

Molecular tools and DNA Barcoding for Conservation

The Darwin Initiative (DI) for the Survival of Species promotes biodiversity conservation and sustainable use of resources around the world (<http://www.darwin.gov.uk>). It is funded and administered by the UK Department for Environment, Food and Rural Affairs, (DEFRA). The main goal of the DI is to assist countries rich in biodiversity but poor in resources with the conservation of biological diversity and implementation of the Biodiversity Convention. Projects funded under the DI are collaborative, involving either local institutions or communities in the host country in collaboration with a British institution.



Here we present four DI projects using molecular tools for species identification, forensic use and conservation.

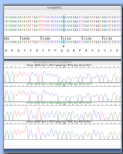
Project in Costa Rica (Ref. 14-001)

Conservation and Monitoring of MesoAmerican orchids

Royal Botanic Gardens, Kew and Lancaster Botanical Garden - University of Costa Rica. *Contact: Mr. J. Warner, Mr. D. Bogarin, Prof. F. Pupulin, Dr. V. Savolainen, Prof. M. Chase, Mr. G. Gigot*



Started in 2005, the project purpose is to record **orchid diversity** and to establish long-term monitoring sites to study Costa Rican orchids.

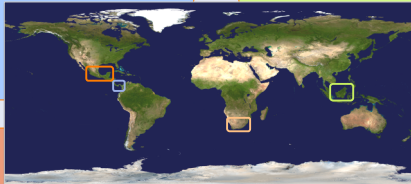


Main activities:

- to undertake a pilot study on **DNA barcoding** for conservation and trade surveillance
- to provide **research training** in orchid biology, linking with global efforts to build the orchid tree-of-life

DNA barcoding is a diagnostic technique for identifying species using a short DNA sequence from a standardized and agreed-upon region in the genome; such DNA barcode sequences are very short relative to the entire genome and they can be obtained reasonably **quickly and cheaply**.

The use of a **standardized identification tool** could provide many potential uses and applications, for example: identification of different life stages (e.g. seeds and seedlings), identification of fragments of plant material, forensics, verification of herbal medicines/foodstuffs, biosecurity and trade in controlled species, inventories and ecological surveys.



http://www.jardinbotanicolankester.org/ing/project_a.html

Project in Borneo (Ref. 10-025)

Molecular tools for promoting biodiversity in rainforest fragments of Borneo

University of York, University of Leeds, Natural History Museum, Institute of Tropical Biology and Conservation University Malaysia Sabah, Forest Research Centre Sabah and the Yayasan Sabah.

Contact: Dr. K. C. Hamer, Prof. M. Maryati and Dr. V. K. Chey



Between 2001 and 2004, this project has focused on land use and environmental changes in **Sabah**. Main objectives were - to provide practical advice on the size and placement of forest patches necessary to **preserve species richness and genetic diversity** - and to assist conservationists in establishing priorities for the conservation of species.

Standard **sequencing** techniques of mitochondrial DNA has been used to study phylogenetic distinctiveness and gene flow/population structure have been estimated to **identify species of high conservation value** and determine their **vulnerability to habitat fragmentation**.



The team has focused on **butterflies** which are highly diverse with many endemic species on Borneo and are well-known **sensitive indicators** of environmental changes, with the hope that the principles developed by the project will be applicable to a wide range of other taxa.

<http://www-uwer.york.ac.uk/~jkb6/>

Project in Mexico (Ref. 14-059)

Certification to support conservation of endangered Mexican desert cacti

University of Reading, Universidad Autónoma de Querétaro and Universidad Nacional Autónoma de México (UNAM).

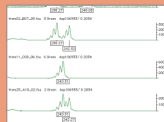
Contact: Dr. J. A. Hawkins, Dr. R. T. Barcenaa Luna and Dr. H. Hernandez



Since September 2005, this project aims to support the conservation, sustainable harvest and use of **Mexican desert cacti** by providing molecular tools which can be used to identify plants to species, to determine their parentage and to locate the populations that they were collected from originally.

These **DNA fingerprinting and barcoding tools** are applied here as a **DNA based certification** for the first time to cacti in trade.

The team can match DNA fingerprints of wild plants against those of cultivated plants, to certify genuine nursery-grown stock.



One of the most suitable molecular tools for forensic use is the **microsatellite** method. Plant genomes contain short, repeated sequences called microsatellites or srs (simple sequence repeats) that are interspersed within longer more stable sections. The number of times that these short repeated sequences occur varies from individual to individual, and the profile across multiple loci may be specific to a plant and its closest relatives (clonal or sexual offspring), or unique to a population.

<http://www.uq.mx/naturales/biologia/cema/index.html>

Project in South Africa (Ref. 13-018)

Building Genetic Forensic Capacity to reduce South Africa's illegal trade

University of Sheffield and University of Kwazulu-Natal.

Contact: Prof. T. Burke and Dr T. Taylor



The purpose of this project, started in May 2004, is to assist the conservation of wildlife in South Africa through institutional capacity building for **wildlife forensic DNA analysis** (fingerprinting and species identity).

The project initially concentrates on two species currently threatened by **illegal trade**: the Cape Parrot and the Blue Crane.



South African MSc students, trained at Sheffield, use **microsatellites** to genotype individuals and perform paternity analyses for **forensic use**. This technique has been developed to enable claims of captive breeding to be confirmed or refuted in order to **detect illegally caught wild birds**.



This knowledge will be transferred to a **forensic facility** in South Africa. Staff will be trained in genetic forensic analysis, chain of evidence, producing forensic profiles, ... Procedures will be drawn up in collaboration with appropriate authorities in South Africa to provide **protocols and guidelines**.

The presence of such a high profile technique will raise awareness of the illegal trade and should prove a deterrent, reducing such activities.



<http://www.shef.ac.uk/misc/groups/molcol/parrotandcrane.html>