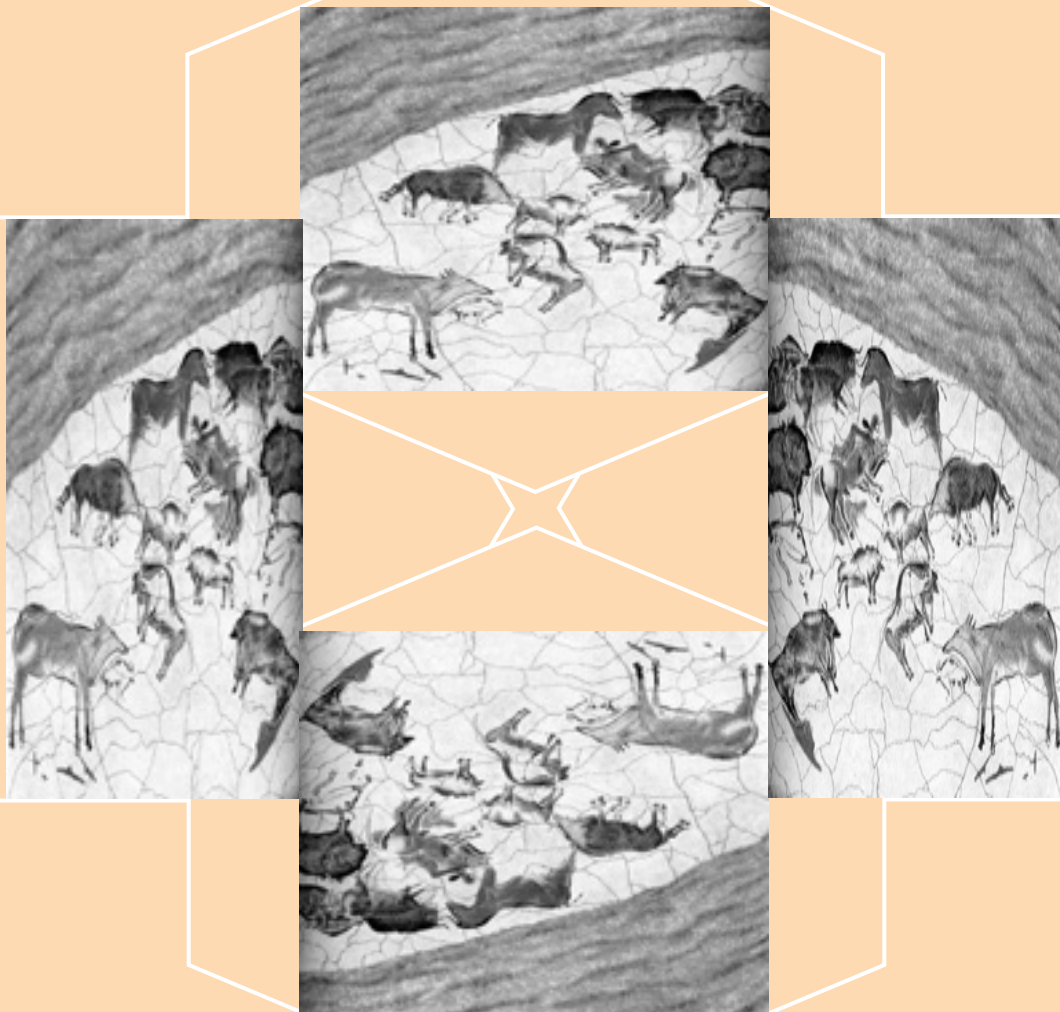


CETAF

Consortium of European Taxonomic Facilities Position Paper



**Biodiversity and Europe:
The Contribution of Taxonomy and the European
Taxonomic Facilities**

2004

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FOREWORD

Taxonomy is a basic science of fundamental importance for understanding biodiversity and ecosystem functioning. It deals with exploring and describing Biodiversity, through scientific analysis and an heuristic organization of biodiversity data. CETAF views taxonomy in a broad sense ranging from the basal recognition and description of species (alpha taxonomy) to higher-level analyses of genealogical relationships among living organisms (phylogeny), including evolutionary and biological scenarios.

Taxonomy maximises the utility of biodiversity information for a wide range of users by providing scientific information that is structured, testable and reproducible. The challenge is to combine and use in a harmonious and compatible way all the information that is produced by the many diverse scientific disciplines, schools and practices. Taxonomy provides a common language that facilitates the integration of local and sectoral politics with national and international directives.

Taxonomic research is closely associated with natural history collections in a positive feedback relationship. Specimens in the collections form the very basis of taxonomic research, even in molecular studies, which are becoming more and more prevalent. Taxonomic research is continually increasing the value of scientific collections, and subsequently their power and capacity as a tool for new studies. Funding collections and taxonomic research is an investment in science that creates a fertile intellectual framework for future scientific discoveries.

There is a strong need in the European Community to advance taxonomic knowledge, to improve access to taxonomic databases (including identifying existing barriers to access), and to strengthen the efforts that are being made in phylogeny.

With this Position Paper, CETAF seeks to address these needs by presenting taxonomy in a broader context, including its significance for the many sectors of society and science, its present status in Europe, and strategies for the future of European taxonomy.

Marian Ramos
Chair, CETAF

CETAF

POSITION PAPER

on

BIODIVERSITY AND EUROPE: THE CONTRIBUTION OF TAXONOMY AND THE EUROPEAN TAXONOMIC FACILITIES.

We share our planet with millions of other species. Animals, plants, fungi and micro-organisms, they feed us, keep us healthy, providing goods and services from medicines to building materials. Other species damage us and our economies. Through the millennia we humans have developed ingenious ways to exploit the planet for our well-being, but even today our knowledge of the total biodiversity of our planet is far from complete.

The Earth Summit in Rio de Janeiro in 1992, the World Summit 2002 in Johannesburg and the following European “Göteborg” target significantly changed the attitudes of people and their governments to their nation’s biodiversity, and that of the world. It was recognised that much more had to be done to halt the loss of biodiversity and, beyond this, to use and manage it in sustainable ways for all human-kind. The implementation of the Convention on Biological Diversity (CBD), which came out of the Summit, requires not only the commitment of governments but the application of specific scientific expertise and resources.

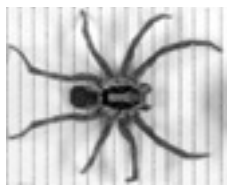
Taxonomy is a key science in the sense that without it many aspects of modern biological science, as well as global and regional initiatives on biodiversity (including the CBD), cannot be tackled effectively and efficiently. The fundamental role of taxonomy has always been to discover, name, and investigate the relationships of all living things, past and present. But today taxonomy is about much more than that.





Taxonomic facilities, such as natural history museums, culture collections and botanic gardens, manage collections of the world's biodiversity for research and to support the objectives of numerous user communities. Many areas of biological research are strongly dependent on these global facilities and Europe holds a significant proportion of the world's most important collections.

This document explains the wider and important part played by taxonomy and taxonomic facilities in the contemporary context of biodiversity and of sustainable development, with a focus on the significance of European policies and actions. It urges support for action to protect Europe's own biodiversity and to use its resources wisely to aid countries in many parts of the world.

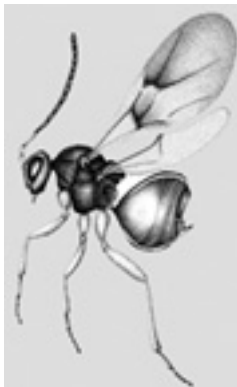


TAXONOMY IN THE KNOWLEDGE SOCIETY

What is taxonomic knowledge used for?

It provides scientifically based knowledge about species, the units of biodiversity, and establishes a basic biological language about them that enables meaningful communication between people.

- It aids species identification making it an essential tool in the control, conservation and sustainable use of biodiversity.
- It leads to the understanding of relationships of species and so helps to find new opportunities for product development in food or medicines.
- It shows which organisms can act as indicators of environmental quality or that are essential for the maintenance of healthy ecosystems, including crop-bearing soils and water resources.
- It is used in the fight against pests, parasites, vectors of disease, invasive species and extinction.



Who uses this knowledge?

The list of users of taxonomic knowledge is extensive and, in addition to other researchers in many fields of biological sciences, it includes:

- The agricultural, fish-farming, forestry and horticultural industries.
- The tourist industry which increasingly focuses on eco-tourism.
- Water authorities.
- The oil and mining companies, including their work on environmental impact.
- Conservation agencies and voluntary bodies concerned with the protection of nature.
- National customs authorities who protect against pests and invasive species as well as trade in endangered species.
- Governments, local and regional authorities who are implementing the



Convention on Biological Diversity, for example, through local biodiversity action plans.

- International agencies dealing with biodiversity.
- Pharmaceutical and drug companies searching for new products.
- The media: from scientific journalists, illustrators, to film-makers and others.

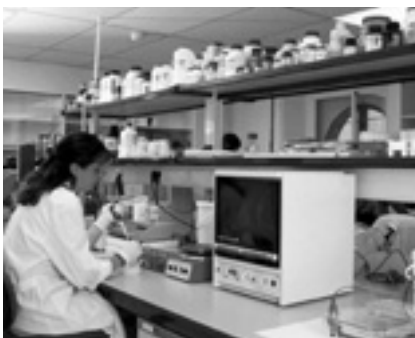
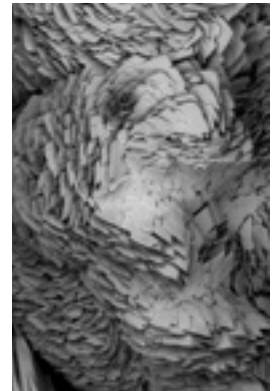
Increasingly, taxonomic institutions work not only to advance the science of taxonomy itself but also in collaboration with other scientists, industry and governments to help tackle current world problems and initiatives.

Do we have a sound knowledge of biodiversity?

The short and surprising answer is “only some of it”. It is estimated that we have named and described about 1.8 million species – representing perhaps only 15% of all those living today. There is a considerable amount of information on the relationships of species and their interactions but there is a huge amount of exciting research still to be done. Similarly, there is increasing information on important species involved in problem-solving areas such as the transmission of disease, or the control of pests of arable crops, but many challenges have yet to be faced.

Elucidating the genomes of organisms is only just beginning but the information it provides, together with other work in molecular biology, is already providing powerful insights into the course of biological evolution and giving new meaning to the world around us. Taxonomists are working to define the ‘tree of life’. As the results of the task unfold so the benefits multiply not only in the increasing usefulness of the information but also by providing a more predictive framework for comparative biology.

The taxonomic institutions will continue the development of well equipped facilities so that the accumulated knowledge associated with the collections can be used to best effect. These facilities will allow for the growing body of information as the urgent task of describing and documenting more of the world’s biodiversity progresses.





How can the knowledge be made more readily available?

European taxonomic facilities are committed to increasing access to the information they hold about species. The opportunities provided by information technology and the Internet are being seized by these facilities to make information about specimens, including images, more readily available on-line. These tools provide a quick and preliminary screening of the contents of the collections prior to visit the institutions. Guides and keys to plants and animals, often with a regional focus, are being developed to meet user needs. Co-ordination and networking of the information held in different institutions is already being shown to improve access by a variety of users.

THE EUROPEAN DIMENSION

Europe is strong in resources for the management of biodiversity and for advancing our knowledge of the Earth's species through taxonomy.

- Europe contains half of the World's biological collections and holds specimens of more than 80% of the described species from all parts of the World, which provide a huge resource for comparative worldwide work.
- European collections are distinguished by their richness in type (or reference) specimens, especially those of the World's most common and economically important organisms. They also represent the occurrence of organisms in time and space and of their genetic variation.
- Europe has occupied a strong position in the development of the science of taxonomy from its earliest origins to modern molecular and theoretical biology.
- Europe contains a significant resource of internationally-recognised taxonomists and a powerful network of taxonomic facilities.
- Europe has a significant diversity of languages and cultures so that its researchers are in a favourable position for collaboration across philosophical, linguistic and political boundaries, as well as across different perceptions of biodiversity.
- Europe has, through the European Union Framework Programmes, developed policies and actions to start improving the effectiveness of its taxonomic resources in scientific research and facilities, and in the implementation of European and global initiatives in biodiversity management. It is achieving this by an integrated approach to networking, collaboration, information provision and training.
- Some twenty leading European taxonomic institutions have formed an important Consortium (CETAF - see box) to help organise and optimise taxonomic research in Europe and to assure continued European focus and leadership in this field.

There are, however, still significant groups of organisms for which Europe has no specialists and numerous groups where the European specialist coverage is very thin and therefore vulnerable. For Europe to maintain and strengthen its leading role in taxonomy, an increased investment in human resources is necessary, especially in the field of basic taxonomy, as a *sine qua non* for biodiversity research in general and sustainable development in particular.

THE WAY FORWARD FOR CETAF

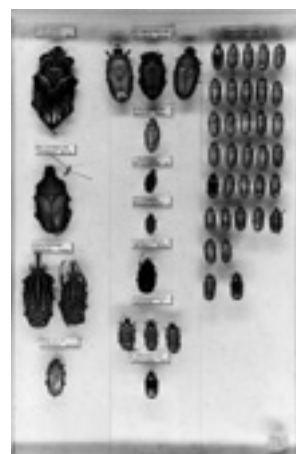
CETAF strives to maximise the benefits that its member institutions can provide for the sustainable use of biodiversity in Europe and elsewhere in the world. It works with other institutions, governments, private organisations and agencies to achieve a programme of co-ordinated work, significantly improving Europe's capacity to fulfil its commitments and obligations under European and international initiatives as well as Conventions (especially the CBD).

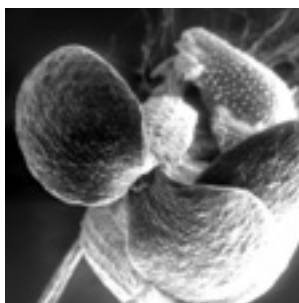
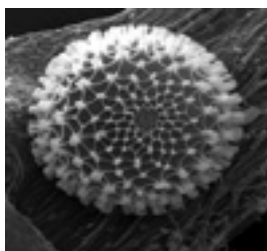
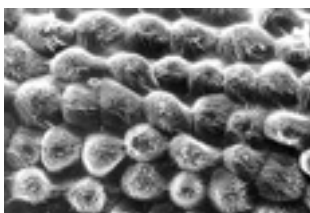
Over the next six years CETAF will:

Promote increased access to collections and associated information.

The collections of the many European institutions are a valuable and irreproducible resource but their potential is far from fully realised. CETAF and its member institutions will:

- Work within the **SYNTHESYS** Integrated Infrastructure Initiative of the European Union to provide enhanced and co-ordinated access by a diverse range of users and researchers to collections, facilities and expertise in many of Europe's taxonomic institutions.
- Use the Framework Programmes of the EU to boost taxonomic research in Europe.
- Co-ordinate contributions of information and aid policy development within the **Global Biodiversity Information Facility (GBIF)** – an internationally funded initiative started in 2001 to establish a high-quality and user-focused network of databases on biodiversity. CETAF is fully committed to the GBIF objectives.
- Be key participants in the EU funded **European Network for Biodiversity Information (ENBI)** which constitutes the European Commission's contribution to the GBIF and also to prepare the way to an 'European Research Area'.
- Accelerate the provision and accessibility of information about biodiversity to users in line with priority needs and to set targets by 2010.
- Campaign to secure continued and increased funding for Europe's unique collections, in particular for their digitisation and access for multidisciplinary use.





Provide international leadership in setting and implementing standards

It is increasingly important to set and implement agreed standards and protocols for the development and maintenance of collections, for their use, and for the associated information and data sets. The importance of the European collections is too high to allow deterioration to occur simply as a result of lack of sound procedures and guidelines. Users are increasingly requiring information on the standards of treatment of specimens, especially for those used in molecular biology research; they also need clear details of the quality of associated so they can assess whether or not it is fit-for-purpose. Over the next six years CETAF will:

- Develop and establish agreed standards and protocols for collections care and data provision, through the SYNTHESYS Integrated Infrastructure Initiative. These standards will be set at a level appropriate for international application.
- Agree priorities for implementing standards, in the context of user needs and within a collaborative framework, across Europe.

Exploit new scientific opportunities

As a scientific activity, taxonomy is continually assimilating new methods and technologies in an innovative way. It is now actively exploiting the benefits of molecular biology, genomics and biodiversity informatics, so as to help accelerate the process of inventorying and databasing biodiversity. European objectives over the next six years include:

- Research into rapid means of species identification through DNA 'bar-coding' and by advanced methods of pattern recognition.
- Development of advanced models for the construction and handling of the relationships of a relatively large number of species within parts of the 'Tree of Life' in order to provide a better understanding of all aspects of biodiversity, including, e.g., ecological, behavioural, physiological and molecular diversity.
- Development of improve systems for the generation of multi-access keys for identification purposes by a wide range of users.

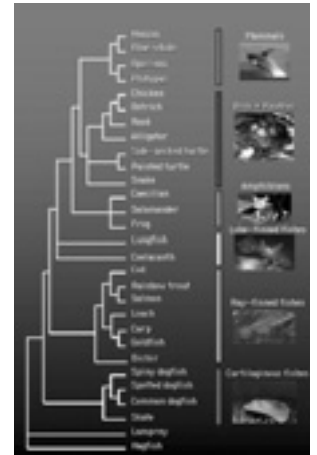
Secure Europe's taxonomic capabilities

Matching the available scientific resources to meet the European and global needs of the many biodiversity programmes is a challenge in itself. The past investment in collections, museums and botanic gardens has, over the last 250 years, been colossal and now is the time to maximise the yield from this investment. This can be achieved only through the combined efforts of Europe's taxonomic institutions. These institutions, working through CETAF, will:

- Analyse the different strengths of the many institutions, especially with respect to their abilities to deliver research outputs and services, so as to aid integrated resource planning and provision. The objective will be to define the existing 'complementarity' among organisations and to use it to advantage in institutio-

nal change and growth, so as to improve effectiveness in meeting user needs. This will be achieved through the SYNTHESYS Integrated Infrastructure Initiative and will lay down the framework for long-term planning in Europe.

- Develop and agree an integrated and collaborative approach to the development of major new collections of cultures, tissues and 'DNA', for molecular biological research.
- Promote, at the European level, a special funding programme to target revision and description of species through monographs, faunas and floras, delivering basic scientific data and creating new knowledge. The US "Partnerships for Enhancing Expertise in Taxonomy" (PEET) may in part serve as a model.
- Establish the first CETAF distributed training module for taxonomy and develop further training courses and opportunities. *It is anticipated that at least three times as many taxonomists as there are today will be needed in Europe's collections-based institutions if the global inventory of biodiversity is to be completed and made accessible in a reasonable time.*

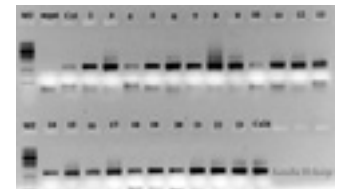


FUTURE STRATEGY DEVELOPMENT

CETAF is now an established part of the European taxonomic scene and has an important future role to play in co-ordinating the European contribution to the global taxonomic effort. It will continue to review, and adapt as necessary, its strategy for integrated and collaborative working across Europe. It will also, where it is able, help support individual institutions to gain support for their valuable taxonomic resources and work.

CETAF will continue to champion the importance of taxonomy in its crucial role in baseline biodiversity research and in the development of sustainable use and conservation in areas where the level of biodiversity is high but the scientific capacity is low.

CETAF provides an authoritative and integrated voice for the discipline in Europe.



Consortium of European Taxonomic Facilities (CETAF)

CETAF was founded in 1996. Twenty five of Europe's largest taxonomic facilities (natural history museums, botanic gardens and other biological collections) are members of CETAF. The objectives are

- to promote scientific research and access to European collections
- to enable the formation of partnerships to exploit European funding opportunities
- to be a voice for taxonomy and systematic biology in Europe.

A number of CETAF members, or national consortia in which CETAF members play leading roles, have, since 1998, received support through the European Commission's Framework Programmes to enhance transnational access to their collections, equipment and expertise. Most recently, under the 6th Framework Programme, twenty CETAF institutions in eleven countries are running an Integrated Infrastructure Initiative: "Synthesis of Systematic Resources" (**SYNTHESSYS**). It provides transnational access to member facilities. In addition SYNTHESSYS seeks to increase the quality of European collections by focusing on such issues as: complementarity and gaps analyses, collection standards, enhanced data processing, new types of collections and new analytical methods for their study.

A consortium of CETAF members have formed the European Natural History Specimen Information Network (ENHSIN), a concerted action which has as its core objectives to develop and assess protocols, standards, methods and management frameworks, together with a consensus on user needs, which will enable the development of a shared, interoperable European Infrastructure of specimen databases.

A following Biological Collection Access Scheme for Europe (BioCASE) also has its roots in CETAF. BioCASE will through its core objectives network biological collections with the aim to fully realise the immense research and documentation value of European biological collections, implement a sustainable and expandable Biological Collection Information Access Service for Europe, a system, which will enable users for the first time to access European collection resources in an integrated and concerted way and create an innovative information system, which provides indirect access to the highly heterogeneous and widely distributed information base formed by the numerous European biological collections through a metadata framework backed by a network of National Nodes.

CETAF was also instrumental in creating the very large thematic network Fauna Europaea. With over 400 contributing specialists, Fauna Europaea is compiling taxonomic lists of more than 115,000 non-marine species of European animals, as well as information on their distribution, thereby complementing the earlier project: European Register of Marine Species (ERMS) and the sister project on the European Flora, Euro-Mediterranean Plant Diversity (Euro+Med PlantBase)

CETAF Member Institutions to date

COUNTRY	INSTITUTION
Austria	Naturhistorisches Museum, Vienna
Belgium	Institut Royal des Sciences Naturelles de Belgique, Brussels
	National Botanic Garden, Meise
	Royal Museum for Central Africa, Tervuren
Czech Republic	National Museum (Natural History), Prague
Denmark	Statens Naturhistoriske Museum, Københavns Universitet, Copenhagen
France	Musée National d'Histoire Naturelle, Paris
Germany	Botanischer Garten und Botanisches Museum, Berlin-Dahlem
	Forschungsinstitut Senckenberg, Frankfurt
	Museum für Naturkunde, Berlin
	Staatliche Naturwissenschaftliche Sammlungen Bayerns
	Staatliches Museum für Naturkunde, Stuttgart
Hungary	Hungarian Natural History Museum, Budapest
Italy	Museum Civico di Storia Naturale, Milano
Poland	Muzeum i Instytut Zoologii PAN, Warsaw
Spain	Museo Nacional de Ciencias Naturales, Madrid
	Real Jardín Botánico, Madrid
Sweden	Naturhistoriska Riksmuseet, Stockholm
The Nederland	Centraalbureau voor Schimmelcultures, Utrecht
	Nationaal Natuurhistorisch Museum Naturalis, Leiden
	Nationaal Herbarium Nederland, Leiden
	Zoologisch Museum, Amsterdam
United Kingdom	Royal Botanic Gardens, Edinburgh
	Royal Botanic Gardens, Kew
	The Natural History Museum

Essential web page addresses:

Biological Collections Access Scheme

for Europe	BioCASE	www.biocase.org
Consortium of European Taxonomic Facilities	CETAF	www.cetaf.org
Convention on Biological Diversity	CBD	www.biodiv.org
Euro-Mediterranean Plant Diversity	Euro+Med PlantBase	www.euromed.org.uk
European Commission	EC	www.cordis.lu
European Natural History Information Network	ENHSIN	www.nhm.ac.uk/science/rco/enhsin
European Network of Biodiversity Information	ENBI	www.faunaeur.org/enbi/info.html
European Register of Marine Species	ERMS	www.erms.biol.soton.ac.uk
European Register of Marine Species	ERMS	www.erms.biol.soton.ac.uk
Fauna Europaea	FaEu	www.faunaeur.org
Global Biodiversity Information Facility	GBIF	www.gbif.org
Global Taxonomy Initiative	GTI	www.biodiv.org/programmes/cross-cutting/taxonomy
Partnerships for Enhancing Expertise in Taxonomy	PEET	www.nhm.ku.edu/peet
Synthesis of Systematic Resources	SYNTHESYS	www.synthesys.info
The Tree of Life Web Project	ToL	tolweb.org/tree/phylogeny.html