



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
Host country Partner Institution(s)	University of Talca; CODEFF; CONAMA; CONAF
Other Partner Institution(s)	
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 (3)
Project Leader Name	Dr Stephen Harris
Project website	http://www.darwinmaule.cl/
Author(s) and main contributors, date	Dr Stephen Harris and Dr José San Martín (April 2009)

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 takes account of the population dynamics of endangered species and their habitats in geographically explicit manners and establishes 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 have been committed to integrating and implementing the CSMS in their environmental management systems, whilst small-forest owners are being encouraged to adopt 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 is through the provision of training in RBS techniques. Since the project incorporates 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 is

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.

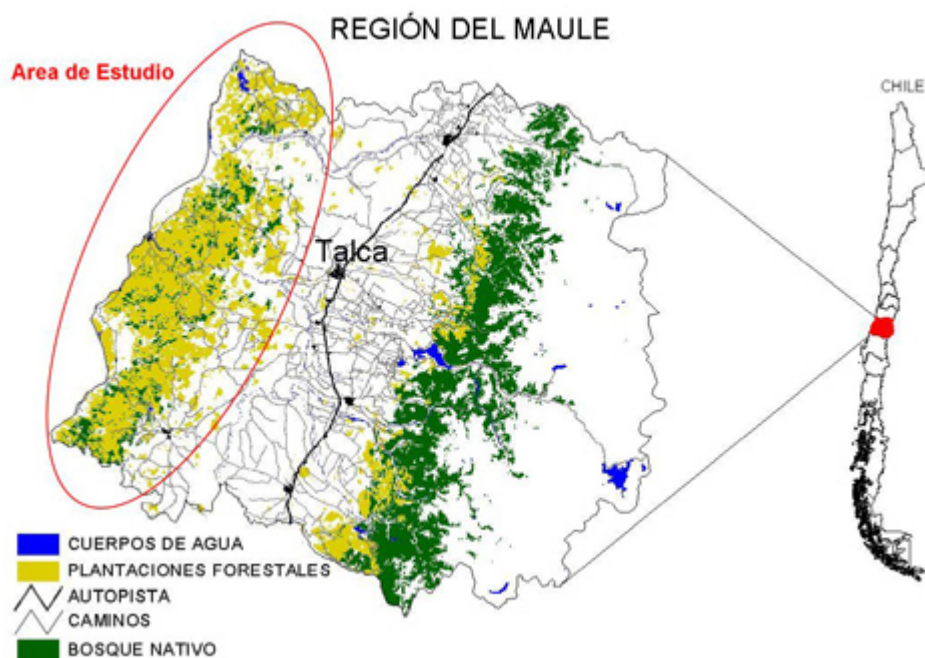


Fig. 1. Maule (Chile) showing the study area and the extreme fragmentation of the native forest.

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. There have been no major changes in the management structure, and communication routes are via e-mail and internet conferencing. The division of responsibilities to date has proven effective.

Other Collaboration: The Chilean project continues to collaborate on software development and data analysis techniques with Darwin-funded projects in Trinidad and Tobago and Bolivia.

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 3 activities were focused on analysing the RBS data from the field sites surveyed in Year 2. All of herbarium specimens (5371; 300 genera, 458 species) from the RBS plots have been reviewed and the identifications checked by taxonomic specialists. These specimens have now been incorporated into the herbarium of the University of Talca. In addition, over 3,000 photographs of native plants, habitats and landscapes have been databased ready for incorporation into the Virtual Field Herbarium (VFH).

Concern had been expressed by Chilean botanists at a botanical meeting that the degree of sampling (over 150 plots at 123 field sites) may not be representative of the flora of the Maule region. It was therefore considered necessary to investigate this possibility, and whether it was necessary to add additional plots. Using model-based GIS sampling procedures to test RBS coverage based on existing vegetation maps and satellite imagery, this potential issue was investigated. It was found that RBS sample points covered 87% of the land use types in the study area and that almost all of the species known from the area were presented in the RBS samples.

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. Provisional analysis of the data in Year 2 identified five Black Star and 14 Gold Star species but an artificially large category of Green Star species. Considerable effort was spent this year in analysing in more detail these Green Star species, based on the experience of Chilean botanists, local people, local priorities and the literature.

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

The 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 was developed for *G. keule* and paternity analysis and gene flow patterns studied in 26 study populations (Annex 3). The main findings from this investigation are:

1. *Gomortega keule* is predominantly visited by syrphid flies in March-April, and that syrphids carry a greater proportion of *G. keule* pollen than the other insects collected. No significant difference was found in insect species composition in the native forest and agricultural study areas. Low intensity agricultural systems appear to provide habitat in which syrphids forage and *G. keule* is able to produce fruit successfully; suggesting that a landscape made up of a mosaic of different landuse types is not necessarily inimical to the continued reproduction of *G. keule*. Given the known sensitivity of syrphids to landscape composition and diversity, these results are likely to be dependent upon landuse type and intensity of management.
2. Reproduction in *Gomortega keule* is characterized by apparent limitation of effective pollination, extensive selfing and vegetative reproduction, and only very occasional seedling establishment. This suite of characteristics suggests that the species is suited to persistence *in situ*, with individual genets surviving potentially indefinitely as clone groups, occasional seedling establishment maintaining the populations on a long time scale, and self-compatibility providing reproductive assurance in small populations. Extensive forest clearance in the species' range has created a landscape where native forest exists as scattered patches containing small populations of native species. While *G. keule*'s ability to coppice and reproduce vegetatively has undoubtedly contributed to its survival despite logging, deforestation and habitat fragmentation, the ability to establish new populations could be valuable in the current anthropogenically-modified landscape. The species' apparent reliance on individual longevity, asexual

reproduction and very occasional seedling establishment may well compromise its ability to survive in the face of extensive landscape change and clearance of native forest and may mean that this species no longer has a viable strategy for long-term population persistence.

3. It is often assumed that fragmented populations are genetically isolated and will therefore suffer genetic consequences of that isolation (e.g., inbreeding depression, genetic drift and loss of adaptive potential). Gene flow between spatially separated populations would reduce or eliminate the genetic consequences of spatial separation, so that habitat fragmentation could no longer be equated with genetic isolation. Four questions were addressed: (i) how far does pollen travel between seed trees and pollen donors?; (ii) is there genetic structure within and between populations of the study species, and if so, is pollen travelling far enough to avoid inbreeding due to spatial proximity of relatives?; (iii) do small sites and single trees contribute to pollen dispersal and genetic connectivity across the landscape?; and (iv) does isolation by distance alone explain the pollen flow patterns observed? The results suggest that *G. keule*'s insect pollinators travel outside of the native forest, between patches, and over distances of up to 6 km. Pollen was found to move from small sites and single trees into large sites, as well as in the other direction. The quantity of pollen transfer between sites, and the number of pollen donors detected per seed tree, was extremely variable. Genetic structure was detected both within and between sites, however, because pollen is moving beyond the distance at which trees are most likely to be related, there is limited biparental inbreeding. Even at the lowest level of pollen transfer found these sites were not genetically isolated, although other consequences of landscape change may still threaten the survival of this endangered species. Substantial research exists to show that fragmentation often does not result in genetic isolation, and that other potential effects of fragmentation such as population reduction, reduced individual survival, environment-related stress, or loss of micro-sites for germination and establishment could be more important impacts of habitat fragmentation.
4. Five aspects of landuse type and composition influence pollen flow in *Gomortega keule*:

(i) Landuse type. Of the four landuse distance variables (agriculture, native forest, plantation, clearfell), clearfell was the landuse variable most strongly negatively correlated with pollination probability. Agriculture was the landuse distance variable least negatively correlated with pollination probability. It must be noted that the agriculture found in the study area is low intensity, high diversity, small farms. Native forest was less negatively correlated with pollination than plantations at distances greater than 1 km, which may show that at distances greater than 1 km native forest is a more appealing medium for pollinator movement than plantation. The most common pattern observed in the models developed, from least to most negatively correlated with pollination probability, was agriculture, native forest, plantation, clearfell. Meadows, when present, were consistently positively correlated with pollination probability, but the rarity of this landuse type makes the data difficult to assess.

(ii) Landuse fragmentation. Increasing average size of clearfell fragments decreased the probability of pollination (i.e., the smaller clearfells were, and the more interspersed with other landuse types they were, the higher the probability of pollination). The same pattern was true for plantations as for clearfells, but only at distances greater than 1 km. In the southwest region, near Quiles Alto, where meadows were abundant the number of meadow fragments and increasing size of meadow fragments positively correlated with pollination probability.

- (iii) Distance. This study found an exponential decrease in pollination probability with linear distance; pollination probability approximately halves for each 2 km of separation above zero, irrespective of other ecological factors that may influence pollination.
- (iv) Spatial distribution of trees. *Gomortega* individuals are grouped inside native forest patches in the north and south and sparse in the centre of the study area, where much of the native forest has been cleared. *Gomortega* individuals tend to be absent from plantation or clearfell areas, although some individuals were found at the Bajo Pino 1, Bajo Pino 2 and Bajo Pino Nuevo sites in the plantations in the north of the study area. *Gomortega* individuals were absent from areas below 350 m, although this probably reflects patterns of forest clearance rather than species autoecology. This arrangement of individuals in the landscape limits the possibilities for pollen movement at the most fundamental level, simply through the absence of individuals in certain areas of the landscape, irrespective of other ecological or abiotic factors that might also influence pollen movement. The rarity of the species at both the regional and global scale, combined with the patchy distribution, pollination limitation and isolation by distance effects mean that spatial distribution of individuals is likely to be an important predictor of pollination probability throughout the species' distribution. The map of documented pollen movement shows a clear 'stepping stone effect' through the centre of the study area where the fewest *G. keule* trees remain, with single 'isolated' trees and small copses that have been left following forest clearance both receiving pollen from and donating pollen to distant sites, maintaining genetic connectivity and reducing the probability of genetic isolation.
- (v) Tree size. The size of individual *Gomortega keule* trees was positively correlated with pollination probability. Apparently smaller trees emphasize pollen production in their reproductive strategy, whilst larger trees invest in seed production. For the documented pollinations, the mean seed tree diameter at breast height (dbh) is 35.15 cm, the mean pollen donor tree dbh is 30.29 cm, and the mean dbh of all trees in the study is 25.12 cm.

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 *Biodiversidad y Sustentabilidad: Visiones de la Ciencia y del sector Público- Privado en la Región del Maule*, was used to contact stakeholders and garner their views. The opportunity was also taken to get stakeholder views at the launch of the 'El Tesoro del Maule' DVD. These data are now being assembled into a CSMS.

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. Two Chilean undergraduates in Forestry Engineering, previously trained in RBS techniques by the Darwin team, presented final year undergraduate projects:

Medina, M. (2009) *Estructura florística del bosque costero de Nothofagus glauca (Phil.) Krasser, Región del Maule*. Escuela de Ingeniería Forestal de la Universidad de Talca.

López, M. (2009) *Estructura alfa y organización de un bosque remanente de hualo costero, Región del Maule*. Escuela de Ingeniería Forestal de la Universidad de Talca.

Monitoring programme for critical areas

The implementation of this component is based on the results that are derived from RBS and PVA analyses. The PVA analysis of *Gomortega keule* reveals:

1. The ability of *Gomortega keule* to coppice and reproduce vegetatively can probably be relied upon to contribute to its survival *in situ* despite logging, deforestation and habitat fragmentation.
2. *Gomortega keule* populations separated by more than 6 km from each other are more likely to be genetically isolated than sites closer together, and sites separated by 1 km or less are likely to have pollen transfer between them. Pollination probability approximately halves for each 2 km of separation above zero.
3. Stepping-stone sites between areas of high population concentration do contribute to genetic connectivity across the landscape.
4. Very small sites and single trees make a genetic contribution, thus no population has too few individuals to be useful in providing genetic connectivity or 'stepping-stones' between larger sites.
5. Populations in agricultural areas are as likely to contribute to genetic connectivity as populations in native forest areas.
6. Larger trees, possibly individuals over 25 cm dbh, are more likely to contribute to seed production.
7. Clearfells are most strongly negatively correlated with pollination probability and low intensity, high diversity agriculture is least negatively correlated with pollination probability. The most common pattern observed in the models developed, from least to most negatively correlated with pollination probability, was agriculture, native forest, plantation and clearfell.
8. At distances greater than 1 km native forest may be a more appealing medium for pollinator movement than plantation.
9. The smaller the clearfell and the more interspersed they are with other landuse types the higher the probability of pollination. The same pattern is true for plantations as for clearfells, but only at distances greater than 1 km.

These results are being incorporated into the RBS analysis to establish a suitable monitoring programme.

Members of the Darwin project team have been invited to become permanent members to serve on the Comité Operativo de Biodiversidad (CORB), established by CONAMA, for the Maule region. This potentially provides a direct route for project results to influence local government biodiversity policy and conservation management.

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.

The environmental education DVD ('El Tesoro del Maule') was copied and disseminated to 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. A formal presentation of the DVD was made in August 2008 at the University of Talca. 70 people attended including the Mayor of Talca, the Provincial Director of Education, the Regional Directors of CONAMA, CONAF and CODEFF and representatives of the forestry enterprises Celco, Mininco and Masisa. In addition, a series of talks were given at five rural schools in the Cauquenes province, especially in the area around Pilén, and copies of the DVD distributed.

A day-long seminar, *Biodiversidad y Sustentabilidad: Visiones de la Ciencia y del sector Público- Privado en la Región del Maule*, was organised for 5th November 2008, at the University of Talca (Annex 4). The aim of the seminar was to share and disseminate experiences of biodiversity conservation in native forests from the viewpoints of business and science. There were about 70 participants, and representing the Universities of Chile and Talca, the Catholic University of Maule, CODEFF, CONAF and the forestry companies Celco, Mininco and Masisa. All the participants had an opportunity to see the DVD.

Chilean partners participated in the *Exposición de Flores y Jardines 2008* in Santiago from 7th to 9th November 2008. This is the most important exhibition of gardening, floral design

and landscaping in Chile, and was an opportunity to inform participants about the conservation of the threatened flora of the coastal region of Maule (Annex 5). Ten copies of the DVD were distributed.

In July 2008, the regional newspaper *El Centro de la Región del Maule* distributed a biodiversity supplement, which included interview with Dr San Martín about the Darwin-funded project (Annex 6).

More academic dissemination activities made by the Chilean Darwin team were presentations at two conferences:

XX Reunión Anual Sociedad Botánica de Chile, Olmué, Región de Valparaíso (25-28 September 2008). Two papers:

Contribución de la flora de los bosques costeros de la región del Maule a la diversidad florística de Chile by P. Peñailillo, C. Sepúlveda, P. Garrido and.

Distribución de la fitodiversidad en relación con la geomorfología de la Cordillera Costera de la Región del Maule by J. San Martín.

LI Reunión Anual de Sociedad Biología y XV Reunión Anual Sociedad de Ecología de Chile, Pucón, Temuco (26-29 November 2008). A paper entitled *Variación y arreglo espacial de la fitodiversidad para un tramo de la Cordillera costera de Chile Central* by J. San Martín, P. Peñailillo, P. Garrido and C. Sepúlveda.

3.2 Progress towards Project Outputs

Year 3 of the Darwin project was marked by three issues: (i) a key member of the Chilean team became seriously ill; (ii) the quality and quantity of data generated during the project meant more sophisticated analysis methods than originally envisaged were needed to get the most from these data; and (iii) the full impacts of the world financial situation have yet to be fully felt in Chile, and therefore the priorities of forestry companies are not fully understood. The temporary absence of the Chilean team member meant that the work on the analysis of the RBS data has proceeded rather more slowly than expected. In collaboration with other projects, the existing software (BRAHMS) has been redesigned to improve its functionality for sophisticated RBS analyses (Annex 7). It was necessary to request a six-month extension from the Darwin Initiative to alleviate these problems. The extension was granted, which will enable the Oxford team to train the Chilean team in the new approaches to data analysis. The weakness of the pound against the dollar has affected the Chilean part of the Darwin award. We have tried to ensure that the dollar equivalent of the award to Chile has been maintained by reducing Oxford's costs, for example not making management visits to Chile when these could be conducted via the web or e-mail. On a more positive side, genetic analyses of the *Gomortega* data have been completed and these are in a form that can now be incorporated into the management strategy documents.

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 assessment	4	4			8	8
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	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	1	1		3	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		2	0
14B	Conference attendance in Chile and Europe.		5	3		8	0

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. In the current financial climate, two of our assumptions may not longer hold: (i) 'private stakeholders, particularly forest enterprises, maintain favourable attitudes towards implementing conservation in the area'; and (ii) 'small forest owners and their representatives disposed to collaborate in planning and implementation of the strategy'. These have direct implications for the measurable indicator 'conservation proposals accepted and implemented and a procedure agreed for their continued implementation'. Notwithstanding the potential problems, the genetic and RBS data sets are now in the process of being brought together in a the final series of documents with the view that even if not implemented in the short-term these documents will provide useful data for the future management of biodiversity in the Maule region of Chile.

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. The data generated in terms of herbarium databases and basic biodiversity information are likely to prove useful in the future, especially for those Black Star species identified.

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 conference calls over the web are a very effective means of discussing specific issues amongst ourselves. We had considered whether the internet would provide an effective means of training, especially given the budget constraints imposed by the weakness of the pound against the dollar. However, we decided that the most effective training on complex aspects of data analysis is done face-to-face. In the project extension we are therefore organising a training workshop where the Chilean partners will come to Oxford. 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, especially given the uncertain economic situation. 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. For example, we directly responded to a concern that the RBS data did not sample Maule habitats adequately.

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

6. Other comments on progress not covered elsewhere

The greatest risk to the successful implementation of the project findings will be the financial climate and the attitude of particular stakeholder groups.

7. Sustainability

The Chilean partners have been active in promoting the Darwin project, the approach to vegetation analysis and Maule conservation at meetings through Chile. An important aspect of these meetings is that they represent different stakeholder groups. The invitation for members of the Darwin project team to become permanent members of the Comité Operativo de Biodiversidad (CORB), established by CONAMA, for the Maule region, provides a direct route for project results to influence local government biodiversity policy and conservation management. The skills that have been developed in Chile are sustainable now and if an exit strategy were needed then a group of young, skilled individuals will remain, together with a well-documented collection of specimens and associated data.

8. Dissemination

The main dissemination activities this year have been associated with school talks, promotion of the DVD and conferences. The DVD can be easily and cheaply copied and hence made available at minimal cost when the project ends. Dissemination of the conservation plans, once they have been completed, will become part of CONAMA's future activities.

9. Project Expenditure

Table 2 Project expenditure during the reporting period (Defra Financial Year 1 April 2008 to 31 March 2009)

Item	Budget	Expenditure	Variance
Rent, rates, heating, overheads etc			
Office costs (eg postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment (specify)			
Others (specify) Laboratory and field consumables			
Salaries David Boshier (Oxford) William Hawthorne (Oxford) Cesar Sepulveda (CODEFF) Pedro Garrido (CODEFF) Franz Arnold (Talca)			
TOTAL			

Note 1. Savings on overheads have been made to ensure that dollar equivalents were transferred to Chile in the light of the weak pound.

Note 2. Internet communications have reduced these costs. Furthermore, the final meeting in Chile has not taken place.

Note 3. Final publications have not yet been produced.

Note 4. Lab costs have dropped considerably and the methods of data generation became more efficient over the last year. Furthermore, it became clear that some planned sampling was unnecessary.

Note 5. The Darwin Initiative has agreed to transfer this balance to an extension into 2009/10.

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

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2008/09

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	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>(report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity eg steps towards sustainable use or equitable sharing of costs or benefits)</i></p>	<p><i>(do not fill not applicable)</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>Star-rating of species proceeding and heat determination of RBS plots continuing. Landscape-based genetic analysis. One university lecture given and one Biodiversity seminar organised. Three conferences attended.</p>	<p>1. Star-rating of species. 2. Statistically analysis of RBS plots, plus plot 'heat' determination. 4. Integration of (2) with landscape-genetic analysis into CSMS.</p>
<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>5,000+ specimens identified and identifications confirmed by specialists. All incorporated into the University of Talca Herbarium. Databases of specimens and botanical images.</p>	
<p>Activity 1.1 RBS plots</p>		<p>Completed.</p>	
<p>Activity 1.2 Specimen databasing and identification.</p>		<p>All identifications done and confirmed; databasing complete.</p>	
<p>Activity 1.3 Digital images of plants in field.</p>		<p>All images databased and keyworded.</p>	
<p>Activity 1.4 Species Star-ratings.</p>		<p>Star-ratings refined but need to be completed.</p>	
<p>Activity 1.5 Bioquality analysis and 'heat' scoring for plots</p>		<p>Data in a form that can be analysed once star-ratings are complete.</p>	
<p>Output 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>Data generated, analysed and written-up as D.Phil. thesis.</p>	
<p>Activity 2.1. Genetic marker isolation and characterisation.</p>		<p>Completed.</p>	

Activity 2.2. Geneflow and paternity data generation.	Completed.	
Activity 2.3. Multivariate analysis of spatial and population parameters in relation to geneflow patterns.	Completed.	
Activity 2.4. Statistical analysis of correlation between land use types and pollen flow patterns.	Completed.	
Activity 2.5. Development of a model to describe variation in permeability of different land uses and combinations of land uses, if such variation is found.	Completed.	
Activity 2.6. Development of insect-mediated pollen flow models in landscapes that are complex mosaics of different land uses	Completed.	
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	Stakeholder meeting completed but implementation procedures remain to be agreed..
Activity 3.1. Stakeholder workshops		Additional stakeholder groups reached through seminar organisation.
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 field teams are operating effectively. Three Chilean and one UK undergraduate trained. Talca Herbarium considerably enhanced.
Activity 4.1 RBS Survey and Bioquality courses.		User-friendly software developed for data analysis; one course remains to be completed.
Activity 4.2 Field teams identified.		Completed.
Activity 4.3 Undergraduate students involved in the research programme.		Completed.
Activity 4.4 Talca Herbarium databased and enhanced.		Completed.
Output 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.	Results of Outputs 1 and 2 influencing this output.
Activity 5.1 Technical monitoring guide published.		In progress.

Activity 5.2 Establish monitoring programme.	In progress.
Output 6. Environmental education prog. and participatory extension prog. with forest owners and general public stakeholder workshop conclusions available, implementation procedure defined and agreed	Project website, 2 radio programmes, 1 educational video, min. 5 school presentations, min. 3 university lectures
Activity 6.1 Project website	Project website is running, radio programmes transmitted and a DVD distributed. Five school presentations made and three university lectures have been given.
Activity 6.2 Radio programmes and DVD	Website (in Spanish) is up; material regularly added.
Activity 6.3 School presentations and University lectures.	Radio programmes aired. DVD distributed.
	Completed.

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>			
Purpose			
<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>
Outputs			
1) Bio-quality analysis of coastal forests and woodlands in the Maule region	4-8 people trained in RBS methodology, digital maps of forest bio-quality, digital photographs in interactive website and botanical database	Project reports, maps, technical documents, herbarium specimens, plot data, photographs, website and botanical database	Access to private land facilitated by landowners, local resources (maps, aerial photos, libraries, botanical collections, satellite images, data bases, GIS, etc.) accessible
2) PVA of model species (<i>G. keule</i>) and development of conservation models	Genetic research results, conclusions and conservation models available	Lab. protocols, progress reports, peer reviewed publications	Agreed access to private land maintained
3) Conservation and Sustainable Management Strategy (CSMS) agreed and implemented by stakeholders	stakeholder workshop conclusions available, implementation procedure defined and agreed	Workshop materials and reports from participants, CSMS reports, forest management plans	Conflicts of interests between actors and management goals of specific land areas in respect to proposed conservation measures are resolvable
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.	Training course materials published on-line, participants course reports, online digital photos from RBS and data on key species.	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
5) Monitoring programme for critical areas	Monitoring guidance published as a specific technical monitoring guide)	Conservation Manual for Maulino Forests	Post-Darwin Initiative financial support for post-project monitoring activities obtained

	1 or 2 local institutions establish monitoring prog. by end project	Technical guide for conservation monitoring including geographical and thematic priorities.	
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

