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The Global Taxonomy Initiative: Shortening the Distance
Between Discovery and Delivery. Report of a meeting held at
the Linnean Society, London, UK on September 10-11 1998.

Submitted by DIVERSITAS

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THE GLOBAL TAXONOMY INITIATIVE:

Shortening the Distance between Discovery and Delivery

Report from a meeting at the Linnean Society, London, September 10-11, 1998,
convened by *DIVERSITAS*, Environment Australia and the Global Environment Facility's
Scientific and Technical Advisory Panel

1. INTRODUCTION

In February 1998, The Darwin Declaration began by stating that:

"The governments of the world that recognise the Convention on Biological Diversity have affirmed the existence of a taxonomic impediment to sound management and conservation of biodiversity. Removal of this impediment is a crucial, rate-determining step in the proper implementation of the Convention's objectives. There is an urgent need to train and support more taxonomic experts, and to strengthen the infrastructure required to discover and understand the relationships among the world's biological diversity.

Information derived from biological collections held in the world's taxonomic institutions underpins ti global, regional and national efforts to conserve biological diversity. The collections, staff an associated information serve as an essential resource for countries in fulfilling their obligations under the Convention on Biological Diversity.

Accordingly, a taxonomic perspective should be integrated into policies and programs established at c levels of government to achieve sustainable development and conserve biodiversity. These policies and programs include, but are not limited to, agriculture, forestry, fisheries, habitat management (includir protection of threatened species), biological resources for medicine and human health, energ production, land use planning to accommodate human population growth, use of traditional knowledg environmental education and training, ecotourism and bioprospecting. In addition, taxonomy should underscore all national, regional and global programs for inventory and monitoring of biological resources in ecosystems and requirements for broad-scale environmental assessment."

Taxonomy is the science of discovering, describing and naming the individual species of plants and animals, including microscopic forms, that make up the biota, and of elucidating their relationships to provide a classification. Taxonomy provides the reference system for all organisms, and the framework on which the skills to identify and specify the elements of biodiversity are based. As such, it has been recognised by the Conference of Parties (CoP) to the Convention on Biological Diversity (CBD), in their Decisions II/8, III/10 and IV/1, as being fundamental to the CBD and needing support by the Global Environment Facility (GEF) (Decisions III/10 and IV/1). The CoP therefore endorsed the Global Taxonomy Initiative (GTI) to promote capacity-building in taxonomy.

A great deal of extra work has been done on implementation of the GTI, outside of the CBD framework although complementary to it. *The Darwin Declaration* was the report of a workshop held in Darwin (Australia) in January 1998, under the auspices of the Smithsonian Institution and Environment Australia, to develop an action plan for implementing the GTI. A second meeting was held in London in September 1998, at the Linnean Society, under the auspices of DIVERSITAS, the Science and Technical Panel of the GEF and Environment Australia. While this meeting addressed the further steps required to implement the GTI, a key feature was seen to be the need to shorten the path between discovery and documentation of living creatures and the delivery of relevant outcomes in the context of the CBD. This document reports the outcomes of that meeting, and provides additional documentation to help policy makers in the CBD, UNEP and the GEF family to assist in the delivery of outcomes to hasten the removal of the taxonomic impediment identified in *The Darwin Declaration*.

Some history

The Global Taxonomy Initiative is a response to a recognised taxonomic impediment to conservation and management of the world's biodiversity. The taxonomic impediment is a term that describes the gaps of knowledge in our taxonomic system (including knowledge gaps associated with genetic systems), the shortage of trained taxonomists and curators, and the impact these deficiencies have on our ability to manage and conserve our biological diversity.

The present level of taxonomic resources is inadequate for the proper documentation of taxa whose existence is known, let alone for the discovery and identification of the taxa whose existence is suspected.

The GTI aims to provide the impetus to address the taxonomic impediment at a variety of levels:

- *Gathering of facts*: collection of specimens and the maintenance of those collections.
- *Development of information*: compilation and organisation of basic data from the collections into databases, regional checklists, maps, etc.
- *Development of knowledge*: synthesis of those data, into monographs, floras, faunas, keys etc. Each level of increasing complexity delivers information crucial to effective implementation of the CBD.

The overall objectives of the GTI were considered by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the CBD. That body, in its recommendation II/2, found an extraordinary level of agreement among delegates that enhanced taxonomic capacity is *sine qua non* for the implementation of the Convention and recommended that the CoP consider the following:

"There is a scarcity of taxonomists, taxonomic collections, and institutional facilities, and there is a need to take measures to alleviate this situation worldwide, to facilitate and assist countries in implementing the Convention on Biological Diversity. In particular, national institutions and regional and subregional networks should be established or strengthened and linkages enhanced with taxonomic institutions in developing and developed countries. In strengthening the taxonomic base, consideration must be given to the information needs for bioprospecting, habitat conservation, sustainable agriculture and the sustainable utilisation of biological resources.

Capacity-building for taxonomy should be linked to the effective implementation of the Convention on Biological Diversity, particularly the national identification of areas of high diversity; improving the understanding of ecosystem functioning; giving priority to threatened taxa, taxa that are or may be of value to humanity, and those with potential use as biological indicators for conservation and sustainable use of biological diversity.

Development of guidelines and programme priorities for funding, including for the financial mechanisms

under the Convention, should take account of the specific needs for capacity-building in taxonomy to serve areas such as bioprospecting, habitat conservation and the sustainable use of biological diversity. Such support should recognise the need for adequate, long-term housing of collections and records and long-term research.

For new taxonomists to be recruited, there is a need to provide employment opportunities. It is urged that Parties take this need into consideration and integrate it into the programme of capacity-building.

Where appropriate, national taxonomic needs assessment and action plans should be developed by setting national priorities, mobilising available institutional resources, and identifying available funds. Countries could benefit from regional and subregional collaboration.

The importance of establishing regional and subregional training programmes was recognised. Attention should also be given to the training of specialists, parataxonomists, and technicians in this field. The field of taxonomy must be integrated with training activities such as biological monitoring and assessments. Maximum use should be made of existing institutions and those organisations active in these fields.

There is an urgent need to make the information on existing taxonomic knowledge, including information about the taxa in worldwide collections, available to countries of origin.

Taxonomic information to assist capacity-building in taxonomy should be included within the clearing-house mechanism. The taxonomic work embodied in existing archives and inventories, field guides and publications needs to be updated and readily accessible through worldwide services and duplication of work already conducted should be avoided. The dissemination of information should further the objectives of the Convention and be linked to user needs. This sharing of information will require greater international collaboration. It should also be recognised that traditional taxonomic systems offer a valuable perspective on biological diversity and should be considered part of the total taxonomic knowledge base at national, regional and subregional levels.

Since taxonomy generally involves the use of biological collections, those concerned should consider the adoption of mutually agreed upon material transfer agreements or equivalent instruments in accordance with the provisions of the Convention on Biological Diversity for exchange of biological specimens and information relating to them.

The Conference of the Parties should consider instructing the Global Environment Facility to support a Global Taxonomy Initiative, providing the necessary funds for the following actions related to capacity-building in taxonomy:

- (a) developing national, regional and subregional training programmes;*
- (b) strengthening reference collections in countries of origin including, where appropriate, the exchange of paratypes on mutually agreed upon terms;*
- (c) making information housed in collections worldwide and the taxonomy based on them available to the countries of origin;*
- (d) producing and distributing regional taxonomic guides;*
- (e) strengthening infrastructure for biological collections in countries of origin, and the transfer of modern technologies for taxonomic research and capacity-building; and*
- (f) disseminating taxonomic information worldwide, inter alia by the clearing-house mechanism."*

The CoP of the CBD subsequently endorsed the GTI, agreeing to a number of specific actions (Decision IV/1). Specific advice to the GEF was also contained in this decision viz:

"CoP stresses the urgent need for adequate financial resources to implement a Global Taxonomy Initiative and requests the institutional structure of the financial mechanism of the Convention to provide financial resources, particularly to assist in implementing, through country-driven activities within the context of the operational programmes of the GEF, the suggestions for action annexed to the present decision."

The Political Decision is in place - now we need action!

2. ACTIONS NEEDED TO PROGRESS THE GLOBAL TAXONOMY INITIATIVE

A number of sample projects are included in Annexe 2. The projects, although each one is real and necessary, are included also as examples of the range of projects needed to activate the GTI. The Annexe does not contain examples of capacity-building programs as such (i.e. establishing functioning reference collections in developing countries), although the meeting recognised the scientific imperative of these types of projects as basic to the implementation of the GTI.

Recognising the fundamental importance of taxonomy in providing the basis for informed decision-making in conservation, sustainable use and benefit sharing-nationally, regionally and globally-the meeting suggested the following priorities:

- That the GTI be formalised as an Umbrella Project, perhaps under the United Nations Environment Programme (UNEP), which would be accessible by all parties in collaboration with key institutions, and would be governed by a steering committee with broad global representation. Such a project would be staged, with a pilot project of \$25M from 1999 to 2002. Included in this project would be a commissioned paper on the role of taxonomy in conservation, sustainable use and benefit sharing of biological diversity, and its linkage with the ecosystem approach (as defined by the Malawi meeting in 1998) and the cross-cutting theme of invasive alien species.
 - *In order for the GTI to be prepared as an "Umbrella Project", funds need to be made available urgently to commission a 2-3 month consultancy to prepare a draft project proposal. Developing the proposal would include bringing together a small workshop of interested parties. This workshop should invite a range of specialists, and operate at a range of scales. Choosing pilot taxonomic groups of significance is a key challenge in this first phase. Also essential is to undertake a focused needs assessment within developing countries. The CBD Secretariat Program Officer, in conjunction with UNEP and other relevant Convention secretariats, should undertake such a needs assessment. The finalised GTI project proposal could be submitted to the Global Environment Facility of the World Bank (GEF) by a consortium of appropriate key nations.*
- That the CBD Secretariat Program Officer (the appointment of whom was agreed upon in CoP Decision IV/1) should serve as the GTI project task manager, and that this position be filled as soon as possible, with the UNEP Executive Directorate taking a major role in expediting this action.
- That UNEP provide a facilitating and coordinating role in the preparation of framework activities to formalise the GTI, including the preparation of a paper on the role of taxonomy in the implementation of the Convention. Preliminary activities required to build the most effective and flexible framework for implementing the GTI include the preparation of a pilot phase with regional meetings of experts to prepare detailed projects ensuring collaboration between developing and developed nations.
- That the support of leaders of world taxonomic institutions is solicited. Such support is already evident, but closer linkage needs to be maintained among the CBD Secretariat (hence the need for

the establishment of the Program Officer), UNEP, other GEF implementing agencies and the key institutions. Establishment of a standing working committee on this issue may be a solution to the communication problem.

- That regional initiatives, eg. the Darwin Initiative and South African Biodiversity Network (SABONET), be used, with the GEF leadership, to build a formal GTI with support within the coordinated framework provided by the CBD.
- That specific training initiatives be developed, for example following the European Union's Large Scale Facilities Model which utilises a "mentor" approach. Career development through fellowships (like those offered by North Atlantic Treaty Organisation (NATO), Wellcome Foundation, etc.) which provide a commitment to engage the trainee as a permanent employee, is of critical importance. The GEF may be able to aid training through a skilfully constructed project context, emphasising training opportunities which lead to permanent career possibilities, and continuing to expand the taxonomic effort.
- That a program of wider public information on the importance of taxonomic activity be constructed. Such a program should particularly target national decision-makers in relation to CBD activities in all countries. The need for this program arises from the apparent lack of will by countries to fund basic taxonomic support, even where budgetary stringency is not necessarily an issue of importance.
- That a project-based approach be used, and partnerships emphasised wherever possible. In the context of wide partnership approaches, rapid assessment methods may be a useful approach, but need careful application. The major aim must be to produce tangible results from larger projects in the shortest possible time frame. Existing protocols for taxonomic work should be made more widely available, and take a global approach.
- That the GEF, based on recent advice from the CBD, include in its Operational Programme and Strategy clear and specific guidelines/criteria for prioritising taxonomic activities within existing and new GEF projects, in order that maximum effort is achieved in providing the information base required for the CBD.

A preliminary set of guidelines/criteria discussed during the meeting is set out in Annexe 1.

3. IMPLEMENTING THE GLOBAL TAXONOMY INITIATIVE

Implementing programs with a primary taxonomic focus under the GEF will require some examination and elaboration of the Operational Programme and Operational Strategy of the GEF. It will require, in particular, moving from the purely ecosystem focus of the programs to embrace taxonomic support as a primary underpinning theme. The CoP to the CBD may also need to reinterpret its instructions to the GEF to clarify this issue, following the detailed study of this issue at the next SBSTTA meeting, to be held in May 1999.

During discussion at the SBSTTA meeting, it is important to recognise that taxonomic efforts:

- are labour intensive processes, due to the large number of organisms involved, and as such require specialist training of the necessary personnel, and the creation of infrastructures within developing countries where reference collections often do not exist. This problem is amplified by the fact that the taxonomic impediment is most severe in the countries which are megadiverse (containing the richest genetic and species diversity, and with the most complex land- and seascape texture).
- must be performed on a regional or global basis and not just nationally, as species do not follow national borders.
- are usually not best performed on an ecosystem-by-ecosystem basis, as many taxa are found in, and are important components of, more than one ecosystem.
- require cooperative action, in both developed and developing countries, as the existing infrastructure and expertise are concentrated in developed countries, and this expertise needs to be

refined and improved in the developing countries. Taxonomic institutions of developed countries have very significant amounts of information from all over the world; these museums and herbaria are essential resources for researchers from all countries.

Framework taxonomic activity, which is necessary to help implement the CBD, and which requires differing levels of support from the GEF, includes:

- creation of taxonomic infrastructure (collections, equipment, human resources) in countries where it does not yet exist, or is poorly developed or inadequate, and improvement of existing infrastructure especially in developed countries.
- projects focused on particular priority taxa, especially those with a high number of species or with known or potential impact on humans/human activity, or which are threatened by human activity.
- projects compatible with the ecosystem approach, as recommended by SBSTTA and adopted by the CoP. For example, such projects might focus on a particular ecological function (eg. pollination) and examine all taxa involved in that function.
- inventories of the taxa at a single site or at the regional level, to provide the basis for biodiversity assessments and subsequent monitoring efforts.
- projects to develop tools that disseminate taxonomic information as widely as possible (eg., keys for identifying organisms, regional Floras, databases) in a variety of media.

Appropriate infrastructure is needed in all countries. While some developing countries lack infrastructure, even developed countries have institutions which lack modern infrastructure. It would be appropriate to ensure information held within the large collections accumulated by former colonial powers was made available at the same time as building management capacity across the world.

Partnerships are central to the success of the GTI. Partnerships can be bilateral, regional or global, depending on the issues or the problems. It would be useful to develop a list of topic areas for which partnerships could and should be established. Such a list could be compiled under the auspices of the CBD, using the secretariat officer, and funded by a one-year GEF grant.

Training programs in taxonomy are critical. There is opportunity for mentor or internship projects, in which students from developing countries can spend time in collaboration with taxonomic experts in developed countries. Such experts should also visit institutions in developing countries for short (3-6 month) periods to impart knowledge in that way. Training must be focused on "threatened knowledge"-taxonomic expertise that resides with only a few people. Training also needs to be linked to long-term employment opportunities.

Components of the Global Taxonomy Initiative

The GTI must be implemented at all levels, nationally as well as internationally, to achieve its objectives. Countries must use their National Biodiversity Action Plans to develop their components of the GTI, and integrate them with other elements to implement the CBD, as well as the objectives of all the post-Rio Conventions to which they are signatories (CBD, United Nations Framework Convention on Climate Change (FCCC), Convention to Combat Desertification (CCD)). The cooperative nature of the GTI will make it particularly effective in enhancing taxonomic capacity in all nations.

The GTI must be a system which encourages communication within the taxonomic community, but also encourages outreach to the wider biodiversity community. The taxonomic community should also be intimately involved in the preparation of material to discuss these issues at all political levels.

Operational Guidelines must be developed which amplify how the CBD requires the GTI to work; the

guidelines would then be promulgated through professional societies and institutions for wider acceptance by the taxonomic community. Elucidation of the linkages between different existing activities and groups is an urgent need, so that they can be integrated into a cohesive overall strategy at the global level. Currently the linkages between taxonomy (academic) and the biodiversity community are not adequate and need to be improved.

The plan of action developed for the GTI must include links with, where appropriate, the principles of the Malawi meeting on the ecosystem approach, and the recommendations of the Mexico *DIVERSITAS* meeting on the science behind the key Articles of the CBD. The end result must be a plan of action which places taxonomy as a cornerstone within the scientific basis of the CBD mandate, and is particularly focused on outputs at a practical level, within the broader outcome of improved knowledge of biodiversity.

Of course, the GTI cannot be, and should not pretend to be, everything to all people. It needs to focus on the priority issues that it can hope to address in the short to medium term, to build capacity across the range of levels required to rapidly enhance our taxonomic capacity to support decision-making. Priority-setting to speed up relevant regional projects that fulfil the needs of the CBD and enhance taxonomic capacity are key requirements. The GTI plan of action must provide firm recommendations on taxonomy training issues at a range of levels.

While taxonomy is a foundation science it must also meet the changing requirements of society and seek out innovative approaches to meeting these needs. Greater communication with the science community and the wider biodiversity community are essential. Accordingly, the GTI plan of action must elucidate the role of taxonomy in the major elements of the CBD, for example, how systematics fits in with conservation through creation of protected areas, sustainable use and agrobiodiversity, and benefit sharing of knowledge, as well as within the ecosystem themes already identified by the CoP.

The London meeting of scientific experts recognised the need to develop a clear and open mechanism for the implementation of the GTI, as a key component of the ecosystem approach for implementing the CBD. The meeting also noted the linkage between the GTI and the ecosystem approach. The CoP has already identified the GEF as the primary funding agency for these efforts, although the London meeting recognised the possibility and desirability of a range of funding support, covering taxonomic activity in all countries.

Role of the World's Great Institutions

The world's largest and oldest Museums and Botanical Gardens have a key role in ensuring the level of taxonomic activity is maintained and enhanced. They are also repositories of significant amounts of taxonomic information, and the potential source of training opportunities for the developing world.

Yet many of these institutions are also resource-poor. Solutions to resolve the taxonomic impediment must address appropriate funding to maintain existing collections as well as providing capacity-building in developing countries, where national collections are absent or poor in quality and maintenance standards.

Role of DIVERSITAS in mobilising the wider community

DIVERSITAS was established in 1991 by a number of scientists from all parts of the world. It is a partnership of international organisations, formed to promote, facilitate and catalyse scientific research on biodiversity-its origin, composition, ecosystem function, maintenance, and conservation. The *DIVERSITAS* umbrella has a number of key Elements, one of which is "systematic inventory-discovering

and describing the world's species". This activity aims to contribute significantly to implementation of Article 7(a) of the CBD by stimulating focused scientific, coordinating and training activities that support and further develop the GTI.

As a global non-governmental group, *DIVERSITAS* has a role in mobilising the wider scientific community to embrace the aims of the GTI, by incorporating taxonomic objectives into the projects it sponsors, and bridging the gap between this community and the decision-makers.

Linkage between the GTI and existing and proposed initiative

In recognition of the fundamental nature of taxonomy to biodiversity research and management, the GTI must be linked to existing biodiversity initiatives and be incorporated into all proposed initiatives.

As the GTI develops, the establishment of a national focal point for taxonomy may be appropriate for some countries. Such a focal point could link taxonomic information derived from systematic studies, ecological studies, economic perspectives and other sources both national and international. It could be a virtual reference centre, rather than a physical one. The amount of information available will depend of course on what is made available by taxonomic institutions around the world. It is clear that a program of digitising large collections to aid information sharing may well need to be undertaken. Such a program, however, needs to be evaluated against other pressing issues in the GTI.

Bioinformatics is essential to enable the GTI to function. At present the Clearing House Mechanism of the CBD (CBD-CHM) is an available, but still developing, resource, and the OECD countries are proposing the establishment of a Global Biodiversity Information Facility (GBIF). This is envisaged as an umbrella facility, which could link regional initiatives, and link with the CBD-CHM. Partnerships between these actual and developing initiatives, and a clear and unambiguous linkage to the GTI as an internationally endorsed process, will be crucial to their success.

Bioinformatics systems must be developed at two levels. First, the basic information on specimen collections must be made available widely, including through the Internet. Internet access facilities in institutions of developing countries are thus also a priority. Second, it is necessary to accelerate innovation in information presentation, such as:

- Species checklists (the Catalog of Life/Species 2000 at the heart of the proposed GBIF is one example here)
- Image-based identification keys
- Automated identification
- Software to help collection management
- GIS related applications for biogeographic aspects

Most important is to develop basic protocols for distributed systems. For some categories of information, eg. mapping protocols, data interchange standards, conservation status of organisms, there are already international standards adopted or endorsed by the Taxonomic Databases Working Group (TDWG), a commission of the International Union of Biological Sciences (IUBS). These standards are being developed *de novo* by sections of the scientific community as commercial products are rarely appropriate.

ANNEXE 1

Guidelines/Criteria for incorporation of Taxonomy within the remit of the Convention on Biological Diversity

Information sharing is part of benefit sharing: we need to free-up and smooth the flow of taxonomic information.

We need to appreciate what biologists themselves see as fundamentally important issues, as these issues may not have been adequately addressed in the CBD.

Areas of taxonomic action which relate to the articles of the Convention on Biological Diversity:

Identification, assessment and monitoring

Collecting, and creation of reference collections to support identification

Rapid assessment methods (indicator groups, higher taxa, morphospecies)

Biodiversity inventories

Molecular assessment methods especially for microorganisms

Assessment of phylogenetic diversity

Conservation

Delimitation of species for conservation action

Identification aids for species on Red Lists, or those that are rare or with limited distributions

Indicator species taxonomy

Reserve site selection criteria based on species richness, endemism

Sustainable use

Identification of resources for harvesting, bioprospecting etc.

Integration of ethnobiological knowledge into mainstream knowledge bases

Predictive phylogenetic tools

Taxonomy of key-stone species for ecosystem services

Sustainable agriculture and forestry

Indicators of sustainable use

Wild relatives of domesticated species

Biological control

Alien species control

Disease control

Cultural use

Identification of resources for ceremonial, subsistence use

Ethnobotanical knowledge sharing

ANNEXE 2

Sample Framework Projects

International marine waters projects.

Background and justification

The deep oceans are the largest biome on earth and oceanic organisms are responsible for half of all global production. The deep oceans are a key component of global biogeochemical cycles that deliver two-thirds of the essential ecosystem productivity needed to maintain our society, but they are one of the least known and most biologically diverse systems.

The developed and developing world jointly manage the resources of the deep oceans. The extent of these resources is only recently becoming appreciated through expeditions involving oceanographic ships and submersibles. Priority needs to be given to making the taxonomic results of these expeditions, especially for those taxa in danger of being lost, generally available to all nations. Coastal and island nations have a particular need for this information to fulfil their obligations under the CBD. Such a program would provide the means for capacity-building through a taxonomic identification support network, with infrastructure in both developed and developing countries. The product would be a geographically referenced database of deep-sea taxa. Nations also have a collective responsibility to monitor change in deep-sea ecosystems and the only available method is the detection of change in taxonomic composition. First priority would be given to providing base-line data, identifying potential indicators and providing tools for future assessments. Such assessments are relevant both to processes of global change and to regional issues concerning economic development (eg. mining, biotechnology prospecting, hydrothermal vents etc.). A further component would be to increase awareness of the unusual life forms in the ocean, and to facilitate involvement of educational institutions and the public in the excitement generated by major discoveries.

Sub-projects

- Deep-sea sediment-dwelling organisms (\$1.5 million)

- Open-ocean primary producers (\$0.5 million)
- Hydrothermal vent organisms (\$0.5 million)
- Commercial fish & by-catch possibilities (\$0.5 million)

Budget

\$3 million

Taxonomy and biogeography of tropical and subtropical leaf beetles (Chrysomelidae, Coleoptera).

Background and justification

This group is part of the megadiverse leaf-eating beetle guild, with great economic significance (agrobiology, food production, forestry) and ecological impact. It is a key component of tropical and subtropical forest and savanna biomes. Many species are virus vectors. They are a group which shows significant differences in diversity and abundance between primary and secondary forest, and have already been used as bioindicators. Some species are also of significance in chemical ecology, through production of secondary metabolic compounds. Many are a perfect model for plant-animal interaction. Their distribution is world-wide, but concentrated in developing countries of the tropics and subtropics. The total number of species is only guessed at, between 150,000 and 400,000.

There are existing networks of active chrysomelid taxonomists, which form a global base upon which to build a more comprehensive effort. The project would develop training and capacity-building through undertaking regional inventories and biogeographic analyses, and developing keys and field identification aids for managers and farmers, and would create a foundation of critical generic revisions through monographs. Training would include both site training, and some training in major institutions. Regional infrastructures, including training and research centres, would be established.

A team of 60 doctoral students, trainees and technicians would be needed with a global supervisory force of 5-8 supervisors.

Sub-projects

- Literature collection
- Regional task force to undertake type revisions
- Collection of distributional data
- Development of keys
- Digitisation of data as it is accumulated
- Development of Web based identification systems

Budget

Yet to be developed

Time frame

This project would take around 10 years to complete.

Pollinating Hymenoptera - their taxonomy, biogeography and ecological specificity.

Background and justification

Pollination (or its failure) in wild and domesticated flora is a significant ecological problem. Lack of understanding of the nature of insect pollinators and their distributions is a major impediment in developing sustainable management of many systems. Lack of capacity-building and training in developing countries is the major impediment to developing this management. Many pollinators are also bioindicators and useful conservation tools. The number of species of Hymenoptera (a major group of insect pollinators) is only vaguely known, but may be between 15 000 and 20 000. Elucidating their taxonomy, biogeography and ecological specificity is of critical importance in the understanding of pollination.

There are some informal networks of hymenoptera taxonomists already in place, and these could form the framework of the project. Hymenoptera are also of interest to, and studied by, amateur naturalists, who could provide valuable assistance in this project.

Sub-projects

- Literature collection
- Species inventory (including synonyms)
- Collection of distributional data
- Development of keys, regional information
- Capacity-building through the formation of regional networks, and cooperation in research methods and in field collecting and collection management
- Regular feedback through regional seminars
- Development of monographs
- Development of Web-based identification systems

Budget & Time frame

Yet to be developed.

Regional and Global Floras of the World.

A number of regional projects to develop Floras are already underway, perhaps more now than at any time in the past. Most of these projects are voluntary, or survive on minimal funding. Their aim is to collate existing information at the species level, develop authoritative and uniform decisions on nomenclature, and provide the keys necessary for identification of the taxa covered. At least some regional floras are in progress on each continent, but there are substantial geographic and content gaps between them. Examples of some existing major regional projects are Flora Neotropica, Flora URSS, Flora Mesoamericana, Flora of China, Flora Malesiana, Flora of North America, Flora of Australia, Flora Zambesiaca, Flora of Tropical East Africa, Flora of Southern Africa, Flora Europaea, etc.

Species Plantarum: Flora of the World (also a voluntary effort) is intended to collate information from existing and future regional (and national) Floras, to provide a uniform account of the vascular plants of the world. The first parts of this series are expected to appear in late 1998. Species Plantarum is a project

of the International Organization for Plant Information (IOPI), which is itself a commission of the IUBS.

Sub-projects

The Floras developed at all levels (national, regional, global) will address different needs and all require support. Development and expedition of national Floras should be encouraged through the CBD mechanisms aimed at national implementation. Support for regional and global Floras should be managed through the GTI mechanisms. This support should be channelled to:

- secretariats involved in publishing and distributing the regional and global Floras, and
- support of taxonomists and taxonomic editors (particularly from developing countries) who will work on the research, compilation and editing of these works, ideally by secondment to existing major taxonomic institutions. This secondment will make a major contribution to capacity-building in taxonomy while simultaneously delivering the tools needed for biodiversity management.

Priority will be given to large species-rich groups, groups of particular importance to the CBD, and groups with high economic potential.

The outputs from this project will be:

- Complete descriptive treatments of all vascular plant families, including keys
- Training of new experts, especially from developing countries, with an aim to double the number of experts in developing countries.
- Establishment and consolidation of regionally standardised databases
- Checklists of currently known taxa (short-term products)
- Identification guides for non-specialists
- Development of tools for utilising taxonomic information for conservation and sustainable use of plant biodiversity

Budget

Up to \$30 million per year.

Time frame

At least 10 years to establish fully functioning projects, with substantial progress in 15-20 years.

Global Program to resolve the Taxonomy of Rubiaceae.

Background and justification

The project is focused on training and strengthening of taxonomic capacity in developing countries, while improving global knowledge of an important megadiverse family. Only a global approach can solve these issues in such an ubiquitous family.

Criteria for selecting Rubiaceae

- Major economic importance (Coffee, Quinine, Timbers, ornamental plants)
- Tropical worldwide distribution
- Megadiverse (perhaps to 12 000 species)
- Important structural component in forest and woodland systems world-wide

- Frequent secondary pioneers - important contribution to regeneration.

An existing network of corresponding taxonomists is in place, but this needs expansion and support if it is to fulfil capacity-building objectives.

Sub-projects.

- Rapid collation of current knowledge, including literature collection, checklist, synonymies, distribution data. This includes a training component, focusing on data-basing techniques.
- Development of user-friendly identification tools for selected regions, groups etc. Training would focus on taxonomic and IT techniques. Liaison with conservation agencies, ethnobotanists, anthropologists and bioprospecting experts will be a key aspect of this phase.
- A contribution to infrastructure, and improving local and regional collections through new collecting. Training would focus on fieldwork and collections management.
- A census/synthesis of the whole family directly contributing to regional and local floras and conservation databases (especially Malesiana, Neotropica, Zambesiaca, Madagascar). Training would focus on conservation technique, flora-writing and editing and taxonomy *ensu lato*.
- State-of-the-art monographs for doctoral projects, involving all modern tools. Training is initiated in the universities, with partnerships developed with local botanical institutes, and cooperation in the field between specialists, supervisors, students, parataxonomists and technicians.

Budget

The overall cost is likely to be \$6-10 million.

Time frame

With an initial "proving" year, three years of collation and five years of active work the project is at least 9 years in length. Throughout there will be emphasis on networking information within and between regions.

Support for DIVERSITAS committee/expert panel.

Background and justification

The DIVERSITAS program has established, as a pilot project, an expert panel to network globally on priority setting and identifying groups and opportunities for projects.

This expert Panel aims to contribute significantly to implementation of Article 7(a) of the CBD by stimulating focused scientific, coordinating and training activities that support and develop further the GTI. Funding is necessary to expedite the work of this panel.

Project

Identification of priorities, gaps, and opportunities

The expert panel will:

- identify successful case studies on systematic inventories at different levels (national, regional and global) and analyse the reasons for their success as possible models for new projects (examples *Southern African Botanical Survey, Flora of Australia, Flora of China, Zoological Catalogue of*

Australia).

- analyse national studies and national reports of the parties to the CBD, as to their content on systematic biology, aiming to use any biosystematic information in such reports to identify needs, priorities, gaps and opportunities for further research projects.
- identify and prioritise (existing and new) projects on taxonomic groups, taking into account factors such as geographical distributions, ecological function and economic relevance. This is directly relevant for virtually all other program elements of *DIVERSITAS*. It is also a prerequisite to fulfilling the obligations under Articles 6-8 of the CBD.

The panel will consult widely, particularly with relevant societies and members of the IUBS. Contributions will be sought from experts, covering the major taxa, the continental regions (terrestrial and freshwater systems), and the other components of biodiversity (marine, soil, microbial).

Budget & Time frame

Yet to be developed.

DIVERSITAS proposal on taxonomy and inventory of inland water biodiversity.

Background and justification

Inland water ecosystems are among the world's most fragile, scarce and threatened ecosystems. Successful long-term conservation of such ecosystems relies on knowledge of their biological diversity.

It is generally assumed that the biodiversity of inland water bodies on the specific level is lower than that of marine ecosystems, whereas the rate of endemism is much higher.

There is an enormous amount of information to be found, often disseminated through many scientific papers, databases, museums collections, theses, reports and unpublished information but there is no inventory of the existing freshwater biodiversity, on either a world-wide and continental basis. As a consequence, many publications related to freshwater present and use inaccurate figures for biodiversity.

The objective of this project would be to provide a reference work on the existing knowledge, based on available data from various sources (publications, reports, data bases, etc.) and on the expertise of recognised specialists.

For each freshwater taxonomic group the project would aim to establish:

- the number of species, genera and families known and estimated worldwide;
- the number of species, genera and families known and estimated for each continent.

For major catchment areas an assessment would be made of what is known of the biota at a range of systematic levels, and of rates of endemism. The project would also identify sources of information (such as literature, institutions, web sites, etc.) and would provide a directory to those sources.

The findings of the project would be published in a CD-ROM and on the internet.

The project would be carried out in two parallel stages, and supervised by a Steering Committee.

- Preparation of lists of species, genera and families of freshwater organisms (including information on their distribution), using all published information and web sites. An additional product would be a directory of relevant web sites. Stage 1 would be completed within a 6-10 month period, by a qualified scientist situated in an institution with access to a large library and Internet communication.
- Organisation of five panels of 6-10 experts each. These panels would evaluate the information gathered in Stage 1, identify the gaps in knowledge and approach the relevant sources (governmental and international agencies, museums, experts, etc.) in order to complete the database.

Budget

Yet to be developed.

Timeline

Completion within 3 years.

Freshwater Fish Taxonomy Initiative For The Americas

Background and justification

It is crucially important to develop a few new pilot projects, bringing together resources of governments, institutions and scientists that will address the critical areas of biodiversity. Ideally such a new initiative should:

- involve a taxonomic group that requires cooperation
- involve taxa with broad geographical distribution
- involve taxa that are relevant for the objectives and priorities of the Convention on Biological Diversity
- yield results in the short term

One group that has been proposed as a group that meets the above criteria are the freshwater fish of the Americas. Significant collections, taxonomic expertise and databases already exist, and any initiative should build upon these efforts in a cost effective manner. National and institutional priorities and capacities will be taken into account in developing this new effort. CONABIO, InBIO, and the Humboldt Institute working with other national institutions could be key partners.

Budget & Time frame

Yet to be developed.

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