



Darwin Initiative for the Survival of Species

Annual Report 1

**Genetic diversity and management implications for high
Andean guanaco populations in Peru.**

1. Darwin Project Information

Project Ref. Number	162/12/022
Project Title	Genetic diversity and management implications for high Andean guanaco populations in Peru.
Country(ies)	Peru
UK Contractor	Cardiff University
Partner Organisation(s)	CONOPA
Darwin Grant Value	£197, 886
Start/End dates	01/07/03-30/06/06
Reporting period (1 Apr 200x to 31 Mar 200y) and report number (1,2,3..)	1 Apr 2003 to 31 Mar 2004 Report number 1
Project website	www.cf.ac.uk/biosi/research/biodiversity/staff/dodd.html
Author(s), date	Ciara S Dodd, Jane C Wheeler, Michael W Bruford.

2. Project Background

This is a collaborative project between Cardiff University, UK and CONOPA (Coordinadora de Investigación y Desarrollo de Camélidos Sudamericanos), a Peruvian NGO based in Lima, Peru. Specifically, the project aims to address issues relating to the conservation management of the Peruvian population of the Andean guanaco through direct population surveys and genetic analysis. By characterising the demography and genetics of these fragmented populations we will enable a rational management programme to be established. This will result from a Population Viability Assessment for the Andean guanaco in Peru through a workshop of all stakeholders

3. Project Purpose and Outputs

The main purpose of the project is to characterise the demography and genetics of highly endangered fragmented Peruvian guanaco populations, to enable the establishment of a realistic conservation management plan. In addition, the project will provide training for a cohort of Peruvian scientists in conservation biology and population viability analysis, as well as intensive training in modern molecular genetic techniques and conservation genetics for two Peruvian trainees. To date, nine months into the project, one Peruvian trainee has completed 6 months of training at Cardiff University, while the second trainee has been conducting field work and doing preliminary sample processing in Peru. The project is on schedule.

The operational plan has been modified from the initial schedule. The start date was delayed by two months until 01/07/03 as requested by DEFRA. Consequently, the dates for some key milestones have been put back by two months especially during the first year of the project. Notably, Peruvian Trainee 1 Jorge Rodriguez (JR) arrived in Cardiff three months later than scheduled due to the prohibitively high

airfare from Peru to UK before 12th September. The UK post-doc Ciara Dodd (CD) and JR travelled to Peru in March 2004 and will return to the UK in September 2004. The first conservation biology course will be held between 14/06 to 09/07/04 instead of being entirely in June. The rest of the timetable remains unchanged except for the PHVA which will be held in Lima in April 2006 rather than in February.

4. Progress

The project began on 01/07/03, and the first two weeks were dedicated to strategic planning and promoting the project in Peru through an organised programme described in detail in section 6 below. Trainee 2 Kathryn Yaya (KY) has done field work at 2 guanaco populations, developing sampling strategies and conducting interviews, and done preliminary processing of the samples in the lab in Lima. In September 2003, JR travelled to Cardiff to begin six months of intensive training in molecular genetics techniques in the laboratory and to attend a conservation biology course. JR and CD returned to Peru in March 2004 when planning for the first one-month conservation biology course commenced.

In Peru, Jane Wheeler (JW) coordinated the field work with authorities at the Instituto Nacional de Recursos Naturales, INRENA, and the Consejo Nacional de Camélidos Sudamericanos, CONACS, the two government institutions with authority over the guanaco. She presented lectures about conservation genetics and the goals of the Darwin guanaco project to authorities at these institutions as well as at the Consejo Nacional del Medio Ambiente, the Peruvian institution responsible for CBD compliance. She has also begun all necessary ground work for the conservation biology course.

The project has progressed according to the revised baseline timetable, outlined in the first six month report, following a two month postponement of the start date that was requested by DEFRA. JR completed the 10 week final year undergraduate conservation biology course taught by MB at Cardiff University, and completed six months of intensive training in molecular genetics techniques in the laboratory, the details of which are provided below.

The laboratory techniques that will be used for this project and in which JR has been trained are: DNA extraction from faeces, agarose gel electrophoresis, polymerase chain reaction (PCR) of mitochondrial DNA and microsatellites, multiplex PCR and genotyping using fluorescent technology and silver staining, microsatellite analysis using Genescan and Genotyper software, and preliminary population genetic analysis.

As a result of the training received by JR in UK, he is using the knowledge to teach scientists within the laboratory in Lima and to deliver lectures on molecular markers at San Marcos University, Lima.

In the field, KY has used direct observation to record information on guanaco social behaviour and defecation, attempting to relate faecal samples to specific animals. On collection, the faecal pellets are preserved in marked plastic tubes with ethanol and returned to the laboratory in Lima where KY has been working on standardizing the extraction of DNA with the Qiagen Ministool kit.

Significant difficulties were encountered with obtaining permits from INRENA to allow sampling to commence. Consequently fieldwork was begun somewhat later than detailed in the initial project timetable. The issue has now been resolved and full scale sampling will begin in early April 2004.

Timetable for Year 2 (April 2004 – March 2005)

Date	Activity
April and May 2004	Sampling at Huallhua, Ayacucho
Mid-June to Mid July 2004	Conservation Biology course
Mid July to end August 2004	Sampling at Calipuy, La Libertad
Sept 2004	Return to Cardiff – sequencing and microsatellite analysis of new samples and train JR in automated sequencing methods and analysis. Sampling Chavin, Ica
October 2004	4 th European Symposium on South American Camelids Sampling at Machahuay, Arequipa
November 2004	Sampling at Yanaque, Moquegua
December 2004	Sampling at Vilani, Tacna
January 2004	Remaining faecal DNA extractions at lab in Lima.
February 2005	JR returns to Peru and continues establishment of lab protocols
February to March 2005	CD finishes mitochondrial analysis and writes first paper

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

Not applicable.

6. Partnerships

There has been close collaboration between the UK and the Peruvian partners. During the first two weeks of the project, Michael Bruford and Ciara Dodd travelled from the UK to Lima to organize, plan and publicise the project. Meetings were held with the authorities at INRENA and CONACS. A stakeholder meeting was also held, with the assistance of CONAM and Conservation International, which brought together all interested parties and set the basis for preparing the PHVA to be held at the end of the project. Public lectures about conservation biology, genetics, the outcome of our previous Darwin project on vicuña and the current guanaco project, were given by Michael Bruford and Jane Wheeler at the Peruvian National Congress, the Peruvian Veterinary Academy of Science, San Marcos University and INRENA. This very level of public exposure at the beginning of the project has been highly beneficial.

The Peruvian trainee, Jorge Rodriguez (JR) travelled to Cardiff where he completed six months of intensive laboratory training provided by the UK post-doc Ciara Dodd (CD) and to attend a course in conservation biology at Cardiff University. The vice president of CONOPA, Dr. Jane Wheeler (JW) visited Cardiff for two weeks in September.

In addition, a new collaborative link has been established between CONOPA, Cardiff University and Juan Carlos Marin (JCM) from the Catholic University, Santiago,

Chile. JCM, funded by his University, visited Cardiff University between 22/02/04-15/03/04 in order to sequence and genotype vicuna and guanaco samples. His data will be combined with the guanaco data resulting from this project and previously unpublished vicuna data generated from a previous Darwin initiative project (N251). Collaboration with JCM has enabled the addition of important populations of guanaco that would otherwise have been impossible to sample, for example populations from Bolivia.

CONOPA is the Peruvian partner of the EU INCO funded MACS project (Sustainable economic utilisation of wild South American camelids - Strategies for improving rural productivity in pastoral communities in Latin America). CONOPA's role in MACS is the analysis of genetic variability in Andean vicuña populations, and to contribute in any way possible to guanaco research. The collaboration with Juan Carlos Marin has its origin in this project, and Michael Bruford has been made a nominal member of MACS, in order to facilitate and maximise the results of the genetic analysis.

CONOPA has been recognized by the Third World Network of Scientific Organizations, TWNSO, as an institution of excellence and their Peruvian partner in their GEF, UNEP sponsored project "Promoting Best Practices for Conservation and Sustainable Use of Biodiversity of Global Significance in Arid and Semi-Arid Zones". Jane Wheeler has participated in planning meetings held in Cairo and Rabat (August 2003) and published a chapter on vicuña genetics in the first report of the TWNSO/GEF/UNEP project (J.C. Wheeler, M. Fernández, R. Rosadio, D. Hoces, M. Kadwell and M.W. Bruford Genetic Diversity and Management Implications for Vicuña Populations in Peru. In: J. Lemons, R. Victor and D. Schaffer Eds., Conserving Biodiversity in Arid Regions. Pp. 327-344. 2003. Boston, Kluwer Academic Publishers, Boston, pp. 327-344). The information reported in this publication is an outcome of a previous Darwin Initiative Project on Vicuña (N251, Genetic Diversity and Management Implications for Vicuña populations in Peru). Participation in this project has provided contact with other third world researchers and has opened the possibility of collaborative research on guanacos with scientists in Bolivia.

7. Impact and Sustainability

During the first two weeks of the project, Michael Bruford and Ciara Dodd travelled from the UK to Lima to organize, plan and publicise the project. Meetings were held with the authorities at INRENA and CONACS. A stakeholder meeting was also held, with the assistance of CONAM and Conservation International, which brought together all interested parties and set the basis for preparing the PHVA to be held at the end of the project. Public lectures about conservation biology, genetics, the outcome of our previous Darwin project on vicuña and the current guanaco project, were given by Michael Bruford and Jane Wheeler at the Peruvian Veterinary Academy of Science, San Marcos University and INRENA. During the month of July a special event, "The applications of DNA in Peru: South American Camelids", was organised at the Peruvian Congress. Included were lectures by Michael Bruford and Jane Wheeler, which introduced the concept of conservation genetics and discussed the importance of the present Darwin Guanaco and previous Darwin Vicuña projects in insuring the conservation and survival of these species.

In collaboration with the British Embassy in Lima, CONOPA helped to organize A special exhibition celebrating 50 years of the discovery of DNA. The event included a series lectures at the Embassy, schools and universities in Lima and a poster exhibition highlighting CONOPA's work in population genetics and especially the

connection with the Darwin Initiative in relation to the present guanaco and past vicuña projects. The posters continue to be on exhibit at different institutions around the country, having been loaned to the National Museum, Ricardo Palma University and several schools.

Both of the events described above have had an important impact on raising interest in problems concerning biodiversity. CONOPA has been consulted directly about implementing the results of their genetic research into law, by the director of National Parks in Peru, by the head of Consejo Nacional de Medio Ambiente, CONAM, by the Technical Director of Consejo Nacional de Camelidos Sudamericanos, CONACS and various Congressmen. The desire to incorporate the outcome of our research from the previous Darwin Vicuña project into law, as well as to set up the framework for protecting the guanaco based on our research is a direct measure of the impact which we have had.

A Population and Habitat Viability Assessment (PHVA) is planned for April 2006, 3 months before the end of the project. The purpose of the PHVA is to use the population demographic and genetic data obtained throughout the project to formulate a management plan for the Peruvian high Andean populations of the guanaco. This PHVA will be conducted as a workshop to which the key stakeholders will be invited and all stakeholders will be involved in the production and implementation of the management plan.

8. Post-Project Follow up Activities (max 300 words)

Not applicable.

9. Outputs, Outcomes and Dissemination

All the agreed outputs for the period have been achieved.

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An evening reception was held at the house of the Deputy Head of the British Embassy in Lima to publicly introduce the Darwin Guanaco Project. This provided an excellent opportunity to discuss the project with many key stakeholders and to foster useful network links within this area.

A stakeholders meeting was held at INRENA drawing together representatives from organisations whose support is necessary for the Population and Habitat Viability Assessment at the end of the project. These organisations are CONACS (National Council for South American Camelids) and INRENA, the two government organisations with legal responsibility for the guanaco, CONAM (National Council of the Environment) and SNVG (National Society of Vicuna and Guanaco), and others. This meeting was well attended and formal support of the stakeholders was gained for the future of the project.

In collaboration with the British Embassy in Lima, CONOPA helped to organize a special exhibition celebrating 50 years of the discovery of DNA. The event included a series lectures at the embassy, schools and universities in Lima and a poster exhibition highlighting CONOPA's work in population genetics and especially the connection with the Darwin Initiative in relation to the present guanaco and past vicuña projects. The posters continue to be on exhibit at different institutions around the country, having been loaned to the National Museum, Ricardo Palma University and several schools.

In December 2003, the President of INRENA, the Director of CONAM and the Peruvian Vice-President of Conservation International, invited Jane Wheeler to speak about the Darwin Initiative Guanaco Project, as well as the results of the previous Darwin Vicuña Project, in relation to the CBD. The most important Peruvian authorities in the area of conservation and biodiversity were personally invited to attend the meeting in an effort to insure maximum support for the Darwin Guanaco Project and to insure its success. As the result of this meeting the Darwin Guanaco Project has full institutional support and can now operate without problem. CONOPA is now considered the authority to be consulted on matters of conservation of the South American Camelids assuring continuity of the project after termination.

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

Code No.	Quantity	Description
3	1	JR diploma for Conservation Biology Course, Cardiff University
6A	1	JR attended 10 week training course in conservation biology
6B	1	JR received 6 months of molecular genetics laboratory training
7	1	CONOPA posters for exhibition celebrating 50 years of the discovery of DNA (in collaboration with the British Embassy, Lima)
8	3	CD and MB 10 days planning in Lima July 2003 CD 10 additional days in Lima to continue training Darwin trainees and to prepare for course
14A	1	Initial workshop held in Lima
14B	7	Michael Bruford (Application of Molecular Genetics Techniques in Conservation) "The Applications of DNA in Peru: South American Camelids", special exhibition for the Peruvian Congress, 4 July 2003 Jane Wheeler (Conservation Genetics in South American Camelids in Peru) 4 July 2003) "The Applications of DNA in Peru: South American Camelids", special exhibition for the Peruvian Congress, 4 July 2003 Michael, Bruford, DNA and the management of genetic resources: worldwide applications. Peruvian Academy of Veterinary Sciences, 6 July 2003 Michael Bruford, Application of Biotechnology for Conservation of Endangered Species in Peru. INRENA, 9 July 2003 Jane Wheeler, Past, Present and Future of the South

		American Camelids in Peru. INRENA, 9 July 2003
		Jane Wheeler, TWNSO–GEF–UNEP International Conference on “Implementing Programmes to Conserve Biodiversity in Arid and Semi–Arid Regions in Developing Countries,” 27–30 August 2003, Rabat, Morocco.
		Jane Wheeler, Cuidando los Rebaños de los Apus: Los Camélidos Sudamericanos, Universidad de Trujillo, 30 October
15A	1	Peruvian press release
15C	1	UK press release

Table 2: Publications

Type *	Detail	Publishers	Available from	Cost £
(e.g. journals, manual, CDs)	(title, author, year)	(name, city)	(e.g. contact address, website)	

10. Project Expenditure

- Please expand and complete Table 3.

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

Item	Budget (please indicate which document you refer to if other than your project schedule)	Expenditure	Balance
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Extra expenditure on flights was necessary due to the rapidly escalating cost of six-monthly tickets from the UK to Peru, which affected the cost of JR’s return flight to Cardiff and CD’s return flight to Lima.

11. Monitoring, Evaluation and Lessons

CONOPA has been consulted directly about implementing the results of their genetic research into law, by the director of National Parks in Peru, by the head of Consejo Nacional de Medio Ambiente, CONAM, by the Technical Director of Consejo Nacional de Camelidos Sudamericanos, CONACS and various Congressmen. The desire to incorporate the outcome of our research from the previous Darwin Vicuña project into law, as well as to set up the framework for protecting the guanaco based on our research is a direct measure of the impact which we have had.

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

In July 2003 (first two weeks of the project) a special event, "The applications of DNA in Peru: South American Camelids", was organised at the Peruvian Congress. Included were lectures by Michael Bruford, Cardiff University and Jane Wheeler, CONOPA, which introduced the concept of conservation genetics and discussed the importance of the present Darwin Guanaco and previous Darwin Vicuña projects in insuring the conservation and survival of these species.

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

In this section you have the chance to let us know about outstanding achievements of your project over the year that you consider worth highlighting to ECTF and the Darwin Secretariat. This could relate to achievements already mentioned in this report, on which you would like to expand further, or achievements that were in addition to the ones planned and deserve particular attention e.g. in terms of best practice. The idea is to use this section for various promotion and dissemination purposes, including e.g. publication in the Defra Annual Report, Darwin promotion material, or on the Darwin website. As we will not be able to ask projects on an individual basis for their consent to publish the content of this section, please note the above agreement clause.

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2003/2004

Project summary	Measurable Indicators	Progress and Achievements April 2003-Mar 2004	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p> <p>To enable conservation management for the Peruvian population of the Andean guanaco.</p> <p>To build capacity in conservation genetics in Peru.</p> <p>To train a cohort Peruvian scientists in conservation biology and population viability analysis.</p> <p>To carry out a Population Viability Assessment.</p>	<p>The production of the management plan (at latest by the end of Year 3).</p> <p>The successful training two Peruvian scientists in conservation biology.</p> <p>The courses having been successfully held and the trainees having earned their diplomas.</p> <p>The production of a risk assessment for the guanaco. To have held the workshop</p>	<p>One Peruvian trainee (JR) has received 6 months of intensive molecular genetics laboratory training in the UK and attended a course in conservation biology (for which he received a diploma).</p>	<p><i>(report any lessons learned resulting from the project & highlight key actions planning for next period)</i></p>
<p>Outputs</p>			
<p>The production of six management plans INRENA can use to guide guanaco conservation.</p>	<p>The plans themselves should be easily translated into specific action.</p>	<p>To be completed in year 3.</p>	

Two scientists who can produce genetic data, analyse it and write scientific papers and management plans.	The scientists' increased knowledge and hands-on capability at conservation genetics should be verified.	JR has been trained to date in DNA extraction, genotyping and analysis, to a level of competence where is can adequately impart that knowledge to others and provide training to scientists within the laboratory in Lima.	JR will be trained in automated sequencing and mitochondrial data analysis.
Two training courses in conservation biology.	The students should be able to pass an exam at the end of their course or demonstrate increased knowledge.	To be held in years 2 and 3.	
A full population viability assessment.	The PVA can run successfully and provide useful indicators of specific threats and solutions for populations.	To be held in year 4.	

Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.