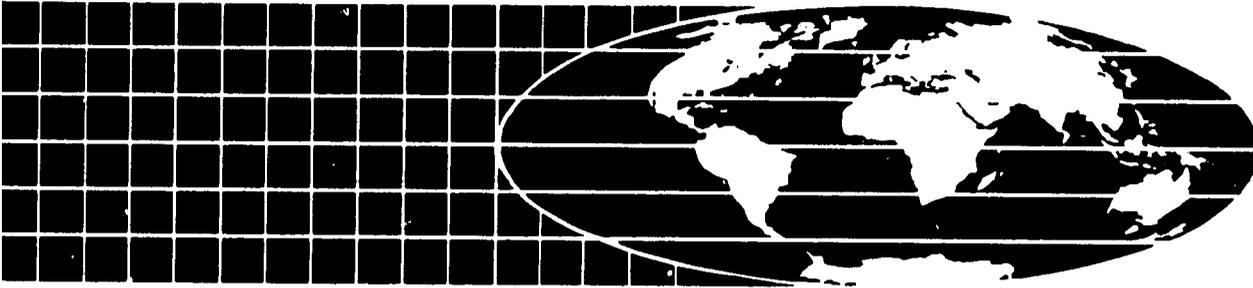


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International Coastal Resources Management Project

The University of Rhode Island

The four major goals of the AID/URI Coastal Resources Management Project (CRMP) are: 1) to apply, as appropriate, existing experience in coastal resources management to developing countries; 2) to assist three developing nations in the design and implementation of integrated coastal resources management programs; 3) to advance the state-of-the-art of coastal resources management in developing countries; and 4) to build URI's capability to assist developing nations with coastal resources management.

The CRMP will work with the cooperating pilot countries to:

- develop procedures for the assessment of the impacts of coastal development proposals
- develop institutional and technical solutions for resource use conflicts
- support research to better understand the issues that affect the condition and use of coastal ecosystems
- improve the capabilities of in-country professional staff to plan for and manage coastal development

The countries selected for pilot projects are Ecuador, Sri Lanka and, tentatively, Thailand.

The AID/URI Coastal Resources Management Project is funded by the Office of Forestry, Environment and Natural Resources, Bureau of Science and Technology, U.S. Agency for International Development through a Cooperative Agreement with the International Center for Marine Resource Development, at The University of Rhode Island.

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URI/AID COASTAL RESOURCES MANAGEMENT PROJECT

ECUADOR: SECOND ANNUAL WORK PLAN

1 October, 1986 - 30 September, 1987

May 5, 1987

THE UNIVERSITY OF RHODE ISLAND/USAID
INTERNATIONAL COASTAL RESOURCES MANAGEMENT PROJECT

ECUADOR: SECOND YEAR WORK PLAN
1 October, 1986 - 30 September, 1987

AID/FENR COOPERATIVE AGREEMENT

LAC-5518-A-00-5054

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1.0 INTRODUCTION AND OBJECTIVES

The Ecuador Coastal Resources Management Project (CRMP) is governed by a Joint Project Agreement (JPA) between the Government of Ecuador (GOE) and the United States Agency for International Development (USAID). The project is implemented by the Office of the Environment within the Ministry of Energy and Mines (DIGEMA) and the University of Rhode Island (URI) through a Cooperative Agreement with the USAID Bureau of Science and Technology with supplemental funding from the USAID/Ecuador Mission. The basic objective is the creation and implementation of an integrated national program for the management of coastal resources. Specific project objectives are:

- (a) To evaluate options for the institutional/legal design of a nationwide Coastal Resources Management (CRM) program for Ecuador and select the preferred option. Legislative needs will be defined.
- (b) To analyze the major coastal management issues and select those that should be the focus for an ongoing CRM Program.
- (c) To broadly disseminate information on the selected CRM issues; the primary target for such education/outreach shall be decision makers and opinion leaders important in establishing an ongoing CRM program in Ecuador.
- (d) To create an information network that makes key CRM documents accessible to all and provides for an information

sharing and retrieval system on the CRM issues selected as the focus of the Program.

- (e) To establish a cadre of people trained in CRM skills. It is desirable to have such people in governmental agencies, academic institutions, and non-governmental organizations.
- (f) To develop and test elements of a regulatory program on such topics as: a shoreline and water use classification scheme, streamlined permitting procedures for shrimp ponds and mangrove management.
- (g) To have documented cases where an integrated CRM approach has made a tangible difference as to how coastal resources are utilized. An example is the analysis of the shrimp mariculture industry and subsequent post larval (PL) mortality and water quality research and extension initiatives.
- (h) To assist the USAID/Ecuador Mission in the design of a follow-up CRM project that will build upon the experience and progress made by this project.

It is the URI/AID CRM Project approach in all the pilot countries (Ecuador, Sri Lanka, Thailand) that the following cycle should be completed for at least some elements of the CRM program during the anticipated 4-year life of the project:

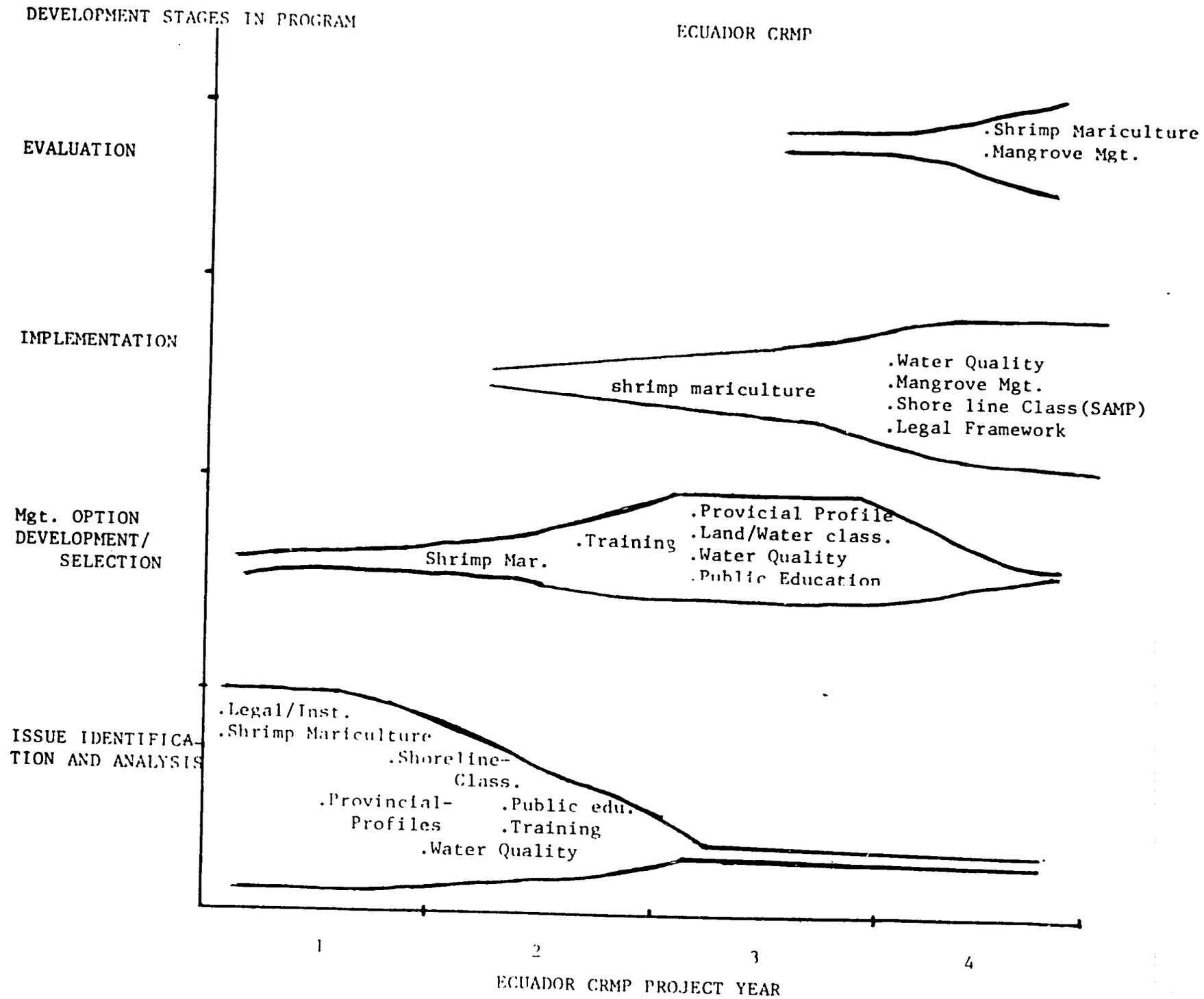
Step 1. Issue estimation.

- Step 2. Evaluation and selection of management options.
- Step 3. Testing (implementation) of selected management options.
- Step 4. Evaluation.

The above objectives and approach serve as reference points in selecting work tasks for the Ecuador pilot. The overall Coastal Resources Management Project (CRMP) strategy for meeting its objectives during a four year period is illustrated in Figure 1. Year 1 was designed to emphasize Step 1. Year 2 will include progress toward Step 3 topics.

In contrast to the other two pilot projects being implemented by URI/AID, Coastal Management in Ecuador is at the initial stages of problem definition. There is currently no governmental agency in Ecuador with authority to implement a Coastal Resources Management Program, and there is, as yet, no organized constituency advocating that such an agency or program be created. It is the position of all the project participants that support for such initiatives will require the active participation and support of both the private and public sectors. This participation must be directed initially at the identification of priority CRM issues, the interrelationship among these issues, and formulation of implementable recommendations for action.

FIGURE 1



-4

4

By directing 79% of the first year non-administrative budget to the formulation of a strategy to promote a sustainable and environmentally viable shrimp mariculture industry in Ecuador, (see Section 2.1 of this Second Year Work Plan), priority issues were identified with the participation of both the public and private sectors. Additional priority CRM issues are being identified as the Ecuador Pilot develops.

The private sector groups that have been identified thus far as playing a key role in supporting the formulation of coastal policy and in developing the needed constituency are the Shrimp Farmers Association (Cámara de Productores de Camarón, or CPC) and the Fundación Pedro Vicente Maldonado (a Guayaquil-based private volunteer organization dedicated to research and education in support of natural resources management). Working closely with this institution is the Polytechnic University of the Coast (ESPOL). The CPC participated actively in the Year One mariculture issue identification process as well as in the recently completed PL mortality project. The CPC is expected to collaborate as principal partners in the proposed water quality assessment (Task 3.6.). All parties involved in the JPA with the GOE believe that support of a strong environmentally sound shrimp mariculture program will help achieve the environmental objectives as stated in the JPA, by mobilizing resources from the mariculture private sector to protect

their self interests by supporting and actively participating in a program of water quality monitoring and control measures.

The Fundación Maldonado, whose principals are ESPOL faculty members, is implementing a major activity slated Year Two, the provincial profiles (Task 3.3.). The Fundación Maldonado is taking a lead role in interacting with public and private sector groups in each province to identify the key issues a national CRM policy should address. ESPOL, represented in both the Water Quality and Mangrove Working Groups as well as the CRM Project Steering Committee, is collaborating in all activities related to training. ESPOL faculty have been designated as counterparts to expatriate collaborators in the project.

Several structural changes were made to the Ecuador CRMP between December 1986 and January 1987. The contract of the URI In-Country Manager was not renewed and it has been recommended that the project be administered by a single "In-Country National" Project Manager. The former counterpart to the URI Manager has assumed this position. Budget cuts for the entire AID/URI coastal management program have made it necessary to significantly reduce annual funding for activities in Ecuador. At present, it is hoped that the total budget for the Ecuador pilot will be retained but that the project's activities will be spread out over four, rather than three years. Since Ecuador is at the first step of developing

a national CRM program, a longer term effort is believed to be a better option. The simplification of the project's administrative structure will make it possible to maintain in-country administrative costs at not more than 25 percent of the total budget.

2.0 ELEMENTS OF THE SECOND ANNUAL WORK PLAN

2.1 Highlights of Planned Activities

This Second Annual Work Plan builds upon the activities undertaken during Year 1 (January 1986 through September 1986) and follows up, where appropriate, on priority recommendations developed through these activities. Thus a number of work tasks are dedicated to priority issues identified through the shrimp mariculture assessment which was the major activity undertaken in Year One. These follow-up activities include: the identification of techniques that will minimize the mortality of the wild caught post larvae that are the major, and least expensive, source of seed shrimp for the mariculture industry; testing of extension techniques to disseminate such information; development of a water quality sampling program directed at estimating the significance of pollutants that are of major concern to the industry (e.g. mercury, pesticides and other toxic organics); and, an analysis of institutional issues posed by water quality problems.

During the first year 79 percent of the non-administrative budget was directed to formulation of a strategy to promote a sustainable shrimp mariculture industry in Ecuador. Substantial progress was also made in analysis of the existing legal and institutional framework related to the management of coastal resources. A focus of this institutional analysis was also upon problems faced by the shrimp mariculture industry. The products from this task are a series of reports and a computerized information retrieval system. These products have been delivered and the computer system demonstrated to the Office of the Undersecretary for Fisheries, several other government agencies, and the Shrimp Producers Association. During Year 2, the Project's basic need for institutional and legal analysis will be completed.

One of the most important tasks for the CRMP is to synthesize the available information and identify key resource management issues other than shrimp mariculture in Ecuador's coastal provinces. It was, unfortunately, not possible for this activity to proceed in tandem with the shrimp mariculture assessment and the legal/institutional analysis during Year 1. Work on the Provincial Profiles began in the last month of Year 1 through a sub-contract with the Fundación Pedro Vicente Maldonado. This activity will produce an overview of Ecuador's coastal region and issue profiles for each of the four mainland Provinces. The focus is upon the importance of the natural resource base to the coastal economy,

trends in the utilization and condition of the coastal resource base, as well as the identification of key issues that a national CRM program should address. This activity will take 12 months to complete, as originally planned.

An activity closely associated with the production of provincial profiles is an assessment of the effect of geomorphological processes on current and future human activities along the shoreline. This activity will also contribute directly to the shoreline and water use zoning scheme called for by the JPA.

Since the coordination of governmental initiatives and collaboration with the private sector are top priorities for the CRMP, two working groups will be formed. It is anticipated that the Mangrove Working Group will be formed in early 1987. The group will be the source of several initiatives for interagency collaboration in the management of an important natural coastal resource. It is also anticipated that in early 1987, a Working Group on Water Quality will be formed to work on the formulation procedures for interagency collaboration on a baseline data generation and monitoring program.

Finally, the Year 2 Work Plan calls for continuing efforts to provide Ecuadorean personnel with training to acquire the skills

required for the effective design and implementation of coastal management strategies.

The activities undertaken in Years 1 and 2 will complete the first phase of the Ecuador CRMP. This may be described as "problem estimation and identification of priorities" (See Figure 1). In Year 3, the focus will be upon the development of an implementable management program.

3.0 WORK TASKS

3.1 Project Administration and Coordination

a. Background and Progress

During Year 1, project offices were set in the Ministry of Agriculture (MAG) Building in Guayaquil, capital equipment was bought and satisfactory fiscal procedures implemented. The project entered Year 2 with an adequately equipped and functioning office. The CRMP was less successful in galvanizing a core group of Ecuadoreans from the governmental, academic, and private sectors with a stake in developing a national CRM Program in Ecuador. Such a group--with a common understanding of the problems and a consensus view of how to begin to solve those problems--is essential to achieving the Ecuador pilot's main objective of "creation and

implementation of a national program for the management of coastal resources".

b. Objectives

- (1) To maintain adequate administrative services to the project including secretarial and accounting services, communications, adequate office facilities, and project vehicles.
- (2) To produce the required activity and progress reports.
- (3) To enhance communication among all project staff and subcontractors.
- (4) To enhance communication between the project and the principal governmental and private sector groups with an interest in CRM in Ecuador.

c. Tasks

Task 1: Administration

During Year 2, URI/S&T funds will be used to complete the furnishings on the Project's Office at MAG so that the Office can effectively serve the project as a whole. Project reports, the library and map collections, meeting facilities and work space for visiting consultants shall all be handled in these offices. DIGEMA

shall continue to pay for its staff and cover the monthly fees for the offices. Both the URI Project vehicle and DIGEMA vehicle will be maintained and kept available to project personnel for project-related business. The need for a professional accountant to monitor URI/S&T funds will be assessed early on in the year. If deemed necessary, such services shall be retained. The IBM PC on loan to the legal consultant will be returned during Year 2 and placed in the CRM project offices at MAG.

Task 2: Coordination and Communication

Within Project Coordination: The In-Country Manager will schedule a monthly contractors' meeting. The meeting will include all project staff plus the principal contractors. The meeting will have a pre-arranged agenda which will feature brief progress reports on each activity and an in-depth discussion of specific issues. The purpose of these meetings is to better integrate the findings of discrete activities and to develop a collective vision of how project objectives can be met.

Interagency Coordination: Project Bulletin. Since Ecuador does not yet have a mandate for a lead agency responsible for CRM, a high degree of coordination among agencies, institutions, and private sector activities responsible for, or interested in, CRM is essential for program development. During Year 1, this communication was largely

informal, and for the most part not sufficient. To enhance knowledge about coastal issues and CRMP activities, the In-Country Manager will prepare and distribute a quarterly bulletin. In addition, both the Board and Steering Committee will routinely receive progress reports as well as copies of major project reports and discussion papers.

d. Responsibility

This work will be implemented by the In-Country CRMP staff.

e. Products

- (1) Functioning, well integrated URI/DIGEMA administrative services and facilities adequate to meet the needs of the resident staff and cooperating contractors.
- (2) Monthly accounting reports, quarterly activity reports, and semi-annual progress reports.
- (3) Monthly meeting of major in-country project participants, quarterly bulletins for in-country distribution.

3.2 Analysis of Legal and Institutional Arrangements for Coastal Resources Management in Ecuador

a. Background and Progress

During the first year, substantial progress was made on collecting key legal documents and producing a computerized index of laws related to coastal resources management. This work, as originally planned, will end in the first half of Year 2. Two areas were initially selected as the focus for institutional analyses and evaluations of management options. The first issue was shrimp mariculture. The contractor prepared a paper analyzing the current incentives and regulations affecting the siting and operation of shrimp farm hatcheries which was presented as part of the August 1986 Shrimp Mariculture Workshop. Examination of the second issue, water quality, began in the last month of Year 1, September 1986.

The legal and institutional analysis task is proceeding well and on schedule. Since the Provincial Profiling Task did not start until the end of Year 1, the institutional analysis work could not address the management issues that will be identified through the profiling process. It is essential, however, that the institutional analysis perspective now be integrated into the profiles. Year 2 efforts will therefore focus on incorporating an institutional analysis within each provincial profile, and on initiating discussions with project participants on options for a management structure for CRM in Ecuador.

b. Objectives

- (1) To complete the collection and analysis of key legal documents and management institutions for water quality.
- (2) To conduct a series of structured discussions within the CRMP that examine the legal and institutional aspects of priority CRM issues.
- (3) To prepare recommendations on legal and institutional actions required to implement specific policy recommendations of the CRMP.
- (4) To participate in the efforts of key agencies and groups to revise laws and programs where appropriate; these will include the February 1987 worksnop of Fundación Natura, and the re-examination by a contractor retained by URI of regulations promulgated by the Dirección de Marina Mercante (DIGMER).
- (5) To collaborate with the Fundación Maldonado on an institutional analysis for each Provincial Profile (Task 3.3).

c. Tasks

Task 1: Legal and Institutional Analysis of Water
Pollution in Ecuador

The work begun in Year 1 on the water pollution issue will be completed by December, 1986. Relevant documents and laws will be reviewed and added to the existing document collection and computer index system. The analysis which includes a summary of the problems, a description of the legal aspects to the problems identified, an assessment of relevant existing policies and programs, as well as recommendations to the CRMP on options for modifying policies to better address water quality problems in the coastal zone will be published as a final report.

Task 2: Development of Policy Options for Specific Coastal
Resources Management Problems in Ecuador

Once legal and institutional recommendations have been prepared for specific issues, the CRMP will be developing specific policy proposals through its Steering Committee and Working Groups, combining the legal and institutional analyses with information on the nature of the problem, and alternative technical solutions. A contractor retained by URI will review the Provincial Profile work (Task 3.3), participate in workshops and discussions, and

collaborate on an institutional analysis of priority issues identified in each province. Another focus on this work will be to collaborate in the formulation of integrated management strategies for the waters now included with the Galapagos Reserve (see Task 3.10).

Task 3: Development of An Institutional Framework for Resources Management in Ecuador

Recommendations by the CRMP to establish new or revised policies to govern the use of Ecuador's coastal resources must be accompanied by the identification of the institutions which could implement these proposals. Taken together, the new initiatives will comprise the institutional framework for coastal resource management and will include both governmental and non-governmental organizations, including the private sector. This task which will begin on a limited basis through initial discussions among CRMP participants will focus on the institutional aspect of two critical questions: how should coastal management policies be effectively integrated and how can the coastal policy development and implementation process become sustainable?

d. Responsibility

Task 1 and 2: Contractor(s) to be identified and retained by URI.

e. Products

- (1) Completed legal and institutional analysis of water pollution, along with a document collection and computerized index of laws.
- (2) An institutional analysis of priority issues identified through the provincial profiling process.
- (3) Working papers that can serve as the basis for project team discussions of integrated, sustainable coastal management policies and implementation strategies.

3.3. Synthesis of Available Information on Ecuador's Coastal Resources and Selection of Priority Issues for the Coastal Resources Management Program

a. Background and Progress

This project was slated to be the major in-country activity during Year One. Since the URI Project Manager was unable to identify a suitable team of contractors until June 1986, a contract was not signed until September 1986. The contractor assigned was the Fundación Pedro Vicente Maldonado, based in Guayaquil, with experience working as an interdisciplinary team on a variety of projects. A highly successful workshop on the regional overview of coastal development and issues will be held in Guayaquil

in late March, 1987. A synthesis of this regional overview will be prepared for broad distribution. The four provincial profiles will be completed by September 1987.

The text describing this project in detail is set forth in Background, Objectives and Tasks in the Year 1 Work Plan and is not repeated here. The profiles of the four coastal provinces will have the following characteristics.

- (1) The characterization of each province will follow a consistent format for all four profiles:
 - a brief description of the long-term development trends for the province in question through graphics with minimal text; and,
 - an estimation of the importance of the coastal natural resource base to the economy of the province including comments on the implications of trends in the degradation of the resource.
- (2) The principal focus of the individual profiles will be (a) identification of the major problems, and (b) selection of the subset of problems appropriate for the CRM program. The causes of the selected priority coastal problems, the interrelationships among problems and projections of existing trends in development will subsequently be presented.

- (3) The institutional analysis work completed by a contractor retained by URI will be integrated into the provincial profiles so that this perspective becomes a major theme of discussions of the causes of priority problems and obstacles, or opportunities, that must be considered while evaluating possible solutions to these problems.
- (4) The profiles will identify current and proposed development projects and trends as well as analyze their likely impacts.

Workshops similar to the one on the regional overview will be held on each draft provincial profile. A final workshop that integrates the major findings from all four provincial profiles with the regional profile will culminate the process.

3.4 Evaluation of Coastal Processes in Ecuador Related to Development Trends

a. Background and Progress

This task is an integral part of the provincial profiling process. It addresses two of the specific activities described in Section 2.3 of the JPA--a water and shoreline use classification

scheme and formulation of shorefront development and protection standards.

The activity proposed here will contribute directly to fulfilling both of these objectives by providing an assessment of those geomorphological processes that impact shoreline development.

b. Objectives

- (1) To evaluate the existing data base on coastal processes in Ecuador.
- (2) To survey the Ecuadorean coast and to identify problems and opportunities posed by coastal development in selected areas.
- (3) To characterize important geomorphological and development processes along the coast through maps, photos and an accompanying report.
- (4) To work with the provincial profiling team (see 3.3) to make initial recommendations to the CRM Program regarding a shoreline classification scheme and shorefront development standards.

c. Tasks

- (1) Review the available data base at ESPOL and CLIRSEN as well as the reports and atlases assembled by the CRMP staff.

- (2) Assess the capabilities of the staff at CLIRSEN and ESPOL to develop and analyze information on coastal management policies and plans.
- (3) View and graphically document the entire coast from a small locally rented airplane as well as visit selected problem areas.
- (4) Identify coastal areas and/or activities that pose priority issues for the CRM Program and focus upon these areas and/or activities in developing preliminary recommendations for construction standards, setbacks, areas unsuitable for development in addition to areas where specified development activities are appropriate.
- (5) Develop recommendations for shorefront construction standards including setback provisions and guidelines for building erosion control facilities, port facilities and other structures that are directly affected by coastal processes.

Tasks (4) and (5) above will be carried out in consultation with the provincial profiling team and the principal findings will be integrated into the profile drafts.

d. Responsibility

The principal contractor(s) will be retained by URI.

e. Products

(1) A report, with supporting maps and photographs, as appropriate, that addresses the following topics:

- Availability of information and expertise in Ecuador on coastal geomorphology related to development strategies, including (a) recommendations for priority development problems and opportunities along the coast as these relate to development strategies, and (b) recommendations for priority training needs.
- An assessment of the priority development problems and opportunities along the coast as these relate to geomorphological processes and development trends.
- A preliminary version of a shoreline use classification scheme and shoreline development standards.
- Recommendations for priorities for further planning, policy development and research.

3.5 Development of an Integrated Management Strategy for Shrimp Mariculture in Ecuador

a. Background and Progress

During Year 1, the major activity for the CRM Project was to make an assessment of the shrimp mariculture industry. Eleven

experts were retained to produce "synthesis papers" on a wide range of topics affecting the present condition and future prospects of the industry. These papers were the bases for a four-day workshop held in Guayaquil, August 4-7, 1986. The workshop was attended by representatives of the industry, involved governmental agencies, academic, and non-governmental organizations. The sessions were devoted primarily to facilitate discussions that focused upon the accuracy of the data presented, priorities for action and priorities for research. The public policy issues raised by the problems and opportunities posed by the mariculture industry were discussed in depth.

This assessment process will result in two products: corrected, edited versions of the background papers that will be released as a book, and, a brief synthesis of findings and recommendations for an integrated management strategy produced by the CRM project staff. The documents will be available in both English and Spanish.

A number of the priority recommendations that emerged from the August 1986 Shrimp Mariculture Workshop assessment process were acted upon during the final months of Year One. These included initial efforts on a post larvae mortality reduction study and the development of an integrated water quality assessment program. These activities are described below. In addition, year-end funds

made available by AID/EC were channeled to the National Fisheries Institute to enable them to expand the shrimp post-larvae sampling program.

b. Objectives

- (1) To assist in the formulation of integrated management strategies for a sustainable shrimp mariculture industry.
- (2) To disseminate the documents produced through the assessment program.
- (3) To implement a post larvae mortality reduction project with the expectation that this activity would significantly contribute to alleviating a primary constraint on the productivity of the industry.
- (4) To assess water quality issues that directly impact the shrimp mariculture industry. NOTE: This task is a response to the principal concern identified through the August 1986 shrimp mariculture assessment in Year One. Since this activity constitutes a major commitment of AID/EC project funds, it is described separately as Task 3.6.

c. Tasks

Task 1 Preparation and Dissemination of Documents

The synthesis papers will be corrected and revised to remove redundancies and incorporate findings made during and after the August 1986 workshop. A professional editor will be retained by the URI Coastal Resources Center, who will work with the authors to produce the final synthesis reports, and who will then oversee production of a book containing the final version of all the synthesis papers. The book will be translated into Spanish. The Spanish version will be published and distributed by a yet to identified publication house in Ecuador.

The synthesis findings and recommendations for a strategy of a sustainable shrimp mariculture industry will be edited by the CRM project staff and released as a project publication in both Spanish and English.

Task 2: Reduction of Wild Caught Post Larvae Mortalities

The objectives of this activity are to: (1) conduct a survey of the methods presently used to capture post larvae (PLs); (2) assess methods presently used to transport both wild caught and hatchery produced post larvae; (3) establish through small scale studies on optimum transport handling methods; and, (4) design and

test an extension program focusing on the improvement of PL survival between capture and acclimation to pond conditions.

A four-phase, four-month project is planned. During phase one an extensive literature survey will be conducted by a consultant contracted through URI who will use library facilities at URI and shrimp industry contacts to establish the present "state of the art" in the handling, transport and acclimation of post-larval shrimp. Also, during Phase I, field work in Panama will be undertaken to document methods utilized in their post-larvae capture fishery to assess the potential for transferring this technology to Ecuador.

In Phase II, a consultant contracted by URI will also undertake three months of field work in Ecuador to assess how the successful mariculture enterprises handle both wild caught and, where applicable, hatchery-produced post larvae. A survey of the major post-larvae capture areas will be made to determine mortality rates and attempts will be made to incorporate this information to current capture and handling practices. Capture and handling methods will be recorded with a video camera.

During Phase III, short-term experiments are planned to assess the mortality associated with various techniques of capture, handling, transport and acclimation. The experiments to be

performed and their design will be determined during the second phase of this activity.

During Phase IV, a series of options for the most effective and appropriate information dissemination techniques will be ascertained. Options under consideration include showing appropriate capture and handling methods on Ecuadorean television, the production of a laminated set of visual instructions, and the demonstration of appropriate techniques to pilot groups of PL fishermen.

A final report will summarize the results of this activity and make recommendations for further follow-up.

d. Products

Task 1

- (1) A book, to be distributed in both English and Spanish, containing the corrected and edited versions of the synthesis papers prepared for the Guayaquil 1986 Shrimp Mariculture Workshop.
- (2) A comprehensive technical report, also in English and Spanish, presenting the synthesis of findings and

recommendations for an integrated strategy for sustainable shrimp mariculture.

Task 2

- (1) A comprehensive report documenting the major findings of the PL mortality study including recommendations for further research and extension.
- (2) Dissemination of information regarding PL handling techniques that will increase survivability.
- (3) Field tested extension materials.

e. Responsibility

Task 1

Co-editors for the book resulting from the August 1986 Shrimp Mariculture Workshop will be identified and contracted by URI. A technical editor will also be retained by the URI Coastal Resources Center to oversee technical aspects of the production of this document. Printing and binding of the English version will be contracted to an Ecuadorean firm or possibly the Casa de la Cultura in Quito.

Task 2

The prime contractor for the post-larvae mortality reduction activity will be identified and retained by URI.

3.6 Estimation of Water Quality Issues Affecting the Shrimp Industry

a. Background and Progress

The top priority identified through the shrimp mariculture assessment process for promoting a sustainable mariculture industry in Ecuador is to maintain water quality in estuaries and nearshore hatcheries. According to the CRMP's Shrimp Mariculture Strategy developed during the August 1986 Workshop in Guayaquil:

"Good water quality in these areas is critically important not only to the success of the cultivated shrimp industry but also to maintaining suitable habitats for juvenile shrimp. A number of development trends are working in combination to reduce water quality in Ecuador's estuaries and coastal waters. Increasing urban development, further industrial growth and the decline of fresh water discharge by river and greater agricultural production brought by dams are all expected to result in further declines in water quality in the years to come. Poor water quality is already having a negative impact

on both the productivity of grow-out ponds and hatcheries. The available, albeit incomplete, data on water quality document the presence of high concentrations of heavy metals and pesticides, the frequent occurrence of toxic red tides and high concentrations of organics that cause low oxygen levels. Hatchery operators and growers report occasional mass mortalities that they attribute to contaminants in their water supply. Some growers are experiencing blooms of microscopic algae in their ponds and reduced growth rates that may also be attributable to the poor quality of the water they pump from estuaries into their ponds."

Declining water quality is a strong indicator of an overall degradation of coastal resources and it may be expected to have repetitive impacts on a wide range of activities. These include losses in fishery resources and declines in environmental qualities that affect tourism and local recreational opportunities. Severely degraded water quality may also pose significant threats to human health.

b. Objectives

- (1) To identify and assess the significance of specific water quality problems that are currently believed to

be impacting the productivity of the shrimp mariculture industry.

- (2) To develop recommendations for how such problems can be resolved through national and local water pollution control efforts.
- (3) To assess the in-country capability to conduct the types of analyses required to monitor water quality parameters of concern and to assist such laboratories in performing the needed analyses.
- (4) To design an integrated and sustainable program for generating baseline data and monitoring water quality.

c. Tasks

Task 1: Assessment of Specific Water Quality Issues Affecting Mariculture Production

The first priority is to make direct measurements of those water quality variables that may be impacting the operations of the shrimp mariculture industry. The problems that have been identified to date suggest the following priorities:

- An assessment of significant concentrations of heavy metals (particularly mercury compounds) and organic chemicals (particularly pesticides) in the vicinity of selected

hatcheries and shrimp ponds. Significant contamination problems, if they exist, are likely to be highly localized. The initial assessments will be directed at known "sinks" for these substances: fine-grain sediments, long lived detrital feeders (e.g. oysters), and predators at the top of the food chain (e.g. fish and fish-eating birds).

- Monitor indicators of poor water quality in shrimp ponds that are most likely to affect the growth and survival of shrimp. The initial focus will be upon oxygen and ammonia levels at "control" and "impacted" sites. Monitoring of selected shrimp ponds will include nutrient, turbidity, BOD, temperature, salinity, etc. variables in order to define the ecosystem dynamics.
- Other contaminants of potential concern, such as petroleum hydrocarbons, will be assessed at "control" and "impacted" sites.

Experimental design, logistical arrangements and oversight of the analytical aspects of this water quality activity will be the responsibility of a Spanish speaking scientist with demonstrated qualifications in the technical aspects of this work, and, contracted by URI. Analysis of samples will be conducted in laboratories with demonstrated capabilities in Ecuador, and, where necessary, in the United States. The technical advisor contracted

by URI will collaborate closely with the "shrimp industry" which will (1) provide local transportation and other logistics, and (2) collaborate in the selection of sampling sites, in addition to arranging for monitoring programs at selected "shrimp farms". The shrimp industry is also expected to contribute substantially to the cost of the above described analysis.

Once data is available upon which an assessment and prioritization of problems can be based, recommendations will be formulated for steps to correct the problems identified. If pesticide residue is indicated as a problem then recommendations on the use of such chemicals can be made. If mercury is present in significant concentrations, steps should be taken to modify the gold extraction industry that is the major source of such mercury pollution. The Water Quality Working Group (see Task 3 below) will provide the appropriate forum for identifying both the sources of pollutants and the governmental entities most capable of correcting the problem at its source.

Task 2: Assessment of In-Country Diagnostic Capabilities
and Strengthening of Selected Laboratories

As the development of Ecuador's coastal region proceeds, water quality problems are likely to increase. It is essential that in-country capabilities to assess such problems be strengthened and

that mariculturists have confidence in the quality of the data in-country labs provide.

Several well-equipped laboratories have been identified in Guayaquil. Their major problem appears to be a lack of operating funds for expendable supplies, and, in some cases, funds for laboratory technicians. The chemist retained for Task 1 will assess the capabilities and needs of these laboratories. The project shall provide modest funding for the necessary supplies and manpower such that an intercalibration exercise and quality control procedure can be conducted. The chemist retained for Task 1 will prepare recommendations for a sustainable funding mechanism, supported in large measure by the fees made to mariculturists requesting analyses. This funding package must be closely integrated with the monitoring program described in Task 3.

Task 3: Design of an Integrated Baseline Data Generation and Water Quality Monitoring Program

During Year 1 of the CRMP, "initial" information on water quality parameters in coastal Ecuador was collected and assessed by Dr. Robert Twilley. The data were presented in a synthesis paper for the August 1986 Shrimp Mariculture Workshop. A major focus of the institutional analysis prepared by Efraín Pérez and Associates was water quality. The final report by Pérez, Prevención y Control

de la Contaminación de las Aguas Costeras y Estuarinas del Ecuador, will be completed in April 1987. DIGEMA staff assigned to the CRMP has continued to compile data on water quality and has surveyed the sampling and monitoring programs of the various GOE agencies.

Early in 1987, the project will establish a Working Group of Water Quality, composed of representatives of all governmental agencies with responsibilities for various aspects of water quality in coastal Ecuador. This group will work to coordinate their efforts and to design an integrated baseline data generation and monitoring capability. The Working Group will focus on water quality, in, and near, shrimp mariculture activities. The results of Tasks 1 and 2 will be considered by the Working Group and a data collection program will be designed that is focused on the priority problems identified through Task 1 that makes best use of in-country analytical capabilities identified through Task 2.

a) Products

- (1) A report presenting the data obtained on priority water quality problems that may be affecting the mariculture industry and an assessment of the significance of the problems identified.
Recommendations will be made concerning potential

steps to be taken in order to correct or mitigate the problems identified as well as the priority need for the further research and monitoring.

- (2) An assessment of the in-country capabilities to conduct the analysis identified as most necessary through Task 1 as well as recommendations for strengthening and supporting such laboratories over the long term.
- (3) An integrated scheme for developing baseline water quality data and a monitoring program for the coastal waters of Ecuador that integrates the capabilities of the several private sector and governmental agencies involved and focuses upon priority water quality problems.

b) Responsibility

A consultant will be retained by URI to lead the activities described in Tasks 1 and 2. The consultant shall identify laboratories to conduct the analyses required for Task 1. The DIGEMA staff assigned to the project and the In-Country Project Manager will continue to oversee the work of the Water Quality Working Group.

c) Products

Task 1: Report summarizing the objectives, methods, and results of the assessment work, a description of problems and recommendations for addressing the problems.

Task 2: Final report prepared by the URI-contracted consultant in close cooperation with the Water Quality Working Group.

3.7 Training

a. Background and Progress

A cadre of well-trained professionals in coastal resources management is essential for the successful development and implementation of a CRM Program in Ecuador. During Year 1, two specific, successful short-term efforts were undertaken:

- CRM Orientation Program: A two-week orientation/project planning visit to the US and Puerto Rico for key Ecuadorian and US CRM project personnel was conducted. The primary objective of the visit was to relate the experience gained from 15 years of coastal management initiatives in the US to the design of a CRM project in Ecuador.

- Environmental Impact Assessment Short Course: A course on Environmental Impact Assessments was co-sponsored by DIGEMA and the Instituto Ecuatoriano de Crédito Educativo during September-October 1986. The course, which was taught by CIDIAT (from Venezuela) was well received by the 30 professional participants from GOE agencies.

The Year 1 training objective to design an overall strategy for the CRMP Ecuador's overall education and training efforts in CRM depends additional issue identification. In August of 1986, a US-based Training Issue Team was convened to develop an overall training strategy for the CRMP. This team reviewed both domestic and international training programs, the skills required by CRM managers, and available training materials.

The Training Team also made a number of recommendations as to how the CRMP should proceed with its training efforts. URI and AID/S&T are currently reviewing the Team's recommendations with a consensus action plan to be developed to by July 1, 1987. It is anticipated that after July 1, the core staff at URI will be able to provide more substantive assistance to the Ecuador CRMP to develop a training strategy, design training courses, and assist with the production of training materials. Due to current CRMP Ecuador staffing and budget constraints, it is unlikely that the Year 2 training program will be significantly affected by these efforts.

In Year 2, the CRMP will continue its Year 1 approach of co-sponsoring training activities with organizations and agencies with interest in, or responsibility for, CRM in Ecuador. It will not, however, play a major role in developing the content of these programs. In Year 3, we anticipate a major effort in developing materials to more directly shape the substance of already existing vehicles for training.

b. Objective: To provide short-term training opportunities for key participants in the Ecuador CRMP.

c. Tasks

Task 1: Participation in Relevant National and International Conferences

In developing a CRM Program for Ecuador, key project participants need to become knowledgeable about the experiences of other countries working to address CRM problems. By participating in workshops and conferences, Ecuadorean participants are exposed to a variety of approaches and experiences and begin to form useful professional contacts. During Year 2, the Ecuador CRMP will sponsor participation of key project personnel in the following conferences.

- (1) Wetlands Conference, Brazil, December 1986 (Dr. Eduardo Figueroa, Director-DIGEMA)

- (2) Fundación Natura Environmental Congress: CRMP will provide support for the coastal sessions of Ecuador's first Environmental Congress, being sponsored by Fundación Natura, Ecuador's largest environmental group.
- (3) URI/AID First Annual Round-Table--How Should the Problems of Implementation Affect CRM Program Design? May 22-25, 1987. Orcas Island, WA. (Dr. Luis Arriaga and Mr. Efraín Pérez)
- (4) Coastal Zone '87. May 25-30, 1987. Seattle, WA. (Dr. Luis Arriaga and Mr. Efraín Pérez)

Task 2: Academic Training

The CRMP will continue to pay tuition and fees for Mr. Marcos Velarde, currently at URI, on leave from ESPOL, who is obtaining a Master's Degree in Resource Economics, with an emphasis on CRM issues. All of Mr. Velarde's remaining expenses are covered by a fellowship.

d. Responsibility

CRMP staff in Ecuador and the US will be responsible for implementation of this program element.

e. Products

- (1) Participation in above-listed conferences.
- (2) Summary descriptions of the results of the above mentioned conferences.

3.8 Mangrove Management

a. Background

During its second year, the CRMP will form a Mangrove Working Team that will include representatives of government agencies, the private sector, and academic institutions responsible or interested in mangrove management. This working group will hold several meetings to discuss development of a cooperative mangrove management project. A forester, identified by DIGEMA, will lead this effort.

The mangrove working group along with several additional governmental and academic institutions will attempt to establish technical units in each coastal province to carry on specified research and management programs related to mangrove ecosystems. These units will require training in order to achieve the high level of technical competency and standardization required to carry out the programs identified.

b. Objectives

- (1) To establish a comprehensive program for mangrove ecosystems management in Ecuador.
- (2) To promote efficiency and coordination among GOE institutions, the private sector, and academic centers responsible for the mangement of mangrove ecosystems.

c. Tasks

Task 1: Mangrove Working Group

Coordinate meetings and activities of the CRMP Mangrove Working Team. Propose ideas and recommendations related to mangrove research and management.

Task 2: Training

Conduct a training workshop on mangrove management and research methodology, with an emphasis on impact assessment.

Task 3: Information Synthesis

CRMP personnel will synthesize available information on mangroves in Ecuador. This synthesis paper will be presented at the

Primer Congreso Ecuatoriano del Medio Ambiente (First Environmental Congress of Ecuador) organized by the Fundación Natura and scheduled for February 1987. The paper will emphasize the protection and management of mangroves.

d. Responsibility

CRMP personnel will be responsible for the program with the forester acting as a consultant identified by DIGEMA. Foreign consultants will be considered for the training workshop and to develop proposals for research on mangrove ecosystems.

e. Products

- (1) Efficient functioning of the Mangrove Working Team.
- (2) Organization of mangrove training workshops and development of specific research methods and techniques.
- (3) Proposals on a comprehensive mangrove resource management plan including sections on legal aspects of this subject.

3.9 Public Education

a. Background and Progress

If a CRMP program is to succeed, the people whose lives will be affected by new management schemes must understand and

support them. Public education is one key element in obtaining that understanding and support. During Year 1, the CRMP undertook two public education initiatives. In late 1986, a foreign consultant (Hilda Diaz-Soltero) reviewed ongoing environmental education activities in Ecuador, focusing on Fundación Natura's EDUNAT II program and made recommendations for a CRM Public Education Strategy.

b. Objectives

- (1) To define a CRM strategy for public education.
- (2) To strengthen existing relevant programs in public education.
- (3) To increase public knowledge on coastal resources and their management.

c. Tasks

Task 1. Public Education Strategy

A consultant will be retained by DIGEMA to define a national program for public education concerning the protection and management of coastal resources. The strategy will be built on the premise that the CRMP should support existing environmental programs, build on the materials being generated by the CRMP (e.g.

profiles, shrimp mariculture papers etc.), and enhance their coastal content.

3.10 Galapagos Islands Marine Reserve Master Plan

a. Background and Progress

The Government of Ecuador recently established a marine reserve in the Galapagos Islands. CRMP participation and support has been asked to help develop a management plan for the new reserve. During Year 1, the CRMP sponsored a production of posters about the marine reserve and also prepared a summary of available information on the Galapagos Islands.

b. Objectives

- (1) To participate in the development of the Master Plan for the Galapagos Islands Marine Reserve.
- (2) To promote consideration of coastal resource management issues in the Master Plan mentioned above.

c. Tasks

CRMP staff will coordinate with appropriate authorities and institutions in the preparation of a Galapagos Islands Master Plan.

In addition, the CRMP will provide technical assistance to the GOE Galapagos Planning Team on the legal institutional aspects of the Galapagos Islands Master Plan.

d. Responsibility

CRMP staff and an as yet to be identified consultant(s).

4.0 BUDGET:

	ECUADOR CRMP			BUDGET			GRAND TOTAL (X\$1000)
	URI/S&T FUNDS		PHASE I	USAID/EC FUNDS (\$1000)			
	YR 1	YR 2	TOTAL	YR 1	YR 2	TOTAL	
ADMINISTRATION							
Ex-Pat Mgr	55.3	31.0	86.3				86.3
In-Count Mgr		15.6	15.6				15.6
Support Staff/Oper	41.6	34.0	75.6				75.6
Committee Support	0.3	1.0	1.3				1.3
Int'l. Travel	4.7	3.0	7.7				7.7
Equipment	16.9	1.0	17.9				17.9
SUBTOTAL	118.8	85.6	204.4	0.0	0.0	0.0	204.4
LEGAL/INST/FRAMEWK							
Shrimp	10.0	0.0	10.0				10.0
Water Quality	3.7	9.5	13.2				13.2
Coord. W/Profile		4.0	4.0				4.0
Nat'l CRM Strategy		3.0	3.0				3.0
Galapagos Analysis		2.8	2.8				2.8
SUBTOTAL	13.7	19.3	33.0	0.0	0.0	0.0	33.0
KEY COASTAL ISSUES							
Provincial Profiles							
Fund. Maldonado		56.0	56.0				56.0
Ex-Pat. Asst	4.4	15.5	19.9				19.9
Shoreline Class	0.0	0.0	0.0		16.0	16.0	16.0
Shrimp Mariculture							
Assessment	67.0	14.0	81.0	36.7	0.0	36.7	117.7
PL Mortality	0.0	30.0	30.0				30.0
Col. Efforts W/Industry							
Water Qual	0.0	0.0	0.0		54.5	54.5	54.5
SUBTOTAL	71.4	115.5	186.9	36.7	70.5	107.2	294.1
TRAINING	4.9		4.9				4.9
Fund. Natura		5.0	5.0				5.0
Meetings/Conf		7.6	7.6				7.6
Tuition		3.0	3.0				3.0
Short Courses/Wksp		6.0	6.0				6.0
SUBTOTAL	4.9	21.6	26.5				26.5
PUBLIC EDUCATION	1.4						
Coordination		3.0					
SUBTOTAL	1.4	3.0	4.4				4.4
TOT DIR COSTS	210.2	245.0	455.2	36.7	70.5	107.2	562.4
INDIRECT (10%)	21.0	24.5	45.5	3.7	7.1	10.7	56.2
GRAND TOTAL	231.2	269.5	500.7	40.4	77.6	117.9	618.6

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In witness whereof, the Government of Ecuador and the Government of the United States of America, each acting through its duly authorized representatives, have received and accepted the Second Annual Workplan for the Coastal Resources Management Project in Ecuador.

GOBIERNO DEL ECUADOR

UNITED STATES OF AMERICA



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