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GLOBAL TAXONOMY INITIATIVE: RESULTS AND LESSONS LEARNED FROM REGIONAL TAXONOMIC NEEDS ASSESSMENTS AND IDENTIFICATION OF PRIORITIES

Note by the Executive Secretary

EXECUTIVE SUMMARY

At its sixth meeting, the Conference of the Parties to the Convention on Biological Diversity adopted the programme of work for the Global Taxonomy Initiative (GTI) (decision VI/8, annex), in order to provide necessary support to the Convention's other programmes of work on thematic areas and cross-cutting issues.

The Conference of the Parties, at its ninth meeting, identified "outcome-oriented deliverables" as relevant outputs of the programme of work of the GTI (decision IX/22, annex). Output 1.2.1 of the adopted outcome-oriented deliverables calls for the completion of at least one pilot regional needs assessment within a United Nations subregion, integrated with implementation of a thematic area or cross-cutting issue of the Convention on Biological Diversity, by the end of 2009.

In paragraph 15 of decision VIII/3, the Conference of the Parties requested the Secretariat to convene, with support from relevant organizations and donors, a project-development seminar aimed primarily for those countries that have already identified taxonomic needs or that have submitted proposals for pilot projects under the Global Taxonomy Initiative.

In summary, the results of needs assessments and lessons learned are:

(a) By 2006, 41 per cent of the Parties reported that a national-level taxonomic-needs assessment has been conducted. Regional workshops for the Global Taxonomy Initiative were held in Africa, Central America, Asia and Oceania;

(b) A notable theme raised by many national and regional assessments is the requirement for check-lists of names of known species, both scientific names and vernacular names in local languages, with additional information regarding geographic distribution, abundance, endangered status, conservation status, pest/invasiveness status, socio-economic importance and other relevant contextual information;

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(c) Project development in the countries where taxonomic-needs assessments have been completed is at an initial stage, for example, in Africa and the East and South-East Asian subregions;

(d) Progress towards outcome-oriented deliverables has been mixed. In some cases, the development of coordinated taxonomy information systems, such as globally accessible checklists, digital specimen information and digitalized literature, results were exceeding targets. In others, for example, information provision to support decision-making specifically in thematic areas of the Convention has been less encouraging;

(e) Innovative approaches to facilitate inventorying and monitoring of the components of biodiversity or taxa, such as DNA barcoding,¹ made significant progress. Further advancement of DNA barcoding as a tool for inventory and monitoring will require international collaboration at global and regional levels, appropriate agreements being reached under access and benefit-sharing legislation,² appropriate storage conditions introduced by collection-holding institutions to preserve DNA, provision of access by those institutions to specimens held, and availability of taxonomic experts to provide information on classification;

(f) Capacity-building initiatives must be enhanced to enable the establishment of adequate taxonomic expertise for major groups of taxa, including invertebrates and micro-organisms, in all regions, including small island developing States, to underpin the implementation of the Convention;

(g) Progress was made on the establishment of a special fund for the Global Taxonomy Initiative. Its governance, objectives and marketing campaign were discussed by relevant stakeholders in June 2009. The goal remains to establish a fund in 2010.

A draft of this note was posted for comments from 5 December 2009 to 20 December 2009 under notification 2009-156, and comments were incorporated as appropriate.

SUGGESTED RECOMMENDATIONS

The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) may wish to recommend that the Conference of the Parties adopt a decision along the following lines:

The Conference of the Parties

1. *Recognizing* limited progress on taxonomic needs assessments at the national level, *urges* the Parties and other Governments to conduct taxonomic needs assessments with particular regard to end-users' needs coupled with capacity assessments that are necessary at national, regional and global levels, if assessments have not already been conducted;

2. *Acknowledging* the progress made at the global level with determining priority taxonomic needs for invasive alien species management, *encourages* Parties, other Governments and relevant organizations to determine priority in the thematic areas and cross-cutting issues of the Convention, taking into account the regionally specific needs in taxa and regionally determined capacity-building needs, following the best practice examples of BioNET-INTERNATIONAL;

3. *Encourages* Parties and other relevant organizations to make relevant data available in response to the information needs identified as national and regional priorities in assessments and

¹ DNA barcoding is a technique for characterizing species of organisms using a short DNA sequence from a standard and agreed-upon position in the genome. For example, the Cytochrome C Oxidase subunit 1 mitochondrial region (COI) is taken as the standard barcode region for higher animals. DNA barcoding makes rapid species identification available with very low cost laboratory processes. Currently, a 2–5 USD cost per sample and 90 min throughput time are reported. Uses of DNA barcoding may greatly help non-taxonomists to identify species in, *inter alia*, conservation projects, for controlling agricultural pests, identifying invasive alien species and disease vectors, detecting illegal trade of materials obtained from the market and monitoring water quality. According to the BOLD systems (v.2.5), 989,177 specimens, 98,215 species of animals, fungi, plants and protists have been barcoded, as of November 2009. For further information, go to <http://www.barcoding.si.edu/>

² www.cbd.int/doc/meetings/abs/abswg-08/information/abswg-08-inf-06-en.doc.

elsewhere such as, *inter alia*, information and expertise to manage invasive alien species and the known endangered species.

4. *Requests* the Executive Secretary, with the assistance of the Global Taxonomy Initiative Coordination Mechanism and in collaboration with relevant international organizations, to hold project development seminars in all subregions, building on the seminar held in Nairobi in November 2009, and develop tools to supplement the Guide for the Global Taxonomy Initiative in order to further facilitate development of fundable projects;

5. *Urges* Parties and other Governments to endorse GTI-related project proposals relevant to their national biodiversity strategies and action plans prepared in collaboration with national, regional and global partner organizations and networks, to facilitate the process of project funding by the Global Environment Facility and other relevant donors;

6. *Noting* that existing capacity to meet the identified needs is not adequate at the national level, *encourages* Parties and other Governments to facilitate the development of the needed capacity, in collaboration with global, regional and subregional networks to benefit by the use of sharable taxonomic knowledge and heritage, by enhancing the activities of in-country collections of referenced specimens, DNA barcoding and training courses both for the users of taxonomic information and for young professional taxonomists;

7. *Considering* that national conditions for the movement of biological material across national borders are not consistent even for non-commercial research, *urges* Parties and *invites* the other Governments and organizations to consider appropriate conditions under an international regime on access and benefit-sharing to maximize scientific collaboration and to facilitate technology transfer, *inter alia*, DNA-sequence-based taxonomic research;

8. *Recognizing* that the number of professional taxonomists is predicted to decrease and that the rapid accumulation of information in DNA sequences will require an expansion of taxonomic expertise in order to maximize the potential of new technologies for a wide range of biodiversity assessments, *encourages* Parties and other Governments to enhance the activities of taxonomic institutions to provide job opportunities for young taxonomists and to strengthen the taxonomic capacity to conduct appropriate training for parataxonomists and relevant end-users of taxonomy at national, regional and global levels;

9. *Further recognizing* that the capacity to inventory and monitor biodiversity by using new technologies, such as DNA barcoding and other relevant information technology is not adequate in many parts of the world, *invites* the Global Environment Facility (GEF) and other donors to review the priority areas and funding schemes to meet the needs of taxonomic capacity-building in order to address science-based biodiversity conservation and sustainable use of biodiversity;

10. *Welcomes* the progress on the establishment of a Special Fund for the Global Taxonomy Initiative and *acknowledges* with gratitude the work of BioNET-INTERNATIONAL and relevant networks and organizations and Parties contributing to the development and promotion of the sponsorship strategy and global campaign, and *encourages* Parties and *invites* other Governments and organizations to respond to the campaign to make the trust fund operational.

I. INTRODUCTION

1. In paragraph 4 of decision IX/22, the Conference of the Parties endorsed a set of outcome-oriented deliverables as relevant outputs of the programme of work on the Global Taxonomy Initiative and urged Parties and invited other Governments and relevant organizations to carry out the activities planned in the programme of work. In the same paragraph, the Conference of the Parties requested the Executive Secretary to report on progress in these matters to the tenth meeting of the Conference of the Parties and to a meeting of the Subsidiary Body of Scientific, Technical and Technological Advice prior to the tenth meeting of the Conference of the Parties.

2. Output 1.2.1 of the outcome-oriented deliverables calls for the completion of at least one pilot regional needs assessment within a United Nations subregion, integrated with implementation of a thematic area or cross-cutting issue of the Convention on Biological Diversity, by the end of 2009, and notes that results and lessons learned can be placed before the fourteenth meeting of the SBSTTA and disseminated by the clearing-house mechanism.

3. In paragraph 15 of decision VIII/3, the Conference of the Parties requested the Executive Secretary to convene, with support from relevant organizations and donors, a project-development seminar aimed primarily for those countries that have already identified taxonomic needs or that have submitted proposals for pilot projects under the Global Taxonomy Initiative.

4. Section II of the present note reports on the implementation of the outcome-oriented deliverables, in particular progress on output 1.2.1; section III reviews progress on project development to meet identified needs, including the project-development seminar convened by the Executive Secretary; and section IV contains some conclusions in the form of lessons learned.

II STATUS OF OUTCOME-ORIENTED DELIVERABLES, IN PARTICULAR OUTPUT 1.2.1, ON REGIONAL AND GLOBAL TAXONOMIC NEEDS ASSESSMENTS

5. Various activities have been carried out to implement the programme of work on the Global Taxonomy Initiative. The table on pages 12-16 below summarizes progress as monitored by the members of the GTI Coordination Mechanism and others on the outcome-oriented deliverables endorsed by the Conference of the Parties in decision IX/22. Specific reports on taxonomic needs assessments are presented below.

A. *At the national level*

6. Many Parties have assessed their taxonomic and related capacity-building needs. The information gathered through national and thematic reports, regional workshops and NBSAPs is compiled at www.cbd.int/doc/programmes/cro-cut/gti/gti-needs-summary-en.pdf and summarized at www.cbd.int/gti/needs.shtml.

7. The results of the three cycles of national reports showed that some 79 countries (41 per cent of the Parties) had conducted a national taxonomic-needs assessment by the year 2006. No national needs assessments have been reported after 2006. Most of the Parties reported that needs assessment was at an early stage or remained at basic levels, and details of the needs were not always given in such a way that clear analysis of priorities could be made. In addition, the format of each assessment was not consistent, and it was very difficult to merge the information to assess regionally or globally important needs out of the existing results of national assessments.

8. The limited progress on national taxonomic-needs assessments was explained in the national reports as due to insufficient in-country taxonomic expertise.

B. At the regional level

9. At the regional level, the following observations can be made with regard to output 1.2.1:

(a) Prior regional and subregional assessments of needs and/or capacity have been carried out in Central America (UNEP/CBD/SBSTTA/6/INF/4/Add.1), Africa (as a part of the GTI workshop in 2001 and as part of the Southern African Botanical Diversity Network (SABONET) project in 2002), Asia and Oceania (as a part of the first and second Global Taxonomy Initiative regional workshops in Asia-Oceania held in Malaysia in 2003 and in New Zealand in 2004 (UNEP/CBD/SBSTTA/9/INF/17)), and on plant pathogenic organisms, and arthropods in members of the Association of South-East Asian Nations (ASEAN) in October 2001 and May 2002 as part of the collaborative activities of BioNET-ASEANET/Australia. Between 1993 and 2004, Parties and other Governments also conducted preliminary prioritizations of needs when establishing regional Locally Owned and Operated Partnerships (LOOPs) affiliated to BioNET-INTERNATIONAL. The regional GTI workshops helped trigger the assessment of national needs, especially in developing countries. For example, SABONET, identified the following taxonomic needs:

- (i) Up-to-date correct name lists for the entire flora of Southern Africa;
- (ii) Standard species list with the following components:
 - a. Endemic species; red-data species; alien species; invasive species/weeds;
 - b. Conservation status; economically important species; medicinal plants;
- (iii) Web-based integrated botanical information systems with digital images, scientific name including synonyms, distribution, specimen, taxonomic literature;
- (iv) Expansion of herbarium collections and involvement of conservation agencies and amateur taxonomists;
- (v) Plant identification service; and
- (vi) General training for parataxonomists, traditional healers and others with extensive literature courses;

(b) In relation to output 1.2.1 from decision IX/22, two regional assessments have been undertaken by BioNET-INTERNATIONAL. BioNET-PACINET (the Pacific Islands partnership for taxonomy led by University of South Pacific, Secretariat of the Pacific Community and the South Pacific Regional Environment Programme) undertook a survey of stakeholder needs. In the East Africa subregion, a regional assessment by the BioNET-INTERNATIONAL Taxonomy for Development in East Africa (UVIMA) project was undertaken by BioNET-EAFRINET with support from Kenya, Uganda, the United Republic of Tanzania, Sweden and Switzerland. This assessment examined end-user needs relating to invasive alien species, pollinators and pests, building on the results of the earlier Botanical and Zoological Taxonomic Networks for Eastern Africa (BOZONET) GEF PDF-B assessment in the region;

(c) The BOZONET project, supported by the Global Environment Facility, conducted interviews and administered open-ended questionnaires, which were reviewed by national consultants in Ethiopia, Kenya, Uganda and the United Republic of Tanzania in 2006, and held a workshop on taxonomic needs, capacity and lessons learned in the activities of SABONET and others;

(d) This survey concluded that major end-users of taxonomy are not only those engaged in the implementation of the Convention on Biological Diversity, but also international organizations responsible for the administration of health (WHO), food (FAO), trade (WTO, IPPC) and conservation (CITES, CMS) agreements;

(e) The needs assessment for plant pathogenic organisms and arthropods in ASEAN countries was conducted in 2001 and 2002 by BioNET-ASEANET and CAB International with support from Australia. This was followed by a survey on plant health capabilities in Southeast Asia in collaboration with CAB International South-East Asia Regional Centre. A series of capacity-building activities has resulted in cooperation with Australia, strengthening collections and information relevant to the management of invasive alien species management, pests and pollinators and supporting biosecurity/sanitary and phytosanitary measures and the objectives of the Convention on Biological Diversity;

(f) The first and second Global Taxonomy Initiative Regional Workshops in Asia-Oceania were held in Putrajaya, Malaysia, in 2002 and Wellington, New Zealand, in 2004 (UNEP/CBD/SBSTTA/9/INF/17). They identified regional taxonomic needs in the following areas: invasive alien species; endangered species; agricultural biodiversity; marine and coastal biodiversity; inland waters biodiversity; indigenous knowledge; access and benefit-sharing; the ecosystem approach to biodiversity and managing protected areas;

(g) In the report of the first Asian Global Taxonomy Initiative Regional Workshop in 2002, it was indicated that issues are best addressed on a regional rather than national level, since species and ecosystems often extend across national boundaries, and cooperation regionally will best suit the identification and resolution of issues that can only be solved by concerted effort. Resources may be optimized on a regional or subregional basis, to avoid unnecessary duplication and operate in the most cost-effective and scientifically efficient manner (UNEP/CBD/SBSTTA/9/INF/17);

(h) At the second Asia-Oceania regional workshop on the Global Taxonomy Initiative, five project proposals were prepared, with the intent of seeking funding from the Global Environment Facility among others, as follows:

- (i) Inventory, evaluation and monitoring of agricultural biodiversity in the East and Southeast Asian region: regional capacity and institutional building;
- (ii) Building national and regional scientific and vernacular taxonomic and biodiversity informatics for conservation and sustainable use of biodiversity in the Pacific Islands;
- (iii) Building national and regional scientific and vernacular taxonomic and biodiversity informatics for conservation and sustainable use of biodiversity in Asia and enhancing the value for rural livelihoods;
- (iv) Regional inventory of freshwater biodiversity in Asia-Oceania;
- (v) Taxonomist and parataxonomist training in terrestrial organisms for sustainable use of biodiversity in Asia-Oceania.

10. Despite the efforts to develop projects in the region, none of the above proposals were funded. Taking the unsuccessful project development into account, the ASEAN Centre for Biodiversity, supported by the European Community, France and Japan, held the “ASEAN+3 Regional Workshop on Global Taxonomy Initiative -Needs Assessment and Networking” in May 2009 to further elaborate needs in taxonomic services and information and prioritize the needs for implementation of the Convention.

11. The workshop concluded that information on species with up-to-date taxonomy should be associated with information on endemism, conservation status, ecological status, geographic distribution, invasiveness and economic value in both the local languages and in English. If applicable, use of existing web-based resources to fill the gaps of information in the region with user friendly interfaces is suggested

as a solution. Information resources such as the Global Biodiversity Information Facility,³ the Encyclopedia of Life⁴ and the Biodiversity Heritage Library⁵ were recommended.

12. A Pacific Islands regional taxonomic assessment, conducted by BioNET-PACINET in 2009, found the importance of vernacular taxonomy as well as engaging indigenous taxonomic knowledge holders in addressing issues such as invasive species and red-list species.

C. At the global level

13. Regarding output 1.3.1 from decision IX/22 targeting the completion of global taxonomic needs assessments, a global-level assessment was conducted in 2008 by BioNET-INTERNATIONAL and the United Kingdom Global Taxonomy Initiative national focal point at the Natural History Museum, with special focus on the management of invasive alien species with support from the United Kingdom, Switzerland and the Global Invasive Species Programme (GISP). The role of taxonomy in supporting prevention, detection, eradication and control was examined and mapped to the management steps identified in the GISP document “Invasive Alien Species: A Toolkit for Best Prevention and Management Practices”. Three broad types of needs were identified in this assessment:

(a) *End-users*: taxonomic outputs and services needed by non-taxonomists for the management of invasive alien species;

(b) *Within institutions*: taxonomic capacity, information resources and prioritization within institutions in order to deliver those services;

(c) *Across institutions*: activities and prioritization of needs at a level above individual institutions, to enable them to respond as required.

14. The assessment concluded that innovation in delivering taxonomy to end-users was essential to respond to the threat posed by invasive alien species with necessary urgency. Best use should be made of available capacities, but there is a near absence of taxonomic capacity to support the management of invasive alien species in most countries, especially developing countries, and a critical decline of expertise in developed countries.

15. Training of the taxonomic experts needed to create products, such as identification tools, for end-users is of great importance. Institutions and funders need to recognize that invasive alien species are a priority and that generating products and information needed to confront them is an important output of taxonomic institutions.

15. With regards to taxonomic needs in specific ecosystems and taxa, the assessment conducted by the Natural History Museum in its role as the focal point on Global Taxonomy Initiative for the United Kingdom in 2006⁶ showed that the majority of taxonomic institutions that responded to the survey were carrying out conservation activities in terrestrial (one half of the respondents), inland waters (one third), forest (one third), marine (one third) and agricultural (one third) ecosystems. Half of the institutions indicated that they worked in protected areas. However, island ecosystems, dry and sub-humid lands, and urban areas were covered by far fewer (one quarter to one seventh of respondents) taxonomic institutions in the United Kingdom.

16. Fewer taxonomic institutions are working in areas relevant to invasive alien species or micro-organisms than in areas such as vascular plants, birds, mammals and terrestrial invertebrates. In addition, marine species were not well covered by the institutes compared to the terrestrial and freshwater species in the report by the United Kingdom. The capacity-needs assessments conducted in Asia

³ www.gbif.org

⁴ www.eol.org/

⁵ www.biodiversitylibrary.org/

⁶ www.cbd.int/doc/programmes/cro-cut/gti/gti-needs-uk.pdf

(UNEP/CBD/SBSTTA/9/INF/17) also indicated that the number of taxonomists who work on microorganisms and lower invertebrates was very limited. Although it is based on a limited information source, the gap of expertise seems to exist in the fields of micro-organisms and invertebrates in marine ecosystems and invasive alien species.

III PROGRESS ON PROJECT DEVELOPMENT TO MEET IDENTIFIED NEEDS

17. Project development for the Global Taxonomy Initiative is still at an initial stage, though successful cases were found in the fourth national reports in Australia, Croatia, Estonia, Finland, India, Liberia, Malaysia, Mongolia, Sudan, Sri Lanka and Yemen, where taxonomy research grants are made available or some taxonomic training was conducted. It is noteworthy that most of these countries have accomplished national needs assessments or joined in the process of earlier regional assessments.

18. Twenty-nine taxonomic institutions in Europe, North America and the Russian Federation are networked under the European Distributed Institute of Taxonomy (EDIT) programme. EDIT has been running workshops, training, biodiversity inventorying and computer application development for professionals and amateurs. EDIT work packages include partnership with the nature conservation community and leading biodiversity information portal sites, and developing tools.

19. The Census of Marine Life,⁷ a global network of researchers in more than 80 nations engaged in the scientific initiative to assess and explain the diversity, distribution, and abundance of life in the oceans between 2000 and 2009, aims to produce, for the first time, a comprehensive global list of all forms of life in the sea. Since the Census began in 2000, researchers have added more than 5,600 new species to the lists.

20. Pursuant to decision VIII/3, paragraph 15, and to follow the results mentioned in paragraphs 9 (c)-(h) above, and taking into account the Kobe Call for Action for Biodiversity adopted by the Environment Ministers of the G8 in 2008,⁸ Japan inaugurated the regional initiative called East and South-East Asia Biodiversity Information Initiative (ESABII), in January 2009, in consultation with the Governments of Brunei Darussalam, Cambodia, China, Indonesia, the Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, the Philippines, the Republic of Korea, Singapore, Thailand and Viet Nam. Working with taxonomic institutions in the region, ESABII is expected to make biodiversity information in the region more accessible and applicable to the implementation of the Convention, and facilitate taxonomic capacity-building through regional projects.

21. A workshop on project development for the Global Taxonomy Initiative was held by the Executive Secretary at the National Museum of Kenya, in Nairobi, from 16 to 18 November 2009 (decision VIII/3 paragraph 15), with support from the Government of Spain and in collaboration with BioNET INTERNATIONAL. The workshop aimed to produce concept notes for fundable projects with some focus on invasive species and protected areas. The workshop scrutinized donors' priorities and identified where taxonomic information and skills are necessary to assist national development within the African region. Participants exchanged information with resource persons from the Division of Global Environment Facility Coordination of the United Nations Environment Programme (UNEP-GEF), CAB International, Global Invasive Species Programme, Global Invasive Species Information Network (GISIN), the IUCN SSC Invasive Species Specialist Group, Japan International Cooperation Agency, Natural History Museum, London and the BioNET-INTERNATIONAL secretariat. The workshop served both to develop and refine project proposals of key importance, and as a capacity-building event to familiarize participants with proposal-writing skills.

22. The Consortium for the Barcode of Life held a project development workshop as a pre-conference event for the third International Barcode of Life Conference from 7 to 9 November 2009, in Mexico City. The workshop focused on project development with the use of DNA barcoding

⁷ The Release of the First Census of Marine Life is at the scientific symposium at the Natural History Museums in London on 4 October 2010, See, <http://www.coml.org/>

⁸ <http://www.env.go.jp/en/focus/attach/080610-a3.pdf>.

techniques. It was stressed that the process of international collaboration for collecting samples and DNA barcoding, which includes sequencing, databasing and outreach to the user communities is beneficial, particularly for developing countries to facilitate the implementation of the Convention. Monitoring the status of biodiversity, inventorying biodiversity, detection of bushmeat/products from endangered species in the market, early detection of agricultural pests, development of biological pest control, quarantine, communication, education, public awareness and others were identified as potential taxonomic services that DNA barcoding can offer to the community.

23. A workshop entitled “Society and Technology Dynamics–Global and National Perspectives”, supported by the International Development Research Centre, Canada, followed the above-mentioned workshop on the Global Taxonomy Initiative. Issues relating to access and benefit-sharing, in the context of the report of the workshop on “Preserving International Access to Genetic Resources for Non-commercial Biodiversity Research” (UNEP/CBD/WG-ABS/8/INF/6) were discussed, especially to make DNA barcoding applicable for identification of a wider range of taxa in all parts of the world.

24. There was a strong call from participants from both developing and developed countries for exceptional treatment under the ongoing access and benefit-sharing negotiation for non-commercial biodiversity research. Uses of such innovative techniques as DNA barcoding can be recognized as carrying high potential of benefits for countries and local communities in understanding their own biodiversity, if appropriate consultation is made about its application on identifying and monitoring for the local communities.

25. The workshops on the Global Taxonomy Initiative mentioned in paragraphs 21-23 indicated that improving inter-agency communication and workshops/training in project-proposal writing may facilitate the process of project development and subsequent endorsement of the proposals by the relevant Governments to submit the project proposal to targeted donors.

26. In paragraph 2 of decision IX/22, the Conference of the Parties welcomed progress towards the establishment of a special fund for the Global Taxonomy Initiative. The Paris Museum national d'Histoire naturelle (MNHN) hosted a workshop organized by BioNET-INTERNATIONAL on establishing a Global Taxonomy Partnership and its Special Fund, in Paris, in June 2009, with support from the European Union, the Fondation Total-Switzerland, EDIT, the Foundation for a New Ethical Business and CABI. The workshop concluded that the Special Trust Fund for the Global Taxonomy Initiative should strengthen the taxonomic science base, particularly in developing countries, that underpins the achievement of Millennium Development Goals and be responsive to emerging agendas, such as that being defined by The Economics of Ecosystems and Biodiversity⁹ (TEEB) and the post-2010 targets being developed under the Convention on Biological Diversity.¹⁰

IV CONCLUSIONS

27. Assessment of taxonomic needs and existing capacity is the first step to implement the programme of work on the Global Taxonomy Initiative. There are still some 59 per cent of countries where no assessment has been conducted. Of the countries whose the national report indicates that needs assessments have taken place, the majority are at a basic level or are in their early stages, with no results made available.

28. Limited capacity in taxonomy seemed to have caused delay in completing assessments of taxonomic needs in developing countries and many of the assessments often resulted in listing of capacity-building needs and not end-user needs.

29. Most useful taxonomic-needs assessments conducted to date clearly identify the needs of end-users, which include, *inter alia*, information on the species crucial for the environment and

⁹ <http://www.teebweb.org/ForPolicymakers/tabid/1019/language/fr-FR/Default.aspx>

¹⁰ <https://www.cbd.int/doc/meetings/csab/csab-03/information/csab-03-strategic-plan-01-en.pdf>

development, such as invasive alien species. The identification of required deliverables to assist decision makers, those responsible for implementing the Convention on Biological Diversity and other relevant international agreements, farmers, educators, members of local communities and other non-taxonomists, are also very valuable components of assessments. It is notable that many of the successful assessments have been able to leverage support from members of international networks such as BioNET-INTERNATIONAL and the Global Invasive Species Programme (GISP) to provide additional support and assistance drawing on international expertise for country benefit. Coordination of inter-institutional and international collaboration to deliver the required taxonomic services and information are significantly dependent on dedicated actors such as BioNET-INTERNATIONAL, Consortium for the Barcode of Life, Global Invasive Species Programme, European Distributed Institute of Taxonomy and others.

30. The projects supporting the implementation of the Convention on Biological Diversity in developing countries, with an emphasis on removing the taxonomic impediment, have been funded extensively by, *inter alia*, Belgium (capacity-building programme in collaboration with the Belgian Development Cooperation), Japan (the East and South-East Asian Biodiversity Information Initiative mentioned in paragraph 20 above) and the United Kingdom (the Darwin Initiative¹¹).

31. In the process of funding projects, a number of agreements between institutions, ministries and local communities are required. Poor communication between taxonomic institutions, local communities and Governments usually resulted in unsuccessful project development. In addition, many researchers in developing countries found it difficult to write grant applications to meet the predetermined priority areas that donors and grant-giving bodies set for the scheme of development aid rather than scientific capacity-building required for conservation and sustainable use of biodiversity.

32. Recent developments in web-based information technology and taxonomy using DNA sequencing data can accelerate discovery and identification of species, and support collaboration between taxonomic institutions in developing and developed countries. They also improve communication, education and public awareness in taxonomy and on the promptly identified species using this new technology. The international programmes of DNA barcoding coordinated by Consortium for the Barcode of Life¹² may assist future taxonomists to develop their careers, and facilitate involvement of local communities in conservation and/or development opportunities.

33. Global information networks such as the Catalogue of Life, the Encyclopedia of Life, the Global Biodiversity Information Facility, the Ocean Biodiversity Information System and many of the other biodiversity informatics projects made significant progress to support access to and generation of taxonomic information¹³ (planned activity 5 under the outcome-oriented deliverables for the Global Taxonomy Initiative). This may grow together with the Group on Earth Observations-Biodiversity Observation Network to assist countries to overview the biodiversity status, trends and threats.

34. Overcoming the taxonomic impediment is largely dependent on national capacities being engaged in international collaboration between taxonomic experts, and integration of non-taxonomic disciplines to maximize the appropriate targeting and delivery of taxonomic benefits. Non-commercial biodiversity research should be facilitated in order to improve taxonomic capacity in both developing and developed countries with appropriate conditions for access to specimens and associated information. An enabling environment must be encouraged to facilitate the benefits of international collaboration.

¹¹ www.darwin.gov.uk/

¹² www.barcoding.si.edu/

¹³ The total number of accepted described species in the world is estimated to be close to 1,900,000, well above the 1,786,000 given in 2006. Worldwide, about 18,000 new species are being described each year and for the year 2007, 75% of these were invertebrates, 11% vascular plants and nearly 7% vertebrates (Numbers of Living Species in Australia and the World, 2nd edition, <http://www.environment.gov.au/biodiversity/abrs/publications/other/species-numbers/2009/pubs/03-nlsaw-exec-summary.pdf>).

35. Despite the efforts made to develop taxonomic capacity nationally and internationally, the number of trained taxonomists appears still to be decreasing. In the fourth national report, Australia has forecast that it will lose between 30 to 50 per cent of its taxonomists in the next 15 years.

36. Although many good practices have been developed and new technologies have been effectively applied, there are many challenges remaining to validate the findings, store the vouchers and care for them in an orderly way. Taxonomists will not be replaced simply by tools such as DNA barcoding and web-based biodiversity information. The vast amounts of data produced by such new technologies will create more work for taxonomists, who are still in short supply and not increasing in number. There is a need for further actions to implement the programme of work for the Global Taxonomy Initiative, especially for creating jobs and incentives for young professionals in taxonomy.

Planned activity ¹⁴	Output	Status in November 2009
<i>Planned activity 1: Country-based taxonomic needs assessments and identification of priorities</i>	<i>Output 1.1.1.</i> Develop an Assessment Support Pack to be made available through the GTI Portal by the end of 2009, building on the assessments done on the BioNET-INTERNATIONAL Website.	The resource pack developed as a part of the Ghanaian National Taxonomic Needs Assessment, which was itself based on protocols developed for the United Kingdom and global invasive alien species assessments, has been made available on the website of BioNET-INTERNATIONAL. The experience and insights gained from other Assessments would be valuable additions.
	<i>Output 1.1.2.</i> A taxonomic needs assessment in at least one sector to have been completed by 10% of Parties by 2010, and by 25% of all Parties by 2012. Suggested actors may include Parties with assistance from taxonomic institutions and networks and GTI national focal points	National taxonomic needs assessments have been conducted in whole or part by 79 countries ¹⁵ Some were produced in the context of national reporting or regional GTI workshops, or meetings discussing setting up regional taxonomic networks e.g. BioNET-PACINET. Priorities for both delivery and capacity are identified by many countries, even at outline level. See Section II above.
<i>Planned activity 2: Regional taxonomic needs assessments and identification of priorities</i>	<i>Output 1.2.1.</i> Complete at least one pilot regional assessment within a United Nations subregion, integrated with implementation of a thematic area or cross-cutting issue of the CBD, by the end of 2009	See Section II above.
<i>Planned activity 3: Global taxonomic needs assessments.</i>	<i>Output 1.3.1.</i> Complete global taxonomic needs assessments for at least two thematic areas or cross-cutting issues of the CBD by the end of 2009.	A taxonomic needs assessment in the context of invasive alien species was discussed in Section II.

¹⁴ Planned activities for which no information was available were omitted from the table.

¹⁵ **Antigua and Barbuda, Armenia, Australia, Austria, Bahamas, Belgium, Benin, Botswana, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, Canada, Central African Republic, Colombia, Comoros, Congo, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Czech Republic, Democratic republic of the Congo, Dominican Republic, Egypt, El Salvador, Estonia, Ethiopia, Fiji, Ghana, Greece, Guatemala, Guinea, India, Indonesia, Iran, Ireland, Japan, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lebanon, Lesotho (capacity), Madagascar, Malawi, Malaysia, Malta, Mauritius, Mexico, Morocco, Myanmar, Namibia, Netherlands, New Zealand, Nicaragua, Niger, Norway, Palau, Philippines, Poland, Republic of Korea (list of taxonomists), St Lucia, Senegal, Singapore, Slovenia, South Africa, Spain, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, Togo, Tunisia, Uganda, United Kingdom** – information taken from Reports to the Convention.

Planned activity ¹⁶	Output	Status in November 2009
<i>Planned activity 4: Public awareness and education</i>	<i>Output 1.4.1.</i> Compile and disseminate a resource pack including background information and ideas for publicity to targeted groups by the end of 2009.	Progress was made by the European Distributed Institution of Taxonomy (EDIT). A social networking application – EDIT "Scratchpads" ¹⁷ provides opportunities for building community web-based tools and resources to mobilize and share taxonomic information and develop new content. Information and data developed on Scratchpads can be provided to external initiatives such as the Global Biodiversity Information Facility, and access is given within the Scratchpads to, <i>inter alia</i> , GBIF (species occurrence data sharing), Biodiversity Heritage Library (biodiversity literature sharing), Flickr (photo sharing) and more;
	<i>Output 1.4.2.</i> Run at least one exhibition, at a national taxonomic institution, on the importance of taxonomy with mention of the Global Taxonomy Initiative by 2010, both physically and with a Web presence.	The United Kingdom Natural History Museum has opened an exhibition focussed on its taxonomic work.
	<i>Output 1.4.3.</i> Provide country Web pages with species lists and identification materials for the national fauna and flora by 2015 (derived from the available information in the literature as baseline information for further research).	No country has reported activity, although examples of developments in this means can be seen in the United Kingdom National Biodiversity Network, the Wild Flowers of Israel site and the Plants of southern Africa site.
<i>Planned activity 5: Global and regional capacity-building to support access to and generation of taxonomic information</i>	<i>Output 2.5.1.</i> Create an online registry of repositories of biological collections that provides globally unique identifiers for these collections, and initiate an analysis of countries and regions that lack essential collection infrastructure by 2012.	The Biodiversity Collections Index aims to facilitate the understanding, conservation and utilization of global biodiversity resources by creating a single annotated index of biodiversity collections, and is developing a list of repositories. The "Insect and Spider Collections of the World" website is the clearing house of information on the insect and spider collections of the world. See also paragraph 35 above.
	<i>Output 2.5.2.</i> All Parties to develop national and regional priorities and action plans for taxonomic capacity-building by 2012, based on national and regional taxonomic needs assessments.	ESABII facilitates national priority setting in December 2009 in East and Southeast Asia.
	<i>Output 2.5.6.</i> Identify national biological reference collections for all Parties by 2010.	Korea established the National Institute of Biological Resource in 2009 as a reference collection. ESABII and ASEAN Centre for Biodiversity facilitate the identifying collections in Asia. EDIT, including participants from the 30 major collections in Europe and North America, facilitates the access to digital information on reference collections.

¹⁶ Planned activities for which no information was available were omitted from the table.

¹⁷ <http://scratchpads.eu/>

Planned activity ¹⁸	Output	Status in November 2009
<i>Planned activity 6: Strengthening of existing networks for regional cooperation in taxonomy</i>	<i>Output 2.6.1.</i> Include all taxonomic institutions in appropriate networks to assess and build capacity by 2012.	There are numerous networks operating globally, particularly as locally owned and operated partnership (LOOPs) of the Technical Cooperation Network BioNET-INTERNATIONAL, which currently includes members in 153 countries. Government approval is required to enable a country to be a formal member of a LOOP.
	<i>Output 2.6.3.</i> Identify regional hubs for DNA bar-coding taking into account other relevant initiatives and incorporate them into the Leading Labs Network of the Consortium for the Barcode of Life (CBOL) as appropriate in accordance with the national legislation by 2010.	Consortium for Barcode of Life (CBOL) has been holding regional meetings. It currently has more than 170 member organizations from more than 50 countries.
<i>Planned activity 7: Develop a coordinated taxonomy information system</i>	<i>Output 3.7.2.</i> Develop an internationally-accepted standard for collections-level descriptions to enable clarity on collections holdings by 2012 before all specimens are included in the database.	Biodiversity Information Standards (TDWG) has developed a standard for access to biological collection data (ABCD). see: http://www.tdwg.org/activities/abcd/
	<i>Output 3.7.3.</i> Produce a widely accessible checklist of known species, as a step towards a global register of plants, animals, microorganisms and other organisms, by 2012.	The contributed participating databases to the Catalogue of Life Partnership have made available a globally accessible checklist of known species currently covering 1.16 million species. According to the second edition of <i>Numbers of Living Species in Australia and the World</i> , the total number of accepted described species in the world is estimated to be close to 1 900 000. GSPC Target 1 towards a working list of known plant species -This has grown from around 20% of plants in 2004 to an estimated 70–80 % in 2010
	<i>Output 3.7.4.</i> Make 1 billion specimen records digitally available by the end of 2008.	As of October 2009, GBIF shared 133,162,268 records on its portal; in addition there are other digital resources not yet participating in GBIF. The Andrew W Mellon funded Latin American and African Plant Initiative involves over 120 partners worldwide and has made over half a million type specimens available on-line. http://plants.jstor.org The South African National Biodiversity Institute (SANBI) maintains over 1.2 million specimens, and the data of 1.0 million of the specimens were already stored in a computer system by 2009.

¹⁸ Planned activities for which no information was available were omitted from the table.

Planned activity ¹⁹	Output	Status in November 2009
<i>Planned activity 7: Develop a coordinated taxonomy information system</i>	<i>Output 3.7.5.</i> Increase the means and rate of digitisation of taxonomic literature, incorporating simple and effective interfaces for location and access to biological content; interoperable with major biological projects; and structured in accordance with appropriate data standards. Milestones from the Biodiversity Heritage Library Programme are: 6,000,000 pages available by end of 2008; 15,000,000 pages available by end of 2009; and 25,000,000 pages available by end of 2010.	In September 2009 the Biodiversity Heritage Library was serving nearly 16 million pages from more than 39 thousand volumes. Digitised taxonomic literature is also available from other initiatives such as AnimalBase, and many journals are making their contents available digitally.
	<i>Output 3.7.6.</i> Develop at least five Web-based taxonomic treatments covering large taxonomic groups, ecosystems or regions to be completed by 2010 in order to enable comparison of their utility.	Web-based taxonomic treatments of the <i>Araceae</i> (palms) and <i>Sphingidae</i> (hawkmoths) have been constructed by the CATE project. Three target groups are being worked on by members of the EDIT project, and through the “Scratchpad” tool, numerous taxonomists are now collaborating through web applications to build taxonomic treatments.
	<i>Output 3.7.7.</i> Develop a prototype for an openly accessible Global Species Information System (GSIS) as requested by the Potsdam Initiative 2010 by 2010, and a comprehensive GSIS version with information on all species by 2020.	Elements of this system are being developed by many actors, including TDWG, GBIF, EDIT, Atlas of Living Australia and EoL towards the targeted year 2020 of the new strategic plan of the Convention.
	<i>Output 3.7.8.</i> Develop a system of species Web pages, with community involvement, and a programme for their growth and sustainability by 2010.	The Encyclopedia of Life project (EoL) is developing a system of openly accessible species web pages Wikispecies is making pages available in a different manner. Many thousand species web pages have been constructed as part of less encompassing initiatives.

¹⁹ Planned activities for which no information was available were omitted from the table.

Planned activity	Output	Status in November 2009
<i>Planned activity 12: Agricultural biological diversity</i>	<i>Output 4.12.3.</i> Develop and begin testing DNA barcodes by 2010 as an identification system for pilot taxa (e.g. tephritid fruit flies or scale insects) in the view of agricultural border inspection.	The Tephritid Barcode Initiative is a two-year “demonstration project” now underway that will create an operational system for identifying fruit flies around the world. Other barcoding initiatives include birds, fish, mosquitoes, Lepidoptera, biota of the polar region, and marine zooplankton. The Plant Protection Research Institute of South Africa is leading a project developing a scale insect reference collection and associated DNA barcode database with the goal of implementing a regionally-relevant identification system.
<i>Planned activity 15: Access and benefit-sharing</i>	<i>Output 5.15.2.</i> Convene an international workshop of competent national authorities and national focal points for GTI and access and benefit-sharing to discuss the obstacles to international transfer of biomaterials for non-commercial research in line with national law and applicable international obligations relating to prior informed consent by the time not later than the SBSTTA prior to COP10.	Ten national agencies and international scientific organizations convened a workshop in Bonn, Germany, in November 2008, to address the issue “Access and Benefit Sharing in Non-commercial Biodiversity Research”. Fifty-one participants from 24 countries were invited based on their experiences with CBD and ABS matters in the biological sciences, policy and government agencies, and NGOs and other stakeholder organizations. These participants also provided a balanced representation among geographic regions and perspectives. The results of the workshop have been made public, and available to meetings discussing the proposed ABS regime. Document UNEP/CBD/WG-ABS/7/INF/6 provides a report of the workshop.
<i>Planned activity 16: Invasive alien species (IAS)</i>	<i>Output 5.16.1:</i> Provide IAS lists/information for all countries by 2010.	Global Invasive Species Database (IUCN SSC) provides information on IAS on the web, and the Global Invasive Species Information Network (GISIN) held workshops to integrate existing IAS databases. Delivering Alien Invasive Species Inventories for Europe (DASIE) reported 11,000 alien species in Europe and made the data accessible on Internet. The North European and Baltic Network on Invasive Alien Species (NOBANIS) provides a gateway to information on alien and invasive species in North and Central Europe. However, integration / inter-operability of databases is not completed due to limited coordination between the data providers.
<i>Planned activity 19: Protected areas</i>	<i>Output 5.19.1.</i> Provide inventories for each protected area for at least mammals, birds, reptiles, amphibians, fish, and butterflies by 2010	Through collaboration between the UNEP World Conservation Monitoring Centre (UNEP-WCMC) and the Global Biodiversity Information Facility (GBIF), information on the occurrence of species in protected areas from the GBIF database has been included into the World Database on Protected Areas (www.wdpa.org).
<i>Planned activity 19: Protected areas</i>	<i>Output 5.19.3.</i> Create a pilot project to demonstrate identification of habitats and priority-setting for establishing new protected areas, through plotting distributions of species at local, national and regional levels to be identified and disseminated through the clearing-house mechanism by 2009.	Network for Conservation Practitioners (NCEP) provides tools available for species distribution models at http://biodiversityinformatics.amnh.org/index.php?section=sdm_build Open Modeller Project in Brazil provide links to available tools at http://openmodeller.cria.org.br/ UNEP-WCMC: The GLOBIO consortium has developed a global-scale spatial model of scenarios of past and future impacts of environmental change on biodiversity.

²⁰ Planned activities for which no information was available were omitted from the table.