

# **Darwin Initiative for the Survival of Species**

**Annual Report 2000-2001**



**Terrestrial invertebrate biodiversity in Galapagos:  
training and collection rehabilitation.**

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### 1. Darwin Project Information

Project title	Terrestrial invertebrate biodiversity in Galapagos: training and collection rehabilitation.
Country	Ecuador
Contractor	National Museums & Galleries of Wales
Project Reference No.	162/9/010
Grant Value	£160,652
Start/Finishing dates	April 2000 – March 2003
Reporting period	April 2000 --March 2001

### 2. Project Background

The Galapagos archipelago is the largest, most complex tropical oceanic island ecosystem that still remains in pristine condition. It is a World Heritage Site of exceptional value for its flora and fauna. The principal threat to the unique biological diversity is the introduction and dispersal of alien organisms.

The WWF funded ecosystem regional planning workshop in the Galapagos in 1999, attended by over 60 scientists from around the world, and endorsed by the Minister for Environment Dr Yolanda Kakabadse, identified the urgent need to obtain baseline invertebrate data for the Galapagos. Invertebrates are the least studied, yet the largest group of organisms in the archipelago. This is one of the most urgent priority areas for research and is essential to the preservation of Galapagos. Prior to identifying species and communities in danger of extinction, it is necessary to know what species are found in the archipelago, and which are entirely restricted to the Galapagos Islands. At the same time, an inventory of introduced species is required to identify species that are a threat to the conservation of flora and fauna of Galapagos. This information is now urgently required with the need to implement the Special Law for Galapagos with a planned quarantine and inspection system for the islands (SICGAL). This work is recognized within the management plan of the Galapagos National Park Service (GNPS), the responsible Government body, although within-country funding is not available for it. The Government relies on the Charles Darwin Research Station (CDRS) to carry out this research in the islands.

The plans for this project were derived from this workshop and discussions with staff of CDRS, including its Director, Head of Department of Plant and Invertebrate Sciences (Dr Alan Tye) and Head of the Invertebrates Programme (Dr Charlotte Causton).

### 3. Project Objectives

This project aims to provide training in sampling and identification of the major invertebrate groups in order to provide baseline data for, a) a self-sustaining monitoring programme and, b) identifying future conservation actions. The overall objectives are:

1. To train CDRS personnel in invertebrate taxonomy.
2. To establish training sessions for local scientists and National Park staff in simple pest identification techniques and sampling protocols.
3. To evaluate current museum infrastructure, identify what is needed to be able to provide a reference collection of common invertebrates and an electronic database, and buy equipment. The rehabilitation of the small existing collection and expansion under this programme will provide the basis for future improvements to the facilities.
4. To strengthen knowledge of potentially invasive organisms that may threaten survival of the unique fauna.
5. To recommend further conservation actions to CDRS and GNPS.
6. Acquire funding for continuation of the project (species monitoring) and for conservation actions identified by the project.

These objectives have not been modified during the reporting period.

### 4. Progress

The project started in April 2000 and this is the first Annual Report.

#### Baseline Timetable 2000-2001

Date	Milestone	Action
May	Agree and sign memorandum of understanding between CDRS & NMGW	Memorandum signed July 2000
June	Recruitment of undergraduate research assistant	
Jun	Start recruitment of investigator	Recruitment process initiated July 2000 (appointment made October 2000)
July	Visit by MRW to Galapagos to assess capital needs and training courses	Visit made in July as scheduled.
July/Aug	Order equipment and arrange shipping	Equipment ordered Sept 2000 -Feb 2001
July	MSc registration for Lazaro Roque	Registration completed Feb. 2001
July	Work on establishing database initiated	Database work started September. BioLink purchased as database.

August/Sept	Set up website newsletter	Details of project on CDRS website
November	1 <sup>st</sup> training courses in Galapagos given by MRW/MBS (NMGW staff)	Training course took place as scheduled but civil disruption in second week.
December	Assessment of first research assistant	

#### Additional outputs and activities

<b>Date</b>	<b>Additional Activity</b>
October 2000	Attendance (M R Wilson & M B Seddon) at Galapagos Day event in London. Presentation of poster entitled “ Biodiversity and Conservation of Terrestrial Invertebrates in the Galapagos Islands”.
December 2000	Attendance (MR Wilson) at joint Entomological Society of America/Entomological Society Canada Annual meeting Montreal, Canada. Presentation of poster (authors M.R. Wilson & C. Causton) entitled “Galapagos terrestrial invertebrates: Collection rehabilitation, training and research opportunities”

#### Research, training, and/or technical work 2000-2001

In June 2000, CDRS Invertebrates officially became a completely independent department with 16 staff, scholarship students and volunteers. In 1996, there was just one person responsible for the whole entomological program and it formed part of the plants and invertebrates department. This expansion of programs has increased the capacity to control the most aggressive introduced insects, and to record the invertebrate species found in Galapagos. Following this expansion, Invertebrates have moved to a renovated building, originally built in the 1960s. This has had the effect of giving the Botany Department additional space in their building, allowing the herbarium to be expanded. The renovated entomological building has more office space, a laboratory area, and allows the CDRS invertebrate collection to be housed in a museum.

Darwin funding has allowed additional staff to be hired and to improve the collection in terms of equipment and infrastructure. New cabinets have been bought and the invertebrate collection is now housed in new facilities with sufficient space to permit the collection to expand, at least for the next few years. The museum is now managed by a head curator with an assistant curator. As a result of this, the collection was recognized and included in the list of entomological collections of Central and South America.

After an initial visit by MR Wilson in July 2000, two training courses were held in November 2000: In the invertebrate collecting techniques, collection management and the application of the Red list for threatened species. Curators of Museums from Canada, USA, Switzerland and the UK were also contacted for information on collection management protocols.

By the end of 2000, the invertebrate collection contained almost 17,000 specimens, an increase of more than 4500 specimens since 1999. This collection also includes a section for species detected by SICGAL inspectors. Where possible, CDRS entomologists rear and identify species intercepted from the mainland. This information is essential to evaluate the efficiency of the inspection system and to identify the invertebrate groups that most frequently arrive in the Galapagos.

All specimens have now been organized into their respective taxonomic groups and protocols have been developed for maintaining the collection. The database for the invertebrate museum is now functioning and information is slowly being entered. Given the enormity of this task, a decision was made to work first with the groups that have the largest number of identified specimens in the museum; Lepidoptera (butterflies and moths) Formicidae (ants) and Arachnida (spiders). Specimens are dried, mounted and labelled and organized in the collection trays in the dry collection. The data is then entered into the database.

The head curator, Lazaro Roque is a specialist in Lepidoptera and has spent much of the last year dedicating his time to revising the specimens of Lepidoptera groups such as the genus *Utheteisa* (Arctiidae), Sphingidae and Noctuidae. Specimens have been compared with specimens held in the Natural History Museum, London, UK. This information will be included in a book on Lepidoptera of the Galapagos which will be published within the next 2.5 years. He has also been working on the ants of the Galapagos and a checklist will be published in 2001. Meanwhile, the assistant curator, Germania Estevez is revising the arachnid collection and entering the information in the database.

An assistant researcher, Ruth Boada, has been hired to work on host-insect relationships with the principal objectives of studying basic biological aspects of the Galapagos species, collecting additional material for the reference collection and prioritizing future research projects. She spent the first few months compiling a database of Galapagos-related literature and reviewing the studies that have been undertaken. She has also created a database of the checklists and taxonomic keys available for invertebrate groups. Now that this information is accessible the large gaps in invertebrate knowledge are evident. Check lists and keys are lacking for many groups, and more worrying is the lack of basic biological information about the species that have been recorded in Galapagos. Virtually nothing is known about the feeding habits of Galapagos invertebrates, even of the bigger groups such as the Lepidoptera species. This information is particularly important for prioritizing research activities in the Galapagos, in particular for endangered plant species that might be at risk from damage by insects.

Collecting surveys have been carried out to amplify the number of species in the collection. Surveys have been conducted in Santa Cruz, Sierra Negra, volcanoes Darwin and Alcedo (Isabela), the islets surrounding Floreana, Edén, Española, Santa Fe, Genovesa, Pinzón, Pinta and Marchena, and San Cristobal. Data and specimens have also been collected from monitoring and control programs that are carried out by the Invertebrates Department. Data from the monitoring programs is particularly important for detecting new introductions and changes within populations. Monthly light trapping in the arid zone of Santa Cruz has identified the arrival of two species of Sphingidae (hawk moths); *Perigonia luzca* and *Xylophanes pluto*. These species are possibly native, having reached the Galapagos by their own means. Biennial monitoring of invertebrates was carried out in Alcedo volcano (fourth year of program) and an annual program was initiated for monitoring Lepidoptera in Darwin volcano. Additionally, programs were initiated to monitor invertebrates on the off shore islands of Santiago and native aquatic fauna in San Cristobal, and native ants on Marchena island in response to the impact of introduced species on these islands. As a result of these surveys, in 2000, there were at least 4 new species recorded for science, 15 new reports for Galapagos and 6 new reports for islands. Other records are likely, however, the separation of specimens and identification is a lengthy process.

Ecological monitoring has been given high priority by the CDRS. What is apparent from historical data and literature is that invertebrate baseline data is needed in order to evaluate the current status of native and introduced organisms and identify monitoring priorities. This plan is obviously subject to the availability of funding. Priority for collections has also been given to surveying areas that have never been surveyed such as inhabited areas of the archipelago, foci of introduced species. Study of the insects in the agricultural zone of

Santa Cruz initiated by a thesis student who is doing a complete survey of invertebrates associated with agricultural crops in the wet and dry season.

#### Difficulties encountered and lessons learnt

There is a need for more personnel in CDRS. Staff salary increases due to the inflation of the US dollar (now used as Ecuadorean currency) has cut short funds. There are large number of specimens that need to be separated, mounted and identified. Need for more personnel to work on separating and identifying species. Gaps in knowledge of invertebrate biodiversity far greater than estimated.

Difficulty encountered during training course in November of civil unrest caused by fishing dispute in Galapagos. CDRS offices were directly targeted and some activities were curtailed as a result.

Wider international discussions with other invertebrate collection curators has allowed refinement of curatorial techniques.

#### Timetable (workplan) for reporting period. 2001/2002

<b>Date</b>	<b>Activity</b>
July 2001	UK visits by Ecuadorian staff: 1. Lazaro Roque to visit Cardiff University to work on MSc. Also visit to Natural History Museum, London for identification research. 2. Germania Estevez to visit National Museum of Wales, Cardiff for training in curatorial techniques. Also additional visit to Brussels to visit Galapagos spider specialist
November 2001	Training courses in Galapagos on Diptera & Coleoptera. Total 2 weeks
Feb/March 2002	Training course in soil biology techniques scheduled

## **5. Partnerships**

#### UK and host country collaboration

There have been no problems with collaboration during the reporting year.

#### In-country links and international relationships

CDRS Plants project has established a project on insects associated with endangered plants as a result of increased capacity of the Invertebrate Department

CDRS already has a high profile with mainland Ecuador. However, it is likely that during the period of the grant new links will be made in Ecuador and with others in south America on invertebrate conservation issues.

## 6. Impact and Sustainability

Presentations given in Brazil (International Congress of Entomology), at Montreal (Annual meeting of Entomological Society of America) and Galapagos Day (Royal Geographical Society, London) have raised awareness of invertebrate research in Galapagos.

As a result of these presentations and also changes to the CDRS website reflecting the Darwin Grant more scientists are visiting and there is increased awareness of the collection.

## 7. Outputs, Outcomes and Dissemination

**Table 1. Project Outputs 2000-2001 (According to Standard Output Measures)**

Code No.	Quantity	Description
4A/6A	4 students	Undergraduates that received training in Ecuador
4B/6B	2 weeks	2 weeks of training course in Ecuador
7	2	2 training manual supplied for the two training courses
8	6	Total of 6 weeks spent by 2 people
12A	1	Collection management database established
13A	1	Reference collections established in some groups of invertebrates
13B	1	Invertebrate reference collection enhanced
15B	1	Local press release in host country
16A	1	Web-based newsletter not yet fully established but details of the Darwin project are on the CDRS website

### Additional project outputs

Code No.	Quantity	Description
14B	1	Poster at Entomological Society of America Annual Meeting, Montreal, December 2000

### Publication and dissemination

The project has been the subject of news items in the host country and has been included in Galapagos newsletters. Activities relating to invertebrate conservation will be continued after the end of the project as part of the publicity from the Charles Darwin Research station and the Charles Darwin Foundation.

Formal publications on results from the first year have not yet been completed.

## 8. Project Expenditure

**Table 3: Project expenditure during the reporting period**

Item	Budget	Expenditure
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Total	44,684.00	45,890.84
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## **9. Monitoring & Evaluation**

Evaluation has centred around two basic measures of progress that contribute towards the purpose of the project. One is the number of people that have been trained during the reporting period. The second is that as a result of training has the collection been enhanced? Measures of achievement in the latter are both qualitative and quantitative. Additional specimens collected and added to the permanent collection are counted and also those that have been added to the database. The enhanced capability and confidence in sampling and being able to deal with the identification and preparation different invertebrate groups is a direct measure of progress to date.

## **10. Author(s) / Date**

M.R.Wilson, Cardiff, November 2001