The Australian Barcode of Life Network

Welcome to the first newsletter of the Australian Barcode of Life Network. This network has recently been established by a group of Australian scientists involved in genetic and taxonomic research and is linked with the International Barcode of Life Project.

The aim of the network is to provide a forum through which those interested in and undertaking DNA barcoding can share information about activities, resources and opportunities in Australia and internationally. We plan to distribute this newsletter twice a year. The network steering committee is also interested in exploring strategic applications of barcoding and funding options to support research in Australia. A barcoding conference is also planned for later in 2009 – stay posted for more information.

We would like to hear from our colleagues in Australia. Are you interested in becoming a member of the Australian Barcode of Life Network? Are you undertaking research that has a DNA barcoding component? What are your barcoding needs? Do you have some barcoding news you would like to share with others? Send us an email at the address below.

So that we can build the network, please forward this newsletter to anyone you think might be interested.

Les Christidis, Chair, Australian Barcode of Life Steering Committee
Email: dna.barcoding@austmus.gov.au

Australian Barcode of Life Steering Committee Members

Dr Stephen Cameron	CSIRO Entomology	Canberra
Dr Les Christidis (Chair)	Australian Museum	Sydney
Dr Paul De Barro	CSIRO Entomology	Queensland
Dr Dan Faith	Australian Museum	Sydney
Ms Rebecca Hancock (Secretary)	Australian Museum	Sydney
Prof Andrew Lowe	State Herbarium & Biological Survey, SA	Adelaide
Dr Andrew Mitchell	NSW Dept Primary Industries	Wagga Wagga
Dr Janette Norman	Museum Victoria	Melbourne
Mr Cameron Slatyer	Commonwealth Department of Environment, Water, Heritage & Arts	Canberra
Dr Brett Summerell	Botanic Gardens Trust	Sydney
Dr Bob Ward	CSIRO Marine & Atmospheric Research	Hobart

Australia joins the International Barcode of Life Project

(The following is from a news item released in 2008 by the Australian Museum)

The Australian Museum, NSW Department of Primary Industries and NSW Botanic Gardens Trust have joined forces with the Biodiversity Institute of Ontario and Ontario Genomics Institute in Canada in an ambitious project to create a database of DNA barcodes of 500,000 species (5 million specimens) within five years.

The organisations signed a Memorandum of Understanding for the International Barcode of Life *(iBOL)* Project at the Australian Museum on 18 February 2008 at an event attended by DNA barcoding participants from Australia and Canada. The Australian Museum will coordinate Australia's involvement in this project through the Australian Barcode of Life Steering Committee.

DNA barcoding is a technique that uses a short DNA sequence from a standardised position in the genome as a molecular diagnostic for species-level identification. For the majority of higher animals, the cytochrome c oxidase subunit 1 mitrochondrial region (CO1) is used. The technique will enable cheaper, more rapid identification of species and thus aid in the management and protection of biodiversity.

Signing the MoU. Photo Carl Bento, Australian Museum. (left to right) Dr Paul Hebert, Biodiversity Institute of Ontario; Dr Christian Burks, Ontario Genomics Institute; Minister John Wilkinson, Department of Research & Innovation, Ontario; Dr Brett Summerell, Botanic Gardens Trust; Mr Frank Howarth, Australian Museum; (not in photo – Minister Ian Macdonald, NSW Dept Primary Industries).

DNA Barcoding Projects in Australia

The following is a list of the projects that we have heard about so far. Please tell us about your project.

FISH-BOL

The following is an extract from a Sydney Morning Herald article, 20th November 2008

Bob Ward, of CSIRO Marine and Atmospheric Research in Hobart, and his team have worked out the genetic fingerprints of more than 1000 fish species - about a quarter of those found in Australian waters. Commercially important fish, such as snapper and tuna, have been barcoded first, and the scientists are now moving onto less economically significant and rarer types of species.

Ward says the research has already proved useful in a recent case of illegal fishing. With his colleague, Dr Bronwyn Holmes, he tested samples from about 200 shark fins confiscated from people fishing in

Australia's northern waters who were discarding the shark carcasses overboard after cutting off the fins.

"Shark fins, by themselves, are extremely difficult, if not impossible to identify to species," he says. Barcoding of the samples, however, revealed they came from 20 species of shark and seven species of ray. "And six individuals were found to be the narrow sawfish, a critically endangered species."

He says the International Barcode of Life Project, which has barcoded about 6000 fish species so far, will provide certainty for seafood consumers and retailers, by eventually allowing them to have suspicious seafood DNA tested to ensure there has not been any substitution. "The dream is to have a hand-held device so anyone could do this task anywhere. We are still hopeful that will happen within five years."

Fishing inspectors would also be better able to enforce sustainable fishing by quickly testing catches which had been filleted at sea.

Barcoding on the Great Barrier Reef: The TOTAL Foundation, under the auspices of FISH-BOL, funded a fieldtrip in September to barcode the fishes of the reefs around Lizard Island in the northern part of the Great Barrier Reef. Scientists from University of Guelph (Canada), CSIRO, Australian Museum, Museum Victoria, Queensland Museum and Museum of Western Australia collected and catalogued more than 400 different fish species.

The data will be widely available through the BOLD database. The information gathered will have many applications including facilitating the association of juvenile and adult stages, species distribution and range extensions and enabling identification of any recreational or commercial catch whether the specimens be entire or partial. Specifically it will produce vital data which contributes to fisheries management, conservation, research and monitoring effects of climate change on fish communities on the Great Barrier Reef.

The specimens have been lodged at the museums of the participating scientists around Australia, with the majority at the Australian Museum. Retaining all the fish specimens and tissues in Museums also enables the wider scientific community to study these important specimens.

For more information: bob.ward@csiro.au and http://www.fishbol.org/

All Birds Barcoding Initiative

The Australasian node of the All Birds Barcoding Initiative (ABBI) has generated over 800 barcode sequences from 327 species. The main groups for which barcodes have been obtained are the cockatoos (Cacatuidae), robins (Petrocidae), wrens (Maluridae), pigeons and doves (Columbiformes), kingfishers (Coraciiformes), cuckoos (Cuculiformes) and the birds of New Zealand and Antarctica. Collaborating institutions are Museum Victoria, Australian Museum, Griffith University and Massey University.

For more information contact: Janette Norman jnorman@museum.vic.gov.au

Tree-BoL

Andrew Lowe, Darren Crayn and Brett Summerell are now the Australian representatives in Tree-BoL, aiming at generating barcode info on all tree species (which has $500K funding from Sloane foundation through CBOL). Together with other major Australian Herbaria involved in DNA barcoding and phylogenetic acitivites, we are also planning to submit an ARC linkage application in the April/May 09 round to support these activities.

A number of plot-based analyses of tree species have proven to be very successful for barcoding tropical rainforest species from the Queensland and New South Wales tropical and subtropical forest ecosystems

An international committee involving the major labs developing plant DNA barcoding approaches has now ratified the loci of choice for plant focused work and a high impact publication is imminent outlining these loci and choice justification. However it is also clear that for plants, due to problems associated with recent adaptive radiations and hyrbidisation, a number of supporting nuclear-based loci will also need to be developed to resolve problematic species. TreeBoL participants are working on this issue.

For further information:
http://www.bgci.org/resources/news/0463/?sec=botanic_gardens&option=com_news&id=0463

Census of Antarctic Marine Life

The Census of Antarctic Marine Life (CAML) is a major project of the International Polar Year, led by scientists at the Australian Antarctic Division in Hobart that aims to determine the biodiversity, abundance and distribution of marine species (from microbes to whales) around Antarctica. One of the objectives of CAML is to contribute to the Barcode of Life project.

Molecular barcoding is providing valuable information on the species richness of marine communities. At the end of 2008, CAML has coordinated about 3,000 sequences from nearly 2,000 species, from all major phyla of marine life. Further information on the barcoding aspect of the CAML project is available at http://www.caml.aq/barcoding/index.html.

Coordinator: Rachel Grant, Cambridge UK, email: rachelannegrant@gmail.com

NSW Department of Primary Industries

NSW DPI is now halfway through its four year project on barcoding insects of agricultural importance. Data sets are in preparation for native scarab beetles and heliothine moths, and for native and exotic scolytid beetle pests, among other taxa.

For more information contact: Andrew Mitchell andrew.mitchell@dpi.nsw.gov.au

Centre for Medical Bioscience, Wollongong University

Mark Dowton and James Wallman at the Centre for Medical Bioscience, Uni of Wollongong are undertaking a project on the use of the barcode for the identification of forensically important flies. They are testing whether the barcode is a useful tool for the identification of Australian blowflies (Calliphoridae) and fleshflies (Sarcophagidae), particularly for those flies that are involved in forensic work. Current work is focussing on characertising the within and between species divergences in the barcode region.

For more information contact: Mark Dowton mdowton@uow.edu.au

CSIRO Entomology

The following is an extract from a Sydney Morning Herald article, 20th November 2008

In Canberra, researchers have been collecting the legs of moths and butterflies and sending dried samples off for barcoding in Canada to build up the worldwide database for insects.

Muscle tissue is needed for the DNA testing, and although the insects' legs are not bulging with muscles, they are the best part for the job, says Dr Marianne Horak, of CSIRO Entomology.

Australia has about 20,000 species of butterflies and moths, only about 10,500 of which have been named. To identify the species that are sampled, the CSIRO team draws on the expert skills of one of its members, Ted Edwards, who has been fascinated by moths and butterflies since a child. "He has an incredible knowledge," says Horak.

While barcoding may help identify new species, she believes the main benefit will be in identifying pests.

Caterpillars cause the most damage to crops, but it is impossible to distinguish between 20,000 types of caterpillar from their appearance alone. Quarantine inspectors might eventually be able make a quick barcoding test at the border to decide which grubs are harmless and which need to be kept out, she says.

For more information contact: julie.carter@csiro.au

Museum Victoria

In addition to contributing to the All Birds Barcoding Initiative researcher Janette Norman, and PhD student Linzi Wilson-Wilde, are working with the Australian Federal Police to develop DNA barcodes for the diprotodontid marsupials and evaluate their use as a forensic tool. Barcodes for 64 species have been generated and work on mini-barcodes for use on trace samples and archival material is in progress.

Janette Norman is also using DNA barcodes to characterize populations of trapdoor and funnelweb spiders as part of a project examining the composition and evolution of their venoms. Another project, being undertaken by MSc student Eivind Undheim, has used COI DNA barcodes to identify 16 species of East Antarctic octopods collected during Voyage 3 of the Aurora Australis (2007-2008) as part of the Collaborative East Antarctic Marine Census (CEAMARC).

For more information contact: Janette Norman jnorman@museum.vic.gov.au

Leading Labs Network

The Consortium for the Barcode of Life (CBOL) has established a Leading Labs Network designed to bring together laboratory managers and data managers involved in DNA barcoding from across the globe. By creating and supporting this network of "Leading Labs," CBOL hopes to help overcome the technical obstacles encountered by barcoding projects, increasing the flow of high-quality barcode data into the public domain.

The Australian Museum and Museum Victoria are the Australian representatives for the Leading Laboratories Network and in June 2008 staff from the two museums attended the 2nd Annual Consortium for the Barcode of Life (CBOL) Leading Laboratories meeting held in San Diego, California.

The meeting was devoted to discussions of barcoding lab protocols and data management and developing resources for barcoding labs. There was rigorous discussion regarding the 'barcode standard' as well as how to develop and share technical knowledge, to increase the number and flow of barcode records into the Barcode of Life Database (BOLD).

During the meeting, a sub-committee was established to oversee the Travel Fellowships and Training Grants program that enables Leading Labs to host workshops to educate potential 'barcoders' in barcoding techniques or to enable members to obtain training at the Guelph or Smithsonian barcoding facilities. This program is aimed at increasing the number of records from all parts of the world. A second sub-committee was established to oversee development of a website for the sharing and promotion of barcoding protocols and techniques.

Australian Genome Resources Facility

The Australian Barcode of Life Network Steering Committee has negotiated a special Project Sequencing rate for members of the Australian Barcode of Life Network. Currently, DNA barcoders at the Australian Museum, Museum Victoria and NSW DPI have signed on for access to the special AGRF rates. The service is flexible and can accept purified and unpurified PCR products in plate or tube format. Sequencing is performed with M13 Forward and Reverse primers or primers of your choice.

For more information on how to submit samples for sequencing under the Australian Barcode of Life Network Project Sequencing contract contact Dr Janette Norman jnorman@museum.vic.gov.au.

Publications

If you have recently published an article that includes applications of DNA barcoding, please let us know so that we can list it in the next newsletter.

Holmes, B.H., Steinke D. & Ward, R.D. 2009. Identification of shark and ray fins using DNA barcoding. Fisheries Research, 95, 280-288.

Jurado-Rivera, J.A., Vogler, A.P., Reid, C.A.M., Petitpierr, E. & Gomez-Zurita, J. 2009. DNA barcoding insect-host plant associations. *Proceedings of the Royal Society B.* 276 (1657): 639-648.

Assefa, Y., Mitchell, A., Conlong, D.E. & Muirhead, K. 2008. The establishment *of Cotesia flavipes* (Hymenoptera: Braconidae) in sugarcane fields of Ethiopia and the origin of the founding population. *Journal of Economic Entomology* 101(3): 686-691.

Mitchell, A. 2008. DNA barcoding demystified. *Australian Journal of Entomology* 47 (3): 169-173.

Ward, R. D., Holmes, B. H. & Yearsley, G. K. 2008. DNA barcoding reveals a likely second species of Asian sea bass (barramundi) (Lates calcarifer). *Journal of Fish Biology*. 72(2) 458–463.

Ward, R. D., Holmes, B. H., William, T. W. & Last, P. R. 2008.DNA barcoding Australasian chondrichthyans: results and potential uses in conservation *Marine and Freshwater Research*. 59(1) 57-71.

Ward, R.D., Costa, F.O., Holmes, B.H. & Steinke, D. 2008. DNA barcoding of shared fish species from the North Atlantic and Australasia: minimal divergence for most taxa but Zeus faber and Lepidopus caudatus each probably constitute two species. Aquatic Biology, 3, 71-78.

Ward, R.D., Holmes, B.H. & O'Hara, T.D. 2008. DNA barcoding discriminates echinoderm species. Molecular Ecology Resources, 8, 1202-1211.

Assefa, Y., Mitchell, A., Conlong, D.E. & Moyal, P. 2007. DNA identification of *Busseola* (Lepidoptera: Noctuidae) larvae in Ethiopian sugarcane. *African Entomology* 15: 375–379.

Kohler, Frank 2007.From DNA taxonomy to barcoding - how a vague idea evolved into a biosystematic tool. *Mitteilungen aus dem Museum für Naturkunde Berlin, Zoologische Reihe*. 83(Supp.) 44-51.

Last, P. R., Gledhill, D. C. & Holmes, B. H. 2007. A new handfish, Brachionichthys australis sp. nov. Lophiiformes:Brachionichthyidae), with a redescription of the critically endangered spotted handfish, B. hirsutus (Lacepède) **.** *Zootaxa*. 1666. 53-68.

Nelson, L.A., J.F. Wallman & M. Dowton, 2007. Using COI barcodes to identify forensically and medically important blowflies. *Medical and Veterinary Entomology*. 21(1) 44-52.

Ward, R.D. & B.H. Holmes. 2007. An analysis of nucleotide and amino acid variability in the barcode region of cytochrome c oxidase I (cox1) in fishes**.** *Molecular Ecology Notes*. 7: 899-907.

Ward, R.D., Holmes, B.H., Zemlak, T.S. & Smith, P.J. 2007. DNA barcoding discriminates spurdogs of the genus Squalus. In: Descriptions of new dogfishes of the genus Squalus (Squaloidea: Squalidae). Eds: Last, P.R., White, W.T. and Pogonoski, J.J., pp 117-130. CSIRO Marine and Atmospheric Research Paper 014, Hobart, Australia. 130 pp.

Ward, R.D., Zemlak, T.S., Innes, B.H., Last, P.R. & Hebert, P.D.N. 2005. Barcoding Australia's fish species. Philosophical Transactions of the Royal Society of London B 360, 1847-1857.

Publications from barcoding projects around the world:
http://www.dnabarcodes.org/publications

Useful Links

Barcode of Life Initiative: http://www.dnabarcodes.org/
The Barcode of Life Initiative is a collection of research projects, organizations, and individuals devoted to developing DNA barcoding as a global standard for identifying species. BOLI began in 2003 at the Canadian Centre for DNA Barcoding at the University of Guelph in Ontario. The Consortium for the Barcode of Life (CBOL) and the Canadian Barcode of Life Network formed shortly thereafter.

BOLD : www.barcodinglife.org
The Barcode of Life Data Systems (BOLD) is an online workbench that aids collection, management, analysis, and use of DNA barcodes. It consists of 3 components (MAS, IDS, and ECS) that each address the needs of various groups in the barcoding community.

iBOL: http://www.dnabarcoding.org/
The International Barcode of Life Project aims to assemble the sequence library and the technology necessary to identify organisms rapidly and inexpensively.

CBOL : www.barcoding.si.edu
The Consortium for the Barcode of Life (CBOL) is an international initiative devoted to developing DNA barcoding as a global standard for the identification of biological species. CBOL has more than 130 Member Organizations from more than 40 countries.

DNA Barcoding Protocols: http://www.dnabarcodes.org/pa/ge/protocols

Articles Sydney Morning Herald 20 November 2008:
Cracking the barcode of creatures small
Gotcha ? nature unmasked