

The Asia Regional DNA barcode meeting

Friday, 21 September 2007

Academia Activity Center
Academia Sinica, Taipei, Taiwan

Report of a Regional Meeting



NSC



Summary. Fifty-eight representatives from 15 countries participated in a one-day regional meeting on DNA barcoding held in conjunction with and immediately following the Second International Barcode of Life Conference (see attached participant list and meeting agenda). The purpose of the meeting was to identify barcoding projects that could address the most pressing needs in the region, and to begin the process of forming networks that would implement plans for these high priority projects. Participants identified plant protection, agricultural pests, mosquitoes, and endangered species as the highest priority areas for barcoding. The meeting also produced recommendations for further outreach and training activities that are needed to promote the region's participation in the Barcode of Life Initiative.

Background. The meeting was the fourth in a series of outreach meetings to developing regions organized jointly by the Consortium for the Barcode of Life (CBOL; www.barcoding.si.edu) and BioNET-INTERNATIONAL (www.bionet-intl.org). Approximately 70 invitations were sent to senior researchers, policy-makers, and government officials in 15 countries in south, southeast and east Asia. A Steering Committee* chaired by Shen-Horn Yen planned the agenda, selected participants, and made all logistical arrangements for the meeting which was held in the Academia Activity Center of Academia Sinica in Taipei on Friday, 21 September 2007. CBOL and BioNET supported the travel for all meeting participants. The participants in the regional meeting had attended the three-day conference which provided them with an understanding of DNA barcoding and its applications in science and to societal problems.

Acknowledgements. This meeting was supported by contributions from CBOL, BioNET (through a grant from the Swiss Agency for Development and Cooperation), and Academia Sinica, the host organization. The meeting was co-sponsored by the following agencies of the Taiwan government: Council for Agriculture; National Science Council; Ministry of the Interior; Taiwan Museum; and the Taipei City Government. The organizers thank all the contributors for their support, and the meeting attendees for their enthusiastic participation.

Format of the meeting. Prior to the conference, participants responded to an e-mail questionnaire on their national capacity for taxonomic research and molecular studies. Their responses were compiled prior to the meeting and a summary was presented at the beginning of the meeting. These background data set the stage for brief presentations by a representative of each participating country. Presenters described barcoding activities that had already been launched in their respective countries and the institutions, agencies, and topics that are the most likely components in future barcoding activities. Following the lunch break, participants divided into three break-out discussion groups that explored the region's capacity, opportunities and needs in three areas related to DNA barcoding: taxonomic collections, molecular biology, and biodiversity informatics. Rapporteurs presented the findings of each group, described below. The final session of the meeting was a whole-group discussion that identified the region's highest priorities for barcoding.

*The Steering Committee for the Taipei regional barcode meeting was Shen-Horn Yen, Chair (National Sun Yat-Sen University); Bo-Feng Lee, Chyong-Yuan Wu, Chyong-Ling Jeng, Hsin-Hua Lin, and Miao-Suey Lin (Academia Sinica); Tzen-Yuh Chiang (National Cheng-Kung University); Wen-Liang Chiou (Taiwan Forestry Research Institute); Athula Perera (Univ. of Peradeniya, Sri Lanka); Richard Smith (BioNET-INTERNATIONAL); Badrul Amin Bhuiya (Univ. Chitagong, Bangladesh, and BioNET-SACNET, BioNET's LOOP for southern Asia); Channa Bambaradeniya (IUCN Sri Lanka and BioNET-SACNET); Wazir Lakra (National Bureau of Fish Genetic Resources, India); D. Chandramohan (National Institute of Oceanography, India)

Survey findings. Twenty-nine survey responses were received from representatives of 14 participating countries. Their responses indicated that all countries have institutions that are active in taxonomic and environmental research; eight reported having programs for agricultural research. All countries reported having reference collections as well as active programs in species conservation. Government agencies and policy-makers were reported as the most common users of taxonomic research results and services, along with academic researchers. Less frequent users were industry, NGOs, and managers of protected areas. Lack of funding, trained professionals, career opportunities and institutional capacity were reported as the most important obstacles to biodiversity research and regional collaboration. Most respondents reported that their countries have regulations controlling the international transfer of specimens, but these were considered significant obstacles in relatively few countries. Internet connectivity and speed were considered adequate to good in all but two countries and access to professional journals was reported as an obstacle in three countries.

Findings of the discussion groups.

Collections and taxonomists.

Participants in this discussion group agreed that barcoding would probably generate a significant increase in the rate of accessions of new voucher specimens into repositories. Managing this increased curatorial workflow will be a significant challenge, especially for smaller universities and countries that do not have well-developed natural history museums and herbaria. Large specimens will create difficult problems and it may not be possible to store entire organisms. Nevertheless, governments should recognize the downstream value of preserving voucher specimens for taxonomic study and regulatory purposes. Participants discussed the centralized and decentralized strategies for storing voucher specimens.

- Singapore's fish research network has adopted a more relaxed and decentralized approach in which specimens are stored in many places, with good documentation of where they are stored.
- Larger countries like India and Kenya are creating national facilities for vouchering. Kenya and the Royal Botanic Garden Kew collaborate on an African seed bank that is stored at Kew. Their agreement states that specimens from the bank cannot be passed on to third parties, and that Kenya can withdraw from the agreement at any time, repatriating its collections. Despite this agreement, there are public concerns about sending genetic material out of the country.
- Thailand and Vietnam have an agreement for fungi. All Vietnamese strains are stored in the Thai biotech collections and they have agreed to share and exploit them commercially in a partnership arrangement.
- The Animal Genetic Resources Information Network in Taiwan is a large scale facility that can keep frozen material and can offer storage to other countries.

Participants concluded that in many cases, international cooperation and transfer of voucher specimens will be needed for their safe-keeping. Permanent loan arrangements are one category of mechanisms to hold material in organizations and countries on behalf of the owners of the specimens. Establishing trust relationships will be a core requirement for these types of arrangements. International organizations could be used as an umbrella to establish regional repositories that would store vouchers and provide training to curators in the countries of origin. Having the repositories in the region would alleviate many concerns

about loss of genetic resources. Participants suggested that CBOL should build up a portfolio of examples of how these international arrangements have been established in different places and how well they are working. CBOL could also develop a checklist of requirements for repositories, with special provisions for holding specimens owned by other institutes or countries.

Participants urged CBOL to include the legal issues associated with genetic resources in its program of work. There is some uncertainty whether PCR products are covered by the Convention on Biological Diversity or not. Many countries (e.g., Philippines, India) are changing their laws concerning the transfer and downstream use of specimens and their by-products. Taiwan does not restrict specimen transfer but wants to ensure that credit for barcode sequences will go to the country of origin. Can a 'free-trade zone' be created in which barcode data, PCR products and even DNA extracts and specimens can be shared among countries? The Swiss Academy of Sciences has developed guidelines for best practices in sharing the benefits of biodiversity research and CBOL may consider adopting these.

In addition to questions of ownership, there may be issues of legal liability associated with barcode data. All countries have designated National Plant Protection Organizations (NPPOs). If a barcode project generates a public data record that says a particular pest species was found in a certain place, this could change the pest status of a country and could affect its trade relationships. The NPPOs of these countries may hold the researcher responsible for the consequences. At the same time, barcoding can be very useful for pest identification and species conservation. A customs official in the discussion group viewed barcodes as a fast and accurate method for import/export control. There is a new customs agreement between the World Trade Organization and CITES about the export of DNA products that CBOL should consider.

There is a severe shortage of expert taxonomists throughout the region, so the argument for adopting and supporting barcoding will have to be connected to non-research uses. The research enterprise is simply too small in the region to generate much support from research councils. The priorities for barcoding should therefore be selected on the basis of their practical applications and the potential generation and transfer of useful barcode data to the users. Some potential priority areas for barcoding projects in the region are:

- Food species, including fish, medicinal products, and pests on agricultural products;
- Health, including the detection of emerging diseases and zoonotic vectors;
- Endangered animals, smuggled wildlife, fish, orchids not in flower; and
- Biodiversity inventories to assist countries in their need to develop their national biodiversity strategies and action plans.

Molecular biology laboratory capacity. Participants endorsed the idea of developing national barcode networks. BioNET LOOPS could be very helpful in developing and maintaining these networks. Participants concluded that there are several countries in the region with institutes that could participate in CBOL's Leading Labs Network immediately. An important factor in selecting regional centers should be the taxonomic expertise in each country. India's national fisheries research bureau has all the necessary facilities, has already started barcoding fish, and has hosted one barcoding training course. CCMB hosts annual short courses on molecular techniques and has visitor accommodations. Most

training activities have been for Indian nationals but it may be possible to open their courses to foreigners. Other institutes in India have started participating in barcoding projects such as the All Birds Barcoding Initiative.

Sri Lanka, Bangladesh and Indonesia each have several research institutes with DNA extraction and PCR capabilities, and each country has a few DNA sequencers but access to them for barcoding projects may be limited. A regional center could solve this problem. Transporting material out of each country to a regional center is possible but would need careful planning and permissions. Transporting PCR products would probably be easier than entire specimens, and having materials carried by students who are obtaining training at the regional center could be easiest. This suggests the need for CBOL to provide training fellowships for travel to the regional center.

Participants thought that having one or several members in the CBOL Leading Labs Network in the region would be very beneficial. Specialists on particular taxonomic groups could then organize themselves into regional networks for the coordinated use of the regional center. Training fellowships to spend time at the regional center would strengthen the networks. Commercially important species such as malaria mosquitoes, and medicinal plants should be considered high priorities because initiatives linked to the well-being of people will attract the most support.

Participants identified several possible institutes that could serve as the region's Leading Lab. There are several in China, Korea and India, and Taiwan has active barcoding programs in several taxonomic groups. Japan has excellent facilities in many labs but there is not yet strong interest in barcoding. The Japan Society for the Promotion of Science offers support for bilateral projects and this may be a source of funding for the networks devoted to specific taxa.

Databases. Participants in this breakout group endorsed the idea of having all barcode data in BOLD, but they agreed that databases that concentrate on the region's biota would be very useful. A database of taxonomists in the region is needed and the BioNET LOOPS could play a leading role in compiling one. Participants also focused on the need for clear ownership of the barcode data and protocols that would protect the IPR of data in each country. Creating certificates of data ownership might be useful. The lack of Globally Unique IDs and the tendency among researchers to hoard their data were considered important obstacles.

Recommendations for regional initiatives. Participants discussed potential barcoding initiatives that would have the greatest impact across the region. They developed two lists: one for barcoding activities and the other for outreach activities that would generate long-term interest in and support for barcoding.

Priority barcoding projects. Participants developed the following list of high-priority barcoding projects that should be developed within the region:

- **Medicinal plants.** This initiative would be of interest to many countries in the region owing to the widespread use and production of herbal remedies. Barcoding would be especially valuable for import/export controls on endangered plants and for detecting economic fraud. Unlike many barcoding projects, this one would include species from a wide range of higher taxonomic groups.
- **Insects in quarantine practice.** Plant protection and quarantine is an important area

in the region and barcoding could be a valuable tool. Participants suggested creating a regional initiative within CBOL's Tephritid Barcoding Initiative. Barcoding projects on thrips and other commodity-related pests were also considered priorities. The ASEAN Diagnostic Network might be a useful partner.

- **Fungi.** There is considerable taxonomic expertise on fungi in the region, as well as important socioeconomic problems related to fungi. Plant pathogens and mycorrhizal fungi are two examples of economically important groups. CBOL has started to organize a Fungal Barcoding Initiative and the region should take an active part in the effort.
- **Mosquitoes.** Public health officials throughout the region are involved in controlling disease-bearing mosquitoes and there are taxonomic projects throughout the region. These projects should be put in contact with CBOL's Mosquito Barcoding Initiative. A regional MBI Working Group could be formed to collect species and areas of special interest and to contribute data to the global database.
- **Ornamental fish.** The aquarium fish trade is very active and economically important in the region. The international trade of ornamental fish is of concern for several reasons. These fish can be vectors of zoonotic disease that can threaten native populations and humans. Some species are endangered and their international trade is prohibited under CITES. A regional activity on ornamental fish species could be developed as part of CBOL's FISH-BOL campaign.
- **Wild cats in trade.** Many Asian felid species are endangered and are sought for folk remedies and hides. Barcoding could be a very useful tool for import/export control of these protected species.

Priority outreach projects. In addition to encouraging development of the regional barcoding projects described above, participants urged CBOL to help organize the following outreach activities in the region:

- **Capacity-building.** Participants agreed that capacity-building efforts would have to start by raising the awareness of strategic stakeholders. AusAid has developed and used an effective format for immersion workshops designed for government officials, taxonomists and other biologists. Training fellowships and scholarships in targeted subregions were also considered high priorities.
- **Conservation program.** The region has many biodiversity hotspots and some of these are areas of intense conservation activities. These "conservation hotspots" should be identified and an active outreach program should be started to promote the use of DNA barcoding as a tool for monitoring. New Guinea is one such underexplored region of high biodiversity.
- **Institutional building.** An important step in promoting barcoding in the region will be identifying regional centers that can be part of CBOL's Leading Labs Network. They can serve as national centers for barcoding projects. In addition, Repositories with adequate environmental controls for vouchers will be needed as barcoding projects develop. These could be national or regional.

Next Steps. CBOL will distribute a report of the regional meeting to participants. Several participants noted that subregions may have strong common priorities that could be developed. A small Steering Committee will be formed to develop the ideas generated at the meeting. BioNET will invite its LOOPs in East, Southeast and South Asia to

disseminate this report and help form project development teams to follow up on the recommendations.

CBOL asked the participants from institutions that have not yet become CBOL Member Organizations to consider becoming members. This would make future communication easier and would not involve any financial commitment.

Participant list, Regional Barcode Meeting for Asia,
Academia Sinica, Taipei, Taiwan, 21 September 2007

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AGENDA, REGIONAL DNA BARCODING MEETING
Academia Sinica, Taipei, Taiwan

Friday, 21 September 2007

8:30 am: Coffee

SESSION 1. Current regional capacity for DNA Barcoding
Session Chair: Shen-Horn Yen, Taiwan

9:00 am: Communication from the Chair

9:15 am: Lessons Learned from CBOL Regional Meetings, Goals of Taipei Regional Meeting
Scott Miller – CBOL Chair, USA

9:30 am: Results of e-mail survey of national capacity
David Schindel – CBOL Executive Secretary, USA

10:00 am: International Consortium Initiative Program, Genome Canada
Christian Burks - Ontario Genomics Institute, Canada

10:15 am: Brief country summaries of barcoding activities and priorities (5 minutes each)

10:45 am: Coffee break

11:15 am: Presentation of country summaries continue

12:00 noon: Description and discussion of regional networks for biodiversity
Badrul Amin Bhuiya, Bangladesh and BioNET-INTERNATIONAL representative

- What networks exist in the region (strengths, weaknesses and possibilities)?
- How can we strengthen and utilize these networks optimally?

12:30 pm: Lunch

Session II: Breakout Discussion Groups of Opportunities and Obstacles
Session Chair: Helida Oyieke, Kenya

2:00 pm Briefing for breakout discussion groups by the Session Chair

Group 1: Biological collections and taxonomic expertise in the region
Moderator: Kwang-Tsao Shao, Taiwan; Rapporteur: Richard Lane, UK

Group 2: Lab capacity for DNA barcoding in the region
Moderator: Rajesh Jeewon, Hong Kong and EASIANET;
Rapporteur: Jose Alves-Gomes, Brazil

Group 3: Informatics for biodiversity in the region
Moderator: Juncai Ma, China; Rapporteur: Jim Edwards, USA

Topics for discussion in breakout groups: In light of the results of the national surveys and the morning presentations of national capacities, how should DNA barcoding be implemented in the region? For each of the three domains (collections, lab capacity, informatics)

- Where and what are the greatest opportunities to implement important barcoding projects in the immediate future (2008-2009)?
- What are the obstacles to the implementation of barcoding projects in the next 2 years?
- Beyond the immediate future, where and when will important opportunities appear in the

next 3-5 years?

3:30 pm: Coffee break

Session III: Summary and Identification of Regional Priorities

Session Chair: Won Kim, Korea

4:00 pm: Presentation of results by rapporteurs (10 minutes each) and discussion

4:30 pm: Identification of the highest-priority barcoding projects in the region

Moderator: David Schindel, CBOL, USA

5:30 pm: Summary and closing remarks: **Shen-Horn Yen**, Taiwan