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Darwin Initiative Annual Report

1. Darwin Project Information

Project Ref. Number	162/12/018
Project Title	<i>Climate Change and Conservation of Galapagos Bird Species</i>
Country	<i>Ecuador</i>
UK Contractor	<i>Wildlife Conservation Research Unit (WildCRU), Oxford University</i>
Partner Organisation(s)	<i>Galapagos National Park Service (GNPS) and the Charles Darwin Foundation (CDF)</i>
Darwin Grant Value	<i>£120,000</i>
Start/End dates	<i>August 2003 / July 2006</i>
Reporting period (1 Apr 200x to 31 Mar 200y) and report number (1,2,3..)	<i>1 April 2003-31 March 2003, Report number 1</i>
Project website	<i>Web-page under construction</i>
Author(s), date	<i>Professor David Macdonald & Hernan Vargas, 30 April 2003</i>

2. Project Background

This project is conducted in the Galapagos Islands, Ecuador. The Archipelago is well known for its unique endemic biodiversity. The majority of the land, and of the marine areas, are protected in the GNPS (GNPS) and Galapagos Marine Reserve, respectively. The project aims to mitigate existing and future negative impacts on

three endangered species of birds and associated biodiversity. The bird species are the Galapagos Penguin, the Flightless Cormorant and the Mangrove Finch.

3. Project Purpose and Outputs

3.1. Purpose

- To increase local expertise in scientific research, ecological monitoring and sustainable management in the Galapagos Islands.
- To understand the mechanisms involved with natural and anthropogenic impacts on the conservation of threatened endemic bird species and associated biodiversity in rich upwelling ecosystems of the Galapagos Islands

3.2. Outputs

- At least 8 Ecuadorian students trained in research methodologies and conservation biology and 8 park rangers trained in wildlife management and monitoring techniques.
- Management plans and manuals for long term monitoring and conservation of the three endangered bird species in relation to climate change, fisheries and alien predators.
- Practical recommendations and multilayered maps for the zoning and use of the Galapagos Marine Reserve

4. Progress

4.1. Brief history of the project to the beginning of this reporting period.

Upon request from the Darwin Initiative, the project budget and outputs were revised and restructured in April 2003 and official initiation of the project was postponed from April 2003 to August 2003. Nevertheless, project planning and the purchase of key capital equipment took place between April and July 2003. This prior effort facilitated the timely deployment of temperature loggers and logging rain gauges during the first intensive field season occurring between August and October 2003. A second intensive field season took place between March and February 2004. Between these first two intensive field seasons (November 2003-February 2004), data continued to be collected on a monthly basis by university students and park rangers. The project is being implemented successfully with host country support provided through the GNPS and the CDF.

4.2. Progress over the last year against the agreed baseline timetable for the period and the logical framework (complete Annexe 1).

See Annexe 1.

The project was implemented according to the schedule. Project planning was carried out between April and July 2003 in conjunction with staff from the GNPS, the CDF and the Wildlife Conservation Research Unit at the University of Oxford (see Annexe 2, in Spanish). The plan was revised in November 2003 and again in March 2004, and this represents an additional output of the DI project. The Plan describes the structure of the DI project, the responsibilities of each partner, and the objectives and methodologies required to answer research hypotheses and to deliver project outcomes on time.

4.3. Project's achievements during the last year.

Planning: The project plan was refined and adjusted in November 2003 and again in March 2004. The plan will continue to be revised on an ongoing basis as more data are produced and as additional logistical support (e.g. more boats) becomes

available for marine transportation - this is one of the most expensive components of any research project in the Galapagos Islands. By August 2004, the GNPS will have a new boat for patrolling and monitoring in the western Galapagos. If we are permitted to use the boat, this could facilitate increased sampling effort by the Darwin project. If this can be negotiated, the plan will need to be adjusted accordingly.

Research technology: A detailed project plan has been produced through discussions with members of the WildCRU, the CDF and the GNPS. The plan, based on the DI proposal, includes specific research hypotheses and methodologies for testing these within the agreed deadlines. Scientific research and monitoring includes the application of logger technology: temperature loggers, logging rain gauges, GPS log, GPS-TD log and Preci-TD Log.

Research on the foraging behaviour of the Flightless Cormorant and the Galapagos Penguin.

We used novel technology to study foraging behaviour in penguins and cormorants. Technological devices included Global Positioning Systems (GPS-log) and Temperature-Depth recorders (PreciTD-log), both of which have been designed specifically for oceanographic applications. The GPS-log tracks the location at which birds are foraging, while the Preci-TD measures instantaneous pressure (indicative of dive depths) and sea temperature during foraging. Over the 2003-2004 field seasons we deployed the GPS-log on 14 adult cormorants, and the PreciTD-Log on an additional 35 adult cormorants and 1 adult penguin. Data are currently being analysed.

Training: 5 park rangers and 2 high school students have been trained in ecological monitoring techniques. 4 undergraduates and 1 Ph. D. student have been trained in research methodologies. The Ph.D. student played a key role in training park rangers and the other Ecuadorian students. Local high school students and undergraduates: 1) represent potential wildlife managers of the future; and 2) provide inexpensive manpower for the project. The continued participation of Ecuadorian students will be encouraged in order to empower the future caretakers of the Galapagos flora and fauna.

Monitoring:

Monitoring Environmental variables: 20 HOBO® temperature loggers and 2 logging rain gauges were deployed in September 2003, and have since been recording data on a continual basis. Temperature loggers were deployed under the sea at 10m and 20m depths, and these were programmed to record data every half an hour. The temperature loggers are located adjacent to selected penguin and cormorant colonies.

A logging rain gauge was deployed at each of two key sites on Isabela island: 1) Caleta Iguana, an important nesting site for the Galapagos Penguin; and 2) Playa Tortuga Negra, the main stronghold of the Mangrove Finch.

Data from temperature loggers and logging rain gauges will be downloaded every six months; the first download took place in March 2004.

This is the first time that this type of weather data has been available for the western Galapagos; we will use it as an index of ecosystem health in terms of food availability for penguins and cormorants.

Monitoring bird variables: In order to facilitate the monitoring of bird variables, we need to mark hundreds of birds with microchips (Pit Tags). We aim to mark one third of the penguin and cormorant populations over the course of the project. We have almost achieved this goal within the first year. By April 2004, we have marked 250 penguins and nearly 500 cormorants.

According to plan, every year we conduct a complete census of the penguin and cormorant populations over the entire distributional range of each species. In addition, we conduct partial censuses at selected bird colonies on a monthly basis.

During these censuses, data are recorded on distribution, total population numbers, egg and chick productivity, survival, movements and dispersion. A complete census of the penguin and cormorant population in September 2003 indicated the presence of 770 penguins and 1456 cormorants in the Archipelago. Although the penguin population seems to have been stable over the last few years, the bad news is that penguin numbers are not increasing as expected. On the other hand, the total cormorant count for 2003 represents the highest number ever recorded since population monitoring began in 1977, and approximately double the number counted in the first census.

Monitoring the effect of Black Rats on the Galapagos Penguin and the Mangrove Finch

It was agreed that, as part of their matched funding, the GNPS would carry out rat trapping (using live tomahawk traps) for ten days every September. This will take place at selected sites that are considered important for the Galapagos Penguin and Mangrove Finch. Trapping will allow us to study the effect of Black Rats on penguins at Islas Marielas, Fernandina, Islote Lougie and Bartolome. Rat trapping will also be conducted at Playa Tortuga Negra and Caleta Black, the two main strongholds of the Mangrove Finch.

Monitoring that took place in September 2003 did not detect the presence of the introduced Black Rat on Fernandina Island. This suggests that the species has not yet arrived on this pristine island where a significant number of penguins live. Sadly, Black Rats were rediscovered on Isla Mariela Grande, an important nesting site for the Galapagos Penguin; previously, it was thought that they had been eradicated from Isla Mariela Grande in 1998. Since the eradication attempt, regular trapping exercises had failed to detect Black Rats, and their presence in 2003 suggests that they may have re-colonised the island - either from Isabela Island, or from nearby Mariela Mediana (270 m away). The other possibility is that the rats have been re-introduced by tourist or fishing boats visiting the island. On 23rd of September 2003, 6.2 kg of Brodifacoum poison was distributed on the Island in a further attempt to eradicate the Black Rats.

Relatively fewer rats were detected on the Mangrove Finch sites than in previous years. This may indicate an effect of the drought during 2003.

Timetable (workplan) for the next reporting period.

Period/month	Year	Activity
April 2004- March 2005	2004 / 2005	Monitoring of bird variables at selected colonies/sites
June-December	2004	Analysis of cormorant diving data
June 2004- March 2005	2004 2005	Preparation of GIS data and GIS layers; training course for GIS technician
July	2004	Completion of instruction manual for penguin and cormorant census
August-October	2004	Training of students and park rangers
September	2004	Implementation of penguin and cormorant census
September	2004	Monitoring of rats at penguin and Mangrove Finch sites
October	2004	Submission of six month DI report
November	2004	Submission of technical reports to the GNPS and CDF
January	2005	Completion of manual for surveying the Mangrove Finch

February	2005	Broadcasts on local TV programmes in host country
February	2005	Hosting of workshop in the Galapagos (project dissemination and evaluation)
January-March	2005	Analysis of sea temperature and precipitation data
January-March	2005	Analysis of GPS and foraging behaviour data
April	2005	Submission of annual DI report

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

Not applicable to this project

6. Partnerships

During the first year, there was political instability in Ecuador; this also affected the leadership of the CDF, and to an even greater extent, of the GNPS. This unforeseen instability in both institutions necessitated additional time in project planning and coordination. Timely action through careful planning allowed us to overcome the difficulties caused by the political instability, especially those related to high personnel turnover and changes in the leadership of both institutions.

The partnership proved truly symbiotic and the collaborations worked really well. The GNPS contributed personnel, transportation and fuel beyond their originally stated commitments. This additional support benefited the project greatly.

The universities that are part of the project supplied students. The local high schools on Santa Cruz Island (these are not official partners of the project) also made students available. The high school authorities are willing to continue to provide this type of assistance over the coming years.

During this first year, the project was also able to collaborate with the Saint Louis Zoo and with the University of Missouri in the studies of avian disease and sex ratios in penguins and cormorants. Blood and faecal samples were taken from the same birds that were captured for marking. Samples are being sent to various laboratories in the USA for the diagnosis of avian diseases that could potentially threaten the long-term persistence of penguins and cormorants.

7. Impact and Sustainability

- Despite political instability, Ecuador made tremendous efforts during the year to promote the work associated with the DI project. Evidence for increasing interest of GNPS authorities includes: 1) inclusion of rat monitoring activities in the GNPS operative plan of 2004; 2) allocation of more funding to finance transportation costs; and 3) allowing park rangers to participate in the project for greater lengths of time. These facts indicate that the GNPS acknowledges the importance of the project and is willing to commit strongly to the long-term conservation of the three endangered species and associated biodiversity via consolidation of the DI project.

8. Post-Project Follow up Activities

Not applicable to this project

9. Outputs, Outcomes and Dissemination

Most of the outputs were achieved. Nearly all of the project activities were filmed in March 2004 and video material is available at the CDF communication office and will be used in the near future to produce short video clips for dissemination at the local and national level. Further details on project outputs are provided in Table 1.

Table 1. Project Outputs (According to Standard Output Measures)

Code No.	Quantity	Description
15D	1	Press release in the UK http://www.gct.org/apr03_3.html Target audience: General public
15A	1	Press release in Ecuador http://www.darwinfoundation.org/news/news04140301.html Target audience: Scientists, park authorities, students and wildlife managers
15C	1	National press release in the UK http://www.ox.ac.uk/blueprint/2003-04/0502/08.shtml Target audience: Oxford students and general public, national UK newspapers. Item was also published in the Oxford Mail and on the GCT and CDF web pages.
4A	5	Undergraduate Ecuadorian students trained in research methodologies
4C	1	PhD student from Oxford University trained in scientific research methodologies
6A	7	5 Park rangers and 2 high school students trained in ecological monitoring techniques
19C	2	Local radio interview on Santa Cruz Is., Ecuador
18C	1	Interview on local TV program, Santa Cruz Is. Ecuador
22	2	Selected mangrove patches for monitoring the Mangrove Finch
22	9	Selected colonies for monitoring the Galapagos Penguin
22	15	Selected colonies for monitoring the Flightless Cormorant
22	8	Selected locations to study the effects of rats on penguins
22	2	Selected Mangrove patches to study the effects of Black Rats on the Mangrove Finch.
22	2	Selected locations to measure precipitation
22	10	Selected locations to measure sea temperature

Table 2: Publications

No publications were produced during this year. We have collected abundant data, which are currently undergoing analysis.

10. Project Expenditure

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

Item	Budget (Project schedule, 1 April 2003 – 31 March 2004)	Expenditure	Balance

11. Monitoring, Evaluation and Lessons

The project was monitored and evaluated this year by the following indicators of achievement:

- Number of field plots (colonies or locations) established for long-term ecological monitoring (taking into account financial considerations, availability of manpower and commitment of host partners).
- Number of birds marked for long-term monitoring.
- Frequency of visits to the study area to monitor birds.
- Support of local partners (CDF, GNPS and Universities) via provision of park rangers, volunteers, logistical and administrative support.
- Number of students and park rangers that have been trained.
- Number of temperature loggers and rain gauges deployed, and success in downloading the information after six months.
- Number of birds on which GPS and Preci- TD devices were deployed.
- Percentage of data that has been entered into databases, and extent of analysis.

We believe that the success of a project depends on good planning and the commitment of all partners involved. We have achieved both of these elements, and this has allowed us to carry out a very successful first year.

12. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum)

■ **I agree for ECTF and the Darwin Secretariat to publish the content of this section**

One of our most outstanding achievements this year has been the collection of copious quantities of data through the application of logger technology, deployed both at sea and directly on birds.

The sea temperature data recorded by the 20 temperature loggers, deployed at 10 and 20 m depths, will help us to understand local changes in oceanographic conditions in relation to global climate change. High sea temperatures (relating to El Niño) ultimately mean that less food is available for penguins and cormorants, no reproduction will occur, and a proportion of their populations will die. On the other hand, low temperatures (relating to La Niña) signify that food is plentiful and that the birds have sufficient resources for successful breeding and survival.

The loggers applied directly to birds are providing unique data, which have not been available before. The devices are making measurements in two dimensions: horizontally and vertically. The GPS units, that are deployed on birds, track their movements when they are away from their colonies, while Preci-TD loggers, take readings of temperature and diving depths. Bird foraging data (GPS fixes, and diving depths) will be overlaid later onto geographical layers of fishing data. Bird data provided by the logger technology will allow us to determine whether the current “no take fishing zones” in the Galapagos Marine Reserve are large enough to guarantee full protection of penguin and cormorant feeding areas.

Project summary	Measurable Indicators	Progress and Achievements April 2003-Mar 2004	Actions required/planned for next period
<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</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p> <p>To increase local expertise for scientific research, ecological monitoring and sustainable management in the Galapagos Islands.</p> <p>To understand the mechanisms of natural and anthropogenic factors on the conservation of threatened endemic bird species and associated biodiversity in rich upwelling ecosystems of the Galapagos Islands.</p>	<p>Original purpose level indicators</p> <p>Increased understanding of the role of natural and anthropogenic factors affecting threatened species.</p> <p>Increased ability to predict population changes of threatened species and make timely management actions to mitigate impacts.</p> <p>Effective management of the GMR in western Galapagos.</p>	<p>Impacts and achievements resulting from the project against purpose indicators</p> <p>A series of temperature loggers, logging rain gauges, GPS and Preci-TD devices have provided abundant data.</p> <p>Data on natural (sea temperature and precipitation) and anthropogenic variables (introduced Black Rats), and bird variables (egg and chick productivity and adult survival) gathered since August 2003 have provided us with information on variation among these factors over almost one whole year. These data will allow us to predict bird population changes and improve management practice.</p>	<p>Lessons learned resulting from the project & highlight key actions planning for next period</p> <p>1) The project has benefited tremendously from the application of the logger technology for producing accurate and abundant data sets.</p> <p>2) Local partners: the CDF and the GNPS have supported the project throughout all phases.</p> <p>The second period will involve investment of major effort into the continuation of data collection and data analysis.</p>

Outputs			
original outputs	original output level indicators	completed activities and outcomes that contribute toward outputs and indicators	lessons learned resulting from the project & highlight key actions planning for next period
UK and host country partner organisations develop a unique partnership for participating in the planning process and implementing project outputs.	Minimum of 8 Ecuadorian park rangers trained in ecological monitoring techniques, 6 undergraduate students trained in research methodologies, one in GIS, and one Galapagos-born student to pursue further education leading to Ph.D. qualifications in conservation biology.	5 park rangers, 2 high school students, 5 undergraduates and 1 Ph. D. student have been trained in ecological monitoring techniques.	The Ph.D. student played a key role in training park rangers and the other Ecuadorian students. Local high school students and undergraduates: 1) represent potential wildlife managers of the future; and 2) provide inexpensive manpower for the project. Their further participation will therefore be encouraged in the next period.
Management plans, manuals technical reports and papers published and distributed	Number of manuals, management plans, workshops, reports, papers, Ph.D. thesis, conferences, and presentations on local radio and television.	Technical reports have been submitted to the GNPS, and to the CDF. Project activities have been disseminated through local radio in Ecuador and through websites in host country and the UK.	A database of all marked birds and recapture data is in place at the CDF, and data are entered as soon as they are available. The press offices of the GNPS and the CDF have committed themselves to the continual dissemination of information on project activities via the media in the next period.

<p>Multilayered GIS database that describes distribution, densities, and foraging ranges of bird species with physical parameters and fishing areas of the GMR.</p>	<p>Number of birds sampled to assess distribution, densities and foraging ranges. Numbers of monitoring devices deployed to measure temperature and precipitation.</p>	<p>Complete and partial censuses of each species have provided distributional GPS point data. Two rain gauges and 20 temperature loggers were deployed in the western Galapagos. 49 cormorants and one penguin were sampled to determine foraging ranges and diving behaviour.</p>	<p>During the next period, GIS data will be placed into several GIS layers.</p>
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Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.