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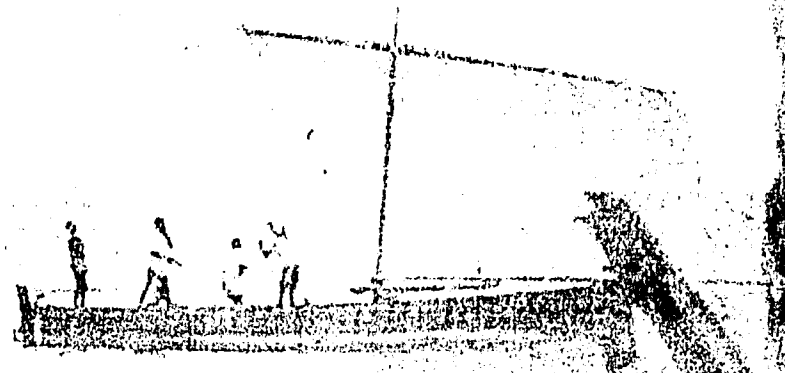
Report of URI, UPR, ESPOL Meeting
June 3-7, 1985
Cooperative Agreement
DAN 4024 A-00-2072-00
"Fisheries Development Support Services"



ICMRD

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INTRODUCTION

Purpose of the ESPOL Meeting

An adaptive research planning meeting was conducted at ESPOL June 3 to June 7, 1985, to include representatives of ESPOL, UPR and URI. Purposes of this meeting were as follows:

- Establishment of a Latin American/Caribbean marine fisheries networking plan
- Define adaptive research projects and procedures for the coming year
- Identify possible linkages

  Student Exchanges
  Faculty Exchanges
  Information Exchanges

- Plan appropriate dissemination workshops in Central America and South America for 1986
- Identify longer-term adaptive research efforts
- Identify training opportunities

The following University of Rhode Island (URI) faculty and University of Puerto Rico (UPR) faculty were available in-country to meet with counterpart faculty from Escuela Superior Politecnica Del Litoral (ESPOL). The meeting took place in Guayaquil, Ecuador.

Faculty Member	Area of Responsibility	Dates in Ecuador
Dr. Donald E. McCreight (URI)	URI Project Coordinator	June 2 - June 7
Dr. Kenneth Simpson (URI)	Mariculture/*Artemia*	May 27 - May 31
Prof. Harlan Lampe (URI)	Fisheries Management	June 2 - June 7
Dr. Alvin Siegel (URI)	Fisheries Products Post-Harvest Losses	May 27 - June 7
Dr. Jon Sutinen (URI)	Fisheries Management and Socio-Economic Studies	June 2 - June 7
Dr. John Poggie (URI)	Fisheries Cooperatives/ Information Systems	May 26 - June 8
Prof. Joseph DeAlteris (URI)	Fishing Technology	June 2 - June 14
Dr. Manuel L. Hernandez (UPR)	Mariculture	June 2 - June 8

During the period of May 27 to June 14, the following working groups met at ESPOL in Guayaquil, Ecuador, to plan joint adaptive research and training efforts and identify other linkages that will improve networking in marine fisheries within the Latin America and Caribbean region. The following working groups were formed:

FISHERIES MANAGEMENT

Prof. Harlan Lampe	URI - Fishery Management
Dr. Jon Sutinen	URI - Resource Economist
Ing. Raul Coello	ESPOL
Ing. Marco Velarde	ESPOL - Vice Dean, Marine Science
Ing. Cristobal Mariscal	ESPOL

MARICULTURE

Dr. Manuel Hernandez	University of Puerto Rico
Ing. Henry Alvarez	ESPOL
M.S. Edgar Arellano	Artemia - ESPOL
Dr. Kenneth Simpson	URI
Ing. Marco Alvarez	Other Mariculture
Ing. Wilmo Jara	Dean, ESPOL

FISHERIES POST-HARVEST LOSSES

Dr. Al Siegel	URI - Food Technology
Ing. Luis Miranda	ESPOL - Food Technology

FISHING TECHNOLOGY

Ing. Miguel Fierro	ESPOL
Prof. Joseph DeAlteris	URI
Ing. Cristobal Mariscal	Artisanal Boat Construction
Prof. Luis Torres	ESPOL/Government
Prof. Jaime Villacis	ESPOL

SOCIO-CULTURAL/ECONOMIC FACTORS

Dr. John Poggie	Socio-cultural - URI
Dr. Donald McCreight	Associate Director, ICMRD - URI
Dr. Jon Sutinen	Socio-economic - URI
Ing. Miguel Fierro	Director, Fisheries Technology - ESPOL

SOCIO-CULTURAL/ECONOMIC FACTORS

Establishing a General Background Information System for the Small-Scale Fishery in Ecuador

Overview

Reviews of small-scale marine fisheries of the world indicate that many result in failure despite apparent technological adequacy. Unfortunately, in most cases, human factors are implicated on the cause of failure in post hoc interpretations. Systematic prior understanding of human impediments to fishery development is needed to carry out rational planning of projects. The first step in generating prior understanding is the establishment of a general background information system for the small-scale fishery.

Outputs

- Produce information identifying important activities and elements of the fishery which require development or management efforts.

- Provide the basis for forming perceptions and hypotheses about the fishery which can be used to design more intensive data collection strategies for effective management.

Inputs

- Personnel — 12 fisheries students from ESPOL (part time, 12 months)

- Supplies — Office supplies

- Travel Local: bus to and from sites

International: 2 RT Providence to Guayaquil

Project Objectives

There are two major objectives: (1) the first objective is to collect background information concerning the small-scale fishery in Ecuador; (2) the second objective is to analyze and compile this data in such a way that it will be of immediate use in preliminary planning for management and development.

Background Information

The proposed background information provides an essential basis for more detailed research involving probability sampling techniques. Background information can be obtained from written records, by observing what goes on when fish are caught, landed and sold, and by interviewing people who are familiar with the fishery. The background information is not based on probability sampling techniques; hence, the confidence limits of estimates cannot be specified, but they are accurate enough to be used for preliminary planning in most cases. Final planning must be based on more intensive survey research which can be more adequately designed with the basis that the proposed project can provide.

General Workplan

Given an estimate of three working days per research site and an estimate of a maximum of 50 sites, the proposed project will require at least 150 man-days for data collection. Field workers will have to be trained, and if they already have some experience or training in

fisheries, the training period would be five full days. Data analysis should take approximately 20 man-days, and preparation of final report approximately 25 man-days.

The greatest amount of time is involved with the data collection, and the number of field workers involved will have the greatest impact on scheduling. For example, if ten field workers are involved, an estimated maximum of fifteen working days will be necessary for data collection (three weeks). Five field workers would require a maximum of six weeks to complete the same task. A schedule is presented below which reflects the first option. The final proposal can be adjusted accordingly.

PROPOSED TIMETABLE

WEEK	Preparation of Data Forms	Training	Field Work	Data Analysis	Preparation of Final Report
1	X	X			
2			X		
3			X		
4			X		
5				X	
6				X	
7				X	
8				X	
9					X
10					X
11					X
12					X
13					X

Detailed Workplan

Methods used to collect the data will be key informant interviews and participant observation (see Stevenson, Pollnac, and Logan 1982 for details concerning the use of these techniques in fisheries planning research). Specific data types to be collected at each port will be those listed under "resource element" and "harvesting element", Appendix A (pp. 107-109, Stevenson, Pollnac & Logan, 1982).

1. Resource Element

Number of species exploited (approximate)
Most abundant species
Most valued species
Length and weight ranges of exploited species
Scientific and common names of exploited species
History of changes in size and abundance of principal species

2. Harvesting Element

Inputs (Fixed)

Identification of all boat-types
Number of each (approx.) by location
Length, width, draft, superstructure configuration by type, capacity of holds
Useable life of boats
Cost of boat-type new and import duties
Common vessel improvement practices
Range of boat-type resale values
Boat building and repair sources
Hull materials used and their supply sources
Sources of training for repairs and construction
History of evolution of boat-types used
How number of boats has changed in recent past
Ownership patterns - owner operated (owner-captain), absentee owner, cooperative ownership
Identification of all methods of propulsion
Number of each (approx.) by location
Motor types used - horse power, fuel used, and other characteristics
Useable life of motors
Cost of new motor types and import duties
Range of motor resale values
Sources of motor purchases
Sources of spare parts
Sources of repairs
Sources of training for repairs
Ownership patterns of motors
Common combinations of boat/motor
Numbers of each combination (approx.)
Physical characteristics of other modes (sails, etc.)
Useful life of other modes
Cost of other modes new
Source of supplies and repairs for other modes
Source of training for repair and construction
Identification of all gear-types used
Numbers of each type used (approx.) by location
Physical characteristics of gear-types - length, width, mesh size, number of hooks, etc.
Useful life of gear-type

Inputs (Fixed), continued

Cost of gear-type new and import duties
Range of gear-type resale value (if any)
Construction and repair sources
Materials used and their sources (and import duties)
Source of training for construction and repair
History of evolution of gear-types
Ownership patterns of gear-types
Patterns of gear-type use among different groups of fishermen
Common combinations of gear with boat-type and boat/motor, boat/sail, etc., combinations
Numbers (approx.) of these combinations by location
Multiple gear-types owned by a single fisherman or single boat
Use of insurance for boat, motor, gear, crew, other
Sources of insurance
Costs of insurance
Sources of credit for boat, motor, gear
Interest rates for equal loan life from different sources
Average repayment period
Registration fees
License fees
Association (e.g., Cooperative) fees
Existence of taxes on income, property, other
Mooring fees
Other fixed fees, e.g., accounting costs, legal fees

Process

Most frequent kinds of maintenance to the hull/motor/gear
Typical cost of maintenance per year to hull/motor/gear
Who pays for maintenance and repair
Who supplies the labor for maintenance and repairs to hull/motor/gear
Average number of lost fishing days for all maintenance per year
Average number of lost fishing days for all repairs per year
Average number of men per boat/gear-types
Use of family relations as crew
Sources of training for fishing, navigation skills
Use of ice in various boat-types
Various forms of ice used
How quantity of ice is determined for a trip
Price per standard unit of ice
History of costs of ice
Number of sources of ice
Ownership of sources of ice
Sources of fuel
Price per gallon
History of price changes
Amount consumed per average trip
Oil sources
Oil prices and their history
Amount consumed per average trip
Typical baits per gear-type
Bait sources
Prices of different baits and history of changes
Standard food costs per average trip
Who supplies food for trips
Additional trip costs, e.g., unloading fees by location
Systems used to divide trip costs such as the cost of food, ice, fuel, oil, bait, etc., among owner, owner-captain, captain, crew members
Time of day/night fishing by gear-type
Frequency of trips by gear-type in a week, month
Average length of trip by boat/gear type
Seasonal differences
Major fishing areas
Relation between home port and fishing area
Areas reserved for certain fishermen or certain gear-types by tradition
Time and distances to reach fishing sites
Usual time for fishermen to return to port
Specific methods of using gears

Process, continued

Several gears used on a single trip
Gears directed at particular species
Differences in catch among gear-type (species, sizes)
Competition for fish with industrial fleets
Supplies of inputs or prices affected by industrial fleet purchases
Number (approx.) of days fishing lost per month or year due to bad weather
Is this seasonal
Recent history of catches for major species -- falling, increasing, etc.

Output

Fish preparation methods
Number of primary buyers, location
Reasons fishermen select a particular primary buyer
Do some fishermen transport the catch of others to sale
Commercial classes of fish
Determinants of commercial class
Rules buyers use to determine if a fish is acceptable
Fish sales at sea or to other than primary buyer
Existence of underutilized species
Reasons for underutilization
Tax on catch - percentage of fish caught actually taxed
Existence of support prices for fish
Current prices of the various species/classes
Price changes (approx.) through time
Large seasonal changes in prices
Competition between artisanal and industrial catch or by-catch
Relative magnitude of industrial vs. artisanal landings of same species
Point of entry in delivery system of industrial catches or by-catch
General quality differences in artisanal and industrial catch of same species
Systems used to divide revenues between the owner, owner-captain, captain, and crew
Differences in systems by home port and boat/gear combination
Fish used to pay the captain and crew, other costs
Revenue for services other than fishing, e.g., towing, transport, etc.
Are the costs of food, fuel, ice, etc., paid before the trip or deducted from the revenue afterward
Who pays for losses, e.g., gear lost during a trip
Fish withheld from sales so that it can be smoked/dried/salted for later sale by season
Species saved for curing
How is the fish that is sold used - sold fresh, frozen, processed (canned, meal), exported
Other services the primary buyer provides
Are fishermen required by these services to sell to a particular buyer
Do primary buyers or transporters give preference to industrial fleet catch or by-catch

Other

Fishermen's perceptions of primary buyers and their profit margins
Fishermen's perceptions of reasons for large differences in the prices they receive and retail prices
Existence of and services performed by cooperatives or fishermen's organizations
Number of members and number of active members
What do the cooperatives own

Other, continued

Sources of training for cooperative officers
Alternate employment opportunities for fishermen
Barriers, e.g., physical, cultural, to entry into the fishery
Seasonality of fishing and relation to agricultural seasons
System of laws pertaining to fishery, e.g., licenses, registrations, inspections, trip reports, insurance requirements, inspection of landed fish, pollution restrictions, season or area closures, industrial fleet interaction, gear use restrictions
Number of landing sites - location, clusters, remoteness from buyers
Pier construction and locations
Ability of landing sites to handle larger, deeper draft boats
Are mooring and shelter sufficient
Infrastructure serving landing sites - roads, communications, centralized markets, public transport, etc.
The fishermen's perception of what others (non-fishermen) think of his work
Attitudes (general) among groups of fishermen to adoption of different gear-types and boat-types
Traditional areas for fishing by certain groups
Traditional barriers to extended fishing trips
Traditional barriers to more frequent trips
The role of the family in the fishery enterprise

Although the above list looks like a great deal of information, its acquisition is rather easy. For example, an interviewer will go up to a fisherman who is in the process of folding his net into his boat. The interviewer will make observations concerning many factors about the boat type and record them while observing or during a break in the interview. Questions not easily answered through observation concerning the vessel and gear, target species, etc., will be posed to the fishermen. Not all questions will be asked of one fisherman -- the interview would become too long, but it is surprising the amount of information that can be obtained in a ten to fifteen minute conversation with a fisherman. The interviewers will be trained so that they can ask a series of questions concerning a given boat/gear combination naturally, without reference to a "questionnaire" which makes some fishermen

uneasy. The notes will be reviewed during a lull in conversation or after the interview is finished, and missing information will be obtained from other fishermen, along with verification of information already received.

The data will be collected at all artisanal fish landing concentrations along the coast of Ecuador. There are somewhere between 40 and 50 such landing spots according to the most recent information. Experience has shown that it takes an average of about three days per location to collect such data. In some cases, where the fishermen are residentially concentrated at a relatively small port and the fishing methods are few and relatively homogeneous, the required information may be collected in one day. Medium sized ports with several types of technology may take two to three days. Large landing areas with landings spread out at different locations along the beach and in estuaries where diverse technologies and methods are used can require four or five days of intensive work. Preliminary work in Ecuador suggests that an average of three days is realistic.

Analysis will proceed by first creating tables composed of cross-tabulations of data by community for each major geographical region (e.g., Esmeraldas, Manabi, Guayas, and El Oro). The analysis will proceed by then grouping communities on the basis of similarity artisanal fishery variables using some form of cluster analysis. The types of artisanal fishing communities derived from this analysis will be discussed in detail, including the developmental implications of the type. The list of communities included in each type will be included.

Factors Influencing the Relative Success of Artisanal Fishermen's Cooperatives in Ecuador

Overview

Fishermen's cooperatives figure prominently in the artisanal fisheries of Ecuador. A large number of these organizations have been formed throughout the country. Many cooperatives are struggling, many have failed completely, while only a few have been successful. This pattern is found in many other parts of the world as well. Cooperatives can be an excellent mode of organizing small producers into more profitable and efficient units, if the factors that contribute to success and failure can be understood and adjusted. The purpose of this project is to compare a sample of less-than-successful cooperatives with a sample of successful ones to try to determine the underlying factors that contribute to relative success or failure of these organizations.

Outputs

- Build significantly on existing minimal knowledge about the predictors of success and failure of fishermen's cooperatives.

- Publish a guide to cooperative formation for fisheries administrators in Ecuador.

Inputs

- Personnel 6 fisheries students from ESPOL (part time, 12 months)

- Personnel (cont.)	1 sociologist from Ecuador (part time, 12 months)
	2 URI consultants (3 man months)
	1 ESPOL faculty coodinator (12 months, part time)
- Supplies	Office supplies
	Computer time
- Travel	Local: ESPOL personnel
	International: 2 RT Providence-Guayaquil

Project Objectives

I. The First Objective is to provide a detailed description of the history and operations of a sample of artisanal capture fishermen's cooperatives in Ecuador.

II. The Second Objective is to determine variables contributing to the relative success or failure of the cooperatives in the sample.

Background Information

The works cited below are for the most part summaries of project reports concerning fishermen's cooperatives. The data analyzed for these reports was only that which was available, that which the different project evaluators felt was important with respect to the cooperative in question. The few comparative studies that were done were conducted across only two or three cooperatives and did not use the long list of variables identified in the literature cited below. In Ecuador we have the possibility to build on this past research and do a scientific comparison across a substantial number of fishermen's cooperatives manifesting varying degrees of success; hence, we will be able to scientifically test the "theories" of cooperative development that have been identified.

Meynell, P. J. (1984) Small-scale Fisheries Cooperatives - Some Lessons for the Future. COPAC Occasional Paper No. 2. Rome: COPAC Secretariat.

Poggie, J. J. (1980) Small-scale fishermen's psychocultural characteristics and cooperative formation. Anthropological Quarterly. Vol. 53: 20-28.

Pollnac, R. (N.D.) Evaluating the Potential of Fishermen's Organizations in Developing Countries (Manuscript prepared for UNFAO).

---- (1985) Social and cultural characteristics in small-scale fishery development. in M. Cernea (ed.) Putting People First: Sociological Variables in Rural Development Projects. Oxford University Press.

---- (1981) Sociocultural Aspects of Developing Small-scale Fisheries: Delivering Services to the Poor. World Bank Staff Working Paper No. 490.

General Workplan

Dr. Pollnac has already spent part of a three-week consultancy in Ecuador developing this proposal. This will not be included in the project schedule. During the first week of the project, field interviewers will be trained in techniques for obtaining the required data. During the training period, the sample of fishermen's cooperatives will be selected, and project travel will be planned and finalized. Either Dr. Poggie or Dr. Pollnac will be involved in the training program. One of them will also be involved in the initial phases of data collection.

If seven field workers are used to collect the required data, each could visit three cooperatives. On the basis of previous experience, it is estimated that the required data can be obtained for each cooperative in seven days or less, resulting in a maximum of 21 working days per field worker (approximately four weeks with weekends free). Data analysis would require at least 30 man-days, and report preparation will require another 30 man-days (six weeks each for data analysis and

write-up). At least one week must be devoted to training of field workers. Given these assumptions, the following schedule is proposed.

PROPOSED TIMETABLE

Week	Training	Field Work	Analysis	Write-up
1	X			
2		X		
3		X		
4		X		
5		X		
6			X	
7			X	
8			X	
9			X	
10			X	
11			X	X
13				X
14				X
15				X
16				X

Methods Independent variables: Previous research and analysis of available literature has identified a number of factors which apparently contribute to relative success or failure of fishermen's cooperatives. These factors include:

1. Source of idea for the organization.
2. Development of cooperative from a previously existing organization.
3. Size of the organization.
4. Rules and regulations applicable to the cooperative and its members, including those in the charter.
5. Distribution of labor in cooperative as contrasted with division of labor in the fishing community in general.

6. Existence of joint hire-purchase contracts or agreements for vessels or gear.

7. Turnover in fishing crews in the fishing community.

8. Residency requirements which conflict with migration patterns of fishermen.

9. Membership restrictions (e.g., boat owners?).

10. Members' level of formal education.

11. Do members believe that the organization performs functions as expected?

12. Entry requirements (e.g., entry fees, dues, labor, etc.).

13. If a marketing cooperative, are members paid for fish upon delivery?

14. Availability of credit for members.

15. Functions and qualifications of management personnel.

16. Meeting schedules in relation to fishing times.

17. Type of monitoring of operations.

18. Types of contacts and relationships with government agencies.

19. Location and structure of organization's meetings.

Many of these factors can be determined through key informant interviews (e.g., items 1 through 9 and 12 through 19), review of written material (at least items 4 and 12), and a few must be obtained through interviewing the members (items 10 and 11).

Dependent variables: The basic dependent variable in this project is the relative success of the fishermen's cooperative. Success, however, is a multidimensional concept. Success can be measured in terms of income, productive ability, physical facilities, changes in ideology, members' attitudes, numbers of members, and perceptions of non-members. In terms of a variety of dimensions such as these, it is quite possible

that some of the dimensions could be unrelated to one another. This project proposes to examine the following dimensions of cooperative "success".

1. Gross per member.
2. Net per member.
3. Capital per member.
4. Members' perception of level of success of the cooperative.
5. Perceptions of level of success of the cooperative by non-member local fishermen.
6. Level of development of physical plant.
7. Membership size.
8. Membership turnover.

Items 1 through 3, 7, and 8 should be available through review of cooperative records, but it is expected that the less successful cooperatives will either not keep records or will not make them available to the project. In this worst of cases, estimates will have to be made through interview of members. Item 6 can be obtained, for the most part, through observation and some key informant interviews. Items 4 and 5 must be determined using survey techniques among the members and local fishermen.

<u>The sample</u> The sample will consist of at least 20 fishermen's cooperatives which vary in terms of their relative "success" as determined by interviews conducted with personnel in the Subsecretariat of Fisheries.

Analysis Analysis of the data will be performed using appropriate parametric and non-parametric statistical techniques depending on the level of measurement of the variables in question. Depending on the quality of the data obtained, attempts will be made to develop some composite measure from the dependent and independent variables, and relationships between these composite measures will be evaluated.

Report Preparation Two types of reports will be prepared. One will be of immediate applied value; it will make recommendations to facilitate the development of fishermen's cooperatives in Ecuador and present the findings of the research in a concise manner which will facilitate its use by decision makers in fishery development. The other report will be more academic in nature. It will relate the findings to the existing literature concerning cooperatives in general as well as fishermen's cooperatives. It will fit the findings into the general theories which concern development through the use of cooperatives. Doctors Poggie and/or Pollnac will act as consultants for project data analysis and report preparation as needed.

FISHERIES MANAGEMENT AND RESOURCE UTILIZATION

ESPOL-URI

I. INTRODUCTION

The outputs of the collaboration between ESPOL and URI are diverse, and some can best be achieved by further collaboration with the INP (Instituto Nacional de Pesca). The training outputs will result from the interaction of URI-ESPOL, while the research outputs will be achieved with the participation of INP.

The development of the management models for small pelagic fish is a particular case in point. The INP has initiated a program for collecting data for the small pelagic fishes from the fishermen in the industry and through surveys with its own research vessels. The program has been developed with the support of a British team. However, the scheme has not involved the development of a management plan or model given the concentration on data base development. There is, in consequence, an opportunity to use the manpower and skills of the URI-ESPOL team to fill this critical gap. The INP supports this view, and a fruitful collaboration will result in an effective and robust management model to which three institutions have contributed their expertise.

It should be made absolutely clear that the objective of the management research is to create a simple, sturdy and practical model for management, not an elegant but costly and useless implement.

The development of the information system for the artisan sector is critical to an appreciation of the problem with which the sector is confronted and to provide a basis for action and policy development. This output will require close collaboration between the various groups

in the ESPOL-URI team. This has begun in the development of the work-plans.

The training outputs themselves are diverse, and all but one are rather typical. A rather novel approach to the development of the expertise that the future will require is to select for special treatment students at an early stage. This will essentially require the early identification of students with the capacities and interests to take advanced education and to provide leadership in the future. These students would be especially prepared through their work with the project and consequent introduction to advanced methods and activities.

The proposed regional workshop in early 1987 will provide an opportunity for the growing network for fisheries professionals to interact professionally on important issues. The tentative title reflects the nature of the program focus--"Modelos Practicas para el Manejo & Analysis de Pesquerias."

II. OUTPUTS

A. Training

1. One professional trained to the M.S. in fisheries management and actively involved in research at ESPOL.

2. Two students (minimum) prepared for graduate study through the advanced identification and participation program.

3. Three faculty members at each institution with in-country training. Three URI staff will have had working experience in research and teaching at ESPOL and vice versa. Each exchange might range from 3 to 6 months.

4. Computer-assisted learning programs for fisheries management and analysis in place. ESPOL is ideally situated to use such programs for students since it has both personal computers and terminals in substantial numbers available for student as well as faculty use.

B. Outreach-Linkage

1. A regional fisheries management workshop--Modelos Practicas para el Manejo & Analysis de Pesquerias

C. Research--Management

1. Practical, tested computer model for the management of a multi-species, small pelagic fishery.

2. Tested operational information system for the artisanal fisheries sector.

3. Strengthened advisory capacities on issues of fisheries management policy as well as strong linkages with INP.

III. INPUTS

A. Personnel

1. ESPOL

a. Professional services 6-9 m/m*

b. Professional training 18 m/m

c. Students-career development 2 part-time

d. Students-artisan fisheries 10 part-time

*m/m = hombres/meses

2. URI

a. Professional services 3-5 m/m

b. Grad. student (Ph.D. level) 12 m/m

B. Equipment

1. Microcomputers

C. Travel

1. In-country for interviews with artisan sector

2. Eight round trips for graduate students and faculty between ESPOL-URI

IV. ALTERNATIVE FUNDING SOURCES

IDRC	LASPAU
RFF	Tinker
OEA	Inter-American Foundation

V. TIMETABLE (APPROXIMATE)

A. Training

1. M.S. program to begin early 1986

2. Career development to begin late 1985

3. Computer assisted learning to begin 1985

4. Faculty-staff exchange to begin in late 1985

B. Outreach-Linkage

Workshop to be held in early 1987

C. Research-Management

1. Small pelagic management research has begun.

   a. Preliminary model complete in mid-1986

   b. Tested model in place in early 1987

   c. Refined model available in late 1987

2. Artisan fisheries information system project initiated

   a. Preliminary-baseline results expected in mid-1986

   b. Final baseline results in late 1986

   c. Results will continue from system in place

3. Collaboration with INP on a continuing basis

VI. SOME ELEMENTS OF A BUDGET EXCLUDING PROFESSIONAL SALARIES

A. Students - career development	
2 half-time, 3 years	$ 6,000
B. Students - interviewing	
10, 3 months each	5,000
C. Travel	
- Between countries	
Airfares - 8 @ $900	7,200
Per diems - 540 days ±	25,000
- In Ecuador	
Interviews, etc.	2,000
D. Microcomputers (2)	8,000

E. Workshop

- Administration & Publications	4,000
- Travel & living support	5,000

POST-HARVEST FISHERY LOSSES IN ECUADOR

INTRODUCTION

Post-harvest fishery losses under the Ecuadorean situation relates to the decrease in fresh fish quality due to spoilage, contamination, and poor methods of handling, transportation, and marketing.

An increase in fresh fish quality will minimize post-harvest losses and thereby increase fish consumption in the rural areas.

Other related areas include consumer preferences for fish and fish handling on board.

WORK PLAN

1. Objective

   To determine where losses occur during the post-harvest fishery system in relation to spoilage, contamination, and distribution within the marketing system.

2. To extend the shelf life of fresh fish by minimizing losses due to spoilage, contamination, and improper handling.

OUTPUTS

1. The development of three models which illustrate where losses occur during the post-harvest fishery system.

2. The development of baseline data to support improved procedures for extending the shelf life of fresh fish within a small-scale commercial operation.

3. The transfer of basic, applied technology, primarily in handling, to the small-scale fishery industry for maintaining fresh fish quality.

4. Training students, faculty-exchange

5. Development of short courses in fresh fish quality evaluation and sanitation.

6. Policies

7. Publications

8. Regional workshop in fresh fish quality and handling.

INPUTS

1. Personnel (ESPOL) - 1 faculty, 5 students

2. Laboratory equipment for chemical, physical, and microbiological tests

3. Reagents

4. Transportation

5. Support services - statistics; secretarial

AVAILABLE FUNDING SOURCES

- Private sector
- Fish Dealers
- Fish exporters
- CONACYT
- BID
- LASPAU
- IDRC
- CONUEP
- USIA
- INP (National Fishery Institute

TIME TABLE/ACTIVITIES

One year

Six months = sampling and analyses

Three months = evaluation of data

preparation of reports

Three months = dissemination of information

transfer of technology (initiate)

1. Acquire baseline data on fish spoilage in relation to handling, sanitation, time, and temperature using two or three species including medium fat fish (2-5%) and lean fish (less than 2%)

A. Fish landing

B. Initial transportation of fish

C. Arrival at market

D. Sales at market

DESIGN

PRODUCT MODEL (A)

- Whole fish
    - eviscerated
    - non-eviscerated

HANDLING/PRESERVATION MODEL (B)

- Broken ice
- Flaked ice
- No ice
- Enzyme preservative

PACKAGING MODEL (C)

- Plastic box
- Wooden box
- Plastic sheet
- No packaging

ANALYSES

- Chemical tests
    - Change in acidity
    - Change in lipid content
    - Ammonia
    - Trimethyl amine
- Physical tests
    - Sensorial methods
        - Appearance
        - Touch
        - Raw odor

- Microbioligical tests
    - Aerobic plate count (APC)
    - Faecal coliforms
    - Staphylococcus aureaus count

- Sampling
- Analyses
- Data evaluation
    - policies
    - recommendations

Extension work for the transfer of developed technology

ESTIMATED COST

$10,000

Fish supplies

Transportation

Reagents

FISHERIES TECHNOLOGY

PROJECT: Transfer of appropriate technology to the small-scale fishermen of Ecuador to increase the production of fish.

PRIORITY: Moderate.

Overview

The artisanal fisheries of Ecuador cover a wide geographic range and a variety of fishing vessels and levels of technology. As in any fishery in the world, there is the opportunity to increase the production of the fishermen using their traditional vessels by making either improvements in methods or gear used in existing fisheries or by the introduction of new methods creating entirely new fisheries on virgin stocks. In the proposed project, the emphasis is on the introduction of new fishing gear technologies to artisanal fishermen in their existing boats. It is proposed to test and evaluate these new technologies in Ecuadorean waters and then to demonstrate these to the local artisanal fishermen. It is proposed to experiment with monofilament gill nets, fishing with lights, bottom traps, pound nets, pair trawlings, surface and bottom longline, etc.

Outputs

1. Testing and evaluation of new fishing gear technologies for use in Ecuadorean waters.

2. Technical reports of these efforts applicable to other tropical fisheries.

3. Demonstration of these methods to local artisanal fishermen.

4. Result: increased production of fish.

Inputs

URI - 1. Evaluation of the present technology of artisanal fisheries in Ecuador.

2. Recommendations for new appropriate technologies.

3. Assist ESPOL in acquiring the gear and equipment when necessary.

4. Assist ESPOL in testing and evaluating the new technologies in Ecuadorean coastal waters.

ESPOL - 1. Assist in the evaluation of present technology.

2. Acquire the new fishing gear.

3. Test and evaluate the new fishing gear.

4. Demonstrate the new fishing gear to local artisanal fishermen.

FUNDING SOURCES: ESPOL

BID

Other sources to be determined

TIME TABLES: 1/86 - 12/88

FISHERIES TECHNOLOGY

PROJECT: To increase the production of larval shrimp for the mariculture industry.

PRIORITY: Highest.

Overview

At present, larval shrimp are collected with fine-mesh, hand-hauled nets along the beach. This production has declined and has resulted in a decline in the overall production of market-sized shrimp. It is proposed to use the artisanal fisherman to collect larval shrimp from the nearshore zone using small fine-mesh frame (box) trawl operated from motorized canoes, skiffs, etc. It is also proposed to conduct a survey of the distribution of larvae in the coastal region from the beach to 1 km offshore to find the greatest concentration of larvae, so that the fishing effort can be directed most efficiently.

Output

If successful, the result of the proposed will be the increase of the production in larval shrimp for the mariculture industry. It is a short-term project with great potential benefit.

Inputs:

URI - provide design for the gear and fishing vessel (canoe) modifications to handle the gear. Preliminary drawings are attached.

Also provide methodology for sampling the coastal zone for larval concentration.

ESPOL - fabricate the gear, coordinate with artisanal fishermen the testing of the gear during the peak production along the beach. Compare the efficiency of the methods - beach collection and nearshore zone collection - also conduct the survey of larval distribution along the coast and from the beach to offshore.

Materials - fine-mesh larval beam trawl (see attached drawings).

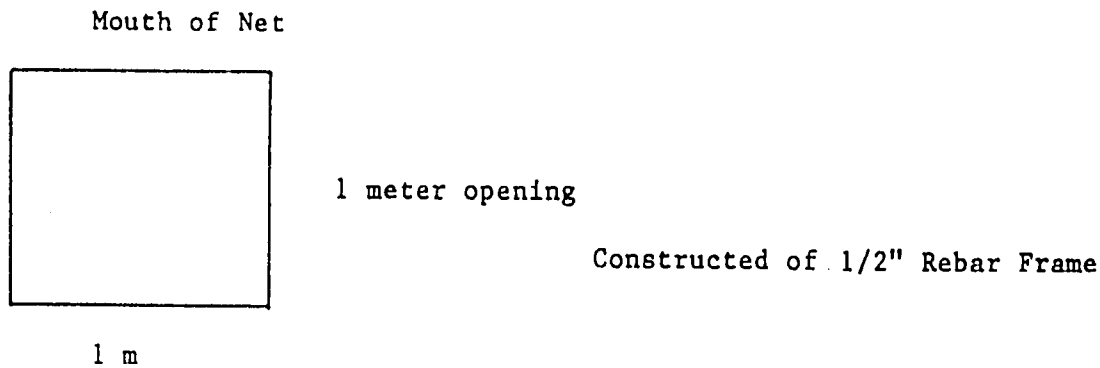
Artisanal Fishermen - to cooperate with testing the collection techniques.

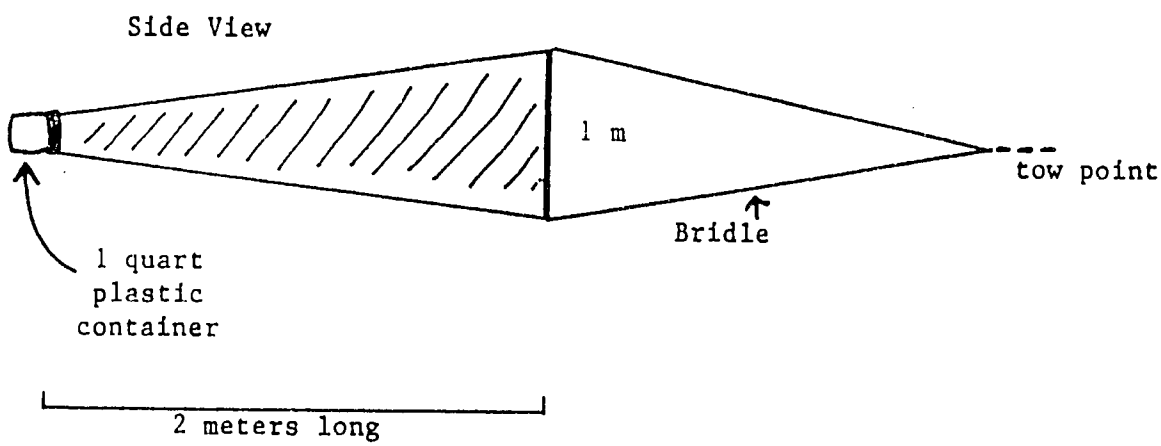
FUNDING: Sources to be determined

TIMETABLE: Immediate, ASAP.

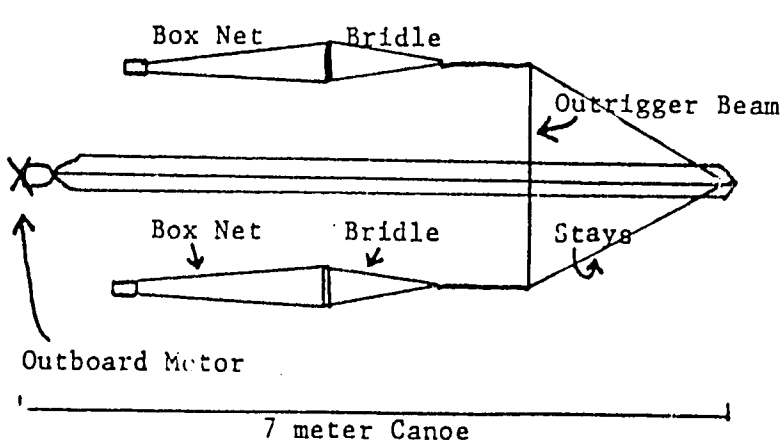
BUDGET: Minimal

Proposed Larval Collection Net, Box Trawl





Operation of Two Nets from Motorized Canoe



FISHERIES TECHNOLOGY

PROJECT: Continuation of pilot project for small-scale fisheries development using new, small fishing vessel designs, locally constructed, with new fishing gear handling equipment.

Overview

In March 1985, S. Drew and R. Pollnac, two URI fisheries consultants, proposed a pilot project for artisanal fisheries development in Ecuador based on their two-week tour of the country. Based on their report and recommendation, ESPOL has drawn the lines for two small fishing vessels for use in developing the artisanal fisheries. It remains to determine the most cost-effective methods to construct the boats (wood or fiberglass), equip the boats with engines and fishing gear, test and evaluate the vessels and the fishing gear in Ecuadorean coastal water, and finally demonstrate this gear to the fishermen. This is a long-term project.

Output

1. Introduction of new fishing vessel designs to the Ecuadorean artisanal fisheries offering greater versatility and efficiency.
2. More economical construction methods to artisanal fishing vessels.
3. Introduction of new fishing methods to the artisanal fisheries based on the new fishing vessel designs.
4. Overall impact of the proposed project is to increase the production of fish from the artisanal fisheries of Ecuador.

Inputs

URI - 1. Provide expertise in the evaluation of construction methods for the new vessels.

2. Provide recommendations on the possible fishing gear to be used on these new fishing vessels.

3. Assist in testing these vessels and gear in Ecuadorean coastal waters.

ESPOL - 1. Construct the proposed fishing vessels.

2. Outfit with engines and equip the fishing vessels with gear.

3. Assist in the testing of these fishing vessels and the new fishing gear.

4. Demonstrate the gear to the artisanal fishermen of Ecuador.

FUNDING SOURCES: To be determined

TIMETABLE: To be determined in accordance with available funding

BUDGET:

1. Vessel construction and engines - $10,000 each (conservative estimate)

2. Gear - $10,000 (conservative estimate)

3. Two months - fisheries technologist testing - $10,000

USE OF MARICULTURE IN ECUADOR

Larval Shrimp Feeds/*Artemia* Production-Quality

Overview

In 1970 the shrimp industry in Ecuador was $2.9 million. This production expanded in 1983 to a total of $183 million. In 1984 a decline to $154 million was experienced. In 1985 the production has been estimated to be even lower. This lowered production has taken place in spite of the fact that pond construction has continued at a very fast pace. The simple explanation is that the shrimp farms cannot get enough post larval shrimp to stock the ponds. The long-term solution to the problem is the construction of shrimp hatcheries rather than importation of post larval shrimp or intensified activity in the collection of post larval shrimp from the sea.

The hatchery production of post larval shrimp is not without its problems. The pre-larval shrimp require a series of live foods--the last being *Artemia*. Evidence is now emerging that the survival of the post larval shrimp *in the ponds* is directly related to the quality of the *Artemia* fed in the hatchery. Thus, increased production of post larval shrimp by the hatcheries will not result in a proportional increase in market shrimp if the pre-larval shrimp are fed existing supplies of *Artemia*.

The intent of this program is to pursue the following objectives:

Objectives - Ecuador

1. Assist in the establishment of *Artemia* production ponds in Ecuador.
2. Establish a quality control laboratory at the ESPOL coastal laboratory.
3. Train ESPOL students at URI in quality control and URI students at ESPOL in shrimp production.
4. Conduct research on the pond survival of post larval shrimp cultured on live feed, fortified live feed and artificial diets.

Priority

Highest.

Background

For the last ten years URI together with the EPA laboratory in Narragansett and the *Artemia* Reference Center in Gent, Belgium, have supplied the base for the research on *Artemia* quality. Because of this research we can predict the profile of a good *Artemia* and one that will not supply good nutrition to the predator. It has now been established that the survival of the post larval shrimp in the growout ponds is directly related to the *Artemia* that is fed to the pre-larval shrimp in the hatchery. At present there is no shortage of *Artemia* on the world market. The supply of good *Artemia* is however very short. At present the survival of the shrimp fed for a short period of time on *Artemia* in the hatcheries is good. Based on unpublished data we would predict that the survival of post larval shrimp in the ponds of present hatchery shrimp is much lower than sea captured post larval shrimp. This estimate is based on feeding studies of commercially available *Artemia* compared to "enriched" *Artemia*. In the short term the hatcheries will

be compelled to use existing supplies of Artemia. If these are enriched their production will be higher. The other alternative is to buy good Artemia. In the latter regard we have been contracted to analyze samples of Artemia for fatty acids and pesticides for several companies before large purchases are made. ESPOL should, for a price, perform this service. It is the intent of this project to give ESPOL this capacity.

In the long term, Ecuador should raise its own Artemia. The climate would appear to be suitable--Ecuasol has been making solar salt for many years. However, Ecuasol's ponds probably are not suitable for the level of Artemia production that is required; this due to the difference in pond management required for Artemia production and human salt production. ESPOL has land available for large experimental Artemia ponds.

Timetable - Ecuador

1. November 1985 (2 weeks) Dr. Bengston conduct class to hatchery managers. Advise on pond construction and Artemia enrichment.
2. February 1986 (2 weeks) Dr. Simpson continuation of above.
3. M.S./Ph.D. student to URI. Instruction at URI--research at ESPOL. January 1986 or September 1986 through 1988 or 1989.
4. Spring 1986 meeting in Ecuador on Fisheries Development Support Service.

Funding Sources

ESPOL

ICMRD

USAID

(Belgian Government)

Budget - Ecuador

1985-1986	3 RT tickets and per diem	$ 3,000
	Release time	3,000
	Student	10,000
	Research supplies-URI	2,000
	Literature search	300
	GS/Tech. to evaluate Ecuador samples and develop feed technology	10,000
		$29,300

Output #1 - Generalized Model of an *Artemia* Production System

Activities/Tasks	Target Dates Starting	Ending
(1) Literature review	- done -	
(2) Develop criteria for site selection	10/85	1/86
(3) Develop/adapt criteria for pond construction (modification)	10/85	1/86
(4) Determine inflow/outflow (evap.) qualitative model for water	1/86	2/86
(5) Determine population growth model for *Artemia*	1/86	2/86
(6) Identify and quantify inputs to system	1/86	3/86
(7) Project outputs	1/86	3/86
(8) Full model, including checklists for site selection and system management	3/86	5/86

Research Associate	2 Months	$4,000*
Travel		2,000
Per diem	20 Days	1,000
Misc.		500
1/2 G.S.		5,000

*Indirect costs and benefits not calculated.

Output #2 - Development of *Artemia* Production in Ecuador

Activities/Tasks	Target Dates Starting	Ending
A. Pond Systems		
(1) Pre-feasibility examination, incl. collection of samples	5/85	6/85
(2) Identification of site for full feasibility study	5/85	6/85
(3) Full feasibility study, incl. algal culture	11/85	2/86
(4) Preparation of experimental design for pond studies	12/85	1/86
(5) Site visit to set up experiment	2/86	2/86
(6) Experiment with inoculation and fertilization schemes	2/86	4/86
(7) Site visit to collect and analyze experimental results	4/86	5/86
(8) Development of country-wide plan for *Artemia* production	1/86	6/86
(9) Implementation of country-wide plan	7/86	7/87
B. Establishment of training and quality control center (ESPOL)		
(1) Present seminars	5/85	2/86
(2) Advise on design of quality control center	6/85	2/86
(3) Advise on set-up of quality control center	10/85	2/86
(4) Produce Spanish-language *Artemia* manual	9/85	2/86
(5) Interlaboratory calibration (URI & ESPOL) on *Artemia* quality from pond studies	4/86	6/86
(6) Training in enrichment of *Artemia*	11/85	2/86

Research Associate	4 Months	$8,000
Travel	3 per	3,000
Per diem		3,000
Chem. Anal./Supplies		2,000

Output #3 - Training of Foreign Personnel at URI

Activities/Tasks		Target Dates Starting	Ending
(1) Train ESPOL student		6/86	8/86
Research Associate	1 Month	$2,000	
Supplies		1,000	
Travel		1,500	

Output #4 - Information Services

(1) Maintenance of *Artemia* reprint collection and have computer access for literature searches

(2) Networked with ISA labs

Work Study student	$1,000
Computer time	500
Repairs	500
Program	500

Output #5 - Shrimp Mariculture

(1) Evaluate survival and growth of post larval pond shrimp raised on enriched live foods.

(2) Train hatchery managers.

(3) Develop encapsulated feed for mariculture species.

Travel and per diem	$2,000
Res. Assoc. 1/4 time	5,000
Computer search	300