



***Darwin Initiative for the Survival of Species
Final Report***

Project Reference Number 162/7/147

***Marine Habitat Mapping Development
in San Andres Archipelago, Colombia***

April 1998/March 2001

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1. Darwin Project Information

Project title	Marine Habitat Mapping Development in San Andres Archipelago, Colombia
Country	Colombia
Contractor	Heriot-Watt University, Edinburgh
Project Reference No.	162/7/147
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2. Project Background/Rationale

The project took place in Colombia's San Andres Archipelago in the Caribbean. Following earlier tentative contacts with regard to joint research and training interests, the Responsible Person (James Mair) for this Darwin Initiative project was invited to visit the collaborating Institution (CORALINA), San Andres Island, Colombia in 1997. Meetings during that visit identified several areas of potential collaboration in research and training of benefit to the conservation activities and environmental/social responsibilities of CORALINA. As a result, CORALINA and Heriot-Watt University collaborated and submitted a successful EU proposal (INCO-DC Programme) on "Appropriate Marine Resource Management in Island Ecosystems". The organisations also applied unsuccessfully to other programmes/agencies (e.g. Leverhulme Foundation) for appropriate funding to assist in exchange of staff and student researchers. Before the marine resources of the Archipelago could be properly managed it was important that the regulating/conserving agency had comprehensive scientific knowledge of the submarine habitats which up until then had only been studied in detail in a few places around the Islands. The specific Darwin Project, which was submitted and approved, was therefore regarded as being of major importance to CORALINA'S biodiversity protection programme by helping to develop modern and comprehensive mapping activities in the organisation.

In 1993, Colombia passed new Environmental Framework Legislation (Law 99) the main principles of which follow the lines of the 1992 Rio de Janeiro Declaration. In 1994 the National Environmental Policy (CONPES Doc. 2750) provided general guidelines for the

priority environmental programmes defined in Colombia's National Development Plan. Three of the six priorities include; 1) the preservation of strategic ecosystems, 2) improved management of water resources, 3) restoration of marine and coastal systems. As an autonomous regional organisation responsible for environmental matters in the Biosphere Reserve of the Archipelago of San Andres, Providencia and Santa Catalina, much of CORALINA's interests lie in conserving and sustainably managing the marine resources of the islands for the social benefit of the indigenous islanders. This Darwin Initiative project was therefore designed to assist the organisation in furthering the fulfilment of Colombia's obligations under several articles of the Biodiversity Convention, mainly in assessment and monitoring, in-situ conservation, training, and public education/environmental awareness.

3. Project Summary

The main objectives of the project were:

1) To establish a unit within the organisation CORALINA (San Andres, Colombia) to specialise in the development of new and, the modification of, established techniques in comprehensively mapping the islands' major marine habitats.

2) To initiate a programme of data collection and mapping of important marine habitats around the main islands of the archipelago. These habitats include mangrove areas, seagrass beds, coral reefs, and various sedimentary and rocky substrates. This mapping exercise was seen as a fundamental requirement in forming an information base essential to CORALINA's other responsibilities of monitoring and managing the marine resources for conservation/sustainable development objectives.

3) To train Colombian researchers during courses in the UK and in San Andres on the techniques and methodology of sonar mapping, diving survey and the resulting habitat data analysis.

4) To assist CORALINA in promoting its activities of increasing awareness of the fragility of the Archipelago's marine resources and the need for the sustainable management of them amongst local residents/stakeholders and seasonal visitors.

5) To assist CORALINA, once project specific local expertise and reputation was established, in attracting further research and development funding for the extension of habitat mapping techniques in its coastal waters.

6) To extend and develop Heriot-Watt University staff and research student expertise in tropical habitat assessment.

There were three significant changes to the initial operational plan of the project:

i) Two developments occurred between the dates of project proposal submission and the project being approved for starting. One development was the arrival of another funding source for obtaining diving equipment for the Colombian organisation. Another

development was that the original CORALINA staff member identified as project co-ordinator was offered and took up a PhD studentship in Puerto Rico. The Director of CORALINA therefore took over as project co-ordinator for the Colombian team but since her salary was fully covered, she suggested that this money be put towards other uses for the project. Amendments were proposed and agreed by DETR to reallocate money within the agreed budgets to buy other, additional equipment (satellite images, GIS software) beneficial to the overall aims of the project. Other savings (from diving equipment purchases, etc.) were put towards additional field work costs. Amendments to the outputs and project were agreed with DETR in September 1998. The original objectives were still expected to be achieved with further enhancements from the additional equipment and software bought.

ii) Due to technical and administrative/legal difficulties, arrangements for one of the Darwin Fellows to undertake a MSc degree at Heriot-Watt University in Year 2 could not be executed. Following discussions and agreement in July 1999 with DETR, the money budgeted for this training was instead used to provide a Remote Sensing Workshop, run by Heriot-Watt staff, at CORALINA in March 2000 at which 8 staff were trained. This had not been planned in the original proposal but, with the revision and purchase of new satellite imagery and GIS software for the project (see above) it was considered greatly beneficial for CORALINA staff in order to fully utilise these resources.

iii) The Side Scan Sonar survey of large areas of seabed around the San Andres islands, originally scheduled for Year 1, was delayed several times due to logistical transport and equipment availability problems (as described in Annual Reports). Eventually the survey took place successfully in Year 3 – September 2000. This did not affect the overall project and indeed permitted more ground-truthing work and identification of key sites to be carried out which helped in the planning of the sonar survey.

The Articles under the Convention on Biological Diversity (CBD) that best describes the project include:

Article 7 – Identification and Monitoring

Article 16 – Access to and Transfer of Technology

Article 12 – Research and Training

Article 17 – Exchange of Information

The project successfully met all its major objectives, including the revised work that was approved after project initiation (see above). Outputs are described below.

Several additional developments occurred on the project. By collaborating with staff at Edinburgh University, an important piece of equipment (spectrophotometer) was obtained on loan from NERC (Natural Environment Research Council) to take out to San Andres for a further period of field measurements in September 2000. This enabled extremely useful calibration data to be obtained that were valuable in being able to interpret more from the satellite images bought for the project. Through separate funding (RGS, EPSRC and Heriot-Watt University Alumni travel grants), two Heriot-Watt

University PhD students were able to assist the CORALINA team in carrying out the sonar survey and additional ground-truthing field work in the September survey. Further separate funding was obtained from several sources to enable additional research to be carried out by UK students on the project, e.g. two Edinburgh University students obtained University travel grants to assist in the ground truthing and mapping associated with the sonar survey. Another Heriot-Watt University MSc student obtained NERC and Heriot-Watt University Travel grants to undertake his 4-month (May to August 2000) MSc dissertation to map habitats in Providencia island associated with important juvenile lobster nursery areas. All these studies will contribute to the overall work of the project and provide additional data for use by CORALINA.

4. Scientific, Training, and Technical Assessment

The main research component of the project was to use a variety of methods to develop expertise in comprehensively mapping the submarine habitats of large areas around the Archipelago. Methods employed included analysis of satellite imagery, calibration of seawater/seabed reflectivity/absorbance in order to enhance satellite data, side-scan sonar imagery of different habitats, photography and video mosaicing of smaller areas of seabed and finally manual collection/observations of benthic communities and biota samples to properly describe community components of each habitat. An overriding aim of this research was to enable comparison and integration of data collected (in a Geographical Information System) at these different scales of survey techniques. Two Colombian CORALINA staff were employed to specialise on this project – Martha Ines Garcia – a marine biologist, and Anthony Mitchell – a scientist specialising in remote sensing/GIS work. Other CORALINA staff and visiting research students also contributed to the surveys and analysis. The main expertise contributed by UK staff was in survey design, planning and execution (Dr James Mair and Mr Bobby Forbes – Heriot-Watt University); data handling of Remotely Sensed information and calibration of satellite images (Dr Jimmy Young – Heriot-Watt University, and Drs Tim Malthus and Chris Place from Edinburgh University who collaborated with the project in its final year). A major contribution has also been made by Ms Evanthia Karpouzli – a PhD student at Heriot-Watt University (1998-2002) who has been able to base much of her research on this Darwin Project, especially in the satellite and side-scan sonar analysis and interpretation. Two scientific publications have been presented at an international conference (September 2001) and one joint paper has been peer-reviewed and is in press in an international journal. Much of the extensive biological information collected has only recently been completely analysed (and is now being interpreted at CORALINA) and much of the detail of the processed sonar data, due to technical problems now overcome, is still yet to be fully analysed (which will form the final part of Ms Karpouzli's PhD thesis). Several joint papers are therefore planned for peer-reviewed journals, but given the lengthy nature of the type of work involved these publications will probably be appearing in 2002 (a year after the official end of the project).

Another main component of the project was in training and capacity building. This included in the UK general survey planning training of the two Darwin Fellows – Martha

Ines Garcia and Anthony Mitchell. In Colombia, they were further trained in *in-situ* practical survey techniques during visits by UK staff. Other CORALINA staff members were included in this *in-situ* training, including basic PADI training qualifications (8 certificates obtained) and technical use of diving survey methodology. Martha Ines Garcia, the Darwin Fellow biologist led the continued training of other CORALINA staff and visiting Colombian students working on biological sample collections at CORALINA. A major training course in Remote Sensing, given by Dr Jimmy Young from Heriot-Watt University, took place in San Andres in March 2000 and this was attended by 8 CORALINA staff. The main beneficiary of this was Anthony Mitchell, the other Darwin Project Fellow. Because of his specialisation in Remote Sensing and GIS work Anthony Mitchell has subsequently been able to train many local students and technicians in San Andres (see Section 10 below).

5. Project Impacts

The following text was provided by CORALINA as part of their response (in April 2001) to Questionnaire B of the ECTF Darwin Rio+10 project:

As the project is in its final year, most proposed outputs are in process. Research is completed and data are being analysed. Extensive training, in both Colombia and the UK, has been carried out and multiplied. Copies of all outputs will be lodged locally and made available to in-country project beneficiaries. Final results will be disseminated at a local conference and in workshops and presentations. Of the Darwin Students, two have completed their commitments and a third has completed a dissertation (defending in May). A second dissertation is in process. Two new Darwin Students will join the project to assist with final laboratory and data analysis, producing papers. A paper resulting from early project research has been submitted for publication and Darwin Fellows at CORALINA will complete two additional papers, with the potential for more. As mentioned earlier, the impact from knowledge and expertise gained in the project is already substantial within the host country. Completion of final outputs will assure a highly productive project, advancing Darwin aims and providing additional benefits in Colombia.

Since the project is ongoing, key successes already identified that have resulted from project activities are: increased capacity of GIS and RS (Remote Sensing) expertise and tools in the San Andres archipelago, expanded information and database on marine benthic habitats and biodiversity, production of marine habitat maps, and establishment of permanent transects with baseline data for coastal waters monitoring. Equally as important, since the Darwin Project was this agency's first international collaboration, the lessons learned and skills of project administration and management gained are of inestimable value. Of especially significant long-term benefit to CORALINA's work are: experience at working in a multidisciplinary framework, both internally and with collaborators; enhanced skill at project development and execution; and the generation of new international ties, projects, and funding to guarantee the project's legacy

Please also see Appendix I (page 17) for project contributions to CBD Articles.

6. Project Outputs

Project Outputs are quantified in Appendix II – page 19. Outputs, originally planned but eventually not achieved were:

2. – CORALINA Biologist (one of the Darwin Fellows) was not able to attend MSc course at Heriot-Watt University (see Section 3 above for explanation). However, as a consequence of the Darwin Project two students (one from Heriot-Watt University and one from Duke University, USA) carried out research contributing to the project and subsequently used this towards their MSc degrees at their respective Universities.

18A/B/C – No TV interviews eventually resulted although there was interest, which did not materialise, from the Discovery Channel to cover the side scan sonar survey work of the project.

Other original planned outputs only partly achieved so far include:

11A/B – One scientific paper has been peer-reviewed and is currently in press. Other scientific papers for peer-reviewed journals are still in preparation (see Section 4 above for explanation) but it is still expected that in the long term the target of 7 scientific papers will be met.

17A – Establishment of Dissemination Network – in the original proposal it was envisaged that the work of the Darwin project would enable CORALINA to establish a Caribbean-wide network specifically concentrating on seabed mapping techniques. The resulting ‘looser’ network that CORALINA operates, through the Darwin Project and its other collaborative programmes/contacts, enables them to disseminate and receive information about progress in a wider range of areas related to their functions of conservation management/environmental control.

Original outputs that were enhanced over planned levels include:

4 – As a result of initial training provided during the Darwin project (see Section 3 & 4 above) Anthony Mitchell, one of the CORALINA Darwin Fellows, received a full scholarship for a 32-week specialist training programme on remote sensing (RS) and geographic information system (GIS) application for tropical coastal and marine ecosystem management at ITC (International Institute for Aerospace Survey and Earth Sciences) in the Netherlands (See section 11).

6A/B – Training courses run by Darwin-trained CORALINA staff (see Section 10 below) include:

	People	Duration
Training in the use of spectro radiometer, light sensor, collection of data in field	3	30 weeks
Training in the use of a differential GPS, collection of data in field.	3	12 weeks
Training in the use of a differential GPS	32	2 days
Training in digital image processing	3	8 weeks
Training in side scan sonar data collection	2	2 weeks

GIS and remote sensing	(SENA)	9	6 weeks
GIS and remote sensing	(INFOTEP)	28	4 hours

Additional outputs achieved include:

9 – The following management plans have been completed, supported with information gathered in the Darwin project

- Management plan for Johnny Cay
- Management plan for Rose and Haines Cays
- Management plan for Old Point Regional Mangrove Park
- Draft management plan for Seaflower Biosphere Reserve

Information from the Darwin project was also used in:

- Nomination of the Seaflower Biosphere Reserve to UNESCO (accepted by the Man and the Biosphere programme November 2000)
- Development of a project to establish a system of multiple-use marine protected areas in the archipelago (accepted by the Global Environment Facility May 2000)
- Development of a project of coral recovery in the coastal waters of San Andres and Old Providence (accepted by the Environment Ministry for special project funding from the InterAmerican Development Bank January 2001).

16A/B -	Number of issues of newsletters produced in the host country(s)	2
	Estimated circulation of each newsletter in the host country(s)	500

Material and publications generated are described in Appendix III – page 21.

Information leaflets have been produced by CORALINA (see Appendix II) to publicise locally and to other relevant Institutions the work that has been carried out by the Darwin project. A major opportunity arose to disseminate scientific research results from the project when the International COLACMAR (Congreso Lationamericano Ciencias del Mar – see Section 9 below) conference was held in San Andres in September 2001 – CORALINA were joint organisers for this conference. Two scientific technical papers from the project survey work were presented at this conference. Due to the type of work involved in sorting, identifying analysing and interpreting biological samples collected there will be a relatively long lead time before scientific papers (under preparation) will appear in peer-reviewed journal. Similarly, due to delays in obtaining fully processed sonar survey data, results are only now being fully analysed and interpreted by the Heriot-Watt University PhD student for her thesis. It is expected that several more papers will be produced jointly by the various UK and Colombian team members. Information dissemination of this type is therefore expected to continue for some time but not at any significant cost since publication production is in any case part of the normal duties required of staff and research students.

7. Project Expenditure

8. Project Operation and Partnerships:

The following text was provided by CORALINA as part of their response (in April 2001) to Questionnaire B of the ECTF Darwin Rio+10 project:

The partnership created by the Darwin Project between Heriot-Watt University, Scotland UK, and CORALINA, San Andres archipelago, has been very productive for this Colombian government institution. As the first international co-operation project in which CORALINA has taken part, this young agency was placed in a new and unfamiliar role. As partner, Heriot-Watt not only led the project but also guided and trained CORALINA in international project implementation, enabling the development of further collaborations. These two institutions plan to strengthen their partnership with future projects. During project planning, CORALINA was consulted on all points and its input was respected. However, owing to lack of experience with project development, CORALINA was poor at defining certain needs and unrealistic about others. Through the execution of the Darwin project and the collaboration with the UK partner institution, this agency is now able to more accurately clarify its needs and develop projects that better take into account its capacity and limits.

CORALINA is a government environmental management institution and is the sole representative of the National Environment System (SINA) in the department. Carrying out national environmental policies in the archipelago is part of CORALINA's mandate. Therefore, Darwin Project objectives were carefully defined to advance priorities of the National Biodiversity Policy (1995): to increase knowledge about key resources, manage biodiversity information, and strengthen technical and management capacity of both the

state and society.

This project does not require a high level of general community participation in its direct execution, but it is strengthening CORALINA's work with the community in related areas. Remote sensing expertise gained in the project has been and will continue to be multiplied to local technicians and students. Marine research results form part of the knowledge base for activities that require in-depth community involvement, particularly establishing zones, policies, and management strategies for the system of marine protected areas.

Other government agencies besides CORALINA took part in project activities including the National Training Institute, Coast Guard, INVEMAR, and local departmental and municipal offices. Project collaborations continue with government agencies as maps made during the project are being used by the local planning board and incorporated into the National Coastal Zone Management Policy. GIS expertise developed in the project is one of CORALINA's contributions to the Territorial Ordering Plan, an inter-institutional process being carried out under the direction of the national planning office.

9. Monitoring and Evaluation, Lesson Learning

Dr James Mair (Heriot-Watt University) and June Marie Mow Robinson and Marion Howard (Director and International Projects Co-ordinator of CORALINA respectively) co-ordinated the monitoring of the overall project in the UK and San Andres throughout the life time of the project and continue to be in contact with regard to resulting scientific result dissemination. The progress of the initial period of training of the 2 Colombian researchers (Darwin Fellows) was followed closely and their strengths and specialities were used in the most effective way for the training of further trainees in the project. The full complement of UK specialists were present to assist in the first full *in-situ* surveys of the project and major evaluation and further planning took place before they returned to the UK. Regular progress reports between co-ordinators ensured structured development and management of the continued training and survey programmes. The use of experienced supervisory staff, the training of trainers, and the selective use of volunteer students to assist in the project, helped the project achieve good value for money. Results and project achievements will be published regularly by CORALINA as part of its normal programme of producing information booklets/pamphlets on coastal management and bioresource conservation in the archipelago. CORALINA monitors the success of its public information campaigns in the local community. These publications are aimed primarily at local stakeholders but more specialised data produced by the project have been disseminated in local workshops and at an International Conference held in San Andres in September 2001 (COLACMAR - Congreso Lationamericano Ciencias del Mar – see web site: www.colacmar.com.co). The results of project research findings will be published in the Proceedings of this Conference and other papers are in preparation for publishing in relevant peer-reviewed scientific journals and therefore to be externally evaluated.

My main comments on the Darwin initiative as a whole were outlined in Questionnaire A

of the ECTF Darwin+10 Project, but basically they are that it is an extremely worthwhile initiative and greatly develops further international co-operation. I would like to see perhaps more central co-ordination from DEFRA on aspects of contacts and advice on follow-on finding sources and sharing of information – however, this appears to be well in progress.

It is useful here also to repeat some of the comments provided by partners CORALINA as part of their response to Questionnaire B of the ECTF Darwin Rio+10 project:

The aims of the Darwin Initiative are very much in keeping with the needs of developing nations in the Latin American and Caribbean (LAC) region to improve biodiversity conservation. This initiative also plays a major role in allowing poorer countries to fulfil obligations under the Convention on Biodiversity, which they are often unable to do because skilled human and financial resources are lacking. The emphases on training host country partners and developing ways to sustainably use natural resources in order to eliminate poverty are of vital importance. The Darwin Initiative's concern with sustainable development and appropriate resource management, combined with its insistence on consultation in project planning, distinguish it from international co-operation programs that are oriented towards pure investigation (versus applied research) and preservation (versus conservation management). Less well-articulated programs carry the potential risk of providing more benefit to the lead agency than to overseas partner(s) and can even result in exploitation of host country collaborators.

Prior to CORALINA's involvement with the Darwin Initiative, this program was unknown in the San Andres archipelago. It is apparent from the recognition accorded the project by national and international contacts and collaborators, that the Darwin Initiative enjoys the highest reputation for the quality and significance of its biological diversity projects. Darwin Projects are considered to set high standards, be based on sound science, be creative, and produce lasting benefits for host countries.

Because of the Darwin Initiative image, as mentioned above, collaborating in a Darwin Project offers substantial opportunities for leveraging sequential and new funding. CORALINA has benefited from the prestige associated with a Darwin Project, having designed and received funding for two related projects. One of these is a GEF biodiversity project that CORALINA developed to ensure conservation of marine biodiversity and habitats, implemented by the World Bank.

The partnership created within this particular Darwin Project has been productive and is expected to continue beyond project completion. Within CORALINA and the San Andres archipelago, which until recently has tended to be isolated from national and regional activities, there is no knowledge of other partnerships on which to judge the success of those created by the Darwin Initiative as a whole.

As host country organisations are often inexperienced at developing and executing projects, potential partners in poor countries would benefit from training in how to realistically define the financial and human resources needed to carry out biodiversity conservation projects. There is also a related tendency to over-commit resources (particularly those requiring "real" money versus in-kind) to projects. This lack of realism during project planning - resulting from inexperience, inadequate training, and the desperate need for the potential benefits generated by a Darwin Initiative (or other

international collaboration) project - ultimately results in excessive unplanned costs to host country partners, failure to complete project responsibilities, or both. If well planned and executed, the impact of Darwin Initiative projects will be very positive during project execution and in the short term, as the aims and objectives set forth by the Darwin programme are achieved. Whether these impacts are sustained over the long-term obviously depends very much on individual project collaborators, especially those in the host country. However, Darwin's outstanding reputation would indicate that positive impacts are being sustained in the long-term.

Clearly Darwin Projects help conserve biodiversity in poorer countries. For a program that is not quite a decade old, this initiative is already building a lasting legacy and has helped many nations to start fulfilling their obligations under the Convention on Biodiversity.

To achieve maximum benefit in developing nations, sustainable development and the alleviation of poverty should be priorities. Darwin Initiative Aims should continue to emphasise resource management, biodiversity use, training, on-the-ground partnerships, and information-sharing over "ivory tower" scholarship. Aims and methods should promote civic empowerment through active community participation and sharing information with the general public and minority groups, to alleviate the risk that benefit from international co-operation projects go to the privileged. Given the history of centralised power and controlled distribution of resources and educational opportunities in many developing nations, this is a real threat as groups with the capacity to carry out projects are often run by the elite. Involving local communities also ensures that the new scientific knowledge generated by Darwin Projects is augmented by traditional wisdom of the people of the host country.

Third World organisations often have neither resources nor experience to design a project, even when collaborating with a UK partner, as this is usually done by correspondence. To ensure sound project development and maximum benefit to collaborators in poorer countries, the Darwin Initiative could consider the feasibility of developing a planning phase. So that project activities, outcomes, and budgets best serve partners' needs, small amounts of funding could go to promising projects to: 1) cover minimal costs so that host countries could put adequate human resources into project development, 2) support training in project design, and 3) permit face-to-face work sessions between partners. Alternatively, a component within projects carried out with inexperienced host country partners could be practical training in project development and administration to both better project execution and promote the leverage of funds needed for long-term project sustainability.

Another hindrance to adequate management of biodiversity in developing nations at the institutional as well as the community level is lack of information. Books, periodicals, maps, and other reference materials are generally very hard to acquire. Strengthening host country reference collections, document centers, etc. about biodiversity conservation could be a Darwin Initiative priority.

10. Darwin Identity:

The following text was provided by CORALINA as part of their response to Questionnaire B of the ECTF Darwin Rio+10 project:

As both an independent project and CORALINA's first international partnership project, the marine habitat mapping project was solely identified with the Darwin Initiative and UK partner, Heriot-Watt University. The Darwin Logo was displayed in the project work space, at training courses, to illustrate articles in the CORALINA newsletter and local periodicals, and at all presentations given by project researchers, both in Colombia and internationally. It will also be put on all publications and special reports that are outputs. Activities that have particularly disseminated project results and information on the Darwin Initiative include posters displayed at conferences, a booth at the navy's maritime week exhibition, presentations at national institutions, participation in international workshops and training sessions, and modules on GIS and remote sensing given by a CORALINA Darwin project researcher for local technical training institutes. Two CORALINA lead researchers in San Andres have the role of Darwin Fellows, while four - three undergraduate and one graduate - interns have formed part of the project team in the archipelago as Darwin Students. Two more Darwin Students will be affiliated with the project later this year to help with final analysis of data. A general information leaflet on the Darwin Initiative was distributed during presentations and at special events. As this project is highly technical, it involves less community participation than most CORALINA projects and is, therefore, less known by the general public. However at the level of national research institutes, universities, and other environmental management agencies, the Darwin Project is well-known.

11. Leverage

From the beginning UK project staff encouraged CORALINA to capture funds from other sources, either in collaboration with Heriot-Watt University or independently. The following text was provided by CORALINA as part of their response to Questionnaire B of the ECTF Darwin Rio+10 project:

During its lifetime, the Darwin marine habitat mapping project has helped attract funds for related projects and to bring about achievements, based on activities carried out during the course of the project, that both use outputs and guarantee long-term project sustainability. A medium-sized GEF project to conserve and sustainably use the marine resources of the San Andres archipelago through the establishment of a regional system of multiple-use marine protected areas was approved by the GEF in May 2000. This four-year project falls within the GEF focal area of biodiversity (coastal and marine ecosystems operational program) and has funding of US \$1,000,000. A second project that was developed using information gathered and expertise gained in the Darwin project has as its purpose coral restoration in San Andres and Old Providence coastal waters. Funded by the Ministry of the Environment special project funds from the InterAmerican Development Bank, this project has a budget of US \$153,000.

In November 2000, the entire San Andres archipelago was declared the Seaflower Biosphere Reserve by UNESCO's Man and the Biosphere (MAB) programme. Not only was the Darwin Project cited in the nomination form, but the information and skills acquired in the project were vital to the creation of the biosphere reserve. This international status will help ensure continued realisation of Darwin objectives. Additionally, one of the Darwin Fellows has received a full scholarship for a 9-month training program on remote sensing (RS) and geographic information system (GIS) application for tropical coastal and marine ecosystem management at ITC (International Institute for Aerospace Survey and Earth Sciences) in the Netherlands. As this specialisation is during this last project year, collaborators agreed that the resulting long-term benefits to Darwin objectives would outweigh any short delay in project completion.

12. Sustainability and Legacy

Colombian Project staff are still in place in CORALINA and continuing to work on Darwin project results but are also applying their skills and experience to other related new and ongoing projects. Resources obtained through the Darwin Project (Satellite images, and GIS software, diving equipment) are still being used not only for CORALINA's marine projects but also, where applicable, for their terrestrial work. Partners keep in regular contact through sharing of newly processed data and collaboration in producing joint publications to disseminate the work of the Project. Contact is also maintained by MSc students (*Marine Resource Development and Protection* MSc) from Heriot-Watt University carrying out 5-month dissertation projects with CORALINA each year in areas relevant to conservation objectives. Another major collaborative project (EU funded INCO-DC project) is coming to an end this year but other joint applications/proposals are actively being considered. In the long term the Darwin Project achievement most likely to endure is the application of training and experience obtained that the two Darwin Fellows will be able to contribute to other programmes within CORALINA's work. The detailed mapping of several areas of seabed will also assist CORALINA in monitoring changes and structuring management plans.

The Project's main scientific conclusions have still to be published and disseminated and this is seen as a longer-term aim once all data are fully processed, analysed and interpreted. Some of the work initiated by the Darwin project will continue to be carried out by CORALINA through other newly funded programmes that it now has (see Section 11 above).

13. Value for Money

Both partner Institutions feel that the project can indeed be considered value for money. Experience has been gained by UK staff in tropical research that can be, and is being applied elsewhere. The project has provided a unique opportunity for one of Heriot-Watt University's PhD students to apply practical research to her thesis and she has also made a considerable contribution to the scientific advance of the work as well as in training aspects of the project. CORALINA has benefited not only by the direct training provided but by the knock-on effect of now-specialised staff being able to train other members of staff. The experience in international co-operation and collaborative research/training projects has helped CORALINA attract further significant funding for related research and other conservation management programmes.

Dr James Mair / 15 October 2001

Author(s) / Date

14. Appendix I: Project Contribution to Articles under the Convention on Biological Diversity (CBD)

Please complete the table below to show the extent of project contribution to the different measures for biodiversity conservation defined in the CBD Articles. This will enable us to tie Darwin projects more directly into CBD areas and to see if the underlying objective of the Darwin Initiative has been met. We have focused on CBD Articles that are most relevant to biodiversity conservation initiatives by small projects in developing countries. However, certain Articles have been omitted where they apply across the board. Where there is overlap between measures described by two different Articles, allocate the % to the most appropriate one.

Project Contribution to Articles under the Convention on Biological Diversity		
Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use	5	Develop national strategies which integrate conservation and sustainable use.
7. Identification and Monitoring	30	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities which have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	5	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation	0	Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity	5	Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.

11. Incentive Measures	0	Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training	10	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	10	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts	0	Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources	0	Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.
16. Access to and Transfer of Technology	25	Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information	10	Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol	0	Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Total %	100%	Check % = total 100

15. Appendix II Outputs

Please quantify and briefly describe all project outputs using the coding and format of the

Darwin Initiative Standard Output Measures.

Code	Total to date (reduce box)	Detail (←expand box)
Training Outputs		
1b	Number of PhD qualifications obtained	0
2b	Number of Masters qualifications	0 (but see Section 6 – 2 indirect MSc qualifications)
3b	Number of other qualifications obtained	8 (PADI Open Water Diving Certificates)
4a	Number of undergraduate students receiving training	3
4b	Number of person weeks of training provided to undergraduate students	60 (see Section 5)
4c	Number of postgraduate students receiving training (not 1-3 above)	1
4d	Number of person weeks of training for postgraduate students	32
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(i.e not categories 1-4 above)	2
6a	Number of people receiving other forms of short-term education/training (i.e not categories 1-5 above)	71 (see Section 6)
6b	Number of person weeks of training not leading to formal qualification	58 (see Section 6)
7	Number of types of training materials produced for use by host country(s)	2
Research Outputs		
8	Number of weeks spent by UK project staff on project work in host country(s)	12
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	4 (plus see Section 6)
10	Number of formal documents produced to assist work related to species identification, classification and recording.	0
11a	Number of papers published or accepted for publication in peer reviewed journals	1 so far (see Section 6)
11b	Number of papers published or accepted for publication elsewhere	3 so far (see Section 6)
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	1
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	0
13a	Number of species reference collections established and handed over to host country(s)	1
13b	Number of species reference collections enhanced	0
Dissemination Outputs		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work in host country	1

Code	Total to date (reduce box)	Detail (←expand box)
14c	Numbers of conferences/seminars/workshops attended at which finding from Darwin project work have been presented/disseminated in the host country	2
15a	Number of national press releases or publicity articles in host country(s)	0
15b	Number of local press releases or publicity articles in host country(s)	5
15c	Number of national press releases or publicity articles in UK	0
15d	Number of local press releases or publicity articles in UK	1
16a	Number of issues of newsletters produced in the host country(s)	2
16b	Estimated circulation of each newsletter in the host country(s)	500
16c	Estimated circulation of each newsletter in the UK	0
17a	Number of dissemination networks established in host country	1 (see Section 6)
17c	Number of dissemination networks enhanced/extended in host country	1 (see Section 6)
18a	Number of national TV programmes/features in host country(s)	0
18b	Number of national TV programme/features in the UK	0
18c	Number of local TV programme/features in host country	0
18d	Number of local TV programme features in the UK	0
19a	Number of national radio interviews/features in host country(s)	0
19b	Number of national radio interviews/features in the UK	0
19c	Number of local radio interviews/features in host country (s)	3
19d	Number of local radio interviews/features in the UK	0
Physical Outputs		
20	Estimated value (£s) of physical assets handed over to host country(s)	£10,000
21	Number of permanent educational/training/research facilities or organisation established	0
22	Number of permanent field plots established	5
23	Value of additional resources raised for project	Estimate £2,000

16. Appendix III: Publications

Provide full details of all publications and material that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications database which is currently being compiled.

Mark (*) all publications and other material that you have included with this report

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost t £
Journal	<i>Underwater light characterisation for correction of remotely sensed images.</i> Evanthia Karpouzli, Tim Malthus, Chris Place, Anthony Mitchell Chui, Martha Ines Garcia & James Mair (in Press 2001)	International Journal of Remote Sensing	Science Libraries stocking Journal	
Conference Proceedings	<i>Marine mapping techniques using remotely sensing data in the archipelago of San Andrés, Providence and Santa Catalina (Colombia).</i> Anthony Mitchell-Chui, Martha Inés García-Escobar, June Marie Mow Robinson, Evanthia Karpouzli, & James Mair (COLACMAR, 2001)	Universidad Nacional de Colombia	Universidad Nacional caribe@bacata.usc.unal.edu.co	
Conference Proceedings	<i>Composición de los macroinvertebrados infaunales en los sector de wildlife San Andres y Smooth Water Bay - Old Providence.</i> Martha Inés García-Escobar, Anthony Mitchell-Chui, June Marie Mow-Robinson, Evanthia Karpouzli, RobertForbes, Andrés G.Morales-Nuñez, Carolina Vélez-Robledo, & James Mair (COLACMAR, 2001)	Universidad Nacional de Colombia	Universidad Nacional caribe@bacata.usc.unal.edu.co	

Please note that at this date several other papers are in preparation for peer-reviewed journals and conference presentation. Some of these papers will have long lead times before final publication. Details, as they become available, will be made available for the Darwin Monitoring Website.

17. Appendix IV: Darwin Contacts

To assist us with future evaluation work and feedback on your report, please provide contact details below.

Project Title	Marine Habitat Mapping Development in San Andres Archipelago, Colombia
Ref. No.	162/7/147
UK Leader Details	
Name	Dr James Mair
Role within Darwin Project	Project Leader and co-ordinator with Colombian colleagues in CORALINA. Survey leader in Colombia each year of the project. Trainer of Colombian Darwin Scholars in Colombia and UK
Address	Centre for Environmental Resource Management, Department of Civil and Offshore Engineering, Heriot-Watt University, Edinburgh, EH14 4AS
Phone	
Fax	
Email	
Other UK Contact (if relevant)	
Name	
Role within Darwin Project	
Address	
Phone	
Fax	
Email	
Partner 1	
Name	Mrs June Marie Mow Robinson
Organisation	CORALINA (Corporation for the Sustainable Development of the Archipelago of San Andres, Providencia and Santa Catalina)
Role within Darwin Project	Director of CORALINA, Colombian co-ordinator of Darwin team in Colombia
Address	CORALINA, San Luis Road, Bight, San Andres Island, Colombia
Fax	
Email	
Partner 2 (if relevant)	
Name	
Organisation	
Role within Darwin Project	
Address	
Fax	
Email	