THE ROYAL SOCIETY

Published online 23 March 2004

Taxonomy and environmental policy

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In 1992, with the United Nations Conference on Environment and Development in Rio de Janeiro and the subsequent Convention on Biological Diversity (CBD), the world changed for the science of taxonomy. Many taxonomists appear not to have noticed this change, but it has significantly altered the political climate in which taxonomic research is undertaken. By the late 1990s it was clear that effective implementation of the CBD needed the participation of and funding for the taxonomic community. In this paper, I chart the rise of the Global Taxonomy Initiative (GTI), review some of its goals and explore how it interacts with the CBD. The interactions of the GTI with the Global Environment Facility, a potential funding body, are explored, as are the possible synergies between the GTI and the many other global initiatives linking to taxonomy. Finally, I explore some of the challenges ahead as taxonomy begins to take a front seat in the implementation of environmental policy on the world stage.

Keywords: Convention on Biological Diversity; environmental policy; environmental politics; Global Taxonomy Initiative

1. INTRODUCTION

The world of taxonomy changed in 1992, and many taxonomists did not realize it. This was the year of the United Nations Conference on Environment and Development, a highly significant political event that gathered more than 100 world leaders, with a common interest in taking steps to protect the environment. The conference resulted in the adoption of three international legally binding agreements on biological diversity, climate change and desertification, as well as a series of guidelines for sustainable development known as Agenda 21.

The conference was the conclusion of a lengthy negotiation process that took place over several years, building on two decades of important steps to strengthen environmental policy, and to link environment with sustainable development. One of the instruments adopted during that meeting was the United Nations Convention on Biological Diversity (CBD), an agreement that has been ratified by 186 countries so far, and which sets a global framework for actions related to the conservation, sustainable use and equitable distribution of benefits derived from access to genetic resources. The CBD defines biodiversity as 'the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems' (Secretariat to the Convention on Biological Diversity 1992: Article 2).

One of the most significant results of the adoption of the CBD is a seemingly simple but profound political statement: that biodiversity belongs to the nations where it is found. Article 3 of the CBD affirms that 'states have, in accordance to the charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies …' (Secretariat to the Convention on Biological Diversity 1992). Up to this time many sectors in society viewed biodiversity as a common resource, an element that was shared by humankind.

For centuries naturalists and biologists had been exploring the world, collecting, cataloguing and describing biological specimens of plants and animals that serve as the foundation for taxonomy and systematics today. Much of this work was the product of explorations driven by a few large institutions two centuries ago, and resulted in very large biological collections in natural history museums in Europe and North America. With the adoption of the CBD not only are taxonomists and their institutions required to obtain all the necessary permits for collecting specimens from the countries of origin, but they are also required to take steps for the equitable distribution of any benefits derived from the use of genetic resources (ten Kate 2002). In many cases this has resulted in a legal barrier for biological research, which persists in many parts of the world to this day, and which has had the unfortunate consequence of hampering the advance of our scientific quest to understand the world in which we live (Grajal 1999).

Nonetheless, the adoption of the CBD also provides a common framework for policy, opens the door to some degree of standardization, and promotes increased scientific and technical cooperation. More and more countries have developed their individual rules and standards for access to biological specimens over the years, and having some common parameters for access to biodiversity is important for researchers and their institutions. Some of these guidelines have been provided through the recent

One contribution of 19 to a Theme Issue 'Taxonomy for the twenty-first century'.

adoption of the Bonn guidelines for access to genetic resources and benefit sharing (Secretariat to the Convention on Biological Diversity 2002). Furthermore, the CBD has recognized that taxonomy is an important tool for the implementation and monitoring of the CBD, and has developed a Global Taxonomy Initiative (GTI) to strengthen research, scientific cooperation and information exchange in this area. Never before has the work of taxonomists received such a high level of political attention.

This paper presents a summary of the recent developments in environmental policy related to taxonomy, especially the GTI under the CBD, and analyses its impacts and potential consequences. I first describe, in §§ 2 and 3, the process that resulted in the adoption of this initiative. This is followed by an overview of the plan of implementation and the operation within the CBD (§§ 4, 5 and 6). I then analyse, in § 7, the relationship between the GTI and other international initiatives, including other multilateral environmental agreements and science initiatives, as well as progress and problems in the implementation of the GTI. The final section (§ 8) offers some thoughts on challenges and opportunities for the GTI in the future, and the implications that it may have for the work of taxonomists.

2. ORIGINS OF THE GLOBAL TAXONOMY INITIATIVE

The origins of the GTI can be traced back to the negotiation process of the CBD itself, when some of the scientists involved in the process were interested in strengthening research and biological collections as a basis for decision making. Nonetheless, many delegates wanted to make sure that work related to taxonomy was linked to the objectives of the convention, and not driven by scientific curiosity alone (H. Camacho, personal communication). The discussions eventually led to the inclusion of Article 7 of the CBD, related to identification and monitoring of biodiversity, and in particular paragraph (a) which states that parties shall 'identify components of biodiversity important for its conservation and sustainable use', and which provided a list of priorities in Annex 1 of the Convention (Secretariat to the Convention on Biological Diversity 1992).

As with many parts of the Convention, the main text provides only a general framework that is subsequently developed though decisions by a Conference of the Parties, a meeting that brings together representatives from all of the member parties. The issue of taxonomy was raised again at the first meeting of the SBSTTA of the CBD, but a substantive discussion on the importance of taxonomy for the CBD did not take place until the second meeting, held in Montreal in 1996. At this meeting several delegations, led by Australia, stressed the need to overcome the 'taxonomic impediment', in reference to the limited and in some cases eroding capacity to perform basic taxonomic research. 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' (Australian Biological Resources Study 1998).

The establishment of the GTI itself can be traced back to Recommendation II/2 of the SBSTTA of the Convention back in 1996, endorsed by Decision III/10 (1997), which states that 'the Conference of the Parties should consider instructing the GEF to support a GTI, providing the necessary funds for the following actions related to capacity-building in taxonomy:

(i) developing national, regional and sub-regional training programs;
(ii) strengthening reference collections in the countries of origin including, where appropriate, the exchange of paratypes on mutually agreed terms;
(iii) making information housed in collections worldwide and the taxonomy based on them available to the countries of origin;
(iv) producing and distributing regional taxonomic guides;
(v) strengthening infrastructure for biological collections in countries of origin, and the transfer of modern technologies for taxonomic research and capacity building; and
(vi) disseminating taxonomic information worldwide, *inter alia*, by the clearing-house mechanism' (Secretariat to the Convention on Biological Diversity 2003).

3. THE DARWIN DECLARATION

One of the crucial steps in the development of the GTI was a meeting held in Darwin, Australia, in February 1998. This meeting was sponsored by the CBD, the GEF, Environment Australia and the Smithsonian Institution, and brought together experts from a group of countries actively involved in the CBD, as well as several of the leading institutions in the area of taxonomy and systematics. The outcome of this meeting is known as the Darwin Declaration (Environment Australia 1998), a document that was later submitted as an information document to the sixth meeting of the SBSTTA. The publication of the Darwin Declaration was subsequently followed by a meeting held at the Linnean Society of London in September 1998.

The Darwin Declaration was the first meeting of a group of technical experts held under the CBD to address the implementation of the GTI, and was an important milestone in this process. The declaration stressed the importance of biological collections for taxonomy, and also the need to mobilize the information contained in these collections for research and policy. Specifically, the Darwin Declaration recommended eight priority actions (Environment Australia 1998).

(i) National governments and authorities responsible for museums and herbaria should invest, on a long-term basis, in the development of appropriate infrastructure for their national collections. As part of that investment, donors, both bilateral and multilateral, in their commitment to the conservation and

sustainable use of biological diversity in countries where they provide investment support, should support infrastructural needs of collection-holding institutions.

(ii) National governments and international donors should encourage partnerships between institutions in developed and developing countries so as to promote scientific collaboration and infrastructure rationalization. Such collaboration should include the development of national, sub-regional, regional and global training initiatives. Taxonomic institutions in each nation, both individually and regionally, should develop national priorities in taxonomic training, infrastructure, new technology, capacity building and market needs.

(iii) National governments and authorities should adopt internationally agreed levels of collection housing (climate control, fire protection systems, pest control, acceptable levels of workplace health and safety) that ensure protection of collections and the well-being of all people working on and accessing collections.

(iv) National governments and international donors should provide training programmes at different educational levels, relevant to the needs of individual countries, including vocational, technical and academic training. National governments should also recognize that ongoing employment for trainees is part of an effective training scheme.

(v) National governments and authorities should use information systems to maximum effect in taxonomic institutions. In developing priority-setting criteria for information products, taxonomic institutions should consider the needs of the wide range of users of that information, including biodiversity managers. In particular, taxonomic information, literature and checklists should be put into electronic form.

(vi) Parties to the CBD should report on measures adopted to strengthen national capacity in taxonomy, to designate national reference centres, and to make information housed in collections available to countries of origin.

(vii) Institutions, supported by national governments and international donors, should coordinate their efforts to establish and maintain effective mechanisms for the stable naming of biological taxa.

(viii) OECD governments should endorse and support the recommendations from the OECD Megascience Forum's Working Group on Biological Informatics, regarding the development of the GBIF to allow people in all countries to share biodiversity information and to provide access to critical authority files.

The declaration also recommended the establishment of a position for a GTI coordination officer at the Secretariat of the CBD, a step that was later adopted by the Conference of the Parties and initially funded by the governments of Australia, Sweden and the UK. It also called for the use of the clearing-house mechanism of the CBD to promote scientific and technical cooperation in the area of taxonomy, and to facilitate the exchange of information housed in biological collections. This document would serve as the basis for the development of a more comprehensive plan for implementation.

4. THE GLOBAL TAXONOMY INITIATIVE PLAN OF IMPLEMENTATION

The adoption of the GTI was an important step for the CBD, and one the most significant recognitions of the importance of taxonomy by governments worldwide. Once the political decision was in place, it was important to develop a strategic plan for its implementation, and to have the parties to the CBD and other relevant actors take the necessary steps to bring about the desired change. One important aspect of the adoption of the GTI was that it was seen by many of the large natural history museums and the scientific community at large as a mechanism to link their work to the CBD. Nonetheless, the perception of some delegates within the CBD was that the GTI was an initiative driven by science, without a clear link to the overall structure and objectives of the CBD. It was therefore important to develop a broader framework to show how taxonomy could relate to national priorities and the plans of the convention, and this would come about through the adoption of Decision VI/8 of the Conference of the Parties (COP) in May 2002.

The GTI Programme of Work is one of the most detailed and coherent decisions produced by the CBD so far, and may have a substantial impact in the field of taxonomy and the CBD itself in the long term. It is a comprehensive document that clearly sets out a strategy, planned activities, expected products, timelines, lead actors and resources needed. The plan itself was important in that it provided a good framework to articulate the GTI to the overall objectives of the Convention. The programme of work for the GTI consists of five general operational objectives outlined in figure 1 (Secretariat to the Convention on Biological Diversity 2002, 2003).

(i) Assess taxonomic needs and capacities at national, regional and global levels for the implementation of the Convention.

(ii) Provide focus to help build and maintain the human resources, systems and infrastructure needed to obtain, collate and curate the biological specimens that are the basis for taxonomic knowledge.

(iii) Facilitate an improved and effective infrastructure or system for access to taxonomic information; with priority on ensuring that countries of origin gain access to information concerning elements of their biodiversity.

(iv) Within the major thematic work programmes of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

(v) Within the work on cross-cutting issues of the Convention, include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

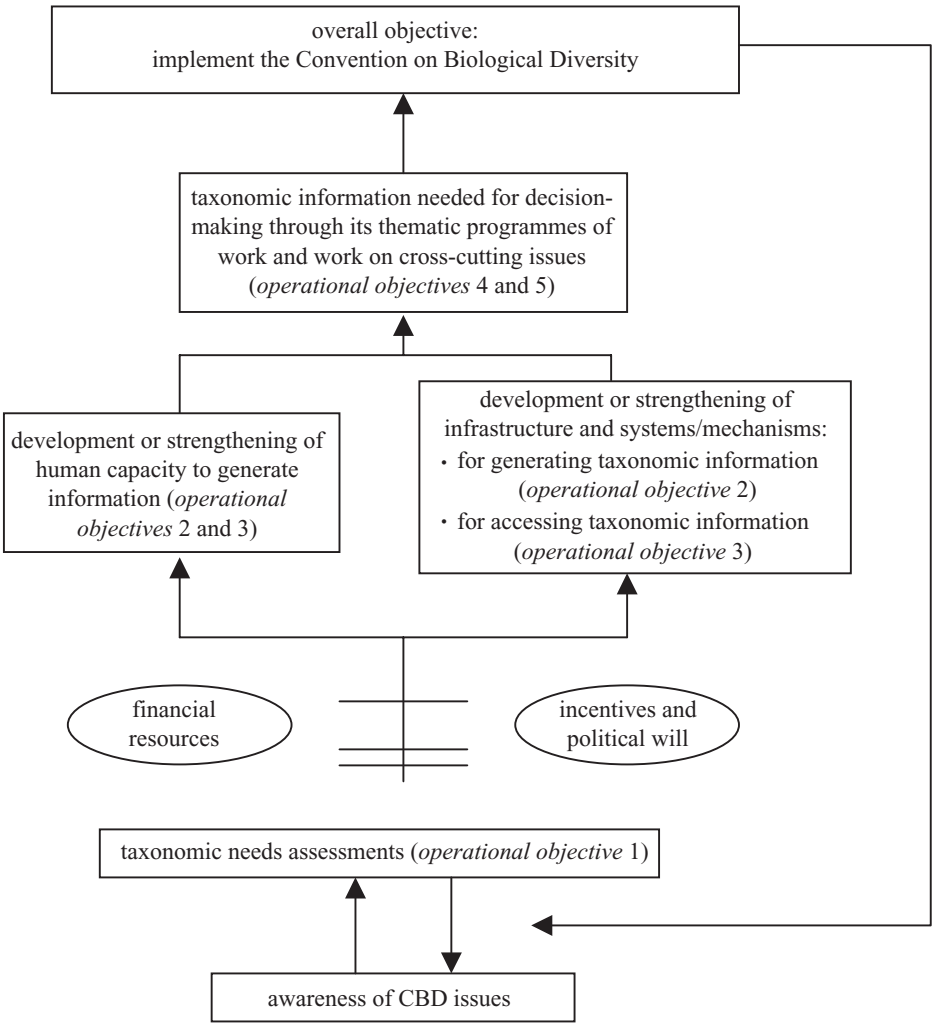

Figure 1. Operational objectives of the programme of work of the GTI. (Adapted from Decision VI/8 of the Conference of the Parties of the CBD, held in The Hague in 2003; see CBD website at http://www.biodiv.org/convention/result.aspxid=7182.)

I will not provide a detailed list of proposed activities under each of these objectives, and would invite the reader to obtain them along with other COP Decisions relevant to the GTI, at http://www.biodiv.org/programmes/cross-cutting/taxonomy/decisions.asp. I would, however, like to point out that many relevant national, regional and international projects and initiatives are identified as pilot projects within the plan, which means they are recognized as such by the CBD and parties to the convention.

5. THE GLOBAL TAXONOMY INITIATIVE IN THE CONTEXT OF THE CONVENTION ON BIOLOGICAL DIVERSITY OPERATIONS

The establishment of the CBD has and will have profound impacts of the work of taxonomists, and the adoption of the GTI provides a unique opportunity to link taxonomy to the needs of society. As with any of the international processes, the impact will depend on the degree to which the GTI is effectively implemented, and it is therefore relevant to understand the operations of the CBD.

It is important to remember that the CBD is a legally binding instrument, but it is implemented almost entirely at the national level by governments. The impact of the establishment of the GTI and the adoption of the plan for its implementation will depend on the extent to which parties take steps to make it happen and appropriate the necessary resources needed. It is interesting to note that a few governments have already identified this issue, and started to address it at the national level, as is the case with the UK (House of Lords 2002). The only mechanism to measure compliance by the parties to the decisions is through their national reports to the CBD, and only two sets of reports have been submitted so far. The first set of reports focused on the general measures related to the implementation of Article 6 of the CBD, whereas the second reports were a comprehensive checklist of decisions, without too much depth in the information required. A survey done by the Secretariat of the CBD based on a subset of the second national reports indicates that only 7% of the responding parties had carried out an assessment of taxonomic capacities and needs by May 2002. We will not be able to determine the impact of the GTI until a detailed thematic report on the GTI is submitted by the parties at a future date.

Decisions by the Conference of the Parties provide guidance to the parties, the secretariat, the scientific advisory body (SBSTTA), the financial mechanism (GEF) and other relevant bodies. The secretariat of the CBD itself

does not itself implement the decisions, and its activities are more related to developing guidance, monitoring implementation through national reports and facilitating the exchange of information. The driving force behind the development and monitoring of the GTI will most probably reside with the SBSTTA. Several additional steps have been taken to ensure the momentum is not lost, namely the designation of national focal points to the GTI and the establishment of a GTI coordination mechanism, and a series of regional workshops to identify needs and opportunities in different continents.

The latest report on progress of the GTI was prepared in May 2002 and presents some of the advances in these areas (UNEP/CBD/COP/6/INF/2). The report shows that progress so far has been slow, as reflected by the fact that only 45 parties have designated national GTI focal points to date. A GTI coordination mechanism was also established based on nominations, and includes delegates from 10 countries (Canada, China, Costa Rica, France, Jamaica, Japan, Kenya, Namibia, The Netherlands and the Russian Federation), as well as several international organizations and initiatives (e.g. BioNET International, DIVERSITAS, Food and Agriculture Organization, GBIF).

Recognizing that the capacities, needs and opportunities may be different around the world, the GTI has also organized a series of regional workshops. The first such meeting was held in February 2001 in Costa Rica, and participants identified human resources, access to information and alliances as their top priorities (Herrera 2001). A second regional meeting was held in South Africa in March 2001, and participants identified the need for increased collaboration, the establishment of centres of excellence, capacity building, exchange of information and funding as priorities (Klopper *et al.* 2001). The last of the regional workshops so far held, in Malaysia in September 2002, noted that no single country in the region had the expertise or funding to fully document all its biodiversity. The four major stumbling blocks for taxonomy in the region were identified as lack of research funds, inadequate staffing levels and an ageing taxonomic workforce, high running costs and difficulty of access to taxonomic literature and libraries. The workshop also developed a regional version of the GTI Program of Work (Wilson *et al.* 2003). Another workshop was held in Pretoria in 2003 in conjunction with BioNET International, which was focused on demand-driven taxonomic capacity building, and centred largely on implementation of the GTI. This gave rise to a strategy for capacity building that has since been developed further, and includes elements to help secure funding and political support for capacity building in taxonomy.

6. THE GLOBAL TAXONOMY INITIATIVE AND THE FINANCIAL MECHANISM OF THE CONVENTION ON BIOLOGICAL DIVERSITY

The ratification of the CBD by a country means a commitment to take steps for the conservation of biodiversity, the sustainable use of its components and the fair and equitable distribution of benefits derived from the use of genetic resources. Increasing responsibilities will invariably need additional financial resources, and parties agreed to 'provide financial support and incentives in respect of those national activities which are intended to achieve the objectives of this convention' (CBD, Article 20; Secretariat to the Convention on Biological Diversity 1992). Furthermore, Parties from developed countries recognized the need to 'provide new and additional financial resources to enable developing country Parties to meet the full agreed incremental costs to them of implementing measures which fulfill the obligations'. The incremental cost refers to those additional costs that a country would have in implementing the provisions of the CBD, and is estimated by estimating the baseline investment made by countries and subtracting it from the total cost of an initiative.

As with the other environmental agreements adopted in 1992, the CBD includes provisions for the establishment of a financial mechanism. Article 21 of the CBD states that 'there shall be a mechanism for the provision of financial resources to developing country Parties for purposes of this convention on a grant or concessional basis', and that this would operate under the guidance of the Conference of the Parties. The first Conference of the Parties decided to use the GEF as the interim financial mechanism, instead of establishing a separate financial entity. The GEF also serves as the financial mechanism for climate change, ozone, and more recently, persistent organic pollutants. The second funding cycle of the GEF included some 2900 million US dollars, of which slightly over one billion was destined for projects related to biodiversity.

It is important to note that the GEF is a separate body from the CBD, with a governing council made up by representatives from 30 donor and recipient countries. This council is in charge of setting the overall priorities for the GEF, approving operational programmes, and also approving projects over one million US dollars. Although the GEF is supposed to respond to the guidance provided by the CBD, the GEF decided not to establish an operational programme on taxonomy, and instead to build taxonomy into projects under existing operational programmes. This separation between the Conference of the Parties of the CBD and the GEF Council has generated some tension, and has probably slowed progress in the implementation of the GTI. Only 10 projects that include a substantial taxonomic component were approved in the first two funding cycles of the GEF, and the total amount of funds granted by the GEF was slightly over 45 million dollars, mostly for African countries (table 1). Undoubtedly all GEF biodiversity projects will include some aspect related to taxonomy, but it is unlikely that this approach will have the kind of impact envisioned by the GTI.

7. THE GLOBAL TAXONOMY INITIATIVE AND OTHER INTERNATIONAL INITIATIVES

The scientific community has been active in developing international initiatives in the area of taxonomy and systematics, and the CBD has recognized them and the need to engage them as part of the GTI. These include BioNET International, Species 2000 and the GBIF, among others. Each of them can contribute to the implementation of the GTI, and it is essential that the CBD welcome their contributions and develop effective partnerships with them, and several agreements have been signed to this effect.

Table 1. Projects with significant taxonomic components funded by the GEF (www.gef.org).

country	title	funding (US$, $\times 10^6$)	year
Indonesia	biodiversity collections	7.2	1992
global	alternatives to slash and burn agriculture	3.0	1993
Turkey	*in situ* conservation of genetic diversity	5.1	1993
Southern Africa	inventory, evaluation and monitoring of botanical diversity in Southern Africa: a regional capacity and institution building network	4.72	1996
Costa Rica	biodiversity resources development	7.27	1997
Sri Lanka	conservation and sustainable use of medicinal plants	5.42	1997
African	participatory management of plant genetic resources in oases of the Maghreb	3.08	1998
Egypt	conservation and sustainable use of medicinal plants in arid and semi-arid ecosystems	4.29	2000
South Africa	the greater Addo elephant park conservation project	10.0	2000
Cameroon	community-based conservation in the Bamenda highlands	1.0	2000

One of the first attempts to have a common agenda for systematics research was the preparation of Systematics Agenda 2000 (Anon. 1994). Originally developed as a North American Initiative, it was later expanded to become a global agenda and adopted by the International Union of Biological Sciences. Systematics Agenda 2000 sets out three missions, and provides a roadmap for the research community.

(i) To discover, describe and inventory global species diversity.
(ii) To analyse and synthesize the information derived from this global discovery effort into a predictive classification system that reflects the history of life.
(iii) To organize the information derived from this global programme in an efficiently retrievable form that best meets the need of science and society.

BioNet International (http://www.bionet-intl.org) consists of a series of regional taxonomy networks, working to build the capacity needed for taxonomy at a regional level. Since 1993 it has established seven LOOPs around the world. The main focus of its activities is in the area of scientific and technical cooperation and capacity building, one of the critical components of the GTI. BioNet has developed a close working relationship with the CBD, as exemplified by a joint meeting held in South Africa in 2002. The last three LOOPs to be formally established after governmental approval all based the rationale for their development on the GTI and implementation of its programme of work.

Species 2000 (http://www.sp2000.org/) is an initiative that resulted from a meeting sponsored by the UNEP and the GEF in the Philippines in 1996, with the objective of enumerating all known species of organisms on Earth. It has joined efforts with the Integrated Taxonomic Information Service (ITIS; www.itis.usda.gov) to produce the Catalogue of Life, a decentralized system of databases managed by organizations, organized by taxonomic groups, and covering some 40% of known taxa (viruses, bacteria, corals, molluscs, Crustacea, Diptera, ichneumon wasps, moths and butterflies, curculionid beetles, fishes, birds, mammals, fungi, cacti, palms, legumes, umbellifers and fossil plants). It is an initiative that is driven primarily by taxonomists and taxonomic institutions.

One of the most recent and ambitious initiatives is the establishment of the GBIF in 2000 as a result from a recommendation of the OECD Megascience forum (www.gbif.org). GBIF's mission is to make the world's biodiversity data freely and universally available using the Internet, addressing some of the problems with the inequality in the distribution of biodiversity information among countries. An important decision in the establishment of GBIF was to open the facility to participation of all countries, and to develop it within the framework of the CBD. The first steps taken by GBIF include the establishment of the digitization of natural history collections, developing an electronic catalogue of names of known organisms, developing systems for database access and database interoperability, and an outreach and capacity-building initiative.

All of these initiatives have recognized the importance of the GTI, and are actively working to collaborate in its implementation. Most of them are focusing on the compilation, organization and dissemination of information, and to some extent to capacity-building efforts. Several other initiatives and organizations are focusing on selected taxonomic groups, and can also contribute to the implementation of the GTI.

8. THE CHALLENGES AHEAD

The adoption of the GTI by the CBD is an important step, as it is the first time that the importance of taxonomy has been recognized at the highest political level. For too many years taxonomists have worked in their institutions, isolated from decision makers and leaders in our society, and with limited support for their activities. It is time to bridge this gap. The GTI provides a global framework that can bring together existing international initiatives, mobilize additional resources, and promote scientific and technical cooperation, essential to tackle the challenge of completing a global inventory of life on Earth.

One of the problems that we need to be overcome in this process is the inequity in the distribution of taxonomic capacity and information around the globe. Most of the

biodiversity is found in tropical countries, precisely those where taxonomic capacity is the weakest. Although taxonomy and systematics need to be seen as a global enterprise, we must seek to increase capacity at the national and regional levels. This will not only increase our capacity to generate new knowledge substantially, but empower people to use it in their own countries to address their national needs. There is a clear need to have increased coordination, and an important role for institutions and collections with a global perspective, but not at the expense of national and regional initiatives. In this regard I would group our main challenges ahead in four broad categories: (i) mobilizing existing information; (ii) building institutional capacity; (iii) generating new knowledge; and (iv) integrating taxonomic information with other disciplines and the needs of society.

Perhaps the area where most progress has been made in recent years is in mobilizing and integrating information. It is clear that there is a wealth of information housed in biological collections around the world, as well as in published literature and in the minds of taxonomists. Technological developments in the area of informatics and communications give us the tools we need to organize distributed information (Godfray 2002; Wilson 2003), and progress has been made in developing common standards. Initiatives such as the Catalogue of Life (www.sp 2000.org) or the GBIF (www.gbif.org) are good examples of steps in this direction. There are still problems that need to be resolved, such as quality control of data, including the issue of synonyms, also the potential for comparing and using more than one classification, and inter-operability issues between specimen-level and species-level data. Nonetheless, this is one area where the time is right to mobilize financial resources at a much greater level to see results in the short term.

The main problem may still reside with the need to build the institutional capacity for taxonomy in both developed and developing countries. Natural history museums in developed nations have been facing a steady base erosion of financial resources for many years, and the basic expertise in taxonomy is being lost with the new generations of scientists. These institutions are not eligible for resources managed under the GEF, and progress in securing additional resources in their own countries is limited, so their ability to deliver knowledge as part of a global effort is hampered. However, the institutional capacity in developing countries is still limited, which is where most of the work needs to be done. We often face the situation where taxonomists are being trained, but they do not have the institutions and resources to perform their work in developing countries. Some countries have taken steps to establish national institutions to coordinate biodiversity efforts, such as in Australia (www.deh.gov.au/biodiversity/abrs), Mexico (www.conabio.gob.mx) or Colombia (www.humboldt.org.co). Still, there is a clear need for strong institutions that can be part of this global effort, increased scientific and technical cooperation through the GTI, and access to financial resources through the GEF and other sources that will be essential to achieve this goal.

The third challenge is related to generating new taxonomic information. We are far from completing the inventory of life on Earth; whole areas of the planet remain to be explored, and many taxonomic groups are poorly understood. New explorations into poorly known geographical areas have been limited by lack of available resources, lack of available expertise and, at least in some cases, political violence and legal barriers. The most effective way to fill in these gaps will be through explorations led by national institutions and scientists, in collaboration with outside experts. This approach has been followed successfully in the case of Costa Rica by the Instituto Nacional de Biodiversidad (InBio; www.inbio.org.cr), through the training of parataxonomists to perform field surveys, and an extensive network of experts from around the world to assist with identifications. Most of these surveys focus on a subset of taxa, and many of the poorly known groups are not surveyed. There have been some initiatives to undertake all-taxa species inventories in a few areas, such as in Guanacaste (Costa Rica), the Smoky Mountains and Hawaii (USA), but these are complex and expensive initiatives that will need to be replicated in many other parts of the world in the future. In some cases the use of new technologies like digital imaging (Gaston & O'Neill 2004) and DNA barcoding (Blaxter 2004) may enhance taxonomic research (Pennisi 2003), but this will not replace the need for basic taxonomic expertise.

Taxonomic information is essential for biological research, and without this knowledge progress in other disciplines will be limited. It is essential to provide better links between the work of taxonomists and other disciplines, and also to show the importance of taxonomy for society at large. There are many areas where basic taxonomic information is directly linked to everyday needs, such as in the management of fisheries, integrated pest management in agriculture, and identification of invasive species. The approach suggested by the GTI plan of implementation is exactly that, showing the importance of taxonomy for the various work programmes and activities of the CBD.

The work of taxonomists has taken place in a different political context since 1992. The adoption of the CBD and the GTI represent an important step for society and an exciting opportunity for the scientific community. Let us embrace it and work to better understand the world in which we live.

This manuscript was produced under the auspices of the National Museum of Natural History of the Smithsonian Institution. Particular thanks go to the staff of the Caribbean Coral Reef Ecosystems (CCRE) programme in Belize for their hospitality during its preparation. I thank Chris Lyal, Len Hirsch, Scott Miller and Jorge Soberón for their helpful comments, Alex Monro for preparing the figure and Sandra Knapp for the invitation to make this contribution.

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GLOSSARY

CBD: Convention on Biological Diversity
COP: Conference of the Parties
GBIF: Global Biodiversity Information Facility
GEF: Global Environment Facility
GTI: Global Taxonomy Initiative
LOOP: locally organized and operated partnership
OECD: Organization for Economic Cooperation and Development
SBSTTA: Subsidiary Body on Scientific, Technical and Technological Advice
UNEP: United Nations Environment Programme