



Global taxonomy initiative Building capacity in taxonomy to underpin the conservation of biological diversity

The Global Taxonomy Initiative (GTI) is a cross cutting issue of the United Nations Convention on Biological Diversity (CBD) to address the lack of taxonomic information and expertise available in many parts of the world, and thereby to improve decision making in conservation, sustainable use and equitable sharing of the benefits derived from genetic resources.

The GTI is specifically intended to support implementation of the work programmes of the CBD on thematic and cross cutting issues. Given the many competing demands for capacity building in taxonomy, activities under the GTI must be clearly linked to the implementation of the Convention¹. Under the Convention there are seven thematic work programmes. These address marine and coastal biodiversity, agricultural biodiversity, forest biodiversity, island biodiversity, the biodiversity of inland waters, dry and sub-humid lands and mountain biodiversity. GTI is underpinning the thematic programmes by providing taxonomic information^{1,2}.

As of December 2005, the CBD involves 188 countries and other governments¹. Implementation of the CBD is largely dependent on the strategy of the parties and the governments to protect the habitat of natural organisms from the fast growing human activity at national, regional and global level. However, sound decisions can only be made if they are based on accurate and contemporaneous ecosystem information.

Given the complexity of ecosystems and target of the totality of biological diversity, all animals, plants and microorganisms need to be more clearly understood by accurate inventorying and long-term monitoring. The scientific community

*Junko Shimura &
Kaduo Hiraki*

National Institute for
Environmental Studies, Japan
E-mail: junko@nies.go.jp

is challenged more than ever to justify research objects for multi-level approaches in order to cover the wide target organisms and to meet the sustainable use of their functions in the ecosystems. Various reports estimate global species numbers based on the described species; these vary from 2 million to 100 million species, with the largest estimate of somewhere near 10 million³⁻⁵. The estimations inevitably fluctuate due to limited data and ambiguity of species identification.

Limitations on the identification of species are largely due to the lack of a mechanism to organise past taxonomic knowledge and frequent recent taxonomic revisions. Despite the bacterial nomenclature code initiated in 1980 to validate species names, great numbers of species are renamed and old names are often still used by different research communities without clearing their synonymy. In addition, huge groups of microorganisms are still not known³, despite the finding of new species by active experts (Figure 1).

The distribution of species in different habitats has not yet received a great deal of attention in microbiology. However, the influence of different land uses on the diversity of soil bacteria has been demonstrated by numbers of studies⁶⁻¹⁰.

Although extremely rapid and effective dispersal suggests that microorganisms are cosmopolitans, strong species-area relationship is found in phytoplankton algae¹¹. In addition, as a component of

the nutrient cycle, microorganisms are considered to carry out important roles, particularly in the ocean¹²⁻¹⁴.

Recent examples of emerging diseases in various parts of the world, such as HIV/AIDS, classic cholera in South America and Africa, cholera due to *Vibrio cholerae* O139, hantavirus pulmonary syndrome, Lyme disease, and haemolytic uremic syndrome are serious global issues of disease control¹⁵⁻²⁰. The taxonomy of pathogenic microorganisms has become increasingly important to identify those pathogens and their vectors.

This is not only in the region where such microbial diversity was originally found. It is also necessary to develop the capacity of rapid identification of those species in remote areas where those microorganisms were introduced by recent global scale human activities. It has become clear that capacity building is necessary in taxonomy to facilitate describing new species and make the information of new species and revised information of species available to the rest of the community, particularly for decision makers and their sectors undertaking the tasks of conservation and public health. Broad studies on species with consideration of their functions in ecosystems is also important to support the CBD.

With this background, the conference of the parties adopted the GTI programme of work at COP6 (2002) of the convention¹. The programme of work presents the overall objectives of the GTI programme, activities addressing taxonomic needs assessments at the national, regional and global levels, and the targeted actions within the broader work programmes of the CBD.



After the adoption of programme of work at the COP6, the first regional level taxonomic needs and capacity were surveyed and the GTI regional workshop was held in Asia (Putrajaya, Malaysia 2002) to discuss the feasible programme of work in regional collaboration²¹.

The major finding of the survey was that infrastructure and the number of experts in microbiology were less adequate than for botany and zoology in most organisations²¹. The type specimens which were originally found in the region are kept in remote countries, and access to both specimens and the corresponding references is difficult for researchers and specialists involved in inventorying and monitoring of biodiversity in the region²¹. It was stressed at the regional workshop that information on type specimens, their locations and the digital images of those types would greatly help taxonomic studies in the region²¹⁻²².

At the follow up workshop (Tsukuba, Japan 2003), microbiology experts requested developed countries to draw up and implement a plan for the advancement of microbiology in collaboration with developing countries. They especially emphasised that governments, providers and users of biological resources to respect the CBD COP decisions and Bonn Guidelines^{1,23}. The Bonn Guidelines stated that taxonomic research, as specified in the GTI, should not be prevented access to genetic resources. Also, they requested accelerated acquisition of specimens and strains, facilitating the use of these biological resources in taxonomy and increased and sustainable information accessibility to the information associated with these biological resources by developing databases to support global networking²⁴.

At CBD COP7 in 2004, further facilitation of the synergistic collaboration between

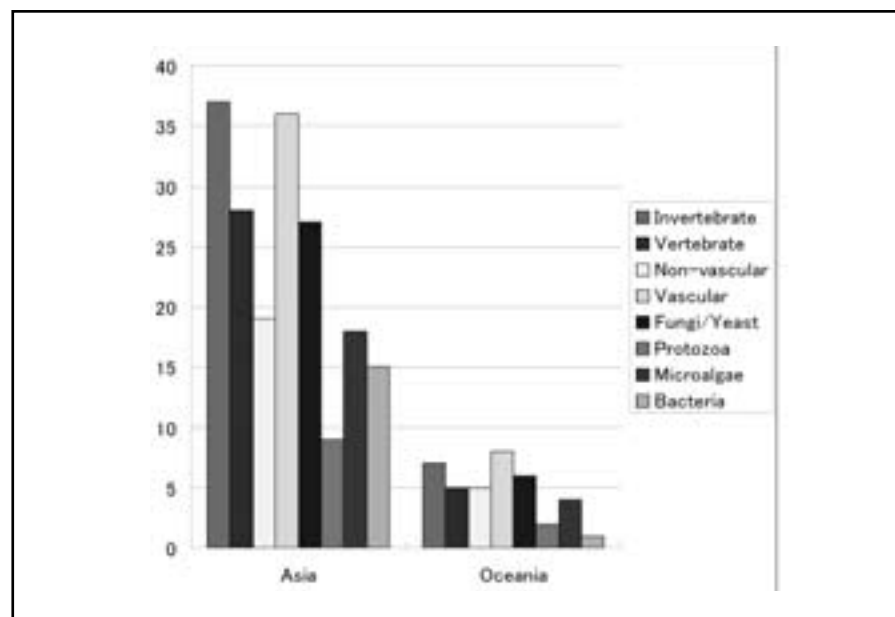
existing initiatives, including the clearing-house mechanism, the GBIF, and regional and sub-regional taxonomic networks, were invited to develop more accessible information sources for countries on their biodiversity. Also, it was suggested to ensure that there are linkages between Articles 15 and 8(j) of the CBD which refer to access to genetic resources and indigenous knowledge, respectively¹.

In 2004, a survey on taxonomic needs and capacity was carried out in the Oceania region including Australia. Subsequently, the second GTI regional workshop was held in Wellington, New Zealand covering countries in Asia and Oceania²⁵. This workshop resulted in four large project proposals for a potential Global Environment Facility (financial mechanism of the Convention), and 11 smaller project proposals for funding by other bodies²⁵.

However, proposals focused on taxonomic capacity building in microbiology have not yet been drafted. More attention to culture collections and expertise in microbial taxonomy in conservation of biological diversity in good partnership between developing and developed area is urged. With this context, establishing regionally cooperative BRCs which can take leading roles in microbial taxonomy in concordance with COP decisions of the CBD is highly valuable.

At the recent SBSTTA11 in Montreal in 2005, in-depth review on the GTI programme of work was presented. Further involvement of taxonomic experts and information networks in the process of capacity building was addressed. Emphasis was made to ensure the financial mechanism of the CBD works efficiently in the prioritised operations such as establishing GTI national focal points in developing countries, taxonomic needs and capacity assessment, as well as urging fast implementation in the area where appropriate measures are required.

Figure 1. Number of collections that actively responded to the survey of taxonomic needs and capacity. The survey was carried out through the existing network (ASEANET, EASIANET) in Asia in 2002 and through Pacific Biodiversity Information Forum in Oceania in 2004. Responding organisations are distributed as follows: Brunei (1), China (2), Hong Kong (1), Indonesia (9), Japan (7), Malaysia (2), Mongolia (2), Myanmar (1), Pakistan (6), the Philippines (4), Singapore (1), Sri Lanka (2), Taiwan province of China (2), Thailand (25), Vietnam (3), Australia (4), Fiji (1), Palau (1), New Zealand (6), USA (Hawaii (1)), Guam (1). 82 organisations in 20 countries were covered by this survey and multiple collections exist in one organisation.





References

1. Secretariat of the Convention on Biological Diversity. *Handbook of the Convention on Biological Diversity* (3rd ed). 2005: <http://www.biodiv.org/handbook/>
2. Secretariat of the Convention on Biological Diversity. *The Global Taxonomy Initiative Programme of Work. The Global Taxonomy Initiative Programme of Work ISBN-0-642-568302003*. Australian Biological Resources Study, Australia 2003, p.1-26.
3. Nee S. More than meets the eye. Earth's real biodiversity is invisible, whether we like it or not. *Nature* 2004; 429:804-5.
4. Hawksworth DL & Kalin-Arroyo MT. *Magnitude and Distribution of Biodiversity*. Global Biodiversity Assessment, ISBN 0 521 56481 6 1995,107-92.
5. Diversitas. The state of knowledge what we (do not) know. *IMPLEMENTING THE GTI: Recommendations from DIVERSITAS core programme element 3, including an assessment of present knowledge of key species groups*. 2002, p.11-22.
6. Grivan MS, Bullimore J, Pretty JN, Osborn AM & Ball AS. Soil type is the primary determinant of the composition of the total and active bacterial communities in arable soils. *Appl Environ Micro* 2003; 60:1800-9.
7. Clegg CD, Ritz K & Griffiths S. Broad-scale analysis of soil microbial community DNA from upland grasslands. *Antonie L eeuwenboek Int J Gen Mol Microbiol* 1998; 73:9-14.
8. Clegg CD, Ritz K & Griffiths S. %G+C profiling and cross hybridization of microbial DNA reveals great variation in below-ground community structure in UK upland grasslands. *Appl Soil Ecol* 1997; 14:125-34.
9. McCaig AE, Glover LA & Prosser JI. Numerical analysis of grassland bacterial community structure under different land management regimens by using 16S ribosomal DNA sequence data and denaturing gradient gel electrophoresis banding patterns. *Appl Environ Micro* 2001; 67:4554-9.
10. Nusslein K & Tiedje JM. Soil bacterial community shift correlated with change from forest to pasture vegetation in a tropical soil. *Appl Environ Micro* 1999; 65:3622-6.
11. Smith VH, Foster BL, Grover JP, Holt RD, Leibold MA & DeNoyelles F Jr. Phytoplankton species richness scales consistently from laboratory microcosms to the world's oceans. *Proc Natl Acad Sci* 2005; 102:4393-6.
12. Talin F, Tolla C & Poggiale JC. Relations between bacterial biomass and carbon cycle in marine sediments: an early diagenetic model. *Acta Biotheor* 2003; 51:295-315.
13. Rothmann DH. Global biodiversity and the ancient carbon cycle. *Proc Natl Acad Sci* 2001; 98:4305-10.
14. Reinthaler T, Winter C & Herndl GJ. Relationship between bacterioplankton richness, respiration and production in the southern North sea. *Appl Environ Micro* 2005; 71:2260-6.
15. Patz JA, Epstein PR, Burke TA & Balbus JM. Global climate change and emerging infectious diseases. *JAMA* 1996; 275:217-23.
16. Weiss RA & McMichael AJ. Social and environmental risk factors in the emergence of infectious diseases. *Nat Med* 2004; 10(12 Suppl.):S70-6.
17. Lipp EK, Hug A & RR Colwell. Effects of global climate on infectious disease: the cholera model. *Clin Microbiol Rev* 2002; 15:757-70.
18. Louis VR, Russek-Cohen E, Choopun N, Rivera IN, Jiang SC, Rubin A, Patz JA, Hug A & Colwell RR. Predictability of *Vibrio cholerae* in Chesapeake Bay. *Appl Environ Micro* 2003; 69:2773-85.
19. Berns DS & Rager B. Emerging infectious diseases: a cause for concern. *Isr Med Assoc J* 2000; 12:919-23.
20. Randorf SE. The shifting landscape of tick-borne zoonoses: tick-borne encephalitis and Lyme borreliosis in Europe. *Phil Trans R Soc Lond B* 2001; 1045-56.
21. Shimura J. *Global Taxonomy Initiative in Asia*. Research report from the National Institute for Environmental Studies, Japan, 2003; 175:11-314, ISSN 1341-3643-175.
22. Shimura J. A regional strategy to achieve key information provision for implementation of the Convention on Biological Diversity. In: Shimura J (Ed). *Building Capacity in Biodiversity Information Sharing*. 2003, p. 13-25, ISBN 4 900626 03 1C3045.
23. Secretariat of the CBD. <http://www.biodiv.org/decisions/default.aspx?m=COP-06&id=7198&lg=0>.
24. Ando K & Watanabe MM. Global Taxonomy Initiative (GTI) and taxonomy. *WFCC Newsletter* 2003; 38:50-3.
25. Wilson KL, Gordon P, Soetkno SS, Fornwall M & Shimura J. The report. *Taxonomy for Biodiversity in Asia-Oceania* 2004, p.2-38, ISBN 4-486-07065-8 C3045.

15th International Pathogenic Neisseria Conference 2006

Cairns Convention Centre, Cairns QLD

10-15 September 2006

www.ipnc2006.org



IPNC06

15th international pathogenic neisseria conference

This conference is held every 2 years and has a long history of scientific excellence, social interaction and discussion. For the last 10 years the conference has consistently attracted 400-600 delegates, with the meetings alternating between Europe and North America. Because of a consistent Australian presence at these meetings, this next conference will be held in Australia for the first time!

Stay tuned for further information regarding international speakers, program and special registration packages. A variety of accommodation options, all within walking distance to the conference venue, together with an exciting Pre & Post Touring Program will ensure a memorable stay in Cairns.

REGISTRATION — EXPRESSION OF INTEREST

Register your expression of interest now so you don't miss out on any registration offers.

Go to the conference website www.ipnc2006.org

Or, contact the conference organisers:

Tel: +61 3 9867 8699 E-mail: janette@theasm.com.au

SPONSORSHIP OPPORTUNITIES

Industry support is an important element of the meeting. IPNC 2006 will provide a fantastic opportunity for strong branding and exposure to a concentrated group of international and specialist industry users. Contact the conference organisers for further information.

IPNC 2006 Co-Convenors Professor Michael Jennings

Professor John Davies Conference Organiser

Australian Society for Microbiology, Suite 23, 20 Commercial Road, Melbourne VIC 3004 Australia

Tel +61 3 9867 8699 Fax +61 3 9867 8722 Conference Manager — Janette Sofronidis, E-mail: janette@theasm.com.au