

DARWIN INITIATIVE FOR THE SURVIVAL OF SPECIES

FINAL REPORT

1. Basic Project Details

DETR Project Ref. No.: 162/6/029

Project Title: *Marine Benthic Invertebrate Study
in Coastal Waters of Ecuador*

Contractor: Heriot-Watt University,
Edinburgh

Host Country: Ecuador

Collaborating Institute: Universidad de
Guayaquil

Grant Round: 5

Grant Value: £124,510

2. Project Expenditure

Total Grant Expenditure: £124,510

Breakdown of Expenditure: See Table

Expenditure in Application	Actual Expenditure
Salary Costs	Salary Costs
Overheads	Overheads
Travel and Subsister	Travel and Subsistenc
Printing	Printing
Seminars	Seminars
Capital Equipment	Capital Equipment
Other (Field Work)	Other (Field Work)

Actual expenditure for the Travel and Subsistence part of the budget was underspent by >10% than was anticipated in the proposal. This was due to initial estimates of travelling costs being higher than what actually was the case and because actual subsistence costs in Ecuador were much lower given the pound/sucre exchange rate. Travel costs were also reduced by the UK project leader being able to share transatlantic travel costs with another Darwin project being carried out in Colombia and work on these projects was carried out back to back on single extended overseas trips instead of separate trips. When these T&S savings became apparent, the project leader contacted the Darwin Initiative office to request virement of some money from T&S to the Field-Work/Other costs so that more productive work could be done in the field. This virement was agreed in a letter on 11 June 1997. Subsequently, and for similar reasons, further savings were able to be made in the T&S part of the budget in years 2 and 3 of the project and this saved money has been used for field-work expenditure. The Other (Field Work) part of the budget in the above table therefore shows an overspend of >10% compared to the original proposed budget.

3. Project Background/Rationale

At the time of the proposal, the University of Guayaquil and Heriot-Watt University were collaborating on project proposals with the EU. The University of Guayaquil/PMRC already ran small-scale benthic and taxonomic studies in the coastal zone of the Gulf of Guayaquil but discussions amongst the Institutes clearly identified the need for more detailed knowledge of benthic invertebrate communities in, not only the Gulf of Guayaquil, but also in the north of Esmeraldas province and other representative coastal areas of Ecuador of important biodiversity interest (e.g. Ecological Reserves and National Parks). Ecuador, in addition, needed a specialist unit of people to develop taxonomic expertise in marine invertebrates and to establish a centralised, national reference collection of samples that would benefit the wider community. The project was intended to assist Ecuador in meeting some of the obligations under the Biodiversity Convention (in particular, for example Articles 7, 12 and 13). The main objectives identified by Ecuador's National Working Group on Biodiversity at that time were:

- 1 to strengthen and develop material and human resources for scientific research;
- 2 to promote basic and applied research on biodiversity conservation.

The priority areas identified by the Working Group included: (a) evaluation of the country's biological resources and of the causes of loss and deterioration in biodiversity; (b) conservation of remaining biodiversity by concentrating on a national system of Protected areas; (c) promotion of the passing of legislation on the environment, protected areas and biodiversity.

There was no specific 'end-user' for the project in mind at the outset but rather it was intended that the project would establish a recognised centre where marine invertebrate taxonomic work would benefit the general community of scientists and marine conservation managers in Ecuador.

4. Project Objectives

The objectives of the project in the original application were:

1. To establish a Unit based at the University of Guayaquil (Ecuador) dedicated to the specialised study of marine invertebrate taxonomy and benthic ecosystems.
2. To train young Ecuadorian marine biologists in the techniques and methodology of benthic invertebrate survey, taxonomy and analysis of benthic community structure.
3. To provide training and supervision of these scientists using the expertise of specialist staff in both Edinburgh and Guayaquil.
4. To initiate a programme of accumulating data on benthic communities in specified areas of Ecuador's coastline.

5. To establish a better understanding of the importance of the biodiversity in benthic communities of Ecuador and thereby to attract additional future funding for the continuation of the work of the Unit.
6. To extend and develop Heriot-Watt staff expertise in taxonomy of tropical benthic fauna.

The objectives were not revised during the running of the project. All objectives of the project have been achieved (descriptions of achievements are expanded in the following sections).

5. Project Outputs

Code No.		OUTPUT DESCRIPTION
		TRAINING OUTPUTS (*after measure indicates that the nationality of trainees should be stated)
1.		Number of people submitting thesis for PhD qualification* Not specified for the project and output therefore not achieved
2.	A.	Number of people attaining Masters qualification (MSc, MPhil etc).* Not specified for the project and output therefore not achieved
3.	A.	Number of people attaining other accredited qualifications (ie. not Outputs 1 or 2 above)* Not specified for the project and output therefore not achieved
	B.	Number of training weeks provided
4.	A. B. C. D.	Number of undergraduate students receiving training* Number of training weeks provided to undergraduate students Number of postgraduate students receiving training (not outputs 1-3 above) Number of training weeks provided to postgraduate students Not specified for the original project output table but numerous Ecuadorian undergraduates at the University were trained either as volunteers on the actual project or as part of their University courses using the facilities of the Darwin Unit.
5.		Number of people receiving at least one year of training (which does not fall into output categories 1-4 above)* Two Ecuadorian Darwin Scholars (Ms Daisi Merino and Ms Maria Fernanda Arroyo) trained in UK for ten weeks in Year 2 on benthic taxonomy and faunal analysis. The third Scholar (Ms Alba Calles) was trained for 4 weeks in the UK in Year 3. Training continued in Guayaquil under supervision of Ecuadorian supervisors.

6.	A. B.	<p>Number of people receiving other forms of education/training (which does not fall into output categories 1-5 above)*</p> <p>Number of training weeks provided.</p> <p>Training of 6 Ecuadorian student researcher volunteers at the University of Guayaquil, Ecuador. Part-time training took place initially while UK Project Leader and colleagues were in Ecuador (4x6x0.5=12 training weeks). Part-time training continued throughout the remainder of the time of these volunteers by Guayaquil University staff (Darwin project collaborators) (35x6x0.2=42 training weeks).</p>
7.		<p>Number of training materials produced for use by host country(s)</p> <p>Not specified for the original project output table but numerous materials for the three Darwin Scholars were provided or made available (e.g. taxonomic books) during their training in the UK and Ecuador.</p>
RESEARCH OUTPUTS		
8.		<p>Number of weeks spent by UK project staff on project work in host country(s)</p> <p>In total Dr James Mair, Dr Paul Kingston and Mr Robert Forbes spent 18 weeks in Ecuador.</p>
9.		<p>Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in host country(s).</p> <p>Not specified for the project and output therefore not achieved</p>
10.		<p>Number of formal documents produced to assist work related to species identification, classification and recording.</p> <p>One manual has been produced (see attached documents). An additional taxonomic manual is in the final stages of production for publication.</p>
11.	A. B.	<p>Number of papers published in peer reviewed journals</p> <p>At present no such papers have been published but plans for at least two to be prepared are in progress.</p> <p>Number of papers published or accepted for publication elsewhere.</p> <p>6 papers have been presented by Darwin project staff and published in abstract form at three national conferences/seminars in Ecuador (see attached documents).</p>

12.	A.	<p>Number of computer-based databases established (containing species/genetic information) and handed over to host country Not specified for the original project output table but a computer database of all specimen material collected and stored in the Darwin Unit has been established using appropriate benthic diversity software bought for and donated to the project. Ecological results from field surveys have also been stored on this database.</p>
	B.	<p>Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country Not specified for the project and output therefore not achieved</p>
13.	A.	<p>Number of species reference collections established and handed over to host country(s) Species reference collection established at Guayaquil. This is now being consolidated and enlarged throughout and beyond project.</p>
	B.	<p>Number of species reference collections enhanced and handed over to host country(s) Not specified for the project and output therefore not achieved – no species collection existed at the University for enhancement.</p>
DISSEMINATION OUTPUTS		
14.	A.	<p>Number of conferences/seminars/workshops organised to present/ disseminate findings from Darwin project work in host country. 4 in total</p>
	B.	<p>Number of conferences/seminars/workshops organised to present/ disseminate findings from Darwin project work elsewhere. none</p>
	C.	<p>Number of conferences/seminars/workshops attended at which findings from Darwin project work have been presented/disseminated in the host country. two</p>
	D.	<p>Number of conferences/seminars/workshops attended at which findings from Darwin project work have been presented/disseminated elsewhere. none</p>
15.	A.	<p>Number of national press releases or publicity articles in host country(s)</p>
	B.	<p>Number of local press releases or publicity articles in host country(s)</p>
	C.	<p>Number of national press releases or publicity articles in UK</p>
	D.	<p>Number of local press releases or publicity articles in UK Not specified for the original project output table but numerous Ecuadorian local press releases mentioned visits of UK staff to Guayaquil and the Seminar/workshop in March 2000 at the conclusion of the project.</p>

16.	A.	Number of newsletters produced Four (see attached documents)
	B.	Estimated circulation of each newsletter in the host country(s) 150
	C.	Estimated circulation of each newsletter in the UK 20
17.	A.	Number of dissemination networks established in host country
	B.	Number of dissemination networks established in elsewhere
	C.	Number of dissemination networks enhanced/extended in host country
	D.	Number of dissemination networks enhanced/extended in elsewhere
		Not specified for the original project output table but it can be considered that networks (such as Ecuador's National Working Group on Biodiversity – marine section) has been enhanced/extended through the project. It could also be considered that a new network (encompassing workers not directly involved in the Working Group) has been established through the March 2000 Darwin Seminar/Workshop. There are plans to make this Seminar/Workshop an annual event (see section 7).
18.	A.	Number of national TV programme/features in host country(s)
	B.	Number of national TV programme/features in UK
	C.	Number of local TV programme/features in host country(s)
	D.	Number of local TV programme/features in UK
		Not specified for the original project output table and none achieved
19.	A.	Number of national radio interviews/features in host country(s)
	B.	Number of national radio interviews/features in UK
	C.	Number of local radio interviews/features in host country(s)
	D.	Number of local radio interviews/features in UK
		Not specified for the original project output table but several (3) local (Guayaquil) interviews took place.
		PHYSICAL OUTPUTS
20.		Estimated value (£'s) of physical assets handed over to host country(s) £11,576.71 of capital assets (computers, microscopes, sampling equipment, bibliography etc) handed over.
21.		Number of permanent educational/training/research facilities or organisations established One – Darwin Unit Laboratory Facility
22.		Number of permanent field plots established Five permanent sites established

		FINANCIAL OUTPUTS
23		Value of resources raised from other sources (ie. In addition to Darwin) for project work. No significant additional resources (see section 8) but some ‘in-kind’ support and donation of £206 from Heriot-Watt University in the form of an additional software package for benthic data analysis for the Darwin Unit computer.

6. Project Operation/Management

Within the research aspect of the project numerous qualitative and quantitative surveys of marine invertebrates were carried out along the whole coastline of Ecuador (for further details, please see attached documents). These surveys were carried out by the main Ecuadorian staff employed by the project (Co-ordinator/specialists – Biol. Elba Mora de Banos and Dr Manuel Cruz, and the Darwin Scholars – Biols. Maria Fernanda Arroyo, Daisi Merino and Alba Calles). A major training/research exercise at the beginning of the project was to develop and adapt standard techniques and methods for collection (both qualitatively and quantitatively) of samples, their handling for optimum narcotisation, fixing, preservation and curation. These specialist techniques, for each of the major invertebrate marine phyla, have been presented for the first time in Spanish in a manual published by the University of Guayaquil through funding from the Darwin Unit (*Guia de Campo para la Coleccion y Preservacion de Invertebrados Marinos* – (2000) – ISBN-9978-59-005-6. Please see copy of this manual with the attached documents. Research findings from the project have been presented at various seminars in Ecuador and papers are in preparation for presentation in peer-reviewed scientific journals. Information on samples collected by Dr David Reid (NHM), will also be published once analysed and collated.

Within the training aspect of the project, the three Darwin scholars received guidance and training whilst in Ecuador from the Ecuadorian project specialists and also from visiting UK specialists. In year 2, Biol. Maria Fernanda Arroyo and Biol. Daisi Merino spent ten weeks in Edinburgh where specialist training in taxonomy and data management was given. Time was also spent with staff at the zoology sections of the National Museum of Scotland, Edinburgh and the NHM, London where further advice and training on curation and museum collection procedures was provided. In year 3 Biol. Alba Calles. made a four-week visit to the UK for similar training but for specialisation on the phylum Annelida. Training in Ecuador was also provided for numerous project volunteers (students from the Faculty of Natural Sciences) – please see 6-monthly and yearly reports for further details.

No major adverse issues or difficulties arose from running and managing the project. Good communication between UK and Ecuador project co-ordinators was maintained throughout the project. In the first year there were administrative difficulties encountered in getting money transferred from Heriot-Watt University to the University of Guayaquil’s bank

account but once a system was established with Ecuador's Central Bank then transfers subsequently occurred smoothly. Only minor issues occurred otherwise (details in 6-monthly and yearly reports).

7. Project Impact

The Darwin project has assisted Ecuador in meeting some of its obligations under the Biodiversity Convention and specifically those mentioned in the original proposal. For example the project has undoubtedly helped strengthen and develop material and human resources for scientific research (in this relatively under-studied area of marine invertebrates). It has also helped to promote basic and applied research on biodiversity conservation. The project has acted as a focus for the developing National Working Group on Biodiversity (marine invertebrate section) and this group will be meeting regularly with the aim of giving advice on future biodiversity/conservation initiatives. On another front, it is everyone's intention that the Darwin Initiative Seminar/Workshop on Marine Invertebrates (held in March 2000 at the conclusion of the project) should be considered as the first in a series of annual events in the future. The University of Guayaquil has already agreed to host these future events. The March 2000 Seminar/Workshop proved useful by gathering together all interested workers in Ecuador (and also participants from Peru, Colombia, UK and Belgium). These scientific meetings will also act as a focus for further integrated development of marine invertebrate studies in the region.

The project has addressed real skill needs by providing specialist training for three Darwin Scholars. They in turn, along with the project specialist of the project (Biol. Elba Mora de Banos and Dr Manuel Cruz) also passed (and continue to pass) on their skills and experience gained to a number of volunteer students on the project. The facilities of the Darwin Unit, being set in a University Faculty which teaches undergraduate courses, was used (and will continue to be used) as a resource (both human and physical) for training the Faculty's graduates.

The project specialists continue in their posts both in the University Faculty as teachers as well as their posts in INP and INOCAR (see section 11). They will thus be able to oversee future biodiversity/conservation study work.

Darwin Scholar 1 – Biol. Maria Fernanda Arroyo is now working on a short term contract (funded by the Oil/Gas company - EDC) to undertake an environmental impact study of marine invertebrates on an island close to the offshore development in the Gulf of Guayaquil. In particular Ms Arroyo is collecting gastropod mollusc specimens (her taxonomic speciality) as indicators and these specimens, once catalogued, will be added to the reference collection of the Darwin Unit.

Darwin Scholars 2 & 3 – Biol. Daisi Merino and Alba Calles are now working within a larger, 9-month project being run by INP – specifically they are sampling for marine invertebrates in the little studied area of the mangroves and estuaries of the Cayapas-Mataje Ecological Reserve in the extreme north of Ecuador (Esmeraldas Province). They, through

an agreement with the University of Guayaquil, are also able to continue to use the facilities of the Darwin Unit laboratory for this work and specimens from this project will be catalogued and added to the Darwin Unit reference collection and the information included on the database. Additional funds (for these two biologists to be able to devote even more time to this project) have been sought from the 100% Fund of Fauna and Fauna International (FFI). A decision on this funding request should be known by the end of September 2000.

The Darwin project, in addition to enabling direct collaboration between staff of Heriot-Watt University and University of Guayaquil, also involved collaboration with staff in the marine zoology sections of the National Museum of Scotland and the Natural History Museum, London. The Darwin Scholars, when over in the UK for specialist training spent some time with staff at both these institutions. Dr David Reid, from the Mollusc Research Section of the NHM in London also spent time with staff at Guayaquil and was accompanied by them on site visits to collect material to further his research on littorinids. The Darwin project has helped to bring together Ecuadorian researchers, in different organisations, who are working on marine invertebrates. The most notable of these collaborating institutions are INP and INOCAR (see section 11). However, most recently the move of the newly-established CEBIMAR (Centre for Marine Biodiversity of Ecuador's Ministry of the Environment) to share and combine the facilities of the Darwin Unit within the University of Guayaquil is very significant for the potential for future research collaboration and information exchange

8. Sustainability

The Host Country Institute (University of Guayaquil) contributed various resources to the project on an 'in-kind' basis. These included laboratory and office space for the 'Darwin Unit' within the research building of the Instituto de Investigaciones de Recursos Naturales (IIRN) at the University's Faculty of Natural Sciences. Other facilities such as administrative/accounting/secretarial support were provided and also the Faculty's bus was made available for field work trips and staff transport during UK staff visits. A monetary value estimate of these various 'in-kind' contributions would be around £5,000.

During the lifetime of the project no other sources of direct funding were attracted although several 'in-kind' contributions may be identified. Staff from the Instituto Oceanografico de la Armada (INOCAR) contributed staff time to assist in the taxonomical studies – particularly of the polychaete groups. The Instituto Nacional de Pesca (INP) had staff who contributed time to some of the work and also made their research vessel available for deeper water sampling as well as providing some specimens to the Darwin Unit from their own fisheries research cruises. A monetary value estimate of these various 'in-kind' contributions for this would be around £2,000.

The work of the Darwin Initiative project is continuing, thanks to staff becoming involved in related smaller scale projects recently started (see further details in Sections 5 & 7 of this

report). These staff are able to use the resources and facilities of the Darwin Unit to carry out these projects but also sample collection and species distributional information will be able to augment the databases developed during the Darwin project. The recent move of having CEBIMAR join up with the Darwin Unit should ensure that similar work continues and develops further into the foreseeable future. In this sense the Darwin Initiative project has very much acted as a catalyst and focus for enabling further projects in the future. Former Darwin project staff and the scholars are actively pursuing proposals for other related projects.

9. Outcomes in the Absence of Darwin Funding

If Darwin Funding had been unavailable for the project it is highly likely that this particular project would not have proceeded. There was a clearly identified need for the establishment of a specialised Unit to advance work on marine invertebrate taxonomy/biodiversity in Ecuador but there were very few identified sources of funding that would have been likely to have been able to provide the type of international collaborative training and research required to set up a successful Unit. If the project had not been undertaken then it is likely that disparate workers would have continued their work on small-scale studies without any clear national strategic focus. Very recently, The Ecuadorian Ministry of the Environment has set up a Centre for Marine Biodiversity (CEBIMAR) which aims to provide a focus for gathering information already published or in unpublished reports on ecuadorian marine fauna and flora. The activities and facilities of the established Darwin Unit, which carried out practical field work collections and established a physical collection of specimens, are therefore very complementary to the work of CEBIMAR and it is encouraging to note that the offices of CEBIMAR are going to combine and be based alongside the Darwin Unit in the University of Guayaquil's IIRN Building.

10. Key Points

The main success of this project has been the establishment of a nationally recognised Unit in Ecuador dedicated to the study of marine invertebrates over all the continental coastline of Ecuador (and now also including information from Galapagos and other offshore island areas – Isla de la Plata, Isla Santa Clara, etc.) and the maintenance of carefully curated invertebrate specimens in a centralised collection. The Initiative has become well known in Ecuador amongst the community of marine research workers and the final Darwin Project Seminar/Workshop resulted in, by popular decision, the aim of making this type of Seminar a yearly event – based on the focus of the work of the Darwin Unit at the University of Guayaquil. The key to the success of these achievements has undoubtedly been the enthusiasm and hard work of the Darwin project team in Ecuador. Additionally, the fact that the host-country co-ordinator and project specialist (Biol. Elba Mora de Banos and Dr Manuel Cruz) are well known in the marine science community and have good contacts nationally and internationally has been of great benefit.

The main problem/difficulty encountered by the project has been the continuing severe economic crisis afflicting Ecuador that affects all aspects of practical and administrative work. It was extremely difficult to find additional funds to complement the work of the project and therefore the core activities of the project relied entirely on Darwin funding.

The key lesson from this Darwin project is the importance of choice of project members of the host country team. The three Darwin Scholar biologists, who received the main training in Ecuador and Edinburgh, were selected carefully from a number of candidates by the Host Country Co-ordinator and the UK project leader jointly. The leaders of the Host Country team, being well known in their field of work nationally, also undoubtedly proved to be important to the project's success.

11. Project Contacts

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Please see, attached, copies of documentation produced by the project.