. 57-88. Botta-Dukát,Z. and Balogh,L.(eds.)2008: The most important invasive plants in Hungary. Institute of Ecology and Botany HAS, Vácrátót, pp.255.

2.3 What is the contribution of taxonomy in your country to efforts to understand the status and trends of key functional groups such as pollinators?

Taxonomy and taxonomic knowledge provide scientific background for the studies on functional diversity, and ecosystem functions.

The Institute of Ecology and Botany of HAS as a partner in the Field Site Network of the EU FP6 ALARM Project participated in geographically extensive but locally intensive studies of ecological interactions focusing on the effects of land use intensity on the status and trends of key functional groups. We studied the changes in species composition and abundance of pollinators on near natural and disturbed habitats. Studies have been carried out on the species interactions in case of rose hip seed predators, and Merodon bulb predators as well as on interactions between woodland wasp communities under the effect of different types of forest management.

There is a distribution database and UTM maps on Bumblebee species (*Bombus* Latr.) in Hungary. Bumble bee distributional data were collected from private and public collections and from the available (mostly Hungarian) scientific literature of the 20th century. One record of the database consists of the species name, information on collecting site, collecting date (if available) and the location identified by the code of the 10X10 km UTM square of the collecting site. The total database contains about 5200 distributional records of 25 *Bombus* species (Sároszpataki et al. 2003). Our summarised data covered the 42% of the UTM squares in Hungary. Analysing this database about 4000 records were suitable to assess changes in distribution and occurrence frequency. Similar databases and analyses on the genus *Megachile* and *Osmia* are under construction and will be completed in a few month.

**Taxonomy, biodiversity and its conservation: “How to manage it in sustainable way?”**

Describe 1-2 flagship projects related to bullet points below and suggest some recommendations useful for the meeting as a result from these projects:

2.4 Are there also non-professional organisations recording biodiversity data collections (e.g. ornithologists) involved in the decision process of land use planning etc.?

The largest and the most widely known organisation collecting and recording biodiversity data on birds is the society of ornithologists, the BirdLife Hungary. It was established in 1974 and the recent number of its members is over 10.000. Its activity is in harmony and coordination with both the national and international nature conservation actions and directives. In the nineties the large amount of data gathered earlier made necessary to create a Bird Monitoring Centre operating on contemporary informatical facilities. Since then the monitoring activities are carried out by the Bird Monitoring Centre at Nyiregyháza supported by the work of regional coordinators.

BirdLife Hungary run several big projects such as Monitoring of Rare and Colonially-nesting Birds, including species of Annex I of the Birds Directive. The Common Bird Monitoring Program has been operated since 1999, collecting data in a standardised system by well trained volunteer observers on common bird species living in different habitat types.

The Monitoring of Migrating Waterfowl Species is carried out monthly from August to April in 23 constant sites. The program titled „My favorite bird-watching place” is very attractive for the wide public.

BirdLife Hungary is governed by highly qualified experts with wide and long experience. Their reliable data and information on bird species and populations constitute a very important input to the Hungarian Biodiversity Monitoring System. The results of the Common Bird Monitoring Project revealed the convincing impacts of land use changes, therefore could be used in the local and regional decision making processes.

Other smaller groups also provide important contribution to biodiversity data collection and are involved mostly in local decision processes. Such organizations are: Hungarian Entomological Society; „Society for the protection of bats “ ; Hungarian Lepidopterological Association.

2.5 Are there some indicators (or red-list species) monitoring Natura 2000 sites for delimitation and management of nature reserves used in your country?

Yes, there are so called „Natura 2000 lists“ of selected plant and animal species exist in Hungary, which were used by nature conservation authorities and the national park directorates for the delimitation of Natura 2000 sites. Among the animal species mammals, birds, reptilians and butterflies have to be mentioned. Among indicator plants rear species of the Pannonic Biogeographical Region can be found. The status and trends of these marker populations serve as indicator of the effectiveness of the management.

2.6 Which taxonomy-related research (standardized taxonomic metadata, delivery of checklist building tools, building expertise network) in developmental non-European biodiversity- rich countries is supported by policy-makers from your country based on your national expertise and experience?

There are several. Coordinated and supported by the Hungarian Academy of Sciences research cooperations with countries like Taiwan, Korea, Vietnam, etc. A lot of taxon based studies were financed by Hungarian granting organizations for studying different groups of plants, animals all over the world or in the Palearctic region (Acarina, Nematoda, Coccoidea, Diptera, Heteroptera, some Hymenoptera, Lepidoptera, Rubiaceae, cryptogams). Zoological and botanical expeditions to South America, Tanzania, Cuba resulted in publications on local floras, world monographs on Acari, tropical bryophytes and other groups, Palearctic Catalogues, etc.

A wide spectrum of animal groups has been studied within the cooperations with the three mentioned countries of South-East Asia different soil mites, myriapods, amphibians and reptiles, small mammals.

2.7 Is there a National Needs Assessment of GTI in your country? If yes, what are your specific needs, e.g. for conservation, protected areas, CITES/customs, dealing with invasive species etc?

There was an initiative of the Hungarian Bioplatform: a status report was published in 2005, titled „Zootaxonomy in Hungary“. The major aim of this „pamphlet“ was to focus attention

on to the crisis situation in the education of future taxonomists, their perspectives in the scientific community (Papp,L. Peregovits,L.&Ronkay,L.. 2005; [www.bioplatform.hu](http://www.bioplatform.hu))  
The basic need is the initiative and financial contribution to the education, training and employment of much more taxonomists at the museums, universities, research institutes and financial support for their scientific projects.

### ***3. Taxonomy, potential users and capacity building of experts***

#### **Open access to information: “How to find out about it?”**

*How does taxonomic information get from, where it resides, to where it is needed elsewhere in the world?*

- *Bioinformatics*

3.1 To what extent is taxonomic research in your country contributing to international biodiversity initiatives and projects (e.g GTI, Global Biodiversity Information Facility /GBIF/, Etc...)

The Hungarian Natural History Museum participates as a consortial partner in the following initiatives are: GBIF, EDIT, CETAF, Synthesys,

**CETAF** is a networked consortium of scientific institutions in Europe formed to promote training, research and understanding of systematic biology and palaeobiology, Together, CETAF institutions hold very substantial biological (zoological and botanical), palaeobiological, and geological collections and provide the resource for the work of thousands of researchers in a variety of scientific disciplines.

**The Global Biodiversity Information Facility (GBIF)** is a coordinated international scientific effort to enable users throughout the world to discover and put to use vast quantities of global biodiversity data, thereby advancing scientific research in many disciplines, promoting technological and sustainable development, facilitating the equitable sharing of the benefits of biodiversity, and enhancing the quality of life of members of society.

**Synthesis of Systematics Resources (Synthesys)** – EU 5<sup>th</sup> Framework – The aim of the project is to manage the coordination of technical development among taxonomical and systematical institution, to form a common policy for the regulation of collections, to develop a virtual database system taking into consideration the Global Biodiversity Information Facility, to support the development of new investigation methods, to help the exchange of researchers of associated countries by financial support.

The **European Distributed Institute of Taxonomy (EDIT)** is the collective answer of 28 leading European, North American and Russian institutions to a call of the European Commission, issued in 2004, for a network in « Taxonomy for Biodiversity and Ecosystem Research Among the members of EDIT are the premier natural history collections-based institutions worldwide, which have both the management capacity and the will to progress toward EDIT’s objectives. Their collections are global in coverage and are supported by complementary expertise. More than half of the world’s natural history specimens, which constitute the large scale infrastructure for taxonomic research, are held in the repositories of EDIT’s membership. The inclusion in the consortium of network institutions devoted to management of biodiversity data, and of a research organisation directly related to users of taxonomy for agriculture and environment, in addition to the links or inclusion of many partners with universities will facilitate dissemination of EDIT taxonomic research and training toward a wide audience.

**EDIT** will bring together the leading taxonomic institutions in Europe that for historical reasons have developed independently. The association with leading North American and Russian partners will make it a worldwide leading network. The consortium so constituted unites the premier natural history collections-based institutions, to progress toward **EDIT**'s structural and scientific objectives.

3.2 What is the state of the art in biodiversity informatics in your country? (e.g. e-taxonomy and e-science tools)

As it was reported under 1.1 there are several taxonomy- based tools, mainly databases in Hungary belonging to the circle of biodiversity informatics.

**The Hungarian Nature Conservation Information System (NCIS)** has the purpose of supporting the work of the Hungarian Nature Conservation Authorities at the Ministry of Environment and Water, the national park directorates and the green authorities. The main tasks of the NCIS are to promote the collection and storage of geopositioned environmental and biotic (species distribution, plant communities, habitats) and landscape (habitat maps) data sets. It has a modular structure which gives opportunity for complex data analyzes by joining the biotic datasets with the nature conservation management ones. General and special core databases are essential for standardized data recording. The Biotic Module focuses mainly on biotic data of conservation importance. Among the special core datasets in the Biotic Module there are Taxonomic and National Habitat Checklists, which are being revised regularly. Core part of the distributed database system is managed and synchronised centrally (national code tables&checklists), while the base datasets part are managed by the 10 regional National Park Directorates. There are several level of user services: from system administration, through basic data management to the open public GIS service ([http://geo.kvvm.hu/tir\\_en/](http://geo.kvvm.hu/tir_en/)).

The NCIS also allows and promotes the basic data analyses (e.g. data aggregation, producing trend graphs and distribution maps).

3.3 Has there been a national assessment of best practices for taxonomic data quality and validation?

In the case of the Hungarian Nature Conservation Information System (NCIS) there is a Biotic Working Team consisting of experts in taxonomy, biogeography, ecology and nature conservation which is responsible for regular updating and revisioning of Core Taxonomic and National Habitat Checklists. There are several checking schemes to control data quality at field surveys, habitat mapping and data input processing. The National Biodiversity Monitoring System is supervised by National Advisory Board of experts.

A good international tool for taxonomic quality control is involved into

**EDIT WP6** (European Distributed Institute of Taxonomy – *WP6: Unifying Revisionary Taxonomy on the Web*) Taxonomic revisions are a fundamental part of our science, and it is still the most time-consuming, difficult aspect to overcome. Thanks to new technologies, knowledge can be shared and work distributed to speed up taxonomic revisions, make them more reliable and more powerful. **EDIT** provides websites and communication channels to speed up and strengthen collaborative revisions.

3.4 Do you have any national guidelines on how to approach the proof of absence?

The Hungarian Red Data Book (1989) contains the extinct and endangered plant and animal species of Hungary. Rakonczay, Z. (ed.) 1989. Akadémiai Kiadó, Budapest, Pp.566.

Concerning the data on recent plant species extinction, the HBMS protocols require the revisiting of known occurrences of the endangered populations in a standard way each year (or at a defined frequency), and this also has to be recorded. So the absence of data in this case means that the population was not found despite the repeated field visits. This implies to certain animal species as well: e.g. souslik populations.

3.5 What are the taxonomic standards used in the databases (TDWG, Darwin core, COL, PESI, etc...)?

TDWG, Darwin core, Digital Database of the Insects of Mongolia (DIDIM, 2004-2006), GBIF Database.

3.6 Could you identify the major digitization efforts for biodiversity data (e.g. collections, observations, species checklists, etc...)?

The existing and functioning monitoring systems are supported by digitized databases. The main biological data collection system is the Hungarian Biodiversity Monitoring System (see 1.3.) which is in close connection with the National Conservation Information System (NCIS) (see 3.3). The NCIS systematizes the primary databases of nature conservation, including biodiversity data of the flora, fauna and communities of distinct spatial areas. Beside it supports to reveal trends and can create distribution maps. For ordering collected data and establishing systematized biological datasets, species checklists were developed.

Further main digitized datasets are the Flora Database, CoenoDat Database, Database of the Lichen Herbarium, the Bird Monitoring database, the catalogues of the Hungarian Molluscs, the Database of Protected Butterflies; the Aggtelek National Park Fauna etc.

This work requires informatics capacity and financial support, what is missing in most cases.

3.7 Is there any effort in your country to make taxonomic information especially identification services easily accessible and useful to practitioners?

Yes, there is an Email-based identification service run by the Zoological and Botanical Departments of the Hungarian Natural History Museum, covering the following groups: vertebrates, invertebrates, cryptogams, conifers and flowering plants.

On several points of the capital and the major cities of Hungary regular identification service for mushrooms is operating in the summer periods with the aim of preventing poisoning.

#### **Capacity building in biodiversity-rich countries and worldwide:**

3.8 Are there any policy initiatives in your country to orient capacity building in taxonomy?

No.

3.9 Are there any sources of finance or policy actions in your country dedicated to applied taxonomy (e.g. identification tools, training for parataxonomists)?

Not yet.

---

### List of contributors

Katalin Török IEB HAS

Ferenc Kozár PPI HAS

Edit Kövács-Láng IEB HAS

Ferenc Szentkirályi PPI HAS

András Gubányi HNHM

Zoltán Botta-Dukát IEB HAS

Olivér Váczi MEW

Edit Farkas IEB HAS

Livia Fodor MEW

Éva Ács HDRS IEB HAS

László Forró HNHM

Gábor Guti HDRS IEB HAS

László Ronkay HNHM

László Somay IEB HAS

Ferenc Horváth IEB HAS

Miklós Sárospataki SZIU