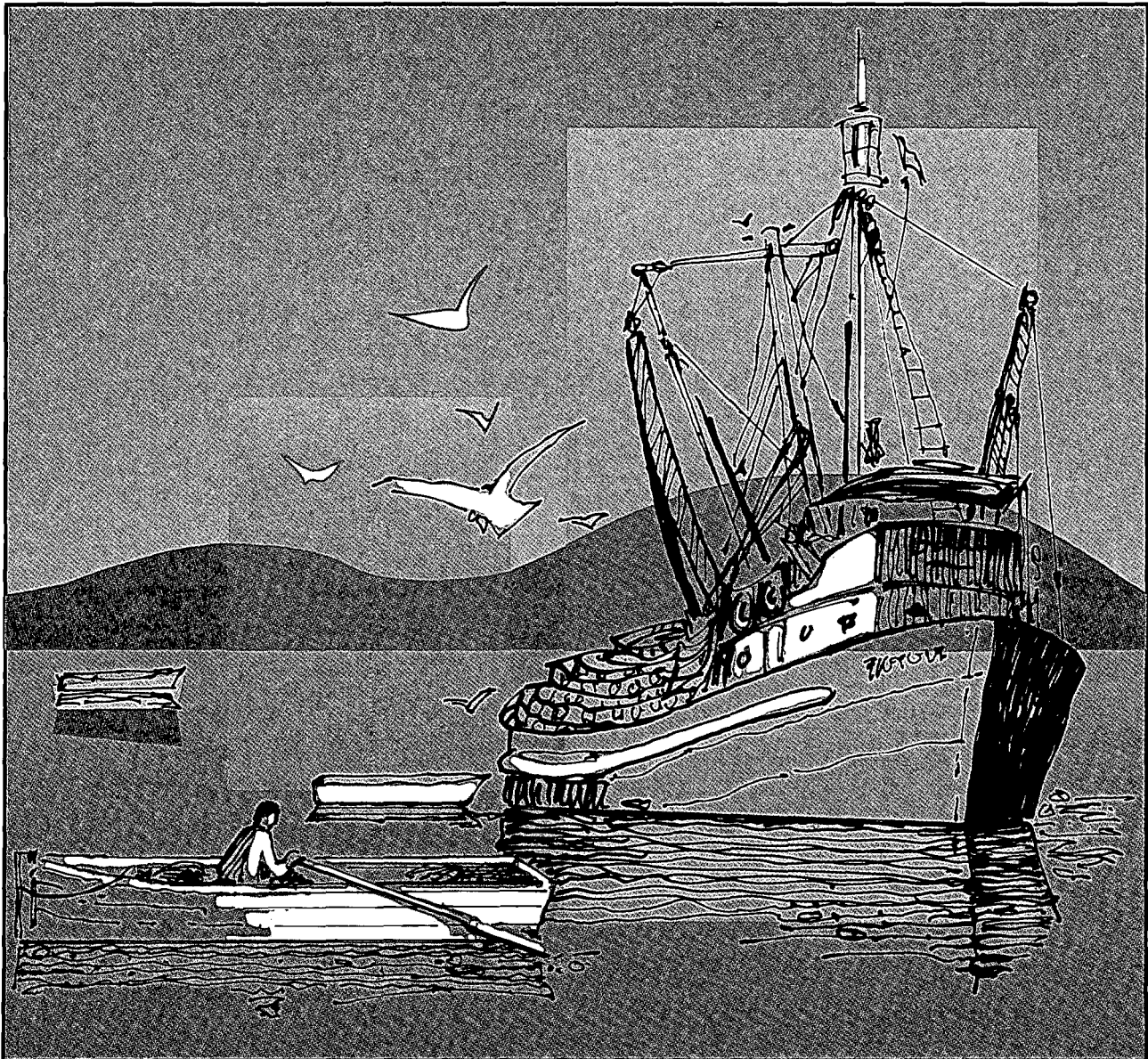


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Small-Scale Fisheries

Research Needs

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Small-Scale Fisheries

Research Needs

The World Bank/United Nations Development Programme/Commission
of the European Communities/Food and Agriculture Organization

The World Bank
Washington, D.C.

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ABSTRACT

This Working Group Report examines the critical problems affecting small-scale fisheries research. It first deals with an outline and diagnosis of the different small-scale fishery situations. This is followed by a more detailed discussion of fisheries management and associated fisheries research needs. It concludes with an assessment of the constraints to undertaking research.

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The Members of the Mission are grateful to the following agencies for supporting this study:

Multilateral Agencies: (Steering Committee) The World Bank; United Nations Development Programme; Commission of the European Communities; and Food and Agriculture Organization.

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FOREWORD

This Technical Paper is one of seven mission and working group reports prepared during the Study of International Fishery Research (SIFR) in 1989-90. The juxtaposition of potentially high socio-economic benefits from fisheries and the relatively low level of success achieved in fisheries development projects has been a matter of serious concern and challenge to the donor community as well as to national fishery administrations. In view of this, the First Fishery Development Donor Consultation held in 1986 decided to undertake a Study of International Fishery Research to determine ways in which research could bring about improvements. This comprehensive effort has now been completed, thanks especially to the effective financial support of a group of multilateral and bilateral donors and the essential intellectual contributions made by virtually hundreds of professionals from academia, fishery administrations and donors who were associated with various stages of the Study.

The objectives of the Study were to identify the specific constraints to fisheries management and development (including aquaculture) posed by the lack of information or the inaccessibility of existing knowledge; to determine high priority research needs; to examine the capacity of developing countries to undertake research; and to propose a strategy and an action plan for improving donor support. It was carried out through a series of missions and by four working groups which addressed specific research topics under the direction of a Study Team Leader and a Deputy. SIFR identified a number of key strategic research areas which are vital for the future development of the sector. Institutes in developing countries may not immediately be able to carry out all of this research, but the Study clearly identifies them as the ultimate beneficiaries of its thrust. In the meantime, countries with important fishery resources and the willingness to further develop their research for improved management and sustainable use of their resources should be assisted in drawing up national research agendas and building up their capacities. In this context, the findings of regional missions are a useful starting point. This volume contains the report of the Working Party on "Small Scale Fisheries: Research Needs" and is intended as background information to support the main study which is being published as "Study of International Fishery Research".

I wish to express my sincere thanks to the fisheries researchers, and fishery administrators in developing countries, as well as the leaders and members of the missions and Steering and Advisory committees for their vigorous effort and thoughtful contributions. It is my sincere hope that these Technical Papers will prove stimulating and provide practical guidance to donors, research institutions and fishery administrations in making progress toward sustainable resource utilization and the realization of new opportunities from fisheries and aquaculture in developing countries.



Michel J. Petit

Director, Agriculture and Rural Development Department

ACRONYMS

SIFR	Study of International Fishery Research
CEC	Commission of the European Communities
FAO	Food and Agriculture Organisation
TURF	Territorial Use Right in Fisheries

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**Small-Scale Fisheries:
Research Needs**

WORKING PARTY:

18-22 September, 1989, Rome, Italy

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1. INTRODUCTION

As part of the Study of International Fishery Research needs for developing countries, a Working Group on Critical Factors Affecting Small-scale Fisheries met at the FAO headquarters in Rome, Italy, on 18-22 September 1989. This is a report of that meeting.

BACKGROUND

The Study of International Fishery Research needs (SIFR) was undertaken under the auspices of the World Bank, UNDP, FAO and the CEC with the support of a dozen bilateral agencies. An important element of the Study is that of identifying the critical research issues that can lead to the improvement of benefits derived from fishery resources in developing countries. In the process of identifying research needs, the SIFR has created several Working Groups to deal with areas where the knowledge of research needs and research direction is generally weak.

One of the most important of these areas is related to the problems and opportunities for enhancing small-scale fisheries. In many developing countries, small-scale fisheries make significant contributions to national economies by providing employment opportunities and producing low cost supplies of animal protein with small requirements for capital and for imported fuel and materials.

The contributions of small-scale fisheries, however, are being weakened because of a variety of factors including excessive pressures on the fish stocks, free and open access to the resources and increased competition for the limited supplies with large scale fishing operations. This is frequently manifested in diminished incomes to small-scale fishers and increasingly pervasive and severe conflict.

Awareness of the benefits and needs for greater attention to small-scale fisheries is growing. The knowledge to deal with the problems, however, is still severely limited. The issues are highly complex and there is wide diversity among the situations. Research concepts and approaches are just in the initial stages of being formulated.

The significance and difficulties of the problems led SIFR to establish the Working Group on Critical Factors Affecting Small-scale Fisheries. FAO generously agreed to host the meeting of the Working Group. The opening remarks were presented by Dr. Armin Lindquist, Assistant Director-General of FAO for Fisheries. He emphasized the importance of small-scale fisheries to developing countries throughout the world and stressed the necessity for identifying high priority research needs and developing strategies for the conduct of the research. He referred to the importance of the multi-agency approach to the Study and expressed his appreciation for the participation in the meeting by the members of the Working Group.

The members of the Working Group included persons with backgrounds in marine biology, economics, sociology and political science (see Annex). Collectively they have wide experience in developing countries and in research. All have had direct working experience with small-scale fishing communities or with communities based on other renewable natural resources. The interdisciplinary nature of the Group and the backgrounds of the members in research and community participation reflect both the nature of the problems of small-scale fisheries and the objectives of the Study.

FRAMEWORK FOR DISCUSSION

The discussions initially focused on the problems associated with the management of small-scale fisheries. It was assumed that fisheries management is the most critical problem to be dealt with, and that the examination of management issues would facilitate the identification of the significant characteristics of small-scale fisheries requiring attention.

The Group then turned to the examination of different small-scale fishery situations, developing a general outline with diagnosis of the elements characterizing the different situations. This provided the basis for identifying critical research areas.

Finally, the Group raised the question as to why the critical research areas were not being addressed and identified some of the major constraints to both the demand for, and supply of, research.

In the presentation of the results of the meeting, it was decided to change the order of the discussions slightly. Thus, the report that follows deals first with the outline and diagnosis of the different situations. This is followed by the more specific and detailed discussion of fisheries management and associated research needs. The final section deals with the constraints to undertaking the research.

GENERAL COMMENTS

During the discussions, several points of a general nature emerged. Some of these concern definitions and others relate to underlying assumptions.

No attempt was made to define the distinctions between small and large-scale fisheries. Definitions are not universally applicable and that which may be called small-scale in one situation may be large-scale in another. It was felt that distinctions were not necessary for the purposes of discussion. With regard to any particular project, however, researchers may need to make precise definitions suitable to the situation.

Similarly, the terms "underexploited" and "overexploited" were not generally defined. Some remarks on the differences are noted in the discussions on the different types of fisheries.

No attempt was made to specify whether specific research needs were of a basic, innovative, targeted or applied nature. However, because of the generalized nature of the discussion, few of the suggestions could be considered as applied research. The focus was primarily on what might be called innovative targeted research. It was recognized that some basic research relating to small—scale fisheries is currently being undertaken in the form of anthropological studies of fishing communities and in the development of social choice theory related to common property resources.

It was an underlying assumption that the topics raised would generally require an interdisciplinary approach, although there are a few exceptions where economists, sociologists, anthropologists or political scientists might have a primary, if not sole, role. Biological research inputs were not specifically identified although it is clear that they would be required for some of the suggested research areas. It was felt that biological research needs would be more specifically identified elsewhere in SIFR activities.

Data needs also were not specifically discussed (except for the need for development of "rapid fishery assessment" methodologies similar to "rapid rural assessment" methodologies). It was recognized that there are serious deficiencies in the availability of economic and social data in virtually all countries and that considerable efforts need to be made to improve the data base.

An important related point made by the Group was that, for many research topics, the information available to fishing communities was often ignored in the conduct of research and in the preparation of projects and development of policies. Ignorance, or even rejection, of local information could render research results meaningless and, in some cases, lead to damaging projects and policies.

The role of fishing communities is important not only in providing information but also in the determination of research agendas. A good deal of fisheries research produces results that are never transferred into actions or policies. This is due not only to the absence of institutions (eg. rules, regulations, organizations) that can effectively use the research results but also to the lack of relevance of the research to the fishing community.

For both of the above reasons, the Working Group strongly recommends that fishers and fishing communities be closely involved in the setting up of research agendas and in the conduct of research.

As a final general point, the Group noted that the framework used in the discussions should not be considered as fully comprehensive. The Group felt that broad categories were useful as a means for classifying extremely diverse conditions into a more manageable analytic framework. Greater emphasis is placed on management issues than on development opportunities. The primary focus is placed on fish harvesting rather than on the fishery sector as a whole. Furthermore, the priorities for research are implicit rather than explicit.

Nevertheless, it is felt that the framework is useful for identifying the general areas of research needs and as a guide for the development of research strategies dealing with small-scale fisheries. Detailed research topics will have to be worked out in the context of specific situations. With regard to specific research topics, it will also be necessary to determine who will be involved in the research and how the research can best be undertaken.

2. TYPES OF SMALL-SCALE FISHERY SITUATIONS

INTRODUCTION

In considering the development of a typology for small-scale fisheries, the Group suggested a number of variables that might be useful for classification. These included:

- the state of the resource in terms of the amount of pressure on the stocks
- the characteristics of the resources with regard to migratory behavior, seasonality, yield functions, etc.
- identity of the dominant participants as subsistence, artisanal, semi-commercial or industrial
- the occupational profiles of the fishers in terms of part-time, full-time, seasonal fishing
- the pressures on the non-fishing resource base and the extent to which there are economic opportunities for alternative employment
- the ease of entry into, or exit from, the fishery in social, economic, cultural and technological terms
- the characteristics of the technology such as the use of passive as against mobile gear
- the modes of social and economic organization; whether the fishery is conducted by households, kinship/primary groups, community groups, capitalist or state-owned firms.

Although these, as well as other, variables would be useful in the eventual development of a more precise typology, it was felt that, for the purposes of the meeting, a more general and simple typology would be appropriate. The four types identified are not entirely distinct. In some cases, they differ more in matters of degree than in absolutes. Furthermore, different types can be found in different fisheries in the same region or even in the same country. The types, however, are sufficiently distinct to serve as a basis for identifying critical research areas. The four types are:

Type 1. Underexploited resources or resources exploited mainly by foreigners; fishing not traditionally an important activity for the coastal state.

Examples include: Gabon, Guinea Bissau, Mauritania, Cape Verde, Somalia, Nicaragua, outlying regions of Papua New Guinea, tuna fisheries off South Pacific island states.

Type 2. Underexploited resources off coastal states where there is a strong tradition of small-scale fishing.

Examples include: Burma, various parts of Latin America, non-tuna stocks of Maldives, eastern areas of Indonesia.

Type 3. Overexploited resources with relatively large catches taken by domestic large-scale fishing units.

Examples include: most developing countries of Asia and many areas in the rest of the world particularly where shrimp trawling is an important activity.

Type 4. Overexploited resources harvested largely or entirely by small-scale fishing community

Examples include: reef and inshore fisheries in the Philippines, Malaysia, the South Pacific island states, other areas in Asian countries in general and lagoon and inland water fisheries throughout the world.

TYPE 1. UNDEREXPLOITED RESOURCES OR FOREIGN EXPLOITED RESOURCES WITH LITTLE LOCAL TRADITION IN FISHING

Diagnosis

- Several hypotheses were suggested for the lack of traditional involvement in fishing as an important activity. These included:
- cultural impediments such as low status or fishing being contrary to religious beliefs
- lack of skills or knowledge about fishing techniques, boat handling or processing of fish
- better alternative employment or income earning opportunities
- disincentives arising from policies or administrative practices such as price controls, import prohibitions, exploitative practices by government officials or middlemen
- structural bottlenecks such as the lack of foreign exchange; lack of communication, transport or marketing facilities; low demand; or imperfections in certain factor markets such as credit markets.

Critical Areas for Research

In this kind of situation, the overall research questions are first, whether it is worthwhile for the nation to invest in the development of a domestic fishery and, if so, whether the fishery should be large-scale or small-scale. In dealing with the overall questions, several critical areas for research were identified as being important.

Since the overall questions may possibly include a trade-off between revenues received from foreigners and contributions to the economy from domestic fishing, research needs to be directed to both aspects.

• *Examination of Factors Affecting Fisheries Development*

Where there is potential for development of a domestic fishery but there is little fishing activity, the most important area for research is that of determining the reasons for lack of development. The hypotheses suggested above are only indicative of some of the reasons why a fishery may not have evolved on its own. There is a need to identify and evaluate all possible constraints or impediments to development.

At the general level, one approach would be to study the process by which established fisheries have evolved — the conditions and incentives that have encouraged people to turn to the sea or inland bodies of water for sources of nourishment and income. This could help in the formulation of a framework for the analysis of the conditions that either facilitate or impede fisheries development. Such analyses should include cultural, social, economic and political factors.

In specific situations, analyses of the range of possible constraints is important before undertaking development projects. The failure to make such analyses is a common reason for the lack of success of many development efforts.

- *Determination of Potential Net Revenues from Foreign Fishing*

Where foreign distant-water fleets are operating, the coastal state or states have the option of extracting revenues from the foreigners within the 200 mile EEZ. The amount of potential benefits depends upon a number of factors, including catch rates, potential yields and value of the stocks. Account must also be taken of the alternative opportunities for the foreigners to take the same or equally valuable species in the waters of other states, because if one state charges too much, the fleets will move to other states.

Instead of economic revenues, the coastal state may wish to receive benefits-in-kind such as training, the development of port facilities, landings of fish for domestic processing, etc. These benefits in terms of contributions to the national economy need to be measured against the potential economic revenues that could be achieved through fee systems.

The calculation of benefits must also take into consideration the costs associated with the system. These include the costs of monitoring, control and surveillance. They may also include the costs of negotiating the agreements with the foreigners and, where desirable, the costs of reaching agreements with other neighboring coastal states sharing the same or related stocks.

The analyses mentioned above must usually be dealt with in terms of specific situations. However, a general area for research is that of developing a methodology for placing an appropriate economic value on the resource itself. Under the open access conditions that have prevailed, there is no clear market for the resource as there is for agricultural land. The economic worth of the resource depends upon the yield functions, the interrelationships among the stocks, prices for the products and the costs of harvesting the stocks at the most efficient levels. Although bio-economic models have been developed, they need to be improved in order to deal with small-scale fisheries in developing countries.

Another general area for research is that of improving the means for reaching agreements among neighboring states over the management of the shared stocks. An evaluation of the experience of the South Pacific states in the creation of their regional body (the South Pacific Forum Fisheries Agency) would be helpful in this regard.

- *Non-monetary Aspects of Foreign Fishing*

The decisions as to whether to continue to allow foreign fishing and under what conditions depends on other factors as well as monetary returns. In some cases, political ties between the coastal state and the distant-water state may be important considerations that cannot be easily evaluated.

In addition, different kinds of arrangements will have different distributional consequences. Where economic revenues are extracted from foreigners, they generally go to the public treasury. Under joint venture arrangements, however, benefits may accrue to specific groups (eg. trainees, fish processors, construction workers, etc.). Such factors need to be examined in specific situations.

- *The Choice to Develop a Domestic Fishery*

If the reasons for the absence of a domestic fishery have been identified and evaluated, the costs and difficulties of dealing with them need to be examined. It may be that relatively costless (although perhaps politically difficult) changes such as the removal of price controls would be sufficient to foster development. Or it may be that development cannot take place without major investments in infrastructure such as ports or transport systems. In some situations, for example where cultural opposition to fishing is strong or where potential fishing incomes are low relative to other employment, development may not be feasible in the immediate future.

Research on the costs of overcoming the various constraints and on the likely benefits that could be produced is necessary. The net benefits of domestic development can then be compared to the net benefits derived from foreign fishers. The situation may not require immediate trade-offs between foreign and domestic fishers since both may operate without interfering with each other or affecting the other's yields. But if the domestic fishery develops inefficiently or through continued public investment or subsidy, the trade-offs between domestic and foreign fishing may become important.

- *The Choice to Develop Small-scale Fishing*

Depending upon the nature of the potential fishery and the kinds of constraints, a choice between the development of a small-scale as against a large-scale fishery may be desirable. In some fisheries, economies of scale may require large-scale operations. In other fisheries, small-scale operations may be more beneficial nationally for a variety of reasons.

There is a general area for research in this regard that has largely been neglected. There is a need for comparative analyses of the relative benefits and costs of large-scale and small-scale fishing operations. Analyses should deal with such factors as: consequences for foreign exchange; employment effects; effects on urban migration; nutritional implications; income distribution; and others.

TYPE 2. RESOURCES UNDEREXPLOITED BY EXISTING SMALL-SCALE FISHERS

Diagnosis

In some situations there are relatively abundant fishery stocks available to small-scale fishers which are not being fully utilized even though fishing is an important activity in the community. There are various reasons why such a situation may persist. These include:

- Demand and supply factors such as low domestic demand for fishery products; the absence of valuable exportable species; or problems of communication and transport of products to markets.
- Policy choices such as inward looking or isolationist policies or fiscal and monetary policies that repress development.
- The lack of access to better technology and skills.
- Better alternatives for employment, income or use of leisure time.
- The presence of traditional management measures or cultural factors that serve to limit fishing effort or the accumulation of capital.

Critical Areas for Research

As in the case of Type 1 fisheries, the major overall question is whether it is worthwhile, in terms of efficiency, equity and sustainable growth, to make efforts to change the situation. This subsumes the question as to whether it may be desirable to make efforts to preserve the situation.

- *Examination of the Reasons for the Situation*

A major area for research is that of examining the reasons for the situation and evaluating their relative importance. Careful diagnosis is necessary in order to prevent wasteful, or even damaging, development

efforts. The discussion with regard to the "examination of factors affecting fisheries development" mentioned above for Type 1, also applies here.

- *Desirability of Maintaining the Situation*

In some cases, it may be desirable to undertake efforts that will preserve the present situation, or elements of it, that will be useful in preventing unsustainable growth. Traditional fisheries management schemes may be in effect and may operate with equity and efficiency. Such schemes need to be examined in order to determine their value and the possibilities for incorporating development activities within the context of the scheme. Many such systems have been destroyed because of ignorance of their importance.

A good deal of research is currently underway on traditional systems for the management of common property resources. Much of this is being undertaken by anthropologists and is of considerable value in providing information about how the systems operate. Traditional organizational structures are informal and have evolved within the context of special conditions and local forces. They are, therefore, both highly vulnerable and quite specific in nature. There is little research on the robustness of the systems and how the informal systems can be formally organized or institutionalized so that they can resist or accommodate the various external and internal pressures for change. Furthermore, within any one country there may be wide diversity in the systems which makes the formulation of appropriate legislation extremely difficult. These are areas that deserve considerable attention. Such research needs to be undertaken for small-scale fisheries in general, not only in situations where the resources are not fully exploited.

- *Desirability of Changing the Situation*

Assuming that change is desirable, the question is how such change can be made in the most cost-effective way. This depends upon the reasons why further development has not occurred. As in the case of Type 1 fisheries, the constraints may vary widely in the cost and difficulty of their removal. Analyses are necessary to determine the most cost-effective approach.

TYPE 3. OVEREXPLOITATION MAINLY BY LARGE-SCALE OPERATIONS

Diagnosis

This type of situation is relatively common throughout the world, particularly for inshore fisheries. There are many reasons why it exists and is becoming increasingly pervasive. These include:

- Demand factors such as the presence of high valued exportable species (particularly shrimp) or increasing real prices for fish. The increase in fish prices relative to other prices (including those for fishing inputs) is an especially strong factor. Since there is a maximum sustainable yield that can be taken from a particular stock, there is a natural limit to the supply. With continually increasing demand, however, it is inevitable that the price for that species will also increase. Higher prices lead to greater pressures on the stocks.
- The choice to adopt large scale fishing technology. Many governments, frequently aided and abetted by international development agencies, have shown a preference for the adoption of large-scale fishing operations.
- Fiscal and monetary policies geared towards closing the foreign exchange and food deficit gaps (e.g., export subsidies, import controls) or resulting in the cheapening of sophisticated foreign technologies.

- Ease of entry of non-local capital and impediments to its exit.
- The condition of free and open access to the resources and the absence or inadequacy of fishery management measures. These are the most critical reasons for overexploitation of resources and conflict between large scale and small-scale fisheries.
- Lack of proper understanding by policy makers of the consequences of open access and the need for fisheries management.
- Difficulties of enforcing regulations.

Critical Areas for Research

The basic, overall question is how to manage the fisheries. A prior question, however, is that of determining the objectives of management and determining the relative roles of large and small-scale operations.

- *Examination of the Reasons for the Situation*

As noted, the most critically important reason for the overexploitation of the resources is that of allowing free and open access to the resources. The effect on small-scale fisheries is compounded by the other reasons mentioned above. Analyses of the relative importance of the different reasons is an important pre-condition to taking actions that will improve the situation.

A general area of research that has largely been neglected is that of analyzing the trends in real prices of fish and of providing a basis for projecting the price changes into the future. It is noteworthy that some of the World Bank projects that were deemed to be successful, were successful only because of unanticipated upward movements of prices.

In addition to understanding price trends, it is also critical to examine the effects of price changes. Increased real prices not only lead to greater pressure on conventional stocks but they also increase the economic feasibility of developing less demanded stocks and of developing aquaculture, which is particularly notable in the case of shrimp culture. An additional effect is that the rise in real prices forces low income consumers to turn to lower quality or less preferred species or to reduce their consumption of fish protein. Research on the effects of price changes is critically important.

- *Evaluation of the Net Economic and Social Effects of Large Scale Fisheries Development*

Overexploitation is assumed to exist by the definition of a Type 3 fishery. There are, however, other consequences that may be associated with large scale fisheries development. These need to be examined both in the overall national context and with regard to local areas where the fishing operations take place. The examination should be in both economic and social terms. In some cases, for example, large scale operations may be desirable because of economies of scale. In other cases, they may lead to a net drain on foreign exchange or may have socially damaging spillover effects on small-scale fisheries.

As mentioned above (Type 2.), comparative research on the net benefits of small, as against, large scale operations would be desirable. The frequently held assumption that small-scale fisheries cannot fully exploit certain stocks because of technological constraints needs to be examined. Furthermore, the benefits of small-scale fisheries in terms of their low use of scarce capital and energy resources are not always given adequate weight.

- *Improvements in Fisheries Management*

The basic problem is that of improving the management of fisheries within which lies the problem of conflict between large and small-scale operations. Management issues were discussed in considerable detail by the Group and are reported more fully below.

TYPE 4. FISHERIES OVEREXPLOITED LARGELY OR ENTIRELY BY SMALL-SCALE OPERATORS

Diagnosis

There are numerous situations where fisheries are being overexploited by small-scale fishing operations. Many of the reasons for this situation are the same as those identified for Type 3 fisheries. These include the condition of open access and lack of effective management systems; high demand for the products; and technological choices such as those promoting more efficient gear (eg. motorization of country craft). There may be, in addition, other reasons for small-scale overexploitation, such as:

- Limited alternative opportunities for labor and capital.
- High population growth within the fishing community or movement of people into the community.
- Use of destructive fishing techniques such as dynamite and poison.
- Breakdown of traditional fisheries management systems and barriers to entry.
- Market imperfections such as exorbitant rates of interest or monopsonistic prices by middlemen, which lower the incomes of fishers and induce them to fish longer hours or more intensively.
- Disruptions of the ecosystem, either gradual or abrupt, from non-fishing activities.

Critical Areas for Research

As in the case of Type 3 fisheries, the basic, overall question is how to improve the management of fisheries. Preliminary questions relate to greater understanding of the nature and characteristics of small-scale fishing communities and of the rules under which they operate.

- *Examination of the Reasons for the Situation*

As for the other types, an important area for research is that of identifying and evaluating the reasons for the existence of the situation. The open access condition and the lack of adequate management systems is of fundamental importance. But other reasons, such as those mentioned above in paragraph 56, also need to be examined.

- *Assessment of the Economic, Social and Biological Effects*

As a means for evaluating the benefits of attempts to improve fisheries management, it would be desirable to assess the present, and likely future costs associated with overexploitation. Several of the possible reasons for the situation mentioned above are likely to have increasingly severe effects — population growth, the breakdown of alternative economic sectors and the rise in real fish prices resulting from the

supply/demand gap. Little attention, thus far, has been paid to the importance and effects of these trends. This is an important general area for research.

- *Understanding the Knowledge, Organization and Rules of Behavior of Fishers and Fishing Communities*

Although under conditions of overexploitation, the traditional management measures of fishing groups may have broken down, there may remain certain important attributes within the group. These may include the individual's knowledge of the resources and resource characteristics and the operational rules within which they operate. An important area of research is that of improving the understanding of the ways in which groups operate. Also, it is important to understand how small-scale fishers respond to resource constraints, such as through work sharing arrangements or rotation of access. These problems are related to other research areas mentioned elsewhere in the report.

- *Improvements in Fisheries Management*

This topic is discussed in more detail in the following section.

3. THE MANAGEMENT OF SMALL-SCALE FISHERIES

INTRODUCTION

The improved management of small-scale fisheries was believed by the Group to be among the critical areas needing research. The majority of small-scale fishers in developing countries operate under conditions where resources are heavily or over exploited (i.e., types 3 and 4). Given the importance and magnitude of the problem, efforts to improve conditions within a fishery need to be focussed on improving fisheries management. Even where resources are currently underexploited, fisheries development activities should be associated with the creation of effective management systems.

The Group identified four sets of actions and policies that could lead to improved fisheries management. For each of the sets, the Group discussed the presumed benefits and costs associated with the actions and identified the critical areas for research. These included both the methodologies for examining benefits and costs and the processes by which the desirable actions might be facilitated. The four sets are: (a) the provision or re-enforcement of exclusive use rights over fisheries to small-scale user groups; (b) integrated development of fishing communities; (c) control over other uses of the environment; and (d) fiscal policies.

In addition to the four sets of actions and policies, it was found necessary to examine some of the important external forces influencing fisheries management and to suggest areas for research that would be beneficial in dealing with these.

This section deals with the management of small-scale fisheries. But it must be recognized that, in cases where there are conflicts between large and small fisheries, the former must also be subject to effective management controls. The techniques for management of large-scale fisheries are generally well known. They include limits on the amount of fishing effort through licensing systems, the provision of individual quotas within a total catch limit and the use of fiscal measures such as taxes or license fees which force surplus capital out of the fishery. Although difficult to implement, there is growing experience in the use of the first two of these systems and of the benefits that can be produced. These systems, however, are not generally appropriate for small-scale fisheries where different approaches need to be taken.

EXCLUSIVE USE RIGHTS FOR SMALL-SCALE USER GROUPS

Benefits

- *Removal of Condition of Open Access*

As noted, the major cause of overexploitation and waste in fisheries is the condition of free and open access to the resources. Although access can be closed by several different techniques (eg., license limits, individual quotas), the technique most relevant to most small-scale fishery situations is that of providing exclusive rights to use a certain area of the sea. Many traditional systems of fisheries management operated on this basis.

Where there is a territorial use right in fisheries (TURF) the user group can determine how best it wishes to use the resources in the area. It can fulfill all the functions of fisheries management: control entry, allocate capital and labor, determine how much and what kind of fish to harvest, regulate fishing gear, extract rents if desired and distribute benefits in whatever manner it wishes. In addition, there is both the incentive and, if the group is sufficiently cohesive, the means for self-regulation.

- *Efficiency of Small-scale Fisheries*

As noted elsewhere in the report, small-scale fisheries may, in some circumstances, be more efficient than large-scale fisheries since they have high labor and low capital intensity and are less dependent upon imported goods and supplies. This presumption needs examination. But where it is proved to be correct, there is an advantage to the country in providing TURFs to small-scale fishers.

- *Reduced National Management Costs*

The management of fisheries at the national level can be extremely difficult and costly. For example, monitoring, control and surveillance of a national license limit scheme in a situation where beach landings take place over vast distances is not practical. In addition, measures adopted at the national level will not be relevant to all fisheries. Allocating management authority to local levels can significantly reduce management costs.

- *Improved Incomes and Employment*

Control over access to a fishery can prevent economically wasteful applications of capital and labor. This can lead to higher incomes to those remaining in the fishery. It may, however, also lead to reduced employment in fish catching although not necessarily in the fishery sector as a whole. The net effects on income and employment of providing exclusive use rights are an important subject for research.

- *Better Income Distribution*

With exclusive use rights provided to a small-scale user group there will be a redistribution of income away from those who previously had access to the resources but are now excluded. Within the small-scale user group, however, the acquisition of exclusive use rights may lead to a better distribution of income than existed previously. Whether in fact this occurs depends upon a number of factors including the ways in which the user group is organized. This is also an important area for research.

Costs

- *Income Distribution Decisions*

In order to provide exclusive use rights to one particular user group it is generally necessary to make a decision to exclude other user groups. This will lead to a redistribution of income. Such decisions will usually have to be made at a political level since fishery administrators do not generally have the necessary mandate. It is extremely difficult to make income distribution decisions directly. The conditions which may facilitate the making of the decisions provides an important area for research.

- *Enforcement*

Where an exclusive use right has been established, it is necessary to ensure that the right is maintained. If the area where the right has been established is of value to fishers outside the user group, there will be pressures to violate the regime. As the value of the managed area increases, the incentives for violation will also increase. Enforcement costs may become high.

- *Dispute Settlement and Compensation Mechanisms*

Machinery for the settlement of disputes and for the provision of compensation to those who are excluded may be a necessary and desirable means for reducing the costs of enforcement and facilitating distribution decisions. Such machinery, however, cannot be created without its own costs.

- *Devolution of Authority*

The devolution of the authority to manage the fisheries, away from the central government to a local user group may be one of the most difficult tasks. Administrators may be reluctant to relinquish their authority, or portions of it, and governments are often opposed to decentralization. Not all elements of fisheries management authority can, or should, be allocated to local jurisdictions or user groups. The task of determining what kind and how much authority should be allocated to user groups is a difficult one.

- *Organization of User Group*

The provision of exclusive use rights to a group of small-scale fishers will be beneficial only if the group is, or can be, organized effectively. Organizing the group may also be an exceptionally difficult task, depending upon a number of factors. The costs will include analysis of the situation, the creation of mechanisms for organizing the user group and the support of the organization (see below).

- *Institutional Change*

In general, the difficulties mentioned above are those of changing fundamental institutions, particularly those related to the creation (or formalization) of exclusive use rights. Without some satisfactory form of property rights, there is little chance of improving the benefits that can be derived from overexploited fisheries. Research on capture fisheries will have only marginal benefits if the institutions are not changed so as to permit effective fisheries management. Conversely, where appropriate institutions are in place, the payoffs from research can be very large.

Changing institutions is not an easy task. The benefits, although potentially great, tend to be diffused so that there is not a strong constituency within the political process. There is, in addition, a strong resistance to change because of the difficulty of making the necessary decisions and, perhaps, the need for acquiring new attitudes with regard to the allocation of authority to local groups.

Critical Areas for Research

- *Analyses of Benefits and Costs*

The benefits and costs of creating or re-enforcing systems of exclusive use rights for small-scale groups need to be examined both in terms of the groups and in terms of society as a whole. It is not necessarily clear that a group of small-scale fishers will be better off, in terms of efficiency and equity, by having an exclusive use right than they are under the situation of open access or under alternative systems of fisheries management. The pressures for overexploitation may still exist or the group may decide that the short term gains of overfishing are greater than the long term losses. In equity terms, mal-distribution of incomes may be exacerbated if the use rights fall under the control of one or a few individuals within the group. In addition, maintaining open access can provide a buffer for employment of the rural poor when other opportunities fail, permanently or temporarily, although this needs to be balanced against the negative effects on income levels.

There is a need for much greater understanding, than exists at present, as to how a group of small-scale fishers will operate under conditions of exclusive use rights. To some extent, this can be achieved by analyses of how benefits are being produced and distributed under traditional systems where such rights are being exercised. But in addition, there needs to be research on the conditions and rules that will facilitate effective group decisions on fisheries management.

With regard to society as a whole, the benefits and costs of systems of TURFs will depend to a large extent upon the difficulties of implementing and maintaining them. These are discussed below.

Income Redistribution Decisions

The provision of any form of exclusive use rights (including license limits, individual quotas and territorial systems) inevitably affects the distribution of incomes. As noted above, such decisions are essentially political in nature and generally difficult to make. The conditions that will facilitate making such decisions provide an important area for research. The decisions are likely to be made when the politician's hands are forced because of pressures from below such as where conflict becomes severe. Pressure from outside the government, such as from donor agencies, can also facilitate the decisions. In addition, demonstration of the benefits to be achieved may be helpful. This includes estimating and demonstrating the potential economic rents that can be achieved through controls over access — rents that may well be extremely large. It may also include estimates of the losses through depletion that result from not making the decisions. The growing awareness of the need to prevent degradation of the coastal, riverine or lacustrine environment may also be influential in inducing decisions to provide exclusive fishing rights.

- *Devolution of Authority*

Research on the conditions that will encourage central governments to allocate fisheries management authority to local levels or to user groups is important. This requires analysis of the different functions of fisheries management and which of those can best be handled at local as against national levels. For example, it may be desirable for local groups to conduct surveillance but not control. Decisions on the level of exploitation of a stock may be left in the hands of a group, but not to the point where the stock may be irreversibly damaged. Where different user groups fish a stock that migrates through their areas, local management authority may have to be constrained by mechanisms such as regional coordinating councils.

More precise definition of the kind and content of authority that should be delegated to the user group may be helpful in persuading governments that the move is more a matter of redressing institutional failure (the lack of satisfactory property rights, inadequate authority and mechanisms to mobilize resources for management, etc.) than one of decentralization. It would also be in keeping with current approaches to "privatization" being advanced by some donor agencies.

Other conditions and factors that may increase the willingness of governments to provide exclusive use rights to user groups also need to be explored. Research similar to that suggested above with regard to income distribution decisions will be desirable.

- *Acquisition and Exercise of Exclusive Use Rights by Small-scale Fisher Groups*

A considerable amount of research needs to be directed to the ways in which small-scale groups can most effectively acquire and exercise exclusive use rights. A first element of research should deal with greater understanding of the traditional systems of group decision making that already exist, even where such systems have been weakened. It is important to understand whether and how the traditional systems can be used to deal with fisheries management functions and how outside interventions can strengthen existing management potential.

With regard to the acquisition of exclusive use rights, several kinds of research are needed. One of these should deal with the natural and technological conditions that facilitate user groups to acquire the rights. These include resource characteristics such as the degree of fugitiveness of the stocks, seasonality of the fishery, presence or absence of natural boundaries, etc. The characteristics of the technology are also important. For example, research to develop more effective passive gear, such as artificial reefs or fish aggregation devices, may be helpful in allowing small-scale groups to acquire exclusive use rights.

A critically important area of research is that of the conditions affecting the mobility of labor into and out of fisheries. Several diverse assumptions have been made in fisheries studies regarding the ease of entry or exit from fisheries. In some studies, fishing is considered to be a "way of life" and that, once a fisherman, always a fisherman. In other studies it has been assumed that there are cultural and social barriers to entry and, also, to exit. On the other hand, some studies have reported fisheries to be the "employer of last resort", assuming that labor displaced from other activities can freely and easily enter fisheries. There is, however, very little evidence supporting the various assumptions and little analysis of the forces and conditions that affect labor mobility. Such studies are of basic importance with regard to interventions that provide for exclusive use rights.

Studies of the processes by which user groups have acquired use rights over fisheries historically would be helpful in identifying the elements which are important and which could have application in current situations.

The legal and other institutions governing the acquisition of property rights and adjudication of disputes over property rights also need to be examined.

An increasing amount of research is being undertaken on social choice mechanisms for the management of common property resources. This research is valuable in identifying and analyzing the conditions, rules and interactions that permit effective resource management by a user group and the sorts of interventions that strengthen or undermine user group management capability. Most of the studies, however, deal with common property resources other than fisheries and they generally deal with situations where exclusive use rights are already available.

Several areas of research are important with regard to the ways in which groups exercise exclusive use rights. These include the conditions of membership in the group and the ways in which entry and exit is controlled; the means by which capital and labor is allocated; the ways in which net benefits are captured and distributed within the group; the systems for ensuring that the rules are respected by members of the group; systems for dispute resolution both within the group and in outside institutions; how groups change operational rules; and the mechanisms for making rules in adapting to changes in internal and external conditions.

BROADEN SCOPE OF DEVELOPMENT FOR FISHING COMMUNITIES

Benefits

- *Alternative Employment Opportunities*

Not all fisheries problems can be solved with reference to fisheries alone. Efforts to improve incomes and levels of living of people in fishing communities also involve development of alternative economic opportunities and strengthening the ability of individuals and the community to take advantage of these opportunities. Integrated development can produce opportunities for present fishers to be employed in other activities either on a seasonal or full-time basis. Providing such opportunities can help stabilize monetary or real incomes and reduce risk. When combined with exclusive rights systems, integrated development will help reduce pressures on the stocks.

- *Alternative Capital Opportunities*

Integrated development which provides investment opportunities outside of fish harvesting activities, may help in reducing over-capitalization in the fishery.

- *Improved Welfare*

The benefits of integrated development may also include improved access to markets, education opportunities and health facilities, greater supplies of protein from non-fishery sources, greater control over population growth, etc. Improved education will also enhance the ability to find alternative employment and improve outward mobility from the fishery.

- *Organizational Strengthening*

Integrated development efforts based on participatory strategies which strengthen local organizational abilities within fishing communities are more likely to result in lasting change than those which are promoted in a top-down fashion. Strengthened organizational capacity within a fishing community is also likely to support local ability to exercise use rights and achieve effective fisheries management.

Costs

- *Organization for Integrated Development*

The record shows that integrated rural development is not easy to achieve, although there have been numerous attempts over the past three decades. Many of the difficulties mentioned above with regard to organizing small-scale fisher groups to acquire and exercise exclusive use rights also apply here. In addition, there are difficulties in achieving cooperative approaches among fishers for several reasons including the possible loss of autonomy and the need to conform to some form of hierarchical organizational structure. The low record of success in developing fishery cooperatives is indicative of these problems.

- *Coordination of Approaches*

Since integrated development includes non-fishery as well as fishery activities, it is necessary to coordinate the various approaches. Where fishery agencies are involved in the process, they must be capable of, and have incentives to, working with other agencies.

- *Monetary Costs*

Where it is necessary to provide investment funds or subsidies to achieve development, the costs that are incurred need to be included in the evaluation of the approach.

Critical Areas for Research

- *Analyses of benefits and costs*

Improvements in alternative employment opportunities to fisheries are clearly desirable. Under open access conditions, such improvements will help draw off the surplus fishers and raise income levels. Even under systems where exclusive use rights have been created, there would be benefits from improved

employment opportunities. However, it is not clear whether activities aimed specifically at integrated development of small-scale fishing communities will produce benefits greater than the costs. This will depend upon the conditions that exist in the specific situation. Research would be desirable to determine the conditions that are most important and how those can best be met.

- *Organization for Integrated Development*

Research questions with regard to the organization of small-scale fishing communities for integrated development are similar in general to those with regard to organizing communities to acquire and exercise exclusive use rights. In addition, however, there needs to be research on the extent to which fishers will engage in non-fishing activities, the kinds of activities that would be most attractive and on the appropriate terms and conditions. Currently, for example, there is much interest in the promotion of aquaculture as a means for providing alternative employment. It is not necessarily clear, however, that those engaged in fish catching would be willing to shift to a farming type of activity or whether, indeed, they would make good fish farmers.

CONTROL OVER OTHER USES OF THE ENVIRONMENT

Benefits

- *Sustainability of Resources*

Fishery resources, particularly those of the inshore, estuarine and inland water areas, are being damaged by other uses of the offshore areas, coastal zone and water basins. The effects are interactive and insidious, making it difficult to determine cause and effect. Examples include: siltation from forestry, road development and land clearing; mangrove cutting and drainage; industrial and ship generated pollution; agricultural chemical contaminants in estuaries and bays; domestic sewage; and mining activities. Inshore fishing communities directly contribute to environmental degradation through overfishing (e.g., by-catch of juvenile fish) and poor practices such as the use of explosives or poisons to capture fish, coral reef and sand mining and by untreated domestic and fish processing waste material. Control over other uses of the environment will help maintain the sustainability of fishery resources and perhaps permit greater predictability in forecasting resource availability.

- *Optimizing Multiple Use*

Multiple use of coastal and offshore resources and water basins ideally should be achieved by the adoption of controls over all relevant uses. In practice this is extremely difficult even where definitive net benefits can be identified. By working sector-by-sector or through more integrative EEZ, coastal zone or river basin management approaches, it is possible to improve the prospects for all users. The small-scale fisheries stand to gain more than most other users because their activities are concentrated in the zones of greatest vulnerability, such as flood plains and inshore and estuarine waters. The full benefit of optimizing multiple use is rarely documented well because the optimization methods are still fairly crude and tend to underestimate the benefits of environmental management.

- *Institutional Strengthening*

Institutional strengthening will be necessary to achieve more optimal patterns of land and water use. New international mechanisms such as the Regional Seas Programme offer environmental improvements which will lead to more effective fisheries management. The most important means remain at the level of individual countries and at lower levels of government. They require the active support and involvement

of small-scale communities in order to be effective. The fishing communities provide a means for environmental monitoring including monitoring of industrial and offshore pollution and illegal activities such as mangrove cutting. Their views are needed in setting the criteria for optimization and in determining acceptable environmental mitigation measures. Developing the means for local participation in environmental planning is a key requirement. This may involve the creation of special management units composed of different user groups. Institutional strengthening to account for cross-sectoral impacts will make management in the fisheries sector more effective.

- *Human Welfare*

Effective controls over multiple uses of the environment will help to improve health conditions and reduce the vulnerability of fishing families to natural disasters such as floods and storms. Fishing communities, isolated from accurate information about weather or about upstream conditions which may create either flooding or drought in their areas, will benefit from environmental monitoring and disaster warning systems. Coastal villages have different requirements for water supply and sanitation than villages in other rural areas. In areas subject to industrial pollution there may be cases of heavy metal poisoning in addition to the many water-borne diseases associated with untreated sewage. Welfare of the fishing families can be measured directly by expanded employment and more diverse income opportunities associated with a healthy environment.

Costs

- *Information Acquisition*

It is very difficult to acquire satisfactory information about the effects of multiple uses of the environment. Sources of environmental change interact, alter in significance and may be difficult to differentiate from factors such as overfishing. Baseline conditions which can be used to identify natural environmental fluctuations often are not well understood. Careful monitoring of aquatic stocks and use of information directly obtained from small-scale fishers will be helpful in providing measures concerning the health of the ecosystem. This may require the development of institutions which create incentives for the fishing community to provide the information.

- *Coordination for Environmental Controls*

Multiple use management and controls require coordination or harmonization of actions among all concerned agencies and all significant legitimate users of the resources and the environment. Such coordination may require that each user group and agency has an institutionalized stake in the outcome. Agencies are reluctant to relinquish authority or to take on the extra costs of the cross-sectoral coordination unless this is clearly in their self interest. Identifying how benefits can balance these costs is, therefore, a prime element on the agenda. Coastal communities faced with intolerable environmental conditions sometimes take matters into their own hands to demand action in the protection of their environment. They may undertake demonstrations, burning of polluting plants or other forceful acts which are generally to no one's long term advantage since the costs in terms of social unrest and economic damage may become even higher as a result.

- *Trade-offs Among Resource Users*

Costs and benefits will not be equally distributed among the various resource user groups in most multiple use strategies. Therefore compensation and mitigation mechanisms are required. Small-scale fishing interests are particularly vulnerable and are at a disadvantage in voicing their needs. Their interests in sustainable employment within the sector may make cash compensation for damages unacceptable. Unless

regulations such as pollution controls are properly enforced (sometimes at considerable costs), the trade-offs on which agreements are based may become inoperative.

Critical Areas for Research

- *Improved Understanding of Ecosystems*

Greater understanding is required of ecosystems and their interactions (especially between aquatic and terrestrial environments) and of the human use patterns which form the basis of the resource systems. Ultimately it will be necessary to predict not only the environmental impact of a given pollution load, for example, but also the economic and social effects within the local community and perhaps in some cases, globally as well. An example is the potential economic damage that a local situation of mercury contamination might have on a country's shrimp export trade.

For complex, multi-species inshore fisheries, ecosystem approaches to management are needed but the theories and information are still inadequate. Research is needed on ecological support functions (e.g., assimilative capacity of coastal waters; juvenile nursery functions) which are poorly understood and rarely translated into economic terms. Such research ought to take into account the values and needs of small-scale fisheries which are most likely to be affected by regulations on use and access.

- *Evaluation of Different Uses*

Environmental assessment techniques appropriate for understanding and acting on impacts facing small-scale fisheries need improvement. Research is also needed on the methodology for their application. Environmental and social impact assessment are seen as expensive procedures often reserved only for major projects. Hence many environmental alterations take place without impact assessments or the application of screening procedures for rapid rural appraisal. Combined economic and environmental methods for evaluating development of all types must be formulated, including the means for identifying the impacts on resources by small-scale fishery projects. Developing methods for the integration of regional development and environmental assessment is another high priority research topic.

- *Institutional Development*

Successful experience in developing and strengthening cross sectoral coordinations needs to be documented. Pilot research is required for coastal zone management, local government environmental planning and management and for specific systems such as weather watch or disaster planning. It is particularly important to strengthen and broaden social research which may help to expand the participatory role of small-scale fishing groups in decision making which relates to their welfare and to their local environment and resource base.

FISCAL POLICIES AND MEASURES

Benefits

- *Fisheries Management*

A variety of fiscal measures can be used by governments to achieve different objectives. These include taxes and license fees, subsidies, grants, import and export tariffs, price controls, low cost loans, etc. In some cases they may be adopted to achieve objectives not directly related to fisheries but of important consequence for fisheries (eg. import and export controls to improve balance of payments). In other cases, they

may be adopted to achieve short term benefits for particular fisher user groups but they may have secondary or long term consequences for other groups that are not fully anticipated (eg. subsidies for the adoption of more technologically efficient gear). In both cases, the net effects on small-scale fishers may be negative, either immediately or over the long run.

Fiscal measures, however, can provide a powerful tool to improve fisheries management. High taxes or license fees, for example, can be used to force surplus capital and labor away from an overexploited fishery. Differential taxes or fees can be used to improve the allocation of capital and labor among different fisheries. Or they can be used to reduce capital intensity and provide more employment opportunities in fisheries.

The ability of fishers to play an effective role in fisheries management may depend upon policies concerning the authority of local jurisdictions or user groups to acquire revenues to finance fisheries management operations. Although the amounts may be small, they represent a commitment to the implementation of the measures and may help to reduce the problem of "free riders" (those who do not abide by the rules but seek to benefit from the other members who do). If the groups cannot control their own members, they will have difficulty defending their exclusive use rights and controlling unauthorized users. Thus, fiscal powers should not be considered the exclusive domain of national governments. Intergovernmental transfers may be of some assistance in this area, but some local resource mobilization may be necessary to convince fishers of their responsibilities and stakes in fisheries management. Public finance research in other sectors also suggests that tax-payers are more willing to pay locally imposed taxes because they have greater ability to ensure that the funds raised are spent for programs of direct interest to them as, for example, the defense of their territorial rights.

- *Generation of Revenues*

Through the use of taxes or license fees, the government can acquire revenues. Where fisheries are over-utilized, the potential revenues (or economic rents) can be extraordinarily large. The revenues that are acquired can be used to help manage the fishery by buying out the surplus vessels in large-scale fisheries, supporting increases in enforcement capacity, providing funds for research, etc.

It should be noted, with regard to large-scale fisheries, that management measures (eg. license limits or individual transferable quotas) work to provide a form of property right to the fishers. Where these measures are effective in reducing overexploitation, the property rights acquire value. In the absence of appropriate taxes or fees, the value of the rights will accrue to the initial generation of licensed fishers and will appear as windfall gains when they sell their rights. Through the use of taxes or fees, the government can share in the rents that are produced by the system and, as noted above, use the revenues to help manage the fisheries.

- *Conflict Resolution*

The government revenues produced by the fiscal measures can also be used to help resolve conflicts by providing funds to compensate those who lose by the resolution arrangements.

Costs

- *Political Costs*

Fiscal measures that provide benefits to user groups, such as subsidies or low cost loans, are easy to adopt but those which extract revenues are obviously much more difficult. It is not only because of their political unpopularity but also because their usefulness as a management tool is not immediately apparent to the politicians and because the benefits (and, therefore, the incentive for political support) tend to be diffused

throughout the sector or through society as a whole. Some less direct fiscal measures, however, such as taxes on imported fuels and engines, may be easier to adopt and may have beneficial management effects.

- *Implementation Costs*

The costs of employing fiscal measures may be high depending upon the nature of the measure. A tax on landings, for example, would induce fishers to under-report their landings, transfer their catches at sea or adopt other techniques for avoiding or reducing their taxes. Such under-reporting would also greatly complicate the task of monitoring fishing mortality and assessing the state of the stocks. License fees will also induce behavior designed to circumvent the measures. If the measure is not carefully chosen, the enforcement costs may outweigh the benefits. It may be necessary to develop a combination of measures to ensure that the fishers have appropriate incentives to comply with the fiscal regulations.

A major difficulty is clearly that of attempting to impose a high tax or fee in fisheries where economic overexploitation already exists and where income levels and returns to capital are low. Clearly, such direct fiscal measures (unless imposed in conjunction with other measures) would create hardship, even for large-scale operations, and would not be acceptable. Less direct or more gradual approaches may, however, be appropriate.

Critical Areas for Research

- *Evaluation of Effects of Present Fiscal Measures on Small-scale Fisheries*

Many countries have adopted a wide variety of fiscal measures with direct or indirect effects on fisheries. Although there is evidence that the effects of some of the present measures may be damaging, particularly to small-scale fishers, there are few attempts to understand and evaluate the significance of the effects, both in the short and the long term. Such studies tend to have political ramifications and may, therefore, be difficult to undertake. Means need to be found to encourage studies of the economic and social impact of present fiscal measures. Analyses of the effects of fiscal policies on fishers might best be done within the context of analyses of the effects on rural producers in general.

- *Conditions Facilitating Positive Changes in Fiscal Policies and Measures*

Means also need to be found to encourage the examination and willingness to adopt new fiscal measures and policies that may serve to achieve more effective fisheries management and, particularly, where desirable, to support small-scale fishing operations. This should include investigation of the experience and potential of local jurisdictions in the exercise of fiscal authority.

- *Determination of the Kind and Level of Fiscal Measure*

Determining the kind of measure to adopt, how it should be applied and the level of the tax or fee is a difficult task and one which has received very little attention. Any specific measure may have widespread ramifications which may not be readily apparent. The costs of collection or enforcement will vary with the type of measure selected. Difficult questions also arise with regard to the ways in which the revenues should be used or shared between the fishers and society as a whole. And it is difficult to determine the optimum amount of revenues to extract. Research on these various matters would be important. To some extent it may be possible to draw on public finance research in other sectors as a guide for examination of the questions in the fisheries sector.

EXTERNAL FORCES INFLUENCING FISHERIES MANAGEMENT

Kinds of External Forces

There are a number of policies and developments external to small-scale fishing groups, to the fishery sector as a whole and also to the country that may have significant impacts on the management of small-scale fisheries. These include international and national development policies. For example, early development policies focussed on industrial growth, with the consequence that large-scale fisheries received large amounts of support producing negative effects, in some cases, on small-scale fisheries. Preferences for state enterprises also affected small-scale operations. Current policies for structural adjustment and privatization are likely to affect small-scale fisheries, although it is not clear at present how those effects will appear.

Policies related to international trade combined with economic forces affecting fish prices also have important consequences. The need for foreign currency and improved balance of payments induces developing countries to invest in activities aimed at the export market. In this regard, many governments have placed emphasis on the development of shrimp fisheries. This has led to greater production of shrimp from aquaculture, to the extent that the market for shrimp is being affected and global prices are dropping, placing a risk on further investments. On the other hand, market forces are driving up the prices of other fish species.

Another important set of policies are those related to population growth and migration. The kinds of policies and the programs adopted by governments may have important effects on small-scale fishing communities. For example, efforts to restrain urban migration may lead to greater support for integrated development of fishing communities.

Environmental changes including global warming, cyclical changes in ocean currents or localized pollution can also affect small-scale fisheries in various ways.

Critical Areas for Research

- *Analysis of Development Policies*

Greater understanding of development policies and their likely effects on the management of small-scale fisheries is important. Several aspects need to be studied. These include the motivations and constraints that influence donor agencies; for example, the extent to which they can, or are willing to, incur the relatively high overhead costs associated with implementation of small and diffuse projects; the extent to which they are willing to sub-contract funding as, for example, through umbrella projects supporting non-governmental organizations which are better equipped to supervise and support local activities; or how they may be influenced by ulterior motives, either commercial or political. The motivations and constraints guiding national administrators of fishery development projects also need to be understood. The reward system for administrators may favor large investments rather than efforts to change institutions. Such research should focus on the possibilities for change and the conditions that would permit improvements in motivations and reductions of constraints as, for example, civil service reform, greater participation by fishers in the design and implementation of programs, etc.

General policies with regard to property rights, ownership of resources and privatization are particularly important for fisheries management because of the need to remove the prevalent condition of free and open access.

In some countries, development policies are influenced by ethnic considerations and these may have important implications for the management of small-scale fisheries. This is also true for security considera-

tions. The institutional implications of development policies for the involvement of fishers in the formulation and implementation of measures that affect their well-being should be carefully analyzed.

- *Analysis of Trade Policies*

Trade policies of both importing and exporting countries can have important effects on small-scale fisheries. The nature and significance of the effects, however, is not always very clear. Although it may be difficult to trace out all the primary and secondary effects of trade policies, such studies are important for both the individual countries and the donor agencies.

In addition to trade policies, the economic forces affecting international trade also need to be studied. In particular, there is a necessity for undertaking demand and supply projections for the major traded commodities that are of interest to the developing countries. Likely changes need to be anticipated in order to improve fishery management and development efforts.

- *Analysis of Environmental Changes*

Research on the causes and effects of environmental changes on small-scale fisheries is important.

4. DEMAND AND SUPPLY CONSTRAINTS TO THE CHOICE AND CONDUCT OF RESEARCH

INTRODUCTION

The Working Group asked the question as to why the critical areas of research identified above have not been addressed. In dealing with the question, the Group identified some of the major constraints to the identification of research needs and the conduct of research. These constraints apply to both the demand for the research on the part of the users of the information produced and to the supply of research by those responsible for undertaking it. It was thought that the identification of the constraints would provide a basis for taking steps to remove them.

Most of the constraints that are identified below are, in themselves, critical areas for research in order to determine their importance and means for dealing with them.

The Group felt that it would also be useful to identify the actors (the people and the institutions at local, national, regional and international levels) that are, or should be, involved in creating the demand for, and providing the supply of, the research. Although there was not sufficient time to explore these aspects, a few points were made. One was that it is important to involve the users, particularly the small-scale fishers in both the identification and the conduct of research.

The Group also felt that there should be a multi-perspective approach to research in terms of cultural, ethnic and gender aspects; local, national and international levels; developed and developing countries; and historic as well as current analyses.

It was suggested that an "umbrella" concept might be used for funding, under which wholesale grants are provided to institutes which then contract out separate elements to other institutes or individuals.

DEMAND CONSTRAINTS

Lack of Awareness of Issues

In some cases, the demand for research may be weakened because of the difficulty of formulating the research needs and asking the right questions. People in donor agencies, governments, research institutes, small-scale fishing communities may not perceive the critical issues correctly. Their views may be too narrow, immediate or bound by conventional approaches to allow them to identify the basic problems.

Disinterest in Small-scale Fisheries

Many governments, as well as some donor agencies, tend to have little interest in fisheries in general even though fisheries may be relatively important sources of employment and protein. The predominant interest in natural resource sectors is generally in agriculture. Where fisheries are viewed as important, development philosophy has tended to place preferences on large-scale rather than small-scale operations, although this view is currently changing. Export orientation for the purpose of earning foreign exchange has also been emphasized and has frequently had damaging consequences for small-scale fishers.

Lack of Influence of Potential Users

A related point is that the potential users of research results may lack sufficient influence or power to create effective demand. This refers not only to fisher groups but also to fisheries research institutes which have difficulty convincing funding sources of the need for the research.

Apprehension about Research Results

Demand for research may be constrained in some cases by the apprehension that research results may force administrators to make difficult decisions or may undermine present positions and programs. For example, where significant investments are being made in the development of offshore fishery resources, the administrators (or development agencies) may not wish to know that the economic feasibility of the development is very low. It can be noted that governments are frequently unwilling to examine the net effects of subsidy programs.

Inability to Make Use of the Information

Potential users may see the importance of the research but they may have little incentive to demand it if they feel that there is little chance that the information produced will be put to use. The perception that decision makers will be unable or unwilling to make difficult decisions reduces not only the incentive to demand the research but also the motivation, on the part of the researchers, to undertake it.

In part this is a problem of accountability. If the researcher is not accountable to the user (group, administrator, funder), the user cannot effectively express his demands.

SUPPLY CONSTRAINTS

Lack of Funds

The lack of funds is one of the major reasons for the lack of research on the critical issues. This, however, is generally a reflection of other factors, particularly those related to ineffective demand.

Research Personnel Problems

The conduct of research on issues of small-scale fisheries may be impeded by a number of personnel problems. One of these is that research on fisheries, in some cases, does not attract the most highly qualified people. Fisheries issues, particularly those relating to small-scale fishers, may be professionally unrewarding for researchers. The status of fisheries scientists may be low relative to those of scientists in other fields. This view may be supported by the opinion that small-scale fishers are part of a "backward" rather than a modern economy.

In some cases, the low status may reflect the low status given to fishers who may be viewed as culturally or socially inferior.

Where fisheries scientists have low status, the opportunities for education and training may also be low. Poorly educated scientists will have difficulties undertaking high quality research which, in turn, may deter others from entering the field.

Some of the conditions of research on small-scale fisheries may impede the conduct of research. This will be particularly true where the research requires living in, or frequent visits to, small-scale fishing communi-

ties. There may also be a reluctance to work on fishing vessels, or even on research vessels where living conditions are difficult.

Limited Research Perspective

Fisheries science has been dominated, to a large extent, by a concentration on the resources rather than the users, and major emphasis has been devoted to the assessment of stocks. In addition, the major developments in fishery science have taken place in the temperate zones of the developed countries. This has influenced both the training of fishery scientists and the kinds of research undertaken.

One of the consequences is that the system tends to perpetuate itself, particularly in developing countries, since the researchers tend to be rewarded more for further refinements in stock assessment studies than in the development of new approaches or the study of broader issues.

Another consequence is that, with limited perspectives, the scientists have difficulty in seeing the importance of other disciplines and are reluctant to engage in inter-disciplinary research.

Research Technology Bias

An interest in the technology associated with fisheries research may tend to have an influence on the kind of research that is conducted. Research institutes often wish to have their own research or survey vessels, up-to-date computers and modern laboratories since these may be viewed as a reflection of their prestige. They may be supported in this by national governments and by donor agencies. The technologies, however, may dictate the research agendas even though the information gained by the vessels has little practical application or the data put in to the computers is unreliable. Research on small-scale fisheries, which generally does not require high technologies, may suffer.

Complexity of Issues

As indicated by the critical areas of research identified in the previous pages, the problems of small-scale fisheries are diverse and complex and generally require an inter-disciplinary approach. Even in developed countries where the resources in funds and talent are available, it is difficult to undertake research on the kinds of problems that need to be addressed.

Lack of Coordination and Continuity

The supply of research is constrained by a lack of coordination and cooperation among donors and regional and national research institutes. This may lead to research being undertaken on an ad hoc basis and to the duplication of research efforts. Too many different topics may be addressed at the same time with the result that research efforts are diffused. There may also be a lack of continuity in the research, necessitating repetition of research efforts.

Data Deficiencies

A serious impediment to research lies in the deficiencies of the data, which are particularly acute for small-scale fisheries. It is exceptionally difficult to acquire accurate information on the social and economic characteristics of small-scale fisheries which land their catches of numerous different species in isolated spots scattered along the coast and which use widely diverse kinds of gear and vessels. The costs of acquiring the basic data may be very high. Such costs can be reduced by research strategies that place greater reliance on the information that can be provided directly by the fishing communities.

Lack of Appropriate Methodologies and Models

The bio-economic models of fisheries which have been produced refer almost entirely to developed country fisheries in temperate zone waters and are of limited relevance to small-scale fisheries in developing countries. Methodologies exist for the study of rural communities in developing countries but need to be refined to deal with open access fisheries. The absence of appropriate research methodologies and models impedes the conduct of research on some of the topics.

5. SUMMARY AND CONCLUSIONS

The Working Group, by focussing on small-scale fisheries, has necessarily and essentially focussed on people-related problems. The research needs identified are, thus, primarily tasks for the social sciences (economics, sociology, anthropology and policy analysis), although they may need to be combined with other disciplines in certain cases. Social science analysis of fisheries problems in developing countries has received insufficient attention thus far. Although there is a growing amount of social science research, there is still a considerable need for improvement.

A critically important condition governing most fisheries, both small and large-scale, is the absence of satisfactory use rights. Where this condition exists, it inevitably results in depletion and economic waste. Catches per unit of effort decrease beyond the optimum level and incomes and returns to capital decline. Frequently, the lack of satisfactory use rights also leads to conflict between different user groups. Attempts to solve these problems by investing in new technology and more capital equipment exacerbate the consequences.

Thus, the direction for research is clear. It must deal with the issues related to the establishment, re-inforcement or protection of satisfactory use rights. The research areas identified by the Working Group in this report deal to a large extent, though not entirely, with these issues. The research areas, in general, fall into three major subject matter areas: (1) the social organization of fisher groups; (2) the institutions within which the groups operate; and (3) the forces and conditions affecting the way in which the group operates.

ORGANIZATION OF FISHER GROUPS

For satisfactory use rights to be established or protected, it is necessary to understand how groups of fishers organize themselves in the conduct of the fishery. This includes the rules governing membership in the group, entry and exit from the group, decision-making authority, the distribution of benefits, allocation of access to the resource, payments to labour, internal dispute settlement and others. It requires understanding of the roles of individuals within households and the roles of households within groups. Where groups have acquired and maintained satisfactory use rights, it is important to understand how the rules have evolved. Where the rights are no longer satisfactory in controlling access to the resources, it is important to understand how the groups have responded to the changes and the kind of, and degree to which, organizational rules remain. A major question is whether, and to what extent, the rules can be adapted to achieve effective fisheries management under the current conditions.

Although there is wide disparity in the specific kinds of organization among fisher groups, a general framework can be used for the analysis of the different situations. Furthermore, the salient elements appropriate to the satisfactory exercise of exclusive use rights are likely to be roughly similar in all situations. The identification of these elements will provide a basis for working with the groups to facilitate their strengthening of their ability to manage the fisheries.

THE INSTITUTIONAL ENVIRONMENT

The institutions within which groups operate include not only the relevant administrative and judicial organizations but also, for example, property rights systems, formal and informal political processes, economic rules and organization, dispute settlement machinery, the bureaucratic structure, communication systems, fiscal arrangements and other rule-based phenomena.

These, and other, institutions have significant implications for the establishment or protection of exclusive use rights in fisheries and for the provision of such rights to small-scale fisher groups. A basic research task is, therefore, the improved understanding of how the institutions work and how they can be changed,

where necessary, to facilitate the creation of exclusive use right systems. For example, one necessary element is the devolution of management authority to the group. This may require changes in the bureaucratic structure, property rights systems and political processes and may also require the creation of new dispute settlement machinery.

As in the case of the organization of fisher groups, there is considerable disparity in specific institutional environments among countries. But a generalized framework can be used for the analysis of the institutions and identification of the major elements that need to be changed. It may be possible to formulate a common approach (at least within regions) that can be used to stimulate the desirable changes.

THE FORCES AND CONDITIONS AFFECTING USER GROUP BEHAVIOR

The behavior of small-scale fisher groups is affected not only by the internal rules within the group and the institutional environment but also by ecological, economic and social forces and conditions. These include the nature of the economy of the group (subsistence or market), the alternative opportunities for employment, whether fishing effort is full-time, part-time or seasonal, the status of the stocks and the health of the natural environment, growth in population, changes in prices and costs, the relationships with other groups using the same or related stocks, etc.

Research to understand the nature of these forces and conditions and their significance is critical for all management and development activities, including those related to the creation of exclusive use rights. Here, the research agendas are likely to be relatively large and will differ according to different situations. The topics can be broken down into three general sets — ecological, social and economic. But the research will generally be best undertaken through inter-disciplinary approaches.

By way of summary, the Report lists below the critical areas for research on small-scale fisheries identified during the discussions. These are listed in order of presentation.

Type 1: Resources exploited by foreign rather than domestic fisheries.

- Examination of factors affecting fisheries development. (p. 7)
- Formulation of a framework for the analysis of conditions that facilitate or impede development. (p. 7)
- Improvement of bio-economic models and techniques for placing a value on fishery resources under the condition of open access. (p. 8)
- Determination of potential net revenues from foreign fishing. (p. 8)
- Evaluation of non-monetary aspects of allowing foreign fishing. (p. 8)
- Estimation of benefits and costs of overcoming constraints to the development of domestic fisheries. (pp. 8-9)
- Conduct of comparative analyses of development of small-scale as against large-scale fisheries. (pp. 9-11)

Type 2: Resources underexploited by domestic small-scale fishers.

- In situations where small-scale fisheries are not fully developed, examination of the social, cultural and economic reasons. (pp. 9-10)
- Where apparent underexploitation is the result of traditional fishery management practices, examination of the value of maintaining the systems or parts of them. (p. 10)

Type 3: Overexploitation by large-scale fisheries.

- Analyses of fish price trends and the effects of rising real prices on overinvestment in large-scale fishing effort. (p. 11)
- Examination of the net economic and social consequences and spillover effects of development of large-scale fisheries. (p. 11)
- Formulation of improved measures for the management of large-scale fisheries and reduction of conflict with small-scale fisheries. (p. 12)

Type 4: Overexploitation by small-scale fishers.

- Improvement in the understanding of the reasons for overexploitation including, but not limited to, the condition of open access. (p. 12)
- Examination of trends in the forces (eg. population growth, rising real prices, diminishing rates of economic growth) contributing to overexploitation and assessment of future effects. (pp. 12-13)
- Improvement in the understanding of the knowledge, organization and rules of behavior of fishers and fishing communities. (pp. 13 and 17-18)

Provision of exclusive use rights to small-scale fisher groups.

- Analyses of costs and benefits of providing exclusive use rights to fisher groups. (p. 16)
- Determination of the conditions and rules that will facilitate effective group decisions on fisheries management. (pp. 13 and 17-18)
- Determination of the conditions and factors that will facilitate the necessary political decisions on the redistribution of wealth. (pp. 17)
- Identification of the essential management functions that can best be fulfilled by the exercise of authority by fisher groups. (p. 17)
- Determination of the conditions and factors that will facilitate the devolution of management authority to fisher groups. (p. 17)
- Improvement in the understanding of how communities organize themselves for fisheries management in systems where traditional measures are still in effect. (p. 13 and 17-18)
- Examination of the resource and technological conditions that facilitate the acquisition and exercise of exclusive use rights and determine ways for improving technology (eg. artificial reefs, fish aggregation devices) appropriate for this purpose. (p. 18)
- Analyses of the factors affecting mobility of fishers into and out of fisheries. (p. 18)
- Analyses of how legal and other institutions affect property rights systems in different cultures and economies. (p. 18)

Broaden scope of development for fishing communities.

- Analyses of the benefits and costs of attempts to broaden the scope of development for fishing communities. (pp. 19-20)

- Analyses of the willingness and capacity of fishing communities to broaden their activities. (p. 20)

Control over other uses of the environment.

- Improvements in the understanding of the mechanics of ecosystems particularly with regard to the resources used by small-scale fishers. (p. 22)
- Improvements in quantitative and qualitative methods of assessing different uses of the environment particularly with regard to small-scale fisheries. (p. 22)
- Development of improved institutions and arrangements for cross-sectoral coordination in dealing with multiple uses of the environment. (p. 22)

Fiscal policies and measures.

- Evaluation of effects of present fiscal measures on small-scale fisheries. (p. 24)
- Examination of conditions that will facilitate positive changes in fiscal policies and measures. (p. 24)
- Examination to determine the most effective kinds and level of fiscal measures. (p. 24)

External measures influencing fisheries management.

- Analyses of development policies of governments and donor agencies. (pp. 25-26)
- Analyses of trade policies of both importing and exporting countries and of likely changes in trade patterns that may affect small-scale fisheries both directly and indirectly. (p. 26)
- Analyses of the causes and effects of environmental changes. (p. 26)

Annex.
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Critical Factors Affecting Small-scale Fisheries

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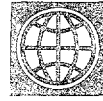
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