

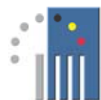


# Tropical Biodiversity: Science, Data, Conservation

## Abstract Volume



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Belgian  
Science Policy

*3<sup>rd</sup> GBIF Science Symposium  
18-19 April 2005, Brussels, Belgium*

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**3<sup>rd</sup> GBIF Science Symposium**  
*18-19 April 2005, Brussels, Belgium*



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**Belgian Science Policy**

**In cooperation with:**



**Belgian Clearing-House to the Convention on  
Biological Diversity**



**Royal Belgian Institute of Natural  
Sciences**



**Global Biodiversity Information Facility**

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## Scientific Programme

### Monday 18 April

(Venue: Royal Museums of Fine Arts of Belgium)

8.30-9.00: Arrival & Registration

9.00-9.20: Welcome

Plenary session I (30 minutes + 10 min. discussion)

9.20-10.00: Research, collections and capacity building on tropical biodiversity at the Royal Belgian Institute of Natural Sciences, *by Jackie Van Goethem (Head, Department Invertebrates, Royal Belgian Institute of Natural Sciences, Brussels, Belgium)*

10.00-10.40: Research, collection management, training and information dissemination on biodiversity at the Royal Museum for Central Africa, *by Guido Gryseels (Director, Royal Museum for Central Africa, Tervuren, Belgium)*

10.40-11.00: Coffee

11.00-11.40: Collections, botanical documentation, research and mission of the National Botanic Garden of Belgium in a historical perspective, *by Jan Rammeloo (Director, National Botanic Garden of Belgium, Meise, Belgium)*

11.40-12.20: The World Federation for Culture Collections' role in managing tropical diversity, *by David Smith (President, The World Federation of Culture Collections (WFCC), CABI Bioscience, UK)*

12.20-13.30: Lunch

Plenary session II (40 minutes + 10 min. discussion)

13.30-15.20: Conserving Aquatic Biodiversity in the Tropics: The Needs for a Strong Foundation with Databases and Information Networks, *by Brij Gopal (Jawaharlal Nehru University - School of Environmental Science, New Delhi, India)*

15.20-15.40: Coffee

15.40-16.30: On-line access to conservation data: challenges and opportunities, *by Silvio Olivieri (Vice President, Conservation Knowledge and Software Architecture, Center for Applied Biodiversity Science, Conservation International headquarters, Washington DC, USA)*

16.30-17.20: What Should We Try to Learn About Tropical Biodiversity, and How Can We Use That Knowledge for Conservation? *by Peter Raven (Director, Missouri botanical garden, St Louis, MI, USA)*

17.20-18.30: Ebbe Nielsen Prize award and presentation

18.30: Reception for Ebbe Nielsen Prize winner

## Tuesday 19 April

(Venue: Royal Museums of Fine Arts of Belgium)

8.30-9.00: An Introduction to GBIF (*Meredith Lane, GBIF Secretariat*)

Session III (15 minutes + 5 min. discussion)

9.00-9.20: Digitalisation of the Type specimens of Lepidoptera (butterflies and moths) of the Royal Museum for Central Africa: before long the pictures on the web, *by Ugo Dall'Asta & Frans Desmet*

9.20-9.40: A digital quantitative comparison of biodiversity data of gracillariid moths (Lepidoptera, Gracillariidae) in the tropical areas with an approach of moth and host-plant relationships, *by Jurate de Prins*

9.40-10.00: Prototype Image Server to Integrate the Martius Herbarium and the Digital Flora brasiliensis, *by Piet Stoffelen & Elmar Robbrecht*

10.00-10.20: NeMys: a generic web based biological information system, *by Tim Deprez & Magda Vincx*

10.20-10.40: *Coffee*

10.40-11.00: Albertine Rift zoodiversity : exploitation of the historical data in the Royal Museum for Central Africa, Tervuren, *by Michel Louette*

11.00-11.20: The tropical collections of the University of Liège Zoological Museum: diversity, data and access, *by Michèle Loneux*

11.20-11.40: Biodiversity at the Ghent University Zoology Museum: potential and implementation, *by Dominique Adriaens & Dominick Verschelde*

11.40-12.00: An assessment of animal species diversity in continental waters, *by E. V. Balian, H. Segers, C. Lévêque & K. Martens*

12.00-12.20: Conservation gap analysis in Africa using a compilation of plant distribution data, *by R.S.A.R. Van Rompaey*

12.20-12.40: Changes in phytoplankton and bacterial biodiversity linked to hydrodynamics in Lake Tanganyika, *by C. Cocquyt, A. De Wever, M. Stoyneva, P.-D. Plisnier & W. Vyverman*

### Lunch

Session III (cont.)

13.40-14.00: Designing automated identification systems for Prokaryotes, *by P. Dawyndt, B. De Baets, H. De Meyer, & J. Swings*

14.00-14.20: Biodiversity of neglected and underutilized crops from Côte d'Ivoire: the case of Cucurbits consumed as sauce thickener, *by Irié A. Zoro Bi, Yao Djè, L. Aké Assi & J. -P. Baudoin*

14.20-14.40: Cryptic ecological degradation in Sri Lankan lagoons : loss of species, loss of function, loss of human lives, *by F. Dahdouh-Guebas, Sanath Hettiarachchi, D. Lo Seen, O. Batelaan, S. Sooriyarachchi, L. Pulkuttige Jayatissa & N. Koedam*

14.40-15.00: Banana (*Musa* spp.) genetic resources managed in the IPGRI/INIBAP gene bank: conservation and documentation status, *by I. Van den houwe, B. Panis, E. Arnaud, R. Markham & R. Swennen*



15.00-15.30: *Coffee*

15.30-15.50: The Neotropics: the experimental lab of nature, *by Marc Pollet*

15.50-16.10: IBISCA : a large-scale study of arthropod mega-diversity in a neotropical rainforest, *by Bruno Corbara, Yves Basset & Hector Barrios*

16.10-16.30: Arthropod biodiversity in tropical rainforest canopies: Panamanian termites in the framework of the IBISCA project, *by Y. Roisin, A. Dejean, B. Corbara, J. Orivel, & M. Leponce*

17.00-18.30: Poster session

(*Venue: Egmont Palace*)

## Invited contributions

### ***Patrimony and expertise of the RBINS regarding tropical biodiversity data***

*Jackie Van Goethem*

Head, department Malacology, Royal Belgian Institute of Natural Sciences, Vautierstraat 29, B – 1000 Brussels, Belgium. [jackie.vangoethem@naturalsciences.be](mailto:jackie.vangoethem@naturalsciences.be)

The Royal Belgian Institute of Natural Sciences is a natural history research institution and museum financed by the Belgian federal government.

Its missions in the field of biological diversity are: (i) zoological research, (ii) monitoring and modelling of the Southern North Sea ecosystem, (iii) curation and management of natural history collections, (iv) public education, and (v) policy advice to the government.

Zoological research targets the three levels of biodiversity: (i) ecological diversity dealing with populations, through niches and habitats, up to ecosystems, (ii) organismal diversity encompassing the taxonomic hierarchy from individuals upwards species, genera and beyond, and (iii) genetic diversity dealing with the components of the genetic coding that structure organisms and variation between individuals within a population and between populations.

Taxonomic expertise is present for many groups of invertebrates and vertebrates worldwide. Focus ecosystems are terrestrial, inland water, coastal and marine. Geographical areas of taxonomic expertise embrace Europe and many other regions of the world in particular sub-Saharan Africa, South East Asia, Papua New Guinea, Indian Ocean, South America, Antarctica and Lake Baïkal in Russia.

In the past, research in tropical areas focused on three national parks in the former Belgian Congo and one in Rwanda (1933-59), on Central African great lakes (1946-1954), and on the West African coast of the Southern Atlantic (1948-49).

Since the eighties, speciation and phylogeny are studied on a long-term basis in ancient tropical lakes such as Tanganyika and Malawi (cichlid fishes, Ostracods), on archipelagos such as the Galápagos Islands (spiders, carabid beetles) and Macaronesia (selected land and marine snail species), and in Central and East Africa (rodents). Besides this area-based research, scientists study the systematics, ecology and host-parasitic relationships of selected taxa in a worldwide perspective.

The collections of the Institute, parts of which go back to more than 220 years ago, total 37 million items, and cover virtually all tropical areas. They are complemented by extensive bird ringing data on Belgian breeding birds and migrants with a wintering area in tropical Africa.



The RBINS acts as the Belgian National Focal Point to the Convention on Biological Diversity and to the Global Taxonomy Initiative. As such the Institute has developed an international research and training programme in the field of taxonomy and curation of collections. The Institute also participates in data sharing activities, with the aim to make its non-European biodiversity data globally available. An upcoming project will involve the valorisation of iconographic archives and publications on the national parks of the D.R. Congo.

### ***Research, collection management, training and information dissemination on biodiversity at the Royal Museum for Central Africa***

*Guido Gryseels*

Director, Royal Museum for Central Africa, Leuvensesteenweg 13, B-3080 Tervuren, Belgium. [guido.gryseels@africamuseum.be](mailto:guido.gryseels@africamuseum.be)

The Royal Museum for Central Africa (RMCA) at Tervuren, founded in 1898, has a triple function as a Museum, as a Research Institute, and as a Centre of Information dissemination about Africa.

The RMCA houses the world's most important collections for Central Africa, many of them the only ones of their kind, and is the custodian of this exceptionally rich and diverse cultural and natural heritage. The RMCA has a long tradition of quality research in the fields of social and natural sciences, and maintains close ties and partnerships with research institutes and government agencies throughout Africa and the world. Through its educational and cultural activities as well as its exhibitions, the RMCA encourages the interest of the public at large and the youth in the cultural and natural diversity of Africa, its people, its societies and its environments. The RMCA also provides a large number of services to the public, government administrations and policy makers.

With respect to biodiversity in Africa, the RMCA has very large collections of all terrestrial and freshwater zoological groups and tropical wood samples. Research in zoology focuses on taxonomic work on, among others: birds, reptiles, fish, spiders, millipedes, mites, butterflies, flies,... Considerable research is also conducted on wood anatomy and many international anthropologists use the unique primate collection. The RMCA has also an African Biodiversity Information Centre which provides fellowships to African scientists, to study its collections and to receive training in its various domains of expertise. The RMCA has also an active policy for the repatriation of information and data to Africa and for the digitalisation of its collections so as to ensure easier access.

A large number of scientific services are being provided as well as training in various disciplines. One of the strengths of the RMCA is the interdisciplinary valorisation of scientific expertise.

Social sciences underpin the work in the natural sciences. Our research on linguistics, for example, illustrates the considerable importance of languages for the dissemination of information about biodiversity and environment. There is also good collaboration with the natural sciences. Considerable benefits are also obtained from partnerships in research networks.

Finally the paper will highlight the importance of research on biodiversity and on the many practical applications of its research results.

The presentation concludes with a reference to the exhibition “Congo. Nature and Culture” which is currently on display in the RMCA and which illustrates the strong links between the natural and cultural heritage in Congo.

### ***Collections, botanical documentation, research and mission of the National Botanic Garden of Belgium in a historical perspective***

*Jan Rammeloo*

Director, National Botanic Garden of Belgium, Domein van Bouchout, B-1860 Meise, Belgium. [rammeloo@br.fgov.be](mailto:rammeloo@br.fgov.be)

The “National Botanic Garden of Belgium” is a typical “old” European botanic garden with strong links to the biodiversity study of plant life in the tropics. “Plant life” has to be understood in the broadest sense, including algal and fungal groups, and even the study of some of the protists. “Botanic garden” has also to be understood in the broadest sense, not only dealing with living collections, but also comprising a library, museum, herbarium, and educational and research facilities.

The oldest collection, predecessor of the garden, was created about 200 years ago, in the centre of Brussels. This collection became the start of a private Society, established by Willem I, king of the Netherlands, aiming to develop, besides others, agricultural prosperity in the Dutch colonies (now Indonesia). After the Belgian independence (1830) the financial situation of the company became worse and in 1870 the royal Society was taken over by the state. Although scientific collections were gathered before that date, 1870 can be considered as the founding date of the research institute. When Congo became a Belgian colony, the link with the tropics was re-established and the research activity of the garden was booming. After the independence of the Congo, European staff members of the “cellule flore” of the INEAC (Institut national pour l’étude agronomique du Congo) were integrated in the Garden’s staff. The



ratification of the convention on biological diversity by the Belgian governments has created unique opportunities through a number of obligations. The Garden is strongly involved, and Belgian focal point for the Global Strategy for plant conservation, and contributes to the 2010 targets.

In this talk an overview will be given of the mission, collection development opportunities, publication policy, research and educational priorities, since the beginning of the institute up to today. Future plans, on the short term, will be highlighted.

### ***The World Federation for Culture Collections' role in managing tropical diversity***

*David Smith*

President of the WFCC, CABI Bioscience, Egham, Surrey TW20 9TY, UK  
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The World Federation for Culture Collections (WFCC) is the largest independent global organisation that represents professional individuals and culture collections, which preserve biodiversity and enable their proper use. These collections target living microorganisms, cell lines, viruses and parts and derivatives of them. Key values are authenticity and genetic integrity of the material and validity of the information provided. The WFCC was founded in 1968 and is a federation of the International Union of Microbiological Societies (IUMS) and a commission of the International Union of Biological Sciences (IUBS) with responsibility for the promotion and development of collections of cultures of microorganisms and cultured cells (<http://www.wfcc.info>). Member collections of the WFCC register with the World Data Centre on Microorganisms (WDCM; [www.wdcm.org](http://www.wdcm.org)). There are currently 489 collections in 65 countries registered. Almost 200 of these collections are in the tropics and many of the 1 million plus strains held by the collections are from the tropics. Indeed the WFCC members do a lot to conserve and enable legitimate utilisation of tropical microbial diversity.

Culture collections:

- Conserve living organisms and cells
- Supply material and related information to teaching, research and industry
- Offer services related to their activities
- Apply quality management and biosecurity control
- Perform innovative research

The WFCC supports the professionals, organisations and individuals with interests in culture collection activities through:

- Networking, providing information and expertise and facilitating communication
- Facilitating access to the collection resources
- Providing training and promoting partnerships
- Encourage the development and implementations of quality and security procedures and the use of common standards and regulations
- Representing member interests in international organisations and fora
- Promoting the establishment of culture collections, their promotion and perpetuation

A key role of the WFCC is to promote capacity building in biodiversity management. The building of resources, facilities and human resources to conserve and sustainably utilise biodiversity has been neglected, although it is on the agenda of many national and international initiatives. The human resources, facilities, technologies and knowledge necessary need development to meet the demands to complete the world's biodiversity inventory, to harness the world's genetic resources for the benefit of humankind and to develop the bioeconomy. The WFCC has played a key role in this area in its thirty decades of existence. The WFCC will continue to improve our ability to identify and understand the role of microbial diversity to harness its benefits for humankind.

### ***Conserving Inland Aquatic Biodiversity in the Tropics: The Needs for a Strong Foundation with Databases and Information Network***

*Brij Gopal*

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The inland aquatic ecosystems account for a very high proportion of the Earth's total biodiversity, disproportionate to their total geographical area. The tropics lying within 35°N and 35°S are particularly rich in aquatic biodiversity despite the fact that a significantly large part of the tropics and subtropics are arid to semi-arid. The diversity of aquatic ecosystems ranges from billabongs to the mighty Amazon and the large Rift Valley lakes. The large expanse of northern peatlands and the numerous large lakes of the temperate and boreal regions are easily surpassed by the tropical seasonal water bodies in their biodiversity. The aquatic biodiversity in the tropics supports both the economics of these countries and livelihood of millions of people. Local communities



throughout the tropics have traditionally used many aquatic organisms (other than fish) for health and nutrition, and there exists considerably large economic potential that is yet to be fully explored. However, not only the conservation has received least attention but the unique biodiversity is also the most threatened because the aquatic ecosystems are seriously impacted by large-scale regulation of rivers and growing levels of organic and toxic pollution. Alien invasive species both from within and outside the tropics are another major threat to the tropical aquatic biodiversity.

In most parts of the tropics, our understanding of the aquatic biodiversity is based largely on the expeditions and investigations by researchers from temperate Europe. Indigenous expertise is rare and very little only a few countries. Interestingly, complete inventories of the entire range of aquatic biodiversity have probably never been attempted for any water body. For most of the taxonomic groups, the latitudinal gradients in the aquatic diversity are not clear but the identification of most organisms (other than fish and birds) remains a serious handicap in its assessment and monitoring. The genetic diversity within the species is also least investigated among the aquatic organisms.

The need for training and capacity building together with the creation of national or regional databases and networking among researchers within tropics and all those with experience in the tropics cannot be underestimated in the wake of all tropical countries having joined the Biodiversity Convention. In many countries there are no national collections of specimens of plants, animals or microorganisms that are essential to the correct identification of the taxa. In vast majority of cases, there is no expertise available to identify the organisms (particularly algae and benthic invertebrates) to the species level that is required for proper assessment of biodiversity and monitoring of the changes in aquatic ecosystems under anthropogenic impacts. The networking through online databases and publications will help the planners, policy makers and researchers alike and contribute to improved policies for conservation.

### ***On-line access to conservation data: Challenges and Opportunities***

*Silvio Olivieri*

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[s.olivieri@conservation.org](mailto:s.olivieri@conservation.org)

The emergence of on-line databases of different kinds relevant to conservation and their increased accessibility is changing the way we can improve access to data, develop better analytical capacities and effectively support decision processes. The new paradigms created by on-line access not only can bridge the gap between scientific data and action but also

accelerate the knowledge process and the impact of new research on policy making.

At the World Conservation Congress in Bangkok, November 2004, IUCN launched the Conservation Commons initiative, an effort to define a framework for facilitating access and data and information sharing within the conservation community. The Conservation Commons Principles support free access to data and information, protection for author's rights and recognition, and for the proper use of the data and information (safeguarding data integrity, etc). This effort, similar to the Science Commons, is already subscribed by more than 50 organizations from the non-governmental, governmental, inter-governmental, academic communities, and the private sector among others. Under this framework, we hope to develop the standards, methods and tools to leverage open access data and information for the benefit of the conservation of biodiversity.

IUCN in collaboration with other organizations has already been developing some of the core databases for such an effort. The Species Information System (SIS) developed by the IUCN Species Survival Commission, constitutes the basis for the development of the Red List on Endangered Species and is being released annually. The World Database of Protected Areas (WDPA), developed by the WDPA Consortium under an agreement between IUCN and UNEP, has been releasing annual versions of the World Database of Protected Areas on an annual basis since 2003, both in CD-ROMs and on-line. ECOLEX is a joint venture between IUCN, UNEP and FAO for on-line access to environmental law, treaties, court decisions and legal publications. PALNet, the Protected Areas Learning Network is a on-line collaboration network for knowledge management concerning Protected Areas issues. Each of these systems has their own organizational framework, constituency, policies and processes.

Many more non-IUCN systems important to conservation are now accessible on-line and are being developed and maintained by many organizations, either directly related to conservation or not. Many of them, like GBIF, already use a data sharing framework similar to the one proposed by the Conservation Commons.

Availability of these on-line data sources opens the way for new paradigms on how to facilitate the interoperability between these systems so new ways to visualize the data and information, perform analysis and synthesis and develop and maintain decision support tools can be developed by different actors. In effect, all of these systems have done the best job at visualizing the kind of analysis that a user can do with their data. If these systems are available in a way that facilitates interoperability it is very difficult for any particular organization or system to visualize the myriad of audiences and needs that can be addressed by these systems. A very simple demonstration was presented at the World Conservation Congress exploring these possibilities. The prototype used on-line GIS interfaces to query and integrate data from SIS, WDPA, GBIF, Arkive and other systems.



The focus of this presentation will be on exploring ways in which we might be able to address interoperability from an end-user point of view (how the user would like to combine, analyze and present data and information) and discuss on-going efforts to address these challenges.

## ***What Should We Try to Learn About Tropical Biodiversity, and How Can We Use That Knowledge for Conservation?***

*Peter Raven*

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One of the most important steps to take in moving toward science-based conservation is gaining an understanding of what is already known, what data sets already exist, and sharing that information so that prioritized initiatives can be undertaken to fill in the most necessary gaps as quickly as possible because of the rapidity of the disappearance of undisturbed tropical ecosystems. Accomplishing this is of course fundamentally dependent on the open sharing of primary data so that if it is possible and they are applicable they can be used again and again for different studies leading to greater cost efficiency. As has been repeatedly noted, much data about the tropics resides in the temperate countries of the northern hemisphere, and so a global system for sharing the data is needed. To use the knowledge we have for conservation, that knowledge will need to become digital and be shared via a global network such as the Global Biodiversity Information Facility. Another important aspect of what we should try to learn about tropical biodiversity is that the studies should not be done without taking the human factors into account – much past research has focused on the organisms of the tropics as though there were no impending interactions with humans and yet we now know that there is virtually no place on Earth that is untouched by the activities of people, so it is important to include sociological elements in biological observations and experiments. The sociology of science itself needs to move toward more cooperative endeavors, which of course will be facilitated by today's capacities for open data sharing.

## Oral presentations

### ***Digitalisation of the Type specimens of Lepidoptera (butterflies and moths) of the Royal Museum for Central Africa: before long the pictures on the web***

*Ugo Dall'Asta & Frans Desmet*

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At the end of 2002 a program was started to digitalise the type specimens of the Afrotropical Lepidoptera (butterflies and moths) collections of the Royal Museum for Central Africa. This project started very slowly due to quite a lot of technical and scientific problems.

\* The 'automatic' setting of the camera proved to be very unsatisfactory for the sharpness and the colours of the pictures. A long series of tests had to be taken and all of the innumerable settings of illuminations were tried out. With the circular neon light one of the choices of 'incandescent light' proved the best (photographs of butterflies), with the 'ring illumination' specific for the camera which came on the market later, one of the 'clouds' settings gave the best results (photographs of the moths). The final adjustment was : flash off, macro on, illumination setting as discussed above, and the photographs were taken in 'fine' setting (maximum sharpness after \*.tiff format)

\* Recto en verso photographs were taken from all primary types, the allotypes if available, and if these two were not present in the collection but paratypes were represented, also one of these. The validity of this type material was verified only with catalogues, the list of which is mentioned in the metadata of the database

\* The validity of these types and cross checking with label data has also been checked by the scientist in charge of the collection.

Now this project has been fully carried out. These data (an excel file and 11 CD's containing 4374 photographs) now need to be transformed into a user friendly website.

## ***A digital quantitative comparison of biodiversity data of gracillariid moths (Lepidoptera, Gracillariidae) in the tropical areas with an approach of moth and host-plant relationships***

*Jurate De Prins*

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Gracillariidae is one of the largest families within primitive Microlepidoptera, consisting at present moment of 1802 recognized species worldwide. Therefore, it was chosen as a pilot group to study the biodiversity in the Afrotropical Region using a multidisciplinary approach and creating a new digital information system. The known data on the Afrotropical Gracillariidae were presented as "An illustrated on-line Checklist of Afrotropical Gracillariidae"

(<http://africagraci.africamuseum.be>). These data are based on the records from 21 African countries: 145 species are recorded from South Africa, 29 from Zimbabwe, 25 from Nigeria, 22 from Namibia, 21 from Madagascar, 14 from Uganda, 11 from Ethiopia and 7 species from the Democratic Republic of Congo. All the other African countries unfortunately have records for only a single or a couple of species. In order to have a complete overview of the gracillariid biodiversity in Tropical Regions, we have prepared a taxonomic database of Gracillariidae worldwide. The different pieces of information, including the data on original description, type specimens and their depository, type locality, biology, parasitoids and detailed distribution have been entered into a relational database, which consists of four modules: taxonomic data, literature data, faunistic data and loan manager. All four modules are united into one relational database. Since the larvae of Gracillariidae are internal feeders and undergo hypermorphosis, the biological data is provided digitally for future studies of moth and host-plant associations. The Afrotropical and Oriental Gracillariidae are closest for their preference of Fabaceae and Euphorbiaceae. On a world scale Fagaceae, Fabaceae, Betulaceae and Rosaceae are the commonest families serving as host-plants for Gracillariidae.

## ***Prototype Image Server to Integrate the Martius Herbarium and the Digital Flora brasiliensis***

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Carl Friedrich Philipp von Martius (1794-1868) is one of the most famous naturalists of the nineteenth century. From 1817 to 1821 he explored Brazil, with the zoologist Spix as travel companion; more than 10,000 herbarium specimens made on that expedition are kept in the Botanische Staatssammlung Muenchen (M). The Brazilian trip was a start for a keen interest in the Brazilian flora. Martius became an expert on palms (*Historia naturalis palmarum*, 3 volumes, 1823-1850) and founded (with Endlicher) and edited the magnificent *Flora Brasiliensis*, a monographical flora series of which 46 fascicles were published before his death. The *Flora* (in total 130 volumes) was completed by Eichler and Urban in 1906. Martius's private botanical collection grew, by purchase and exchange, to become one of the most important private herbaria of the nineteenth century. When he died, it contained ca. 300,000 specimens representing 65,000 species and covering the entire world; about half of the collections came from the Amazon Basin. The *Herbarium Martii* was acquired by the Belgian government in 1870 and formed the beginning of a world collection for the then newly established *Jardin botanique de l'Etat*. The entire archive, with detailed lists for many of Martius's acquisitions, are also conserved in BR.

The project named 'Prototype Image Server to Integrate the Martius Herbarium and the Digital *Flora brasiliensis*' is an inter-institutional feasibility study within Workpackage 13 of the European Network for Biodiversity Information. For eight pilot groups all historical type specimens of Brazilian taxa were imaged and databased as well as the texts and plates of the *Flora Brasiliensis*. Specimens, images, plates and texts are linked to each other and made available on the web. Critical notes and determinations are added.

url: <http://projects.bebif.be/enbi/martius/>



## ***NeMys: a generic web based biological information system***

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The biological digital information system NeMys was developed at the Marine Biology Section of Ghent University (Belgium), mainly to create a system to store data on Marine Nematodes and Mysid shrimps. NeMys is an online, which enables biologists to link all kinds of biological data together. Next to the purely systematical data, the system allows to store also many types of other data:

- Taxon data: common names, synonyms, links to websites, links to data portals like GBIF can added to taxa very easy.
- Literature data: a fully digital library can be linked to taxa. The literature sources can be linked in a digital format to the references and if so, an automatic procedure based on full-text-indexing of the literature sources makes it possible to automatically link the literature to taxa. This method of linking is much more time-efficient and enables also linking taxa to e.g. non-taxonomical literature.
- Biogeographical data: based on literature sources, collection items, observations or research datasets it is possible to link stations in which taxa were found to these taxa. By means of a hierarchical geographical gazetteer it is possible to visualize interactively the distribution of taxa.
- Morphological data: morphological and morphometrical data can be entered for taxa based upon observations on collection specimens and literature sources. The data is stored through a character-states system and allows to be reused in an online identification system.
- Pictorial data: any kind of photograp, movies, scanned drawings can be linked to taxa in the media-module. Next to pictorial information the system allows also to link sound-files, or any other kind of digital documents.
- Molecular data: molecular data with links to the online genetic databases can easily be entered for taxa.

All these types of data are integrated in an online platform which can be accessed through <http://www.nemys.ugent.be>. The online platform offers identification tools, biogeographical visualization tools and fast data-retrieval systems. All data-entry can be done through online forms and in a real multi-user environment.

At this moment, several datasets are running on the system, which proves the real generic structure of the system. There is a dataset on the world Mysida fauna which holds all the types of listed datatypes for about 1200

species. Another marine dataset is the one about marine free-living nematodes. It is a growing dataset with data about 6000 species. Almost all species are documented with pictures, literature and a growing number also holds biogeographical data. A popular dataset is the one on European Herpetofauna. This dataset provides a well-documented (literature, biogeography, identification keys, ...) overview of the European reptiles and amphibians. Other datasets are in development. Nemys is linked to different data-portals like GBIF, OBIS, Eurobis and ERMS by means of a digir-provider.

### ***Albertine Rift zoodiversity : exploitation of the historical data in the Royal Museum for Central Africa, Tervuren***

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The paper, presented by the Head of the Department, will give an overview of present activities concerning this subject by the scientists of the Department of African Zoology of the RMCA.

Then follows a presentation of some of the ongoing data sharing processes:

- database of the collections, including those collected during the colonial period in the National Parks of the Belgian Congo.
- involvement in ENBI website showing some data of important groups.
- inclusion of relevant data in WCS-led inventory

Finally, the author will briefly present a case study "Importance of historical bird collections for in-situ conservation in the Albertine Rift", taken from the ornithological research group.

### ***The tropical collections of the University of Liège Zoological Museum: diversity, data and acces***

*Michèle Loneux*

Zoological Museum curator 1991-2003

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The University of Liege Zoological Museum is one of the oldest Belgian academic museums. Its collections comprise to date more than 21,700 items of invertebrates and vertebrates recorded since the nineties in a computerized database. But a lot of invertebrates are not registered individually, especially the insects. One third of the recorded animals come from tropical countries. Most of these specimens have been collected from 1820 to World War I. The South Asian, South American and Australian animals have been collected notably during the 19th century. One of the collectors was Francis de Laporte, Comte de Castelnau. Most of the specimens have been preserved up to now, and several are nowadays threatened or even extinct species. The African specimens have been collected from the fifties, along with the development of cooperation projects with some African countries.

The travel to Brazil by Ed. Van Beneden in 1872 and the marine expedition to the Australian Great Coral Reef in 1967 are two examples of special expeditions of the University to collect material in tropical areas. Since its public opening in 1962, the museum is organized to present a maximum of specimens, illustrating the biodiversity worldwide, but as numerous specimens are also preserved in depositories. Since the end of the World War II, the scientists in Liege see the collections almost as educational tool only, and don't use them any more as research material. Too few examples of collection utilisation for the last ten years try to refute this affirmation. The potential of the collection should be better known and used for scientific purpose. The diversity of the tropical specimens of the University of Liège Zoological Museum, the search facilities through the database, the systematic organized depositories make this collection worth to be visited by scientists interested in tropical biodiversity.

Museum web-site: <http://www.ulg.ac.be/museezoo>

### ***Biodiversity at the Ghent University Zoology Museum: potential and implementation***

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The Ghent University Zoology Museum has since its foundation in 1817 continuously invested in the expansion and management of its collection using a minimal budget. The collection comprises both a survey of the biodiversity of the animal kingdom, ranging from protozoans to large mammals, and a very important collection for comparative anatomy of vertebrates. The mission statement of the museum has since been

collecting, managing these two collections, and applying it for educational purposes, *i.e.* during lectures for academic students. The last decade, however, substantial efforts have been made to stimulate the access of the collection by the general public.

The last eight years, efforts have been going on to digitally archive the collection, which comprises an estimate of over 20,000 specimens. Till 2003, only a subset of this collection has been archived, due to limited staff and funding. By then 8,610 specimens were archived digitally, of which 3,771 invertebrates and 4,839 vertebrates. This information has since been made accessible worldwide through the web page of the museum ([www.zoologymuseum.ugent.be](http://www.zoologymuseum.ugent.be)), but recently, the access has been much improved thanks to the coordination of the data by the Global Biodiversity Information Facility (GBIF – [www.gbif.net](http://www.gbif.net)). Additionally, a recent funding by the Belgian partner (BeBIF), allowed us to increase the archived collection with 5,901 records only in about one month time. Four students could be paid to do a full time job in archiving 1,193 insects (mainly lepidopterans), 2,996 coleopterans, 666 birds and bird anatomy specimens, and 1,046 skulls and other anatomical specimens of mammals. This clearly demonstrates that an important biodiversity collection, such as the Ghent University Zoology Museum, substantially benefits and largely depends on external funding, in order to allow efficient archiving, and thus providing useful biodiversity data that can be accessed by taxonomists or other scientists.

### ***An assessment of animal species diversity in continental waters***

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There is a need for monitoring the status and trends of freshwater biodiversity in order to quantify the impacts of human actions on freshwater systems and to improve freshwater biodiversity conservation. Current projects carrying assessment of freshwater biodiversity focus mainly on leading- better-known groups such as fish, or identify keystone species and/or endemic freshwater systems for conservation purposes. Our purpose is to complete these existing projects by providing quantitative estimates of species numbers for all freshwater groups on each continent and/or major eco-regions. Here, we present results of the first implementation phase carried out from September 2002 to June 2003 and which addressed only freshwater animal species. The project consisted in: (1) compiling existing data from literature, web sites and museum



collections; (2) contacting scientific experts of each group to provide an estimate of species numbers ‘to the best of their knowledge’. In this study, we consider as “true freshwater species”, those that complete part or all their life cycle in freshwater, and “water dependant species” those that need freshwater for food or that permanently use freshwater habitats. The current order of magnitude for known freshwater animal species worldwide is 100,000, of which half are insects. Among other groups, there are some 20,000 vertebrate species; 10,000 crustacean species and 5,000 mollusc species that are either true freshwater or water dependant species. The study highlighted gaps in the basic knowledge of species richness at continental and global scales:

(1) Some groups such as Protozoa, nematodes or annelids have been less studied and data on their diversity and distribution is scarce. Because current richness estimates for these groups are greatly biased by knowledge availability, we can expect that real species numbers might be much higher.

(2) Continents are not equal in the face of scientific studies: South America and Asia are especially lacking global estimates of species richness for many groups, even for some usually well-known ones such as molluscs or insects.

We hope that this project will initiate interactive exchange of data to complete and update this first assessment.

### ***Conservation gap analysis in Africa using a compilation of plant distribution data***

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Which areas need most urgently conservation effort? How can we make a worldwide priority list of biodiversity hotspots the most threatened? How much detail do we need in plant distribution data, e.g. for Africa, to answer these questions reliably?

Conservation gap analysis is in fashion in America since a couple of decades. Using geographic information systems, the distribution of threatened species is crossed with the protected area network with the purpose of planning additional conservation effort in areas that need it most. Conservation gaps are detected: areas providing habitat for species underrepresented in the protected areas.

For a presentation at the 5<sup>th</sup> World Parks Congress (Durban, September 2003), we developed an alternative strategy for assessing the representativeness of the world’s protected area system (i.e. the extent to which this system includes samples of all elements of biodiversity).

Information on the distribution of biodiversity is often mapped at a very

coarse spatial resolution relative to the scale of most land use and management decisions. Furthermore such mapping tends to focus selectively on better-known elements of biodiversity (e.g. vertebrates). Our approach focuses on estimating spatial pattern in emergent properties of biodiversity (richness and compositional turnover) rather than distributions of individual species. We have developed a “global biodiversity model” linking these properties to mapped ecoregions and fine-scaled environmental surfaces.

The results are compared with the ‘count per square’ approach of the Worldmap group, like the analysis of all 6000 existing plant distribution maps for Africa by Bonn researchers. Hotspots, in the meaning of conservation priority areas, contain both lots of rare species as a lot of human pressure to convert natural habitats, as expressed by the ‘human footprint’.

We conclude that conservation gaps become more and more precisely known, thanks to better data compilation due to informatics, and smarter data processing using GIS-based continuous models. Now still public awareness, political will and local acceptance...

### ***Changes in phytoplankton and bacterial biodiversity linked to hydrodynamics in Lake Tanganyika***

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Biodiversity and productivity in Lake Tanganyika, known for its high endemism, are highly linked to hydrodynamic processes such as upwelling, internal waves and turbulence, whose impact is dependent on wind intensity (particularly the south-eastern monsoon) and air temperature. The disturbance of the water column is maximal during the windy and colder dry season from May to September, when upwelling is observed in the south.

We studied biodiversity of phytoplankton using inverted and fluorescence microscopy and prokaryotic biodiversity using 16s rDNA DGGE analysis at two stations, Kigoma in the north and Mpulungu in the south respectively and along a north-south transect. The highest values for biodiversity (Shannon index H) are observed in the planktonic algal community during the dry season. However, variations can be observed in



different parts of the lake. Differences in biodiversity and evenness are most distinct in the southernmost part of the lake, where upwelling events are most important. During the dry season, the southern basin is characterized by the dominance of picoplankton, the northern basin by larger phytoplankton. In the dry season of 2002 an increase in the prokaryotic diversity to the south of the lake was observed. This increase in diversity seems to be linked to the upwelling in the south and can be related to some genotypes occurring in the hypolimnion of the lake, which are also detected in the epilimnion in the south.

The presented results are part of the Climlake project (EV/02/2C) financed by the Belgian Science Policy which also financed a Research fellowship for MS.

### ***Designing automated identification systems for Prokaryotes***

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Fast and accurate identification of microorganisms is of large environmental, clinical and economical importance. Notwithstanding the enormous potential that faster and more sophisticated computing offers to the field of pattern recognition has been exploited in many fields, its application for the identification of bacterial species remains in a comparatively early stage and the technical challenges remain considerable. However, the huge progress that has been made by a few largely exploratory projects is impressive. It suggests that the bounds on just what machine learning is possible to achieve remain to be established. Cultural and organisational issues and availability of adequate and appropriate resources have undoubtedly severely constrained progress so far. However, given the magnitude of the possible prize – a generic automated species identification system that could open up vistas of new opportunities for pure and applied work in microbiology and related fields – it would seem foolish not to find ways of overcoming these obstacles in the near future. The strength of automated bacterial species identification is strongly dependent on several issues, including accuracy of the prokaryotic taxonomy, reproducibility and resolution of the taxonomic markers, information content of the polyphasic databases and predictiveness, flexibility and performance of the identification algorithms. Consequently, the development of the tools for automated species identification undoubtedly requires access to sets of skills that are not typically encountered among systematists or within the departments and institutions in which the bulk of formal taxonomic identifications are

conducted. Developing such approaches requires novel collaborations between microbiologists, engineers, mathematicians, computer scientists and personnel who have significant knowledge of both applied biology and computing science. The present climate of encouragement for interdisciplinary research could do much to fulfil these needs.

One can easily envisage a global information system, which in a structured and uniform way captures the reams of experimental data that are generated in the field of microbiology. Such a knowledge management structuralisation would dramatically simplify the application of intelligent and well-founded data mining techniques, as tools for the discovery of objective and universal taxonomic consensus models in a more dynamic and a more automated manner. In addition, these automated reasoning systems could adapt in a flexible way to the advent of new incoming data and interact with the outside world whenever some of the necessary pieces for completion of the taxonomic puzzle are missing or unclear. As well as new insights and hypotheses on microbial life and its evolution could be easily tested against this vast knowledge base, and possibly have an instant impact on standing taxonomic models. Achieving the goals of such a self-learning reasoning system designed for landscaping the bacterial diversity – used as a figure of speech for taxonomic modeling in an objective, automated and dynamic fashion – yet means that several major technical and organisational hurdles will need to be overcome. This includes advancing the barriers of global data sharing, identify and come up with ways to fill the gaps of observational efforts, and explore the possibilities of novel data mining techniques to the benefits of understanding bacterial life. Fashioning complex conceptual constructs is one thing, but bringing them into practice is yet another issue. Therefore, it is of utmost importance to start building prototypes for landscaping the microbial world, i.e. the development of automated, dynamic and interactive information systems for knowledge accumulation and exploitation.

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## ***Biodiversity of neglected and underutilized crops from Côte d'Ivoire: the case of Cucurbits consumed as sauce thickener***

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A survey of the biodiversity of cucurbit species consumed as sauce thickener in Côte d'Ivoire was carried out in the framework of a collaborative research project involving the Agronomic University of Gembloux (FUSAGx, Belgium) and the University of Abobo-Adjamé (UAA, Côte d'Ivoire). Investigations were made throughout three zones (South, East, and Centre), based on agroecology and food habits and covering 5 administrative departments. In each zone, a participatory rural appraisal-based method was used to gather local community knowledge of traditionally cultivated cucurbit species, namely their vernacular names, diversity, their relative cultural and social importance and uses.

A total of six cucurbit species consumed in sauce were found: *Citrullus lanatus*, *Citrullus* sp., *Cucumeropsis mannii*, *Cucumis melo* var *agrestis*, *Cucurbita* sp, and *Lagenaria siceraria*. Five species were recorded in South and East zones whereas three species were observed in North-Centre. Among the selected sites, the most common species were *C. lanatus* and *C. mannii*. Intraspecies diversity based on fruit and seed shape and/or size was noted for all the species except *Citrullus* sp.

Traditional cucurbit species consumed in sauce in Côte d'Ivoire are mostly grown as minor crop in association with major food or perennial commercial crop such as acajou except in the Centre where *C. lanatus* is sometimes cultivated as major crop. Across all zones, the traditional cucurbits constitute an important source of income for rural women who are the main producers.

Data obtained from these investigations showed that the studied species have good market potential so that their promotion can contribute to the economic well-being of rural people, since these species are widely accepted at both cities and villages levels, due to their cultural and culinary values.

## ***Cryptic ecological degradation in Sri Lankan lagoons: loss of species, loss of function, loss of human lives***

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The increasing anthropogenic pressure on natural environments results in impacts that affect tropical forest areas and their biodiversity. Adverse impacts on terrestrial and oceanic environments often compound in the intertidal area, where mangrove forest ecosystems thrive. In tropical coastal areas of many developing countries, where people depend on wood and other mangrove forest products and services, forest degradation leads to socio-economic problems. At the same time, increasing freshwater needs in these areas are expected to cause additional problems. Based on remote sensing and ground truthing, complemented by colonial archival material from the Dutch East-India Company (1602-1800), we report that changes to the historic system of inland freshwater management have increased dramatically in recent times. Hydrological changes, such as inter-basin transfers, have resulted in a qualitative ecological and socio-economic degradation in three coastal lagoons in southern Sri Lanka. Variations in river hydrology have caused changes in the areas suitable as mangrove habitat, and thus resulted in an altered distribution. However, increases in mangrove area can mask the degradation of the site in terms of floristic composition, significance of the species and biodiversity. It is important that such changes be carefully monitored to ensure biological and socio-economic sustainability.

## **Banana (*Musa spp.*) genetic resources managed in the IPGRI/INIBAP gene bank: conservation and documentation status**

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The international banana germplasm collection is managed by the IPGRI/INIBAP Transit Centre in Belgium since 1985. This unique collection, placed under the auspices of FAO in 1994, consists of approximately 1200 accessions of wild, cultivated and improved bananas, introduced from 44 countries in the world. Samples of these accessions are permanently maintained *in vitro* as proliferating shoot cultures under slow growth conditions at low temperature (16°C) and reduced light intensity (25µmol/m<sup>2</sup>/s). Incoming germplasm undergoes a standardized indexing process for five virus diseases in collaboration with 3 indexing centres (Australia, France and South Africa) and pathogen-free accessions are made freely available for international distribution. Throughout the last five years, over 25,000 samples of germplasm have been delivered worldwide to hundreds of institutes and individuals involved in development projects with farmers, for various research activities or to underpin specific gene bank activities such as cytological studies and virus eradication research. Currently, also a long-term base collection is being established, using a cryopreservation protocol developed at the Laboratory of Tropical Crop Improvement, KULeuven, Belgium. At present, nearly one quarter of the entire collection is safely stored in liquid nitrogen (-196°C).

Evidently, the effective management and use of this unique collection strongly depends on its documentation status. To facilitate data maintenance and processing relevant for the day-to-day activities of the gene bank, a tailored-made information system using bar-codes has been put in place recently. All passport data, and available characterization and evaluation data are documented in the INIBAP's *Musa* Germplasm Information System (MGIS). This decentralized system contains standardized information on banana varieties managed in 16 banana gene banks around the world and is readily accessible for potential users (<http://mgis.grinfo.net>). The data of the INIBAP Transit Centre, which are part of the MGIS database, are also available through SINGER (System-Wide Information Network on Genetic Resources), an on-line database containing information on genetic resources held by the CGIAR Centres (<http://singer.cgiar.org>).

## ***The Neotropics: the experimental lab of nature***

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At present, it is widely assumed that most vertebrate species have been described and therefore newly discovered species easily reach news headlines. In contrast, invertebrates which represent at least 75% of all existing zoobiota remain strongly undersampled and largely unexplored. And within invertebrates, in contrast to butterflies, moths and beetles, flies (Diptera) belong to the less favoured taxa. This holds true for the Neotropics in particular.

With over 6,500 species thus far described, long-legged flies (Diptera: Dolichopodidae) are among to the most species rich families within the order. The observation that tropical regions house the highest biodiversity, however, is not reflected in the catalogs available at present. Indeed, the Neotropical catalog even lists less species than are reported from e.g. the Palaeartic and Nearctic realms. Moreover, Sciapodinae represent the dominant subfamily in the former catalog, whereas Diaphorinae comprise by far the highest number of species and specimens in Malaise trap samples.

Achalcinae show a worldwide distribution with a distinct diversity hotspot in the Neotropics. It is only lacking in the Afrotropical realm. The genera *Achalcus* and *Australachalcus* are known from both the Palaeartic, the Nearctic and the Neotropical realm and New Zealand, whereas *Xanthina* is exclusively Neotropical. Since 1996, Pollet (1996; 2005) and Pollet & Cumming (1998) described no less than 26 new species from the Palaeartic region and the New World. In recent years, a thorough search for Neotropical Achalcinae mainly in Costa Rican and Colombian samples revealed an unprecedented species richness with about 20 new *Achalcus* and *Australachalcus* species, more than 25 new *Xanthina* species and a new genus with over 45 new species. Moreover, male specimens in the latter genus feature a combination of Male Secondary Sexual Characters (MSSC) that is unique in the family and most probably plays a role in courtship. The observed variation in the latter characters resembles an field experiment of nature itself at large.

## ***IBISCA: a large-scale study of arthropod mega-diversity in a neotropical rainforest.***

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The IBISCA (Investigating the Biodiversity of Soil and Canopy Arthropods) project aims to study the relationships between beta-diversity and the vertical stratification of arthropods in a neotropical rainforest. To this end, the entomofauna of nine sites (400 m<sup>2</sup>), all less than 2km apart, was studied from the ground to the upper canopy in the San Lorenzo Protected Area, Panama. In order to conduct investigations in the canopy, IBISCA participants used " fogging ", single-rope techniques and a variety of devices including the Fort Sherman Canopy Crane, the Canopy Raft, the Canopy Bubble and IKOS. These techniques and devices complement each other well and IBISCA represents the first attempt to combine them in a large-scale investigation. They provided spatial replication during a six-week field study that took place in September-October 2003 (rainy season). Seasonal replications were conducted three times at the three different crane sites : one complete replication (all the sampling protocols were used) in May 2004 (beginning of the rainy season) and two partial replications (only a few sampling protocols involved) in February 2004 (dry season) and October/ November 2004 (rainy season). To collect arthropods, 14 different protocols were used involving sampling techniques such as fogging, branch beating, various kinds of traps including pitfalls, small and large flight intercepting traps, sticky traps, light traps, bait traps, Berlese-Tullgren (for microarthropods in suspended soils and on the ground), Winkler sifter (litter) and hand-collecting (ants and termites). The sampling protocols used by IBISCA at the different canopy/ground sites permitted, for the first time, a large-scale study of the interactions between horizontal and vertical faunal turnover to be undertaken. The analysis of a careful selection of focal taxa from different phylogenies and ecological niches (more than 50 focal taxa studied in all) will provide valuable information on faunal distributions.

The interpretation of the results (in terms of vertical stratification and beta-diversity of the different focal taxa), which is only beginning, will benefit from the information provided by several sub-studies aimed at characterising the sites surveyed (e.g., type of vegetation, canopy thickness, incidence of light, apparent leaf damage, etc.).

Information about the arthropods collected during IBISCA have been entered into a shared database which is accessible (Internet) to all participants, including the taxonomists involved in the identification (at

least to the morphospecies level) of the different taxa. IBISCA, which is an initiative of the Canopy Raft Consortium (CRC-France) and the Smithsonian Tropical Research Institute (STRI-Panama, USA), and whose patron is Pr. E.O. Wilson, may be considered as a model for ongoing large-scale investigation programs.

### ***Arthropod biodiversity in tropical rainforest canopies: Panamanian termites in the framework of the IBISCA project***

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Termites are important decomposers in warmer ecosystems, where they play a major role in the carbon cycle and contribute to the emission of greenhouse gases. Up to now, many studies have evaluated their specific diversity or their abundance at ground level in tropical forests, but evidence for their presence in the upper strata has remained anecdotal. In October 2003 and May 2004, we conducted systematic sampling campaigns to evaluate the diversity of the termite fauna at all levels of the forest in the San Lorenzo Protected Area (Panama). Dead wood or termite-built covered runways were examined on a total of 125 trees along two transects, whereas quadrates provided samples of the ground fauna for comparative purposes. Canopy collections (here defined as higher than 10 m above ground) yielded 63 occurrences (colony samples) representing 10 termite species, whereas 29 species were recorded in 243 occurrences from the ground. Five species were recorded in both habitats. Species accumulation curves revealed that the inventory of canopy species was near completion, whereas ground species were still accumulating in a logarithmic pattern. Remarkable components of the canopy fauna include several drywood species (Kalotermitidae), forming small colonies within dead branches or stumps. By contrast, soil feeders were exclusively found in ground samples, where they were abundant (19 species, 110 occurrences). Wood feeders displayed similar species richness at both levels, although most species showed a clear preference for either ground or canopy. Our study therefore demonstrates that the canopy fauna contributes significantly to the diversity of the termite assemblage, especially when the wood-feeding guild is considered separately.



## Posters

### ***A worldwide virtual herbarium of Myxomycetes***

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Myxomycetes or plasmodial slime molds are eukaryotic, phagotrophic bacterivores usually present and often abundant in terrestrial ecosystems. The life cycle involves two very different trophic stages, one consisting of uninucleate amoebae, with or without flagella, and the other consisting of a distinctive multinucleate structure, the plasmodium (Martin et al. 1983). Under favorable conditions, the plasmodium gives rise to one or more fruiting bodies containing spores. The fructifications are mostly 0.5-5mm in size and can be kept as dried herbarium specimens.

The study of myxomycetes at the National Botanic Garden of Belgium started in the mid 1970s with the work of J. Rammeloo. He accumulated an important herbarium and his research resulted in many publications and floras e.g. 'Icones Mycologicae' (mainly European) and 'Flore illustrée des Champignons d'Afrique Centrale'. In May 1996 the herbarium of Mrs N.E. Nannenga-Bremekamp, one of the most important myxomycetes specialists of the world, was transferred by legacy to the National Botanic Garden of Belgium. The herbarium currently contains 17,399 descriptions of specimens from all over the world, 14,296 exsiccata, about 6,500 drawings and 11,575 microscopic slides. Because of the great scientific value of this collection, comprising about 15% of all type specimens, the Garden took on the task to continue Mrs N.E. Nannenga-Bremekamp's work and made the information available on the web at:

[www.br.fgov.be/RESEARCH/COLLECTIONS/HERBARIUMS/FUNGI/MYXO/NANNENGA/DB/index.html](http://www.br.fgov.be/RESEARCH/COLLECTIONS/HERBARIUMS/FUNGI/MYXO/NANNENGA/DB/index.html)

In 2004 a project funded by the Global Biodiversity Information Facility (GBIF) was started between 5 institutions (Belgium, Herbarium BR; Germany, Herbarium M; Russia, Herbarium LE, Spain, Herbarium MA & USA, Herbarium UARK). The project will link and extend the ongoing initiatives to database myxomycete collections in these institutions. Our aim is to speed up ongoing specimen digitalisation and to create a global virtual herbarium using these databases via the GBIF network with an estimated total of 90,000 specimens, containing almost one third of all types. Since myxomycete specimens are difficult to gather, and many species are therefore seemingly rare, a joint virtual herbarium would enable taxonomists to access sufficiently large series of specimens.

## ***Freshwater diatoms from Guadeloupe (French Antilles) : cosmopolitanism versus endemism***

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Diatoms are a group of microscopic algae (Class Bacillariophyceae) abundant in almost all aquatic habitats. They are used more and more extensively as efficient biological indicators of organic pollution, eutrophication or acidification in continental waters. They are also used as stratification indicators in studies on paleoenvironments. Diatom taxonomy is subject to intensive reorganisations and there is an increasing need for updated checklists and identification textbooks in order to perform bioindication in a proper way. Within the scope of biological water quality management in Guadeloupe (French Antilles), the benthic, epilithic diatom flora of 15 watercourses was studied biannually during a three-year period. In 148 samples, a total of 250 taxa (very few in comparison to higher latitude regions) have been found. 30% of these taxa are to be considered as tropical taxa, including 3% certainly new for science. Cosmopolitans made up the biggest part of the inventory. This study and other investigations on diatoms in tropical regions showed that especially such taxa highly tolerant to pollution conquer any freshwater ecosystem when appropriate environmental conditions can be found and "native" taxa are displaced. Tropical, cosmopolitan and new taxa will be briefly presented with discussion on their occurrence. The layout of an iconography of the epilithic diatoms of Guadeloupe will also be presented.

## ***Diatom diversity of thermal springs in Burundi (Central Africa)***

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The diatom communities of 13 thermal springs in Burundi (Central Africa), situated between 773 and 2550 m above sea level, were investigated. Their temperatures vary between 29 °C and 57.5 °C and they belong mostly to the bicarbonate water type while others are rich in chlorides. The highly mineralized thermal springs are located at relatively low altitudes (773-1000 m asl) in contrast to the weakly mineralized springs which are present at medium to high altitudes (1795-2550 m asl).



Eighty diatom taxa, belonging to 26 genera, were observed of which 25 were only observed in 1 site and with a relative abundance of less than 1 %. The major part of the species recorded from the hot springs are not different from those observed in other water bodies of Burundi and are thermo-tolerant taxa. The highly mineralized springs are characterized by a diatom community composed of: *Achnanthes exigua*, *Anomoeoneis sphaerophora*, *A. sphaerophora* f. *sculpta*, *Craticula cuspidata*, cf. *Navicula margaritacea* and *Placoneis eliginensis*. The weakly mineralized springs are characterized by *Diadismis confervacea*, *Eunotia exigua*, *Frustulia rhomboides*, *Gomphonema parvulum* f. *lagenula*, *Navicula cryptocephala*, *N. seminulum* and *Nitzschia latens*. A comparison is made with the diatom composition of some other thermal springs from Africa (e.g. Congo, Kenya, Namibia, South Africa).

### **Taxonomic diversity and distinctiveness of the chironomid fauna (Insecta: Diptera) inhabiting high-elevation lakes on Mount Kenya and the Ruwenzori, East Africa**

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As a result of global warming, ice caps and glaciers in the mountain regions of tropical Africa are expected to disappear within two decades (Thompson et al., 2002). Clearly, loss of permanent ice from the tops of the highest mountains will have profound effects on the hydrology and temperature regime of lakes located downstream from those glaciers. Adding to the direct effect of a rise in air temperature, this may have a severe impact on lake biology. Consequently, there is an urgent need to characterize the aquatic fauna and flora of these (still relatively) undamaged mountain lakes, compare them with lowland lake communities, and evaluate possible future changes in biodiversity. In this context, we analysed sub-fossil remains of larval chironomids (Insecta: Diptera) from 11 mountain lakes located between 2900 and 4575 m elevation on Mount Kenya (Kenya) and in the Ruwenzori Mountains (Uganda – DR Congo) to investigate the taxonomic diversity and distinctiveness of the chironomid fauna in East African high-elevation lakes. Surface-sediment samples from 8 lakes on Mount Kenya and 5 lakes from Ruwenzori yielded 19 morphospecies or higher taxa including 1 Diamesinae, 3 Tanypodinae, 6 Orthocladiinae, and 9 Chironominae (6 Chironomini; 3 Tanytarsini), all of which have been described based on preserved diagnostic features. Comparison with a similar analysis conducted in 68 East African lakes at low and middle elevations, and with literature and checklists of chironomid species distribution indicates that eight taxa (mainly Orthocladiinae and Tanytarsini) seem restricted to the

specific habitat of cold lakes above 3900 m elevation (Alpine and Nival zone), which are subject to night-time freezing. Unlike the high proportion of endemic species and genera among Afro-alpine terrestrial plants, we do not expect a high level of endemism in the Afro-alpine chironomid fauna. Snowline depression during Quaternary ice ages must have significantly facilitated dispersion of cold-stenothermous species between Africa's highest mountain ranges, and from or to the Palaearctic region via the Ethiopian highlands. Documentation in this study of the distinct character of Africa's true cold-water lakes is a first step towards chironomid-based reconstruction of past temperature-change in Africa, and so helps to improve understanding of tropical climate dynamics.

*Reference:*

Thompson, L.G., Mosley-Thompson, E., Davis, M.E., Henderson, K.A., Brecher, H.H., Zagorodnov, V.S., Mashiotta, T.S., Lin, P.N., Mikhalenko, V.N., Hardy, D.R. & Beer, J. (2002) Kilimanjaro ice-records: evidence of Holocene climate change in tropical Africa. *Science*, 298, 589-593.

***Taxonomic diversity and biogeography of Chironomidae (Insecta: Diptera) in lakes of tropical West Africa, using sub-fossil remains extracted from surface sediments***

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We conducted a survey of sub-fossil chironomid remains (Insecta: Diptera) preserved in surficial sediments of 12 lakes in tropical West Africa and the central Sahara to assess whether their chironomid faunas are biogeographically and ecologically sufficiently compatible with those of East African lakes to allow treating them as derived from a single continent-wide species pool, and to justify merging regional paleoenvironmental data sets into a pan-African data set. Surface-sediment samples from eight crater lakes in Cameroon, three lowland forest lakes in Gabon, and one hypersaline lake in northern Chad yielded 84 morphotypes, including 17 Tanypodinae, 14 Orthocladiinae, and 53 Chironominae (43 Chironomini and 10 Tanytarsini). We analysed 1525 specimens and identified 94.9% of these to species, species group, genus or tribe level depending on the taxonomic resolution of preserved diagnostic features. As represented in our sub-fossil collections, the West African chironomid fauna shares at least 59 taxa (or 70.2 % of faunal diversity) with the East African fauna, and literature study also indicates that the majority of West African chironomid species are shared by the drier regions of North, East and southern Africa. Freshwater lakes in tropical West Africa display a greater average taxon richness and diversity than



freshwater lakes in East Africa, partly because Plio-Pleistocene climate variation in West Africa was more favourable to species survival and accumulation (promoting beta-diversity), and partly because current climatic and hydrological conditions in the region permit narrow niche differentiation and hence a more complex community structure (promoting alpha-diversity). Freshwater lakes in East Africa, especially those located in the semi-arid Eastern Rift valleys of Kenya and Ethiopia, experience fluctuating hydrological regimes which select for species able to tolerate a wide range of environmental conditions. Considerable species overlap between the larval chironomid faunas of West and East African study lakes suggests that paleoenvironmental calibration data sets from these two regions can be merged.

### ***Monographs of selected groups of tropical vascular plants at the National Botanic Garden of Belgium***

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Monographs aim at revising all available information on and material from a certain taxonomic group, and thus are essential for providing reliable biodiversity data. The Department Vascular Plants of the National Botanic Garden of Belgium focuses its monographic attention on two highly evolved and successful angiosperm families, Acanthaceae (ca. 4,500 species in ca. 450 genera) and Rubiaceae (ca. 12,000 species in ca. 650 genera), both predominantly woody and (sub)tropical. A survey of the work undertaken is given.

### ***Macromycetes and ethnomycology in Bénin (West Africa)***

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The National Botanic Garden of Belgium has a long-standing experience in the study of African Macromycetes. Since decades emphasis was mainly put on the study of fungi from Central Africa, in 1997 a start was made with the fungi from the Republic of Benin (West Africa). During the rainy seasons of five consecutive years, collecting trips were organised in order to obtain material and data for taxonomical and ethnomycological studies. The ethnomycological results of this research project were synthesized in “Guide des champignons comestibles du Bénin”.

The main objective of this book is to reach the larger public in Bénin and abroad, i.e. students, teachers, schools, botanical gardens, scientific institutions and people involved in the valorisation and sustainable use of NTFP, including wild mushrooms. The first part deals with all aspects concerning morphology, ecology and distribution of fungi in general, and Benin in particular. Aspects on poisoning, cultivation, recording local knowledge, ethnomycology and methods for assessing natural productions and valuation of wild edible fungi are largely treated, taking into account the conditions in Benin and Western Africa. The second part presents over 70 colour photographs and drawings, morphological descriptions, local names and detailed information on distributions and edibility of more than fifty wild and commonly used species in Benin. A glossary and an extensive bibliography is given.

Everyone interested in collecting or studying West-African fungi will find this book a useful reference. Non-Governmental Organisation and anyone dealing with the sustainable use and management of natural resources in tropical Africa, will find a multitude of techniques and tools for a better management and conservation of natural ecosystems. Those involved in education will find a textbook on mycology, as well as examples illustrating what sustainable use of NTFP means, and how scientists, authorities and local people can collaborate in this.

### ***African Plants Initiative: Databasing and imaging of African types and colour plates***

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The aim of the African Plants Initiative (API) is to construct a comprehensive database of high-resolution images of the African plant and fungal kingdoms from the botanic gardens of the world. Support has been provided through a non-profit organisation associated with the Andrew W. Mellon Foundation. Its mission is to build and support an online database of resources from around the world with content important to the local and international scholarly community. The first regional focus is Africa and within this framework the API was born.

The National Botanic Garden of Belgium (NBGB) has two API projects currently underway; the digitisation of all vascular-plant type specimens held at the Garden along with the digitisation of watercolour paintings and slides of macromycetes (Fungi).

The herbarium at the NBGB holds ca. 22 000 nomenclatural type specimens in its tropical African collection of vascular plants. Of these 60% are derived from Central Africa (Democratic Republic of Congo, Rwanda and Burundi). These particular specimens are of great importance since they represent the only remaining collection from this region for more than a century. The majority of duplicate specimens



hosted in these countries have been destroyed as a consequence of political instability and civil war. Therefore the digitisation of this collection is of utmost importance for the API and the international community. The second project is currently digitising images of African fungi. This includes 1000 watercolour paintings by Mrs Goossens-Fontana and 800 slides from Prof. J. Rammeloo. Digitising will provide an invaluable resource in the countries of origin where information is currently scarce and mushroom variability high.

### ***Vertical and horizontal differences in prokaryotic diversity in Lake Tanganyika***

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The prokaryotic community of Lake Tanganyika was studied during the dry season of 2002 by means of DGGE analysis of PCR amplified 16sRNA fragments and sequencing of dominant bands. These bands were identified as members of the Cyanobacteria, Actinobacteria, Nitrospirae, green nonsulfur bacteria and Firmicutes division and the Gamma- and Delta-Proteobacteria subdivision. While Actinobacteria and Cyanobacteria are part of the typical freshwater bacterial clusters, Gamma-Proteobacteria are generally less common members of bacterial communities in pelagic freshwater environments. The distribution patterns of dominant genotypes showed strong horizontal and vertical differences in bacterial community composition. Vertical variation in bacterial community composition could mainly be related to oxygen concentrations, with some genotypes being restricted to the anoxic hypolimnion. Horizontal variation in bacterial community composition was primarily related to upwelling and increased primary production in the Southern part of the lake. Upwelling may influence bacterial community composition in the epilimnion through increased nutrient levels, increased supply of organic matter by phytoplankton as well as advection of deep-water bacteria. A significant positive relation was found between epilimnetic bacterial production and prokaryotic diversity, with a higher diversity in the south of the lake.

De Wever received support from the Institute for the Promotion of Innovation through Science and Technology in Flanders (IWT-Vlaanderen). The presented results were obtained in collaboration with the Climlake project (EV/02/2C) financed by the Belgian Science Policy.

## **Online identification through NeMys**

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Identification of specimens is a task that every biologist is confronted with. The process of identification in many cases delivers many problems due to unavailability of keys, difficult specialised keys or old keys. Within NeMys (<http://intramar.ugent.be/nemys>) recently a new identification module has been added. Based upon morphological data derived from published literature, polytomous digital identification keys are made. This kind of keys has the advantage that users are not forced to follow a predefined pathway (as in dichotomous keys), users can choose their best suitable characteristics to work with and the keys can be easily updated with new insights through a fully online key-generation system. By using internet technologies, the identification keys are at any time anywhere available for use. As the data used in the keys is derived from the database system NeMys, it is also possible to check the identification process at any level, with literature sources, images, distribution patterns, on the website of NeMys. This kind of technology opens new possibilities for biologists to share their taxonomic knowledge with a broader audience without being forced to go through the difficult process of creating dichotomous paper-based keys.

## **Collecting and evaluation diversity in Bambara groundnut landraces from Côte d'Ivoire**

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Bambara groundnut (*Vigna subterranea* L. Verdc.), a neglected and under-utilised crop is an indigenous grain legume with high protein contents and has several agronomic advantages such as drought tolerance and ability to produce acceptable yield under poor soils that are unfavourable for the cultivation of other important legume crops. In Côte d'Ivoire, the cultivation of Bambara groundnut is located in the western and northern parts of the country. These zones are characterised by contrasted agroecology including tropical rain forest and dried savanna. This crop is mainly grown by female peasants and it represents an important source of income for subsistence in these regions.



Unfortunately, no program concerning their conservation and characterisation are made in Côte d'Ivoire. In order to avoid the total depletion of this important genetic resource, we have prospected different region where Bambara groundnut is cultivated in Côte d'Ivoire and collected 40 accessions. It's appears from our investigations that farmer's knowledge, local traditional practice and landraces preference differ between regions. These accessions showed a great diversity basis on morphological characters. The testa is greatly variable among landraces, with unique or varied color. The growth status (spreading or bunchy type) appears clearly different in fields and is closely related with local population. Merely, landraces have names based on these two characters that appeared very discriminative according to peasants. In experimental fields we observed a correlation between duration of reproductive cycle, life cycle and growth habit. Landraces with a short life cycle (90 days) are bunchy type and shown a short reproductive cycle. In contrast, landraces with long life cycle (160 to 200 days) are spreading type and have long reproductive period.

### ***Phytosociology of Lake Baringo (Rift Valley, Kenya)***

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The aquatic macrophytes were spatially described through 296 stations along the shoreline of Lake Baringo and of its main island Kokwa. The most commonly species were *Nymphaea lotus* L., *N. nouchali* Burm. f. var. *caerulea* (Savigny) Verdc. for typical hydrophytes, *Salvinia molesta* Mitch. for free-floating species, *Cyperus articulatus* L. and various Poaceae for helophytes. Environmental factors affecting their distribution were statistically analysed and correlated: 72 stations measure sediment characteristics as 86 stations present depth, Secchi transparency, pH and conductivity measures. Results demonstrated a correlation between species and some environmental parameters.

## ***The Léon Candèze's Collection: Lepidoptera from the World***

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The entomologist Léon Candèze (1863-1926) studied the Lepidoptera from the world, and particularly the Heterocera. He died before to publish himself his findings about Heterocera from Indochina, French colony in his time. But the manuscript he prepared was published in 1927 in French in the journal "Lepidoptera". That catalogue covers only the material collected before 1914 in Cambodia, Laos, Tonkin, Cochinchine and Annam (these actually Vietnam), meaning only a part of his collection. This entered the University of Liège collections after his death, while the entomologist Fritz Carpentier (1890-1978) was the curator of the Zoological Museum. The Candèze's collection comprises more than 9,500 specimens and includes several types. The majority of the specimens belong to the Heterocera (exactly 7943 specimens, 2542 species, 768 Genus, 44 Families), only 1639 specimens (599 species, 186 Genus, 16 Families) are Rhopalocera. Among the total specimens, more than 80% come from tropical areas, mostly Asia. The collection is well preserved till the present time and constitutes a reference collection of the Lepidoptera from those tropical countries. As such, its contents should be widely diffused among the scientific community concerned by these geographical areas.

## ***The tropical birds preserved at the University of Liege Zoological Museum***

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According to the list of the "Threatened bird of the world", most of the threatened bird species live in tropical areas, notably South America and South East Asia. The Zoological Museum holds a lot of birds from these tropical areas, collected and purchased during the 19th Century. This contribution is an inventory of the tropical bird species preserved in collections and lists the specimens who belong to the threatened or extinct species.

Museum web-site: <http://www.ulg.ac.be/museezoo>



## ***The Castelnau's fish collection and its watercolour travel notebooks***

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It is strange to find watercolour notebooks among the specimen collections of the zoological museum. This small art treasure belongs to the museum for 140 years. In 1865, to improve the zoological collection, Jean-Theodore Lacordaire, professor of natural sciences, purchased a thousand of specimens collected by François Louis Nompur de Caumont de Laporte known as Comte de Castelnau. French naturalist born in London in 1812, Castelnau travelled around the world being either explorer or diplomat. His most famous trip was to cross South America from Mato Grosso to Peru, coming back by the Amazon. He finished his life as general consul in Australia, and died in Melbourne in 1880. The specimens purchased were birds and fish, but four Castelnau's travel watercolour notebooks accompany the mounted fish. They illustrate fish and very few other animals from various origin and expeditions: the Bahia's Bay (from 1848 to 1854), the Cap of Good Hope (1856), the southern Africa (1857), as well as Siam, Singapore and Sea of China. These documents are of great richness, not only by the scientific rigor Castelnau proceed his surveys and drawings, but also by the art quality of his watercolour paintings, combining colours and realism. These watercolours have been used to restore the colours of some of the mounted fish. Their content should be diffused.

Museum web-site: <http://www.ulg.ac.be/museezoo>

## ***Tropical insects in collection at the University of Liege Zoological Museum: a first approach***

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The big insect collection of the Zoological Museum is not well known. Each specimen is not yet individually recorded in the database, and very few entomologists come to visit the collections in Liege. At least three major sources provided insects from tropical areas for the collections: the expedition of Edouard Van Beneden in Brazil, in company of two entomologists, the Leon Candèze's collection of Lepidoptera from the world

and the investment of the University for cooperation in some African countries. This contribution is a first approach for an inventory of the tropical insects preserved to day in collection, and an invitation for entomologist researchers to come and study them.

Museum web-site: <http://www.ulg.ac.be/museezoo>

## ***The Belgian Focal Point to the Global Taxonomy Initiative***

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In 1992, the United Nations Convention on Biological Diversity (CBD) was adopted. Conservation of biodiversity, sustainable use of its components and fair and equitable sharing of the benefits arising from the use of genetic resources, the three goals of the CBD, became prime points on the political agenda of contracting parties. It was quickly realized that effective implementation of these objectives was going to be largely dependent on the capacity to inventor and monitor biodiversity.

Taxonomic research, modern collection management and liberation of taxonomic data were realized to be important keys to achieve this. The Global Taxonomy Initiative (GTI), one of the cross-cutting issues of the CBD, is the operational vehicle that strives to install a satisfying amount of taxonomic capacity worldwide.

The Royal Belgian Institute of Natural Sciences (RBINS), as GTI National Focal Point (GTI NFP), contributes to Belgium's GTI engagements by being: (i) an information centre, (ii) a facilitation centre, (iii) a partnering centre, and (iv) a tutoring centre. Even though the RBINS is the largest of Belgium's high quality taxonomic research institutes, it can only come to terms with its obligations through synergistic cooperation with the other national taxonomic research institutes: i.e. the Royal Museum for Central Africa in Tervuren and the National Botanic Garden in Meise, as well as with various other national and international partners.

This contribution sketches the modus operandi of the GTI NFP contributing to taxonomic capacity building in developing countries, together with a synopsis of first results. Lessons learned so far are pointed out.



## ***Taxonomy in a Brave New World***

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Through the theory and practice of classifying, taxonomy searches for natural nested clusters of organisms. Detection, description, naming, classification and understanding of biodiversity are achieved through integrating a huge variety of hitherto scattered biodiversity data.

Since biodiversity has distinct, and strongly intertwined dimensions (ecological, organismal and genetic), a taxonomist is deemed to grasp, digest, correlate and synthesize the amalgam of data that the plethora of biological sub-disciplines offers. This assembling of knowledge underpins robust hypotheses on the structure and evolution of biodiversity.

The intellectual challenge of taxonomic research is obvious if one realizes that the different biological perspectives offered to the taxonomist are largely embedded in highly specialised methodologies and theoretical frameworks. This makes the *modus operandi* of the professional taxonomist a black box which is, at least partially, inaccessible to the fellow-biologist whom often is only confronted with end-products of taxonomic research, such as: revisions, identification guides and keys. However, these are nothing but tools that allow pragmatic storage and retrieval of information.

Database managers have the important task to make biodiversity information more accessible. They work in close cooperation with the staff of many natural history institutions that are nowadays increasingly digitising their collections. However, and unfortunately, not everybody involved in the process fully understands the intricacies of the taxonomic research, which delivers the taxonomic data (records and scientific names classified in the hierarchical system) that feed their databases.

This contribution attempts to unveil the most striking components of the black box in which the contemporary taxonomist operates. In addition, some of the constraints encountered by taxonomists are identified. Ultimately, it will aid the database manager and other interested biodiversity stakeholders to get a better grasp of the complexity of taxonomic science.

## **Sea Cucumbers (*Echinodermata: Holothuroidea*) of the Comoros Archipelago**

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Sea cucumbers have been harvested for centuries in consuming countries as China, Malaysia and Japan. Over-exploitation, due to an increasing market demand has led to local depletion of certain standing stocks. De novo investigation at Grande Comore (one of the four islands of the Comoros Archipelago) allows re-appraisal of local, shallow-water holothuroid biodiversity. Comparison with neighbouring areas permits extrapolation of species richness to the complete Archipelago. The current exploitation of Holothuroidea is documented and signs of blind over-exploitation are conclusively given. As a consequence conservancy measures urgently need to be installed if exploitation of this natural resource in this area is to become sustainable in the near future.

## **Plankton diversity in Lake Kivu: a “desert” in the heart of East African equatorial rainforest**

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Lake Kivu (2°S and 29°E) is a deep, equatorial lake at high altitude surrounded by one of the world's most important equatorial altitude rainforest. It has a surface area of 2370 km<sup>2</sup>, maximum depth approaches 450 m and it is located at 1463 m above sea level. Biodiversity among plankton of the pelagic zone of this lake is practically unknown. During this study, not more than 30 species of phytoplankton were observed during the 2002 to 2004 period. Phytoplankton biomass is dominated by diatoms (*Urosolenia eriensis* and *Nitzschia spiculum*), however, the group of algae that accounts the largest species number is cyanobacteria. The zooplankton community in Lake Kivu has neither great diversity: 20 genera were identified. Even if copepods dominates in biomass, only 3 genera were identified (*Thermocyclops*, *Mesocyclops* and *Tropocyclops*).



Rotifers are the most diverse group among zooplankton, and curiously benthic taxa were found in the pelagic zone.

Contrarily to terrestrial environment, great tropical lakes flora and invertebrate fauna doesn't show an astonishing diversity. This is even more pronounced in Lake Kivu. By contrast, the plankton of great temperate lakes exhibits much higher diversity, mainly as a result of marked seasonal changes in environmental conditions.

### ***Congolese ethnobotany: Historical plant uses recorded on herbarium material at the National Botanic Garden of Belgium***

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The National Botanic Garden of Belgium (herbarium BR) has been involved in studying and collecting Central African plants since the 1880's. Most of the Congolese specimens collected from that period onwards have been deposited in BR, and are now the only easily accessible historical samples from this region. The most intensive period of botanical exploration was 1935-1970, when the collectors of the 'Institut National pour l'Etude Agronomique du Congo' (INEAC) focussed on collecting as much information as possible on the indigenous flora, vernacular names, and local plant uses. Although the plant material has extensively been studied by taxonomists, the ethnobotanical information has been left untouched for almost 70 years. Thus far, these collections contain the most comprehensive ethnobotanical information available from Congo. The aims of this study are to compile ethnobotanical information from the Congolese Cucurbitaceae and Caesalpinioideae, check the plant identifications and linguistics, and compare the plant uses with the available ethnobotanical literature of other African countries. The preliminary results of the Cucurbitaceae are presented here.

## **Study of microbial biomass and diversity in Lake Tanganyika (FRFC project # 2.4580.05)**

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In Lake Tanganyika, the heterotrophic plankton is abundant, and picocyanobacteria often dominate the autotrophic plankton. Our project aims to determine abundance, biomass and biodiversity of bacterioplankton and cyanobacteria of Lake Tanganyika, and to study temporal and spatial variation of these plankton components. Our working hypothesis is that marked contrast in environmental conditions may select for very different microbial communities.

As a first step, the molecular diversity of planktonic cyanobacteria was studied by two methods. A Denaturing Gradient Gel Electrophoresis (DGGE) was performed on three surface stations taken along a North-South transect. A clone library based on sequences of the ribosomal operon was constructed for one station, using the size fraction greater than 2 µm. The majority of the 15 clones corresponded to 16S rRNA sequences of planktonic *Anabaena* with 97 to 98% similarity. One sequence was 99 % similar to the one of a *Synechococcus* from lake Biwa (Japan). Finally, two sequences were moderately affiliated to a Prasinophyceae (*Mesostigma viride*). As the similarity is quite low (93%), the exact origin of these sequences remains enigmatic.

## **A web searchable database of Rubiaceae in the Albertine Rift**

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The Albertine Rift is situated between the Tanganyika Lake and the Albert Lake. It extends from Uganda and eastern Congo D.R., through Rwanda and Burundi, to north western Tanzania. The elevation varies from about 600 m to more than 5,000 m above sea level; the vegetation varies from lowland forest and savannah to mountain forest and alpine vegetation. The Albertine Rift is indicated to be one of the mountain regions that served as important rainforest refuge for animals during the glaciation. This is resulting in a high level of endemism for animals. In



several studies, the Kivu, which is part of the Albertine Rift, is indicated as an important glaciation refuge for plants as well. In the Albertine rift about 5,800 plants species are recorded, this is about 14 percent of Africa's mainland plant species, with more than 550 endemic species.

In 2004 an inter-institutional project "Providing Access to Albertine Rift Biodiversity Data" was launched. It aims to provide online access to information on butterflies, birds, cichlid fishes and Rubiaceae of the Albertine Rift. It is a feasible study of the European Network for Biodiversity Information (ENBI WP13).

Within this project the National Botanic Garden of Belgium is responsible for the data on the plants. The Rubiaceae were selected as pilot group for the digitalisation of the plant diversity of the Albertine Rift. For each taxon of the Rubiaceae occurring in Rwanda, Burundi and eastern Congo representative specimens were selected and databased; the nomenclature is updated as well. The label data and 'post-collection' data are made available online. For each taxon a selected number of specimens is imaged. This project prevails an update and geographical extension of the 'Flore du Rwanda' published in 1985.

### ***The Herbarium of the National Botanic Garden of Belgium: a survey of history and important collections***

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The foundation of the herbarium of the National Botanic Garden of Belgium (BR) goes back to 1826 when, under the Dutch rule, a 'Royal Society' for horticulture & arboriculture was established in Brussels. In 1870 the buildings and properties of the Society were purchased, through the intervention of Barthélemy Dumortier, botanist and politician, by the Belgian government and became the 'Jardin Botanique de l'Etat'. At that time, Belgium had much interest in the New World, and discoverers participated in the exploration of Mexico, Costa Rica, Colombia, etc. As a consequence BR obtained several important historical collections including thousands of nomenclatural types of New World taxa (e.g. Funck & Schlim, Pittier & Durand, Galeotti, ...).

Already in 1871 the newly established institute acquired the famous 'Herbarium Martii', one of the most important private herbaria of the nineteenth century (ca. 300,000 specimens including thousands of types, half of them from Brazil).

Since the 1880's, the National Botanic Garden has been involved in the study and collection of central African plants and fungi. Th. Durand, the then director, introduced African studies by naming and publishing some 1000 specimens of the Senegal explorer Lecard. The first Congo collections

in our herbarium are from Frans Hens, a painter from Antwerp. Continuously from that period onwards most of the Congolese specimens collected have been deposited in BR..

Nowadays, worldwide coverage is aimed at. The herbarium is among the 25 largest of the world. Its steady growth is in the last decades accelerated through acquisition of large existing collections, e.g. Nannenga-Bremekamps Myxomycetes, the bryological herbaria Douin, J.L. De Sloover, Vanden Berghen, Onraedt and Arts; and the transfer of all historical vascular plant collections from LV.

## ***The Ghent University Zoology Museum.***

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Founded in 1817, the Zoology Museum has collected over 16,000 specimens, covering all major taxa of the animal kingdom. The collection represents taxa ranging from amoebas (Protista) to whales (Animalia), as well as it comprises a large collection for comparative anatomy. The initial aim of this collection was to be an “illustrated guide” for the systematic zoology lectures and so to be studied by the biology students of our university. Nowadays, educational and scientific service efforts are done towards the different levels of the society. Guided tours are organised to visitor groups, practical courses are provided for secondary school students (e.g. Science Week), and even kindergarten classes are visited. On a broader scale, a web-site is maintained, where through GBIF, our collection database is made accessible to scientists all over the world. As we are a University Museum with a scientific collection, we would like to invite zoological taxonomists to consider our museum as a *collection deposit* for their *type specimens*. For example, the Zoology Museum currently curates a nematode type collection of over 4,000 specimens.





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# **Tropical Biodiversity: Science, Data, Conservation**

## **Abstract Volume**

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