

DARWIN INITIATIVE FOR THE SURVIVAL OF SPECIES: APPLICATION FOR GRANT FOR ROUND 10 COMPETITION

Please read the accompanying Guidance Note before completing this form. Give a full answer to each section; applications will be considered on the basis of information submitted on this form. Applicants are asked not to use the form supplied to cross-refer to information in separate documents except where this is invited on the form. The space provided indicates the level of detail required but you may provide additional information on a separate sheet if necessary. Copies of this form are available on disk or by e-mail on request. You are asked also to complete the summary sheet. Although you may reproduce this sheet in a reasonable font, you should not expand it beyond an A4 sheet (leaving the allocated space for DEFRA comments to be made) as additional information will not be taken into account.

1. Name and address of organisation

Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY

2. Principals in project

Details	Project leader	Other UK personnel (if working more than 50% of their time on project)	Main project partner or co-ordinator in host country
Surname	Funk		Jiménez
Forename(s)	Stephan Michael		Jaime Enrique
Post held	Research Fellow		Full time professor
Institution (if different to above)			Universidad de Los Lagos, Casilla 933, Osorno, Chile
Department	Institute of Zoology		Laboratorio de Ecología
Telephone			
Fax			
Email			

Please provide a one page CV for each of these named individuals.

3. Project title (not exceeding 10 words)

Conserving the critically endangered Darwin's fox on Chiloé Island, Chile

4. Abstract of study (in no more than 750 characters)

The Darwin's fox (*Pseudalopex fulvipes*) is critically endangered and is considered the species with the highest extinction risk in Chile. Aside from limited ecological studies, no information on population structure and conservation threats posed by the increasing sympatric domestic dog population exists. UK experts in population ecology, genetics and disease epidemiology (Institute of Zoology) will train, act as consultants, and collaborate with Chilean scientists (Universidad Los Lagos) and conservation organisations (Senda Darwin Foundation, Bosque Modelo Chiloé, Comunidad Ahuenco) to collect essential baseline data, to devise conservation strategies, to develop expertise - which in turn will facilitate local capacity required for conservation of Chile's biodiversity - and to raise local awareness and enthusiasm for conservation on Chiloé Island.

5. Timing. Give the proposed starting date and duration of the project.

1 April 2002, three years

6. Describe briefly the aims, activities and achievements of your organisation. (Please note that this should describe your unit, institute or department within a university.)

Aims

The mission of the Institute of Zoology (IoZ) is 'to identify, undertake, and communicate high-quality biological research which benefits the conservation of animal species and their habitats'. This mission is pursued through three complementary objectives: 1) To undertake relevant, high-quality biological research, 2) To respond to research priorities identified by conservation practitioners, and 3) To communicate significant outcomes and results to the scientists, conservation practitioners and the wider community. IoZ is the research arm of the Zoological Society of London (registered charity number: 208728) which has a mission to 'to achieve and promote the world-wide conservation of animals and their habitats'.

Activities

The Institute of Zoology is funded through the Higher Education Funding Council for England (HEFCE). The University of Cambridge is our academic partner and the activities of the Institute are managed through a joint committee from the University of Cambridge and the Zoological Society of London.

Our activities are as follows: 1) Research on fundamental and applied aspects of whole organism biology, emphasising topics in: Animal health & welfare, Reproductive biology, Genetic variation, fitness and adaptability, Behavioural ecology, Population dynamics and community ecology, Wildlife epidemiology, Biodiversity and macroecology; 2) Regular programme of research seminars, and training and technology transfer through MSc and PhD training programmes.

Achievements

IoZ has become recognised as a leading international centre for conservation biology science and action. The 1996 UK Research Assessment Exercise confirmed the international importance of IoZ's research output. Recent significant achievements include 1) contributions to the understanding of processes that generate and maintain biodiversity, including the roles of speciation and population differentiation and the significance of genetic diversification for threatened population management, 2) methods for priority-setting for conservation in both area- and species-based analyses, including the technical work underlying the IUCN Red List categories, 3) contributions to understanding complex population dynamics and their implications for population management for conservation, including individual-based behavioural models, population viability analyses and analyses of population synchrony in taxa ranging from invertebrates to elephants, 4) elucidation of the role of infectious diseases in biodiversity conservation, publication of the first report of a species extinction (*Partula turgida*) due to infectious disease, and the discovery and description of a new viral epidemic disease of frogs in Britain, and 5) novel techniques for non-invasive monitoring of inbreeding effects in threatened species. This work has been published in leading international journals (including *Nature*, *Proceedings of the Royal Society of London*, *Science*, *Proceeding of the National Academy of Science*, *Ecology*, *Conservation Biology*).

7. Has your organisation received funding under the Initiative before? If so, please give details.

(1) 'Patterns of diversity in Ugandan forests (Dr A.Balmford, 1994-7), (2) 'Vicuna and guanaco conservation and genetic resource management' (Dr H. Stanley, 1997-2000), and (3) Development of a research and monitoring unit at Garamba, D.R. Congo) (Dr G. Cowlshaw, 2000-3), (4) Conservation of Critically Endangered *Gyps* spp. Vultures in India (Dr A. Cunningham, 2001-4).

8. Which overseas institutions, if any, will be involved in the project? Please explain the responsibilities of these institutions.

UNIVERSIDAD DE LOS LAGOS (ULA)

Although Universidad de Los Lagos (ULA) has only 9 years of history, it is the largest academic institution in southern Chile and the closest to Chiloé Island. It has a small, but recognised group of researchers that focuses its research on natural resources, both terrestrial and aquatic. Since 1996 ULA has a Master of Science program on management of natural resources and is implementing a doctoral program on coastal management as part of a recent collaborative agreement with University of Connecticut in the USA.

ULA is the main project partner in this proposal. Through its accounting office ULA will manage and administer the local budget. It will also oversee and co-ordinate most of the work in Chile. ULA staff will conduct field work and laboratory analysis; this faculty will also organise courses and train students in formal and informal ways on field techniques and genetic analysis.

Genetic and molecular analyses will be handled in the Laboratory of Genetics, run by Dr. Gonzalo Gajardo, a renowned expert in studies conducted on local vertebrate and invertebrate species. He will be responsible for the molecular and genetic analysis in Chile. In addition, Dr Gajardo will work closely with training of the lab technician and the post-doc. Dr. Gajardo and dr. Funk also plan to extend collaboration to joint supervision of MSc and PhD students.

UNIVERSIDAD DE LOS LAGOS (ULA) *continued*

The analyses of the ecological information collected will be managed and analysed in the Ecology Laboratory, known worldwide for its contributions on carnivore ecology. Dr. Jaime Jiménez has been working on the Darwin's fox since he was 15 years old, when he discovered a small and disjunct mainland population. His expertise is on the ecology and conservation of terrestrial vertebrate predators and he has published more than 40 scientific papers on the ecology of Chilean birds, mammals, and reptiles. Dr Jiménez will be responsible for training students, supervising and co-ordinating the field work. He will also oversee the collecting and processing of the information and the setting up and running of the GIS that will be implemented in the Ecology Lab as part of this research.

SENDA DARWIN FOUNDATION (SDF)

Senda Darwin Foundation (SDF) is an NGO based on the northern portion of Chiloé Island with the mission to conduct research and to provide training and education on the threatened native forest ecosystems located on the Island. As the name implies 'Darwin's Trail Foundation', the property is located on the trail that was used by Darwin when he visited the island in 1934-35 (Rozzi *et al.* 2000).

SDF will provide its expertise in developing and implementing an outreach and education program through the local media and itinerary talks and lectures to local rural and urban elementary and high schools. This program will be organised around the rich biodiversity and the conservation problems faced by natural resources used by the people on the Island. The Darwin's fox and its dependence on pristine habitats will be used as a model species to develop this program. A scientist from SDF with extensive experience on local education will be dedicated half time to develop the education program.

In addition, workshops on conservation strategies and sustainable use of resources as well as lectures on the use of molecular techniques to help conserve endangered species will be organised and held at Senda Darwin Biological Station. These will be aimed at local farmers, managers, rangers, decision makers, and national and international graduate students. SDF's Field Laboratory will be intensively used for storing and processing field samples. Research and education personnel involved in this project will use its field lodge. SDF scientists will support, with their knowledge on local ecosystems, the scientific research proposed.

Dr. Juan Armesto, the head of SDF and full time professor at Universidad de Chile, is the best-qualified forest ecologist in Chile. He currently has a Chile's president recognition award for his contributions to conservation research. Dr. Armesto has >20 years of experience conducting leading-edge research on forest ecosystems and publishing in the most prestigious journals.

BOSQUE MODELO CHILOE (BMC)

Bosque Modelo Chiloé (BMC) was founded in 1998 based on a Canadian initiative presented during the Earth Summit of Rio in 1992. It consists of an innovative association between the local government and NGOs, peasants and indigenous communities, private organisations and the Catholic Church, to promote the responsible use of natural resources and to protect the environmental heritage on Chiloé Island in southern Chile. Its main focus is on the participation of local communities in their own development and the improvement of their quality of life while caring for their natural environment, through productive, education and research activities. Therefore, BMC's major strength lies in education and training.

After three years of operation, BMC has supported more than 50 projects, being closely linked to all of the initiatives that are being developed in Chile in the field of sustainable development and conservation of biological heritage.

Through its General Manager, Forest Engineer Santiago Elmúdesi, and its staff, BMC will be key in serving as a link with the community (landowners, schools, indigenous communities, etc.) and in assisting with its experience in implementing the education and outreach program proposed. Its office space will be used for educational purposes.

COMUNIDAD AHUENCO (CA)

Comunidad Ahuenco (CA) is an NGO funded in 1994 by a diverse group of visionaries who's aim was to protect a portion of pristine land on a remote area by the Pacific shore of Chiloé Island. CA owns an 800 ha property which is covered by pristine Valdivian Forest and which is protected. The property is utilised for conducting research on the native flora and fauna, and for environmental education. Emphasis is given to the management of the terrestrial ecosystems located on the coast through scientific research.

CA encourages research and in this regard, they will help in the logistics at the site by providing a lodge, information on the local resources and direct help from their personnel.

The president of CA, Dr. Alberto Carvacho, is a professor at Universidad de Chile with vast international research experience and a specialist on marine invertebrates, mainly crustaceans.

PROJECT DETAILS

9. Define the purpose (main objective) of the project in line with the logical framework.

To assist Chile, which is rich in biodiversity but poor in resources, with the conservation of biological diversity and implementation of the Biodiversity Convention. Specifically, the purpose of this project is the conservation of one critically endangered species, the Darwin's fox, which will act as a catalyst for the conservation of biological diversity and endemic species in Chile, by

- (1) providing a range of essential information on fox density and distribution, population genetic structure and exposure to canine diseases of foxes,
- (2) assessing the threat to fox conservation by feral dogs,
- (3) developing the capacity for demographic, genetic and disease monitoring of biodiversity on Chiloé Island,
- (4) involving the local communities by raising awareness and enthusiasm for conservation, and
- (5) raising awareness of conservation managers and owners of domestic animals for conservation threats by domestic animals.

10. Is this a new project or the continuation of an existing one?

This is a new project

11. What is the evidence for a demand or need for the work? How is the project related to conservation priorities in the host country(ies)? How would the project assist the host country with its obligations under the Biodiversity Convention?

How was the work identified?

Charles Darwin discovered the endemic Darwin's fox in 1834 on Chiloé Island in southern Chile. Although smaller (~3kg), darker, and different in morphology from its closest mainland relative, the South American grey fox or chilla (*Pseudalopex griseus*), Darwin's fox was considered an island subspecies of the chilla (*P. g. fulvipes*). The discovery in the 1970s, of a small, disjunct mainland population of Darwin's foxes in Nahuelbuta National Park, 600km to the north of Chiloé, and subsequent genetic investigations identified the Darwin's fox as a distinct species (*Pseudalopex fulvipes*) in 1996.

Up until very recently, the ecology of the fox was totally unknown; there were only a few individuals reported for the species, three skins exist in museums world-wide and the entire species population is suspected to be small. Further, by being restricted mainly to the Island of Chiloé, the species is highly vulnerable to potential threats such as viral diseases, as has occurred in some other canid species. In addition, the wild population appears to be declining in nonprotected settings, likely as the result of the rapid destruction of its habitat, the Valdivian forest, and persecution by humans.

Aside from limited ecological studies, no information on population structure and conservation threats posed by the increasing sympatric domestic dog population exists. Local extinctions of wild dog populations and population declines of Ethiopian wolves were caused by rabies and canine distemper virus which were transmitted from sympatric domestic dogs. The impact of possible spill-over of fatal canine diseases from domestic dogs to foxes will depend on the foxes' population structure, which remains unknown. Therefore, identifying population structure of Darwin's foxes and conservation threats are amongst the most urgent priorities facing the Chilean research and conservation community today. Universidad Los Lagos, the government institute Servicio Agrícola y Ganadero (SAG) and local non-government organisations have all emphasised that long-term conservation of the Darwin's fox and the ecosystem requires crucial ecological information together with training opportunities and the

How is the project related to conservation priorities in the host country?

A recent assessment of conservation status and conservation priorities for Chilean mammals (Cofré & Marquet 1999) has identified that the Darwin's fox is critically endangered and has the highest extinction risk amongst mammals in Chile. The IUCN Canid Specialist Group Conference in 2001 has identified that the Darwin's fox and the Island grey fox are the two most endangered canid species.

One of the endorsing agencies, Servicio Agrícola y Ganadero (Chile's Livestock and Agriculture Bureau), that is in charge of the legal protection of wildlife in Chile, considers research on the Darwin's fox as the highest priority, because of its precarious status and extinction risk.

How will the project assist the host country meet its obligations under the Biodiversity Convention?

The proposed project is designed to assist with obligations under the Biodiversity Convention by

- (1) research to identify conservation threats and extinction risk for the Darwin's fox;
- (2) identifying genetic population structure and genetic diversity with the main Darwin's fox population;
- (3) providing training to key Chilean scientists in molecular genetic methods, health monitoring techniques and geographic information systems;
- (4) development of a conservation action plan for the Darwin's fox;
- (5) transferring technology, training and capacity building to monitor and conserve Chile's biological diversity.

The conservation of the Darwin's fox will, by acting as an umbrella, promote the conservation of its habitat –the pristine forest- and, hence, will conserve the biodiversity of entire and functional ecosystems.

12. In what ways can this project be considered a Darwin project? How does the project relate to the Darwin principles? How would the project be advertised as a Darwin project and in what ways would the Darwin name and logo be used?

The proposed project is a Darwin project because it aims to prevent the extinction of a critically endangered mammal species, the Darwin's fox, by identifying conservation threats, producing a conservation management strategy, and by enhancing the capacity to conserve Chile's biological diversity. Key components of this will be conducting research, training of key scientists and students and involvement of local communities.

Charles Darwin was the first to collect the Darwin's fox. Darwin collected 36 new species in Chile (seven carry 'darwini' in the species name) and made observations on the natural history of about 40 birds and 14 Chilean mammal species (Jaksic, FM & I Lazo. 1994. Darwin's contribution to the knowledge of Chile's terrestrial vertebrates. *Revista Chilena de Historia Natural* 67: 9-26).

It is clearly related to the Darwin principles as it is designed to assist conservation agencies in Chile, a country rich in threatened biological diversity (e.g. Chile includes a biodiversity hot-spot as identified by Conservation International), with the conservation of its biodiversity, and with obligations it has under the Biodiversity Convention. Darwin's fox is the most threatened mammal species endemic to Chile, and is thus of global conservation importance. The proposed work will build upon, and help to further develop, the conservation, research and education expertise established within Chile.

The proposed project will be collaborative, bringing together staff of the Universidad Los Lagos (ULA), Senda Darwin Foundation (SDF), Bosque Modelo Chiloé (BMC) and Comunidad Ahuenco (CA) in Chile and the Institute of Zoology, London (IoZ). The ULA, SDF and BMC provide expertise in ecology, education and public relations. But expertise in the fields of modern molecular population and conservation genetics and wildlife epidemiology are lacking and will be provided by IoZ.

The project is designed to have real impact on conservation by ensuring that the results of research and monitoring work generate conservation action by producing a conservation strategy, training key staff in Chile, providing technical support (sample and data storage, analysis and interpretation), and raising awareness amongst local communities and scientists for the general threat for conservation posed by disease transmission from domestic animals which is probably one of the most pressing conservation issues in Chile and world-wide. Although the project will focus on a single species, the impact of this project will go beyond the conservation of Darwin's foxes by training and capacity building.

The main objective of the training element of the project is to empower a nation-wide constituency of conservation biologists with a wide-ranging background of technical expertise, allowing in-country specialist consultation and advice.

To raise public awareness of conservation issues involving the Darwin's fox, we intend to publicise the research project widely while it is in progress. This promotion would be designed to encourage people to take an interest in what was being done and why. An important part of the training element of the project are workshops to transfer key skills and these workshops would be promoted as Darwin workshops, using the name and logo of the initiative. A number of publications, including a final report, conservation management plan, scientific papers, articles for the popular science press, the production of an educational video, a slide show, information packs for dog owners and press releases are planned as part of the project. All publicity will include the fact that the project was funded by the Darwin Initiative and would, where possible, bear the Darwin name and logo. All equipment used through the programme would also bear the Darwin name and logo.

13. Set out the proposed timetable for the work, including the programme's measurable outputs using the attached list of output measures.

PROJECT OUTPUTS		
Year/Month (starting April)	Output Number (standard output measures)	Description (include numbers of people involved, numbers of publications printed or produced and days/weeks where applicable)
2002/10-11, yearly	4A	Total 72: 3*16 undergraduate students at courses (see 'e' in section 15) and 3*8 undergraduate students at workshops (see 'f' in section 15), approx. 2/3 Chilean & 1/3 international
2002/10-11, yearly	4B	6 weeks: 6 courses at 1 week each and 3 workshops at 2 weeks each (see 'e' and 'f' in section 15)
2002/10-11, yearly	4C	Total 72: 3*16 graduate students at courses (see 'e' in section 15) and 3*8 graduate students at workshops (see 'f' in section 15), approx. 2/3 Chilean & 1/3 international
2002/10-11, yearly	4D	6 weeks: 6 courses at 1 week each and 3 workshops at 2 weeks each (see 'e' and 'f' in section 15)
2002/04 – 2005/03	5	Total 4: field assistant, laboratory assistant, GIS assistant, veterinary post-doc
2002/04 – 2005/03	7	Total 9: information leaflets, posters, slideshow, information pack for adults, information pack for children, course & workshop manual, web-site, newsletter
2002/04 – 2005/03	8	Total 24, one staff (PI): each year 8 weeks on average
2005/03	9	Total 2: One IUCN Species Action Plan, one Management plan for Chiloé Island
2003/04 – 2006/03	11A	3
2003/04 – 2005/03	11B	6
2002/04 – 2004/03	12A	Total 2: one GIS data base including dog and fox distribution; one genetic database
2002/04 – 2005/03	14A	Minimum of 32 (see 12.2 in indicator column in logframe)
2002/04 – 2005/03	14B	Minimum of 6, location and time not specified yet
2002/04 – 2005/03	15A/B	Minimum 6
2002/04 – 2005/03	15C	Minimum 3
2002-2005, yearly	16A	Total 3
	16B	400
	16C	100
2003/03	17B	new website created and linked to websites of all partner institutions and other conservation related websites
2002/04 – 2005/03	18A,B,C,D	One in each category anticipated
2002/04 – 2005/03	19A,B,C,D	One in each category anticipated
2005/03	20	All hardware / physical assets handed over ULA & SDF (approx. £25,000; includes equipment purchased by ULA & IoZ outside Darwin funding)
2002/04 – 2003/03	21	
2002/04 – 2003/03	22	Two: the GIS laboratory at ULA, field laboratory at SDF [the extension of the existing ULA laboratory is not included here]
2002/04 – 2003/03	23	Two: one field station created, one campsite created [repair of the currently not functional station at Piruquina is not included here]
prior to 2002/04		Contributions in kind and equipment contributions: £ 88,663.77 (see section 20, Table B, and sections 22 and 23). Additional contributions will be sought from Earthwatch Institute, WCS New York and others

Key Milestones

Description (include travel dates, drafts and other processes that support the delivery of outputs)

Year/Month (starting April)

In brackets: reference to column 'measurable indicator' and row Activities in logframe

RESEARCH

2003/03 [2.3] First round of collecting faecal samples completed after 1st field season

2003/04 [1.1] First density estimation in four study sites

2003/04 [2.1] At least 10 foxes captured in four study sites and hair samples for genetic analysis

2003/09 [2.3] Mitochondrial DNA and microsatellite analysis for samples collected during 1st field season

2003/09 [3.1] Density and distribution of dogs estimated

2003/12 [2.2] First round of non-invasive sampling for fox DNA (faecal samples) completed

2004/03 [2.3] First round of collecting faecal samples completed after 2nd field season

2004/04 [1.1] Second density estimation in four study sites

2004/04 [2.1] At least 10 foxes captured in four study sites and hair samples for genetic analysis

2004/04 [2.2] Analysis methods for non-invasively sampled DNA established

2004/04 [3.2] Feral dog activity and space use patterns (radio-tracking) completed

2004/04 [3.3] All dog samples collected for serology

2004/04 [3.4] All fox samples collected for serology

2004/09 [1.2] GIS mapping of fox habitat across Chiloé Island completed

2004/09 [1.3] Estimation of fox density and distribution across Chiloé Island based on 1.1 and 1.2

2004/09 [2.3] Mitochondrial DNA and microsatellite analysis for samples collected during 2nd field season

2004/09 [3.3] Serology results for CDV and CPV in dogs received and analysed

2004/09 [3.4] Serology results for CDV and CPV in foxes received and analysed

2004/11 [4.1] Draft for conservation management plan for the main population (Chiloé Island) produced

2004/12 [2.3] Analysis of population genetic structure and genetic diversity of foxes completed

2005/01 [4.1] Conservation management plan for the main population (Chiloé Island) produced

2005/02 [4.2] Draft for IUCN Action Plan produced

2005/03 [4.2] IUCN Action Plan produced

TRAINING AND INSTITUTIONAL CAPACITY BUILDING (see also section 15)

2002/12 [9.1] Field station at Piruquina repaired

2003/10 [9.2] Field station at SAG site created

2003/10 [9.3] Campsite at Quellón created

2002/12 [9.3] Lab facilities at SDF field station created and equipped

2003/03 [9.4] Equipping genetics laboratory at ULA completed

2002/12 [9.4] Equipping GIS laboratory at ULA completed

2002/05 [5] ULA staff trained in sampling methods by PI (2 weeks in Chile)

2002/06 [6] ULA staff in genetic methodology trained by PI (10 weeks in London and 4 weeks in Chile)

2002/07 [7] ULA staff trained in analysis of serological and epidemiological data by Dr Cunningham (2 weeks in London)

2002/09 [6] ULA staff in genetic methodology trained by PI (2 weeks in Chile)

2003/04 [8] ULA staff trained in GIS by Dr Carbone (3 weeks in London)

2003/09 [6] ULA staff in genetic methodology trained by PI (2 weeks in Chile)

ENVIRONMENTAL EDUCATION AND AWARENESS

2002/09 [11] Information packs for adults and children and posters produced

2002/11 [10.1]. Two one-week training courses at SDF completed by PI
2002/11 [10.2] Two-week workshop at ULA completed by PI
2002/12 [12.1] Slideshow produced
2003/11 [10.1]. Two one-week training courses at SDF completed by PI
2003/11 [10.2] Two-week workshop at ULA completed by PI
2003/12 [12.2] Target of having shown slideshow 2 hour lessons at least 16 times fulfilled
2004/11 [10.1]. Two one-week training courses at SDF completed by PI
2004/11 [10.2] Two-week workshop at ULA completed by PI
2005/03 [12.2] Target of having shown slideshow 2 hour lessons at least 32 times fulfilled

DISSEMINATION OF RESULTS

2003/12 [14.1, 14.2] 50% of press releases and popular articles produced
2005/03 [14.1, 14.2] Final 50% of press releases and popular articles produced
2003/03 [14.3] TV and radio features proposed to at least four national and international stations
2002/10 [15] Web-site created and accessible – continuously updated over course of project
2003/03 [13] First newsletters produced and circulated
2003/03 [17]. At least 1st presentation given at conference
2003/09 [16] First manuscript submitted to peer-reviewed journal
2004/03 [13] Second newsletters produced and circulated
2004/03 [17]. At least 2nd presentation given at conference
2004/09 [16] Second manuscript submitted to peer-reviewed journal; if first was not accepted, a revised or an additional manuscript submitted
2005/03 [13] Second newsletters produced and circulated
2005/03 [16] Third manuscript submitted to peer-reviewed journal; if second was not accepted, a revised or an additional manuscript submitted
2005/03 [17]. At least 3rd presentation given at conference

REPORTING

2002/10 First half-year report produced and submitted
2003/04 First year report produced and submitted
2003/10 Second half-year report produced and submitted
2004/04 Second year report produced and submitted
2004/10 Third half-year report produced and submitted
2005/04 Final report produced and submitted

14. Do you know of any other individual/organisation carrying out similar work? Give the details of the work, explaining the similarities and differences.

Elise McMahon, a student of University of Massachusetts, under the advice of Dr Todd K Fuller and Dr Warren E Johnson, is conducting ecological research on the small mainland Darwin's fox population (estimated at <70 foxes) in Nahuelbuta National Park. It is of interest to note here that this work is carried out where Dr Jiménez discovered this relict mainland population and where he conducted the first ecological studies on the Darwin's fox. Elise McMahon's work focuses on the ecology of Darwin's fox in this 64 km² habitat island, mainly on population dynamics, spatial ecology, diet, and potential interactions with two other sympatric foxes. Locally, dogs are a major problem in the park, but no studies are being conducted to assess their threat to foxes. Also, no studies on the population structure are being carried out.

Therefore, our project is novel with regard to assessing disease risks to the Darwin's fox, estimating distribution and abundance in the much larger Chiloé population using novel GIS and genetic approaches, providing training and involving local communities in conservation efforts.

At the end of our project, we will jointly write a IUCN Action Plan for the Conservation of the Darwin's fox, combining the ecological and conservation related data of our proposed project and the ecological data from Elise McMahon's study. Dr

Jiménez has established the baseline for collaboration by co-authoring with Elise McMahon the Darwin's fox species account for the Canid Action Plan.

15. Will the project include training and development? Please indicate how many trainees will be involved, from which countries and what will be the criteria for selection. How will you measure the effectiveness of the training and will those trained then be able to train others? Where appropriate give the length of any training course.

Training Activity	Dates	Who will participate, how many will participate and for how long?
a) Collection of samples for serology and genetics (see measurable indicator 5 in logframe)	a) May 2002	a) 2 persons from Chile (the field assistant and the veterinary post-doc), 2 weeks in Chile
b) Genetic methodology (laboratory analysis and analysis of data; see indicator 6)	b1) July-Aug 2002 b2) Sept 2002, Sept 2003	b1) 2 persons from Chile (the laboratory assistant and the veterinary post-doc), 10 weeks in London b2) 2 persons from Chile (the laboratory assistant and the veterinary post-doc), twice 2 weeks in Chile
c) Analysis of serological and epidemiological data (see indicator 7)	c) July 2002	c) 2 persons from Chile (the laboratory assistant and the veterinary post-doc), 2 weeks in London
d) GIS analysis (see indicator 8)	d) Apr 2003	d) 1 person from Chile (Jiménez), 3 weeks at IoZ
e) Conservation biology course (see indicator 10.1)	e) Oct/Nov 2002, 2003, 2004	e) 16 undergraduate and graduate students from across Chile (1/3 may be international), six times 1 week, twice yearly, in Chile
f) Conservation genetics & epidemiology workshop (see indicator 10.2)	f) Oct/Nov 2002, 2003, 2004	f) 16 undergraduate and graduate students from across Chile ((1/3 may be international), three times 2 weeks, once a year, in Chile
g) Education courses with slideshow and lessons	g) 2002-2005	g) at least 32 sessions of 2 hours minimum (20 schools and 12 meetings involving farmers and forest users); in Chile

16. How will trainee outcomes/destinations be monitored after the end of the training?

The outcome of training will be assessed during annual supervisory and training visits to Chile and during the visits to the UK by the ULA staff member involved in conservation genetics, epidemiology and ecological research. UK staff will be in regular contact with ULA staff, allowing the application of training to be monitored and modified as the project proceeds. Training outcomes for people attending workshops will be assessed during workshops using simple exercises.

The aim of the training workshops is for the project to become self-sustaining after a three year period of Darwin funding. A constant supply of high quality, locally trained biology students with a background in conservation biology, epidemiology and population genetics should be available for further training investment for the foreseeable future.

The technical assistants will be most closely monitored, and if their progression is satisfactory, they will become priority candidates for PhD programmes and subsequent employment within ULA or SDF using either ULA, SDF or external funding at the end of the three year project. It is hoped that some of the students will attain positions either in government, NGOs or in further education where the capacity built during this project will be further disseminated.

17. How is the work of the project expected to continue after the end of grant period? A clear exit strategy must be included.

This project will develop capacity for conservation biology at ULA. Strong expertise will result in the fields of ecology, disease epidemiology, conservation genetics, population genetics, and geographic information systems. The methods used for the Darwin's fox can be extended to other animal and plant species in the Chilean biodiversity hotspot.

The molecular genetics and geographic information systems laboratory and the expertise in epidemiology will be vitally important for the future of conservation in both plant and animal populations on Chiloé Island. Given the increasing degree of habitat fragmentation, the loss of populations and the conservation threat from emerging diseases, epidemiological and population genetic applications are abundant. For example, the chinchilla *Chinchilla lanigera*, was once widespread in Chile, but is now critically endangered. It persists in the wild in a small number of discrete colonies in semi-arid Chile and both the number and size of colonies are decreasing (Jiménez 1996). Because of dramatically declining density and population fragmentation, population genetic analysis is urgently required in order to develop species management and recovery plans. Similarly, the Senda Darwin Foundation has expressed keen interest in utilising molecular tools in their research on plant and bird species. Such genetic studies will follow once capacity has been built.

We will have established a new phase in the conservation biology of the region. ULA will continue to run a course on conservation biology after completion of the project. SDF, BMC and CA will continue to use experience gained in Darwin's fox conservation in their training programmes. After our departure, assistance in grant application writing will continue to be available for Chilean staff (via e-mail).

We hope that long-term collaborations will continue and which will involve exchange of students between ULA and IoZ. Joint supervision of MSc and PhD students in areas other than Darwin's fox conservation are already being planned.

The establishment of a conservation management plan for the Darwin's fox is the beginning of the conservation progress and local scientists and conservation managers will then implement long-term management.

MONITORING AND EVALUATION

18. Describe how progress on the project would be monitored and evaluated in terms of achieving its aims and objectives, both during the lifetime of the project and at its conclusion. How would you ensure that it achieves value for money? What arrangements will be made for disseminating results? If applicable, how would you seek the views of clients/customers?

Monitoring and Evaluation

Visiting experts will carry out monitoring during the lifetime of the project. IoZ has held Darwin grants previously and IoZ, ULA and SDF have much other international collaboration, thus being both familiar and experienced with organisation of overseas projects. All organisations involved have excellent communications, and all have efficient e-mail servers. Monitoring will gather the information needed to measure the indicators detailed in the logframe, as well as highlighting lessons and problems.

Monitoring information will be available in the form of project progress reports (produced by IoZ in consultation with ULA and SDF), mission reports from visiting experts, and training course and workshop reports.

Specific supervisory visits by Dr Funk (IoZ) will ensure that major elements of the project and associated training, are delivered on time and to an appropriate standard. Dr Jiménez will provide close supervision in Chile. E-mail updates will be exchanged between the two PIs one every week. All staff will send progress reports to the two PIs at least once every month. Other IoZ staff (Dr. Cunningham and Dr Carbone) will continuously monitor progress in epidemiological analysis and GIS analysis via e-mail and will report to the PI. Annual review meetings will be held between IoZ ULA and SDF in consultation with BMC, CA and SAG, to review progress against objectives, draw lessons from experiences and agree modifications in the workplan if necessary.

The final project report will be compiled by IoZ, ULA and SDF in consultation with BMC, CA and SAG and outside experts, and will address the results of the project and their management implications.

Monitoring of training is detailed in section 16

Value for Money

The financial management of the project will be by IoZ in the UK and ULA in Chile. Both organisations have established independent audit procedures and stringent reporting and auditing requirements will be agreed in line with Darwin requirements (including independent annual Audit of accounts).

Capital equipment will be procured in UK or Chile after comparison of prices and technical specifications. Chilean expertise and suppliers will be used wherever possible.

The project is expected to generate additional revenue from other conservation foundations. For example, the ecological survey part of the project is ideal for voluntary contributions, such as delivered by the Earthwatch Institute, and contact have already been established.

Dissemination Arrangements

Dissemination outputs are specified in section 13.

Scientific papers will be co-authored, as appropriate, by scientists from all institutions involved and submitted to international journals in the usual way.

Primarily the education and PR specialists of SDF will initiate newsletters, press releases and electronic media publicity. ULA and IoZ have experienced press offices and publications departments who will support dissemination locally and globally.

IoZ, SDF and BMC have close links with local and global conservation organisations and will promote the work through their newsletters and publications. A website will be designed and regularly updated which will carry news of the project.

Views of clients/customers

Education programmes organised via SDF will continuously seek feedback from the local communities. This feedback will be used to adjust education programmes where necessary. The project will continuously liaise with local conservation managers and government institutions (primarily SAG) and we will take on board suggestions regarding the research programme and dissemination of results wherever appropriate.

Logical framework. Please enter the details of your project onto the matrix using the note at Annex B of the Guidance Note.

Project summary	Measurable indicators	Means of verification	Important assumptions
<p>Goal</p> <p><i>To assist countries rich in biodiversity but poor in resources with the conservation of biological diversity and implementation of the Biodiversity Convention</i></p>	/	<p>Quantifying biological diversity and long-term monitoring (post-project) and status review by IUCN.</p> <p>Chilean national reports to CBD</p>	
<p>Purpose</p> <p>To assist Chile with the conservation of its biological diversity with the initial focus on the conservation of one critically endangered species, the Darwin's fox.</p>	<ol style="list-style-type: none"> 1. Conservation management plan produced and endorsed by Chilean government (SAG) 2. Implementation of laboratory work, geographic information system, disease screening and field research judged to be self-supporting by the end of the project 	<p>Conservation management plan document and correspondence</p> <p>End of project report</p>	
<p>Outputs</p> <ol style="list-style-type: none"> 1. Determination of Darwin's fox abundance and distribution and assessment of conservation threats by feral dogs 2. Establishment of a high quality long-term mammal monitoring program using ecological and epidemiological methodology, and non-invasive population genetic techniques that will be applicable to biodiversity monitoring on Chiloé Island and across Chile. 3. Establishment of a university teaching programme in conservation science through which candidates for further training can be identified, and through which increased national awareness of conservation issues can be raised. 	<ol style="list-style-type: none"> 1. International scientific and conservation community endorses the results 2. Training needs fulfilled 3. Training needs fulfilled 	<ol style="list-style-type: none"> 1. Publication of results in peer-reviewed international scientific journals 2. Annual reports and training reports; new research and conservation programmes launched at ULA and SDF 3. Annual reports and training reports 	<p>Continued government support for research and conservation (support by SAG has been given and it is unlikely to be rescinded; see attachments</p>

<p>4. Raising awareness of conservation managers and owners of domestic animals for conservation threats by domestic animals</p> <p>5. Constituency in support of Darwin's fox conservation developed on Chile and Internationally</p> <p>6. Field and laboratory facilities established and equipped where necessary</p>	<p>4. NGO and government interest in conservation management sustained</p> <p>5. Interest by media and local communities sustained</p> <p>6. Facilities operational</p>	<p>4. Correspondence with national government and NGOs on file; final report</p> <p>5. Media reports and correspondence on file; final report</p> <p>6. Reports by ULA, SDF and BMC; final report</p>	
<p>Activities</p> <p>RESEARCH</p> <p>1. Density and distribution of foxes across Chiloé Island identified</p> <p>2. Population substructure on Chiloé Island and migration between sub-populations identified</p> <p>3. Conservation threats by feral dogs assessed</p>	<p>1.1 Density estimated in the two already established study sites (Piriquina, Ahuenco) and two new study sites (SAG site, Quellón)</p> <p>1.2 GIS mapping of fox habitat across Chiloé Island</p> <p>1.3 Estimation of fox density and distribution across Chiloé Island based on 1.1 and 1.2</p> <p>2.1 At least 20 foxes captured in four study sites and hair samples for genetic analysis</p> <p>2.2 Non-invasive sampling for fox DNA (faecal samples) and analysis methods for non-invasively sampled DNA established</p> <p>2.3 Mitochondrial DNA and microsatellite analysis for determining population structure and genetic diversity of foxes completed</p> <p>3.1 Density and distribution of dogs estimated</p> <p>3.2 Feral dog activity and space use patterns identified by radio-tracking</p> <p>3.3 Prevalence and exposure to selected pathogens in feral dogs (CDV and CPV) estimated by serology</p> <p>3.4 Prevalence and exposure to selected pathogens in foxes (CDV and CPV) estimated by serology</p>	<p>1.1 Final report and re-prints of peer-reviewed papers</p> <p>1.2 Electronic and hard copy versions of database at ULA; final report and re-prints of peer-reviewed papers</p> <p>1.3 Final report and re-prints of peer-reviewed papers; web-site</p> <p>2.1 final report and re-prints of peer-reviewed papers</p> <p>2.2 laboratory reports; final report and re-prints of peer-reviewed papers</p> <p>2.3. laboratory reports; final report and re-prints of peer-reviewed papers</p> <p>3.1 final report and re-prints of peer-reviewed papers</p> <p>3.2 final report and re-prints of peer-reviewed papers</p> <p>3.3 final report and re-prints of peer-reviewed papers</p> <p>3.4. final report and re-prints of peer-reviewed papers</p>	

<p>4. Conservation management plan for the Darwin's fox produced</p>	<p>4.1 Conservation management plan for the main population (Chiloé Island) produced</p> <p>4.2 IUCN Action Plan produced in collaboration with colleagues in Nahuelbuta National Park, who research the ecology of Darwin's foxes in the second Chilean population, and the IUCN Canid Specialist Group (see section 14)</p>	<p>4.1 copy of conservation management plan and web-site</p> <p>4.2. copy of conservation management plan and web-site</p>	
<p>TRAINING AND INSTITUTIONAL CAPACITY BUILDING</p>			
<p>5. Provide training in genetic and veterinary sample collection</p>	<p>5. ULA staff trained (2 weeks in Chile)</p>	<p>5. Final report</p>	
<p>6. Provide training in genetic analysis (laboratory methods and data analysis)</p>	<p>6. ULA staff trained (10 weeks in London and 4 weeks in Chile)</p>	<p>6. Final report</p>	
<p>7. Provide training in analysis of serological data</p>	<p>7. ULA staff trained (2 weeks in London)</p>	<p>7. Annual and final reports</p>	
<p>8. Provide training in GIS</p>	<p>8. ULA staff trained (3 weeks in London)</p>	<p>8. Annual and final reports</p>	
<p>9. Create and repair field stations and equip</p>	<p>9.1 repair field station at Piruquina</p>	<p>9. Annual and final reports</p>	
	<p>9.2 create field station at SAG site</p>		
	<p>9.3 create campsite at Quellón</p>		
	<p>9.3 Create and equip basic lab facilities at SDF field station</p>		
	<p>9.4 Contribute to equip the genetics laboratory at ULA; create and equip GIS laboratory at ULA</p>		
<p>ENVIRONMENTAL EDUCATION AND AWARENESS</p>			
<p>10. Establish course and workshop in conservation biology at Senda Darwin for university students and conservation managers and at ULA</p>	<p>10.1. Three training courses established (total 6 weeks in Chile)</p> <p>10.2. Three workshops established (total 6 weeks in Chile)</p>	<p>10. Course and workshop training manuals; annual and final reports, web-site</p>	
<p>11. Design and distribute information pack to dog owners, print posters, press and radio releases</p>	<p>11. 500 information packs for adults and children produced and distributed; 100 posters produced and distributed</p>	<p>11. Information packs and posters for adults and children</p>	
<p>12. Design a slide show on the Darwin's fox, human impacts and ways to help its conservation to be targeted at local elementary schools, farmers, and loggers on the island</p>	<p>12.1. Slideshow produced</p> <p>12.2 Slideshow shown during 2 hour lessons at at least 32 occasions (20 elementary schools and 12 meetings involving farmers, forest users and others)</p>	<p>12. Annual and final reports, web-site</p>	

<p>Activities continued</p> <p>DISSEMINATION OF RESULTS</p> <p>13. Produce annual newsletter for participating/interested organisations</p> <p>14. Provide up-dated information to the public through mass-media and popular scientific articles</p> <p>15. Create website at Bosque Modelo Chiloé (in Spanish and English) and link websites of all partner organisations to it</p> <p>16. Submit papers to peer-reviewed journals</p> <p>17. Present results / lessons of the project at national and international seminars / conferences / workshops</p>	<p>13. Three newsletters produced and 400 hard copies circulated in Chile; 100 in the UK and distributed electronically</p> <p>14.1. At least 6 press releases in Chile, 3 in the UK</p> <p>14.2. At least 6 articles published through mass-media / newsletters / magazines</p> <p>14.3 TV and radio features proposed to national and international stations</p> <p>15. Web-site created and accessible</p> <p>16. At least 3 manuscripts submitted to peer-reviewed journals and accepted within a year after end of project the latest</p> <p>17. At least 3 presentations given</p>	<p>13. Reprints</p> <p>14. Reprints and newspaper clippings; correspondence</p> <p>15. Web-site</p> <p>16. Reprints</p> <p>17. Conference proceedings and workshop reports</p>	
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