

Darwin Initiative Annual Report

Important note:

To be completed with reference to the Reporting Guidance Notes for Project Leaders – it is expected that this report will be about 10 pages in length – Submission deadline 30 April 2007

Darwin Project Information

| | |
|---|---|
| Project Ref Number | EIDPO13 |
| Project Title | Integrating Evolutionary History and Phylogenetic Measures of Biodiversity into Conservation Planning |
| Country(ies) | South Africa |
| UK Contract Holder Institution | Royal Botanic Gardens, Kew (RBG Kew) |
| UK Partner Institution(s) | |
| Host country Partner Institution(s) | South African National Biodiversity Institute (SANBI) University of Cape Town (UCT) University of Johannesburg (UJ) |
| Darwin Grant Value | £98,297 |
| Start/End dates of Project | 01 August 2006 to 31 July 2008 |
| Reporting period (1 Apr 2007 to 31 Mar 2008) and annual report number (1) | 1 April 2007 to 31 March 2008 (2) |
| Project Leader Name | Dr Vincent Savolainen (now dual appointee between The Royal Botanic Gardens Kew and Imperial College London) |
| Project website | http://www.sanbi.org/research/dnabank.htm (original project website) |
| Author(s), date | M. Powell & V. Savolainen |

1. Project Background

This post-project (hereafter referred to as the 'project') results from a previous successful Darwin project, 162/12/008: DNA banking, phylogeny and conservation of the South African flora. As described in the previous annual report, this project seeks to build upon the successful data production and networking of the original project by focusing on four scientific aspects deserving further attention:

(i) link conservation planning with the phylogenetic data (some of which were produced during the original project), by coordinating follow-up scientific research;

(ii) calculate extinction risks, building on red lists for the South African flora;

(iii) continue to transfer knowledge regarding the use of phylogenetic data to in-country scientists, students and conservationists, by providing training and research opportunities;

(iv) provide baseline data for the development of future conservation actions within current partnerships and to develop new partnerships (e.g. see below and with other Darwin projects in South Africa), and extend the use of DNA resources to DNA barcoding for conservation (e.g. at the Kruger National Park; KNP).

2. Project Partnerships

The working relationship between UK and South African project partners has continued to be very fruitful and productive, with regular communication between institutions and visits from project members to both the UK and South Africa. As mentioned in the previous annual report, collaboration between partners of a further Dr Savolainen led Darwin project (14-001: Conservation and Monitoring of Meso-American Orchids) has been highly productive and resulted in a ground-breaking publication on DNA barcoding (see below). The successful working relationship between South African and UK project partners is further reflected by the award of a five-year Royal Society/South African National Research Foundation grant to work on 'Regional patterns of biodiversity and conservation in South Africa: the flora of the Kruger National Park as a case study'.

Contact has also been established with three further, South African-based, Darwin projects with a view to hosting a workshop between the projects to discuss putative collaborations and other matters arising from working in South Africa (14/012: Limbavane Outreach Project: Exploring South African Biodiversity and Change; 15/012: Protecting Key South African Biodiversity Sites through Community-based Conservation; 16/003: Tools, training and research for managing eco-hydrology of Cape flora).

Links between project partners, particularly Dr Michelle van der Bank (UJ), and SANBI, UCT, SAAB (South African Association of Botanists) and SASSB (South African Society for Systematic Biology) have been enhanced during the year, with the UJ molecular laboratory being utilised by collaborators at SANBI (Pretoria and Kirstenbosch) and UCT. Collaboration with Prof Gideon Smith and Yolande Steekamp (SANBI Pretoria) has also been strengthened as a result of data sharing with the PRECIS (Pretoria National Herbarium) database. Gouritz conservation assessments have been initiated by Dr Felix Forest (Kew) and Prof Richard Cowling (Nelson Mandela University). The SAAB/SASSB VII conference in January 2008 produced a special themed issue of *Molecular Phylogenetics and Evolution* which cemented the partnership between this project and those two South African societies.

3. Project progress

The project has endured a highly productive and eventful year, with substantial progress made against each output of the logframe.

DNA barcoding work is well underway at UJ, and has superseded our targets, culminating in the publication of a highly publicised, ground-breaking paper which has identified a universal DNA barcode for flowering plants (published in the *Proceedings of the National Academy of Sciences USA (PNAS)* in February 2008).

Whilst progress has been made with regard to the calculation of extinction risks in plant lineages, with South African national Mr Jonathan van Alphen Stahl hired in August 2007 as Extinction Risk Analyst and upgrading a database of the distribution of each of the 2,200+ South African plant genera per quarter degree square (QDS; PRECIS), he subsequently left the project at the end of December 2007 to pursue a career in medicine.

There have been several reciprocal visits between project partners, for example, Ms Keshni Gopal (DNA bank manager at SANBI) visited Kew for training purposes (2-15 July 2007); Dr van der Bank (UJ) visited Dr Savolainen to discuss progress of the project (2-9 July 2007; 21-26 January 2008); Dr Renaud Lahaye (UJ) visited Kew to work on the PNAS paper with Dr Savolainen (22 July-18 August 2007); Mr van Alphen Stahl (UCT) worked with UK project partners (29 November-19 December 2007).

3.1 Progress in carrying out project activities

The DNA barcoding aspect of the project has undoubtedly been the major success of the past year, with the PNAS publication by Lahaye *et al* producing widespread publicity for the project's results in this field.

Over 50 websites (a select few examples are included in Annex 3) reported on the publication, as did various radio and TV stations. An example of the trend of opinion voiced is detailed below with a quote on the Defra website from Joan Ruddock, Minister for Climate Change and Biodiversity: "This is a great breakthrough that could save many endangered plants. The Defra-funded Darwin Initiative has a reputation for producing real and lasting results and I congratulate everyone involved in this project which could have huge benefits for plant identification and conservation in the future."

Several students have received bursaries from the project and conducted research within our project activities:

Two Masters students are working at UCT with Prof Terry Hedderson, Alastair Potts and Matthew Britton, and they are due to complete their projects by the end of this Darwin project. Mr Martyn Powell, appointed UK Darwin Project Officer in October 2007, visited them on 28 March 2008 to discuss the progress of their projects. Two honours students at UJ working with Dr van der Bank, Phip Moolman and Genevieve Thompson, completed their projects on DNA barcoding in December 2007, and a third, Anneli van Rooyen, began her barcoding project in January 2008.

DNA extractions and sequencing for DNA barcoding

The DNA extraction and sequencing facility at UJ is now routinely being used to generate DNA extracts (which are banked at UJ) from which DNA barcode sequences are being produced (see following section for figures). In addition, this facility is also now being used by SANBI (e.g. Pretoria) and UCT, as well as by other departments within UJ.

Data compilations, assessing extinction risks

An extremely detailed dataset, derived from the PRECIS database with the assistance and cooperation of Prof Gideon Smith and Yolande Steekamp of SANBI Pretoria, has been upgraded to enable future assessment of extinction risks within South African taxa. The database, an inventory which contains taxonomic and distribution (in Quarter Degree Squares; QDSs) information on all of the angiosperm genera in South Africa (comprising approximately 10,000 species) had to be updated to match the taxonomic delimitation described by the Angiosperm Phylogeny Group and that of *rbcL* sequence data from GenBank. The database had to be converted from its original format (Access) to a more readily usable style (R computing environment) to enable the assessment of extinction risks to be made.

Analyses of phylogenetic diversity (PD)

The PD analyses for the Cape region was completed and reported on in last year's report (Forest *et al.* publication in *Nature*), the analyses for the Gouritz region and KNP have been completed and manuscripts for each are in preparation (Figs 1 and 2 below).

In the Gouritz region of the little Karoo analyses have shown that the most recent vegetation types (i.e. fynbos) have low levels of PD given their generic composition. A correlation was also observed between ecosystem status (with respect to IUCN criteria) and PD levels, with the more threatened areas having lower than average PD values. (Fig 1). This same observation has been made in the Cape (Jonathan Davies & Vincent Savolainen, in prep).

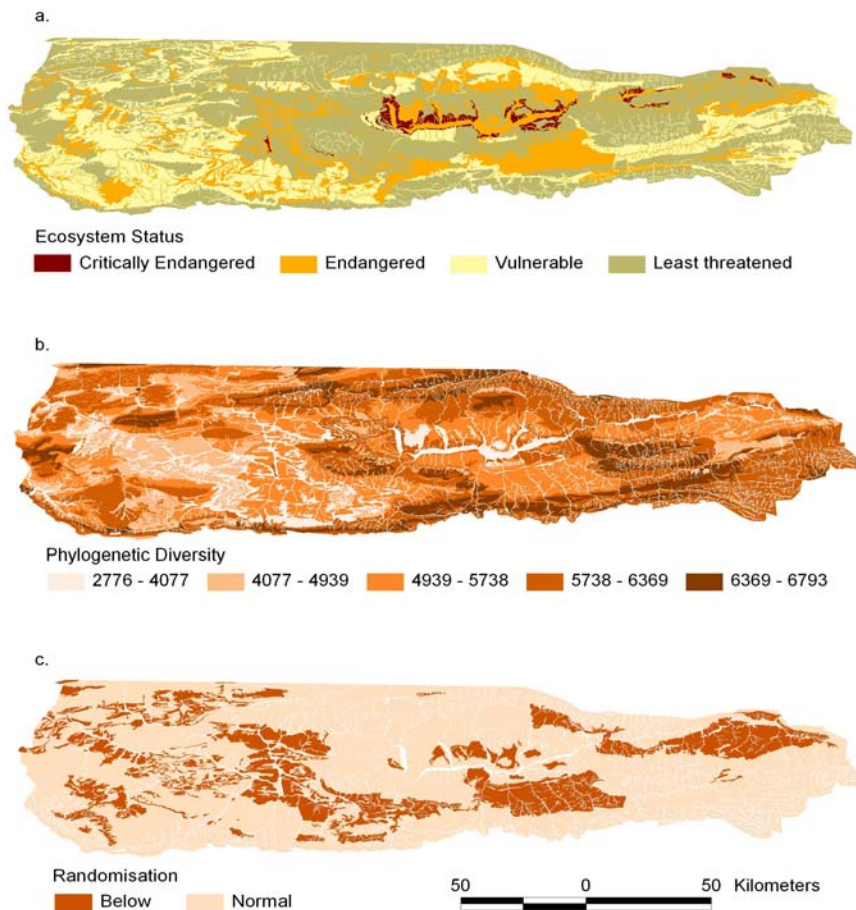


Fig. 1. Map of the Gouritz region (Cape). (a) vegetation types and levels of threat. (b) distribution of phylogenetic diversity (relative scale). (c) randomisations showing in dark orange the parts that have less PD than expected given their number of genera. **Note that these areas correspond to relatively young and endangered ecosystems (e.g. fynbos).** – a detailed account of the implications of these results for conservation will be provided in the final report - this project ending 31 July 2008.

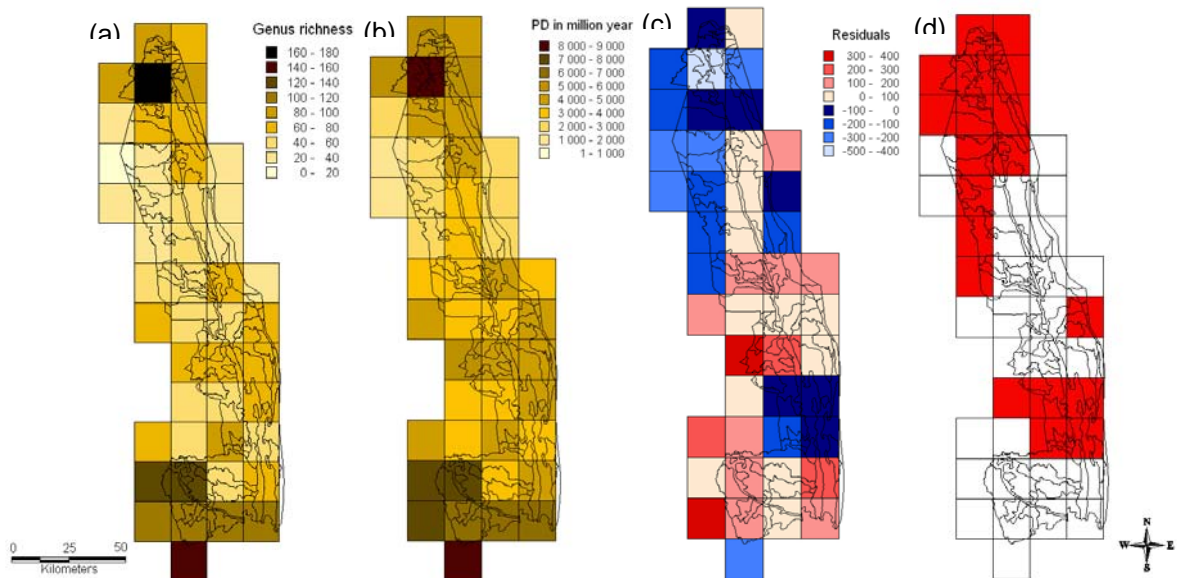


Figure 2 : Maps of Kruger national Park showing (a) genus richness per quarter degree square (QDS), (b) phylogenetic diversity (PD) per QDS calculated using NPRS absolute age estimates in million years, (c) residuals in million years from a linear regression of PD on genus richness and (d) QDS showing significant low PD (in red). Solid lines inside the KNP show the land types delimitations. **Note that regions of high taxonomic richness (South and North of the Park), are either PD-deficient (North) or have an expected amount of PD given their generic composition (South). – a detailed account of the implications of these results for conservation will be provided in the final report - this project ending 31 July 2008.**

Workshops

Contact has been made with three other South Africa-based Darwin projects and a workshop between them has been agreed in principal. The original plan to hold this workshop in January 2008 was not possible for logistical reasons, and as such alternative dates are being looked into. The final project workshop will be held in July 2008 in South Africa as originally planned.

Course

The only designated training course associated with the project was completed at UCT during the first reporting year (see previous annual report for details). Other training has been carried out over the past year, with multiple visits to the UK from South African scientists. In addition, in April 2008 two further courses ('DNA barcoding: a practical guide' and 'Grant writing') were carried out by UK project officer Mr Martyn Powell and Dr Savolainen; these will be reported on fully in the final report.

3.2 Progress towards Project Outputs

There are five types of project outputs listed in the Logical Framework: i) DNA barcoding; ii) Training; iii) Dissemination; iv) Conservation assessments; and v) Enhancement of South African Conservation Scientists network.

DNA barcoding

The target of 500 barcodes produced has been exceeded, with over 900 DNA barcodes of South African taxa produced at UJ. All of the trees and shrubs of the KNP (totalling approximately 450 species) have been sequenced for the barcoding region. Resulting from trialling multiple regions as putative DNA barcodes, a universal DNA barcode for flowering plants has been identified (*matK*).

Abstract of the publication in PNAS:

DNA Barcoding the Floras of Biodiversity Hotspots

Renaud Lahaye*, Michelle van der Bank*, Diego Bogarin[†], Jorge Warner[†], Franco Pupulin[†], Guillaume Gigot[‡], Olivier Maurin*, Sylvie Duthoit*, Timothy G. Barraclough[§], Vincent Savolainen^{‡,§}

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DNA barcoding is a technique in which species identification is performed using DNA sequences from a small fragment of the genome, with the aim of contributing to a wide range of ecological and conservation studies in which traditional taxonomic identification is not practical. DNA barcoding is well established in animals, but there is not yet any universally accepted barcode for plants. Here, we undertook intensive field collections in two biodiversity hotspots (Mesoamerica and southern Africa). Using over 1,600 samples, we compared eight potential barcodes. Going beyond previous plant studies, we assessed to which extent a 'DNA barcoding gap' is present between intra- and inter-specific variations using multiple accessions per species. Given its adequate rate of variation, easy amplification and alignment, we identified a portion of the plastid *matK* gene as a universal DNA barcode for flowering plants. Critically, we further demonstrate the applicability of DNA barcoding for biodiversity inventories. In addition, analyzing over 1,000 species of Mesoamerican orchids, DNA barcoding with *matK* alone reveals cryptic species and proves useful in identifying species listed in CITES appendices.

Training

The majority of the training targets were met and reported on during the first year, with an additional MSc student (Matthew Britton) having started his project at UCT. Both MSc students are scheduled to finish within the duration of the project, and two of the UJ Honours students have already completed their projects. A third UJ honours student is scheduled to finish her barcoding study later this year. Two week-long courses carried out by UK project partners took place in April 2008 and participation at these will ensure that training achievements will exceed the target values.

Dissemination

Three papers have already been published (Forest *et al.*, Lahaye *et al.*, Boatwright *et al.*), in addition to the circulation of two newsletters (Kew Scientist and UJ magazine). Awareness of the project has also been greatly increased as a result of the publicity generated by the PNAS paper, which was featured in over 50 websites (including that of the Science Development Network). A paper, on extinction risks, is due to be written towards the end of the project and will aim for publication in a high-impact journal.

Project results and activities have been disseminated at various conferences, both within the host country and internationally: Dr Savolainen presented the results of the Cape and Gouritz PD analyses at a symposium dedicated to PD at the Evolution meeting in June 2007 (New Zealand); these same results were also presented on behalf of the project by Dr Jonathan Davies in July 2007 at the Annual Meeting of the Society of Conservation Biology in South Africa; Dr van der Bank attended the Second International Barcode Conference (of the Consortium for the Barcode of Life) in Taipei in September 2007 and presented the KNP barcoding results; several project partners presented results at the SAAB/SASSB VII conference in South Africa in January 2008, from this meeting a themed issue of *Molecular Phylogenetics and Evolution*, dedicated to conservation and biodiversity in the Cape, will be edited by Drs Savolainen, Verboom (UCT) and Dreyer (U Stellenbosch).

Conservation assessments using PD

One conservation assessment, based on measures of phylogenetic diversity (PD), has been written for the Cape flora and received a significant amount of positive publicity (published in *Nature* and reported on in the previous annual report). As described above analyses of PD have been carried out for the Gouritz region and the KNP (Figs 1 and 2), and the conservation assessments for these two areas are scheduled to be written by the end of the project. In addition, a paper on extinction risks is also planned to be submitted before the completion of this project.

Enhancement of South African Conservation Scientists network

The high level of publicity generated by the two high-profile publications produced from the project have gone a long way to enhancing the network of South African Conservation Scientists. Presentation of these results, both at national conferences and within the national press, has led to a great level of interest in the project amongst local scientists in South Africa, as well as the greater public.

That the network of South African Conservation Scientists has been enhanced is evidently illustrated by the fact that Dr van der Bank is now at the forefront of all plant DNA barcoding activities within Africa; Tree-BOL, a major new multi-national 'barcoding of life (BOL)' initiative, has now been launched in an

attempt to barcode a sample of each of the ca. 100,000 tree species in the world, and Dr van der Bank has undertaken the role of 'Regional Working Group Co-Chairperson for Africa'.

The imminent publication of a special issue of Molecular Phylogenetics and Evolution, arising from the SAAB/SASSB VII meeting in South Africa in January 2008, highlights the close working relationship between Conservation Scientists working in South Africa and wide range of research topics that these Scientists now collaborate on and communicate to each other.

3.3 Standard Output Measures

Table 1 Project Standard Output Measures

| Code No. | Description and target | Year 1 Total | Year 2 Total | TOTAL |
|----------|---|-----------------|--|-------------------------------|
| 2 | 2 MSc | 1 | 1 (Matthew Britton) | 2 Target met |
| 4A/B | 3 undergrads for 10 months per year | 2 | 1 (Anneli van Rooyen) | 3 Target met |
| 4C/D | 20 students for 1-wk course at UCT | 18 | 0 (but April 2008 course students to be reported on in final report) | 18 Target will be exceeded |
| 5 | 1 Extinction Analyst for 18 months at SANBI | 0 | 1 (Jonathan van Alphen Stahl; resigned in December 2007 to take up medical studies in South Africa) | 1 |
| 6A/B | 1 Darwin project officer (10 months) | 0 | 1 (Martyn Powell, from October 2007) | 1 |
| 7 | 1 training material produced (UCT course) | 1 (UCT course) | 0 (April 2008 training manual for DNA barcoding) | 1 Target will be exceeded |
| 8 | 8 wks spent by UK staff in RSA | 7 | 2 (Savolainen), 1 (Powell) | 10 Target exceeded |
| 9 | 3 sp/management plans (Cape, Gouritz, KNP) | 1 (Cape) | Gouritz and KNP in progress (analyses complete, manuscripts in preparation) | 1 Target will be met |
| 11A/B | 4 peer-reviewed papers | 1 (2 submitted) | 2 (Lahaye <i>et al.</i> , PNAS; Boatwright <i>et al.</i> Syst.Bot.); 4 submitted in Mol.Phyl.Evol. issue (Verboom <i>et al.</i> , Forest <i>et al.</i> , Proches <i>et al.</i> , Sauquet <i>et al.</i>) | 7 Target will be exceeded |
| 12A | 1 DNA barcoding computer database | 1 (UJ) | UJ barcoding database in use | 1 Target met |
| 12B | 1 DNA bank computer | 1 (SANBI) | SANBI DNA bank database regularly | 1 |

| | | | | |
|-------|---|--------------------------------------|--|------------------------|
| | database enhanced | | updated | Target met |
| 13A | 1 sp ref collection (500 barcodes + 200 <i>rbcL</i>) | | UJ DNA bank and sequence matrices | 1 Target met |
| 13B | 2 sp reference collection (Compton Herb, KNP) | | KNP and UJ herbarium collections | 2 Target met |
| 14A | 2 workshops (Darwin projects + final wshp) | | In preparation | Target will be met |
| 14B | 1 conference attended (Evolution) | 1 (SASSB VI) | 4 (Evolution meeting – special PD symposium, SAAB/SASSB VII; CBOL Taipei; Society of Conservation Biology) | 5 Target exceeded |
| 15A/B | 1 press release in host country | | >10 (e.g. Beeld, Star, Lowvelder KNP Times, Landscape) | >10 Target exceeded |
| 15C | 1 press release in UK | | >50 (e.g. Defra, BBC, Nature, RBG Kew) | >50 Target exceeded |
| 16 | 2 newsletters (SANBI + Kew Scientist) | 0 | 2 (Kew Scientist and UJ magazine) | 2 Target exceeded |
| 17B | 1 network enhanced (PD/barcoding) | | Dr van der Bank part of Tree-BOL, special Cape edition of Mol.Phyl.Evol. | 1 Target met |
| 20 | 1 laptop (£800) | 1 | | 1 Target met |
| 23 | £196,483 | Application to Royal Society pending | Royal Society grant awarded (2+3 years) £228,451 + ZAR 1,593,642 | Target exceeded |

Table 2 Publications

| Type * | Detail | Publishers | Available from | Cost £ |
|---|---|-----------------------------------|---|---|
| (eg journals, manual, CDs) | (title, author, year) | (name, city) | (eg contact address, website) | (if applicable) |
| Proceedings of the National Academy of Sciences, USA 105: 2923-2928 | DNA barcoding the floras of biodiversity hotspots Renaud Lahaye, Michelle van der Bank, Diego Bogarin, Jorge Warner, | National Academy of Sciences, USA | http://www.pnas.org | USD 250 research article reprint rights |

| | | | | |
|--------------------------------------|---|--|--|--|
| | Franco Pupulin, Guillaume Gigot, Olivier Maurin, Sylvie Duthoit, Timothy G. Barraclough, and Vincent Savolainen 2008 | | | |
| Systematic Botany 33 (1): 133-147 | Systematic Position of the Anomalous Genus <i>Cadia</i> and the Phylogeny of the Tribe Podalyrieae (Fabaceae) James S. Boatwright, Vincent Savolainen, Ben-Erik van Wyk, Anne Lise Schutte- Vlok, Félix Forest, and Michelle van der Bank 2008 | American Society of Plant Taxonomists, Wyoming, USA | | |

3.4 Progress towards the project purpose and outcomes

Co-ordination of research to link conservation planning with phylogenetic data is well on its way. The editing of the special issue of *Molecular Phylogenetics and Evolution* arising from the SAAB/SASSB VII conference in one big step towards this goal. In addition to this, the conservation assessments that will be completed during the course of the project provide further evidence of the important role that phylogenetic data plays in making conservation decisions, following on from the revelations in the Cape PD analyses reported on last year.

Good progress has been made towards the calculating extinction risks for taxa within the Cape of South Africa. A paper surmising the extinction risks for taxa in these areas will be submitted before the end of the project. This paper will be shaking ideas on the geographic pattern of extinction risks, and question the use of IUCN criteria for assessing plant threat. Indeed, in the Cape, it would appear that younger lineages are always more prone to be classified as threatened simply because they have restricted geographic ranges.

The transfer of knowledge to in-country scientists and students with regard to the use of phylogenetic data continues to take place, with a training course on DNA barcoding having been undertaken for scientists and students at UJ in April 2008. The provision of student bursaries by the project has also seen two further students this year receive training in phylogenetic techniques. The mass of publicity surrounding the PNAS barcoding publication has also transferred knowledge of this technique to the South African scientific community.

The extensive DNA resources available within South Africa as a result of this project and the original Darwin project, from which this arose, have been utilised to conduct the single largest study on DNA barcoding, with the flora of the KNP now recognised as a case study in this field. Along with the enhancement of existing partnerships, several new partnerships have also been developed, for example the Tree-BOL initiative. Baseline data have been, and continue to provide data for conservation actions within South Africa, through the PD analyses and assessment of extinction risks.

3.5 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The PD analyses and conservation assessments of Gouritz, KNP and the Cape have tremendous potential for playing an important role in decision-making processes with conservation activities and priorities in South Africa. The use of DNA barcoding and PD for rapid assessment of biodiversity hotspots are proving to be highly valuable with respect to monitoring the CBD's 2010 biodiversity targets.

4. Monitoring, evaluation and lessons

Monitoring and evaluation was undertaken in accordance with the logframe, and communication between UK and South African project partners (both with respect to face-to-face visits and email/telephone communication). In addition, there have been multiple visits by project partners to and from the host country, which have greatly aided monitoring of the project and ensuring that targets are being met.

5. Actions taken in response to previous reviews (if applicable)

n/a

6. Other comments on progress not covered elsewhere

n/a

7. Sustainability

The network of South African scientists, coupled with the increased awareness of the barcoding aspect of the project resulting from the PNAS publication, will ensure that the conservation activities will continue after the project is completed. The Royal Society grant awarded to continue working on the KNP will also guarantee that the project's activities will not cease upon the cessation of the project.

Dr van der Bank's key position as African coordinator in the Tree-BOL project will also provide assurance that the current project's activities will be sustained. Her efforts in being at the forefront of publicity for the project (see below) have resulted in her being recommended for the position of Associate Professor at UJ.

8. Dissemination

The profile of this project, both within South Africa and globally, is extremely high, aided by the plethora of publicity generated surrounding the publication of the PNAS paper. Several international and national (in the host country) organisations have reported on the results of this work, including interviews with several of the participants involved, e.g. by Dr van der Bank on RSG's (Radio) morning and Sunday afternoon eco-focus programmes, Radio Pretoria, SABC news (TV).

Furthermore, there has been considerable coverage of the barcoding project in both the popular and scientific press in South Africa, for example national newspapers (Beeld, Star, Lowvelder, and Kruger Park Times) and a four-page article in Landscape magazine.

In addition, the project has been presented in several national conferences (plus two international conferences; Evolution meeting, USA, June 2007; Second International Barcode Conference, Taipei, September 2007), including:

- Science Network Meeting of the Kruger National Park (South Africa, April 2007)
- 21st annual meeting of the Society of Conservation Biology (South Africa, June 2007)
- SAAB/SASSB VII conference (South Africa, January 2008)

9. Project Expenditure

Table 3 Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)

| Item | Budget (please indicate which document you refer to if other than your project schedule) | Expenditure | Balance |
|--|--|-------------|---------|
| Rent, rates, heating, overheads etc | | | |
| Office costs (eg postage, telephone, stationery) | | | |
| Travel and subsistence | | | |
| Printing | | | |
| Conferences, seminars, etc | | | |
| Capital items/equipment | | | |
| Others | | | |
| Salaries (specify) | | | |
| TOTAL | | | |

10. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

The following text is taken from the Defra press release (one of over 50 international press releases on the subject) regarding the PNAS publication on 5 February 2008:

A 'barcode' gene that can be used to distinguish between the majority of plant species on Earth has been identified by scientists. The research, which was partially funded by the Defra Darwin Initiative, is published today in the *Proceedings of the National Academy of Sciences* journal. This gene, which can be used to identify plants using a small sample, could lead to new ways of easily cataloguing different types of plants in species-rich areas like rainforests. It could also lead to accurate methods for identifying plant ingredients in powdered substances, such as in traditional Chinese medicines, and could help to monitor and prevent the illegal transportation of endangered plant species.

The team behind the discovery found that DNA sequences of the gene '*matK*' differ among plant species, but are nearly identical in plants of the same species. This means that the *matK* gene can provide scientists with an easy way of distinguishing between different plants, even closely related species that may look the same to the human eye. The researchers made this discovery by analysing the DNA from different plant species. They found that when one plant species was closely related to another, differences were usually detected in the *matK* DNA.

The researchers, led by Dr Vincent Savolainen from Imperial College London's Department of Life Sciences and the Royal Botanic Gardens, Kew, carried out two large-scale field studies. One was on the exceptionally diverse species of orchids found in the tropical forests of Costa Rica, and the other on the trees and shrubs of the Kruger National Park in South Africa. Dr Savolainen and his colleagues in the UK worked alongside collaborators from the Universities of Johannesburg and Costa Rica who played a key role in this new discovery.

Dr Savolainen explains that in the long run the aim is to build on the genetic information his team gathered from Costa Rica and South Africa to create a genetic database of the *matK* DNA of as many plant species as possible, so that samples can be compared to this database and different species accurately identified. He said "In the future we'd like to see this idea of reading plants' genetic barcodes translated into a portable device that can be taken into any environment, which can quickly and easily analyse any plant sample's *matK* DNA and compare it to a vast database of information, allowing almost instantaneous identification."

Joan Ruddock, Minister for Climate Change and Biodiversity said "This is a great breakthrough that could save many endangered plants. The Defra-funded Darwin Initiative has a reputation for producing real and lasting results and I congratulate everyone involved in this project which could have huge benefits for plant identification and conservation in the future."

[I agree for ECTF and the Darwin Secretariat to publish the content of this section](#)

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2007/08

| Project summary | Measurable Indicators | Progress and Achievements April 2007 - March 2008 | Actions required/planned for next period |
|---|---|---|---|
| <p>Goal: <i>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve</i></p> <p><i>The conservation of biological diversity,</i></p> <p><i>The sustainable use of its components, and</i></p> <p><i>The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</i></p> | | | <p><i>(do not fill not applicable)</i></p> |
| <p>Purpose (i) co-ordinate research; (ii) calculate extinction risks; (iii) transfer knowledge to in-country scientists, students and conservationists with regard to the use of phylogenetic data and DNA barcodes; (iv) integrate the human dimension; (v) publish concerted conservation actions</p> | <ol style="list-style-type: none"> 1. Research and training activities in partnership with academic and governmental sectors increase 2. Awareness of biodiversity issues increase among students and young scientists 3. In-country CBD strategy and monitoring of 2010 targets take into account post-project outputs and outcomes | <p>Research and training activities continue to be highly successful and in high demand. The publicity generated by both the <i>Nature</i> paper last year, and <i>PNAS</i> paper this year have served to greatly increase awareness amongst the scientific and general community of the biodiversity issues South Africa are faced with. The CBD strategy is in progress.</p> | <p>April 2008: DNA barcoding and grant writing training courses</p> <p>June 2008: Extinction risk manuscript to be submitted by Drs Savolainen and Davies; KNP and Gouritz PD manuscripts to be submitted</p> <p>July 2008: Extinction risk paper submitted; Final project workshop in South Africa</p> |
| <p>Output 1. DNA barcoding</p> | <p>500 DNA barcodes produced</p> | <p>900 barcodes produced for South African taxa</p> | |
| <p>Activity 1. DNA extractions and sequencing for DNA barcoding and for hotspots-wide surveys</p> | | | <p>DNA extraction and sequencing facility at UJ is expanding and being used by other groups, both within UJ and from national institutions (e.g. SANBI Pretoria and Kirstenbosch).</p> |
| <p>Output 2. Training</p> | <p>20 training-weeks, 2 MSc, 3 Hons, 2</p> | <p>2 MSc due to complete at UCT by project end; 2 Hons completed at UJ and 1 scheduled for completion by July 2008; 2 post-docs, Drs Sylvie Duthoit and</p> | |

| | | |
|---|---|---|
| | post-docs (total 89 month-person) | Renaud Lahaye trained at UJ. |
| Activity 2. Course | | Completed, and reported on, during year one; an additional course completed in April 2008 which will be reported on in the final report. |
| Output 3. Dissemination | 5 papers submitted/2 newsletters circulated | 2 newsletters circulated (Kew Scientist/UJ magazine); >5 papers submitted (e.g. Lahaye <i>et al.</i> , Boatwright <i>et al.</i> , Verboom <i>et al.</i> , Forest <i>et al.</i> , Proches <i>et al.</i> , Sauquet <i>et al.</i>). |
| Activity 3. Data compilations; assessing extinction risks | | Data compilation complete for all South African genera and extinction risks analyses complete for the three target regions (Cape, Gouritz and KNP). |
| Output 4. Conservation assessments | 3 assessments published | 1 assessment published for the Cape; preliminary assessments made for Gouritz and KNP. |
| Activity 4. PD analyses | | PD analyses done for the Cape; Cape and Gouritz results presented at the Evolution meeting in June 2007 and Annual Meeting of the Society of Conservation Biology in July 2007. |
| Output 5. South African Conservation Scientists network enhanced | >15 staff working together | Savolainen, Powell, van der Bank, Hedderson, Lahaye, Duthoit, Forest, Manning, Tolley, Gopal, Proches, Boatwright, Verboom, Smith, Bogarin, Kapinos, Maurin, Smith, Dreyer, van Alphen Stahl etc. |
| Activity 5. Workshops | | Workshop between DI projects agreed upon in principal; final project workshop to be held in July 2008. |

Annex 2 Project's full current logframe

| Project summary | Measurable indicators | Means of verification | Important assumptions |
|---|---|--|--|
| <p>Goal:</p> <p><i>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</i></p> <p><i>the conservation of biological diversity,</i></p> <p><i>the sustainable use of its components, and</i></p> <p><i>the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</i></p> | | | |
| <p>Purpose</p> <p><i>(i) co-ordinate research; (ii) calculate extinctions risks; (iii) transfer knowledge to in-country scientists, students and conservationists with regard to the use of phylogenetic data and DNA barcodes; (iv) integrate the human dimension; (v) publish concerted conservation actions</i></p> | <p><i>1. Research and training activities in partnership with academic and governmental sectors increase</i></p> <p><i>2. Awareness of biodiversity issues increase among students and young scientists</i></p> <p><i>3. In country CBD strategy and monitoring of 2010 targets take into account post-project outputs & outcomes</i></p> | <p><i>1. Joint supervision and research documents and correspondence between SANBI, UJ, UCT & Kew</i></p> <p><i>2. Records of requests to undertake Hons/MSc, participate in projects, and attend courses by students and young scientists</i></p> <p><i>3. Conservation & CBD documents updated</i></p> | <p><i>Strategies developed throughout the post-project are of high quality and in demand by wider scientific and nature conservation authorities</i></p> <p><i>Joint programme of activities has proven useful and partnership continues</i></p> <p><i>SANBI's statutory mission continues to be supported by Government</i></p> |

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|--|--|---|---|
| <p>Outputs</p> <p>1. DNA Barcoding 2. Training 3. Dissemination 4. Conservation assessments 5. South African Conservation Scientists network enhanced</p> | <p>1. 500 DNA barcodes produced 2. 20 training-weeks, 2 MSc, 3 Hons, 2 postdocs (total 89 month-person) 3. 5 papers submitted/2 newsletters circulated 4. 3 assessments published 5. >15 staff working together</p> | <p>1. DNA sequences available in GenBank 2. Attendees lists/diplomas 3. Manuscripts available, correspondence with editors/publishers 4. Reports available 5. Meeting reports available</p> | <p>There is a broad interest from staff and students for training and networking in biodiversity and conservation</p> <p>Material produced is of good quality & accepted for publication</p> <p>Collecting permits continue to be issued by KNP</p> |
| <p>Activities</p> <p>1. DNA extractions and sequencing for DNA barcoding and for hotspots-wide surveys 2. Data compilations; assessing extinction risks 3. PD analyses 4. Workshops 5. Course</p> | <p><i>Activity Milestones (Summary of Project Implementation Timetable)</i></p> <p>Months 1-12: Data compilations (IUCN, phylogenies) and extinction risks analyses start (08/06); training course analyses at UCT (01/07); 2 MSc and 2 Hons research projects start (02/07); presentation of results at conference (06/07); one paper submitted (08/07);</p> <p>Months 13-24: Darwin Initiative officer start (09/07); 250 DNA barcodes produced (11/07); 2 Hons completed (11/07); Workshop at SASSB VII ((01/08); 2 Hons start (02/08); Extinction risks analyses completed (02/08); 1 paper submitted and 1 press release (03/08); 250 additional DNA barcodes produced; 3 additional papers submitted (06/08); Workshop (07/08); Conservation assessments completed and reports produced (07/08).</p> | | |

Annex 3 onwards – supplementary material (optional)

Six PDF documents are attached to this report as supplementary material; five of these are examples of the press coverage afforded to the PNAS publication by Lahaye *et al* and the sixth is the Lahaye *et al* publication itself:

1. EIDPO13_01_BBC
2. EIDPO13_02_Defra
3. EIDPO13_03_BGCI
4. EIDPO13_04_UJ
5. EIDPO13_05_SciDev
6. EIDPO13_06_Lahaye et al

Checklist for submission

| | Check |
|--|-------|
| Is the report less than 5MB? If so, please email to Darwin-Projects@ectf-ed.org.uk putting the project number in the Subject line. | Yes |
| Is your report more than 5MB? If so, please advise Darwin-Projects@ectf-ed.org.uk that the report will be send by post on CD, putting the project number in the Subject line. | No |
| Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. | No |
| Have you completed the Project Expenditure table? | Yes |
| Do not include claim forms or communications for Defra with this report. | |