

Darwin Initiative Annual Report

Darwin Project Information

Project Ref Number	15/023
Project Title	Conservation of endangered coastal biodiversity hotspots of Central Chile
Country(ies)	Chile
UK Contract Holder Institution	University of Oxford
UK Partner Institution(s)	
Host country Partner Institution(s)	University of Talca; CODEFF; CONAMA; CONAF
Darwin Grant Value	£224,036
Start/End dates of Project	1 st May 2006 – 30 th April 2009
Reporting period	1 Apr 2007 to 31 Mar 2008 (2)
Project Leader Name	Dr Stephen Harris
Project website	http://www.darwinmaule.cl/
Author(s), date	Dr Stephen Harris and Dr José San Martín

1. Project Background

The project is aimed at developing a Conservation and Sustainable Management Strategy (CSMS) for the Maule region's coastal forests in the Chilean Biodiversity Hotspot (Fig. 1), and building the technical and educational capacity and policy framework for the CSMS's implementation. The landscape-oriented conservation approach adopted in this project will take account of the population dynamics of endangered species and their habitats in geographically explicit manners and establish a monitoring system for the Maulino-forest conservation strategy. Conservation and conservation-related research in the project area, and the Chilean Mediterranean vegetation zone as a whole, is scarce and dispersed. The project builds on the CONAMA-coordinated Regional Biodiversity Strategy (RSBD) and focuses on the coastal Maulino ecosystems, which, despite their international biodiversity significance, are underrepresented in existing policy frameworks, conservation strategies and protected area networks. Furthermore, essential biological information on many of the endangered/endemic species and rare ecosystems of coastal Maule is lacking. For example, the biological quality of forest patches is poorly known, as are the population dynamics of endangered species. The project will enhance biological understanding of Maule and its species, providing a sound scientific basis for conservation planning and management. The research will focus on the genetic viability of a model endangered species (*Gomortega keule*) in fragmented forests and the Rapid Botanical Survey (RBS) and Bio-quality Assessment of Maule's forest remnants. The CSMS developed during this project will be supported by education programmes and policy frameworks to ensure its effective implementation. Since 90% of the region's forest is privately owned, implementation of the project results will depend on the participation of large forestry companies and small-forest owners. The forest companies involved in the project are committed to integrating and implementing the CSMS in their environmental management systems, whilst small-forest owners will be encouraged to adopt the conservation and management strategies through multi-stakeholder consultation processes. In addition, project partners are committed to providing extension and education materials and technical assistance to all forest owners, ensuring the project's findings and outputs are implemented effectively. Major capacity building will be through the provision of training in RBS techniques. Since the project aims to

incorporate conservation practice into land-management in the region in general, not just in Conservation Reserves or on government land, it is important to undertake a wide-ranging environmental education programme aimed at rural land-owners, children, and future policy makers. The project's main contribution to the conservation of Chilean coastal forests will be a systematic approach to conservation in the Maule Region, filling critical gaps in knowledge and generating a participatory planning process aimed at balancing biodiversity needs with the prevalent social and economic realities of the area.

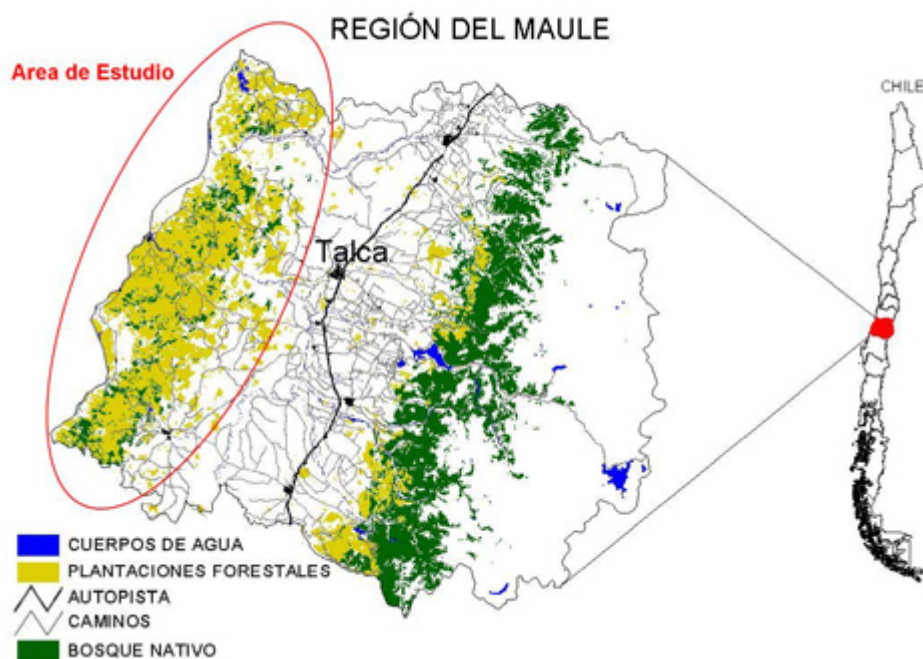


Fig. 1. Maule (Chile) showing the study area and the extreme fragmentation of the native forest.

2. Project Partnerships

Project partnerships: The project is a partnership of University of Oxford, the University of Talca, CODEFF, CONAMA, CONAF. Each of these organisations have their own roles and responsibilities within the project and these have been established in the form of a Memorandum of Understanding (MOU). Oxford is responsible for the genetic analyses, providing training on Rapid Biodiversity Strategies (RBS), reporting back to the Darwin Initiative and overall project management. The University of Talca is responsible for developing the programme of biodiversity monitoring, production of the manual of Maule forest conservation, University level dissemination of results and overall project management in Chile. CODEFF is responsible for coordinating the public extension and programme of environmental education. Together with CODEFF, CONAMA will coordinate participatory planning workshops. Together CONAMA, CODEFF, and CONAF will develop, publish and promote the Strategy of conservation and sustainable development that will result from this project. The challenges identified in the previous Annual Report over administration have been overcome; the MOU has been signed and flows of financial resources to Chile have been clarified within the University of Oxford. Communications via video conferences (e.g., Skype) have proven effective at resolving immediate issues and enhancing communication pathways.

Other Collaboration: As a direct result of the needs of the participants in this project to have simple, clear means of biodiversity data analysis, routines for the analysis of plot data have been incorporated into the BRAHMS package. This has been undertaken in

collaboration with the current Oxford-based project in Trinidad and Tobago and will be used by the recently funded Oxford-based Darwin project in Bolivia. These software options are to be made freely available as a standard part of the BRAHMS software package to the global biodiversity community. During the reporting year, an application for a regionally-based plant biodiversity project was made by a consortium headed by the Universidade de Brasília to CNPq Edital PROSUL; this collaboration involved partners from Chile, Bolivia, Argentina, Peru and Brazil. The Chilean involvement in this collaboration was a direct result of the current Darwin-funded project. This application was well received but unsuccessful since CNPq decided that it wished to direct resources into zoological biodiversity.

3. Project progress

3.1 Progress in carrying out project activities

Bioquality analysis of coastal forests and woodlands in the Maule region

Much of the Chilean partner's Year 2 field activities were focused on undertaking RBS plots. 123 field sites were surveyed which generated 153 complete RBS plots throughout the study area (Fig. 2); this is approximately twice the number originally planned. The vegetation units surveyed included sclerophyllous coastal scrub, sclerophyllous forest, hygrophyllous forest and scrub, hualo forest (*Nothofagus glauca*), ruil forest (*N. alessandrii*), coastal waterways, Queule forest (*Gomortega keule*), ñirre forest (*Nothofagus alpina*) and spinal forest (*Acacia caven*). Politically, four Provinces (Cauquenes, Talca, Linares and Curicó) and 14 Communes (Cauquenes, Pelluhue, Chanco, Stoned, Talca, Constitution, San Javier, Maule, Pencahue, Curepto, Licantén, Vichuquén, Hualañé and Rauca) were surveyed. During the field season, 6-12 RBS samples were completed each week.

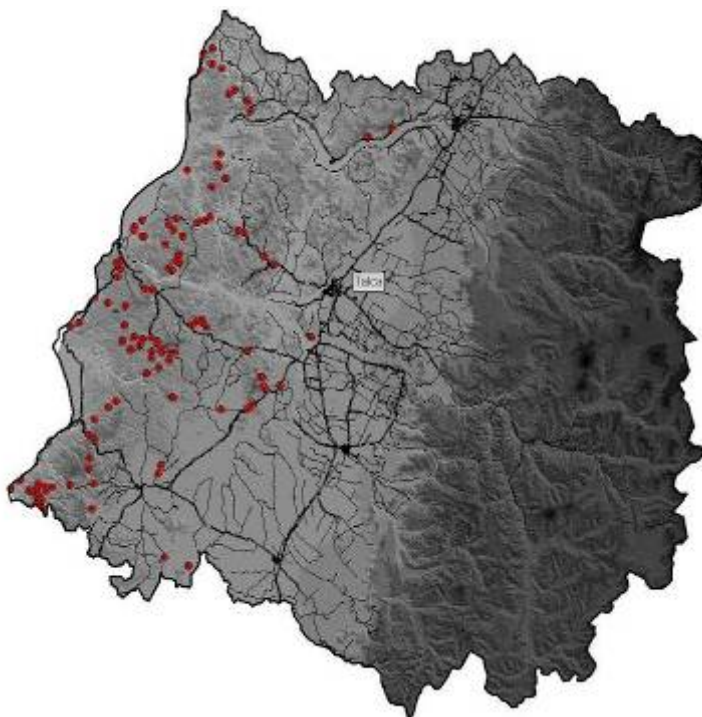


Fig. 2. Map of the Maule Region showing RBS sample points in red.

Approximately 5,000 specimens were collected and all data have been entered into BRAHMS. Approximately 95% of the specimens have been identified to species (Table 1) and the remaining specimens will be identified through collaborations with Chilean specialists in Concepcion (CONC) and Santiago (SGO).

Table 1. Specimen identification summary of the Maulino Coast Forest RBS plots.

Taxa	Ferns	Gymnosperms	Angiosperms	Total
Family	11	2	91	104
Genus	14	3	268	285
Species	23	3	418	444

All of the specimens have been accessed to the Herbarium of the University of Talca. The addition of these specimens has doubled the size of the herbarium and created a well documented, representative collection for the whole flora of Maule Coastal Vegetation. The growth in both quantity and quality of the existing collection will be one of the foundations for indexing this collection in *Index Herbariorum*. Such indexing will increase the recognition and the profile of the Talca collection and be of long-lasting benefit to all future workers on Maulino biodiversity.

An important aspect of the RBS strategy is the analysis of bioquality of the plots. For this type of analysis each species in the flora is assigned a coloured Star-rating (Black, Gold, Blue, Green). Black and Gold Stars are endemic to Chile but differ in the extent of their distributions, and may therefore be considered to have the highest conservation value. Based on the analysis to date, five Black Star and 14 Gold Star species (Table 2) have been identified. Thirty-one Blue Star and 215 Green Star species have been identified. However, the Green Star Category is artificially large and with more detailed revision, some of these ratings are likely to become either Gold or Blue. All of the Star-ratings will be checked against the experience of Chilean botanists' local people and the literature.

Table 2. Black and Gold Star species tentatively identified in the Maulino Coastal flora.

Species	Family	Star rating
<i>Berberidopsis coralline</i>	Berberidaceae	Black
<i>Gomortega keule</i>	Gomortagaceae	Black
<i>Myrceugenia pinifolia</i>	Myrtaceae	Black
<i>Nothofagus alessandrii</i>	Fagaceae	Black
<i>Nothofagus glauca</i>	Fagaceae	Black
<i>Pitavia punctata</i>	Rutaceae	Gold
<i>Adiantum scabrum</i>	Adiantaceae	Gold
<i>Azara integrifolia</i>	Flacourtiaceae	Gold
<i>Escallonia pulverulenta</i> var. <i>pulverulenta</i>	Escalloniaceae	Gold
<i>Escallonia resoluta</i>	Escalloniaceae	Gold
<i>Laurelia sempervirens</i>	Monimiaceae	Gold
<i>Lithrea caustica</i>	Anacardiaceae	Gold
<i>Lomatia dentata</i>	Proteaceae	Gold
<i>Myrceugenia lanceolata</i>	Myrtaceae	Gold
<i>Myrceugenia obtusa</i>	Myrtaceae	Gold
<i>Podocarpus salignus</i>	Podocarpaceae	Gold
<i>Pteris chilensis</i>	Adiantaceae	Gold
<i>Quillaja saponaria</i>	Rosaceae	Gold
<i>Satureja multiflora</i>	Lamiaceae	Gold
<i>Sophora macrocarpa</i>	Fabaceae	Gold

The exact details of bioquality formulae are yet to be confirmed by the project team. However, based on the preliminary analysis of 33 RBS plots, the RBS scores for many samples are >200 and therefore high globally, corresponding to hotspots within West Africa and Mexico-Oaxaca (300-400), and well above all the 'coolspots' of the dry forests of Quintana Roo, and secondary tropical dry semi-deciduous forests in Ghana (typically 0-100). Only one site can be considered 'cool' (<100) by global standards. To provide benchmarking it will be necessary to sample more 'degraded vegetation', e.g., roadside thickets. However, it is evident that there is a relatively high concentration of

endemism throughout the Maule forests, even in natural vegetation associated with exotic pine trees. Such a pattern of biodiversity has obvious policy, exploitation and conservation implications.

PVA of model species (*Gomortaga keule*) and development of conservation models

Maule landscape is a complex mosaic of economic landuses and native vegetation, ideal for the study of matrix effects in landscape fragmentation and its broader implications for the development of conservation models. A set of microsatellite markers have been developed and published for *G. keule* and paternity analysis and a study of gene flow patterns has been completed. For the paternity analysis, 1200 seeds and 100 seedlings collected from 120 mother trees were used, whilst for the analysis of gene flow pattern a 100% sample of the 640 adult trees in 16 study populations was used (Annex 3). Surprising findings include high rates of selfing, up to 31% at some study sites, and extensive pollen dispersal, with a mean pollen dispersal distance of 690 m. It was also found that the species commonly reproduces vegetatively, to the extent that 29% of the 650 adult trees sampled turned out to be members of clone groups. These clone groups range in size from 2 to 18 adult trees. Findings on clonal reproduction, inbreeding, breeding within and between native forest patches, and distance of pollen dispersal have been presented in two talks and two posters at conferences in Europe and Chile.

The landscape analysis for the investigation into the impacts of landuse type on pollen flow between patches of native forest is now underway. Landuse data is being drawn from LandSat 7 satellite images, aerial photos provided by our Chilean partners, RBS samples, and the landuse map published by CONAF and CONAMA.

Conservation and Sustainable Management Strategy (CSMS)

As part of the programme of involving various stakeholders associated with the conservation of the Maulino Coastal Region a day-long seminar “Diversidad florística y ecología del bosque maulino costero” was organised at the University of Talca (Annex 4). This event was the first of its kind nationally, with leading Chilean researchers presenting their data on the Maulino forests to different groups: the national scientific community, students, academics, public and private institutions and general public; approximately 130 people participated in the meeting. This Meeting was covered by the local Chilean Press (Annex 4).

Biodiversity conservation skills and capacity increased in Maule Region

A highly competent RBS field team has now been established in Talca and the size and quality of the University Herbarium has been significantly enhanced through the activities of the Darwin Project. Three Chilean undergraduate students have been trained in RBS techniques:

Alumna, Paula Izquierdo: “Metodología para evaluar la conservación de un bosque nativo costero, Región del Maule”.

Alumna, Macarena Medina: “Estudio actual de la estructura florística del bosque costero de *Nothofagus glauca* (Phil.) Krasser, Región del Maule”.

Alumna, Marilyn López: “Estructura alfa y organización de un bosque remanente de hualo costero, Región del Maule”

In addition to the herbarium specimens, approximately 2,500 high-quality digital photographs, which include habit, reproductive characters and morphological characters of many species have been prepared. These images will be made available as part of the Virtual Field Herbarium and be linked to herbarium specimens and provide an important resource of those interested in the botany of the Maule region.

Monitoring programme for critical areas

The implementation of this is an important component of Year 3 and will be based on the results that are derived from RBS and PVA analyses.

Environmental education and participatory extension programmes.

Numerous interest groups live in and use the coastal forests of Maule. Therefore, there is a need to publicize and raise awareness about the state of Maulino Coastal Forest Conservation and the importance of its flora. Specific education programmes conducted in Year 2 of the project were:

Environmental education DVD

An environmental education DVD ('El Tesoro del Maule') of five native forest species has been prepared. The DVD is currently being copied for dissemination to all rural schools in the study area, together with forestry companies, small-forest owners, NGOs and higher education organizations concerned with species and landscape conservation in the Maule Region.

Radio

A radio programme on endangered species was transmitted on the radio stations of four Communes (Chanco, Cauquenes, Pelluhue, Constitution). Efforts are being made to ensure that this programme is aired on regional and national Chilean radio.

Environmental education talks

An environmental education lecture was given in five mixed Municipal schools (10-15 years old): Escuela San Alfonso de Canelillo in the Pelluhue Commune and four urban schools in the city of Talca; Escuela Carlos Salinas, Escuela Pte. José Manuel Balmaceda y Fernández, Escuela El Edén y Escuela la Florida.

3.2 Progress towards Project Outputs

Year 2 of the Darwin project has made better than expected progress over the number of RBS plots samples (approximately twice the number planned). This will have the effect of improving the resolution and quality of the biodiversity data overall. Similarly, collection of all of the genetic data for *Gomortega* has proceeded better than might have been imagined and the patterns of gene flow revealed to date make *Gomortega* an excellent choice of model species for the analysis of landscape level processes. Significant work remains on ensuring that all of the species in the Maulino flora are given appropriate Star-rating but this is on-target. The overall bioquality training and analysis part of the RBS strategy has been delayed slightly because of the desire to make the process as straightforward as possible. This has been achieved by the implementation of biodiversity analysis features within BRAHMS. Involvement of forestry companies and Government organisations for implementation of recommendations is good. Furthermore, much has been done this year to cover issue of environmental education and participation in Chile.

3.3 Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Total to date	Total planned from application
Established codes							
6A	Chileans trained in RBS & Bioquality	4	4			8	8

	assessment						
6B	RBS & Bioquality assessment training	2				2	5
7	Training Course materials published on project website	1				1	1
7	Project website online					1	1
7	Educational video 'El Tesoro del Maule'		1			1	1
7	Conservation Manual for Maulino Forests					0	1
10	Technical Guide for Conservation Monitoring					0	1
9	Conservation & Sustainable Management Strategy for Coastal Maulino Forests (CSMS)					0	1
10	Interactive digital photolibrary (Virtual Field Herbarium)					0	1
11B	RBS manuscript for publication					0	1
11B	<i>Gomortega</i> SSR paper		1			1	1
11B	Landscape fragmentation paper					0	1
12A	RBS Botanical Database					0	1
14A	University lectures	1				2	3
14A	School presentations		5			5	5
14A	Final Workshop					0	1
15A	Press release		2			2	1
19C	Radio programmes		2			2	2
4A	Three Chileans and one UK undergraduate		4			4	0
13B	Enhancement of the Talca herbarium		1			1	0
14A	Maule biodiversity seminar		1			1	0
14B	Conference attendance in Chile and Europe.		5			5	0

Publications

Type * (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
*Journal	Isolation and characterization of eight polymorphic microsatellite loci for the endangered, endemic Chilean tree <i>Gomortega keule</i> (Gomortegaceae). Lander, T.A., Boshier D.H. & Harris S.A. (2007)	Blackwell Science, Oxford	Molecular Ecology Notes, 7: 1332-1334	
*DVD	El Tesoro del Maule	University of Talca	Dr José San Martín, University of Talca.	

3.4 Progress towards the project purpose and outcomes

The purpose of the Darwin project is to develop a public-private biodiversity conservation strategy for coastal forest ecosystems in the Maule Region. Two high quality, complementary datasets have been generated to date: the RBS data and the genetic data. In addition, good relations have been established with all of the major players needed for the development of the conservation strategy.

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

The impacts of the current project are likely to be felt in the long-term. However, it is expected that a more explicit understanding of the complex dynamics that exist among fragments in a heterogeneous matrix are likely to have direct, positive effects on the conservation of the highly diverse forest fragments.

4. Monitoring, evaluation and lessons

Internally, each of the partners has very clear roles as defined by the MOU. The partners are in e-mail contact with each other and we have realised that conference calls over the web can be a very effective means of discussing specific amongst ourselves. We have been considering whether this might be an effective means to undertake specific training activities issues, especially when it will be necessary to engage in detailed discussions over habitat bioquality and Star-ratings. The most important products of this project that will directly contribute to the project purpose are the Conservation Manual for Maulino Forests, the Technical Guide for Conservation Monitoring and the contribution made to the Conservation & Sustainable Management Strategy for Coastal Maulino Forests (CSMS). The indicators of achievement will be that the CSMS is implemented, although this may be something that will only have any impact beyond the life of the project. We continue to ensure that all of the main CSMS players are aware of the project activities and that their comments are taken into account.

As might be expected with a project of this complexity difficulties have been experienced, and we have continued to learn how to cope with different bureaucracies in Chile and Oxford. One of the great administrative difficulties this year was to cope with a complete financial restructuring of the University of Talca, which led to delays in the releasing money for fieldwork. In the light of these experiences we will try to anticipate when such problem might arise. The need for straight-forward software solutions led us to introduce biodiversity analysis routines into BRAHMS.

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

The Review of the Year 1 report was a useful document that allowed us to direct our activities in Year 2 and has allowed us to clarify issues that we considered to be self-evident.

Three major issues were raised by the Reviewer:

The RBS analysis is purely botanical. This is correct and we fully accept that a complete assessment of 'ecological quality' should take into account other groups. The issue becomes which would be the most appropriate groups. Should we consider the mycoflora since this is likely to be very important for the structure of the below ground diversity? Should insects be considered and if so, which groups? Would birds be an

adequate additional measure? We believe that plants, as the primary producers in a habitat and, in many cases, the main structural elements of a habitat, are one of the most effective groups to investigate as an overall surrogate for ecological diversity. Plant diversity is, after all, one of the main features used in the global definition of biodiversity 'hotspots'. Furthermore, despite their importance to all ecological investigations the plant element of habitats is often overlooked.

The role of forestry companies and continuing land conversion is queried. The good relationships that we have with the forestry companies is a major factor in this project and many of the RBS plots have been conducted on forest company land, with their full cooperation. One of the outcomes of the research will be to rank forest in terms of threat, isolation, priority, etc. The land use change that is occurring is through the conversion of primary or secondary vegetation into either forestry or agricultural purposes. This remains a threat, especially in a region of Chile where the land has such high production value.

The relevance of the natural forest to local people. This is an integral part of the project and the bioquality assessment that we are to make and the Star-ranking that will apply to species will be influenced by discussion with local peoples over their species priorities.

The reviewer queried the Consultant role. The Consultant we have been using is an individual with a deep knowledge of the forest policy and conservation in Chile, together with excellent relations with all of the main players in the private sector. He has been instrumental in ensuring that we have been able to bring together a group of organisations with differing perceptions to attack a common goal.

6. Other comments on progress not covered elsewhere

Overall the project is progressing well but it will be necessary to ensure the continued goodwill and support of the Chilean private sector.

7. Sustainability

The recent Maulino Forest Symposium got good press coverage in the Maule region and our Chilean collaborators have been very active in promoting the activities of the project among schools. The skills that have been developed in Chile are sustainable at the present moment and if an exit strategy were needed then a group of young, skilled individuals will remain. Furthermore, the collections of specimens and digital images are in a form that are readily kept and made available. Duplicate sets of all biodiversity data will be kept in Oxford and Talca.

8. Dissemination

The main dissemination activities this year have been associated with school talks, radio programmes and a DVD. These activities have focused on increasing general awareness of environmental issues in the Maulino landscape.

9. Project Expenditure

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

Item	Budget	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			

Note 1. Internet communications have reduced these costs.

Note 2. Emphasis on DVD and internet methods reduced costs below budget.

Note 3. The Chile Seminar was unplanned at the start of the year but it became clear that this was an excellent opportunity to reach many different interest groups.

Note 4. Lab costs have dropped considerably and the methods of data generation became more efficient over the last year.

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

[I agree for ECTF and the Darwin Secretariat to publish the content of this section](#)
(please leave this line in to indicate your agreement to use any material you provide here)

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>Purpose Develop a public-private biodiversity conservation strategy for coastal forest ecosystems in the Maule Region (build the technical capacity and policy framework to implement the strategy)</p>	<p>Conservation strategies and management plans for coastal native woodlands based on scientific information generated by the project</p> <p>Conservation proposals accepted and implemented and a procedure agreed for their continued implementation</p>	<p>Eight Chileans trained in RBS, plus two weeks of specific RBS training. One academic paper has been published. One website. One environmental DVD has been released. Two university lectures and five school presentations, plus two press releases and two radio programmes. Three Chilean and one UK undergraduate trained in RBS and genetic techniques. Talca Herbarium considerably enhanced and one Biodiversity seminar organised. Five conferences attended.</p>	<ol style="list-style-type: none"> 1. Star-rating of species. 2. Statistically analysis of RBS plots, plus plot 'heat' determination. 3. Landscape-based genetic analysis. 4. Integration of (2) and (3) into CSMS.
<p>Output 1. Bio-quality analysis of coastal forests and woodlands in the Maule region</p>	<p>4-8 people trained in RBS methodology, digital maps of forest bio-quality, digital photographs in interactive website and botanical database</p>	<p>Eight Chileans trained in RBS. 153 RBS plots completed. 5,000 specimens collected (95% identified to species) and databased. 2,500 digital images taken.</p>	
<p>Activity 1.1 RBS plots</p>		<p>153 completed. It may be necessary to do an additional 27 in more degraded vegetation when the full data are analysed.</p>	
<p>Activity 1.2 Specimen databasing and identification.</p>		<p>95% of identifications done; databasing complete.</p>	
<p>Activity 1.3 Digital images of plants in field.</p>		<p>2,500 images taken to date; images will continue to be taken on an opportunistic basis.</p>	
<p>Activity 1.4 Species Star-ratings.</p>		<p>Provisional Star-ratings applied to all species but need to be refined in the light of discussions with researchers and local people.</p>	

Activity 1.5 Bioquality analysis and 'heat' scoring for plots		Provisional analysis for 33 but need to complete for remaining plots.
Output 2. PVA of model species (<i>G. keule</i>) and development of conservation models	Genetic research results, conclusions and conservation models available	Microsatellite markers identified; geneflow and paternity data generated.
Activity 2.1. Genetic marker isolation and characterisation.		Completed.
Activity 2.2. Geneflow and paternity data generation.		Completed.
Activity 2.3. Multivariate analysis of spatial and population parameters in relation to geneflow patterns.		In progress.
Activity 2.4. Statistical analysis of correlation between land use types and pollen flow patterns.		In progress.
Activity 2.5. Development of a model to describe variation in permeability of different landuses and combinations of landuses, if such variation is found.		In progress.
Activity 2.6. Development of insect-mediated pollen flow models in landscapes that are complex mosaics of different land uses		In progress.
Activity 2.7. Incorporation of analyses into CSMS.		In progress.
Output 3. Conservation and Sustainable Management Strategy (CSMS) agreed and implemented by stakeholders.	Stakeholder workshop conclusions available, implementation procedure defined and agreed	Two stakeholder workshops have been completed and priorities defined.
Activity 3.1. Stakeholder workshops		Two completed; at least two more to define implementation procedures.
Activity 3.2. Define and agree implementation procedures.		In progress.
Output 4. Biodiversity conservation skills and capacity increased in Maule Region	2 RBS Survey/Bio-quality Assessment training courses completed, project partners participate in field research programme.	Chilean RBS is operating effectively. Three Chilean and one UK undergraduate trained in RBS and genetic techniques. Talca Herbarium considerably enhanced.
Activity 4.1 RBS Survey and Bioquality courses.		One course has been completed, one remains to be completed.
Activity 4.2 Field teams identified.		RBS field teams are working effectively; twice as many RBS completed as planned.
Activity 4.3 Undergraduate students involved in the research programme.		Three Chilean and one UK undergraduate trained in RBS and genetic techniques.
Activity 4.4 Talca Herbarium databased and enhanced.		Completed.

<p>Output 5. Monitoring programme for critical areas</p>	<p>Monitoring guidance published as a specific technical monitoring guide). 1 or 2 local institutions establish monitoring prog. by end project.</p>	<p>Results of Output 1 starting to influence this output.</p>
<p>Activity 5.1 Technical monitoring guide published.</p>		<p>In progress.</p>
<p>Activity 5.2 Establish monitoring programme.</p>		<p>In progress.</p>
<p>Output 6. Environmental education prog. and participatory extension prog. with forest owners and general public stakeholder workshop conclusions available, implementation procedure defined and agreed</p>	<p>Project website, 2 radio programmes, 1 educational video, min. 5 school presentations, min. 3 university lectures</p>	<p>Project website is running, whilst radio programmes have been transmitted and a DVD has been made. Five school presentations have been made and two university lectures have been given.</p>
<p>Activity 6.1 Project website</p>		<p>Website (in Spanish) is up but material is continually added and updated.</p>
<p>Activity 6.2 Radio programmes and DVD</p>		<p>Radio programmes produced and DVD made. DVD remains to be distributed.</p>
<p>Activity 6.3 School presentations and University lectures.</p>		<p>Five school presentations made and two university lectures done; one remains to be completed.</p>

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal: 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 the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilisation of genetic resources</p>			
<p>Purpose</p>			
<p><i>Develop a public-private biodiversity conservation strategy for coastal forest ecosystems in the Maule Region (build the technical capacity and policy framework to implement the strategy)</i></p>	<p>Conservation strategies and management plans for coastal native woodlands based on scientific information generated by the project</p> <p>Conservation proposals accepted and implemented and a procedure agreed for their continued implementation</p>	<p>New scientific publications</p> <p>Project reports</p> <p>Workshop reports</p> <p>Conservation Strategy documents</p> <p>Management plans of forest companies</p> <p>Sustainable forest management certification</p>	<p>No significant changes in Chilean Government's National Biodiversity Action Plan with respect to public-private conservation policies</p> <p>Private stakeholders, particularly forest enterprises, maintain favourable attitudes towards implementing conservation in the area</p> <p>Small forest owners and their representatives disposed to collaborate in planning and implementation of the strategy</p>
<p>Outputs</p>			
<p>1) Bio-quality analysis of coastal forests and woodlands in the Maule region</p>	<p>4-8 people trained in RBS methodology, digital maps of forest bio-quality, digital photographs in interactive website and botanical database</p>	<p>Project reports, maps, technical documents, herbarium specimens, plot data, photographs, website and botanical database</p>	<p>Access to private land facilitated by landowners, local resources (maps, aerial photos, libraries, botanical collections, satellite images, data bases, GIS, etc.) accessible</p>
<p>2) PVA of model species (<i>G. keule</i>) and development of conservation models</p>	<p>Genetic research results, conclusions and conservation models available</p>	<p>Lab. protocols, progress reports, peer reviewed publications</p>	<p>Agreed access to private land maintained</p>
<p>3) Conservation and Sustainable Management Strategy (CSMS) agreed and implemented by stakeholders</p>	<p>stakeholder workshop conclusions available, implementation procedure defined and agreed</p>	<p>Workshop materials and reports from participants, CSMS reports, forest management plans</p>	<p>Conflicts of interests between actors and management goals of specific land areas in respect to proposed conservation measures are resolvable</p>
<p>4) Biodiversity conservation skills and capacity increased in Maule Region</p>	<p>2 RBS Survey/Bio-quality Assessment training courses completed, project partners participate in field research</p>	<p>Training course materials published on-line, participants course reports, online digital photos from RBS and data on key species.</p>	<p>Trained staff stay in posts (private/public), given opportunity to apply and disseminate skills, continued interest among public and private actors in conservation issues relevant to the region</p>

	programme.		
5) Monitoring programme for critical areas	Monitoring guidance published as a specific technical monitoring guide) 1 or 2 local institutions establish monitoring prog. by end project	Conservation Manual for Maulino Forests Technical guide for conservation monitoring including geographical and thematic priorities.	Post-Darwin Initiative financial support for post-project monitoring activities obtained
6) Environmental education prog. and participatory extension prog. with forest owners and general public	Project website, 2 radio programmes, 1 educational video, min. 5 school presentations, min. 3 university lectures	Website, presentation and lecture materials published on-line, participant reports, project progress reports, interviews with actors and beneficiaries	N/A

Annex 3

Poster prepared for Seminario Diversidad Florística y Ecología del Bosque Maulino Costero, 3 April, 2008, Talca, Chile

El impacto de fragmentación y uso del suelo por flujo de polen para el queule, *Gomortega keule*



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Gomortega keule (Gomortegaceae)

Introducción

Este estudio investiga la utilidad de los modelos de 'aislamiento por distancia' y 'matriz neutral' de la teoría de Biogeografía de Islas por el estudio del influencia de tipo de uso del suelo sobre flujo de polen entre parcelas de bosque nativo.

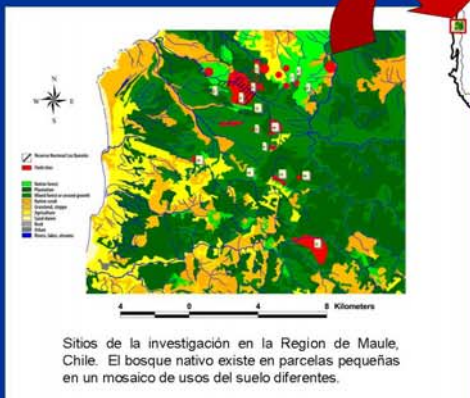
La especie estudiada es un árbol endémico y amenazado de la Región Maule de Chile, *Gomortega keule* (Gomortegaceae)

Sitio de estudio

Maule es una de la Regiones de Chile más importantes por su agricultura y producción de madera. Por eso, el paisaje es un mosaico complejo de usos de suelo económico y vegetación nativa, una mezcla ideal para el estudio de los efectos de la matriz en el fragmentación del paisaje.

Pregunta de la Investigación

¿El polen viaja con el mismo éxito entre parcelas de bosque nativo que están separadas por tres diferentes tipos de matriz: agricultura, plantaciones de pino y bosque nativo?

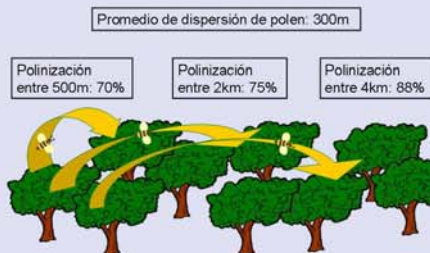


Resultados: Origen del polen

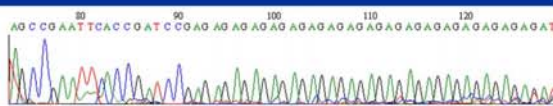


El análisis de paternidad revela que un promedio de 52% de polen viene de adentro de cada parcela. Este 52% es una combinación de 15% autofertilización, 10% cruza entre parientes, y 27% cruza entre árboles que no están relacionados el uno con el otro. Del 48% del polen que viene de afuera de cada parcela, 2.5% viene de árboles 'aislados'. Estos árboles son individuos separados por un mínimo de 300m de bosque nativo y otros individuos de *Gomortega*.

Resultados: Dispersión



Utilizando un combinación de datos de todas las parcelas, 70% de polinizaciones ocurren dentro de 500m. Hay una cola larga a esta distribución, y a 4km solo 88% de las polinizaciones han ocurrido.



Microsatélites y análisis de paternidad

El componente central del estudio es un análisis de paternidad de semillas y plántulas de *G. keule*, utilizando marcadores microsatélites desarrollado por este estudio (Lander, 2007). Tenemos una muestra de 100% de los 653 adultos en las 22 poblaciones del estudio. Este análisis provee los datos sobre el origen del polen, sobre cuáles tipos de matriz el polen ha viajado, y con qué nivel de éxito.



De izquierda a la derecha 1) Flores de *G. keule* 2) Estigma de *G. keule* con tubos de polen de un experimento de polinización 3) Plántula y frutos de *G. keule*

Reconocimientos

Comité Nacional Pro Defensa de la Flora y Fauna (CODEFF), Universidad de Talca, La Comisión Nacional del Medio Ambiente (CONAMA), La Corporación Nacional Forestal (CONAF), Forestal Mininco, Forestal Masisa, Forestal Arauco, Franz Arnold, Paul Rymer, Christina Vinson, Jesús Cordero, Sarah Rendell, The University of Oxford Botanic Garden, IUCN – Global Trees Specialist Group, The Genetics Society (UK), The British Ecological Society

Annex 4

Coastal Forest Seminar, Programme and local press reaction


 UNIVERSIDAD DE TALCA
 INSTITUTO DE BIOLOGÍA VEGETAL Y BIOTECNOLOGÍA
 PROYECTO DARWIN INITIATIVE

Te invita a participar **SEMINARIO**

Diversidad Florística y Ecología del Bosque Maulino Costero

Jueves 3 de abril 2008 8:30-18:00 hrs.
 Salón Diego Portales, Universidad de Talca
 Av. Lircay s/n, Talca
 Tel. (71) 200277-200270
 www.darwinmaule.cl

Crónica

COORDINADO EN CHILE POR LA UNIVERSIDAD DE TALCA

Avanza Proyecto Darwin en la Región del Maule

Seminario. Diversidad Florística y Ecología del Bosque Maulino Costero, a cargo del docente de la UTAL, Dr. José San Martín, dio a conocer el avance de la interesante iniciativa



OBJETIVO. Proyecto Darwin Maule es el proyecto "Conservación de la Biodiversidad Costera Amenazada en un Hot Spot de Chile Central", financiado por Darwin Initiative (Reino Unido).

Darwin Maule tiene como objetivo desarrollar una estrategia específica de conservación y manejo sustentable para los bosques nativos costeros del Maule y generar las capacidades técnicas y un marco político local para su implementación.

La zona focal del proyecto forma parte central del "hot spot" de biodiversidad de Conservación Internacional, por su alto porcentaje de especies amenazadas y endémicas.

Darwin Maule genera el conocimiento actualmente faltante para asistir y perfeccionar la puesta en práctica de las obligaciones de Chile en el contexto de la CBD (Convención de la Diversidad Biológica), para la subregión costera del Maule. Para ello se están efectuando tres programas de trabajo: Investigación, Capacitación y Educación.

PARTICIPACIÓN

Los principales componentes del proyecto serán:

- Análisis de biodiversidad de bosques costeros del Maule.
- Análisis de viabilidad de poblaciones de especies amenazadas.
- Módulos de conservación para especies emblemáticas (e.g. Quilcay).
- Planos de conservación local y planes de manejo adaptativo.
- Programa de monitoreo para áreas críticas de conservación.
- Programas de educación y cultura participativa para propietarios de bosques y público general.

El área de estudio de Darwin Maule comprende la cordillera de la costa de la Región del Maule, desde su límite político administrativo norte al extremo sur.

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BREVES

Expertos analizarán la realidad del bosque costero maulino

Este jueves 3 de abril se desarrollará en el Campus Lircay el seminario "Diversidad Florística y Ecología del Bosque Maulino Costero", que forma parte de una iniciativa proyecto financiada por Proyecto Darwin (Inglaterra) y que está a cargo de las universidades de Talca y de Oxford. En la actividad participarán especialistas especialistas nacionales que abordarán temas como los patrones estructurales de las comunidades vegetales en el bosque maulino y la contribución de su flora a la diversidad del país, entre otros. El comité organizador está compuesto por los profesores del Instituto de Biología Vegetal y Biotecnología, José San Martín y Patricio Peráltillo, además de los ingenieros del Comité Nacional Pro Defensa de la Fauna y Flora (CONDEF) César Sepúlveda y Pedro Garrido. Para mayores informaciones, comuníquese al teléfono 71-200264.

PROYECTO DARWIN Biología reunió trabajos sobre bosque nativo de diversas zonas de Chile

La actividad estuvo abierta a estudiantes y profesores locales y de otras regiones y se orientó a sentar las bases de una estrategia común de conservación.



El seminario "Diversidad florística y ecología del bosque maulino costero", organizado por el Instituto de Biología Vegetal y Biotecnología (IBVB), usará investigaciones sobre la materia en varios lugares de Chile, con el propósito de elaborar una plan común para la conservación. Uno de los organizadores, el académico José San Martín, explicó que el encuentro es parte del proyecto "Conservación de la biodiversidad costera amenazada" de la fundación británica Darwin, proyecto binacional que ejecuta desde hace dos años la Universidad de Oxford y la Universidad de Talca. La actividad, de carácter gratuito, estuvo abierta a estudiantes y profesores locales y de otras regiones. San Martín agregó que "el objetivo fue intercambiar experiencias entre los profesionales que estudian el

bosque costero en Chile, para elaborar una estrategia común de conservación". Los expertos analizaron la estructura del bosque, grupos vegetales y asociaciones con la participación del investigador de la Universidad de Chile, Luis Hinojosa, quien habló de la fitogeografía histórica del bosque costero. En tanto, el profesor del IBVB, Patricio Peráltillo, se refirió a la diversidad del bosque, especies y al uso de los datos recopilados. Asimismo, la profesora del IBVB, las Rosales, se refirió a los vegetales que son parte del bosque costero, pero que muchas veces son ignorados. Finalmente, el profesor San Martín abordó la organización de la vegetación en el bosque costero amenazado.

- 08.30 – 09.00 Inscripción
- 09.00 – 09.15 Saludos Bienvenida
Saludos del Sr. Rector Dr. Juan Antonio Rock
Saludos del Director de Programas de Investigación Dr. Carlos Padilla
Saludos del Director(s) del Instituto de Biología Vegetal y Biotecnología Dr. Alejandro Troncoso A
- 09.15 - 09.30 Presentación Proyecto Darwin
Dr. José San Martín A (Instituto de Biología Vegetal y Biotecnología, Universidad de Talca)
- 09.30 – 10.00 Delimitación sintaxonómica y patrones estructurales de la diversidad de las comunidades vegetales en el Bosque Maulino de Chile Central
Dr. José San Martín A
- 10.00 -10.30 Contribución de la Flora de los bosques costeros de la región maulina a la diversidad florística del país
Dr. Patricio Peñailillo B. Ing. For. César Sepúlveda, Ing. Agr. © Pedro Garrido y Dr. José San Martín. (Instituto de Biología Vegetal y Biotecnología, Universidad de Talca y CODEFF)
- 10.30 – 11.00 Café
- 11.00 – 11.30 Modelo de distribución espacial de la diversidad líquénica y su contribución a la riqueza florística del Bosque Maulino
Dra. Iris Pereira (Instituto de Biología Vegetal y Biotecnología, Universidad de Talca)
- 11.30 - 12.00 Diversidad y patrón de distribución espacial de la flora endémica vascular del Bosque Maulino costero de Chile Central
Ing. Forestal Persy Gómez (Jardín Botánico Universidad de Talca)
- 12.00 -12.30 Fitogeografía histórica
Dr. Luis F. Hinojosa (Departamento de Ciencias Ecológicas, Facultad de Ciencias, Universidad de Chile)
- 12.30 - 14.30 Almuerzo
- 14.30- 15.00 Plantas Invasoras: ¿Una amenaza para el bosque mediterráneo-templado de Chile?
Dr. Aníbal Pauchard (Facultad de Ciencias Forestales, Universidad de Concepción e Instituto de Ecología y Biodiversidad (IEB), Facultad de Ciencias, Universidad de Chile)
- 15.00 - 15.30 Causas y consecuencias de las invasiones biológicas en el bosque maulino: el caso de *Pinus radiata* y *Teline monspessulana*
Dr. Ramiro Bustamante (Instituto de Ecología y Biodiversidad (IEB), Facultad de Ciencias, Universidad de Chile)
- 15.30 - 16.00 El valor de los fragmentos pequeños en la conservación de la biodiversidad del bosque Maulino
Dra. Audrey Grez (Directora de Investigación, Departamento de Ciencias Biológicas Animales, Facultad de Ciencias Veterinarias y Pecuarias Universidad de Chile)
- 16.00 - 16.30. Café
- 16.30 – 17.00. El rol de la vegetación nativa en la distribución de la fauna en los paisajes de la región del Bosque Maulino
Dr. Cristian Estades (Departamento de Manejo Recursos Forestales, Facultad de Ciencias, Universidad de Chile)
- 17.00 – 17.30 Interacciones y procesos en bosques fragmentados: espacio y tiempos de cambios en el Bosque Maulino
Dr. Javier Simonetti (Departamento de Ciencias Ecológicas, Facultad de Ciencias, Universidad de Chile)
- 17.30- 18.00 Estructuras de redes mutualistas en bosques fragmentados
Srta. Alejandra Bahamondez (Facultad de Ciencias, Universidad de Chile)

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.	
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.	X
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.	X
Have you completed the Project Expenditure table?	X
Do not include claim forms or communications for Defra with this report.	