

# Darwin Initiative – Final Report

(To be completed with reference to the Reporting Guidance Notes for Project Leaders  
(<http://darwin.defra.gov.uk/resources/reporting/>) -

it is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

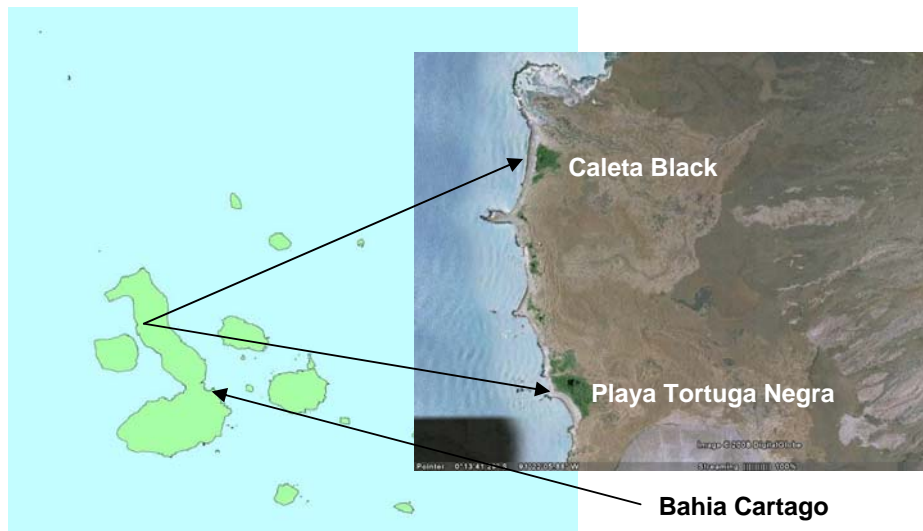
## Darwin project information

Project Reference	15-005
Project Title	Conservation of the Mangrove Finch <i>Cactospiza heliobates</i>
Host country(ies)	Ecuador
UK Contract Holder Institution	Durrell Wildlife Conservation Trust
UK Partner Institution(s)	
Host Country Partner Institution(s)	Charles Darwin Foundation, Galápagos National Park
Darwin Grant Value	£173,500
Start/End dates of Project	Start 1 <sup>st</sup> June 2006. End 31 <sup>st</sup> May 2009
Project Leader Name	H Glyn Young
Project Website	
Report Author(s) and date	H Glyn Young and Birgit Fessl

## 1 Project Background

The goal was to assist in conservation of the critically endangered and geographically restricted Mangrove Finch *Camarhynchus (Cactospiza) heliobates* in the Galápagos Islands through focused field research on the last remaining population of the species, and by means of interventions to control the main recognised agents of decline (i.e. disease and predation). Skills necessary for *in-country* head-starting and release in order to establish new populations were established through a trial captive breeding programme. The Durrell Wildlife Conservation Trust (Durrell) assisted in skill transfer to build required institutional capacity in Galápagos. The Project developed a medium to long-term action plan to ensure the survival of this species beyond the project lifetime, and thus help Ecuador meet its CBD obligations.

Project was awarded a further two years funding from Darwin Initiative as EIDPO031: Restoration of the Mangrove Finch in Isabela, Galápagos.



**NOTE.** The Project has adopted the scientific name *Camarhynchus heliobates* following the use of this name by BirdLife International:

[www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=9612&m=0](http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=9612&m=0)

## 2 Project support to the Convention on Biological Diversity (CBD)

Project activities have particularly supported the implementation of Articles 7 (Identification and Monitoring: paragraphs a-d), 8 (*In-situ* Conservation: notably paragraphs d, f and h) and 12 (Research and Training: paragraphs a-c). The establishment of aviaries in Santa Cruz, training of staff in captive husbandry and production of appropriate manuals in part supports Article 9 (*Ex-situ* Conservation).

Article 15 (Access to Genetic Resources) has been supported through the provision to Galápagos National Park of genetic samples from Mangrove Finch and Woodpecker Finch and Article 17 (Exchange of Information) through the provision of electronic library material throughout the Project.

The goals of the Global Island Partnership (GLISPA, Strategies 1 & 2) were strengthened through the establishments of the partnerships throughout this project while those of the Protected Areas Provisions (Dec. VII/28), notably sub-paragraph (c) were supported through the management of biological resources important for conservation of biological diversity within a protected area (The Galápagos National Park). The programmes of work on Island Biodiversity (Dec. VIII/1 COP8) and commitment to significantly reduce the loss of biodiversity were supported through the protection of the components of biodiversity and control of threats to island biological diversity from invasive alien species.

Other biodiversity conventions (CMS, CITES) were not supported.

## 3 Project Partnerships

The project has two local partners: the Charles Darwin Foundation (CDF) and Galápagos National Park (GNP). Both these organisations are based in Puerto Ayora, Santa Cruz in adjacent offices. CDF works in partnership with GNP, the government authority in charge of conservation and natural resource issues in Galápagos, providing the scientific knowledge required to protect the unique ecosystem of Galápagos. A Memorandum of Agreement was signed by Durrell and CDF for the life of this project and extended in 2009.

The Project partnership continues to be very effective and well received. Field Manager Dr. Birgit Fessl was included onto the staff of CDF for convenience and to ensure that she received local benefits available to CDF staff. Wages etc. for B Fessl come from Project funds transferred to CDF. HGY and B F were granted the rare status of Collaborative Scientists by GNP; HGY was also granted this status by CDF. HGY and Bryan Milstead (CDF) jointly co-ordinated overseeing Project until March 2008 when Rachel Atkinson (CDF) replaced BM.

The Mangrove Finch Workshop in Isabela, November 2008, was jointly hosted by CDF and GNP.

Two members of the Durrell Bird Department were seconded to the Project to assist in the captive breeding trials in 2008 and 2009. Durrell experience with issues involving many aspects of conservation including captive breeding and rearing continue to be further utilised by CDF and GNP for other projects in Galápagos including the conservation of the Floreana Mockingbird *Mimus trifasciatus* (Action Plan published in February 2008) and Project Floreana. Durrell's partnership with CDF was further strengthened in 2009 with the signing of an MoU covering a variety of collaborative work including Project Floreana.

### Other collaborations:

The Project continues to benefit from close collaboration with Hernan Vargas whose Galápagos based DI project (project id 12018) came to an end in 2006. Hernan who took part in the 1996-2000 Mangrove Finch survey and was the initial impetus to conservation of this species now works for The Peregrine Fund based in Panama and continues to be consultant to Project.

Ken Petren (University of Cincinnati) undertook genetic analyses of wild Mangrove Finch and captive Woodpecker Finch throughout the Project. A joint paper on genetic history of Mangrove Finch will be submitted in the near future.

*Philornis* studies at Charles Darwin Foundation, notably investigation into captive breeding for study and development of an attractant, were undertaken in partnership with SUNY (State University of New York).

Sharon Deem (St Louis Zoo, WildCare Institute) has been a station volunteer at the Charles Darwin Foundation since 2008 and served as veterinarian to the captive trials. Sharon also acted as veterinary consultant to the Project and took part in the Mangrove Finch Workshop.

Michael Dvorak (BirdLife Austria) took part in the 1996-2000 Mangrove Finch survey and was first author on the published report (*Oryx* 38 (2): 1-9). Michael volunteered at the field sites in 2008 and 2009 and carried out several surveys. Sabine Tebbich (University of Vienna) also continued her association with the Project particularly through collaboration with captive trials and trials with radio-transmitters in Santa Cruz.

Hendrik Brumm (Max Planck Institute Seewiesen, Germany) volunteered for the project and helped in song analysis (paper in prep.).

Other close and invaluable links were maintained with Alan Tye (Pacific Regional Environment Programme (SPREP), Paquita Hoeck and Lukas Keller (University of Zurich), Patty Parker (University of St Louis), and Peter and Rosemary Grant (Princeton University).

## 4 Project Achievements

### 4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The Project aimed to identify the main threats to Mangrove Finch survival and establish methodologies to mitigate these. This was attained through thorough studies of the finches' ecology, monitoring of bird and predator numbers with a managed programme of rat control at Playa Tortuga Negra (PTN) and Caleta Black (CB).

The populations at PTN and CB were monitored from late 2006 until 2009.

Sites	year	number of points	number of observations	density (birds ha <sup>-1</sup> )	% coefficient of variation	Estimated population size with ranges
CB	2006/7	11	12	4.3 (1.3, 13.9)	60.6	42 (12, 139)
	2007/8	32	42	4.8 (2.5, 9.1)	33.6	48 (25, 91)
	2008/9	16	28	4.9 (2.4, 10.1)	36.9	49 (24, 101)
PTN	2006/7	26	25	2.8 (1.3, 6.2)	40.6	53 (24, 117)
	2007/8	57	64	3.8 (2.2, 6.7)	28.9	72 (41, 127)
	2008/9	32	32	2.7 (1.3, 5.5)	36.2	51 (25, 103)

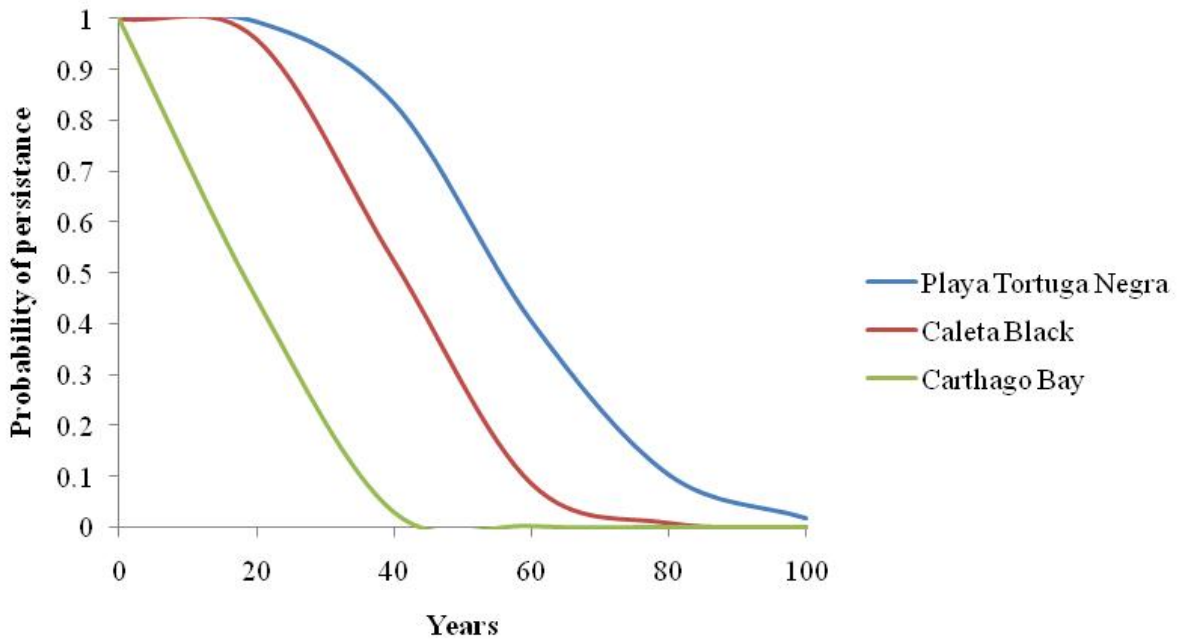
**Estimates of mangrove finch density and population size at Caleta Black (CB) and Playa Tortuga Negra (PTN).** From Fesl *et al.* (submitted): How to save the rarest Darwin's finch from extinction?

Site	# territ.	Observation	# territ.	Observation	#territ.	Observation
		2006/2007		2007/2008		2008/2009
CB	15	11 nests 2 pairs 1 male 3x 1 male 1x	15	10 nests 1 pair 2 males 2x 2 males 1x	16	6 nests 2 pair 7 males 2x 1 male 1x
PTN-B	3-4	2 nests 2 females 2x	3-4	1 nest 2 males 2x 1 male 1x	2	1 nest 1 pair
PTN-A	22	15 nests 2 pairs 4 males 3x 1 male 1x	23	19 nests 1 pair 3 male 2x	21	16 nests 5 males 2x

**Numbers of territories found for three successive breeding seasons at three sites. Territory boundaries were drawn according to observations: sightings of males (1, 2 or 3 times during different mapping events) females (1,2 or 3 times; no male singing), pairs (at least in one mapping event a pair was encountered) and nests (at least in mapping event a nest was encountered).** From Fessl *et al.* (submitted): How to save the rarest Darwin's finch from extinction?

No birds were seen in traditional sites on Fernandina, despite visiting birding groups reporting several, until a single bird was observed and filmed in November 2008. In February 2008 a small remnant population (4-5 birds) was found in extensive mangroves at Bahia Cartago (Cartago) in eastern Isabela (confirmed in 2009). This latter site had not been visited since 1998.

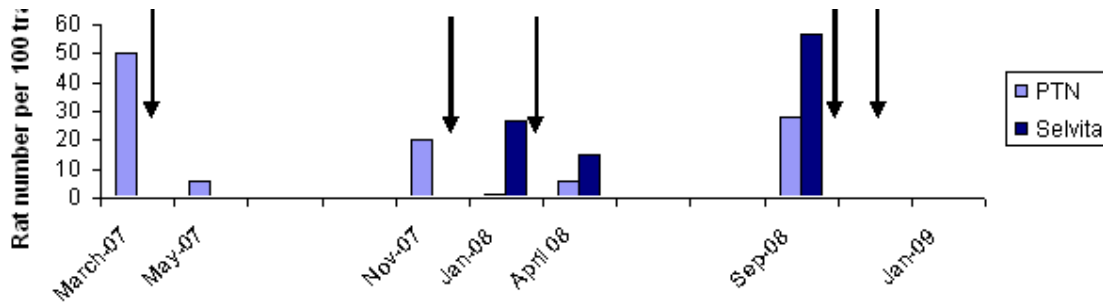
Monitoring of Mangrove Finch nesting success and an artificial nest experiment revealed heavy losses during the egg-phase due to predation by black rats *Rattus rattus*. During the nestling phase, infestation by the larvae of the introduced parasitic fly *Philornis downsi* causes additional mortality. Given this extremely low reproductive success, a population viability analysis with the Vortex computer programme (at the Mangrove Finch Workshop, Isabela, November 2008) predicted that the species would decline towards extinction. With such a high juvenile mortality rate all three populations had negative stochastic growth rate leading to a probability of zero survival for CB and Cartago and near zero for PTN; and all became extinct in a small period of time. The small number of scenarios that Vortex gave a survival over a 100 year period were from PTN, with a mean extant population size of less than 10 birds and genetic diversity less than 0.65. These results indicate that the species is in high risk of extinction in a very short period of time, with the Cartago population the most critical. The results also revealed the importance of establishing immediate management actions to guarantee the long term viability of the species.



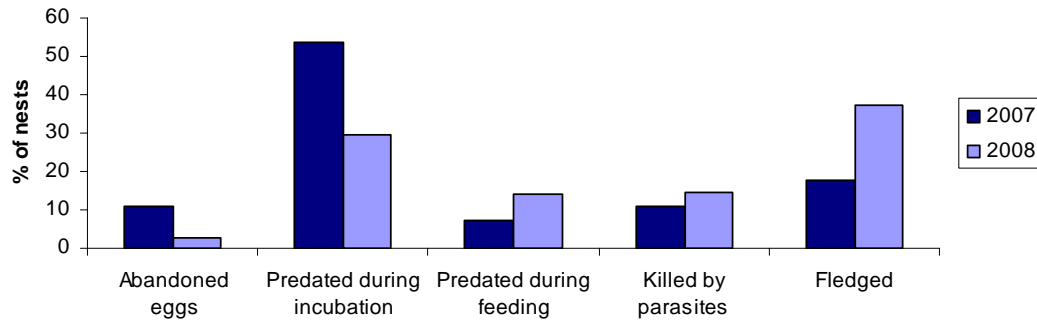
**Vortex predictions of persistence of the three mangrove finch populations for 100 years.**

The main threat to the Mangrove Finch's survival comes from high mortality of eggs and fledglings due to rat predation and *Philornis downsi* parasitism, factors that can be controlled by direct actions.

After intense rat control from early 2007, nesting success doubled which the model predicted to be sufficient to stabilise the population. However, effective control methods of the parasitic fly still need to be developed to increase the population to carrying capacity and allow dispersal. It is essential that these conservation efforts are implemented over the long term in order to save this species from extinction.



**Rat monitoring data:** Columns show the number of rats trapped in live-traps for several trap-nights for PTN and *Selvita* (monitoring started in January 2008). Black arrows indicate rat poisoning events; either single actions (March 2007) or refilling of permanent rat feeding stations (first installation in PTN in Nov 2007 and in *Selvita* in January 2008). Data show that a steady effort is necessary to keep rat populations low.



**Fate of Mangrove Finch nests with eggs or young 2007-2008 showing reduction of predation and increase in fledging through establishment of rat poisoning programme**  
From Fessl *et al.*, (submitted).

The most significant impact has been the stabilisation and overall slight increase in the Mangrove Finch population through the reduction in existing threats to breeding.

**4.2 Outcomes: achievement of the project purpose and outcomes**

The Project has shown that the most significant problem facing the small existing populations of mangrove finch is the low reproductive success caused by invasive species. Black rats are the most important threat followed by the parasitic fly *Philornis downsi*; although information on impact of other predators like cats and smooth billed ani is still missing. Control measures are time and cost intensive especially in an environment like Galápagos; thus evaluation of risk and adaptive management are imperative. We have shown with this study that striking results can be achieved with a simple change in methodology. Empirical data (nesting success, rat monitoring data - table), experimental data (artificial nests) and the applied model all show the efficiency of a simple modification in the established rat control programme, indicating the importance of adaptive management.

Major outcomes to the Project are the increased breeding success and overall numbers of Mangrove Finch which has allowed the development of plans to translocate birds to the former finch site: Bahia Cartago in eastern Isabela (Darwin Initiative project EIDPO031).

**Problems**

Some problems are obvious and include the inaccessibility of all Mangrove Finch sites and the high level of preparation and support needed for every single visit to the site. The long term support of the Galápagos National Park and several tourist companies for assistance with support and boat travel were essential.

Results from captive trials showed, that this method should not be used in Galápagos for birds if not as an emergency. Identified problems were disease risk, skill transfer (high turnover rate in personal) and technical problems due to the environmental conditions.

The Project has so far not overcome difficulties with developing control techniques for *Philornis*. To date attempts to breed the flies in captivity have failed as the larvae's first host environment (chick nostrils) has not been successfully replicated artificially. Trials at developing attractants that will lure flies in the field, slowed through the lack of captive bred flies, continue in partnership with State University of New York (SUNY). SUNY has committed to continue trials throughout the next year and the new project (EIDPO031) will help with logistics from Galápagos; GNP helped with a permanent permit for exporting live larvae and pupae and on June 26<sup>th</sup> 2009 the first samples were sent to the lab in New York.

The risk of catastrophic new threats reaching the populations of Mangrove Finch is real with disease representing one of the emerging problems. Avian pox, which has been present for several decades in Galápagos, causes high mortality in species such as mockingbirds and possible fitness reduction in finches. It was reported in 2004 from Playa Tortuga Negra (14% prevalence in ground finches); one Mangrove Finch was seen with symptoms in 2009. It is

unclear the impact this disease could have on the population, but it is known that its closest relative, the Woodpecker Finch, is highly susceptible. The recent discovery of a *Plasmodium* species, a still unidentified species closely related to avian malaria, in the Galápagos Penguin *Spheniscus mendiculus* and potential for transmission to the Mangrove Finch may also be significant given the fact that the species in close proximity at PTN and CB.

Climate change will result in a higher frequency of *El Niño* events (hot and rainy years for Galápagos), thus vectors for pox, *Plasmodium* and other diseases might be able to increase their range and conditions for the establishment of diseases and parasites will be improved.

### **4.3 Outputs (and activities)**

The Project will achieve its outputs. Several papers are in preparation or have been submitted:

- Paper: Deem, S.L., Cruz, M., Jiménez-Uzcátegui, Fessl, B., Miller, R.E. & Parker, P.G. (2008): Pathogens and parasites: an increasing threat to the conservation of Galápagos avifauna. In: *Galapagos Report 2007-2008*. Puerto Ayora, Galapagos, Ecuador.
- Paper in a special edition of the *Philosophical Transactions of Royal Society*; main data of the project (authors: Fessl, Dvorak, Rodriguez-Matamoros, Young, Tebbich, Young & Fa). Preliminary title: How to save the rarest Darwin's finch from extinction? Submitted June 2009.
- Paper in *Cotinga* on species' conservation and identification draft end of July 2009, authors: Fessl, Dvorak, Vargas & Young
- Paper on genetic information (journal not decided yet), draft for end of July 2009, authors: Petren, Vargas & Fessl
- Paper on habitat requirements and feeding ecology (journal not yet decided), draft for Dec. 2009, authors: Fessl, Loaiza, Mauchamp & Young.
- Paper on song information (journal not decided yet), draft October 2009, authors: Brumm & Fessl)
- Together with Ben Heumann (Walsh group): assessment of Mangrove Finch habitat suitability by satellite images: not before July 2010.

Manuals for captive management of birds in Galápagos (Woodpecker Finch and Galápagos Mockingbird), care of captive birds and staff training have been produced. These are the first internal materials available for staff at CDF and GNP. The Mangrove Finch Action Plan will be published in mid-late 2009 (see Annex 5).

### **4.4 Project standard measures and publications**

See Annexes 4 and 5.

The Project was detailed in numerous publications of Durrell and Charles Darwin Foundation throughout as well as in international media. High profile, peer reviewed, papers were not published but are now being completed and submitted at the end of the project.

### **4.5 Technical and Scientific achievements and co-operation**

Perhaps surprisingly there has been a lot less conservation activity of this kind in Galápagos than is widely believed. The well formulated and managed programme of activity for one species in its limited habitat has set a template for other species' management in future. It is perhaps the highest accolade that in discussion on other endangered birds in the archipelago it was several times stated that what each of these needed was its own Birgit (a reference to the skill and determination of Project field manager, Birgit Fessl).

### **4.6 Capacity building**

The host country partners have seen in action the necessity to undertake detailed systematic study of this species and further see how similar programmes could be developed for many other species. GNP staff members were trained in bird monitoring techniques and able to compare and contrast different methodologies.

Two students undertook and completed degree theses:

Abraham Loaiza (Universidad Central, Quito): *Comportamiento de alimentación del pinzón de manglar (Cactospiza heliobates), comparado en dos estaciones climáticas* (Feeding behavior of the mangrove finch (*Cactospiza heliobates*) over two seasons). Completed 2009.

Viviana Morales (Universidad Politecnica Salesiana, Cuenca): *Endoparásitos en varios Pinzones de Darwin en la Isla Santa Cruz, Galápagos* (Endoparasites in several Darwin's finches on Santa Cruz Island, Galápagos). Completed 2009.

Durrell has sent two members of its Bird Department to work as technician in the aviaries. Capacity building worked both ways with the Durrell personnel being able to impart bird husbandry skills developed in Jersey and Mauritius to personnel at CDF and GNP. The Durrell personnel were also able to test methodologies in an environment very different to that they normally experience and further develop the 'toolbox' of skills available for Durrell's overseas projects.

#### **4.7 Sustainability and Legacy**

Initial project has received a further two years funding from Darwin Initiative. The Project confirmed the significant threat to native passerines from Black Rat predation. Establishment of a repeatable rat poisoning programme at finch sites will go a long way to ensure survival of finch.

The Project further highlighted the importance of *Philornis* to GNP and they are subsequently now actively involved in supporting visiting scientists and ex-situ collaborators with all aspects of study to identify attractants and to develop controls (e.g. in issuing permits for field study and export of specimens).

### **5 Lessons learned, dissemination and communication**

The key lessons learned have been: that Galápagos needs more site based and species led conservation initiatives as these bring high levels of success in conservation of threatened endemic species. It is all too easy to lose site of specific and often localised problems through attempting to manage large encompassing projects that are often unwieldy and fail to achieve their original aim. Rat control has been seen to improve success rates of nesting Mangrove Finch and localised control programmes will reverse problems rapidly. This practice of localised, co-ordinated, control is probably much more effective than attempts at widespread control in inhospitable terrain (e.g. in Isabela). Declines in Medium Tree Finch *Camarhynchus pauper* on Floreana have led to this species being designated as Critically Endangered (in 2009) and management techniques developed for Mangrove Finch are probably transferrable.

*Philornis* parasitism and the threat of other avian diseases such as avian pox have been identified as potentially major threats to Mangrove Finch and all native landbirds in Galápagos. Further work on these issues is essential and will require multi-institutional collaboration.

The Project has been well received by partners and highlighted as a 'model' programme not least because of the dedication and skill of the field manager. Partners have been regularly updated on progress and results. GNP guides have been annually trained in understanding the Project and in disseminating results to tourists.

Communication between partners has been good and problems with isolation of the Project and occasional conflicts of interest have been overcome by the Project Leader and Field Manager. The Action Plan Workshop in Puerto Villamil (November 2008) drew together representatives of all three partners and several consultants. The results will be published as an Action Plan in late 2009.

#### **5.1 Darwin identity**

Darwin Initiative was publicised in all reports etc produced by partners in relation to Project. Materials such as pens, badges and stickers were widely used and circulated.

The Mangrove Finch Project was considered almost separate from its joint partners' programmes as a separate entity within the Galápagos where it was considered as a relatively



unique project (restoration of a single species). The Darwin Initiative support for the Project was synonymous with that of the partners. Darwin Initiative has a long history of involvement in Galápagos and, therefore, is a widely known and respected institution in the archipelago.

## **6 Monitoring and evaluation**

The Project was delayed at the start (2006) through the late hiring of the Field Manager and further hampered when, disappointingly, no students applied for the two positions until Year 2. Darwin Initiative agreed to allow some money to be transferred to Year 4 to allow the Field Manager to complete her contract and the students to complete their theses. The Action Plan Workshop was moved to Year 3 as this was considered more suitable as better data was then available.

The captive breeding trials were completed at CDF; however, the results of these trials highlighted logistical problems (scarcity of suitable equipment and food for birds), regular problems with power and water supplies and constant threats from avian diseases in Santa Cruz. The trials were sufficient for the compilation of husbandry guidelines for future use; however, captive-breeding will not now be considered as a primary tool in the conservation strategy for Mangrove Finch.

The Project was monitored by partners and included annual visits by the Project Leader. Monthly reports by the Field Manager were circulated to all partners, consultants and actively involved collaborators. All consultants and collaborators including recognised experts, e.g. Peter and Rosemary Grant (Princeton University), Lukas Keller (University of Zurich), John Fa (Durrell), Patty Parker (University of Missouri) and Arkhat Abzhanov (Harvard University) were consulted directly throughout the project and reviewed outputs. Several peer reviewed papers are in preparation.

### **6.1 Actions taken in response to annual report reviews**

All issues raised in the reviews were addressed. Reviewers comments were typically minor and straight forward to address. The reviews were circulated to partners, consultants and to other people working with the Project.

## 7 Finance and administration

### 7.1 Project expenditure

Item	Budget (please indicate which document you refer to if other than your project application)	Expenditure	Balance
Rent, rates, heating, overheads etc			
Office costs (eg postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment			
Others (maintenance of captive birds)			
Salaries (specify) H G YOUNG B FESSL (Project manager) H VARGAS (Consultant) B FESSL (2006)/ R YOUNG (Consultant) FIELD ASSISTANT/STUDENT* INVERTEBRATE/ <i>Philornis</i> TECHNICIANS* CDRS Aviary technician* LOCAL CONTRACT Other staff costs			
TOTAL			

\* Through reorganisation of staffing and acquisition of extra funds for students, salaries originally under Field Assistants, students, invertebrate technicians and aviary technicians (£25,800 on Stage 2 application are combined).

\*\* Darwin Initiative agreed a carry over of £17,956.09

### 7.2 Additional funds or in-kind contributions secured

Additional funds were received throughout the project for support of students. Galápagos Travel gave a full scholarship for Abraham Loaiza and a contribution to Viviana Morales. The Project received \$10,800 for Abraham and \$1,000 for Viviana.

Friends of Galápagos (Switzerland) gave funds for travel to Bahia Carthago (c. \$10,000).

Galápagos Conservancy and Galápagos Conservation Trust funded the *Philornis* project. The Mangrove Finch Project supplied personnel, notably Birgit Fessl who eventually took over the running of the project.

In-kind contributions were received from:

- Galápagos National Park for boat travel between Santa Cruz and Isabela Islands and use of Isabela caseta.
- Several tourist companies provided travel from field sites to CDF. Project received all such travel free of charge.
- Durrell Wildlife Conservation Trust seconded members of the Bird Department for six months in 2008 (Harriet Good) and 2009 (Elizabeth Corry) for the captive trials at CDF. These two staff members' wages and some expenses plus cost of employing replacement staff in Jersey were met by Durrell (c. £25,000).
- Ken Petren Laboratory (University of Cincinnati) for genetic analyses of blood samples taken from wild Mangrove Finch and captive Woodpecker Finch.
- Martin Wikelski (Max Planck Institute) supplied radio transmitters and receivers trialed on captive Woodpecker Finches at CDF. Woodpecker Finches were returned to the wild with transmitters on and tracked for five weeks.
- Arkhat Abzhanov (Harvard University) donated incubation equipment to captive trials at CDF.

### **7.3 Value of DI funding**

The project would not have been possible without Darwin Initiative funding. Funding covered the most significant costs: remuneration for field personnel particularly Birgit Fessl for three years; establishment of a field camp and all supplies necessary for field work. The Darwin Aviaries at Charles Darwin Foundation in Puerto Ayora, Santa Cruz were funded entirely by Darwin Initiative.

## Annex 1 Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements April 2007 - March 2008	Actions required/planned for next period
<p><b>Goal:</b> 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</p> <ul style="list-style-type: none"> <li>• The conservation of biological diversity,</li> <li>• The sustainable use of its components, and</li> <li>• The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</li> </ul>		(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)	(do not fill not applicable)
<p><b>Purpose</b> Long term conservation of the Mangrove Finch ensured through intensive field research efforts and building capacity in small population management in partner institutions, CDF and GNP</p>	<p>Stakeholders meeting between key partners held at start of Y1 to identify research priorities. Understanding of species ecology and demography by end Y2. If required, captive management facility set up at CDF HQ mid or end of Y2. PHVA at end Y2 to design species conservation action plan and establish requirements for captive population. CDF &amp; GNP successfully implemented species conservation action plan by beginning Y3. Evidence of stability or growth in Mangrove Finch population and historical sites recolonised by project end</p>	<p>Main causes of Mangrove Finch decline identified and programme of black rat <i>Rattus rattus</i> control implemented. Finch population stabilised and showing signs of improving. Captive facility built and used for husbandry trials. Workshop held in Year 3.</p>	
<p>1. Institute system for monitoring species' ecology, habitat, genetic status and determinants of population growth.</p>	<p>Protocols for repeatable monitoring established by end Y1. All partners agree key findings of field research at PHVA end Y2; Successful testing of invasive species control measures by end Y2; Genetic analysis completed by end Y2.</p>	<p>Protocols in place and GNP personnel trained. Invasive species control tested and implemented (<i>Rattus</i>) and research continuing (<i>Philornis</i>). Genetic analysis being completed by collaborator.</p>	

Activity 1.1. Research protocols agreed at workshop. Implementation of monitoring.Y1-2:	Monitoring implemented from Year 1. Workshop in Year 3.	
Activity 1.2, Population surveys, bird ringing and blood sampling, nest success study, habitat surveys, impact of invasive species study; genetic analysis.	All surveys and field research undertaken and awaiting publication.	
Activity 1.3. Assessment of sites for release of captive reared birds. Y3: continuation of monitoring in all sites including released birds.	Principle release site (Bahia Cartago) identified and assessed. Second possible site assessed and rejected for now (Ramsar site at Puerto Villamil). Translocation planned for 2010.	
<p><b>Output 2.</b> Technical skills in GNP &amp; CDF are strengthened to enable long term conservation of Mangrove Finch.</p> <p>Minimum of 2 personnel trained in captive management skills that can be transferred to other species.</p>	<p>4 GNP &amp; CDF staff and 2 university students fully trained by Project Leader in field research, invasive species control and captive management techniques, creation of database management by end Y2; Training workshops, on the job training Y1-2; PHVA run by GNP/CDF to design species conservation action plan end Y2; Meeting to agree on future fund-raising strategy mid Y3; Action plan initiated and led by GNP/CDF in Y3</p>	<p>Staff trained in field research and captive husbandry and two students completed theses by end of Year 3. Workshop held in Year 3. Funding assured for two more years and action plan in completion.</p>
Activity 2.1. Facility built, birds caught, protocols established. Y2-3: captive rearing.	<p>Facility built start of Year 2 and general as well as specific husbandry guidelines completed using model species. Captive-breeding no longer considered except in extreme emergency. Emergency plan written.</p>	
Activity 2.2. Release of captive reared birds to historical sites.	Site identified (Bahia Cartago) and translocation planned for 2010.	
<p><b>Output 3.</b> Species conservation action plan implemented</p>	<p>Monitoring programme running successfully by end Y3; Invasive species control measures tested (Y1-2) and implemented in Y3; Captive rearing and management facility run by GNP at end Y3; Successful trial release of captive reared birds in Y3</p>	<p>Action Plan in draft end of Year 3: will be published in 2009. Invasive species controls implemented (<i>Rattus</i>) and undergoing further ongoing research (<i>Philornis</i>).</p>

Activity 3.1. Invasive species controls tested, action plan agreed at workshop.		Controls tested at PTN and CB. Agreed at Workshop in 2008.
Activity 3.2. Y3: invasive species control activities implemented.		Implemented as part of GNP workplan.
<b>Output 4.</b> Population limits established and declines halted.	Monitoring programme will provide data to show trends in population size by end Y3	Monitoring programme implemented. Results will be published. Population stabilised and showing signs of increase and dispersal.
<b>Output 5.</b> Awareness of Mangrove Finch raised in local and international community	Radio interviews held; Press releases; International newspaper articles; Reports and scientific papers published; Website created. Community based projects in Isabela and links with existing tortoise programmes and children's clubs here	Achieved within Galápagos scientific community. There is no human habitation anywhere near existing Mangrove Finch population; however, Workshop held in Puerto Villamil (Isabela). Awareness campaign with Villamil town planned for 2009-2010. Specific website not created.  Various contacts to international and national press (radio, television), and presentation of main data set at the Galápagos Science Symposium at CDF in July 2009.
Activity 5.1. Assess training needs, on the job training. PHVA and conservation action plan workshop.		PVA modelled during workshop (in collaboration with CBSG Mesoamerica)
<b>Output 6.</b> Post-project workplan is in place to continue conservation action plan	CDF & GNP to produce workplan for the continuation of species conservation action plan at end Y3	Action Plan will be published in 2009. Project extended with Darwin Initiative project EIDPO031
Activity 6.1. Conservation action plan initiated and led by CDF and GNP.		Action Plan will be published in 2009. Strategies incorporated into GNP workplan.

## Annex 2 Project's final logframe, including criteria and indicators

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p><b>Goal:</b></p> <p><b>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</b></p> <ul style="list-style-type: none"> <li>• <b>the conservation of biological diversity,</b></li> <li>• <b>the sustainable use of its components, and</b></li> <li>• <b>the fair and equitable sharing of benefits arising out of the utilisation of genetic resources</b></li> </ul>			
<p><b>Purpose</b></p> <p>Long term conservation of the Mangrove Finch ensured through intensive field research efforts and building capacity in small population management in partner institutions, CDF and GNP</p>	<p>Stakeholders meeting between key partners held at start of Y1 to identify research priorities. Understanding of species ecology and demography by end Y2. If required, captive management facility set up at CDF HQ mid or end of Y2. PHVA at end Y2 to design species conservation action plan and establish requirements for captive population. CDF &amp; GNP successfully implemented species conservation action plan by beginning Y3. Evidence of stability or growth in Mangrove Finch population and historical sites recolonised by project end</p>	<p>Species conservation action plan; Project reports from partner institutions; Published scientific papers</p> <p>Monitoring programme results</p> <p>Mangrove Finch conservation activities included in long term workplan of CDF and GNP end Y3.</p>	<p>Full cooperation from GNP and CDF will be required</p>
<p><b>Outputs</b></p> <p>1. Institute system for monitoring species' ecology, habitat, genetic status and determinants of population growth.</p>	<p>Protocols for repeatable monitoring established by end Y1. All partners agree key findings of field research at PHVA end Y2; Successful testing of invasive species control measures by end Y2; Genetic analysis completed by end Y2.</p>	<p>Project reports; Published papers; Microsatellite library results published.</p>	<p>Trained staff remain working on project</p> <p>Effective collaboration between project partners</p>
<p>2. Technical skills in GNP &amp; CDF are strengthened to enable long term conservation of Mangrove Finch.</p> <p>Minimum of 2 personnel trained in captive management skills that can be transferred to other species.</p>	<p>4 GNP &amp; CDF staff and 2 university students fully trained by Project Leader in field research, invasive species control and captive management techniques, creation of database management by end Y2; Training workshops, on the job training Y1-2; PHVA run by GNP/CDF to design species conservation action plan end Y2; Meeting to agree on future fund-raising strategy mid Y3; Action plan initiated and led by GNP/CDF in Y3</p>	<p>Project reports; On the job evaluation and at workshops</p>	

3. Species conservation action plan implemented	Monitoring programme running successfully by end Y3; Invasive species control measures tested (Y1-2) and implemented in Y3; Captive rearing and management facility run by GNP at end Y3; Successful trial release of captive reared birds in Y3	Project evaluation at end Y3; Copies of action plan and project reports sent to Darwin Initiative	
4. Population limits established and declines halted.	Monitoring programme will provide data to show trends in population size by end Y3	Published papers; End project report	
5. Awareness of Mangrove Finch raised in local and international community	Radio interviews held; Press releases; International newspaper articles; Reports and scientific papers published; Website created. Community based projects in Isabella and links with existing tortoise programmes and children's clubs here	Transcripts, papers, reports sent to Darwin Initiative	
6. Post-project workplan is in place to continue conservation action plan	CDF & GNP to produce workplan for the continuation of species conservation action plan at end Y3	CDF & GNP annual workplan; End of project evaluation report; DW visit end Y4	
<b>Activities</b>	<b>Activity milestones (summary of project implementation timetable)</b>		
1. Field research programme	Y1: research protocols agreed at workshop. Implementation of monitoring. Y1-2: population surveys, bird ringing and blood sampling, nest success study, habitat surveys and monitoring, impact of invasive species study; genetic analysis. Assessment of sites for release of captive reared birds. Y3: continuation of monitoring in all sites including released birds.		
2. Captive rearing programme	Y2: facility built, birds caught, protocols established. Y2-3: captive rearing. Y3: release of captive reared birds to historical sites.		
3. Conservation action	Y2: invasive species controls tested, action plan agreed at workshop. Y3: invasive species control activities implemented.		
4. Capacity building	Y1-3: assess training needs, on the job training. PHVA and conservation action plan workshop. Y3: conservation action plan initiated and led by CDF & GNP.		
5. Public awareness	Y1-3: radio interviews, press releases, newspaper articles, website established. Y2-3 papers written and submitted to peer-reviewed journals. Community based activities on Isabela.		



## Annex 3 Project contribution to Articles under the CBD

### Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use	10	Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	10	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	50	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity		Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training		Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness		Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.

<b>Article No./Title</b>	<b>Project %</b>	<b>Article Description</b>
16. Access to and Transfer of Technology	10	Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such access and joint development of technologies.
17. Exchange of Information	20	Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution		Smaller contributions (eg of 5%) or less should be summed and included here.
Total %	100%	Check % = total 100

## Annex 4 Standard Measures

Code	Description	Totals (plus additional detail as required)
<b>Training Measures</b>		
1a	Number of people to submit PhD thesis	-
1b	Number of PhD qualifications obtained	-
2	Number of Masters qualifications obtained	
3	Number of other qualifications obtained	2 Ecuador degrees (BSc equivalent)
4a	Number of undergraduate students receiving training	
4b	Number of training weeks provided to undergraduate students	
4c	Number of postgraduate students receiving training (not 1-3 above)	1
4d	Number of training weeks for postgraduate students	
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification( ie not categories 1-4 above)	3 Galápagos National Park guards
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above)	3 CDF aviary staff
6b	Number of training weeks not leading to formal qualification	
7	Number of types of training materials produced for use by host country(s)	1
<b>Research Measures</b>		
8	Number of weeks spent by UK project staff on project work in host country(s)	49: Project Manager (11), Durrell Population Specialist (2) and two Durrell aviculturalists (36)
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	1
10	Number of formal documents produced to assist work related to species identification, classification and recording.	2 husbandry guidelines (Woodpecker Finch and Galápagos Mockingbird), 1 practical guide for work with captive birds
11a	Number of papers published or accepted for publication in peer reviewed journals	
11b	Number of papers published or accepted for publication elsewhere	1
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	1: biometrics, nesting data, parasite load, 1: habitat use, 1:rat monitoring, 1: ArcView based map

Code	Description	Totals (plus additional detail as required)
		of breeding sites with data implemented, bird count data
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	
13a	Number of species reference collections established and handed over to host country(s)	1 Genetic material from 33 Mangrove Finch. Insect collections from Playa Tortuga Negra and Caleta Black.
13b	Number of species reference collections enhanced and handed over to host country(s)	
<b>Dissemination Measures</b>		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	6: seminars to Galápagos National Park guides and University of San Francisco  Zookeeper Workshop of the Charles Darwin Foundation, with the Galapagos National Park.
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	1: in July
15a	Number of national press releases or publicity articles in host country(s)	1
15b	Number of local press releases or publicity articles in host country(s)	2
15c	Number of national press releases or publicity articles in UK	2 articles in <i>Independent</i> . 2 articles in <i>Galápagos News</i> . And in Belgium, Denmark, USA ( <i>BioScience</i> ), Germany ( <i>GEO</i> , <i>Focus</i> ),
15d	Number of local press releases or publicity articles in UK	
16a	Number of issues of newsletters produced in the host country(s)	
16b	Estimated circulation of each newsletter in the host country(s)	
16c	Estimated circulation of each newsletter in the UK	
17a	Number of dissemination networks established	
17b	Number of dissemination networks enhanced or extended	
18a	Number of national TV programmes/features in host country(s)	1
18b	Number of national TV programme/features in the UK	2 in Japan, 1 in Korea
18c	Number of local TV programme/features in host	

Code	Description	Totals (plus additional detail as required)
	country	
18d	Number of local TV programme features in the UK	
19a	Number of national radio interviews/features in host country(s)	
19b	Number of national radio interviews/features in the UK	3: in Germany, Austria, Columbia
19c	Number of local radio interviews/features in host country (s)	
19d	Number of local radio interviews/features in the UK	
<b>Physical Measures</b>		
20	Estimated value (£s) of physical assets handed over to host country(s)	15,000
21	Number of permanent educational/training/research facilities or organisation established	1 (aviary at Charles Darwin Foundation)
22	Number of permanent field plots established	Playa Tortuga Negra (including Caleta Black and mangrove patches in between)
23	Value of additional resources raised for project	
<b>Other Measures used by the project and not currently including in DI standard measures</b>		

## Annex 5 Publications

Type *	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Manual	Husbandry Guidelines for the Woodpecker Finch ( <i>Camarhynchus pallidus</i> ) at Charles Darwin Foundation. Good, H., Corry, L., Fessl, B. & Deem, S. 2008	Durrell & Charles Darwin Foundation	Durrell & Charles Darwin Foundation	
Manual	Husbandry Guidelines for the Galápagos Mockingbird ( <i>Mimus parvulus</i> ) at Charles Darwin Foundation. Good, H., Corry, L., Fessl, B. & Deem, S. 2008	Durrell & Charles Darwin Foundation	Durrell & Charles Darwin Foundation	
Manual	Captive Care Guidelines for Avian Species. Deem, S.L., Fessl, B., Good, H., Jiménez-Uzcátegui, G., Tebbich, S., Teschke, I., Zabala, J. & Parker, P. 2009	Charles Darwin Foundation	Charles Darwin Foundation	
Manual	Training Manual of Zookeeper Workshop, Charles Darwin Foundation and Galápagos National Park. Georgii, C. & Good, H. 2008.	Charles Darwin Foundation	Charles Darwin Foundation	
Action Plan Report	Galápagos Mangrove Finch <i>Camarhynchus heliobates</i> Recovery Plan. 2009	Charles Darwin Foundation	Charles Darwin Foundation	
Report	Pathogens and parasites: an increasing threat to the conservation of Galápagos avifauna. Deem, S.L., Cruz, M., Jiménez-Uzcátegui, G., Fessl, B., Miller, R.E. & Parker, P.G. 2009.	Charles Darwin Foundation	Charles Darwin Foundation	
Journal	The critically endangered mangrove finch: conservation and identification. In prep. Fessl, Dvorak & Young	<i>Cotinga</i> Journal of Neotropical Bird Club	Neotropical Bird Club	
Journal	How to save the rarest Darwin's finch from extinction? – submitted. Fessl, Dvorak, Young, Matamoros, Tebbich, Young & Fa	<i>Philosophical Transactions, special issue Darwin's Finches</i>		

## Annex 6 Darwin Contacts

Ref No	15-005
Project Title	Conservation of the Mangrove Finch <i>Cactospiza heliobates</i>
<b>UK Leader Details</b>	
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Role within Darwin Project	Project Leader
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Email	
<b>Other UK Contact (if relevant)</b>	
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Role within Darwin Project	
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Phone	
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<b>Partner 1</b>	
Name	Dr Mark Gardener
Organisation	Charles Darwin Foundation
Role within Darwin Project	CDF co-Project Leader
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<b>Partner 2 (if relevant)</b>	
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