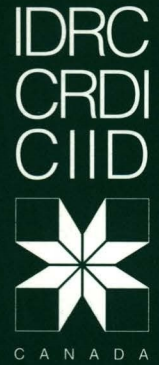


Fisheries Socioeconomics in the Developing World

**Regional Assessments
and an
Annotated Bibliography**

Anthony T. Charles
Theophilus R. Brainerd
Alicia Bermudez M.
Herminigildo M. Montalvo
Robert S. Pomeroy



The International Development Research Centre
Le Centre de recherches pour le développement international
El Centro Internacional de Investigaciones para el Desarrollo

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with a Foreword by Parzival Copes

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ABSTRACT

In fisheries of the developing world, where social and economic concerns often dominate, intelligent policy making requires an adequate understanding of both "economic" and "human" factors -- the economic structure and dynamics of the fishery system, on the one hand, and the role of social, cultural, institutional and political aspects on the other. Interdisciplinary linkages between these two elements form the essence of fishery socioeconomics, which addresses a wide range of topics: analyses of management and developmental goals, income distribution, social accounting, fishery ownership and access, fisher dynamics and labour markets, the socioeconomic structure of fishing communities, economic aspects of gender differences, the nature of fishery decision making, and so on.

Despite its recognized practical importance, the fishery socioeconomics literature is widely dispersed and often inaccessible. This report presents the results of an international effort to compile this literature and to assess the "state of the art" in socioeconomic research on developing fisheries and aquaculture. The report consists of two key elements: (1) a series of regionally-based assessments of fishery socioeconomics research, for each of Africa, Latin America and Asia/Pacific, and (2) an extensive annotated bibliography (on diskette) containing over 1100 references from across the developing world.

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FOREWORD

Parzival Copes

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It is with pleasure that I agreed to provide the foreword to Fisheries Socioeconomics in the Developing World. I am gratified to be associated with this work, responding, as it does, to a serious need in an important area of fisheries enquiry that is engaging the attention of a growing number of researchers.

The greater part of the world's commercial fish stocks inhabits waters adjacent to developing countries. And the greater part of the catch in these waters is taken by fishers from these countries. It is true that several industrialized nations over the past forty years developed large distant-water fishing operations that have taken significant harvests from waters off the coasts of developing countries. However, with the protection afforded by 200-mile fishing limits that became effective in 1977, developing countries increasingly have moved to expand their own fisheries and to reduce or eliminate foreign fishing operations off their coasts. Using improved technology and having much lower labour costs they are, indeed, often able to produce fish at prices low enough to induce industrialized countries to phase out many of their distant-water operations. Some developing countries have successfully extended their own operations into distant waters. Thus it seems that countries that are now classified as "developing" have the prospect of becoming, collectively, the world's dominant fish producers.

Fishing operations around the world are commonly divided into two major sectors. One generally uses small boats that are often owner-operated and that fish close to shore. The other generally employs fleets of larger vessels, owned by companies or private investors, that frequently fish at greater distances from their home base. Depending on local or national circumstances the two sectors are variously referred to, respectively, as small-scale and industrial, artisanal and commercial, or inshore and offshore. The distinction between the two sectors is blurred by the many fishing operations that are intermediate in character, and often the two sectors compete for the same stocks. Nevertheless, the dual classification has been found useful under widely varying circumstances for purposes of social and economic analysis as well as effective policy formulation.

Despite spectacular developments in offshore fishing technology, the small-boat, inshore fisheries continue to account for much the larger share of the world catch. This is particularly so in the developing world with its relative scarcity of capital and abundance of labour. In consequence, an overwhelming majority of the world's fishers are employed in the highly labour-intensive, small-scale fisheries of developing countries. It is here where competition for shares of the catch is the most severe and where incomes are most commonly depressed to subsistence levels. Naturally, this also is where socioeconomic problems in the fishery are most prominent, providing ample justification for a major effort in research and policy applications. Of course, this is precisely where the information provided in this publication will be of greatest use.

There are reasons to believe that the socioeconomic problems of fishing communities in many developing countries will further deepen before the means are found to improve conditions of life in these communities. For explanations we must look to the special ecological, institutional and historical circumstances that apply to fisheries.

Since the end of World War II we have witnessed a continuing global expansion of fishing effort. This has been spurred on by the growing demand for fish that has resulted from increasing populations and advancing incomes. The expansion of fishing effort has been facilitated by rising investment and advances in technology, which have permitted access to a succession of stocks previously beyond the technical or economic reach of the fishing industry. A good

part of this expansion has been achieved through the newly developed offshore operations of distant-water fleets. However, the much more extensive small-scale fisheries have also expanded their operations enormously. In part this has come from technological improvements, extending both their range of operation and their ability to access previously unexploited or underexploited stocks. But the expanded small-scale fishing effort is also a reflection of supply and demand pressures. High growth rates in the land-poor coastal population of developing nations have impelled many to enter the fishery, where in most places conditions of relatively free access to the resource prevail. At the same time, the rising demand for fish from an expanding population has tended to keep prices at levels affording subsistence incomes to larger numbers of fishers.

FAO, which put the world fish catch at around 30 million metric tons in 1956, reported steady annual increases until 1989, when the global harvest for the first time passed the 100 million ton mark. But this also may prove to have been a turning point, for since that year the world catch has declined. We should be aware that a portion of the expansion that we have seen in the global fish catch represents the one-time-only harvest bonus that may be taken from a newly accessed stock, when it is fished down from its maximum biomass level, as determined by environmental carrying capacity. If we are now running low on additional stocks to bring under exploitation, we will have to rely principally on sustainable yields, representing the annual net growth that may be taken from exploited stocks. As fisheries scientists will tell us, there is a strict upper limit to the long-term sustainable catch we may take from an individual stock or stock-complex, represented (somewhat simplistically) by the maximum sustainable yield (MSY) in biomass terms. A slightly lower sustainable catch is associated with the economically-optimal maximum economic yield (MEY). To achieve optimal returns for the fishing industry by MSY, MEY or similar criteria, it is obviously necessary to maintain stocks at appropriately high levels of productivity and therefore to avoid "overexploitation" in these terms.

Researchers in the fisheries field are acutely conscious of the overfishing problem associated with the unregulated or poorly-regulated common-use conditions that have prevailed in most fisheries. Many industrialized countries have introduced fisheries management regimes designed to curb overexploitation and produce better net returns from the fishery, with but modest success so far. Attempts to manage fisheries in developing countries have been much weaker and most often have had little effect. The reasons for this are not difficult to discern. Purposeful fisheries management generally requires the application of considerable financial and administrative resources. Both are in short supply in developing countries, where the requirements of effective management are particularly onerous given the massive numbers of fishers involved and their precarious conditions of subsistence. High levels of unemployment and underemployment, along with low levels of skill, have left greatly excessive numbers of workers dependent on the fishery as employer of last resort.

The small-scale fisheries sector in many developing countries is now suffering a condition of what has been called "Malthusian overfishing". The daily pressure on impoverished fishers to provide a modicum of subsistence for their families drives them to fishing practices designed to secure an immediate catch, no matter what impact these practices may have on the stock and its regenerative powers. Fine-mesh nets, dynamite and poison are used indiscriminately. They prevent stocks and catches from reaching mature weights, interfere with optimal reproduction, destroy fish that is not harvested, and wreak havoc on the aquatic environment. It is here that we witness the depressing reality of "the tragedy of the commons", illustrating both the original cause and the deepening effect of the disastrous conditions to which vulnerable fishing communities may fall prey.

Fortunately, developing countries also provide examples that deny the tragedy of the commons. The South Pacific is particularly noted for the development of systems of customary marine tenure (CMT), many taking the form of territorial use rights in fisheries (TURFs) which, under appropriate conditions, help to maintain productivity and equitable catch distribution in the use of community fish resources.

In the circumstances of developing countries, where fisherfolk often live close to the margin of subsistence, the analysis of fisheries problems and attempts at their resolution need to be particularly sensitive to social conditions. Efforts to apply "efficient" economic solutions that do not accommodate to troublesome social circumstances cannot possibly meet the clear and present needs of fishing communities. Conversely, socially sensitive research that ignores the real limitations set by biological and economic realities, cannot but fail to provide an effective basis for advancement. Without close attention to both social requirements and bioeconomic constraints, little progress will be made in overcoming the deepseated problems of the fisheries in developing countries. A true appreciation of socioeconomic reality and socioeconomic solution patterns is a requisite.

Canada has been an acknowledged leader in research on fisheries problems and in the development of new approaches for fisheries management. At the same time, Canada has demonstrated a commitment to work with developing countries in their efforts to advance economically and socially. For these reasons it may be fitting that this work has been sponsored by a Canadian agency, the International Development Research Centre, through a commendable initiative vigorously pursued by Dr. Brian Davy. Praise is equally merited by Dr. Anthony Charles for his dedicated and skilful leadership of the project. He and his team of authors and compilers -- Theophilus Brainerd, Alicia Bermudez, Herminigildo Montalvo and Robert Pomeroy -- are to be commended for their efforts in completing this valuable work. It promises to be an important tool in the intensification of efforts to forge solutions to the problems besetting fisheries in developing countries, so that they may contribute more effectively to improving conditions of life in their fishing communities.

Chapter 1.

INTRODUCTION

Anthony T. Charles

What makes a fishery system "sustainable"? Certainly conservation of fish resources is a necessary condition, but it is not in itself sufficient. Given the inherently human nature of the fishery endeavour, management and development efforts must also ensure that fishing communities, fisher livelihoods, fishery institutions and fishery culture are sustained (Charles 1993). The importance of the human factor is clear to those who work in the "real world" of fishery policy making and resource management, where ecological and technological factors must be carefully balanced with social and economic considerations.

The need for such integrated approaches has been recognized not only by practitioners but also by many in the fishery research community (Durand et al, 1991). It is clear that successful fishery management and development efforts require not only biological and technological knowledge, but also a range of social and economic research, including at least some understanding of human behaviour, human aspirations and human organization. In other words, there is a recognized need for more interdisciplinary research approaches. Unfortunately, however, the effects of inertia have kept fisheries research overwhelmingly discipline-based; most research agencies are so organized, and the vast majority of published literature falls into "neat" disciplinary categories (fishery biology, fishery economics, fishery sociology, and so on).

The study of socioeconomics in fisheries and aquaculture represents one attempt to implement interdisciplinary fishery research, in particular through studies linking the "economic" and "human" aspects of the fishery. There is a certain symmetry to the subject; it can be seen as integrating social and institutional studies into conventional economic analysis, or alternatively as bringing the concepts and analytical methods of economics into social science research. Indeed, more broadly, for the purposes of this report, socioeconomics can be viewed as including political, cultural, institutional, and legal, as well as social and economic aspects.

Within the sphere of economics, socioeconomics is the sub-field that attempts to incorporate the "human element" into what is often a rather "hard" science. As such, it has tended to be a more descriptive, policy-oriented area of study, contrasting with other more quantitative components of economics, such as microeconomic theory and monetary economics. However socioeconomic research also contributes an inherent realism, based as it is on the economic analysis of people rather than economic proxies such as "firms" and "consumers"; this presents an interesting challenge to economists who seek to adapt the complex mathematical tools that form the basis of microeconomic and macroeconomic theory.

A literature review on the theme of "fishery socioeconomics" published a few years ago (Charles 1988) highlighted the highly diverse and disparate nature of the topic, with publications found in a variety of academic journals (ranging through sociology, economics, geography, policy and fishery science), as well as in government reports and the like. The paper focused on seven key aspects of socioeconomics: (1) the multiplicity of fishery objectives, (2) the interaction of income generation and income distribution, (3) the nature and variety of property rights systems, (4) the dynamics of labour markets and labour mobility, (5) the role of social and opportunity costs, (6) the behaviour of fishermen and fishing communities, and (7) the state of socioeconomic information and research.

While that publication contains over 100 references, there are relatively few from the developing world; this reflects the difficulty of compiling Southern research, which is often published in less accessible "grey" literature. The present report represents the results of an international effort to focus on the socioeconomics of fisheries and aquaculture in the developing world. The report presents an extensive annotated bibliography, together with a set of regionally-based assessments of socioeconomic research. Apart from the present WordPerfect version, the bibliography is also available in dBase and ASCII formats, or as printed copy.

1.1 Organization and Scope of the Report.

This introductory chapter brief addresses the key components of fishery socioeconomics, and outlines a selection of the general literature on the subject. In Chapters 2, 3, and 4 a series of regional assessments present the current state of fishery and aquaculture socioeconomics in each of Africa (T.R. Brainerd), Latin America (A. Bermudez) and Asia/Pacific (H. Montalvo and R. Pomeroy), based on literature reviews drawn from the material in the bibliography. These are followed in Chapter 5 by a broad discussion of socioeconomic information needs and research priorities (T.R. Brainerd).

The format followed in each of the regional assessments is as follows:

- (1) an outline of the special characteristics of the fisheries in the region.
- (2) a review of the available literature on fisheries and aquaculture socioeconomics, past and present, organized according to the subject headings described above.
- (3) a synthesis of socioeconomic research, focused on 4 particular topics: the rationale and goals of the research, the range of country-specific studies, geographical differences (particularly between marine and inland fisheries), and aquaculture research.
- (4) Analysis of research methodology, data considerations, research infrastructure and institutional constraints, and
- (5) A discussion of critical areas for socioeconomic studies of fisheries and aquaculture, and an examination of the role of the socioeconomist in fisheries development planning and management.

The annotated bibliography follows the regional studies and the discussion of research needs; it provides the bulk of the report, divided into 4 components.

The first section of the bibliography contains a limited selection of "general" references, relevant to the theme of fisheries socioeconomics in the developing world, but lacking particular regional connections. It should be noted here that since this report focuses on the developing world, there is no attempt to present a complete listing of relevant publications from Northern countries. Hence many important "general" books and papers containing conceptual, social science and/or common property research in fisheries and related resources are not included here. While efforts have been made to include as many of the key references as possible, the collection in this first section should be viewed as a sampling of general research in the area rather than a determination of the most important works.

The three regional bibliographies utilize the categorization used for the regional assessments, with Southern nations divided into three broad regions: Africa and the Middle East, Latin America and the Caribbean, and Asia/Pacific. Fisheries and aquaculture papers are included from most of the South, but due to the knowledge base, the contacts and the geographical location of those compiling the bibliography, there was greater emphasis placed on Africa, Latin America and Asia, with less on the Middle East, the Caribbean and the Pacific. It is hoped that subsequent compilations will provide full coverage of these important areas.

Two further caveats should be noted concerning the regional bibliographies. First, the project to produce this report operated on a decentralized basis, with different participants responsible for each of the geographical regions (as indicated in the Table of Contents). Although efforts were made to coordinate activities, the reader may find that the overall balance of references uncovered will vary from region to region, again due to differences in emphasis and in background between those responsible for each region, as well as differences between the regions themselves. Secondly, while over 1100 references are included herein, limitations on the budget and time span of the project have meant that undoubtedly many other relevant references did not come to the attention of the authors, and thus were not included. We apologize for these omissions, and

particularly we apologize to authors of those publications missed in this compilation. We hope that this report will nevertheless be of value, and that future updates will improve the overall degree of completeness. (To this end, the first author, A.T. Charles, would be grateful to receive a copy of any relevant publication.)

1.2 Socioeconomic Subject Areas.

Amongst those involved in fishery socioeconomics, there is undoubtedly a wide spectrum of views about what constitute the key research topics. In compiling this report, nine subject areas were identified within the overall theme of fishery socioeconomics; subject codes were assigned for each of these, and references were categorized under one or more of these codes. This procedure thereby provides a framework for compiling the bibliography and the regional assessments, and enables readers to identify material of particular interest. In this section, the chosen subject areas are presented, and brief subjective commentaries are given for each.

(1) Philosophy and objectives.

This subject area involves consideration of two fundamental questions: What contributions do fisheries and aquaculture make to society as a whole? What aims are to be achieved through the control of fishery activity? The effectiveness of fishery developmental and management efforts can be judged by the extent to which societal goals and objectives are achieved. This implies a natural progression in policy development, from decision makings about the objectives to be pursued, to discussion of the regulatory and policy instruments best suited to achieve these goals.

In reality, there is often little discussion of the initial step in this progression -- the choice and prioritization of objectives. This is understandable in that such discussion necessarily highlights the philosophical differences amongst participants, thereby leading to conflict (Charles 1992). Yet avoidance of such discussions is merely an implicit acceptance of the objectives chosen by whomever is in a position to determine and implement regulatory measures. Thus conflict is not avoided, but merely postponed and likely exasperated. The papers under this subject heading typically present approaches which examine the roots of conflict before regulations are implemented and change becomes difficult.

(2) Income and human well-being.

This subject heading concerns the fundamental interest of socioeconomic research in practical issues of human welfare, on the themes of distribution, social accounting and welfare economics. How is the well-being of individuals, groups and communities affected by fishery policy and fishery operation? How are fishing incomes distributed amongst participants? How should society measure and balance benefits and costs of various sorts? Literature is also included here dealing with the differences between social and private costs, as well as with quantitative analysis of inputs and outputs in fishery and aquaculture economics, such as "costs and earnings" balance sheets and profitability measurements.

The topic of income distribution is one that tends to clearly differentiate socioeconomics from other areas of economics. While no one disputes the practical importance of distributional issues, by and large economists avoid dealing with those issues, due to (a) a belief that questions of income distribution can be divorced from the pursuit of economic efficiency, and (b) the fact that distributional considerations are not easily analyzed mathematically. Yet such matters are of theoretical as well as practical relevance; Mueller and Wang (1981, p.10) note that "economic efficiency [alone] does not necessarily dictate the socially desirable course of action in the face of the income distribution issue". Socioeconomics attempts to deal with the dual goals of efficiency and distribution, but given the potential incompatibility of these objectives, basic economic theory is of limited applicability, and a more complex multi-objective approach is usually required.

(3) Management, development and human responses.

The choice of fishery objectives discussed above impacts directly on the choice of appropriate development directions and management methods. This subject area deals with the variety of approaches to the management and development of fisheries and aquaculture, the choice of regulations, and the human response to regulation. Included is a wide range of analytical and descriptive material, ranging from broad policy-oriented overviews of management/development options through to rigorous analyses of specific regulatory proposals, provided that a substantive socioeconomic perspective is adopted.

A key point in the socioeconomic analysis of fishery management is the possibility that certain fishery policies may be seen as being incompatible with declared objectives. For example, privatization of the resource through individual catch quota schemes may be viewed as incompatible with a desire to strengthen fishing communities. In a multi-objective context, any single policy option may well meet some fishery goals while being contrary to others; in this context, it is important to seek out within the spectrum of options that which best balances the stated objectives.

(4) Property rights.

This subject heading incorporates what is perhaps the "hottest" topic in natural resource studies. In recent years, discussion of property rights in fisheries, as an alternative to central regulation, has revolved around two competing views: (1) market-oriented quasi-private property, typically in the form of so-called "individual transferable quotas" (e.g. Neher et al 1989) and (2) community-oriented "common property" arrangements, in which resources are owned or controlled jointly by a clearly-defined group, such as a community (e.g. Ciriacy-Wantrup and Bishop 1975; Christy 1982; Berkes 1989).

The study of common property resource systems has emphasized the social and institutional dynamics in fishing communities, which result in systems of informal and traditional property rights such as the so-called "territorial use rights in fishing" or TURFs. Also important has been a reassessment of Hardin's (1968) famous "Tragedy of the Commons" paper, which has become central to the conventional wisdom in environmental and resource economics. Hardin's paper, it has been shown, confuses the ownership-based concept of common property with the use-based idea of "open access"; in fact it is the latter, rather than a common property regime, that implies a lack of control over resource use.

In addition to the literature on property rights, this heading includes all papers dealing with general ownership issues, including self-regulation and the development of fishing cooperatives, whether or not the latter are concerned with property rights per se.

(5) Labour.

This socioeconomic subject area moves beyond the conventional economic view of labour as but one input in the production process, to focus instead on the interactions between economic considerations -- notably involving markets, costs, and investments -- and the human side of those working in the fishery. This is particularly important since empirical evidence demonstrates that fishers often operate very differently from hypothetical profit-maximizing firms.

To understand the functioning of fishery labour markets -- the supply and demand of people as fishers and fishery workers, it is crucial to determine the objectives and the decision making criteria of fishers. What are the dynamics that drive fishers and others working in the fishing industry? How do they make their decisions about entering into and exiting from the fishery? To what extent are fishers mobile geographically or between occupations? What are the real costs of fishing from the perspective of the fisher, that is, the opportunity costs of their labour in the fishery? How do work conditions, safety, etc., affect the role of fishers and of shore-based workers? Such questions are important both from the perspective of understanding the industrial structure and from that of understanding the dynamics and behaviour of the people in the fishery system.

(6) Communities, post-harvest and aquaculture.

This undoubtedly broad subject heading captures socioeconomic studies dealing with fishing communities (a subject that is well-represented in social science fishery research) as well as all aspects of onshore or land-based fishery-related activity. The principal topics included are: (a) socioeconomic aspects of fisher households and fishing communities, or components thereof, (b) coastal zone management, if a particular focus is placed on fisheries or aquaculture considerations, (c) socioeconomic aspects of the handling, processing, marketing and distribution of fish products, (d) fishery-related onshore activities such as ship-building (where these relate to fishery concerns), and (e) aquaculture. Note that in the latter case, papers on aquaculture are also identified in the separate bibliographic classification of "Type of Fisheries", described below, where aquaculture is contrasted directly with capture fisheries. A separate index of aquaculture papers is also provided.

(7) Women.

This subject area focuses on the participation of women in fishery and aquaculture activities. While historically such involvement has been considerable (as it has been in agriculture as well), this fact has only recently become widely recognized. Now, a substantial body of literature has developed on the role of women in fishery systems, particularly in the post-harvest sector, but also in harvesting (e.g. Chapman 1987).

Publications which examine this role from a socioeconomic perspective are reported here, with both descriptive and analytic contributions, including work on gender analysis as well as on descriptions of the specific fishery activities of women. The social and economic status of women is addressed with respect to both the harvesting and processing sectors of the fishery, as well as activities in fishing households and coastal communities.

(8) Information and research assessment.

This subject heading incorporates publications which examine the need for and the nature of socioeconomic information, the current state of knowledge in fishery and aquaculture systems, and the requirements for socioeconomic research in fisheries. Also included under this heading are papers which provide major sources of primary data on socioeconomic aspects of fisheries and aquaculture, such as reports on substantial socioeconomic surveys and the like. (It should be noted, however, that the mere provision of socioeconomic information does not warrant a paper's inclusion under this subject heading, since all references in this bibliography provide information of some sort...)

(9) Innovation and technology transfer.

This heading incorporates discussion of innovation, technology transfer, and adoption of new methods, both at the fisher level (such as innovation that involves new fishing methods or new aquaculture development) and at the level of management (such as adoption of new monitoring technology, etc.). It has become clear within the international development community that technology transfer must be both economically and socio-culturally acceptable. New "improved" methods have little chance of being utilized in practice if they fly in the face of economic forces faced by the fisher or aquaculturist, or if they are contrary to traditional social and community structures.

As the need for efficiency in the execution of international development activities becomes ever more important, it is crucial to better understand the processes by which change occurs in natural resource systems. This in turn is both a technical/scientific and a socioeconomic matter. When and how are new methods and new technologies adopted? How do the processes of innovation proceed? What is the utility of "technology transfer" under varying circumstances? Such questions must be addressed before the more technical considerations.

1.3 General Socioeconomic Studies.

This section briefly reviews socioeconomic papers which are of relevance to developing nations but which are not region-specific. This is a brief and admittedly partial review, in keeping with the principal focus of this report on regionally-based bibliographies and assessments. The material below is organized under five headings: (1) overviews of topics in fishery socioeconomic, provided by review papers, textbooks, conference proceedings, and other collected works, (2) philosophical aspects, notably the range of objectives inherent in fishery operations, (3) publications dealing with the management and development of fisheries, from a socioeconomic perspective, (4) organizational aspects of the fishery system, particularly issues of property rights and ownership, and (5) socioeconomic information and research needs.

Overviews.

Broad reviews of fisheries socioeconomic are contained in a variety of publications. For example, the textbook of Lawson (1984) reviews aspects of fishery economics and fisheries management, including practical socioeconomic aspects such as conflicting developmental objectives, institutional arrangements, project assessment, and the complex interactions in the fishery system. As noted earlier, Charles (1988) presents a literature review of socioeconomic research on fishery objectives, income distribution, property rights, cooperatives and fisher organizations, social and opportunity costs of labour, fishery labour markets, fisher behaviour, fishing communities, and socioeconomic information and research needs.

Collections of original research are provided in a number of edited books. The 28 papers in Panayotou (1985) present a wide range of socioeconomic analysis, on various aspects of artisanal fisheries and aquaculture in Asia, including marketing, social and institutional constraints, and government programs. Pollnac (1989) presents 10 papers on methodological discussions and case studies relating to the monitoring and evaluation (from socioeconomic and other perspectives) of artisanal fishery and aquaculture projects, with case studies on Guinea Bissau, the Philippines, and the Caribbean. The volume edited by Pollnac and Morrissey (1989) contains 8 papers on a variety of artisanal fishery themes related to socioeconomic, including the occupational perceptions, income variability and investment orientations of fishermen in Costa Rica, the artisanal fisheries of Senegal, and the nature of cost-effective information for fisheries management. Verdeaux's (1990) special issue of an ORSTOM human sciences journal focuses on fishery topics, with 15 papers on a variety of subjects, including the effects of fishery rights schemes such as individual fishing quotas and sharing systems, the role of fisher groupings, the role of women, aspects of marketing, and the effects of fishery industrialization. Case studies presented are drawn from New Caledonia, the Ivory Coast, Senegal, Mali, Martinique, and Zaire, amongst other nations, while the author list includes Chaboud, Chauveau, Diaw, Gilly, Kebe, Miras, Morisset and Reveret.

Troadek (1989) contains 22 chapters on a variety of biological, economic and social aspects of fisheries, by authors such as B.J. Rothschild, R.B. Rettig, T. Panayotou, S. Garcia and J.-P. Troadek. Included in the volume are discussions of fishery use rights and property rights, the social organization of fishery management systems, international dimensions in fisheries and fishery development in the Third World. Anon (1982) includes 33 contributions, including 9 specific case studies, on the theme of improving the utilization of by-catch, particularly from shrimp fisheries; many papers are of a technological nature, but elements of socioeconomic appear in much of the discussion throughout. Allsopp (1985) presents a series of case studies on "fisheries development experiences" from Africa, the Middle East, Latin America and Asia, together with discussions of bilateral and multilateral fishery development agencies; a focus is placed on institutions, infrastructure and training aspects.

Conference proceedings also provide a wealth of socioeconomic research in fisheries, and fishery development in particular. The three-volume proceedings prepared by GERMA (1987) present a wide variety of theoretical contributions and

applied case studies on fishery economics, fishery socioeconomics and fishery development, with most regions of the developing world being represented. The 2-volume proceedings edited by Durand, Lemoalle and Weber (1991) provide a rich source of material on research in fishery socioeconomics, including a series of "regional syntheses" describing the current state of research in small-scale fisheries, together with multidisciplinary papers giving theoretical analyses and applied case studies.

Philosophy and Objectives.

Philosophical considerations in fisheries development are addressed by a number of authors. The important paper of Emmerson (1980) argues that greater attention should be paid in fisheries development to the process of goal setting, to distributional considerations, and to "horizontal" integration of fishery participants with other groups and other employment opportunities outside the fishery. It presents biological, economic, legal and anthropological views of small-scale fisheries, and emphasizes the diversity of the overall system.

A "Strategy for Fisheries Management and Development" together with "Programmes of Action" are contained in FAO (1984); among the points discussed are the role of fisheries in alleviating under-nutrition and in meeting national economic and social goals, as well as the involvement of fishers in management.

Management and Development.

Bailey (1987) outlines the various impacts of overfishing and poor resource management, including increased social conflicts, a greater use of destructive fishing techniques, changes in food supply and distribution (with negative effects on rural populations), as well as increased concentration of economic power. With respect to the Asian situation, the paper notes the need for an integrated view of the fishery system: "fisheries management cannot be divorced from broader problems of Southeast Asian nations, and are only solvable within this larger context".

The key paper of Panayotou (1982) provides "an analytical framework for the management and development of small-scale fisheries in developing countries", describing constraints under which fishers operate, the measures available to control fishing effort and the criteria for choosing such measures: "acceptance by the fishermen, gradual implementation, flexibility, encouragement of efficiency and innovation... and due attention to employment and distributional implications." The paper concludes that "revival and rejuvenation of traditional territorial community rights... offer perhaps the best possible management option for small-scale fisheries."

Ruddle (1988) also deals with this topic, focusing on the importance of traditional knowledge in fishery management. Ruddle describes "a research framework developed by the UNESCO project Traditional Knowledge and Management of Marine Coastal Systems, to analyse and evaluate traditional systems of inshore fisheries management in the Asia-Pacific region, and particularly in the coralline environments of the Pacific Islands." The paper analyses traditional management systems and their potential modern role, then presents a substantive series of questions which must be addressed in research on the subject. Community based development is also dealt with in a book edited by Poggie and Pollnac (1991), which presents a number of papers on the development and management of artisanal fisheries and mariculture in Asia and Latin America.

An emerging alternative to conventional centralized government-controlled fishery management, involving joint management by government and users, is detailed in a volume edited by Pinkerton (1989). This is perhaps the first to analyse in detail the "co-management" option for fisheries. Its introductory and concluding chapters present conceptual analysis and synthesis, while the bulk of the volume consists of 14 North American case studies, with particular emphasis on cooperative fishery management involving indigenous native fishers.

The papers of Bailey (1985) and Rao (1988) each analyze the contribution of social science research to integrated development and management of marine fisheries. Bailey describes aspects of a "sociology of fisheries management and

development", and the role of sociologists in fisheries, focusing on the interaction between technological innovation, distributive equity and resource allocation. Rao examines past trends in fisheries research, identifying some of the constraints and weaknesses inherent in fishery science research, and discussing the need for social science research, particularly to deal with the problems associated with modernization and expansion of the marine fisheries.

Property Rights and Fishery Organizations.

A key area of discussion in the modern fisheries literature is that of property rights -- assignments of the right to harvest fish -- and in particular the pros and cons of common property arrangements. An important paper by Christy (1982) discusses the form of property rights known as "TURFs" (territorial use rights in fishing), contrasting it with the situation of a resource where "access is both free and open to a set of users or potential users". The conditions that affect the creation and maintenance of TURFs are described, including natural resource attributes, boundaries, technology, culture, wealth distribution and institutional factors. The paper of McGoodwin (1983) "reviews a great variety of indigenous and/or traditional mechanisms of self-regulation", representing one of the first broad surveys of traditional common property fisheries management available in the global literature, and includes an extensive bibliography. Dahl (1988) presents and analyses five social conditions thought to be crucial in the maintenance of traditional marine resource tenure, based on experience in Micronesia. The potential for using traditional marine resource ownership in designing management regimes for artisanal fisheries is also explored.

The volume by the Panel on Common Property Resource Management (1986) focuses on the rapidly emerging field of study on management of common property resources, presenting a series of conceptual papers together with a set of case studies. Of the latter, three deal with fisheries (in Turkey, Brazil and the Philippines). The approach is typically multidisciplinary throughout, emphasizing institutional analysis and issues of property rights. The volume of Berkes (1989) contains a variety of conceptual contributions to the study of common property in natural resource systems, together with fishery case studies drawn from Mexico (spiny lobster), Japan, and the U.S. (Maine lobster). Typically, an institutional perspective is taken, addressing interactions between people, the resource and the management structure, with the goal of understanding why certain management regimes are successful while others are not.

While property rights dominate discussions in the current fishery literature, they are but one aspect of fishery organization, a subject that has been the focus of considerable human science research. For example, in a report to the World Bank, Pollnac (1981) presents "a framework for assessing the socio-cultural feasibility of small-scale fishery projects", focusing in particular on the question of fisher cooperatives -- when are they are needed, and what factors influence their likelihood of success. "Examples are provided of both successes and failures [in cooperative development] that could be attributed to socio-cultural variables." Platteau (1988), in a historical assessment of Third World fishery modernization processes, addresses "the comparative role and strategies of the State and private initiative" and the factors influencing choices made about "organizational forms" in the fishery. He uses a theoretical framework drawn from "New Institutional Economics", in which institutional structures are seen to play key roles in determining social and economic outcomes.

Information and Research Needs.

Key papers concerning priorities for research and information acquisition in fisheries socioeconomics include the seminal monograph of Smith (1979), which discusses multidisciplinary research needs and a framework for decision making in artisanal fishery systems, and FAO (1985), which is a particularly significant report on an expert consultation into the acquisition of socioeconomic information in fisheries. The latter presents a systematic analysis of information needs in fisheries, paying particular reference to small-scale fisheries. The 12-page paper of Pollnac and Sutinen (1979) also discusses the information that is needed

in fishery development, what might constitute a suitable information system, and the sociocultural aspects of obtaining information from fishers. Josupeit (1981), on the other hand, is a source of useful socioeconomic data of importance to the fishing industry in various countries. Brief discussions associated with the various tables highlight the importance of fish for daily protein intake, and for the balance of payments, the number of fishermen and the role of fisheries in employment, and the influence of the fishing industry in national economies.

The edited volume of Sutinen and Pollnac (1981) reports on a project to examine small-scale fisheries in Central America, particularly Costa Rica, El Salvador and Guatemala. A wide variety of topics are covered in this multi-disciplinary volume, ranging from food science and fish quality to marketing and economics, to sociocultural and anthropological aspects of fishers and their communities. Its importance as a research contribution lies beyond the particular region of study, due to its focus on information needs and acquisition processes. The textbook by Shang (1981), on aquaculture economics, also addresses the topic of information acquisition, through a discussion of how to develop a suitable socioeconomic survey. In addition, the book covers a wide range of material relating to policies and strategies for aquaculture development, involving such means as education, training, infrastructure and institutional credit facilities.

Two reports published by World Bank [et al.] (1991a,b) present the output of Working Parties which provided input into the major multi-donor "Study of International Fishery Research". The first of these focuses on small-scale capture fisheries, reviewing the various types of such fisheries (categorized according to the level of resource exploitation and who is doing the exploiting), describes options for fishery management and development, and discusses the "demand and supply constraints to the choice and conduct of research". The authors emphasize 3 major research areas: the social organization of fisher groups, the institutional environment, and the forces and conditions affecting how fisher groups function. The second report deals with aquaculture, discussing "a systems approach for analysing research needs", examining research capacity in developing countries, and presenting an assessment of current research needs in tropical aquaculture, organized by discipline (including economics and social science).

Summary.

To reiterate an earlier point, the above represent but a sampling of the socioeconomic literature dealing with theoretical aspects and with developed nation fisheries. In the following chapters, we turn to more detailed and more complete assessments of the "state of the art" in fishery and aquaculture socioeconomic, focused on each of three broad regions of the developing world: Africa, Latin America, and Asia/Pacific.

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Chapter 2.

SOCIOECONOMIC RESEARCH ON FISHERIES AND AQUACULTURE IN AFRICA

T.R. Brainerd

The advent of the new legal regime on the oceans (Exclusive Economic Zones - EEZs) together with increased access to fish culture technologies have provided most countries with more control over their fishery resources. At the same time, these countries are faced with increased responsibility for appropriate resource management, to ensure that continuous and equitable benefits accrue to society, both within the countries and at large. African nations, some of which are endowed with considerable fishery resources, have witnessed significant transformation of their fisheries since the early 1970s. However, for such change to be successful and sustainable, sound fishery management and development plans are needed. In turn, these plans need as input suitable socioeconomic research. This paper reviews the state of fishery/aquaculture socioeconomic research in Africa, first outlining the current state of fisheries and aquaculture, then synthesizing various socioeconomic reports, and finally identifying critical areas and possible constraints for future research work.

1. SPECIAL CHARACTERISTICS OF AFRICAN FISHERIES AND AQUACULTURE

This section describes the major fisheries in Africa, and the state of aquaculture development in the continent. Special attention is given to (1) the nature of the resource endowment (by region and sub-region) and its implications for fishery development, (2) the management of transboundary stocks, (3) the artisanal fishery, a very important sub-sector in most African countries, and (4) problems concerning foreign fleets.

1.1 The Fisheries of Africa

The 1988 African fishery catch totalled 8.7 million metric tons, or approximately 9% of the world's total (based on FAO regions 1, 34, 47 and 51 excepting South Asian, Middle Eastern and Mediterranean nations). The catch was primarily marine, but freshwater catches from Africa's many rivers and lakes were also important.

Indeed, several landlocked countries have significant fresh-water fisheries, which can play a key role in the food supply in such nations. These freshwater harvests are obtained exclusively by African fishers and have shown a steady upward trend from 1.3 million tons in the early 1970s to an estimated 1.8 million tons in 1988. The major freshwater species are Nile perch (14% of the catch) followed by catfish, tilapias, dagaas, carps and cichlids (FAO, 1990a). Theoretical calculations estimate a high potential fish yield from inland waters, however much of the unrealized potential is in waters which are relatively inaccessible and far from markets (Congo/Zaire, Okavango, etc.) (FAO, 1990b).

There have been serious depletion of fish stocks in many inland waters of Africa due to climatic changes. This has been particularly marked in the Sahelian zone where Chad, Niger, Mali and Senegal have been the most affected. The continent-wide trend is towards a focus on small water bodies for natural and culture-based fisheries.

Although aquaculture production in Africa increased throughout the 1980s, in 1988 it accounted for only 4% of total African fish production, and less than 1% of the total world aquaculture production (with 80% of the reported yield being from Asia, and 12% from Europe). African aquaculture output increased from 34,000 metric tons in 1984 to 68,000 metric tons in 1988, representing an average annual increase of 20% over this period. This compares favourably with the world's average annual increase of 5% and shows that the potential exists for developing aquaculture in Africa. The main aquaculture species in Africa are tilapias and carps.

The marine catch is taken by both African and distant water fishers. The vast majority of the marine catch is taken in the Atlantic Ocean, with smaller Indian Ocean catches being dominated by distant water vessels. Major marine species in African fisheries include jack and horse mackerels, small pelagics, tuna, hake, and chub mackerels. Marine catches have shown a generally upward trend, although there are significant differences across species. Total catch of tuna, hake, chub mackerels and pilchards has substantially increased. Harvests of cephalopods, shrimp, and lobster, while smaller in absolute numbers, have also shown significant rates of increase.

The Food and Agriculture Organization (FAO) statistical classification divides the African marine environment into three major fishing areas: the Eastern Central Atlantic (from Morocco to the northern tip of Angola), the South-east Atlantic (including Angola to South Africa), and the Western Indian Ocean (Somalia to South Africa).

Some of the world's most important fisheries are found in the Eastern Central Atlantic area. Catches in this region peaked at 3.8 million tons in 1977, then dropped during the early 1980s, climbing back to 3.6 million tons in 1988. This reflects the large fluctuations of the small pelagic resources such as horse mackerel and sardine under the climatic and fishing pressure that are characteristic of this region. The (1988) share of landings by non-African long-range fleets remains high at 56% (FAO 1990b).

In the northern sector, demersal stocks such as cephalopods, hakes and sparids are almost fully exploited or overexploited. The coastal stocks of seabreams are also heavily exploited, while the stock of Moroccan sardines seems to have returned to historical levels. In the Mauritania-Senegal sector the fishery went through major developments in the last decade due to increases in fishing by foreign fleets and development of national fishing capacity. Catches have not increased and all the traditionally exploited species are considered at least to be fully fished.

In the southern sector, recent trawl surveys indicate that in Guinea, coastal resources inside 15 metres depth were largely untouched, offering a significant potential for artisanal fisheries development. The traditional offshore stocks have been heavily fished by foreign fleets. In the Sherbro area stocks have been heavily exploited by foreign fleets in recent years. The pelagic stocks of the Cote d'Ivoire-Ghana-Togo-Benin area, which collapsed in the past due to high fishing pressure and bad climatic conditions, returned to record and steady levels since the early 1980s.

Total catch in the Southeast Atlantic was 2.4 million tons in 1988 (FAO, 1990a). There has been significant fluctuations in annual catches in recent years, due to the variability of anchovy and horse mackerel catches. A large share of the catch was taken by distant water fleets operating mainly off Namibia and Angola. During the period in which Namibia's independence was pending, there was no coastal control over fishing off Namibia, making this one of the world's few free fishing grounds since the advent of the EEZ era.

Hakes, the most abundant demersal stocks in this area, had high catches in the 1970s, which dropped significantly in the 1980s. All the stocks are said to be overexploited, although the most southern stocks seem to show some sign of recovery. The most abundant pelagic stocks are the cape horse mackerel (moderately to fully exploited) and the anchovy (fully exploited). Another important pelagic stock, the sardinella, is said to be moderately exploited.

Total landings in the Western Indian Ocean were 2.9 million tons in 1988 (FAO, 1990a). However, total landings in countries bordering the South Western Indian Ocean (African countries), excluding landings by foreign fleets, were only 162,000 tons in the same year. Most stocks in the region are considered fully exploited, except for pelagic resources off Somalia, Mozambique and most likely Madagascar.

1.2 Artisanal Fisheries

The artisanal fishery sector provides the bulk of the fish consumed in Africa. In recent years African governments and international donors have increasingly recognized the importance of this sector, particularly since

numerous large investments in industrial fisheries have not increased national fish production and foreign exchange earnings at the rate expected. This recognition has been supported with numerous sectoral policy papers on small scale fisheries development.

This fishery involves marine (coastal) areas and inland water bodies. For some landlocked countries with major water bodies, the artisanal fishery is practically the only fishery. For coastal countries, the importance of the artisanal fishery is more apparent in countries whose coastlines border the Eastern Central Atlantic and the Southeast Atlantic regions. In such cases, artisanal production supplies up to 80% of the fish consumed, while in the Southwest Indian Ocean most marine fishing involves foreign industrial vessels.

Due to the dispersed nature of the artisanal fishery in Africa (with landing sites scattered along the entire shoreline, covering hundreds of kilometres and most of them in isolated areas) accurate data on the state of the resources, the fishers and the level of fishing effort are difficult to obtain. In some countries artisanal fishers are very mobile and sometimes conduct their activities across territorial boundaries. This makes it difficult for countries to carry out effective planning for this fishery sub-sector. However, governments have recognized the importance of the artisanal fishery, and with the assistance of external donors are implementing projects to aid its development.

1.3 Foreign Fleets

Foreign fishing vessels have historically enjoyed uninhibited exploitation of rich fishing grounds adjacent to coastal African countries, before most countries declared 200-mile EEZs. Now these vessels can no longer fish legally in these waters, unless they enter into agreements with the coastal countries. Nevertheless, foreign fleets still catch about as much fish off Africa as do African countries themselves. In 1988, these vessels harvested 3.7 million tons of fish off the Atlantic and Indian coasts of Africa, a figure almost exactly equal to that caught by African nations (i.e. 50% of the total marine catch). The level of foreign fishing is slowly declining, largely due to expansion of domestic marine fisheries and stepped up enforcement of EEZs.

Several African countries reported substantial income from European and Asian fleets, which now have to pay for fishing rights. However, most African countries still lack the resources to adequately control the activities of foreign vessels that are fishing under licensing agreements and those that are fishing illegally in their EEZs. Under-reporting of catch and fishing effort by legally-fishing foreign vessels makes it impossible to derive accurate data on resource exploitation. Thus, management and development policies are often made on erroneous information. Furthermore, problems exist in assessing the appropriate economic rents for these vessels.

Even when fishing activities are being conducted legally, there is always the element of secrecy to prevent competitors from knowing the reasons for each others' successes. This behaviour impedes the efforts of scientists who require the cooperation of those in the industry to conduct their research work. The bureaucratic nature of government institutions, which sometimes makes it difficult to conduct certain activities, is also relevant.

1.4 Transboundary Fisheries

The issue of the management of transboundary stocks is critical to the countries bordering the Eastern Central Atlantic and the Southeast Atlantic statistical areas, where most pelagic stocks are highly migratory. To ensure rational exploitation of these stocks, coordinated management is needed between the countries concerned, in two areas: (a) scientific cooperation to study the nature of the stocks, the levels of exploitation, social, environmental and other factors that affect their exploitation, and (b) formulation and implementation of appropriate management measures that will take into consideration the interests of these countries.

Scientific cooperation is relatively easy to achieve particularly when funds are available to conduct the required activities. The second type of

cooperation is more difficult to achieve and introduces the problem of delegation of authority. Every sovereign nation is free to take whatever action it thinks appropriate in the light of its national objectives. Thus, even when countries are parties to international agreements, they sometimes fail to implement such agreements for various reasons.

One major problem in both regions is that most of the countries do not have the resources and sometimes the political will to put into effect both types of cooperation. Also, the fishery sector in these countries is subordinate to agriculture, and with declining economic conditions in most of these nations, funds for fisheries management activities have been drastically reduced. There is almost complete reliance on foreign assistance to conduct these activities.

2. THE STATUS OF SOCIOECONOMIC STUDIES OF AFRICAN FISHERIES

This section provides an overview of selected socioeconomic studies drawn from the bibliography presented later in this report. The discussion herein is organized first according to the subject codes used in the bibliography, and then in the form of syntheses, based on themes such as "marine versus inland" and "the state of aquaculture socioeconomics". Note that while many studies fall under more than one subject or thematic heading, for reasons of space limitations, a given study is noted at most once herein (under its most appropriate heading).

2.1 Subject-by-Subject Reviews

2.1.1 Philosophy and Objectives

Relatively little of the literature reviewed dealt with the philosophical elements and the objectives of fisheries. Gaudet et al (1986) look at critical factors in the development of small-scale fisheries and the socioeconomic profile of small-scale fishermen. They argue that the lack of attention to sociological and economic factors have resulted in the failure of past efforts to develop small-scale fisheries. Kellecher and Tshibanda (1986) describes policy objectives in theory and practice for the fishery sector and presents the socioeconomic issues involved under institutional management and outlines various approaches to conflict resolution.

The report of Daneau (1983) discusses the place of fisheries in the economy of the coastal Sahelian countries (Cape Verde, The Gambia, Mauritania and Senegal) and outlines the objectives and problems of the marine fisheries sector. It looks at various elements of fisheries development projects and identifies those that are particularly essential. It ends with a discussion on the socio-political environment and on governments' policies to aid fisheries development.

Everett (1988) looks at control measures, management and development objectives for the small scale fishery in two sub-regions (Mauritania to Liberia, and Cote d'Ivoire to Congo). He discusses some aspects of the implementation of artisanal fishery projects and the complementarity between artisanal and industrial fisheries.

The report by Mabawonku (1978) reviews the various programs and strategies for developing artisanal fishery in Nigeria. It discusses some of the key issues and identifies some of the constraints to small scale fishery development in Nigeria. Posner and Sutinen (1984) describes the status of the fisheries in West Africa and reviews present management and development policies with reference to their adequacy and constraints. The prospects for implementing successful management and development programs are discussed.

2.1.2 Income, Distribution and Welfare

Fawumi (1983) quantifies the relative effects of some major socioeconomic variables influencing the performance of Nigeria's coastal artisanal fishery. A variance analysis of the socioeconomic data, performed to compare the Bonny fishery to four other fisheries in Rivers State, shows significant differences between these fisheries based on nine economic performance variables.

In the context of Lake Victoria fisheries, Reynolds and Greboval (1988) look at the distribution of benefits, especially with respect to the relative role of artisanal and large scale fishing operations, and the fundamental question of sustainability. They suggest that under proper management, the fisheries of Lake Victoria, and the Nile Perch fishery in particular, could continue to provide high yields and substantial benefits for the riparian communities in the area.

Nimtz's (1974) research tests the hypothesis that fishermen's decision-making behaviour in Bagamoyo, Tanzania seeks to maximize utility or to achieve the widest possible spread between costs and returns. No indication is provided on whether this hypothesis was accepted or rejected. She also discusses the strategic rules of behaviour in the fishing industry.

Deme (1981) describes the network of supply of fish from the artisanal fishery to factories in Senegal, emphasizing the social and economic impact of the artisanal fishery in the economy, with reference to job creation and distributional effects. He also evaluates the impact of subsidies, tax breaks and transfers, and analyzes the structure of fish exports.

Bellemans (1982) presents results of an economic analysis of different artisanal fishing operations in Mbour, Senegal. He shows that purse seine operation yielded twice as much revenue as other fishing gear, although in terms of dollars invested, other fishing gear could yield better returns. He suggests that fishermen are in fact most concerned with their total revenue.

Brainerd (1989b) describes and evaluates the Cacheu fishery Development Project in Guinea Bissau, performing a socioeconomic evaluation to determine whether the project achieved its stated objectives. The report concludes that a number of exogenous factors affected the outcome of the project. The reports of Diaw (1981 and 1989) analyze the share system with respect to the return to labor and capital for the artisanal fishery in Senegal. They look at the logic and the internal mechanisms necessary for instituting such a system from a practical standpoint. Also, the distribution of profits, organization of the labor force and the methods for obtaining fishing gear are discussed.

2.1.3 Management and Human Responses

In Lawson and Robinson (1983) the relevance and effectiveness of management measures for West African artisanal fisheries are discussed. They describe the fishery structure and the relevant sociological background, and analyze the relevance of various management tools in the West African context.

Mabawonku (1983) focuses on the reasons for conflicts between the industrial and artisanal fisheries in Nigeria. The inability of government agents to enforce fishery legislation with regard to coastal zone restriction for industrial fishing activities is one factor that contributes to this conflict. He suggests that the extended range of the artisanal fishing vessels as a result of motorization has increased the problem.

Moorson (1987) looks at the prospects for developing the fisheries of Namibia, outlining some socioeconomic factors that should be considered in the development process, and concluding that considerable development assistance, and the cooperation of Angola and South Africa, would be necessary. Greboval (1989) examines the recent evolution and the socioeconomic characteristics of the new fisheries of Lake Victoria, discussing management issues and presenting a proposal for a management framework.

The work of Johannes (1981) provides specific examples of how research conducted with artisanal fishermen can give insights into matters such as local palatability of proposed management schemes and local traditional conservation practices.

2.1.4 Property Rights

Verdeaux (1989) emphasizes the role played by sociological evolution in the changes that have taken place in the fisheries of the Aby Lagoon in Cote d'Ivoire over the past fifty years. The period was characterised by a shift from collective patrimonies to individually appropriated means of production, a change

which led to overfishing. Comparison of both systems of exploitation shows how modern management methods can quickly lead to the disappearance of traditional methods, to the detriment of the communities.

Weigel (1985) describes and analyzes the methods of traditional fisheries management in selected coastal lagoons in the Gulf of Guinea. He shows that such practices are linked with the socioeconomic status of fishing communities and cautions that modern management schemes should be guided by traditional management practices.

Barrania (1985) assesses the socioeconomic impact of the Cooperative Fishing Centre concept in the Red Sea and the Gulf of Aden. The facilities include boat building, fishing technology, boat mechanization, fish marketing, investment proposals and training program. Despite some constraints, the results show that there was some success in the CFC concept. Barrania (1982) describes fishing cooperatives in Djibouti and discusses the constraints faced by them.

The thesis by Cormier (1989) studies the allocation of aquatic space in the Casamance region in Senegal. It looks at the problems linked with the allocation and management of aquatic space, fishery disputes and fishery organizations. Jeay (1989) describes traditional rights as they pertain to the control of fishing activities in small water bodies in Niger. It discusses ownership requirements and obligations and revenue collecting regulations. The report indicates that a government decree now regulates the use of water bodies. This is affecting the socioeconomic status of those who depend on these water bodies for their well being. It suggests that management, control and mode of exploitation should be left to the fishing communities.

2.1.5 Labour

An important study in this category was conducted by the International Labor Organization on conditions of work in the fishing industry (Anon., 1988b). The report indicates that technological changes have affected fishermen's way of life and the system of wage payment. Also, because fishermen are now able to go further out to sea, there are safety considerations which require governments' attention. There has also been changes to fishermen's employment conditions.

Studies on the migratory patterns of fishermen include those of Charles and Solayman (1972), Chauveau (1983), Haakonsen (1989 and 1987), Hendrix (1983a) among others. Such studies assert that migration of fishermen is closely linked with trade and with the economic and social history of the groups. Ethnology, technology and the use of common dialects are also factors that determine migratory patterns.

Fay (1989) surveys the traditional fishing organization in the middle Niger Valley with reference to the types of appropriation and control of fishing territories, which is related to the traditional lineal deities. Anon. (1981) discusses the movement and migration of fishermen in Niger, in relation to fish marketing, and looks at the needs and possibilities for organizing a national market for smoked fish. The report catalogues the different stages of development of the fisheries along the river and presents proposals for organizing new services.

The case of Nomads turned "instant" fishermen in Somalia is discussed in Haakonsen (1984). He reviews and analyzes the traditional pastoral society and describes the fishing cooperatives for resettled Nomads and the role of fishing settlements in Somalia's cooperative development. Quinn (1971) looks at the decision-making process of the Mfantse fishermen in Ghana. She describes the several discrete groups of fishermen based on crew turnover and the social, cultural and economic factors that determine the mobility of these fishermen.

Martinelli (1985) describes the organization of labour among the Eve fishermen in Southern Togo, with particular reference to the social structure of the community, and the various types of fishing gear and fishing techniques used.

Sen (1985) describes the overall work conditions of the Saint-Louis fishermen in Senegal, including the different types of boats and fishing gear used. He discusses the rivalry between operators of big and small boats and

suggests that this could force the fishing population to come under the dominance of large companies or cooperatives.

Mulala (1986) describes the economic and social consequences resulting from the expansion of the fishery sector to absorb surplus labor. The report lists the various fishery regulations with comments on their impacts on the exploitation of the fisheries. Tumbo-Masabo (1985) looks at division of labor and output distribution in farming and non-farming activities including fishing in Tanzania.

2.1.6 Communities, Coastal Areas and Post-Harvest

A large proportion of the literature surveyed falls under this category, and can be sub-divided between (a) communities and households, (b) processing, and (c) marketing and distribution.

Communities and Households.

Atti-Mama and Houndekon (1986), and Atti-Mama and Rais (1986) describe fishing communities and societies in Benin, including sociocultural structures, social dynamics of women in these communities, sources of financing and the role of fishing cooperatives.

Kotnik (1981) summarizes demographic and infrastructural data on the Tombo fishing Village in Sierra Leone. The report indicates that 95% of the population are engaged in fishing and related activities, that there is a strong and supportive extended family structure in 91% of the households, and that only 14% of the children receive formal education.

Fishing and systems of production among the precolonial Nunu of the middle Zaire are reviewed by Harms (1989). He discusses the choice of production systems, which in turn has important implications for population densities, gender division of labor and social stratification. Ijff (1989) describes socioeconomic aspects of fishing communities in two states in Nigeria and elaborates on some of the experiences gained from past fisheries development projects.

Henriksen (1974) reports on the development of the fisheries of Lake Rudolf and the concomitant growth of the importance of the monetary economy, which affects the traditional Turkana pattern of life, affecting their dependence on livestock, their migratory habits, as well as their family structure and household economy.

Knowles (1987) looks at beliefs, religion and culture of the people of the northern coast of Kenya and how these affect their attitudes toward fishing. He suggests that the paucity of external technology and economic influences account for the fact that the fishing industry in this area remains integrated with spirituality and superstition. The social structure and organization of the Ngalawa fishermen in Northeastern Tanzania, and the historical reasons for their contemporary problems, are outlined in the work of Lanberg (1975), who asserts that these are associated with the structure of the regional economy. Lanberg (1977) analyzes kinship systems in the Kigome area in Tanzania, describing the different cognatic descent groups and their roles, and relating these to their attitudes toward fishing.

Processing and Handling.

Ayanda (1989) presents the findings of a study on the socioeconomics of traditional fish preservation and storage techniques used in Jebba Lake Basin (Nigeria), and provides suggestions for introducing improved processing methods.

Collart (1986) describes the small-scale fishery in West Africa in terms of resources, foreign aid and government policy options. He discusses fish processing activities in terms of the socioeconomic and technical level of the fishing communities. The report of Duran and Conway (1983) describes the "old" and "new" types of fish processing by different kinds of supply and method of operation. They indicate that the processing sector can no longer be considered as a passive sector whose role is merely to absorb surplus. The report ends with an analysis of the advantages, adaptability and future prospects for this sector.

Mabawonku et al (1982) describes different forms of processed fish products in Nigeria and identifies sociocultural factors that contribute to the acceptance or non-acceptance of some of these products by different ethnic groups. In their description of post-harvest activity in two fishery projects (large- and small-scale), Morrissey and Pollnac (1988) point out the differences and overlapping socioeconomic constraints. They suggest that by identifying these constraints and addressing them, future projects could be designed to adequately meet the needs of target groups.

Peyton (1988) stresses the importance of the "mbuta" (Nile Perch) to the local artisanal fishermen, small-scale processors and consumers. He indicates that the industry is in a period of dramatic changes which the local people have no control over. The traditional smoking method is inadequate but can be improved. He notes that most studies have presented the socioeconomics of present changes from only one perspective and that local people (representing a significant percentage of the population) have been neglected.

Fish Marketing and Trade.

Adekanye (1983) provides a case study of fish marketing in Nigeria and discusses the socioeconomic role of women who obtain fish supplies from fishermen husbands, thus eliminating the middlemen. He notes that there is need for adequate storage, processing and transportation facilities. Anon. (1986a) details an investigation into the acceptability and marketability of roller-dried fish in Tanzania, assessing the potential for the product in major dried fish consuming countries.

The papers by Bartels (1970) and Lawson (1966b) describe the various channels fish products pass through in Ghana before reaching consumers -- and the activities of middlemen, "fish mummies", and others involved in the process. Cormier (1981) also describes the socioeconomics and dynamics of fish marketing, in this case at Gueule-Tapee in Senegal, and also discusses the world of fish traders and the fish trading process for different products.

Hoof (1986) describes the different agents in the marketing chain of the small-scale fishery in Shenge (Sierra Leone) and analyzes the socioeconomic constraints faced by these agents. Mansvelt-Beck and Sterkenburg (1976) carry out a socioeconomic analysis of fish marketing in Cape Coast, Ghana, noting the key role of women.

Ogunmoroti (1989) analyzes the structure of fish pricing at the wholesale level in Lagos State, Nigeria, providing a general description of the market for fish products, including the socioeconomic factors that determine the demand for these products. The author concludes that the volume of fish imports also influences the pricing of fish from local production.

Weber (1983) traces the channels of fish supply from landing to consumers, with emphasis on the social and economic aspects of the Senegalese fishery policy. The author uses cooperative trade centres' experiences to illustrate assistance to the artisanal fishery and points out some of the problems with research and planning.

2.1.7 Women

Most of the work in this category deals with women's participation in fish processing, distribution and marketing; their role in fishing cooperatives; as financiers to fishermen and their social status within fishing communities. Their economic prowess and ability to organize into viable economic units are emphasized.

The work of Adekanye (1988), Chikhi (1984a), Lopez (1984), Meeran (1984), among others, reports on the role of women in fishery cooperatives, the cultural factors affecting their participation in fishery-related activities and the possibilities for improving their earnings. Akerele (1979) asserts that Liberian women play a vital role in fish marketing but earn marginal profits because of competition from expatriate wholesalers.

Chikhi (1984b) reports on a study of the socioeconomic environment of fishermen's wives in seven fishing communities in Benin and discusses their needs

in terms of the formation of cooperatives and provision of credit schemes. The introduction of motorized canoes in Ghana gave women the opportunity to utilize their entrepreneurial skills. Christensen (1977) shows that the socioeconomic power of women fish traders increased following canoe motorization.

Cormier-Salem (1987 and 1989) show that women's participation in fishing is limited to gathering in the Senegambia area. Oyster harvesting is their main activity. It provides supplementary income and is of high nutritive values in their diets. She indicates that oyster gathering is threatened by environmental degradation and rural urban migration.

Eeles (1984) looks at various initiatives that could improve the socioeconomic status of women in fishing communities in Benin. For example, the regular supply of kerosine can improve fish processing activities and the establishment of fish processing cooperatives can provide the women with more control of their activities. Haakonsen (1988) reviews the relationship between fishmammies and fishermen, showing that a mutual relationship exists, despite popular beliefs that the fishmammies exploit fishermen. He maintains that there are complexities and intricacies of the traditional patron-client and capital-credit relationship which are not appreciated by outsiders.

In Ghana fishing activities can affect family relationship. Hagan (1976) describes how the annual cycle of divorce coincides with seasonal fluctuations in fishing activities. While men migrate to other areas to fish, women are left at home for long periods and this puts a strain on relationships. Lecarme (1985) highlights the fact that in Dakar, Senegal the importance of women in fish processing and marketing is downplayed because the men monopolize power, are better educated and control credit facilities.

Women also play an important role in aquaculture production. Bernadette (1989) describes their role in this activity, using examples to show that limited time, lack of ownership of land and unavailability of credit are some of the factors limiting the involvement of women in aquaculture. She proposed that women should be included as a target group in extension and training activities.

2.1.8 Information and Research Assessment

A small but important set of studies conduct assessments of socioeconomic information and research needs in fisheries and aquaculture. For example, the report on the conduct and utility of socioeconomic studies on fisheries of the CECAF region (Anon., 1988a) presents the status of socioeconomic studies, listing areas of priority and suggestions on methodologies. The role of the socio-economist in fisheries development planning and management is highlighted.

Several FAO reports present socioeconomic information for decisions on fisheries management and development. They also discuss the nature of the demand and the kinds of socioeconomic information useful for decisions, and mention some of the problems of analysis and data collection. One recent report is the FAO circular on a socioeconomic data base for African fisheries (Bonzon and Horemans, 1988).

Forde (1986) provides a list of socioeconomic research activities underway at the time for providing information to develop the artisanal fishery in Sierra Leone. He also presents the recommendations of a workshop which outlines the importance of the fishery sector in the overall socioeconomic development of Sierra Leone. Anon (1987b) lists socioeconomic studies conducted by CRODT/ISRA researchers in Senegal, describing the focus of these studies and summarizing the major findings. Constraints encountered in conducting such studies are listed. The paper by Kwei (1975) discusses the role of scientific research in the development of Ghana's fishing industry, outlining some of the information needs that could be met through scientific research.

The variables essential for socioeconomic studies in fisheries are described in Mabawonku (1987). He lists methodological problems in empirical studies, provides some important findings of recent studies on the artisanal fishery in Nigeria, and makes suggestions for conducting future studies. Weigel (1987) outlines the problems and constraints encountered in the acquisition of socioeconomic information on the fisheries of Cote d'Ivoire and Togo and provides some recommendations on how such problems and constraints can be minimized.

Black-Michaud and Johnson (1986) examine the benefits and requirements for a successful participatory approach in small-scale fisheries development projects. Lessons gained from past attempts at participatory processes in small-scale agricultural projects are reviewed and compared with requirements for small-scale fisheries.

In addition to discussions of socioeconomic information needs, there are also a variety of papers presenting original data, typically through the means of surveys. For example, Pollnac and Logan (1984) analyze socioeconomic aspects of the fisheries of Oman. Their report analyzes data collected in 1979 during a sociocultural survey and provides suggestions for the utilization of the information generated to make recommendations regarding the development of Oman's small-scale fishery. Price, (1987) presents the results of fishermen's household and market surveys on the River Niger. A wide range of socioeconomic data was collected during both surveys.

The methodologies, constraints and final results of three socioeconomic studies on the small-scale fishery in Senegal are summarized in Sall (1987). Schmidt et al (1987) present the results of a socioeconomic survey of the small-scale fishery of Morocco. The characteristics of the production and distribution sectors and the fishing communities are detailed. The role of the small-scale fishery in the national economy is evaluated and constraints to fishery development are identified.

The results of a 1984 socioeconomic survey on 174 fishermen from six settlements in two states in Nigeria are presented in Williams (1986). She highlights the status of artisanal fishermen and suggests that the government should provide incentives and encouragement for further research in fisheries. Odoi-Akersie (1988) analyzes the results of the 1986 canoe frame survey in Ghana. The analysis includes time trend data on socioeconomic indicators.

2.1.9 Technology and Innovation

Various studies were conducted in Senegal to assess the impact of introduced technology. Among these are the studies by Deme (1990) and Diaw (1985), both of which looked at the range of fishing techniques from a socioeconomic perspective and assessed their impacts on fishing communities. They also looked at the means of obtaining fishing gear, distribution of profits, organization of labor and the sharing of overhead expenses. Brainerd (1989a) studied the socioeconomic impacts of the introduction of purse seine and outboard motors in Senegal. The results show that fishermen using purse seines can significantly increase their earnings, although the high cost of the purse seine made it imperative for the fishermen to adjust the share system. The total contribution to the national economy and the multiplier effect of fishermen's earnings were also significant.

Ettewa (1986) details the socioeconomic aspects of fishing activities conducted in the Mediterranean by Egyptian fishermen. The study focuses on the government's role, new fishing technology and research programs. Atti-Mama (1989) presents the findings of an investigation conducted in Benin to determine the sociological impacts of the construction of the Pahou-Kpota trail to facilitate access to commercial centres. The construction enabled the installation of storage facilities in the area and greatly increased trade in fishery products.

Kwei (1961) and Lawson (1966a) describe technological innovations in the canoe fisheries of Ghana. Particular attention was given to the increasing use of outboard engines, introduction of the purse seine, improved processing methods and the impact of these technologies on the fisheries. Brainerd (1984) examined the possibility of introducing semi-industrial all purpose vessels in Ghana, showing that industrial purse seine vessels were not as efficient as artisanal purse seiners. A number of factors accounted for the former's poor performance, particularly lack of management skills for the level of operation, unavailability of spare parts for the vessels, low stock density and poor marketing strategies. Lawson and Kwei (1974) examine African entrepreneur-ship and its response to economic growth, focusing on the fishing industry in Ghana. They also discuss the role of women in fish processing and marketing.

Beck and During (1986) analyze the technical, social, environmental and economic factors involved in improving traditional fish processing methods in Sierra Leone. They conclude that the traditional "banda", though less efficient economically compared to other smoke processing methods, has an important role in the social organization of the fish processing family and the fishing community. Hendrix (1983b, 1984) examine relationships between technology, production and socioeconomic development occurring in the maritime fishing societies along the West African coast and at Tombo Village (Sierra Leone) in particular. Meeren (1986) outlines the components of the social structure in relation to community development and the integration of technology in small-scale fisheries at Shenge Village in Sierra Leone. He provides a plan for active target group participation and for collecting basic socioeconomic data on a continuing basis.

A series of studies conducted in Southern Africa (Anon., 1987a) looked at the implications of integrating aquaculture with rural development in four aspects: sociocultural, socioeconomic, bioenvironmental and biotechnical. Egert et al (1987) examine the various adaptations in fishing traditions and technology of the Two Way River fishermen in Botswana, suggesting that diminishing land access could promote increased reliance on fishing.

2.1.10 Financing of Fisheries Activities

Everett (1989) discusses sources of financing for the small-scale fishery sector, summarizing information on surveys of fishing activities, fishermen's earnings and other socioeconomic indicators important for decision-makers. The final section highlights some of the common dilemmas facing administrators of fishery development projects. The report of an FAO workshop on small-scale fisheries development and management (Anon., 1986b) provides information, discusses sociological considerations, and examines the role of credit and subsidies, globally and for Africa in particular.

The paper by Asmah (1973) describes the various sources of funding (both formal and traditional) for fishery investment in Ghana, and presents justification for supporting and improving traditional systems. Atti-Mama (1990) presents the findings of a study to compare the various forms of financing in the fishery sector in Benin. Traditional systems for savings and loans, and modern credit systems are described. Of the various sources of financing, the author concludes that the "tontine" system and bank loans are the most important.

Deme (1988) describes the economic and financial aspects of the sardinella fishery in Senegal. The sources of funding for both the artisanal and industrial sardinella fisheries are listed and some indication is provided on their effectiveness to the different groups. The paper by Mabawonku (1983) discusses the role of the private sector in the development of the fishery sector in Nigeria. Elements such as investment capital, infrastructure, importation of fishing inputs, import and export of fish products, among others are reviewed to identify the role of the private sector.

2.2 Synthesis

2.2.1 Research Rationale and Goals

The rationale for research on socioeconomic aspects of African fisheries varies widely among the different countries. Most of this research was undertaken to provide information to planners and decision-makers, while some, particularly that conducted by scientists at universities, was basically academic in nature. The latter appears to have been of limited utility in terms of fisheries management and development. In general, research on socioeconomic aspects of African fisheries is relatively recent, generally dating back only to the early 1970s. Early studies were general in scope and basically descriptive in context, while studies conducted in the 1980s were more specific though still descriptive. Some studies were initiated in response to questions posed by biologists who needed better understanding of the relationship between fish stocks, the environment and those exploiting the stocks.

2.2.2 Country Reviews

A variety of papers in the bibliography discuss (usually in quite broad terms) the socioeconomics of fisheries and/or aqua-culture in a particular country. Since these form a substantial component of the socioeconomics literature, one which is not covered in the subject codes of our bibliography, some discussion of this literature is given here.

For example, the socioeconomic status of artisanal fishermen in Senegal is described by Chaboud and Kebe (1986), who also discuss the impact of artisanal fishery development projects and the role of fish in nutrition. Guerra and Conolly (1985) describe the artisanal fishery of Cape Verde with respect to its socio-economic organization, management and training of professional personnel to enhance fishery development activities.

Atti-Mama (1987) discusses the nature and overall importance of socioeconomic studies on the small-scale fisheries in Benin, and the role of the FAO Regional Program in initiating such studies. Jorion (1985) presents an ethnographic and socioeconomic analysis of the small-scale fishery in Benin, examining ways by which fishery development could be advanced, and listing some of the constraints that must be overcome before meaningful development could be achieved.

A report to the Tanzanian Government (Anon., 1964) describes the different types of fisheries in Tanzania with reference to the socioeconomic activities of fishermen. It assesses the socioeconomic impact of fish marketing along Lake Victoria and provides suggestions for enhancing fishery management and development. Anon. (1982) provides a sectoral review of the fishery sector of Nigeria, noting its contribution to GDP, providing some socioeconomic indicators, and giving suggestions for future development activities.

Ba (1983) looks at the present situation of small-scale traditional fisheries in Western and Central Africa and outlines future objectives and strategies from nutritional and socioeconomic standpoints. Action programs are suggested for the development of these fisheries. The measures adopted by the government to develop the fisheries in Algeria are outlined in Bennama et al (1986), who describe the types of fisheries, and discuss the impacts of the development measures.

2.2.3 Inland Fisheries

Socioeconomic studies on African inland water bodies are scanty. Most of the work done in this area are on traditional management systems, dealing mainly with the various traditional rules governing access and use of small water bodies. However, few studies provide insight into socioeconomic factors related to fishing activities in these water bodies. In addition to studies reviewed above, the following are relevant in this regard.

Palm (1989) examines the impact on yield of various environmental parameters and management options for fish production in small water bodies. She asserts that although biological, engineering and economic factors have often contributed to the failure of projects, the primary reasons are social and cultural.

Sen (1990a and 1990b) present the results of surveys conducted to identify socioeconomic factors that affect demand for fresh fish in communities around small water bodies in Lesotho and Botswana. He catalogues these factors, discusses their significance, and presents tables with the socioeconomic profile of fishers, their communities and consumers of fish products.

Akinyemi's (1985) thesis discusses the management needs for Lakes Eleiyele and Asejire fisheries and provides economic models that could be applied for management purposes. The shortcomings of the models due to the lack of basic socioeconomic data are explored. The work of Alamu (1989) shows that the lack of uniform fisheries regulations in the Jebba Lake Basin (Nigeria) contributed to the mass migration of fishermen from one side of the lake to the other. Fishers are still utilizing traditional equipment resulting in low catches and consequently low income.

Poewe (1976) traces the interrelationships among economic activities, kinship ties, and religious activities of people inhabiting the lake and river fishing communities in Luapula Province (Zambia). They are faced with limited access to modern technology and uneven potential for economic development. He analyzed the material, ideological and institutional means which these people employ to raise their standard of living, observing that fishing communities in the valley of Luapula Province (Zambia) continue to be matrilineally organized.

2.2.4 Aquaculture

The work of Ali (1988) shows that cultivation of the mother of pearl oyster in the red Sea coast of Sudan is of considerable socioeconomic importance to native fishermen. The author suggests that it is necessary to set up a pilot project for the resumption of commercial cultivation and that there is need for studies on the socioeconomic aspects of the native fishermen. Grover et al (1980) presents a synopsis of aquaculture activities in West Africa, describes the sociocultural factors influencing fish culture development and makes recommendations for improved implementation of such projects.

Jhocson and Smith (1985) provides a bibliography on the socioeconomic aspects of aquaculture, technology transfer in aquaculture, institutional aspects of culture fisheries and general issues on aquaculture. Koffi (1991) describes some socioeconomic aspects of aquaculture production in Cote d'Ivoire. His paper discusses the experiences gained from fish culture activities by the rural populace in the Central and West Central Provinces and the factors that are likely to promote fish culture activities.

The report by Lazard et al (1988) describes three artisanal tilapia rearing techniques related to three different socioeconomic environmental conditions in Benin (brackish water pen culture), Cote d'Ivoire (hydro-agricultural scheme) and Niger (Sahelian river). The main elements of production are also discussed. Meltzhoff (1990) explores the social dimensions of shrimp mariculture. It deals with the relationship between society and technology and discusses the research needs for the future.

Mustaller (1982) evaluates the socioeconomic situation in the Central Sudanese Red Sea by examining the integration of new fishery development programs into the structure of the coastal population taking into account their development needs. The factors that influence the adoption of fish culture activities in Cameroon are described in Nji (1991). He argues that the strong preference for fish makes it relatively easy to introduce fish culture activities.

Nyman (1988) looks at the constraints to developing small-scale aquaculture in Southern Africa, the environmental factors influencing aquaculture development and the socioeconomic impacts at the community level. Pollnac (1978) applies a generalized model of sociocultural factors influencing the diffusion of innovations to the problem of aquaculture development. He also looks at potential problems associated with a shift from marine capture fisheries to mariculture and examines the sociocultural aspects of introducing aquaculture systems into communities adapted to small-scale marine capture fishery.

The paper by Satia (1991) describes the various groups involved in fish farming in the West and North West Provinces of Cameroon. Particular attention is given to demographic, social, cultural and economic factors which are of importance to the activities of the different groups. Schmidt (1982) outlines the potential role of coastal aquaculture in integrated rural development and emphasizes the relevance of socioeconomic aspects for adequate planning and implementation. The process of studying the socioeconomy and formulating a social postulate is outlined using a case study undertaken in Kenya.

Van der Mheen (1991) looks at the potential of aquaculture in promoting rural development in small communities in Zambia. He outlines some of the elements required for the successful implementation of aquaculture projects and provides some guidelines for those involved in community development activities. Wijkstrom and Hans (1989) presents the results of a survey of socioeconomic factors influencing the demand for, and the production of fish by fish farming methods. The significance of some of these factors are discussed.

3. RESEARCH METHODOLOGY AND CONSTRAINTS

3.1 Methodological Considerations

Because of the highly diverse and complex nature of most African fisheries, it is problematic to determine which economic, social and environmental data to collect and how to collect them. This is particularly true for the small-scale fisheries which are dispersed along coastlines, rivers, lakes and other water bodies of Africa. Each fishery has its own unique features which should be considered in any management and development plan. However, it is important to identify the absolutely critical areas for study and if possible relate them to what has already been done in different areas. One way to do this is to identify as best we can the types and levels of decisions to be made. This first step could help in classifying the needed studies and their scope in terms of short- and long-term research activities.

The importance of utilizing suitable research methodologies for conducting socioeconomic studies in fisheries cannot be overemphasized. It is fundamental for providing reliable information suitable to achieve development and management objectives. The bottom line is that resources are limited and any methodology has to take into consideration the available resources. On the other hand, the demand for information in this area is virtually unlimited, particularly as far as socioeconomic data is concerned. Thus, we have to recognize that no one methodology for any particular study, no matter how well thought out, can satisfy the needs of all those making use of the provided information.

The first steps in any research methodology lie in defining research objectives and identifying end users. Usually research is conducted to address existing problems or to provide answers to a number of questions. In some cases some information has been documented on the situation while in others virtually no information is available. It is important that the objectives of the study are clearly stated taking into consideration the amount of resources available, the time frame for the study, the nature of the study and the conditions under which the study will be conducted.

Oftentimes socioeconomic studies in fisheries involve data gathering through oral interviews, observations, questionnaires and library research. In situations where researchers have to interview people and/or want people to answer questionnaires, care should be taken to ensure that the respondents are not distorting the information they provide, for strategic reasons. It is useful to conduct trial runs with test questionnaires so that changes can be made when appropriate. Also, it is important that the respondents do not get worn out with too many questions. Since differences between seasons are important in fisheries activities, this aspect should be built into the methodology.

In most cases, socioeconomicists provide information for fisheries administrators, planners and managers. The levels of these groups will differ according to their interests and the types of activities they are involved in. It is of no utility to develop a mathematical model to explain the pricing of fish if that information is directed at project managers in small fishing communities without any appreciation for mathematical modeling. Thus, the methodology should be such that the results obtained from the study are understandable and meaningful to the users.

3.2 Data Considerations

In fisheries socioeconomic the process of data gathering can potentially be very extensive. For some studies time series data are needed while for others cross sectional data are needed. The former is a major problem in African fisheries because historical data do not generally exist. Where they do, there are usually gaps in the data, or different statistical methods were used over different periods, making it impossible to make clear comparisons. Perhaps this is one major problem affecting the conduct of studies requiring historical data.

The problems associated with the use of cross sectional data are different. If resources are available, such data could be collected. However, field workers are needed to collect the data. These people are mainly high school leavers and

only accept such jobs on a temporary basis. Most of them are waiting to get into colleges or to pursue other career objectives. Their interests in such jobs are minimal and the turnover rate is also high. In order to ensure that the data collected are valid, care must be exercised in selecting enumerators and they should be properly supervised. If possible, some incentive should be provided to encourage them to perform efficiently.

Furthermore, the bureaucratic nature of government institutions does not provide the kind of flexibility needed to collect fishery data, particularly in the case of artisanal fisheries. To obtain data from these fisheries, field staff have to be at the landing sites when fishers are landing their catches, yet fishers conduct their fishing operations at many different times of the day and night. Oftentimes these enumerators are paid to work regular hours and no provision is made for them to work outside those hours. Hence no data is collected at times, or the data provided by these enumerators are of questionable quality.

Once such considerations have been given adequate attention, the data gathering method should clearly define the nature of the data to be collected, the process of collecting the data, methods for verifying the accuracy or validity of the data and the time frame needed to collect the data. Also, it should indicate whether the process is to be done once or whether it will be repeated on a regular basis.

Methods for analysing the data should have some scientific basis if the results of the study are intended for management measures and policy prescriptions. It is important that the results of any study stand the scrutiny of other peers in the field and can be used for the purpose of comparison. Also, the methods used to analyze the data should produce results that can be interpreted with clarity. This is very important in making the results, conclusions and recommendations meaningful to the users.

It is evident that given the constraints existing in most African countries, researchers are limited in the amount of information they can obtain. Furthermore, it will serve no useful purpose if information is collected when facilities to analyze the information are inadequate. The ideal situation would be to identify the kinds of socioeconomic information that would be most useful to those making decisions on fisheries management and development. If such identification could be made, it would be straightforward to collect only the data required and also to conduct the research. However, this does not obtain in the real world. Researchers have to develop criteria for determining the critical mass of information needed for any socioeconomic study, the usefulness of the information and the extent to which the required information is available.

In the African context, strategies should be developed for making improved decisions on the basis of little information because of the lack of research facilities and other logistic factors. In the same vein, care should be exercised in the interpretation of the results obtained from limited information and the level of confidence that is placed on the inferences and recommendations. To this end, socioeconomic researchers should clearly state the limitations of their studies.

To maximize the utility of socioeconomic research, it is important that key words and expressions used in survey forms and in research reports be clearly defined. For example, fishing effort could be defined in various ways depending on the nature of the fishery, the types of boats or gear participating in the fishery or the duration of fishing trips. Similarly, the price of fish could be ex-vessel, wholesale (which could include transportation and storage costs if appropriate), or retail. Thus, the definition given to key words and expressions will largely depend on the nature of the study. By defining these explicitly, users of reports and those dealing with questionnaires and similar forms will be able interpret questions and information correctly. Even better would be the standardization of terms so that the results of similar studies could be compared if necessary. To achieve standardization in a wide range of key words and expressions is not an easy task by any means, but this problem has to be addressed to facilitate the work of researchers.

3.3 Research Infrastructure and Institutional Constraints

The formulation and implementation of sound fishery management and development plans is a complex task, requiring accurate and timely information on biological, economic, social, and environmental aspects. Fisheries administrations in Africa have given some attention to obtaining biological information, while the acquisition of economic, social and environmental information have been relatively neglected. A probable reason for this is the dearth of fisheries economists, sociologists and environmental specialists -- competent social scientists in these disciplines are not readily available in most African countries. This is one of the most serious impediments to effective policy-making and planning in developing countries, one which deserves serious consideration in the design of research programs. It is of no utility to design research that requires the input of scientists from several disciplines if these people are not available. The results of such research would be lopsided.

The organization of fisheries socioeconomic research needs adequate planning to encourage the achievement of objectives with a minimum of overlapping of responsibilities between the different groups involved. Within fisheries departments, a number of possible arrangements could be suggested, but the actual choice depends on the history of the development of the department and other related research institutions, and their immediate and long-term needs. One logical point is that the size and role of the institutions should be related to the importance of fisheries in the economies of the countries.

Academic institutions also have an important role to play in aiding the management and development of fisheries in African countries, although again, their role will vary according to the importance of fisheries in national economies. They can assist in providing training for nationals, particularly in fishery related sciences. There should be close links between those involved in teaching and research in fishery sciences at universities and those at government fisheries departments and other institutions. This close collaboration will avoid unnecessary duplication and ensure effective use of limited resources.

Governments should ensure that they provide the minimum facilities and support systems to their institutions, given the resources at their disposal so that they can function effectively. In particular, African countries need to recognize that they have to train their nationals in the appropriate disciplines and once these people have acquired the knowledge, they should be provided with adequate incentives so that they can perform their work effectively. This is not going to be an easy task, given the state of the economies of most African countries. The financial resources required to train and maintain quality scientists are considerable, but there is no alternative if quality results are expected from research efforts. It is only when institutions are able to provide adequate statistics and other data needed by socioeconomists, scientists of other disciplines and policy makers for the formulation of national fisheries policies, that resources can be managed and developed on a rational basis.

With respect to the choice of suitable research programs, this is very subjective and depends to a large extent on what is already available on the socioeconomic aspects of the fisheries, the needs that are to be fulfilled, the expertise available in the relevant fields, the stage of development of the fisheries and the resources available to the researchers. In the past, social scientists working at African research institutions have conducted research on fishery socioeconomics based mainly on their interests. Often (particularly at academic institutions), such studies have failed to fully address the information needs for management and development activities. On the other hand, scientists in fisheries departments have conducted studies that were designed to provide short term solutions or answers to the most pressing issues, but lack the resources to continue structured research on a long term basis.

For most African fisheries, a multidisciplinary approach is needed in research programs, because the factors influencing the fishery transcend more than one discipline. In general, social scientists should be prepared to work together as teams and should also endeavour to acquire basic understanding of other disciplines to facilitate discussions with other groups.

4. DISCUSSION

Social scientists working on various aspects of African fisheries generally deal with people who are poor, with considerable needs and high expectations. Since social scientists must rely on the cooperation of these people to conduct their studies efficiently, these people must see some positive outcome (related to them) from these studies in order to obtain their continued cooperation. However, social scientists have no control over this issue. Once the results and recommendations are made available to the managers, planners and policymakers, the job of the scientist is over. If the latter group of people fail to act on the results and recommendations, the credibility of the social scientist is put at stake, and it becomes difficult for the social scientist to conduct other studies effectively with the same target groups.

Also, there are always questions as to how objective the researcher should be in his or her research methodology, particularly with regard to conclusions and recommendations. There is no magic formula for defining the level of objectivity required of the socioeconomist. Much of this is left to the discretion of the researcher, taking into consideration the nature of the research and the conditions under which the work is being done.

Another major issue concerning the socioeconomist's role is whether the individual should also be involved in extension work. In Africa, there is a lack of expertise in these areas and it is only relatively recently that more and more Africans are training in specialized areas. Thus, because of the lack of manpower it may be necessary for the socioeconomist to be involved in extension work. However, such involvement could lead to potential conflict between the individual's work as a researcher and as an extension agent. The ideal situation would be for researchers not to be involved in extension work, but this is only possible if African countries can acquire and retain enough people to carry out the different duties.

With these problems and constraints in mind, the following list provides some ideas of what role the social scientist should play in fisheries management and development:

- provide background data and analysis of results to officials who make policy decisions about how the fishery should evolve.
- ensure that the data is of high quality (given the prevailing situation), the analysis should be defensible among colleagues and made available to interested parties.
- the social scientists should always adopt an "objective" approach toward problem solving.
- ideally the social scientists involved in research should not be engaged in fisheries management and extension activities since there is likely to be a conflict of interest.

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Chapter 3.

SOCIOECONOMIC RESEARCH ON FISHERIES AND AQUACULTURE IN LATIN AMERICA

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This chapter focuses on Latin America, a region consisting of 21 nations with a total of 45,600 km of coastline. We first discuss the nature of Latin American fisheries, then review literature on fisheries socioeconomics in the region, and finally address research and information needs and constraints.

1. SPECIAL CHARACTERISTICS OF LATIN AMERICAN FISHERIES

The Central American nations of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panamá, together with Mexico (which may be seen as located in both Central and North America) had average total landings of 1.5 million tonnes per year over the period 1980-1989, while the 11 coastal states and 2 landlocked states (Bolivia and Paraguay) of South America had average annual landings of 12.7 million tonnes over the same period.

In the region are found approximately 800 species of fishery resources, of which no more than 20% are currently exploited commercially. The available harvesting capacity is estimated at about 153,000 boats of which some 147,000 correspond to small scale operations ("open boats" or boats under 50 GRT) and the remaining to the industrial sector. About one million people are estimated to be directly engaged in fishing activities, of which about 90% belong to the small scale sector (Aguero 1991a).

Table 1 provides selected data on fishers, fleets and catches in the artisanal fisheries of Latin America. This Table is based on Aguero (1991) and FAO's Bulletin of Fishery Statistics No. 30 (1991), which provide full source information. Note that only those nations were included which have a coastline and which have fishery data that differentiates clearly between artisanal and industrial fisheries.

TABLE 1. ARTISANAL FISHERIES IN LATIN AMERICA.

COUNTRY	POPUL'N (000s)	FISHERS (000s)	FLEET (Boats)	CATCH (tonnes)
Argentina	31,930		200	
Brazil	147,404	554	49,100	290
Columbia	31,193	50	11,000	45,000
Costa Rica	2,941	6	2,344	6,000
Chile	12,961	58	15,199	640,000
Ecuador	10,490	6.6	1,900	32,000
El Salvador	5,138	5	9,552	
Guatemala	8,935	5	1,666	800
Mexico	86,737	186	40,250	560,000
Nicaragua	3,745	6	1,400	1,100
Panama	2,370	1	500	
Peru	21,791	25	4,489	200,000
Uruguay	3,105	0.8	250	7,000
Venezuela	12,246	20.6	10,000	220,000
TOTAL	380,986	924	147,850	2001,900

1.1 The Importance of Latin American Fisheries

Fisheries in Latin America produce approximately 15% of the total world catch, most of it coming from commercial marine harvesting. The importance of aquaculture and inland fisheries in the region is still minimal but is rapidly increasing, offering great potential for increased production. Recreational fisheries are of minimal importance. During the last decade, total landings in Latin America have increased at an annual average rate of about 8%, compared with a global rate of 3%. The fishing sector thus increasingly contributes to both Gross National Product (GNP) and generation of foreign exchange.

According to FAO World Fisheries Statistics (FAO 1991e), total fish production in the region for 1989 was 17.6 million tonnes, with Chile, Perú, México and Ecuador accounting for about 15.4 million tonnes (87.6%). In fact, Chile and Perú, which together caught approximately 13.2 million tonnes, rank among the top five world producers of fish and the two most important world suppliers of fish meal in the international market. Total export earnings from fishery products in these two nations are about US\$1.4 billion (FAO 1991b), generating direct employment for approximately 100,000 people (Bacigalupo et al. 1991; Zapata and Espino 1991).

Fisheries in the region also play an important social role in the small scale fishing sector, providing employment to a significant portion of the population and a "way of life" to a large number of coastal communities (Pollnac 1981, Panayotou 1982, 1985). In particular, Agüero (1991) estimates that about 900,000 people are directly involved in small-scale fisheries, distributed in more than 2,200 fishing communities (with about 1500 of these being in Mexico alone, according to Calderon and Munoz, 1987). Most of the small-scale fishery harvest of roughly 2 million tonnes annually is directed to local human consumption, providing an important source of low-cost animal protein to the low-income coastal population. Indeed, in most nations, harvests from small-scale fisheries satisfy 80-90% of domestic consumption of fish products.

1.2 Fisheries and Fishery Resources

Coastal Fisheries. Fish abundance in the region is highly concentrated in two or three major areas. The most productive fishing area, found in the Pacific upwelling system located off Chile, Perú and Ecuador (FAO Fishing Area 87), is also among the world's most productive systems. This productivity results from the coastal upwelling which occurs in response to southeasterly trade winds, shifting relatively cold and nutrient rich waters to the surface (euphotic zone) along the coast. Fishing activities in this area are predominantly based on small pelagic species of which anchovy, sardines, jack and horse mackerels are among the most important, making up around 75% of the total landings. Most of these landings are reduced into fish meal for animal food.

A second important fishing area is located in the Atlantic Ocean, between Argentina and Uruguay, extending from the mouth of the *Rio de La Plata* up to 200 miles within the Exclusive Economic Zone (EEZ). This area sustains a relatively important demersal fishery based on hake, Corvina and Pescadilla, with a total catch of about 0.5 million t. captured by Argentina, Uruguay and other foreign vessels allowed to fish in this area. Hake alone makes up about 80% of the total catch in this area (Achurra, 1991), and important hake resources are also found in Chile and Peru.

Another important fishing area is located in the Central East Pacific from Ecuador to Mexico, where small pelagics (sardine, anchovy, herring, and shrimp) and large pelagics (such as Yellowfin tuna) are of importance. The FAO (1991e) reports that in 1989, landings of small pelagics, large pelagics and shrimp in the area were about 1300, 149 and 78 thousand t. respectively.

The status of biological resources (stocks) upon which most of the fishing activity is based, are not yet fully established, nor are their dynamics well understood. This is especially true for stocks captured by the artisanal sector. However, for the major fishing areas and stocks, general assessments are available, namely those conducted and published by FAO (1991c). A brief summary for the region is as follows:

a) sardine and anchovy fisheries carried out along the Pacific coast between Ecuador and Chile are being intensively or fully exploited (estimates of potential biomass are of 3 and 2-5 million tonnes, respectively), while the jack mackerel fishery for the same area is considered to be moderately exploited, with a potential biomass estimated at over 2 million tonnes;

b) the hake fishery off the coast of Argentina and Uruguay is considered to be fully exploited, with an estimated potential biomass of between 400 and 600 thousands tonnes;

c) there are no estimates of the status of the hake fishery in the South Eastern Pacific off the Chilean coast, although catches do not exceed 70 thousands tonnes;

d) the sardine, anchovy and herring fisheries in the central Pacific between Mexico and Ecuador are considered to be between slightly and moderately exploited (with available estimates of potential biomass being a few hundred thousand for sardines and herring, and from 0.5 t. to one million tonnes for Californian anchoveta);

e) Numerous species of cetaceans are found in the seas of Latin America, especially in the south. The most important ones are sperm whales, blue whales, minke or Rudolphi finback, and the sie or lesser finback. Illegal hunting for these species is still taking place and several of them are near extinction. A large biomass of krill, a small planktonic crustacean, exists in this area, but its full commercial exploitation apparently is not yet profitable -- although several countries, including Japan and the former Soviet Union, have shown interest.

Inland Fisheries. The region is characterized by a diverse topography and hydrology. The mountains of the Andes run along the Pacific Coast of South America from Colombia to Southern Chile, producing a rich fluvial configuration (from mountain to coast) that supports several artisanal riverine fisheries: the Magdalena River in Colombia, the Guayas River in Ecuador, and the Marañon River in Perú. The riverine system of southern Chile provides one of the few recreational fisheries based on trout in the region. Colombian and Ecuadorean rivers are rich in tropical species such as Tilapia, Cachama and related carps, used mostly for local consumption.

In addition, there are important lakes of which Titicaca, in Perú/ Bolivia, sustains considerable artisanal fishing activities (Levieil 1987) and the Llanquihue Lake in the southern region of Chile sustains growing salmon aquaculture and recreational fisheries. However, the major riverine systems of Latin America are certainly dependent on the Amazonian ecosystem, which is one of the world's richest biota both in variety and size. The Amazonas River is by far the world's largest, with a wide range of tributaries extending its area of influence from Venezuela to Argentina (an area approximately the size of Australia). Its mouth/delta supports an important crustacean fishery based on small-scale and industrial activities as well as other species of minor importance. Other important rivers depending on the Amazonian ecosystem, and supporting important numbers of artisanal fishing communities (native), are the Orinoco River (Venezuela), the Paraná (Brazil and Paraguay) and the Río de La Plata (Uruguay and Argentina).

Aquaculture. Biological productivity of aquatic ecosystems for cultured species is also concentrated in two or three major areas located in southern Chile, where salmon aquaculture is rapidly developing, and in Ecuador and Panama where pond-raised shrimp have been grown for several years now. Recently, pond-raised shrimp grown in converted mangrove areas is developing in Colombia, Perú and Mexico, as well as Ecuador. Although a wide array of other culture and capture species (fish, molluscs, seaweeds) are found in various aquatic ecosystems of the region (rives, lakes, estuaries, etc), their volume is still insignificant, offering however, great potentials for further development.

Coastal Environment. Several reports (UNEP 1989 and Escobar 1991) have highlighted the increasing deterioration of the aquatic environment, especially in the coastal areas of Latin America, where use conflict between competing alternatives results in coastal resources degradation. A clear example is the growing conversion of mangrove ecosystems into shrimp ponds. A total of about 35,000 ha. have already been converted into this use in Colombia, Ecuador and Perú (Clirsen 1987; B. Zapata, C. Estrella, 1989 personal communication). Another example is the growing elimination of mangrove swamps in the Tabasco State of Mexico, of which 65% have been lost through petroleum related activities, threatening the existence of the shrimp fishery in the area (UNEP 1989). The sustainability of many coastal fisheries located in productive areas like the riverine deltas of large river systems (Amazonas in Brasil, Guayas in Ecuador, Magdalena in Colombia, Bio-Bio in Chile, de la Plata in Uruguay/ Argentina, etc) are also being seriously threatened due to indiscriminate discharge of pollutants (human waste, industrial effluent, erosion, sedimentation, etc.).

1.3 Fishing and Post-Harvest Operations

The fishery sector in Latin America is highly heterogeneous in production, distribution and rent appropriation. Accordingly, analysis of fisheries in the region requires a clear distinction between different scales of operation (industrial and artisanal), technologies (gears and fishing strategies), processing and marketing strategies, and social and property systems.

Scale of operation. One of the salient characteristics of the fisheries sector in Latin America is the co-existence of large-scale operations with artisanal or small-scale activities. The latter date back several centuries prior to the Spanish invasion of the region; archaeological artifacts and written documents are available describing gears, tools, strategies and regulations prevailing in the pre-spanish era (Lenz-Volland and Volland 1991). On the other hand, industrial fisheries emerged only after the Second World War. Sustained increases in landings of the industrial fleet have been due to the introduction of technological improvements, adoption of more effective fishing methods (including aerial fish detection and the use of mother ships and factory vessels) and increased investments in the sector. From a total catch of 290,000 t. in 1938, the region reached a total of 5 million tonnes in 1960 and 15.5 million tonnes in 1970, at the peak of the anchovy fishery of Perú (Tapias 1985). In spite of the subsequent collapse of this fishery in the early 1970s (presumably due to the combined effect of the El Niño phenomenon and overfishing), landings over the period 1985-1990) have again reached similar levels of production to those prevailing in 1970.

Technological improvements in the industrial fishing sector were not adopted intensively by the small-scale sector (Hoefle 1991), so the fisheries sector today in Latin America presents a dual and heterogeneous structure not only in production but in distribution and appropriation of benefits and rents as well. Duality in production is found in both harvesting and processing activities, where large scale operations (factory vessels, large trawlers, purse seiners) compete with small boats and artisanal methods (e.g., small pelagic fisheries in southern Perú, and conger and king crab fishery in southern Chile). Diversity in boats and processing plants is also characteristic of the fisheries sector, where a large variety of boats, gears and processing systems co-exist.

Duality and diversity in distribution are found in transport, storage and marketing, where human and animal energy-based transportation systems (hand-carried baskets, bicycles and horse-pooled carts) co-exist with sophisticated transportation means such as refrigerated trucks and containerized cargo. Rudimentary preservation systems (live storage, salted and cured fish) are widely used in the region, but so are other more advanced methods like refrigerated and sanitized systems. Duality in marketing ranges from direct ex-vessel sales between fisherfolk themselves and the final consumer, to frozen, vacuum sealed, sanitized and certified quality products sold at retail outlets after a complex wholesaler-retailer chain.

Finally, duality and heterogeneity is also found in rent appropriation and income distribution, as evidenced by the existence of multiple and complicated arrangements for labor compensation (share/lay systems), payments to capital (interest rates and participation) and resource rents appropriation (taxes, fees, licenses, permits, abnormal profits, etc) captured by both, governments and private owners.

Wage differentials between industrial and artisanal crew members can be extremely large with monthly income of industrial workers being ten to twenty times higher than their artisanal counterparts. The same holds for differentials existing within the small-scale sector (Hoefle 1991) where depending on target specie, equipment, location and institutional arrangements, some fisherfolk can take, on average, a share several times that of other fishermen in the same community or country (Agüero 1991).

Gears and strategies. A wide array of gears and fishing methods can be found in Latin America, depending on target species, scale of operation and aquatic ecosystem. Pelagic resources off Peru, Chile, Mexico and Ecuador are mainly caught by industrial seiners [numbering 2029 in 1989, according to FAO (1991d)]. In Chile, where fishing operations are most developed, harvesting is increasingly conducted using sophisticated electronics, such as echo sounders and sonar, satellite navigation equipment and air and land-based information support systems. Furthermore, their fishing operations are continuously radio-monitored from land in order to synchronize harvesting with plant processing capacity.

In Argentina, Uruguay, and Peru, hake resources are captured by mid-water trawlers, while in southern Chile hake is caught mostly by large stern-trawlers (factory vessels), with average capacity of about 1,800 GRT, with in-board processing facilities to produce frozen fish (HG, fillets, head-off, whole, and others) and fishmeal as by-product. Tuna resources, found mostly beyond the 200 mile zones of both the Atlantic and the Pacific Oceans, are harvested by long-liners and purse-seiners, with the latter being used more intensively (FAO 1991c).

In the small scale fishing sector of Latin America, many different fishing operations can be found, ranging from simple push-nets and hand-carved canoes (Brazil, Ecuador or Colombia) to small trawlers with in-board motors and electronic equipment (as in Costa Rica, Chile and other countries of the region). The collection of molluscs, seaweeds and crustaceans, although generally done with simple manual gears, is also conducted with more elaborated equipment (scuba-diving, motorized boats, etc).

Processing and marketing. Of the total fish production, a great percentage is processed into fishmeal and sold in international markets for animal food, through national marketing associations (CORPESCA in Chile, EPCHAP in Perú, etc). Total production of fishmeal between Chile, Perú and Ecuador takes about 12.5 million t. of landed fish, being about 71% of total Latin American landings. Of the remaining catch in the region (2 million t.), 40% comes from small-scale fishing. Due to the nature of the gear used (greater selectivity, manual handling), this catch is of higher quality and is used for direct human consumption. On average, small-scale fishery products have minimal processing before marketing (simply ex-vessel gutting, scaling and removal of heads). Only a few species are processed (mostly at a semi-industrial level) into frozen products such as fish blocks, sticks and portions, and fillets, which are subsequently exported to developed countries (shrimp, tuna, salmon, cod, swordfish, among others).

However, the processing and trade of fishery products in the region is experiencing important changes as a consequence of (1) improved technologies and communications, (2) higher incomes in industrialized and newly developed nations (Japan, USA, Europe, Korea, Malaysia, etc), and (3) a dynamic entrepreneurial breed of young professionals emerging in the sector, who are rapidly responding to the expanding market economy in the region (Chile, Peru, Uruguay, Argentina, Ecuador, Mexico, etc.). Thus, new and more products are being demanded and supplied as urban population grows, incomes increase and food tastes change.

Overall, most of the fish produced by developing countries of Latin America is consumed or used in developed nations; this provides export earnings to fleet owners/processors, transporters and brokers, but only a small share of this returns to the fishermen. In addition, a large percentage of the total catch landed by the industrial fleet is used for animal food, and only catches from small scale fishing activities are consumed (mostly fresh, dried or salted) by the local population, providing on average between 70% and 80% of local animal protein intake.

Social and property structure. In most countries of the region, fishery resources are viewed as "common property resources". There is a great degree of open access which has led in recent years to resource over-exploitation and over-capitalization of the industry. In Perú, over-capacity of fishing fleets and processing plants is estimated at about 50% (World Bank Workshop, Lima 1992); pelagic and demersal resources in Chile are already considered to be fully or over-exploited (FAO 1991c); and shrimp fisheries in Mexico, Costa Rica and Panamá are already fully exploited (FAO 1991c).

Most legislation, until very recently, was concerned with regulatory measures controlling various components of effort (mesh size regulations, GRT, horse power), with occasional spatial and temporal closures, and the charging of nominal fees for fishing. In rare cases, global regulations to control access consistent with bio-economic rationality have been implemented. Thus, management interventions have generally placed the emphasis more on preserving the fish resource than attempting to optimize the benefits to people harvesting the fish. However, a new trend seems to be emerging in the most important fishery countries of the region. In Chile, new legislation attempting to regulate effort and access through a combination of total allowable catch (TAC's) and transferable quotas (ITQ's) has been enacted (Fisheries Law 1991). A similar one is now under discussion in Perú, and in Argentina there is growing interest in the establishment of a more comprehensive fishery policy.

The property structure of fishing fleets and processing plants of the industrial sector is highly concentrated, either in few private hands (Chile, Ecuador and Uruguay, among others) or state owned (Perú, Mexico, etc). Ownership of the artisanal fleet, on the other hand, is more widely spread among members of the fishing community, though some concentration has emerged as a consequence of the increasing process of capital accumulation and income concentration within fishing communities (Hoefle, 1991). In contrast to the tendency towards a mix of TAC's with ITQ's in industrial fisheries, various forms of territorial use rights in fisheries (TURF's) are being recognized as being desirable and appropriate mechanisms for managing small-scale fisheries in Latin America.

2. SOCIOECONOMIC STUDIES OF LATIN AMERICAN FISHERIES AND AQUACULTURE

2.1 Subject-by-Subject Reviews

Socioeconomic research on Latin American fisheries is relatively recent. Most of the studies reviewed were conducted in the 1980s, with a majority being after 1985. Furthermore, most were essentially descriptive studies of specific situations.

2.1.1 Philosophy and Objectives

Only two studies were found that fall into this category. The first addresses relationships between society and technology, and what forms of research need to be carried out in the future (Meltzohoff, 1990). It focuses on social problems that surround the transfer of technology from one society to another. The other study (Buzeta, 1983) reviews the requirements of applied research oriented toward fisheries development in the third world, showing how basic knowledge stemming from fisheries research has been used to develop important activities in these regions.

2.1.2 Income, Distribution and Welfare

Most of the literature included under this category refers to specific case studies. For example, in the southern cone of South America, Robben (1982) analyses the variety of systems for social ranking and stratification, based on ethnographic data from two villages on the Northeastern coast of Brazil. In both communities, economic changes led to major shifts in patterns of alliance and in the relative power levels of various groups.

In Peru, Vilchez et al. (1991) describe an IMARPE-IDRC project in the coastal "caletas" of Carquin and San Andres. The goal of the project is to give advice to fishermen, producers, administrators and researchers for support of artisanal fisheries as a source of food, jobs and income. Income, education, and living conditions, among other characteristics of the Peruvian fishermen, are analysed by Valdivia et al. (1987), in a paper describing the importance of the artisanal fishery in Atico, Arequipa.

In the Caribbean, McGoodwin (1984) presents the findings of a socio-economic study of the fisheries of St. Lucia, analysing (1) socio-economic, attitudinal and cultural characteristics of fishing industry participants, (2) factors associated with variations in income levels derived from various categories of participation in the fishing industry, (3) the role of fisheries cooperatives, (4) the social impact of fishery changes and (5) the various fishing methods currently in use.

2.1.3 Management, Development and Human Responses

A fairly high proportion of the literature surveyed falls under this category, most dealing with management and development of the fishery sector in the different countries and regions. A notably wide-ranging study in this area, by Poggie and Pollnac (1991), focuses on social and cultural factors in small-scale fisheries development. The papers included in the book deal with: community context and cooperative success in Ecuador, survival strategies of artisanal fishermen in Panama and Peru, and the inappropriate management of crab mariculture technology in the Dominican Republic.

In Peru, Valdivia (1991) deals with the idea of Integrated Coastal Development along the south coast, reviewing the various components of this approach: resources, technology and socio-economics. Pastor Caverro (1991) studies the socio-economic effects of the El Nino phenomenon during the period 1970-1990 in Peru. Among these effects were a decrease in catch, an increase in lost boats and equipment, declines in family income and worse living conditions for fishermen in the Peruvian coast. Valdivia (1990) focuses on artisanal fishery communities in the South of Peru where rocky coastlines provide few places appropriate for the settlement of communities or harbours.

A Chilean government study (Ministerio de Economia, Fomento y Reconstruccion, 1986), gives a global vision of the state's role in certain aspects of national fishing policy. Key roles in relation to resource administration, and encouragement and support to the artisanal subsector, are indicated. Campos Lira (1976) describes the Chilean Governmental structure related to the artisanal fishery, noting a special interest in promoting "an integrated development of the artisanal activities, to increase its productivity and to reach levels of progress and work dignity."

Rusque (1986) analyses a Chilean project to develop an artisanal fishing community model based on productive organizational prototypes and to implement a training program for artisanal fishermen. The study contains a preliminary diagnosis of social, economic and productive characteristics of the bights of Lo Rojas and Puerto Sur, based on secondary data for these fisheries.

Trujillo et al. (1991) document a project developed in Uruguay by the CCU with the help of IDRC, analysing the current situation and trends in Uruguayan artisanal fisheries, looking for solutions to current restrictions and problems within the sector. Giordano (1991) discusses the increasing interest shown by both local and national governments toward the development of artisanal fisheries in La Paloma, situated in the Atlantic coast of Uruguay. He analyses the

characteristics of the sector from a functional, economic and social point of view.

Diegues (1989) discusses the incentives given to the small-scale fisheries in Brazil since 1967 and the impacts of these incentives on the resources, infrastructure and relations between different sectors of the fishing industry. Oliveira de Araujo (1988) addresses the need to redefine the fisheries sector in Brazil, because of limitations on human and financial resources. The author describes the main species captured, the organizations of institutions related to sector, and the fishery's economic status, providing strategies for the development of the sector.

Zapata Navarro (1989) analyses the main environmental impacts of recent construction projects, pesticide pollution and urban waste disposal on fisheries in the Gulf of Guayaquil, Ecuador. Jara (1987) comments on the many problems that threaten the existence of subsistence fishing communities in Ecuador. The paper analyses the situation and gives a development strategy for artisanal fisheries.

Gines (1976) discusses reasons for the limited support given to improve the technical, social, and economic conditions of Venezuelan fishermen, despite the great importance the artisanal fishery has for the national food supply. Dintheer et al. (1989) describe the increasing research support given to management of the fishery in French Guyana, where the penaeid prawn resources are biogeographically part of the large homogeneous populations of the northern coast of South America.

In Costa Rica, Villalobos (1986) discusses the lack of clear-cut policies and appropriate levels of implementation which have limited development of the Costa Rican fisheries in general, especially regarding the availability of infrastructure for harbours, financing, marketing, and quality control. The book of Breton et al. (1990) reports the initial results of a project researching the diversity of coastal fisheries in Costa Rica. It includes history and socio-demographic characteristics of the communities, resources, technology used, economic organization of the sector, production, marketing and impact of the activity on the population.

McGoodwin (1987) examines a chronic conflict arising from a dual and contradictory management policy in an inshore fishery of Pacific Mexico. The author summarizes and discusses the dual policy and analyses the widespread conflicts that have resulted among various components of the local rural population and between that population and its government.

In the Caribbean, the results of economists of the Pole de Recherche Oceanologique et Halieutique Caraibe are synthesized by de Miras (1989). Martinique's fishing sector is characterized by: high market demand locally, non-selective public fisheries subsidies, developmental policies lacking suitable economic integration, a long-standing shortage of suitable fishery information, and in particular the link between open access resource use and low levels of economic profitability in Martinique's fishing units.

Higgs et al. (1982) present the Report of the Evaluation Team for Aquaculture in the Caribbean, noting that aquaculture development should not only be aimed at the development of high technology commercial ventures, but should also include small local aquaculture ventures aimed at self-sufficiency and local markets. FAO (1981) presents the report of a Working Group on the development of mariculture in the Caribbean's "Smaller Islands". Aquaculture activities in some of the Caribbean Islands are reviewed briefly and some aquaculture technologies discussed. Based on observations by the Working Group, the developmental prospects in the Caribbean as a whole are summarized.

Archambault (1981) analyses the question of aquaculture development in the West Indies and Guyana. He touches on the positive aspects of aquaculture in tropical zones, where growth is faster, for transplanted as well as local species. Economic aspects also seem favourable because the final costs are not excessive. The socio-economic study of small-scale oyster farming in Jamaica by Lalta and Espeut (1990) includes both economic and social analysis, dealing with non-technical constraints to production; multiple occupationality, natural resource management and sustainable development, and cooperatives and the future of oyster farming.

In the Eastern Caribbean, Benjamin (1988) provides an insight into the experiences of Antigua and Barbuda in relation to the effect of government

imposed price controls in the development of the fishing industry in the country. The author reviews the work of a 1980 committee set up to examine the question of price controls on fish and argues for a change in the present system of price controls. Manickchand-Dass (1986) analyses the 10-year fisheries program of the Government of Trinidad and Tobago, 1980-89. The specific objectives of the program which are to increase domestic supply, per capita consumption of fish and the income of fishermen. He also examines the socio-economic and ecological impact of Government policies. Koester (1985) provides an overview of fishing along St. Lucia's southeast coast, and describes a community-based and initiated fisheries development project, the conditions under which the fishermen carry out their activities, the labour and market conditions, as well as the living conditions.

Hunte (NA) describes the effects of trap mesh size and ghost fishing on catch rates in reef fisheries. He concludes that in over-exploited reef fisheries, small increases in trap mesh size result in drastic reductions in catch rates, indicating that rehabilitating reef fisheries through mesh size regulations would create short term socio economic difficulties. Mahon and Drayton (NA) conclude that fishery yields in Barbados could probably be substantially improved by management measures which would reduce the amount of fishing effort. The majority of fishermen perceived the need for such measures, although the feasibility of such management would depend largely on the costs incurred.

2.1.4 Property Rights

Most of the literature reviewed in this sector deals with fishermen organizations and cooperatives, particularly their success or failure in managing the fishery resources. Only a few papers, highlighted here, refer to TURFs or common property.

Levieil and Orlove (1989) and Levieil (1986) consider the communal control of aquatic resources in Lake Titicaca, Peru, through TURFs systems of water and fishery tenure which involve the holding of exclusive and limited rights by locally and/or culturally defined communities of shore dweller. These articles examine the communally-controlled fishing territories of Lake Titicaca, located in the Andes on the border between Peru and Bolivia. Although it is often held that TURFs are "fragile" customary institutions, Lake Titicaca's TURFs have demonstrated considerably more resilience to social change and official opposition than many formal management schemes.

Berkes (1987) analyses the common property resource problem and the fisheries of Barbados and Jamaica. Common property resources tend to be particularly susceptible to depletion and degradation. This creates problems for sustainable development and for resource stewardship in general since many of the key global resources are common property. The author explores the different definitions of CPR and the traps associated with the harvesting of CPR without understanding the social, economic and environmental costs related to their exploitation.

The book by Taconet (1986) describes the beach seine fishery of Martinique. Section I.3 discusses the historical bases and current operations of the self-regulatory mechanisms developed by seine fishers to systematically allocate space and fishing opportunities amongst themselves on fishing grounds.

Quesada (1989) describes the "ejido" system which applies to common property managed by a village. It has been applied to coastal fisheries since 1971. The author presents the historical and economic background of the system, with emphasis on the Yucatan Peninsula where it has been relatively more successful than in other parts of Mexico.

Turning to papers on cooperatives, Valenzuela (1990) analyses the advantages of organizing cooperatives, as base structures to carry out development initiatives in the artisanal fishery of Chile. While the sector constitutes an important part of society due to its contribution to the economy, and the number of people involved, it is a poor sector which needs economic and social growth to improve the living conditions of its members.

Ferreira Pacheco (1991) evaluates the cooperatives and colonies of artisanal fishermen in Brazil, trying to identify the current situation of the sector, its resources, technology, and training facilities, in order to be able to establish a centre for training and support of artisanal fisheries.

The history of the fishermen cooperative movement in Costa Rica is analysed by Jimenez Castro (1976), who addresses how the Ministry of Labour handled the program, its objectives and techniques used. Molnar et al. (1985) describe selected structural and situational factors that affect decision making and continued operation of community-managed fishponds in communities in central Panama. He examines community factionalism, property rights, social status differences and the role of leadership, in terms of the viability of group farming and long term sustainability of community-managed enterprises.

The work of Jentoft (1986) deals with the cooperative model, which has been the most widespread tool employed to tackle organizational and managerial problems in fishery development projects, but which has often failed. A practical solution to the problems faced is demonstrated by showing how these have been addressed in a specific fisheries industry in Nicaragua. Beca Infante (1976) briefly describes the activities of the Bank of Farming and Livestock Improvement in El Salvador, in relation to artisanal fisheries in general and organized fishing cooperatives in particular.

McGoodwin (1980) discusses Mexico's inshore Pacific fishing cooperatives. Following their establishment by the central government in 1933, cooperatives enjoyed great prosperity, but today they are marginal entities and many are failing. The author analyses the factors that caused the failure, using the inshore cooperatives of southern Sinaloa state as a case in point.

2.1.5 Labour

Few studies were located related to fishery labour markets. The references to labour in many cases is very general, for example in the work by Celaya et al. (1988), Verburg Moore (1982), Calderon and Munoz (1986), Espeut (1990), Martinez and Montano (1989), and MAG/OLDEPESCA (1991).

Rusque (1990) states that the labour force in the Chilean small scale fishery has experienced a large increase due to higher demand for resources; their current catches are important, especially in economic terms. Retamal et al. (1986) give a global view of the Chilean fishery sector, in two parts: (1) analysis of the labour force, its geographic distribution, harvests, and marketing and financial resources, and (2) a socio-cultural profile of the fishermen, with analysis of individual aspects, family, living conditions, and social organization.

Quiroz Alcalde (1991) examines labour aspects in the course of detailing the various production forms existing in the Chilean artisanal fisheries communities, and the diverse acting agents. Valdivia et al. (1991) consider mollusc aquaculture as an alternative source of employment for artisanal fishermen in Chile.

Quiroz Alcalde (1991), referring to the Peruvian situation, shows the importance of understanding the different aspects related to labour organization of artisanal fisherman, to better understand the activity and the social agents affecting the system. Molina and Caypa (1991), members of the fishermen trade union of Peru, express their point of view in regard to fishing and the socio-economic situation of fishermen, examining problems and suggesting solutions.

The work of Belisle et al. (1987) analyses the structure and dynamics of the fishery labour market in Ecuador, based on data from the communities of San Mateo and Salango (Manabi).

Phillips (1985) studies the many problems faced by fishermen of the Gulf of Nicoya in the Pacific coast of Costa Rica, mostly due to poorly developed infrastructure facilities and marketing systems, and the fact that the Gulf has long been saturated with fishermen to the point that stocks are over-exploited. Aquaculture could become an alternative occupation for this group of people.

2.1.6 Communities, Coastal Areas and Post-Harvest

A fairly large proportion of the literature surveyed falls under this category. A major proportion of these refers to the fishery communities of a particular country in general terms, describing in most cases the socio-economic characteristics of the fishermen, as well as the fisheries operation, production system, fishing gear, etc. Such are the cases of:

Barbados: Ministry of Agriculture, Food and Fisheries (1985)
Barbuda: Berleant-Schiller (1981)
Bolivia: Arteaga Hayashida (1991)
Brazil: Ferreira (1976), Cayalcanti and Bernardes (1950)
Columbia: Valverde Pretelt (1989), Gutierrez Bonilla (1991)
Costa Rica: Bretton et al. (1991), Bermudez et al. (1981)
Lopez and Breton (1991)
Chile: Maira et al. (1986), Serrano (1987)
Domin. Rep.: Montes de Oca and Dominici (1991)
Ecuador: Jara (1987), Alvarez (1987)
El Salvador: Street (1978)
Grenada: Finlay (1990)
Honduras: Caballero (1976)
Peru: Espino et al. (1991), Fiestas Palva and Purizaca
Querevalu (1991), Soberto et al. (1990)
St. Lucia: Walters et al. (1990)
Venezuela: Mendoza et al. (1986), Selaya et al. (1991).

Another important group of papers in this section deal with specific problems, or specific communities. We consider some of these studies here, moving from south to north.

A description of the experiences of three self-financing programs in the caletas of Lirquen, El Blanco and Cerro Verde of the VIII region of Chile, is made by Martinez et al. (1991). The project tries to face and eliminate socio-economic problems that have caused low self-esteem in the communities. Using econometric models, Aguilera Vidal (1989) analyses the behaviour of some variables basic to the development of the fishing sector, such as education, income, marketing, etc. The data used comes from the communities of Coliumo, Lo Rojas, Puerto Norte and Puerto Sur of the Santa Maria Island, Tubul and Tumbes, of Chile.

Chamorro (1990) discusses integrated development for the artisanal fishery communities in Chile, from the perspective of fishermen, in which organization is considered an essential element. It is noted that to achieve development, three factors are required: government support, the establishing of norms and the provision of financial aid; scientific research carried out by different institutions, and; the presence of strong local, regional and national organizations.

Silveira (1991) presents a study of the fishermen communities of Nueva Palmira, Carmelo Dolores and Villa Soriano of Uruguay. He studies socio-economic aspects and evaluates the programs of local and international agencies working in the region during the period 1988 to January 1991.

In Peru, Garcia (1991) describes the socio-cultural changes in the caleta of Laguna Grande, since the first settlers arrived. He refers to changes in transportation, the marketing system, development of the fishing industry, the role of women, the introduction of new techniques, the lack of government policy, pollution, etc. Ildefonso Campos (1991) describes different aspects of the caleta of San Andres, located in the province of Pisco, Peru. His work includes demographic characteristics of the population, community services, marketing systems, the artisanal fisheries industry, etc. He proposes alternatives to boost production and the living conditions in the community.

Valdivia G. and Vizcarra V. (1990) analyse the artisanal fishery at Quilca, Peru, a settlement of 200 people, most of them dedicated to fishing or related activities. The facilities on land are minimal: a small pier, a place to clean and eviscerate fish, a net repairing service, and grocery, fuel and lubricant

stores. There are public services of telephone, mail, primary school, clinic and police station, but houses are poor, built of mud and cane. Marketing of fish is done mainly by brokers.

Galvez P. and Yamunaque P. (1991) study the basic socio-economic variables for an integrated development of the caleta Yacila-Paita, Peru. They present socio-economic data of the fishermen and the community and identify as factors limiting the development of the community, the lack of infrastructure, loans and technical assistance and the low prices of the product. Canales Castro (1991) describes the socio-economic conditions of the artisanal fishermen of Huanchaco, Peru, a caleta located in the north coast of Peru. There are 706 farmers and 87 fishermen in the community. The purpose of the author is to demonstrate that the fishing activity at present is not an alternative for the people living in the community. He presents the problems and suggests solutions for the situation.

Flores Palomino and Vera Tirado (1991) discuss the cholera epidemic which has been extremely damaging in Peru, and which has caused additional problems in the fishing communities due to malinformation about sea food, viewed as the main cause of the epidemic. The consumption of fresh seafood has fallen, and so has the income of fishermen as a consequence. The authors make an estimate of the consequences of this epidemic and how organized fishermen have dealt with it.

Bezerra de Meneses and Boulcault Flores (1986) present an alternative concept for development of small-scale fisheries in the state of Rio de Janeiro, Brazil, based on a pilot project with the assistance of the authors in the fishing community of Jurujuba, located in the Guanabara Bay. The proposed program was the result of multidimensional analysis of the situation of the small-scale fisheries communities in the state, with the main focus on social, political and economic aspects. Hartman (1986) deals with the low net returns on the sale of fish by artisanal fishermen in northern Brazil, which are due mainly to high marketing costs and low prices paid as a result of technical and price insufficiencies prevalent in the marketing system.

Aguero (1988) describes a project in the Pacific coast of Narino and the Port of Tumaco, Colombia. The main goal of the project was to promote the development of productive activities to increase employment, income, and food availability in the region using the human and hydrobiologic resources as well as the existing infrastructure. Gonzalez Cabellos (1990) analyses fishery activity in the Nueva Esparta state, Venezuela. Even though it does not have great technical development, this fishery is very important because it is a source of jobs for many people.

Bort and Sabella (1986) discuss the appropriate technology and development strategies of fishing in the Azuero Peninsula of Panama. They present two approaches: a conventional project of government-sponsored cooperatives, which failed; and a locally organized cooperative involving some former participants in the government scheme, which is succeeding. Cruz and Gonzalez (1991) describe the main characteristics of coastal fisheries in the state of Colima, Mexico, referring to landings, boats used, fishing gear, techniques, infrastructure, marketing, socio-economic characteristics of the population, and cooperatives.

Gerald Cecil (1972) refers to geographic characteristics of fisheries in selected Caribbean islands. The Southeastern Caribbean fishery system involves myriad interactions between heterogeneous elements. The heterogeneity is most evident in the boats and equipment that make up the fishing units. The patterns of spatial distribution influence the island's fish production capacity. Fishing units are owned by many types of individuals, with three broad groups identified. Their personal attributes are important variables within the industry. All the diverse elements of the industry are combined into a model, which aims to be useful in development planning.

Koester (NA) examines the place of fishing in the Virgin Island biosphere reserve, and its role in the economy and culture of St. John. He describes the fishermen and their methods, the marketing and distribution of local caught fish, the changes that are affecting fishing, and fishermen's perceptions of ecological transformations and institutional constraints.

2.1.7 Women

The literature included in this category deals with women's participation in fish processing, distribution and marketing; their role in development projects and their social status within fishing communities. General studies include those of Witham Kiley (1990) and Nash et al. (1987). The former deals with the role of Latin American women in capture, processing and marketing aspects of artisanal fisheries, providing some recommendations to improve their participation, while the latter discusses the role of women in aquaculture internationally, including Latin America.

Celedon and Kliwadenko (1990) give a view of the condition of women in Chilean artisanal fishing communities, based on a study of socio-economic, working, productive and organizational conditions, carried out at three coves in the VIII region of Chile. While the role of women in social and family life is traditionally recognized, in development efforts the ones who receive the benefit are the (male) fishermen, and it is assumed that the improvements reach the whole family.

Vizcarra et al. (1991) describe the female population of the fishing community of Quilca, Peru. He tries to define the role of women in the community with the purpose of increasing their participation in activities both, related and unrelated with fishing.

Quiroz (1991) describes a fisheries development project that tries to integrate women in their roles as wife, mother or daughter of the fishermen, to develop productive activities. Marca et al. (1991) characterize the socio-economic situation of women linked to the artisanal fisheries sector in the caleta of Ancon (Lima, Peru) with the purpose of integrating them into the development of the caleta.

Atherley (1988) analyses the involvement of women in the fishing industry in the English-speaking Caribbean. The extent of this involvement is surveyed in the different aspects of the industry including fish catching, processing, and research and development. Although similarities and differences exist in the different countries, the case of Trinidad and Tobago is used to make recommendations for providing opportunities for women to contribute to the industry.

The rest of the studies reviewed discuss the role of women in fishing communities in a more general way, as part of a broader context. Some of these studies are: Mora et al. (1990), uilera Vidal (1989), FAO (1990 and 1991e), and Perier et al. (1991).

2.1.8 Information and Research Assessment

Polo Romero (1991) notes that the absence of methods and models for analysing artisanal fisheries in Colombia has hindered planning activities, since the main socio-economic variables involved in the relation between natural and human resources remains poorly understood. One possible model in this regard is described by Buzeta (1991); the Integrated Coastal Development approach is an evaluation tool and frame of reference for action in the artisanal fisheries sector. It takes into consideration from a multidisciplinary perspective the basic elements involved in the development process. The author explains their relative importance and the internal dynamic of the system, using the model to evaluate the development of artisanal fisheries in Chile.

Luna (1980) describes the Latin American model for fishery development. Ten years previously, the FAO and the Inter-American Development Bank had undertaken an analysis of the possibilities and significance of fishery development in Latin America, formulating guidelines for action to promote development and outlining strategies and means for implementation. This study describes the evolution of fishery development in the region over the 1970s.

Aguero (1989) presents an analysis and discussion of the evolution, characteristics and trends of small-scale fisheries research on the Pacific coast of Latin America (Chile, Colombia, Ecuador and Peru). Emphasis is placed on methodological approaches in which this research was developed. Rusque and Carrasco (1986) give a historical synopsis of training actions in the Chilean

artisanal fishing sector, highlighting SENCE's (National Service of Training and Employment) actions and those of the Training Centre for Artisanal "Lo Rojas".

Relying on a framework borrowed from economic anthropology, Breton (1991) examines the actions so far undertaken by international and national agencies in the development of artisanal fisheries in Costa Rica. The restricted results obtained in these projects lead to conclusions showing the necessity of enlarging the vision of the social dimension of fishing.

The book by Arrizaga (1989) collects twenty seven papers presented to the Second Latin American Seminar on Artisanal Fisheries held at Talcahuano, Chile in 1989, on topics of fishery management, fishery development, biology, socio-economics and technology transfer. The papers deal with fisheries of Chile, Argentina, Brazil, Peru, Venezuela, and others.

Finally, relatively rare sources of primary fishery socioeconomic data include two studies referring to the fishing industry of St. Lucia. McGoodwin (1984) describes a study carried out by FAO on the request of the government of St. Lucia, which included a description of the socio-economic, attitudinal and cultural characteristics of participants in the fishing industry; determination of the factors associated with variations in income level; social impact of changes in the industry and the wider economic environment at the level of the rural community. More recently, Murray and d'Awergne (1990) present preliminary results of a 1989 survey carried out by the Department of Fisheries of St. Lucia to provide information on socioeconomic aspects of the fishing industry; the paper itself analyzes the significance of apparent socio-economic relationships.

2.1.9 Technology and Innovation

Only a few studies were found in this category. A recent example is that of Araujo and Costa (1991), who discuss an experimental development of strategy, techniques and models for transferring technology to illiterate fishermen.

The book by Arrizaga (1986) includes the proceedings of the Seminar-Workshop on technology and development for the artisanal fisheries, held in Talcahuano, Chile in 1986. The purpose of the meeting was to gather a group of professionals and government officers to discuss development alternatives and strategies for the artisanal fisheries sector in Latin America.

Poblete et al. (1990, 1991) have two studies. One analyses technology transfer to the artisanal fishery in Chile. Knowledge of resources, which are of principal interest, and other types of knowledge useful for the fishermen, can be transferred; it is proposed that the transfer be carried out by an intermediary between the organization which generates knowledge and the fishermen. The other study presents the results of an experiment in technology transfer to teenagers (12 to 18) in Colcura, VIII region of Chile.

2.2 Synthesis

2.2.1 Research Rationale and Goals

Most of the literature reviewed deals with descriptive studies, typically describing the situation of the artisanal fisheries sector for one particular country, region or community, dealing with a particular problem (Berkes, 1987 for example), or highlighting the situation of the fishermen, analysing their problems and searching for solutions to improve their living conditions. An important set of studies was undertaken to provide information to planners and decision-makers.

Other documents were of an academic nature, carried out in universities, as graduate theses or as part of specific projects. A good example of this kind of research is the anthropological work of McGoodwin (1980, 1984, 1987), Breton et al. (1990, 1991), and the researchers of the University of Rhode Island (Pollnac et al. 1989; Sutinen and Pollnac 1981; Poggie and Pollnac 1991).

About one third of the socio-economic documents reviewed dealt with micro issues, involving specific projects that have taken place in a given community or area of a country. Such is the case, for example, in the work of Arteaga

Hayashida (1991), Furtado and Maneschy (1989), Serrano (1987), Escobar and Rubio (1991), Prieto et al. (1989), Dintheer et al. (1989), Garcia (1991), Verburg Moore (1982), Lopez Estrada and Breton (1991), and Caballero (1976). The rest of the documents provide a macro vision of the fisheries sector, involving a particular country or a larger area. Notable examples include those of Buzeta (1983), who reviews the requirements of applied research toward fisheries development for Latin America, and Aguero (1989), who discusses the evolution, characteristics and trends of fishery research in the Pacific Coast of Latin America. Mora et al. (1990) analyse the integration of women into artisanal fisheries in the South Oriental Pacific of Latin America, and Chakalall (1991) studies the "commons problem" created by the open access fisheries of the Lesser Antilles.

2.2.2 Country Reviews

A substantial number of studies provide general overviews of the socioeconomic situation in a particular country. A selection of such studies is provided here, since the papers in this category do not fit well under any of the subject areas described above.

In the southern cone of South America, Crossa (1990) gives information about the current situation of Uruguayan artisanal fishery communities, which are among society's poorest. The socio-economic level is low, with low and irregular income, and with no real access to the social security system. Bertolotti et al. (1990) examine fishing activity in Argentina, which underwent important development at the beginning of this century. The study reports that in major ports of the country, there are now better incomes, and fishermen in general have a reasonable quality of life. Aranda et al. (1989) describe Chile's artisanal fishery: characteristics of the fleet, resources, labour force, income and educational level and other socio-cultural aspects of the fishermen. The Chilean Subsecretaria de Pesca (1990) gives information on socio-economic aspects of Chile's artisanal fishery, and its extensive development as a consequence of export encouragement policies. Peralta (1990) studies the Peruvian artisanal fishery and evaluates its different components: fisheries in continental waters, aquaculture activities, and marine artisanal fisheries.

The situation of the artisanal fishery in Brazil is analyzed by Oliveira et al. (1990), who discuss the level of knowledge about exploited resources, the extractive technologies, and possible strategies to encourage development. The authors conclude that there is almost no organization amongst fishermen, trading and distribution are tightly controlled by intermediaries with low prices for the fishermen, and there is practically no catch processing and very few support facilities on land. The present situation and perspective for development of the fishing sector in Brazil are also addressed in two papers by de Souza Neive (1990, 1991). The author describes the marine and inland resources and the different agents of the fishing sector: artisanal fisheries, coastal fisheries, and aquaculture. He also comments on subsidies for the sector and related legislation.

Ajiaco Martinez (1991) describes the current situation of the artisanal fisheries in the Colombian Orinoquia. The author analyses the main obstacles to the development of the activity and makes recommendations on ways to increase profitability and improve the living conditions of the fishermen. A general description of the fishery sector of Guayana is given by Reuben (1990), including development, infrastructure, training, production and capture, marine resources, management issues, and small scale fishermen income and living conditions.

In Central America, the Costa Rican fisheries sector is described by Bermudez et al. (1981), including its economic importance, harvest levels, characteristics of the fleets, and processing and marketing of the products. Corrales (1991) describes the main characteristics of the artisanal fisheries sector in Nicaragua: the fishermen, their living conditions, the communities, their organizational level, the resource, its distribution and its main species, and the fishing gear. Aquaculture is presented as a new alternative for income and development.

2.2.3 Geographical Differences

The research covered Latin America (South and Central America) and the Caribbean. In South America, where a majority of the work was concentrated, all the countries were represented but there were major differences in the number of studies between them -- most of the documents were for Peru, Chile and Colombia. An important reason for this may be the fact that the main conferences or meetings dealing with artisanal fisheries in Latin America took place in Peru and Chile.

All Central American countries, including Mexico, were represented. In this group, Costa Rica and Mexico produced about half of the studies located, while some countries (such as Belize, Honduras and Guatemala) produced only a few documents.

Considerably less literature (about 10% of papers in the bibliography) arose in the Caribbean islands. Studies included for: Antigua, Barbados, Barbuda, Cuba, Dominican Republic, Grenada, Guyana, Jamaica, Martinique, St. Lucia, Trinidad and Tobago, and the Virgin Islands, although only a few documents were found in each case.

2.2.4 Aquaculture

Only approximately 12% of the studies included refer to aquaculture matters, most of them in a descriptive way. Some of the more detailed studies on the subject are described in this section.

Nash (1987a) gives an outline of economic prospects for the aquaculture industry in order to aid donors in setting priorities for planning purposes. Trends and development prospects are examined for Africa, Asia, Latin America, Mediterranean and Near East, Caribbean and Oceania. Future assistance to aquaculture has to be highly selective, the author says, being most valuable when provided in conjunction with development of biotechnical, socio-economic and in-country policy and management skills.

FAO (1986) discusses the development of aquaculture in rural communities of Latin America. Cardenas Ronco (1978) discusses the role of aquaculture in the social and economic development of Latin America. He describes activities of the Action Committee on Freshwater Products of the Latin American Economic System for the development of aquaculture in the region. Nash (1987b) address the role of women in aquaculture in different parts of the world.

Potocnjak and Solari (1991) analyse the role of artisanal fishermen in the development of Chilean aquaculture. Berger (1989) describes the development of aquaculture in Peru in the last ten years; a fast growth rate for products with a high international price, but a slow development of those considered low price food.

Meltzohff (1990) addresses shrimp mariculture in Ecuador, as do LiPuma and Keene Meltzoff (NA) with respect to the "social economy". Aguero and Gonzalez (1991) present the overall history of aquaculture development in Ecuador, and some figures related to Latin America in general.

Escobar and Rubio (1991) describe an aquaculture project that has taken place in the Bahia de Buenaventura, on the Pacific coast of Columbia. Hernandez (1991) analyses the possibilities of aquaculture as a development factor to improve the living and working conditions of the communities in the coast of Colombia. Rey Rodriguez et al. present a primarily techno-economic (income and costs) analysis of polyculture in three climatic zones of Huila, Colombia.

Estes (1976) describes the general conditions of artisanal fisheries and aquaculture in the Central America and Panama region. Phillips (1985) analyses aquaculture as an alternative occupation in the Pacific coast of Costa Rica, and Smith and Phillips (1984) analyse the general attitudes toward aquaculture in some communities of the Gulf of Nicoya, Costa Rica.

Corrales Sanchez (1991) deals with aquaculture in his description of the principal characteristics of the artisanal fisheries sector in Nicaragua, presenting shrimp aquaculture as a new alternative for income and development. Molnar et al. (1985) discuss structural and situational factors affecting decision making and continued operation of community-managed fishponds from 22 pilot projects in communities in central Panama. Lovshin et al. (1986) take an

integrated approach to the analysis of cooperatively managed fish ponds in Panamanian rural communities.

The International Centre for Aquaculture (1974) discusses problems and progress in the fisheries program of El Salvador. This report suggested that farm fish culture in the country was then in a "pre-emergence stage", that consumption of fish per capita was very low, and that research had only begun to examine the various production possibilities for different areas of the country, despite favourable climatic conditions. The study points out the need for further research and for the training of Salvadorean aquaculturists. Street (1978) briefly describes the aquaculture sector in the same country.

An account of aquaculture in Cuba is given by the Ministerio de la Industria Pesquera (1984), describing areas covered, species cultured, public and private financing, and problems to be resolved regarding development. Cervigon (1983) studies the current state and perspectives of aquaculture in Venezuela. The report by FAO (1981) deals with the development of mariculture in the smaller islands of the Caribbean region.

An economic assessment of Jamaica's fish culture program is made by Street (1978). Fish culture has been chosen as a tool for economic development by the national government of Jamaica. The report, based on a study conducted in 1978, discusses alternatives for fish culture and the development potential for fish culture in the country. More recently, Lalta and Espeut (1990) provide an in-depth analysis of oyster farming in Jamaica.

3. RESEARCH METHODOLOGY AND CONSTRAINTS

3.1 Methodological Considerations

In general, fisheries research in Latin America has been focused more on the status of the resource base, its dynamics and environmental determinants (fish, yield and water) than on the users/exploiters of the resource and their social institutions (fishermen, industry and society). Research agendas have been concerned almost exclusively with the fish, their environment and the determinants of fish mortality (Pauly and Agüero 1991). As research has been under the leadership or conducted generally by fisheries biologists, oceanographers or fisheries engineers, it has also been generally driven by the methodological approaches and techniques of their respective disciplines¹. In general, until very recently, social, economic, and institutional aspects of fisheries have received little professional attention in the region.

The limited research that has been conducted on economic and social aspects of fisheries has been generally descriptive, qualitative and site-specific (Aguero 1991) with little capacity for generalizations. Social and economic studies have tended to focus on determining specific social attributes of fisherfolk, fishing fleets and fishing communities (such as age, location, education, health, community structure, and effort deployment), while cultural and institutional studies have dealt with the operation and behavior of cooperatives, community organizations and institutions (such as tribes, family, crew, and intermediaries). Only a few recent studies and workshops have addressed issues related to women in fisheries. While some research exists on marketing and cost/return structures (such as prices, profits, and input costs), these efforts generally result in more of an accounting procedure for fishing operations than an economic or financial analysis of the industry.

There is a lack of comprehensive treatments of fisheries in Latin America, covering both industrial and artisanal sectors from an integrated bio-economic and technological perspective. There have been a few relevant attempts, induced

¹Current and past directors of most national research institutes of the region (IMARPE, IFOP, INAPE, INP, CITEP, etc) have generally been from biological or oceanographic background.

and promoted by developed countries, to integrate technological, biological and socio-economic aspects in analyses of small scale fisheries in Central America and the Caribbean (Estes 1976, Higman 1978, Sutinen and Pollnac 1981) and more recently in the South West Pacific area (CPPS 1989, 1991). However, a lack of institutional support, funding and an interested critical mass have kept these efforts from being continued and extended to other nations.

The available literature is dominated by a large number of unpublished reports (grey literature) produced as consultancy reports, theses and dissertations, internal governmental reports and international technical mission reports, but these are either difficult to find (if only a few copies are produced) or are of a restricted and/or confidential nature. Probably, the best sources of references are found in conference proceedings of national and regional meetings, which are among the few opportunities local researchers have to interact and prepare written documents. It seems that a salient characteristic of most so-called "socio-economic" studies in the region is a tendency to fall into the "survey syndrome", that is, to think that all that is needed to conduct social and economic research is to design a questionnaire and start the data collection process, expecting it will provide all the necessary information. Careful review of the few relevant research reports conducted to date shows the results of this approach: thick, heavy documents describing large numbers of individual and isolated fishery components, rather than identifying and explaining the functional relationships between them, or drawing generalizable conclusions.

In national or regional research and training institutions, it is hard to find fisheries social science research groups with a minimum critical mass. Generally, fisheries training programs or research agendas whose main emphasis has been on biological or oceanographic components, have attempted to deal with social and economic factors as well, but without involving professionals specialized in these fields as part of the core group or at the early stages of conceptualization. The end result of this process is that when social science specialists are needed, no funds have been budgeted for their input, and training or analysis is then requested from outside, either on a consultancy basis or through inter-institutional agreements with universities or other kinds of research groups. Consequently, no training/research tradition or continuity has developed.

The above behavior reflects the marginal role which has been traditionally assigned to social sciences in this sector. It is only recently that efforts are being made at the major fisheries research centers to establish research units addressing social, economic or institutional problems, hiring specialists in these fields. Thus, the Instituto de Fomento Pesquero (IFOP) in Chile, the Instituto Nacional de Investigaciones y Desarrollo Pesquero (INIDEP) in Argentina, the Instituto Nacional de Pesca (INP) in Ecuador, and the Instituto Nacional de Pesca (INAPE) in Uruguay, have all created departments or units of fishery economics in recent years. However, their staffing is still kept at a minimum (with at most one or two full-time members in each institution), with little funding for research and strong mandates to maintain and update large data bases and short-run descriptive reports on the status of the various fisheries. Therefore, most of their efforts and resources are allocated to data collection, tabulation and report writing, with little incentives (time, money or recognition) for analysis and adaptive or innovative research (World Bank 1991a, Agüero 1991).

Overall, fisheries research efforts in this region are often characterized by an application of foreign approaches without sufficient critical analysis of their applicability to local conditions. Although, this tendency also affects research in other related disciplines, like fishery biology and oceanography, the problem is more serious in the social sciences area, where social and cultural differences and considerations are at the heart of the problems. Furthermore, the absence of a well-known and widely accepted "paradigm" for social and economic research in fisheries and aquaculture has prevented many "hard science" professionals from gaining the necessary confidence in their results. Hence, funding for fisheries social science research is marginal and rarely a major component of a research project.

3.2 Data Constraints

One of the obvious constraints on rigorous social and economic research in Latin America, besides the lack of a well accepted set of theories ("paradigms"), has been the inadequacy of data and information systems. Existing socio-economic data and information for fishery research and management purposes in the region presents several common deficiencies. In general, most nations lack ongoing and timely data/information systems, ones that are coherent and systematic (regular). Where attempts have been made, lack of continuous financial support forced their discontinuation (as in the case of Costa Rica and the University of Rhode Island -- see Sutinen and Pollnac, 1981). While availability and quality of fishery information varies markedly among countries in the region, most data/information systems present some or all of the following problems:

a) **discontinuity:** continuous data requirements for social and economic research are poorly specified, so data items are not regularly collected, recorded and reported over time and space, and consequently time series are often incomplete.

b) **inconsistency:** the lack of trained and experienced personnel (high turnover) leads to data series that are often recorded in different units of measure and time, making proper comparisons difficult.

c) **fragmentation:** insufficient funding and support for data collection generally results in partial coverage of the various areas, periods and activities, and in the partial tabulation, recording and reporting of results.

d) **lack of reliability and accuracy:** insufficiently trained personnel in the statistical units of government agencies lead to collection methods that are inappropriate, with deficiencies such as misleading questions, nonrepresentative survey frameworks, mis-specified samples, unreliable informants, and inappropriate sampling procedures.

e) **confidentiality:** the strategic nature of some data sets and the high acquisition costs create a situation in which such data is regarded by government agencies and private research centers as a valuable asset, so that access to appropriate data sets can become difficult or impossible, as it may be "confidential" or released at extremely high costs.

f) **costliness:** as most required social and economic data for research and management purposes is not readily available, specific data needs bear fixed costs (infrastructure, learning process, etc) which could have been shared within a larger data base system.

Furthermore, the "compartmentalized" nature of government institutions and the interdisciplinary character of fisheries mean that data and information in this sector is collected and reported by different ministries, agencies and units of the government. Generally, little coordination or communication takes place among them and consequently, available data is widely dispersed, with serious implications for accessibility, consistency, and cost-effectiveness of data systems.

However, the emerging wide use of computer hardware and software promises a possible effective transition to a unified system of information and databases in the fisheries sector in the region. Networking and the use of terminal systems is becoming a financially feasible option, as the implementation costs are decreasing in relative terms.

A related data constraint is the limited capacity of both professionals and infrastructure (such as equipment, data bases and funding) to effectively handle large data sets (time series, cross-sectional tabulations, etc). However, this problem is also being solved by the increasing availability of micro-computers and quantitative computer software packages in the hands of more experienced local professionals, who are demonstrating skills to use these tools, and to adapt them to local conditions as well.

3.3 Research Infrastructure and Institutional Constraints

Infrastructure needs for research in fisheries vary greatly depending on the purpose, scope and disciplinary area of the research project. Oceanographic studies require large investments and operating funds (research vessel and sophisticated equipment), highly trained personnel (oceanographers) and long-term data collection efforts. Biological studies are, on average, less demanding, and with the aid of appropriate methods, considerable reductions in research costs can be attained. Social and economic research is probably the most cost-effective kind of fisheries research in terms of infrastructure requirements and potentials for improvements in human welfare.

In spite of these limited infrastructure needs, not one institution in the region has as its main objective the conduct of research in fisheries socio-economics. While most national research institutes already own or have access to vessels and laboratories to carry out oceanographic and biological studies, providing a wide range of possibilities for joint collaborative work with developed countries, in the social sciences area, foreign assistance needs to be more selective and data requirements more stringent. Furthermore, few institutions in the developed world have good working experience with socio-economic fisheries research in the region, and thus possibilities for collaboration are more limited.

However, on the positive side, it is worth noting that some international development institutions have been actively involved in fisheries social science research in the region for some time now. They have provided financial support to develop local research capacity and some infrastructure to set the basis for future development of research in this area. Notable in this regard are the International Development Research Centre (IDRC) from Canada, which supports two professional networks (Small Scale Fisheries Network and Coastal Management Network); the InterAmerican Foundation (IAF) from USA, which has supported important research in small scale fisheries, and GTZ from Germany, which has funded various research projects related to bio-economic research in Peru and other countries of Latin America.

There is also a positive trend in many national fisheries research centers/institutes, noted earlier in this section, to establish socio-economic research units, which in the near future will probably become the main source of data and information about socio-economics in fisheries. Activities are also underway at some universities, government institutions and nongovernmental groups (NGO's), where research agendas have been established in specific social or economic aspects of fisheries. These include, for example, the Centro de Capacitacion Laboral in Lo Rojas, a training center for small scale fishermen in Southern Chile, which engages in some research, the Centro de Planeacion Social y Economic (ECUADOR) in Quito, Ecuador, which has undertaken significant work in social and economic aspects of (mainly small-scale) fisheries in Ecuador, and others.

The major institutional constraint on effective social science research in Latin American fisheries is probably the lack of appropriate human research capacity. Socioeconomic research in fisheries requires not only a good understanding of the various social science disciplines (sociology, anthropology, economics, etc) but equally important, an understanding of the various biological, environmental and technological processes determining fish yields, fish mortality, technological efficiency and the dynamics of the ecosystem over time. In addition, and most importantly, is the capacity to conceptualize and model the various components of the fishery system into a unified view of the fisheries under investigation. This requires a good mix of mathematical skills, empirical knowledge and understanding of the social context in which fisheries exploitation takes place. Rarely are these skills obtained at the undergraduate level of university training, especially since as a relatively new subject area, fisheries economics (or more generally, social and economic sciences applied to fisheries) has not yet permeated traditional training programs in the region.

Thus, practitioners today are either trained in foreign universities (namely those of USA, Canada or Europe) or are "self-made" from other disciplines. In the first case, often local institutions cannot offer the necessary incentives to attract and keep recent graduates. Better opportunities may be

offered to recent graduate returnees in the research or public administrative bureaucracy, pushing them out of the main thrust of research and thus, becoming at best research administrators instead of research scientists. Even if recent graduate pursue a socioeconomics research career, several years are needed upon returning to his/her native country before being fully familiar with local conditions to effectively adapt his/her knowledge and tools. In the second case, of "self-teaching", methodological lags and bias may remain undetected even by the professional himself/herself. In either case, several years are needed for him or her to become involved in research effectively. Overall, efforts should be made not only to train local professionals at higher levels in the socio-economics area, but to secure sufficient research means to create minimal critical mass that would secure their permanence, thereby properly developing local research capacity in this disciplinary field.

4. DISCUSSION

The open access nature of fisheries in Latin America, combined with attractive market conditions for fishery products, has led to problems of over-capitalization and some degree of over-exploitation of important stocks. As a consequence, considerable resource rents seem to have been dissipated (although few studies have addressed this in the region). Furthermore, with the bulk of fishery products exported out of the region, such externalities as resource over-exploitation and degradation, congestion, and pollution are not internalized by resource users/exploiters. Hence, part of the rent is continuously transferred to importing countries (generally developed nations).

The generally low efficiency which characterizes production processes of developing economies also holds for most fishing industries in the region, both at the industrial and artisanal level. Efforts focused only on improving technology or preserving biological resources (as has been the emphasis of most development strategies) have not succeeded in improving the conditions of artisanal fishing communities or avoiding resource rent dissipation due to over-capitalization in the industrial sector. However, failure to consider economic, social, cultural and institutional factors in management policies is increasingly being recognized by academics and policy makers in the region as a cause for failure in fishery interventions.

In spite of all this, various authors note that good potential seems to exist for improved social and economic performance of the fishing sector in the region. These opportunities, among others, exist in:

- a) development of more intensive aquaculture activities (through improving breeds and yields with more cost-effective husbandry, integrated farming and application of fish genetics),
- b) development of processing and post-harvest technology that increase value added for fishery products at the local level,
- c) establishment of national regulatory policies to prevent over-capacity build-up and to maintain sustainability of aquatic resources and ecosystems,
- d) development and adoption of techniques and strategies to exploit and process non-traditional resources and new markets,
- e) allocation and decentralization of access to resource users (avoiding open access) and establishment of mechanisms to force internalization of externalities, and
- f) strengthening of local research capacity that is innovative and adaptive, with additional support from the private sector.

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Chapter 4.

SOCIOECONOMIC RESEARCH ON FISHERIES AND AQUACULTURE IN ASIA AND THE PACIFIC

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Asia is the largest continent in the world and is home to 29.9 billion people or 70% of the world's population (World Resources 1990-1991). It is estimated that around 75% of the people in this region are still dependent on agriculture (defined as including fisheries as one of its components). In Asia, the fisheries sector remains a valuable source of cheap food protein and is one of the primary sources of livelihood and employment. Extreme poverty, specifically within the small-scale sub-sector, continues to prevail within the fishery. This is considered to be a serious social, economic and political issue. It is quite alarming that coastal fisheries management and development strategies have, in most cases, failed to reverse the trend of poverty and resource overexploitation and degradation. This can be attributed to a number of factors including the open access nature of the resource; the lack of knowledge about the behaviour, organization and socio-economic structure of fishers and fishing communities; and poor planning/implementation of management and development programs.

The continuous search for relevant and cost-effective solutions to these complex concerns in both capture and culture fisheries requires a multi-disciplinary approach. New policies and strategies will need to be developed which will consider the constraints and opportunities prevailing on fishermen and other stakeholders within the sector. These policies/strategies will need to be assessed under varying economic, social, cultural, resource, political and institutional conditions. More importantly, the active participation of social scientists in providing the much needed input in terms of socio-economic research is imperative. As its primary purpose, this paper will review the state of socio-economic research in both fisheries and aquaculture in Asia.

1. AN OVERVIEW OF ASIA/PACIFIC FISHERIES AND AQUACULTURE

1.1 Background

This section provides a brief background on the origins of the issues and concerns currently prevailing in Asian/Pacific fisheries and aquaculture. The review relies on previous studies by Librero and Collier (1979), Panayotou (1985), Ruddle (1986), Lampe (1989), Pauly and Chua (1988) and Bailey and Skladany (1991).

Fishery-Related Issues in Asia. The emphasis of developmental efforts in South and Southeast Asia and in other parts of the world commencing in the period after World War II was on agriculture and industrialization. Not until the late 1960s and the early 1970s, have fisheries been considered as an extractive industry whose economic utilization was associated with increased extractive capacity. The Asian governments' explicit or implicit promotion of increased mechanization and rapid expansion of the fishing industry was borne out of the perception that, with open access, larger shares of the catch in marine fisheries could be realized through larger and faster fishing vessels. This has led to the adoption of fisheries policies encouraging the use of modern fishing technologies and providing access to investment funds to support this innovation even at subsidized rates. Between 1978 and 1984, the governments of Thailand, Indonesia, Malaysia and the Philippines received over US\$590 million in fisheries aid, 88 percent of which was for capital investment. The focus of these aid programs was on mechanization and modernization of fishing vessels and technologies to increase fisheries exports by providing subsidies, concessionary credit and even outright distribution of fishing boats at token prices. Landing and marketing

facilities were, likewise, provided and/or improved to complete the assistance package.

With this situation, a dualism was developed as large-scale fisheries co-existed with small-scale artisanal fisheries. The continued existence of traditional fishermen was considered to be just a fleeting attribute of fisheries development and was initially ignored. It was anticipated that the development process would open up employment opportunities and that the stagnating coastal communities would gain some of its beneficial effects.

It was then realized that the dualism was not just a fleeting attribute of fisheries development, as small-scale fishermen remained in existence and socio-economic conditions of the coastal fishing communities began to deteriorate. The expected "trickle down" effect of benefits did not materialize and this has subsequently resulted in further polarization which has been a consequence of the rapid economic growth in many countries. Thus, increased government intervention became imperative with the intention of alleviating rural poverty.

The preference for commercial rather than small-scale fisheries development is based on the perception that capital intensive fishing technologies are more economically efficient. Similarly, the choice between developing fisheries for domestic or export markets is defined in economic terms, especially where high valued species (e.g., shrimp and tuna) are involved. The assumption is that commercial export-oriented fisheries will contribute to national development by earning valuable foreign exchange.

The rapid growth of export oriented fisheries in Asia posed serious problems for small-scale fisheries, especially in areas where commercial trawling for shrimp was introduced. The encroachment of commercial trawlers into traditional fishing grounds negatively affected the catches and incomes of small-scale fisheries who found themselves unable to compete with the more effective trawlers. Subsequently, competition has given way to conflict as small-scale fishermen fight to retain access to local resources. The benefits received from the fishery were often skewed in favor of a relatively few trawl owners. Small-scale fishermen are often competing on unequal technical terms for a declining resource. This threat to a vulnerable resource has serious implications for domestic consumers in the region, where fish is the only affordable source of high quality protein for the majority of the population. The increasing number of fishermen adopting mechanized fishing gear has triggered a levelling off of the individual catch as the productive capacity of the fishing resources approach its limit.

The demand for continued government intervention increased as nonmechanized fisheries began losing ground. As these programs have political and social implications, there was a need to expand the coverage to all the remaining non-mechanized units to enable them to maintain, at least, their pre-mechanization level of catch and income. The persisting income differential between mechanized and non-mechanized fishing operations justified the continuing promotion of mechanization.

With the increase in fuel prices following the fuel crisis of 1973 coupled with the increase in the cost of maintaining larger vessels and engines, the mechanized vessels' operating costs soared to a level where the advantages in terms of income over the non-mechanized operations diminished or was even totally eliminated. This necessitated the review of the policy supporting the mechanization of the fishery, which had become difficult to maintain, as well as other related policy instruments including credit and subsidies. While there was no doubt that small-scale fishermen would insist on more government assistance, the mechanization option was no longer appropriate.

As this developed, there was an apparent change in perception of the fishery from that of an extractive industry to that of an economic activity based on a renewable but destructible resource. The change in philosophy was brought about, in part, by the new ocean regime of extended fisheries jurisdiction giving the coastal states sovereignty over the mass of fishery resources. This new regime featured not only the expansion of exclusive national jurisdiction over the fishery resources, it also defined the limits of these resources. While the former opened up new opportunities for the development of fisheries, the latter made the vulnerability of the resources to unrestricted exploitation more

conspicuous. With this development, the national fishery has gained a more definite and exclusive resource base which can be utilized up to an optimum capacity if properly managed. Thus, the necessity for effective fisheries management and the corresponding derivable benefits has, likewise, become more apparent. In addition, the continued conflict between large- and small-scale fisheries became more intense as the boundaries for fishing have already been set and the area for fishing became more limiting. With higher fuel prices, the large scale operators will find it more to their advantage to fish inshore.

Panayotou (1985) identified three distinct but interdependent issues faced by Asian governments:

- * How to attain a sustainable improvement in the socio-economic conditions of the small-scale fishing communities;
- * How the resources can be managed to maximize their productivity; and
- * How to allocate the country's limited marine fishery resources between small-scale fishing communities and industrial fisheries, so that conflict can be minimized.

While these three issues are not generally mutually compatible in the long run, proper management of fishery resources coupled with reduced internal conflict would contribute to easing up the problems of poverty among fishermen, simultaneous with maximizing the derivable benefits the populace can get from the fishery. With the current number of fishermen far exceeding that which is necessary for the socially optimum level of management, resource productivity improvements and favorable living standards can be achieved only if complemented with other fishery-related interventions on a broader resource base. These interventions include community/economic development initiatives such as fish processing, aquaculture, cottage industry, farming, tourism, and the like.

Such an endeavor will require a substantial amount of information as to the demographic and sociocultural characteristics of fishing communities; their occupational structure; income levels; indicators of well-being; size and quality of the resource base; productivity; cost structure; profitability of existing fishing technologies; the marketing system; the potency of social and institutional constraints; and the potential for alternative or supplementary economic activities such as coastal aquaculture. Government policy decisions to improve the standard of living in the fisheries sector will require an understanding of the constraints and opportunities within the sector and other related sectors. There is a need for information for policy making which addresses linkages among the above factors and the various economic sectors in which they exist.

Fishery-Related Issues in the Pacific. South Pacific fisheries are characterized by two distinct fishing technologies; small-scale domestic fisheries and a commercial distant-water fleet.

The former has historically been of great importance to the island people, in terms of both food and income. The development of these fisheries is restricted by the diversity of species, the relative abundance of small fishes, and the unsuitability of reef areas for trawling and purse seining. Further, given the nature of the gear employed in small-scale fisheries - the indigenous fisheries of the South Pacific are often characterized by simple gear such as handlines, gillnets, pots and traps, and spears - fishing is seriously disrupted by bad weather. In the South Pacific, nearly all small-scale fishermen reside in remote villages where capital is scarce, labor relatively cheap, and fuel is costly. Development of the inshore fisheries has entailed expansion into new areas that are labor intensive and fuel saving. In the majority of the islands in the Pacific, problems of over-exploitation of the inshore fisheries have not been recognized as a serious threat, although such threats are looming. The traditional tenure system, which in some cases extends beyond the reefs, is a means of protecting valued fishing grounds for clans and villages. Population pressures are minimal, unlike in Asia.

Despite benefits accruing from the artisanal fishery, before 1982 the island states of the Pacific were, with the exception of Fiji, Papua New Guinea, Nauru and Solomon Islands, mostly poor, isolated, and existing at a largely subsistence level, with very few economic resources and little prospect of development. They could only observe offshore fish resources in adjacent oceans being caught by the modern distant water fleets of developed nations at no benefit to them. In 1982, the Law of the Sea brought a completely new perspective. Individual states were able to claim ownership of resources within a 200 mile Exclusive Economic Zone (EEZ). Once ownership was defined, the island states took measures to enforce fishing licenses, although most required assistance to administer the EEZ.

Now, the commercial fishery of the South Pacific is dominated by foreign fishing fleets which target tunas and tuna-like species. Most of the catch is taken within the 200 mile Exclusive Economic Zone, which has significantly extended the control of South Pacific island countries. The highly migratory behaviour patterns of these species has created several problems for South Pacific island nations. Among them are: the need to gain regional cooperation and manage the resource; the need to make decisions on the trade-off between domestic development and foreign fishing allocations; the need to attract capital to develop the resource through joint ventures; and the need for monitoring and enforcement of fishing rights. While resource rents are earned through licensing of foreign fleets, the South Pacific islands have had limited success in increasing value added through processing and canning in the lucrative tuna fishery.

Aquaculture. Both inland freshwater and coastal marine aquaculture have centuries-old histories in Asia, although they are little developed in the Pacific. Aquaculture offers an important means of increasing the available supply of affordable protein to domestic consumers in the tropical developing countries of Asia. Aquacultural development has also been an important part of strategies for increasing employment opportunities and income among rural populations through the use of simple technologies and locally available resources. In recent years, however, these potential roles of aquaculture have been overshadowed by the emergence of commercially profitable capital-intensive production of penaeid shrimps in coastal brackishwater ponds.

Inland aquaculture in Asia has a long tradition from which has emerged diverse production systems characterized by intensive managerial and labour inputs and high levels of productivity. In particular, the influence of China, Indonesia and India on regional aquacultural production systems has been pronounced. Chinese immigrants introduced aquaculture into Thailand around 1910. Chinese carp fry were imported from mainland China and transported by boat to Thailand, Hongkong, Singapore, and Malaysia during this period. Existing systems for the most part are based on sophisticated but low cost techniques well adapted to rural small-scale producers. Virtually all production is consumed locally, either by producer households or others in the immediate area. It is estimated that freshwater aquaculture in Asia represents as much as 80% of world production, most of which is carp and tilapia.

Coastal aquaculture also has a long tradition in Asia, with well established systems for the production of fish and shrimp. Traditional coastal aquaculture can be characterized as an extensive polyculture of fish and shrimp. Ponds are stocked with post-larval shrimp through tidal action. Tidal flow also brings in nutrients to enhance primary production within the ponds. A key advantage of such a system is that there are very few costs. The fact that these production systems have been in existence for hundred of years testifies to their sustainability and their relatively benign impact on coastal ecosystems.

Reacting to world demand, over the last decade there has been a shift away from polycultures of fish and shrimp to shrimp monoculture. Current efforts to develop coastal aquaculture aim at increasing the productivity of these systems through application of purchased inputs. The shift from extensive to more intensive systems represents a movement towards capital intensive technologies requiring substantial technical as well as financial inputs. Extremely high yields can be gained in intensive systems such as those used in Japan and Taiwan.

Within most developing nations, however, semi-intensive production systems are the most common type being promoted. National policy-makers and international development assistance agencies are investing heavily in shrimp mariculture. Despite these investments, the key factor in the growth of Asian shrimp mariculture has been private sector initiative including involvement of multi-national corporations.

Inland freshwater aquaculture is becoming increasingly important as a source of inexpensive food fish for rural populations in Asia. Rural populations in rice-growing regions have long relied on seasonal migrations of endemic fish populations which spread through flooding into low lying paddy land and flood plains. Unfortunately, in many parts of Asia, this source of protein has been seriously reduced as a result of pesticide use associated with adoption of Green Revolution rice technologies, although new rice varieties and production practices have allowed the reemergence of these integrated farming systems.

Prior to the 1970s, coastal aquaculture was the province of small-scale producers of fish and shrimp for domestic markets. Over the past two decades, however, coastal aquaculture has been transformed into a major source of foreign exchange earnings due to technical advancements in the production and international marketing of penaeid shrimp. The shift away from a polyculture of fish and shrimp to shrimp monoculture has resulted in declining production of milkfish (*Chanos chanos*) and other species grown in coastal ponds and sold in domestic markets. Moreover, in the rush to develop coastal ponds, large areas of mangrove forests are being destroyed with serious consequences for commercially valuable fish and shrimp stocks which depend on mangrove habitat during the juvenile stage of their life cycles. The results may be serious reduction in marine harvest and domestic fish supply in the future.

1.2 Current State of Asia/Pacific Fisheries

The fishing industry plays a pivotal role in the social and economic life of the people of Asia. As stated earlier, the industry provides one of the primary sources of livelihood to Asian coastal communities as well as the major source of cheap protein to the broader base of the population. The region has a total coastline of 163,609 kilometers (World Resources 1990-1991), accounting for 28% of the world's aggregate coastline. In view of its largely archipelagic features, it also has the second largest exclusive economic zone (EEZ) at 20,258.5 square kilometers (Europe has the largest EEZ) which is 18% of the world's EEZ.

More than 15 million fishermen and fish farmers working full time and perhaps twice as many working part time rely on nearby waters for their livelihood. A large bulk of the fishing communities are from three major developing nations; India (6.5 million), China (3.1 million) and Indonesia (2.2 million) and most of these are small-scale fishermen and fish farmers.

The fishing industry has undergone a period of changes in the past 40 years. It was predominantly a traditional fishing industry before World War II. Postwar expansion of the industry was in response to greater demand for fish protein as a result of rapid economic growth especially in the 1960s and 1970s. More and more fishing vessels were mechanized, offshore and distant water fishing vessels were constructed. Some nations such as Japan, South Korea, Taiwan and Thailand were able to expand their fishing activities from nearshore to offshore and eventually organized distant water fishing. The catch increased at an accelerated rate but soon levelled off in the 1970s leaving behind problems of overfishing, displaced fishermen and a depressed fishing industry. Declaration of the Exclusive Economic Zone (EEZ) in 1983 has caused changes to the fishing industry and certainly created considerable impact on the future management of the fisheries resources and the future development of the industry.

Now, Asia is a center of fishing and aquaculture activities. Six out of 10 top fish producing countries in the world in 1990 are from Asia; Japan, China, India, South Korea, Indonesia and Thailand (see Table 1). They contribute about 80% of total Asian landings. Seven out of 10 top shrimp producing countries are also from this region: India, Indonesia, China, Thailand, Malaysia, Vietnam and Japan.

Table 1. Nominal Catches by Principal Producers, 1990. (Source: FAO Yearbook of Fishery Statistics 1990)

Country	Production (mt.)
China	12,095,363
USSR	10,389,030
Japan	10,353,555
Peru	6,875,072
USA	5,856,003
Chile	5,195,418
India	3,790,598
Indonesia	3,080,450
Korea Republic of	2,750,000
Thailand	2,650,000

The major resource of the Pacific area is tuna, primarily skipjack with a total reserve of around 3 million metric tons. Yellowfin, albacore and bigeye tuna are also available. The Forum Fisheries Agency (FFA) based in the Solomon Islands and with 16 Pacific nation-state members, has the mandate to manage and conserve the fish stocks of the region. The FFA pursues fisheries cooperation among its members and, among its other functions, conducts research, issues licenses, collects fees and monitors and enforces regulations.

Current objectives of the fishery sector in the Indo-Pacific region are to increase food supply for domestic consumption and to develop export products for foreign exchange earnings (SEAFDEC/FAO 1985). Asia and Oceania produced about 38% (36 million t) of world fish landings in 1990; 65% of the inland fisheries came from East, South and Southeast Asia and about 1 million t came from West Asia (Near East).

Of the sixteen regional bodies of water, five are located within the territorial boundaries of the Asia/Pacific region: the Pacific Ocean (Northwest, Western Central, Southwest) and the Indian Ocean (Western and Eastern). The catch compositions during the 1985-1987 period for each of the Asian bodies of water are shown in Table 2.

Based on the 1985-1987 figures on the average annual marine catch, the most productive of all these regional bodies was the Pacific Ocean (northwest part) with an annual average marine catch of 25,187,000 metric tons. Nonetheless, this catch level was already way beyond the range of estimated sustainable yield of 13,500,000 to 16,500,000 metric tons per year. The same holds for the Indian Ocean (Eastern part); the average annual marine catch during the same period was 2,277,000 metric tons whereas the range of estimated sustainable yield for the area was set at 1,500,000 to 2,200,000 metric tons per year. These areas are, therefore, already considered "biologically-overfished areas". The average annual catch level of fisheries in the western central part of the Pacific Ocean was already within the range of the estimated sustainable yield. The levels of average annual catch in the two remaining Asian bodies of water (the southwest portion of the Pacific Ocean and the western part of the Indian Ocean) were still slightly below the minimum of the range of the estimated sustainable catch.

It can be concluded from the above discussions that substantial fisheries abound in Asia, though present levels of production were still slightly below the potential productive capacity. The Food and Agriculture Organizations (FAO) had estimated that the regions' potential yield could reach as high as 33 to 41 billion metric tons per year. The fishery industry in each of the developing countries within the region had been adopting various strategies which were geared towards enhancing capabilities to cope up with the continuously increasing demand for fish and fishery products. These strategies include the use of

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 Table 2. Catch Composition for Asia/Pacific Regional Water Bodies,
 1985-87. (Source: World Resources 1990-1991, World Resources Inst.)
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Indian Ocean (Western)

Average Annual Catch: 2,605,000 mt.
 Estimated Annual Sustainable Yield: 2,700,000 - 4,200,000 mt.

* Redfishes, basses, congers	-	19%
* Tunas, bonitos, billfishes	-	17%
* Miscellaneous marine fishes	-	20%
* Herrings, sardines, anchovies	-	15%
* Shrimps, prawns	-	9%
* All others	-	20%

Indian Ocean (Eastern)

Average Annual Catch: 2,277,000 mt.
 Estimated Annual Sustainable Yield: 1,500,000 - 2,200,000 mt.

* Miscellaneous marine fishes	-	43%
* Redfishes, basses, congers	-	9%
* Herrings, sardines, anchovies	-	8%
* Jacks, mullets, sauries	-	6%
* Shads	-	5%
* All others	-	29%

Pacific Ocean (Northwest)

Average Annual Catch: 25,187,000 mt.
 Estimated Annual Sustainable Yield: 13,500,000 - 16,500,000 mt.

* Herrings, sardines, anchovies	-	23%
* Cods, hakes, haddocks	-	21%
* Miscellaneous marine fishes	-	19%
* Mackerel, snoeks, cutlassfishes	-	7%
* Redfishes, basses, congers	-	6%
* All others	-	24%

Pacific Ocean (Western Central)

Average Annual Catch 6,369,000 mt.
 Estimated Annual Sustainable Yield: 5,800,000 - 7,800,000 mt.

* Miscellaneous marine fishes	-	26%
* Tunas, bonitos, billfishes	-	19%
* Jacks, mullets, sauries	-	13%
* Herring, sardines, anchovies	-	11%
* Redfishes, basses, congers	-	10%
* All others	-	21%

Pacific Ocean (Southwest)

Average Annual Catch 745,000 mt.
 Estimated Annual Sustainable Yield: 1,200,000 - 2,000,000 mt.

* Cods, hakes, haddocks	-	22%
* Jacks, mullets, sauries	-	17%
* Redfishes, basses, congers	-	20%
* Miscellaneous marine fishes	-	10%
* Squids, cuttlefish, octopus	-	15%
* All others	-	16%

improved technology in fish culture as well as the shift from the traditional to modern fishing methods. While the former can contribute to increased production without sacrificing long term sustainability, the latter, unless excess effort has been totally eliminated, can, likewise, increase catch in the short run, but it can also contribute to the problem of overfishing in the long run.

For freshwater fisheries, during the same period, the top five producers in the region were as follows: China headed the list world wide with an annual average production of 3,415,000 metric tons; India, (second, worldwide) 1,169,000 metric tons; Indonesia, (third, world wide) 609,700 metric tons; Bangladesh, (fourth, world wide) 584,900 metric tons; and Philippines, (fifth, world wide) 545,000 metric tons.

About 55-60% (ca. 50 million t) of world production is directly consumed annually. The rest are processed and a substantial amount converted into fish meal as livestock feed. The catches by most developing nations in Asia are mainly used for domestic consumption; only high priced commodities are exported. In the Philippines, even trash fish are eaten. However, per capita consumption of fish varies from country to country depending on availability, price and sociocultural beliefs. While per capita consumption in Japan (83 kg.), Hongkong (37 kg.), the Philippines (41 kg.), Malaysia (43 kgs.) and Taiwan (35 kg.) are amongst the highest in the world, a number of South Asian nations consume relatively less fish than some of their neighboring countries. Per capita consumption varies from a low of less than 1 kg. in Nepal to a high of 7.3 kg. in Bangladesh. The mean per capita consumption of the region was only 12 kg. in 1990 compared to 27 kg. in developed nations. However, the contribution of fish to direct human consumption could be underestimated as the amounts of fish taken by subsistence fishermen and small-scale fish farmers are not usually reflected in government statistics.

Estimates of the world demand for fish by the turn of the century range from 82 to 104 million t. Since population growth is expected to be higher in South and Southeast Asia than in developed nations, pressure for increased fish supply will probably be highest in Asia. Another 5 million t will be needed for this region if consumption is to be maintained at the 1980 level.

Increasing demand for fish and the lucrative fishing business prior to the 1970s, when most of the offshore fishing grounds were already underexploited, have encouraged public and private investment with the development of capital-intensive offshore and distant water fishing. In order to benefit from economies of scale, the processing and distribution functions are vertically integrated and the governments usually provide the necessary support facilities in terms of ports, water, electricity, ice factory, cold storage, most of which are part of the fishing port complex usually located in urban areas. In some big companies, factory ships are at sea to process the harvest from distant fishing vessels.

Japan was ahead of the rest of Asia after World War II, spearheading offshore and distant-water fishing, taking advantage of the technical skill of the Japanese fishermen and vast fishery information collected over the previous years. With new innovations in equipment and fishing gears, annual fish landing from Japanese vessels quickly reached 10 million t. in 1972. South Korea and Taiwan, like Japan, ventured into large-scale fishing in offshore and distant waters all over the world. Deep-sea fishing in South Korea has also grown fast. Some Southeast Asian nations also ventured into offshore fishing but vary in scale of operation. Since the introduction of trawlers in the 1960s, many Southeast Asian nations have rapidly adopted the new fishing technology which initially boosted fish production considerably. The introduction of mechanical seining improved fishing efficiency of the pelagic fisheries in offshore waters.

The period between the 1950s and 1970s saw the blooming of the fishing industry. Towards the beginning of the 1970s, however, the industry began to encounter serious problems of resource depletion, rising fuel costs and increasing competition among the fishing nations as well as the imposition of the Exclusive Economic Zones.

Serious competition between Japanese and South Korean fishing fleets has intensified as both compete for limited fishery resources in the common offshore waters. Similarly, Taiwanese fishing vessels are increasingly being caught

encroaching on Philippine territorial waters while an increasing number of Thai commercial fishermen are being arrested by Burmese and Vietnamese authorities.

In general, the commercial fisheries sector of the fishing industry in Asia is facing a murky future. The ability to revive this sector of the industry depends on the ability to enter into more favorable terms in joint ventures with coastal nations which may need infrastructure and technical skills to exploit the offshore renewable resources.

In Asia, small-scale or traditional fisheries still play a dominant role. Traditional fishermen form the bulk of the fishing population, providing 75% of the domestic demand in India, Bangladesh, Burma, Indonesia, Sri Lanka and many other developing nations in Asia. Traditional fisheries are an integral part of rural economy of many coastal nations, providing direct employment to millions.

After decades of development, the traditional fishermen in Asia remain in poverty and are among the poorest. Even in Malaysia where per capita income is among the highest in Southeast Asia, more than 50% of traditional fishermen live below the official poverty line, as do 75% of the Philippine population, which includes the fishermen, and a large number in Indonesia, Bangladesh and India. Their fishing boats remain non-powered and very few can afford mechanical gears.

Modern fishing technology has accelerated growth of the fishing industry in terms of production and national revenue, but also has caused serious detrimental impact on the fishery resources in many coastal waters. The rapid increase of varying sizes of trawlers indiscriminately reaping valuable fishery resources has resulted in overfishing in most traditional fishing grounds. The Gulf of Thailand, Malacca Straits and coastal waters of the Philippines and Indonesia have been fished to the extent that trawling was banned by the Indonesian government and restricted by many others to reduce fishing intensity and to protect the livelihood of the inshore, traditional fishermen. However, these measures came rather late when most damage had been done.

Overfishing has caused serious reduction in the work force resulting in thousands of traditional fishermen being displaced. About 1/3 of the artisanal fishermen were displaced in Thailand in recent years and those in Malaysia were given alternatives to be resettled in land based rural agro-industry. The fishermen in Singapore are no better than their counterparts in neighboring countries being faced with limited marine resources which are already heavily fished. The fishermen are 13% older and earn 20% less on average than others in the urban state. There is limited entry of fishermen to the dwindling fishing industry in most Southeast Asian and East Asian nations. Japan faced a similar situation decades back when the younger generation preferred land-based occupations than work at sea.

An exception can be made for the traditional fishermen of the newly independent Brunei Darussalam. Because of the rice oil resources, fisheries resources in the inner Bay of Brunei and the coastal waters on the northwest coast are underexploited and provide a livelihood for about 500 fishermen and four times that number of part-time fishermen. Strict immigration control and rigid regulation on entry have enabled the government to keep the fishermen to a manageable number.

Traditional fishermen are scattered along the coasts, estuaries, rivers, lakes and reservoirs. They are mostly disorganized and many are illiterate. Several attempts to organize them into cooperatives have not met with success in Malaysia and Thailand. On the other hand, fishery cooperatives in Burma and China are active and effective with state support. Many traditional fishermen in Asia depend heavily on financiers or middlemen and most of them are unable to repay their debts.

Fishery workers worldwide, and in Asia and the Pacific in particular, face a host of tough challenges in their collective efforts to steer the development of the fishery sector. These challenges arise from several areas: 1) fish production from the wild is levelling off with little chance of increase from new fisheries resources; 2) environmental degradation; 3) habitat destruction; 4) deteriorating water quality in riverine and coastal waters; 5) increasing demand for fish; 6) intense competition for land and water resources for fish production; and 7) institutional and organizational arrangements for managing multiple resource use conflicts.

1.3 Current State of Asia/Pacific Aquaculture

Based on the most recent FAO statistics, aquaculture production in the World increased from 10.1 million metric tons in 1984 to 15.3 million metric tons in 1990, a 54% increase, or about a 8.6% increase annually. Asian countries dominate aquaculture production with about 84% of the global total in 1990, followed by Europe (8%), North America (3%), USSR (2.6%), and South America (1.2%), with other regions producing a further 1.2% of global aquaculture production.

There is very limited aquaculture activity in the South Pacific, and much of this is at an experimental stage. Shrimp monoculture exists at minimal levels in various island countries. A good deal of research activity is underway on coral reef aquaculture systems such as mollusc culture, including the giant clam, pearl oysters, oysters and mussels. Due to the relative abundance of marine fish and the lack of ideal land-based sites for aquaculture, the latter has not caught on a large scale in the South Pacific. Given this situation, this discussion will focus on aquaculture in Asia.

In 1990, China was the leading country among the top ten aquaculture producers in Asia, and contributed about 56% of aquaculture products in Asia, followed by Japan (10.6%), India (7.9%), Korea Republic (6.1%), Philippines (5.2%), Indonesia (4.3%), Taiwan (2.7%), Thailand (2.0%), Korea D.P.R. (1.6%), and Bangladesh (1.3%). These top ten countries produced about 97.7% of the aquaculture products in Asia in 1990.

By species category, Asia contributes about 83% of aquacultured finfish, 80% of crustaceans, 73% of molluscs, 99% of aquatic plants, and 99% of other species in 1990. In the finfish category, carps, tilapia, milkfish and catfish are the major species. Major carp producers are: China, India and Indonesia. China is the leading carp producer where polyculture and integrated systems (integration of fish and agriculture crops/animals) are widely practiced. Carps are also produced in lakes, reservoirs and rivers in cages as well as in paddy fields in the region. Milkfish are mostly produced in Indonesia, the Philippines and Taiwan, while tilapia are primarily produced in China, the Philippines and Thailand, and catfish in Thailand. Asia contributed about 88% of the global aquacultured carp production, 82% of tilapias, and 100% of milkfish. The average annual growth rate of finfish production in Asia for the period 1984-1990 was about 16% compared with about 15% for the world.

In the crustacean category, shrimp/prawn, crabs and lobsters are the major species. Production of shrimp (the most important species in this category) accounted for about 86% of the total crustacean production in Asia in 1990; shrimp are mainly produced in China, Indonesia, the Philippines and Thailand. Asia contributed about 83% of the global aquacultured shrimp, 99% of crabs, 42% of freshwater crustaceans, 66% of lobsters and about 99% of miscellaneous marine crustaceans. The average annual growth of crustacean production in Asia for the period 1984-1990 was about 43% compared with about 36% for the world.

The major species in the molluscs category are oyster, mussel, clams and cockles, and scallops. Asia contributed about 68% of the global aquacultured oyster, 54% of mussels, 99% of scallops, 81% of abalones and 95% of clams and cockles. The average annual growth rate of molluscs in Asia for the period 1984-1990 was about 145% compared to about 8% for the world. Mollusc production does not rely on artificial feeds. Costs of production are relatively low compared with crustaceans and finfish. However, expansion of mollusc production in near-shore areas will become increasingly difficult due to a shortage of sites that are both accessible and without pollution.

Seaweeds include brown, red and green seaweed, and miscellaneous aquatic plants. Asia contributed about 100% of global aquacultured brown seaweeds, 96% of red seaweeds, 100% of green seaweeds, and 100% of miscellaneous aquatic plants. China, Korea, Japan and the Philippines are the major producers of various seaweeds. Except red seaweeds, all other seaweeds had a fluctuating production with a negative growth during the recent years.

Aquaculture plays many important roles in the local economy in Asian countries. It provides a cheap source of animal protein, generates employment

and income, contributes to foreign exchange earnings, and enhances the existing resources.

Aquaculture provides a significant portion of the total fishery production in Asian countries. In 1989, for example, aquaculture contributed about 8 to 58% of fishery production in the selected countries (Table 3). Most aquacultured species (except shrimp, eel and ornamental fish which are produced primarily for export) are consumed within the producing countries. Prices of many locally grown species, such as carps, milkfish, tilapia, catfish, mussels, etc are relatively low compared with other meats, especially when compared in terms of per unit of protein. Since significant increases in production for domestic consumption from the captive fisheries is unlikely, due to overfishing problems, aquaculture is becoming more important as a source of animal protein in most Asian countries. In addition, aquaculture products counterbalance the fish shortage and keep fish prices relatively low, to be affordable to many low income people. Furthermore, the small-scale extensive fish farms provide a cheap and nutritious food in isolated or rural poor areas.

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 Table 3. Share of Aquaculture in Fishery Production (% by Weight) in Selected Countries, 1989 (Sources: FAO Yearbook of Fishery Statistics 1989, FAO Aquaculture Production, 1986-1989).
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Country	%
=====	=====
China	58 (46% excluding seaweeds)
Nepal	58
Philippines	30
Korea RP	30
Korea D P RP	20
Bangladesh	20
Indonesia	18
Viet Nam	17
India	14
Japan	12
Malaysia	9
Thailand	8

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 Information on employment in aquaculture is not well documented. The available information from China indicates that the aquaculture production and labor ratio (full time and part-time labor) is about 1.2 metric tons per participating individual. Applying this ratio to total aquaculture production in Asia, the number of participants in aquaculture in Asia was estimated to be about 10 million in 1990. Many of these people engaged in aquaculture are part-time laborers. Therefore, aquaculture is a valuable source of supplementary employment and income for rural people, especially for part-time fishermen - farmers and women or children. In addition, aquaculture generates "spin-off" employment, estimated to be at least 12 million in Asia in 1990.

The rapid expansion of shrimp culture is primarily export-oriented. Shrimp export contributes a significant share of foreign exchange earnings in major shrimp producing countries in the region. However, shrimp culture usually requires the importation of hatchery equipment, feed, aerators, and technical experts in many developing nations. The net contribution to foreign exchange earnings in those countries should be the differences between the export value and import cost.

Sea ranching or cultured-based fisheries involving the production of hatchery produced seed, intermediary nursing and releasing them into the open

waters, enhances the existing fishery resource. Japan is the most successful country in sea ranching.

2. SOCIOECONOMIC STUDIES OF ASIA/PACIFIC FISHERIES AND AQUACULTURE

There are over 600 entries included in the Asia/Pacific bibliography. This section intends to provide an overview of only selected socioeconomic studies classified under each of the subject codes used in the bibliography. Although a given study can be considered under more than one subject code, for purposes of brevity, each study appears no more than once in this review.

2.1 Subject-by-Subject Reviews

2.1.1 Philosophy and Objectives

There are numerous studies which deal with the philosophical elements and objectives of fisheries management and development in the Asia-Pacific region, although the bulk are on the Asian part of the region.

Kurien's (1983) paper examines why small-scale fisheries continue to be so important in the Asia-Pacific region despite the extension of the EEZ's. He raises questions about what constitutes "appropriate technology" for development and what type of organizational forms are called for in view of the sociocultural importance of small-scale fisheries as a whole.

Panayotou (1982) reviews the basic concepts of welfare economics and focuses on market failures and possible remedies. He provides examples of market failures in aquaculture in Asia and suggests areas where policy changes and research are necessary such as market imperfection, insecurity of land tenure and other externalities. He suggests that these efforts should be confined to areas where the market fails to produce a socially optimal allocation of resources.

In their article, Brewer and Corbin (1984) examine some environmental, economic and socio-cultural characteristics of the Pacific Islands that will affect the aquaculture development potential of the region. Identifying common characteristics provides a broad framework from which island governments and private investors can better identify opportunities for commercial aquaculture and also focus on potential constraints to achieve substantial aquafarming levels in the near future.

Fredericks and Wells (1979) examine the significance of the fisheries sector to the West Malaysian economy, the policy objectives relevant to fisheries development and the policy strategies necessary to achieve the developmental goals. They recommend the use of decision models involving two extreme and one medium policy strategies in evaluating goal conflicts.

Birowo (1979) shows in his study that the artisanal fisheries in Indonesia share more than 90% of the total fish production in spite of its low productivity. He describes the current fishery policies in Indonesia as now directed towards the development of artisanal fisheries and that the current developmental policy includes two basic integrated elements: the provision of production, processing and marketing facilities and the creation of infrastructure facilities.

In the context of Indian prawn culture, Dwivedi (1982) states that the current major objective of fishery development in India is to improve the socio-economic condition of the fishermen and to increase production of protein to fight malnutrition. He cites the availability of low input technology for fishermen which will enable them to produce a relatively high yield level of prawn. An issue is raised whether the government should encourage prawn culture through the small fishermen or through private industry with high technology inputs and a pre-defined objective of export trade.

White (1989) describes the marine conservation and development program of Silliman University, the goal of which is to organize community-based marine management programs for three island villages in the Visayan Region in the Philippines. The paper provides an overview of the program, the implementation strategies utilized and the results obtained. The positive results attained,

which have persisted after the two-year project life span, emphasize the significance of education and community organization/involvement in the development of successful marine resource management programs in the Philippine context. The need for relatively immediate and tangible benefits for communities/participants involved in the management efforts has been identified as an essential element for success.

The paper by Chutiyaputta (1979) examines the potential of aquaculture and marine resources, and the corresponding policies, in Thailand. The study indicates that there were some attempts in 1975 to identify environmental criteria and policies for coastal zone management and to develop detailed guidelines for regulating new development in the coastal zone of Thailand. Part of the result of the study is the proposal for the establishment of a Central Pollution Control Center to coordinate and direct the governmental agencies, governmental enterprises and private sector concerned with handling pollution cases.

Floyd (1985) describes Indonesia, Malaysia, the Philippines and Thailand as all having rich fisheries resources and well-established fishing industries that play vital roles in their economies and provide an important source of high quality protein food. The government's emphasis on export-oriented industrialization in these countries has accelerated growth in the fishing sectors of each country and led to the expansion of international trade. While this has resulted in considerable economic benefits, there also may have been several disadvantages. One potential disadvantage is a reduced supply of fish for local consumption and concomitant rise in domestic fish prices.

Mines and Baluyut's (1988) study is intended to determine effects of the Laguna de Bay Fishpen Development Project in the Philippines on the participating sustenance fishermen's livelihood and social conditions. The study indicates that fishermen beneficiaries resorted to other means of livelihood such as the setting up of fish traps/fish corrals and gill nets around their pens to catch fish outside their module. The authors observe the increase in income levels per fisherman though they express their doubt about favorable loan repayments since production remains significantly lower and amortization plus interest payment are still to be considered. The study recommends the adoption of higher stocking densities/stock manipulation and restructuring of loans to allow longer amortization period along with lower interest rates.

Sakiyama (nd) analyzes the causal relationship between renewable aquatic biological resources and man's activities in Southeast Asia. He contends that the advancement of technology and capital availability not only from domestically generated sources but internationally procured financial resources are leading to an intensified exploitation of biological and mineral resources. He considers these activities to be contributing to the economic development of national economies, while at the same time being highly incompatible with individual interests. The paper suggests the urgency of multidisciplinary joint approaches to ensure sustainability into the future.

Koreuber (1990) provides details on the administrative set-up and funding of the small-scale fisheries development project at Nusa Tenggara Barat in Indonesia. The Project's immediate objectives include promotion of employment, improvement of the supply of high quality food for the population, as well as to effectively manage the marine resource of the area. Project activities in the following areas are discussed: fish processing, marketing and training, group formation, credit programme, monitoring and evaluation activities, and brackishwater aquaculture.

2.1.2 Income, Distribution and Welfare

Khoo and Ellison (1984) in their survey on the income and expenditure patterns of selected fishing households in the fishing villages along the lower east coast of Peninsular Malaysia, highlight the poverty of most fishermen. Their findings provide a clear indication that even those in the higher income bracket have to spend the bulk of their earnings on food and other household expenditures

Collier, et. al (1979) examine the development of sea fisheries off the north coast of Java to determine the benefits and costs of economic development. Since the majority of the fishermen in Java are dependent on traditional fishing boats, the introduction of modernized fishing boats in the area, in spite of efficient and mobile technology, only creates conflicts between trawl operators and traditional fishermen. Their paper indicates that the traditional fishermen were getting the lowest returns to fishing compared to modernized fishing boat operators and concludes that economic development may not have benefited the majority of the fishermen in the area.

Rau (1980) argues in his study that, in spite of the apparent improvement of economies in the Southeast Asian region in terms of expanding gross national product and industrial growth rate, the living standards of the majority of the population, particularly those in the small-scale fishery, remain low. He concludes that not only have economic development measures had little effect on the development of the small-scale fishery, they oftentimes have adverse effects.

Smith and Mines (1982) examine the economic efficiency and distribution of benefits from the fisheries of San Miguel Bay, Philippines. Small trawlers which constitute only 3% of the fishing units and employ only 7% of the labor force were found to be earning the largest shares of the total catch value and 50% of pure profits or resource rents. They suggest that emphasis should be given to the divergence between goals of economic efficiency and equity and conclude that serious considerations should be placed on limiting effective fishing effort so as to maintain positive resource rents and to deal with the presently highly skewed distribution of benefits that favor trawlers at the expense of non-trawl gear users.

Khan (1989) describes fisheries in Bangladesh as a common property resource subject to possible over-exploitation if improperly managed. He contends that a controversy exists over the effect of the present system of leasing various water bodies and whether it renders the fishery a free-access resource or not. He suggests that the stratification of fishermen on the basis of the use of outside labour to family labour appears to be suitable in analyzing the income sharing among various classes. His study indicates that sharing of output among boat, net and laborers is not uniform at all sites and that input share values do not exhaust revenue income.

Reintrairut (1985) concludes that income differentials in the development of small-scale fisheries in Thailand are attributable to geographic location, type of fishing gear, and the degree of competition in input and output markets.

Villafuerte, et.al. (1982) analyze the sharing system and patterns of ownership of several common small-scale gears and compares these with those of the small and medium trawlers operating in San Miguel Bay, Philippines. The paper indicates that there are significant differences between these two groups in terms of concentration of ownership, presence of non-economic and social relationships between owners and crewmen and flexibility of sharing arrangements. The authors, likewise, discuss the differences in terms of existing legal definitions of municipal and commercial fisheries.

2.1.3 Management and Human Responses

Rahman (1989) describes the institutional organization of the Bangladesh government for the management of aquatic resources in the country. He provides a view of the present revenue oriented management system of the government-owned fisheries and at the same time highlights the problems and drawbacks of the system.

In a workshop paper, Munro and Fakahau (1988) summarize the process through which all fisheries in the South Pacific Region must pass if they are to be managed effectively. The importance of the availability of scientific and socioeconomic information is stressed as the primary basis. The paper provides a detailed discussion of the process and how the process can lead to the development of management measures. In the end, the paper emphasizes that the management measures need to be based on a very wide array of often conflicting biological, social, economic and political considerations, and if the resource is shared with adjacent countries, there may also be international implications.

Ruddle (1987) reviews aspects of the general behavioral context within which the administration of the Japanese fisheries and the resolution of conflicts should be viewed. He also describes and provides examples of the historical antecedents of the present day situation. He examines the system of coastal sea tenure as administered by either formal government regulations or informal customary elements. Sea tenure development evolved through problems of conflict management and resolution proceeding from the personal and small-scale level to the impersonal prefectural and national level. He concludes that the most effective, most frequent and culturally legitimate methods employed in managing and resolving conflicts in Japan are informal and personal.

Rowchai (1991) investigates the condition of marine resources in Tarutao National Park in Thailand and identifies the major management problems. He attributes the degradation of the marine resources and habitats to improper use. He suggests the implementation of management programs which emphasize cooperation in the protection of marine resources.

Panvisava (1991) describes Ban Don Bay in Thailand as a biologically productive area currently undergoing rapid development of various human activities. His paper indicates that the continuous exploitation of mangrove forest at the Bay has already caused various problems that require immediate attention if future beneficiaries are to be sustained. He interviews respondents from three communities and considers their knowledge and attitude towards mangrove forest conservation and management as far from satisfactory.

Delmendo (1990) describes coastal fisheries in the Philippines as a major resource of the coastal zone and considers the fisheries within the zone as the most heavily fished resources due to excessive fishing efforts. Low productivity has been the major problem in ASEAN countries during the last few decades. He concludes that unless the situation improves, diminishing fishery productivity will remain a major concern and the socio economic status of coastal fishing communities will remain poor.

Valencia (1988) describes management of Yellow Sea resources as being complicated since the coastal states bordering the Sea differ in internal political ideology and external political and economic alignment. He lists the transnational resource problems to include, among others, overfishing, the role of North Korea and of Japan, and inadequate data and its exchange.

Bailey and Zerner (1992) emphasize the dynamic, historically conditioned nature of community management institutions and their embeddedness in the wider setting of economic and political forces in Indonesia. Similar to community management institutions in Southeast Asia and the Pacific, those in Indonesia manifest major variations in their environmental consequences, distributive designs and dependence on indigenous knowledge of the environment. The paper presents the positive prospects as well as problems of local resource management in Indonesia, utilizing case studies in Kalimantan and the Maluku Islands. General discussion on the rationale for local management of common property fisheries resources preceded the case studies.

Liao et al (1989) describe how human interventions have caused great changes in the Pearl River in China. Water pollution and damming have resulted in decline of the commercial fish population. Overfishing coupled with the use of harmful gear, such as electric shocking, bombing and poisoning, has led to the depletion of certain species. Improved management measures would prevent further deterioration of the aquatic environment, stabilize the fish population and increase fish production.

Majid (1985) provides a detailed discussion of the management Malaysian fisheries focusing on problems faced by the fishing industry in enforcing the necessary regulations. Yahaya (1988), on the other hand, examines a number of issues and constraints confronting the implementation of government management policies in Malaysia to address the issue of overfishing. The paper analyzes the potential effect of management instruments such as license limitation, allocation of fishing grounds, and mesh size regulation policies on productivity of the individual fishermen, employment, cost of fishing and pressure on the fish stock.

Naqi (1989) analyzes the two alternative access systems in Bangladesh - licensing and leasing. These two are being used for the allocation of inland fishing grounds. He highlights the fishery management problems in terms of

legal, economic and institutional characteristics of both systems. His paper indicates that the gradual shift from leasing to licensing has a positive impact on the fishermen as the exploitation of leaseholders has been eliminated and the fishermen are enjoying more benefits than before.

Chian Hung-Tuck (1987) describes the management of mangrove forests in the ASEAN Region (Indonesia, Malaysia, Thailand, the Philippines, Brunei Darussalam, and Singapore). He identifies some of the major management goals such as: to produce and sustain the maximum volume of wood for conversion to charcoal, firewood, poles, wood chips, etc., for local use and export purposes; to provide livelihood and employment for traditional inhabitants dependent on forest resources; to maintain the protective role of riverine and coastal mangroves against erosion and storm surges; and to protect and preserve critical breeding and feeding mangrove habitats of coastal fisheries and wildlife. He observes that while sustained yield management is the main objective of mangrove forest management, there is an increasing occurrence of quality mangrove forest being consigned to non-sustainable uses such as large-scale clear felling for production of wood chips as is underway in Sabah and Sarawak, both in Malaysia. He describes the various techniques and methodologies which can be used in the development of mangrove forest management plans which include: resource inventory, rotation age, harvesting system, natural regeneration, and thinning.

Galvez (1991) looks at socioeconomic aspects of the management of artificial reefs in Lingayen Gulf, Philippines. After discussing the various issues affecting the management of the reefs, which include cultural tradition, the issue of ownership, the conflict between habitat restoration and short term economics, and multiple use conflicts, the author urges the formulation of clear and implementable socioeconomic guidelines geared towards addressing the issues.

Dixon (1989) discusses the importance of valuing coastal resources such as mangrove, and describes the various valuation measures which can be used for this purpose. He elaborates the various country-specific issues affecting the valuation process in Thailand and Indonesia. The author concludes that: 1) decisions on whether or not to convert mangroves to other uses are frequently based on the value of marketable forestry products produced by natural unmanaged mangrove; 2) a natural mangrove is a self-sustaining, productive ecosystem, while many conversion-based alternative uses have proved to be expensive to construct and maintain, or have produced disappointing economic results due to low and declining productivity; and 3) the linked land-ocean system of a mangrove forest creates complicated and far-reaching ecosystem linkages affecting the production of a wide range of socially valuable goods and services.

2.1.4 Property Rights

While there are a number of studies on the subject of property rights, most of these are from the Pacific sub-region. Johannes (1978) describes the reef and lagoon tenure systems in the Pacific Islands. He stresses that the Pacific Islanders have already been aware, even before the first western explorer stepped ashore, of the limits of their fisheries resources and have been using almost all the marine conservation measures in existence this century. He initially discusses what he considered to be the "cornerstone of sound fisheries management" -- limited entry - which limits the number of fishermen that are allowed to harvest a given stock. Awareness of the value of limited entry occurred much earlier in Oceania. Reef and lagoon tenure - a form of limited entry - appears to have been the single most widespread marine conservation method in operation before western contact. The paper provides a detailed account of the basic features of this practice and its value today in the Pacific Islands where it still survives.

In another paper, Johannes (1977) deals with a different aspect of property rights, not the rights of different countries in offshore waters, which is another branch of the law of the sea, but one that touches on the rights of people to coastal marine resources within single countries in Micronesia. The paper explains briefly why potentially serious environmental and economic problems related to this issue are not being dealt with adequately.

Sims (1989) blames the westerner for the erosion of the traditional marine tenure and management systems in the Cook Islands. He cites the displacement of traditional marine tenure by colonial legislation, granting Crown jurisdiction over all lagoon and reef areas following the dismantling of the traditional political systems. He contends that the entire process hastened the demographic changes and western cultural impacts such as diversification of fishing activity which lessened the perceived value of lagoon and reef.

Baines (1989) explains the nature of traditional rights to and the corresponding perceptions of the living marine resources within traditional areas, and the relevance of both primary and secondary rights in the Solomon Islands. The paper places heavy emphasis on an issue which will have far-reaching implications for development - whether traditional rights are rights to use or to own.

An account of some aspects of Kanak history and social organization that relate to customary marine tenure in New Caledonia is provided by Teulieres (1989). He also discusses the mechanisms such as marine tenure and sexual division of labour which would limit the access of resource users to marine resources, which is another means of indirectly managing the fisheries.

Davis (1989) describes the belief of North Australian aborigines regarding maritime claims. They believe that the exclusive right to inhabit coastal waters in their area and exploit the resources it contains has been theirs since time immemorial. The paper states that recent studies of aboriginal fishing customs and traditional sea rights in N. Australia have helped reconcile aboriginal needs and those of growing numbers of non-aboriginal fishermen in a number of very significant cases.

In the South Asia sub-region, Alexander (1980) provides some insights into the sea tenure in Sri Lanka, which basically evolved around the concept of land tenure. An ideal model of Sri Lankan land tenure contains three elements; the concept of the estate as a common property domain in which the co-owners are also kinsmen, the use of genealogies to allocate floating shares in the estate and the system of rotation to equalize environmental effects. Beach seining is cited as one of the most common fishing techniques used in peasant communities.

Ruddle (1988) defines and discusses six social principles common to many traditional systems of sea tenure in the Pacific Basin: 1) sea rights depend on social status, 2) resource exploitation is governed by use rights, 3) resource territories are defined, 4) marine resources are controlled by traditional authorities, 5) conservation has been traditionally widely practiced, and 6) sanctions and punishments are meted out for infringement of regulations. He contends that most remaining systems are hybrids of traditional and modern components, with the latter becoming dominant.

Schatz (1991) attempts to estimate the potential economic rent available to commercial fishermen and holders of leases on government-owned intertidal lands in the Philippines. These estimates are then to be the basis for setting up the new license fees for both commercial fishing vessels and fishpond leases. The intention of the study is to set up a system of license fees which would discourage the operation of less efficient fishing vessels for purposes of reducing fishing effort and in the case of fishponds, base the license fee on the opportunity cost of the land in its best alternative use.

Smith and Panayotou (1984) discuss the mechanics and implications of the use of municipal waters for fish corrals, oysters culture beds and gathering milkfish fry in the Philippines. Concessions such as these are awarded annually to the highest bidder. Smith and Panayotou's paper provides theoretical discussions of the system for economic efficiency. They conclude that the system increases economic efficiency in resource use and generates significant income for municipalities which they can distribute as they see fit whether or not this necessarily benefits the fishermen.

The paper by Cruz (1985) describes the characteristics of the San Miguel Bay fishery in relation to the manner in which government intervention aggravates the problem of overexploitation of resources. He states that the introduction of common property approaches to management could have sufficiently controlled the exploitation of the coastal fishery, but the formal institutional structure of the resource use does not recognize the common property attributes of the

fishery. He contends that government policy considers the resource management problem similar to a private property problem or a mere case of enforcing fishery access rights. Consequently, the intervention and the introduction of new technology aggravates existing conflicts, which will result in increasing population pressures in the area. The discussion then underscores the existence of a resource sustainability threshold beyond which transitions are neither gradual nor peaceful; indeed, they are characterized by conflict.

2.1.5 Labour

There are only a few studies, particularly on labour mobility, which are included in the bibliography on labour.

Pandjaitan (1985) concludes in his paper that transmigration or the transfer of households from thickly to sparsely populated areas in Indonesia can offer unique opportunities for the development of small-scale fisheries. He also explains the various avenues to achieve specific development, as a component of the overall transmigration programme, is directed toward solving the issues of market development, sanitation, improved culture methods and processing technology.

Panayotou and Panayotou (1986) estimate the degree of mobility among fishing households in Thailand and identify and measure the relative significance of impediments to mobility. Their paper provides indications that fishermen are responsive to economic incentives and do move between occupations to take advantage of earning differentials. They conclude that labour appears to be quite mobile between occupations but less mobile between locations and reject both the extreme positions of perfect mobility and immobility in favor of imperfect but substantial mobility. The paper states that government efforts to upgrade small-scale fisheries will be met with considerable response from fishermen if the right incentives are given.

Bailey (1982) examines the existing patterns and future potential for occupational and geographical mobility among small-scale fishermen of San Miguel Bay, Philippines primarily to determine whether such mobility has led or is likely to lead to a reduction of surplus fishing labor or an improvement in the productivity and income of those fishermen who remain. The issue of competition between small-scale fishermen and trawler operators is discussed. The author questions the propriety of displacing small-scale fishermen from their traditional fishing ground in view of the limited alternative employment opportunities. The paper recommends better enforcement of current management regulations designed to minimize competition between small-scale fishermen and trawlers, which would subsequently improve the economic condition of the small-scale fishermen.

The adoption of fisheries as an occupation by tribes (Bhils, Damors and Garasias) of the southeastern division of the state of Rajasthan of India is discussed in the paper of Kullshrestha (1990). The paper relates the ongoing effort of the Indian government to improve socioeconomic conditions of the poor tribal people by providing them employment through fisheries.

Rao et. al (1988), investigate the monetary wages in the fishing industry of Versova fishing villages in Bombay, India. The survey indicates that there is no uniform wage structure and that the total wages paid are based on the number of days of fishing trips as well as the size of the boat.

In Malaysia, Siwar and Ngah (1979) examine the socio-economic characteristics of the fishing community at Trengannu with particular focus on the nature of labour utilization and the extent of the effect of low income prevailing in the area. Their study indicates that given alternative employment opportunities, about 67% of the ordinary crew were prepared to leave the industry. They observe that seasonality in fishing activities and seasonal fluctuations in income can be minimized in the long run by the construction of marine infrastructures.

Hotta and Wang (1985) describe the Malaysian Fishermen's Relocation Program (FRP) whose objectives are to alleviate the incidence of poverty of traditional fishermen by offering them alternative employment opportunities, and to decrease in absolute terms, the number of fishermen in order to reduce the impact of fishing effort on the resources.

In a related study, Wahyono (1987) discusses in his paper the trans-migration programme of fishermen and brackishwater fish farmers in Indonesia. The Program is basically aimed at transmigrating people from one region to other regions primarily to achieve better distribution of population and labour forces; to open up production area; to achieve a better standard of living for the people; and to gain a more equitable growth of development between regions.

Bailey (1987) reviews the basic demographic information on small-scale fishing communities in Indonesia focusing on the causes of variability between communities in household size, and the differences in educational attainment between owners and crewmen. Information on occupational and geographic mobility among fishermen indicates a net movement of agriculturists into fishing. He also describes the ownership pattern and the sharing systems. He likewise reviews the government programs designed to overcome constraints to small-scale fisheries development. Two assumptions seem to govern program design and implementation; that middlemen who act as both financiers and fish buyers exploit small-scale fishermen; and that fishermen are reluctant to adopt innovations in technology or social organization.

Esporlas (1982) discusses the seasonality of fishing in San Miguel Bay, Philippines in relation to weather patterns and the presence of hills and mountains which shelter different parts of the bay during the two monsoonal seasons, allowing for year round fishing. The paper indicates that the seasonal nature of fishing commonly necessitates a shift from one gear to another to take advantage of various fishing grounds and fisheries. This has some effect on the marketing patterns and activities of the processors. Marketing relationships and constraints are related to community size, numbers of buyers present and availability of fish, and the impact on price levels during seasons of peak supply.

2.1.6 Communities, Coastal Areas and Post Harvest

Literature reviewed under this category are grouped into two categories: communities and community-based management, and marketing and distribution.

Communities and Community-based Management. A volume of essays edited by Spoehr (1980) brings together literature dealing with fisheries and fishing communities in India and Sri Lanka. The purpose of this collection is to make readily available a body of substantive analyses bearing on maritime resources and their utilization. This volume contains essays on communities of small-scale fishermen covering a wide range of subjects including socioeconomic issues including, among others, issues of customary fishing organizations and comparison between ocean fishing and agriculture in fishing communities.

Engvall's (1978) paper highlights some major issues concerning the development of marine small-scale fisheries in Southwest Asia vis., Bangladesh, India, Pakistan and Sri Lanka, focusing on the need for a rational community development approach, improved means of production, suitable marketing and credit arrangements and institutional services requirements.

Yap (1979) assesses the factors which caused the failure of the cooperative movement in the fishing industry in Malaysia and notes the urgent need to consolidate and strengthen the entire movement. He suggests that one step is the integration of Fishermen's Association and Cooperative Society which are existing in the same area. Technical and extension services required to sustain their continued existence should be made available and activities of these groups should be expanded to include more programs which require active participation of members.

Alix (1989) describes how the Central Visayas Regional Project in Cebu, Philippines, used community-based resource management methods to address the problems of declining productivity and resource degradation in the uplands and in coastal waters. Organization to assist communities to identify and priorities needs, aspirations and constraints to development is critical.

Munoz (1991) presents a synthesis of lectures and presentations on community-based approaches used in the implementation of the coastal resource management component of the Fishery Sector Program in the Philippines. She

describes how coastal communities get involved in the sustainable management of their resources.

Rosen (1989) studies the Kattumaram fishing family in the fishing village of Pattipulam kuppam in India. It is primarily aimed at achieving a better understanding of kattumaram fisherfolk to improve their living conditions. It concludes that any improvement implemented has to take into consideration the present work organization and living pattern of the fisherfolk.

Sehara, et. al. (1986) compares the socioeconomic conditions of fishermen in the villages of Maharashtra and Gujarat coasts in India focusing on income, consumption and employment patterns, and available credit facilities. Conditions in Gujarat villages are found to be comparatively better.

Panvisava, et al (1991) evaluates the local patterns of coastal resource use in the fishing community of Pak Kra Dae, Ban Don Bay, Thailand. In his study, he describes both the demographic, educational and socioeconomic status and patterns of these households. He identifies the major issues on resource use, as seen by the villagers, as the depleting of mangrove forests, worsening water quality and declining inshore fisheries. The villagers saw the causes of these as beyond their control and they are forced to adapt to changing environmental conditions.

Baum and Maynard (1976) survey two fishing communities in Palawan, Philippines. The survey primarily intends to provide the necessary socio-economic background information for the formulation of broad-based projects designed to meet some of the specific needs and problems of the municipal fisheries. The study indicates the apparent lack of social cohesion and community pride among local citizens. Such a state of community insensibility could be overcome through the creation of a community enterprise which could produce tangible benefits for the majority of the citizens. The authors conclude that this project area possesses all the basic and necessary resources, human and natural, for commercial development of an integrated fisheries industry, considering that there are no other natural possibilities for the creation of an industrial or commercial base for the local economy.

Nuruzzaman (1989) discusses the problems and issues of survey and data collection in rural fishing communities in Bangladesh. He describes the problems of data collection as mainly institutional, financial and technical. The major institutional problem is the lack of coordination among agencies dealing with fisheries. He suggests the elimination of irregularity, inconsistency, and lack of representativeness in the data collection through provision of properly trained personnel, and improved coordination with other departments/agencies.

Flores (1992) describes the experience of community-based coastal fishery resource management in dealing with the issue on the destruction of natural resources in four island communities in the central visayas region of the Philippines, namely; Sumilon Island, Apo Island, Balicasag Island, and Pamilacan Island. Problems encountered in implementation and eventual successes are both discussed. The author describes the lasting effect of involving the fisherfolk in managing their own resources using the knowledge they learned through years of experience.

Pollnac (1988) designs a guide intended to provide information necessary to adequately understand the social and cultural factors which influence the development of fishermen's organizations. The guide contains instructions for obtaining social and cultural information useful in evaluating a fishery organization, the potential for establishing organizations, as well as providing guidelines for using the information in decision making during the development of fishermen's organizations.

Fernando (1987) describes the inland and marine fisheries of Sri Lanka considering recent developments and implications for resource management. Social and cultural factors involved in the control of fishery resources are detailed indicating how such factors have assisted the fishing communities in Sri Lanka to manage an open access resource in a manner where economic returns to capital and labour are higher than their respective opportunity costs.

Kurien (1992) reviews the role of fishermen's organizations in fisheries management in the Indo-Pacific region, specifically India, Indonesia and the Philippines. He cites the traditional adoption of well integrated systems of

governing fishing practices of many communities in the study area as well as the rights of access to the sea. The author illustrates how fishermen's organizations have strongly influenced government decisions to initiate steps for fisheries management, though their concrete involvement in the actual process of fisheries management is still minimal. He then concludes that for these organizations to fulfil more formalized roles in fisheries management, they would require recognition and support from governments and national and international organizations.

Marketing, Trade and Distribution. Mabunay (1986) describes the management of fish catch and its sale by small-scale fishermen in Iloilo province, Philippines. The paper shows the network of linkages along which products move, and examines the socioeconomic characteristics of those engaged in fish marketing in the rural setting of six coastal communities.

Aguero and Cruz (1991) examine the investment and marketing strategy that would maximize returns for grouper farms operating in the Philippines, using decision theory and financial analysis. The result of the study indicates that all investment and marketing combinations yielded attractive returns, though the staggered investment, export market strategy seems to favor the small-scale entrepreneur.

The Bureau of Fisheries and Aquatic Resources (BFAR) (1983) studied the socioeconomic characteristics of municipal fishermen and fry gatherers and their households, costs and returns of fishing operations and fish marketing practices in Bayawan, Negros Occidental, Philippines. The paper indicates improvement in infrastructure, health facilities, and electrification leading to the satisfaction of more heads of households. The system for sharing catch from fishing operations appears to be non-profit oriented and there are signs of willingness to undertake collective efforts to bring about change as evidenced by higher percentages of membership in social, civic and other organizations.

Szanton (1972) provides a very detailed description of subsistence marketing in the small fishing town of Estancia in the province of Iloilo, Philippines. The study reveals the considerable amount of cooperation between various groups of what she calls "subsistence" vendors who operate on a small-scale basis. She explores the concept of the individual's right to survive which she considers to be more basic than profits, spreading risks, or gaining of assistance - a right which goes beyond all other economic or legal considerations. She stresses the existence of the "suki" (regular exchange partners) relationship which is a patterned interaction between buyers and sellers focusing around the bargaining process which transcends economic factors to establish social relations between the buyer and the seller. This relationship involves mutual trust and services, credit included. The author emphasizes that the extension of credit is a crucial problem and is a critical factor for the continuance of the "suki" relationship. The book presents a vivid account of a market system somewhere in transition from traditional exchange to modernity.

Fernando (1985) verifies the popular postulate that middlemen "exploit" fishermen through loan-secured preemptive marketing in Sri Lanka. He examines the fishermen's dependence on credit from fish traders, the dominant mode of fish-sale, and the numbers of traders both at the wholesale and retail level. He concludes that the fish marketing system in Sri Lanka is more competitive today due to the improvements in transportation and communication network and the increased profitability of fishing, which allows internal generation of capital for investments. His study shows that fish traders are earning substantial profits attributable to risk premiums associated with these new ventures. Indications of ongoing entry into the markets and observed profits are in disequilibrium. The author recommends government intervention to identify and diffuse the required skills for successful fish marketing, to develop more efficient means of transport and to facilitate the flow of market information to the fishermen thus reducing any frictional inefficiencies in the marketing system of Sri Lanka.

Librero (1985) analyzes market structure, in terms of the degree of concentration of sellers and buyers, product differentiation, and conditions of entry and exit, in the marketing system of fish in the Philippines. She

concludes that the fish marketing system is imperfectly competitive and nearing oligopoly in many cases. The most common marketing practices are auction sale, contract sale, and sale on a "first-come-first-served" basis. Fish auctions are of specific interest in view of the so called "whispering system" used in receiving bids which allows the seller to take into account nonprice considerations such as the credit standing, honesty, and loyalty of the buyer (suki), so that the sale does not always go to the highest bidder. Overall, prices of fish differed directly with size and freshness and inversely with credit standing of the buyer, the size of the lot bought, and the volume of fish available in the market. The author concludes that it would be imperative to develop more landing facilities, improve the distribution of ice plants, and reduce the number of links in the market chain as a prerequisite for increasing efficiency of the marketing system in the Philippines.

In his doctoral dissertation, Pomeroy (1989) analyzes the economic aspects of production and marketing in the small-scale fishery of Matalom, Leyte, Philippines. He identifies the assumptions which served as the basis for the existing policies and regulation for small-scale fisheries. These include: the homogeneity of fishermen and fishing communities with respect to resource endowments and patterns of behaviour; the irrational action of fishermen in terms of their economic behaviour; and the exploitative nature of the common credit and marketing arrangement between middlemen and fishermen, specifically the "suki" relationship. These assumptions are utilized as hypotheses which are tested in the study. Focusing on the marketing part of the study, the author utilized three different, but complementary market analysis methodologies -- descriptive, organizational and price efficiency - to examine the exploitative nature of the "suki" relationship. The study indicates the existence of conditions for oligopsonistic market behaviour at the producer/primary buyer level. It also shows no proof of the excessive earnings of middlemen. The paper reveals that the middlemen are constrained by three factors from exercising market power. These are: the low barrier to entry for new middlemen; the close social and kinship ties between middlemen and fishermen; and the fact that the "suki" relationship is mutually beneficial.

Mubyarto (1979) analyzes the export potential for fisheries in Indonesia. He observes that domestic demand had increased rapidly due to population growth and the apparent increase in per capita income.

Saefuddin (1979) provides some insights on the problems of fish marketing in Indonesia. The availability of handling facilities, such as ice plants in most fish ports is considered to be one big factor in ensuring a better price for the catch. He concludes that limited capital not only weakens the bargaining position available to fishermen in determining the price but also provides the fish traders a better chance to dictate the price.

Artachinda (1979) analyzes the domestic market for Thai shrimp including its market potential for export. The author uses a simple model to analyze the factors affecting the quantity of exports to Japan, USA and Hongkong. The quantity demanded by Japan showed statistically significant coefficients.

Mudiantono (1983) analyzes the marketing system for milkfish in Semarang Regency in Indonesia. He concludes that the marketing system is efficient, although he identifies the various factors which will affect its efficiency. One factor is that the middlemen use credit to tie producers to sell their catch at prices lower than what is prevailing in the market. The paper describes the market structure, conduct and performance of the system and utilizes various indicators such as marketing cost and margins in the analysis.

Lim Chong Keat (1976) provides a general view of fish marketing problems in the East Coast of Peninsular Malaysia. In a broad context, the fish marketing problems can be grouped into five categories; 1) problems brought about by inadequate allocation of funds by the government; 2) structural and technical problems affecting fishermen; 3) structural and technical problems affecting middlemen; 4) fish handling and transportation problems; and 5) problems in the implementation of new marketing plans due to sociological barriers. The author provides detailed discussion on each of the areas of concern along with its corresponding impact on fishery development in the area.

Sajo (1986) examines the viability and profitability of fish processing activities of small-scale fishermen in Iloilo. Viability of processing needs strengthening since traditional methods are still being used. Fewer fishermen are actively engaged in processing, while more processed fish is for consumption rather than for sale, and it is being done irregularly. The author concludes that to improve the efficiency and increase profitability, small-scale fishermen must improve their management, logistics and financing and adopt new technology in fish processing.

The pricing efficiency and related aspects of fish processing and marketing in two communities of San Miguel Bay, Philippines covering salting, dried fish processing and marketing are examined by Yater, et. al (1982). Pricing efficiency was found to be low. Group activities that manage gasoline supply and provide processing to compete with existing suppliers and processors, are perceived to be the best hope for the community.

Kuperan et, al. (1988) assess the inadequacy of fry and fingerling supply in meeting the needs of the aquaculture industry. The study reveals that the thinness of the market for fry and fingerling is a major factor that will influence the development of the industry. The authors contend that unless the grow-out farmers expand their operations or new areas are opened up for fish and prawn culture, further investments in the fry and fingerling operation will result in reduced returns or losses. Being the single largest component of operating cost for fry and fingerling production, the importance of labor in the industry is emphasized.

Ishak (1988) studies the marketing system for fresh fish in Malaysia. Some conclusions are that the cooperative movement is ineffective unless intervention is made in markets that provide price leadership to others; the interlocking role of credit that characterizes the whole system stifles competitions, and the conventional policy perception of market intermediaries as merely independent traders fails to recognize the threat posed by their associations.

Torres, Pabuayon and Salajo (1987) analyzed the market structure of the two fish landing ports, Dalahican, Lucena City, and the Navotas Fishing Port Complex in Metro Manila, both in the Philippines. The various marketing practices, operations and performance were compared. An oligopolistic market structure was found to exist due to the multiple economic functions performed by traders and vertically integrated operations.

2.1.7 Women

While there are a number of studies concerning women in fisheries, most of these materials are from the Bay of Bengal countries (India, Sri Lanka, Indonesia, Thailand, Burma and Bangladesh) since the Bay of Bengal Programme has a separate project about the role of women in fisheries.

Drewes (1986) reports on the approach adopted by the Bay of Bengal Project. The approach entails group action among fisherwomen led by trained "link workers" who serve as contact persons between villages and the government for purposes of ensuring that all available welfare and subsidy schemes for them were made available to their villages. He proposes a statewide expansion of the link worker scheme.

In another related study, Natpracha (1986) describes a pilot project to improve the living standards of fisherwomen from two villages near Chittagong, Bangladesh. The project tried out the "participatory approach" where groups of fisherwomen led by "link workers" took active part in the project at all stages. The paper highlights the project methodology, achievements and failures, problems and lessons for the future.

Tempelmen (1986) discusses the finding of a 1984-1985 socioeconomic study of fisherwomen in four coastal villages in Visakpatnam district, Andhra Pradesh, India. The primary purpose of this study is to identify pilot projects which will upgrade the living conditions of fisherwomen in coastal villages.

On the role of women in marketing and distribution, Kalavathy (1986) describes the marketing organization of a large fish landing center and characterizes in particular the role of women in the marketing business in India. The paper indicates that while the modernization of fishing technology and fish

transport has benefited some women by way of higher earnings or new earning opportunities, it has further aggravated income disparities among fisherwomen.

In the Philippines, Tungpalan et al (1991) analyze the role of women in sustaining fishing households, the extent of their involvement in the economic-political activities in fishing communities, how they cope with the double pressure from their traditional gender roles and increasing economic activities, and the implications of these situations for a community-based coastal resource management scheme. Their study reveals that, in spite of women's expanded role, economic life in the fishing villages continues to be male-dominated.

In the Pacific sub-region, David's (1989) article attempts to address some issues of post-harvest fisheries activities in Vanuatu and explores the possibilities of involving women in the post-harvest processing and marketing of products from village fisheries.

Regionally, K-C Chong and Sehara (1989) present the results of a survey in the Southeast Asian region regarding the role of women in aquaculture research and training activities. The results indicate that improvements have been made in the integration of women in aquaculture technology development and transfer.

De Castro (1986) studies the role of rural women in the development of the fisheries resources in Panay Island, Philippines for purposes of their integration in the fisheries development program in the Western Visayan Region. The author indicates that the ineffectiveness of several government development programs was attributable to non-involvement of rural women. The study emphasizes the need for society to give recognition to women's role in production, marketing, and fish food preparation. The author concludes that there is a need to undertake policy and program initiatives which will: 1) harness capabilities of women to help alleviate unemployment and malnutrition, and 2) provide more research and other support for subsidizing fishing activities of women on their own or in joint undertaking with their men.

Srinath (1987) presents a case study to investigate the socio-economic conditions of the fishing communities of Vypeenkara, in particular the role played by women. Prawn peeling, fish curing, drying and marketing, net making, fishing in the canals and clam shell collection are the major areas of the women's participation. The study concludes that participation of women is governed to a certain extent by caste. Likewise, the availability of infrastructure is found to be a major factor influencing women's role in fishery-related activities.

Firth (1984) compares the roles of men and women in the fishing communities of Tikopia (Solomon Is.) and Kelantan (Malaysia). The study indicates the existence of a number of common features in the respective roles of men and women in the economy.

Yahaya (nd) studies the role and status of women in the rural sector of Malaysia from the perspective of their economic contribution and participation, focusing on the fisheries sector and in particular, the small-scale fishing communities. The paper describes the current economic activities together with sets of recommendations to enhance women's participation in the small-scale fisheries sector.

Pomeroy (1987) describes the role of women and children in small-scale fishing households in Matalom, Leyte, Philippines. He contends that researchers and policy makers are becoming aware of the active participation of women and children in providing added income and services to the fishing household. Thus, in recognition of these roles, they should form an integral part of the development efforts in the sector.

2.1.8 Information and Research Assessment

Under this category are studies which assess socioeconomic information and research needs in fisheries and aquaculture.

The contribution of scientific research, including socioeconomic aspects, in the development of fisheries in Asia is examined by Chua and MacLean (1988). They lament the rather limited amount of research on socioeconomic and other important fishery-related non-biological disciplines, as it contributes to the failure of fisheries research to have positive impact on the development of the

sector. Lack of strong leadership, insufficient funds, lack of research direction and role misconceptions are cited as the major reasons for such failures.

In a related paper, Yamamoto (1990) cites the importance of involvement of more social scientists in Fisheries Science. He states that social science in the fishery field can be considered as a scientific link between fisheries science as a whole and the fishing industries..

Rao (1988) analyzes the contribution of social science research to the integrated development and management of marine fisheries in India. The study is primarily intended: 1) to study the past trends in fisheries research and its role in the development and management of marine fisheries; 2) to identify some of the constraints and weaknesses inherent in fishery science research in the promotion of fisheries; 3) to discuss the need for social science research, especially fisheries economics, to deal with the problems associated with increased modernization and expansion of marine fisheries; and 4) to suggest an integrated approach for the sound development and management of marine fisheries.

Chou Gek Chua (1989) traces briefly the history of the Kelong fishery in Singapore and discusses how the mode of production does not depend entirely on economic considerations of profitability alone. Rather, much rests on certain ideological stances of social relations and networks among the workers, and in particular on religion and how it influences the concepts of time and space.

The FAO/Regional Office for Asia and the Pacific (RAPA) (1986) publication provides a concise description of the salient features of the marine small-scale fisheries of Indonesia. Information regarding the small-scale sector, compiled from various sources, is presented on different facets of the fisheries. The publication serves as a basis for further study of small-scale fisheries and planning for development of the small-scale fisheries sector.

Ramos et al (1979) identifies the sources of aquaculture information for fish farmers in the Philippines and the existing channels for information flow between research institutions and end- users, and describes strategies used in the dissemination of information from the view point of the fish farmers.

Chong et al (1982) examines the unified body of information assembled on milkfish aquaculture to determine where further efficiencies of resource use in the milkfish systems can be obtained.

Munasinghe (1980) provides basic instructional information on fishery resource management for the use of students with little or no economic background. She stresses the necessity of integrating economics in the management of fishery and provides basic economic concepts for this purpose.

Chia and Khan (1991) present the results of a questionnaire survey in Singapore primarily conducted to determine the awareness of the community on marine issues and concepts, their preferences for marine resource commodities and their general perception of the use of the limited coastal area. The study indicates that awareness of the respondents on marine issues and concepts was poor, though the results varied widely across level of educational attainment. Likewise, income and educational levels are the primary factors for citizen's preferences for seaside accommodation and marine recreation. The paper concludes that the survey shows no clear indication of the citizens' perception of use of the coastal zone.

Seenappa and Surrendra (1988) study the knowledge and attitude of fishermen trainees in India towards fish culture, and probable associations between socio-economic characteristics. The result indicates that training produces significant overall gains in knowledge and some increase in favorable impressions about fish culture.

Coates and Mys (1989) provide details about the analysis of a database concerning the socioeconomic status of the people living in the Sepik and Ramu Rivers region in Papua New Guinea. The following aspects are covered: population distribution by catchment and province; number of villages; population distributions related to water temperatures; vegetation types; roads; water resources; rivers and lakes; and other socioeconomic data. This database may be used in analyzing socioeconomic issues in this area in the near future.

Pollnac (1989) compiles nine (9) papers which examine an important range of issues on the subject of monitoring and evaluation of the impacts of

small-scale fishery projects. The papers cover the following topics: the perspective of the development agency on impact evaluation; systems of standard impact evaluation for an international development organization; operational assessment of fisheries development; monitoring and evaluation of peace corps marine fisheries and mariculture projects; monitoring and evaluation of small-scale fisheries projects as small business; artisanal fisheries development ; and evaluation of two small-scale marine fishermen's training projects. These papers tackle critical issues in various locations including Southeast Asia. Both the diversity and commonality of the studies should be of interest to those involved in the difficult process of fishery project impact monitoring and evaluation.

A Bay of Bengal Programme (BOBP) (1983) magazine provides a guide for teachers in non-formal adult education centers for fisherfolk in Tamil Nadu, India. The teacher or what is called "animator" is a person coming from the village where the center is located. The animator helps the "learners" acquire knowledge, attitudes and skills relevant to recognizing their own potential in improving their environment and occupation. The guide covers eight major subject areas - community, occupation, health and nutrition, social problems, leadership, income and saving, cooperation and education. The guide highlights the problems relevant to the fisherfolk and outlines the approaches on how to analyze such problems. Background materials in the form of discussion papers , statistical data and case studies are provided.

2.1.9 Technology and Innovation

Under this category are studies conducted to a) analyze the effectiveness of a given technology, methodology, model or concept, and b) introduce a new technology, methodology, model or concept.

Panayotou (1982) provides an analytical framework for the management and development of coastal small-scale fisheries in developing countries. Smith (1982) introduces a methodology used in the case studies presented in a workshop focusing on the role of relative prices in farmers' production behaviour. He, likewise, presents a model for explaining output variations among farmers.

The paper by Wattanuchriya, et. al. (1982) deals with the cost structure, profitability and production technology of catfish production in Thailand. The study reveals that there is a dominance of feed and particularly trash fish, in the cost structure and profit differential between small and large farms as well as between inexperienced and experienced farmers. The paper concludes that there is inefficiency in input use and recommends that more credit be given to small farmers and that research and extension be intensified to determine optimum feed formulas and ways to control disease.

Lee (1982) examines the entire milkfish system in Taiwan including fry gathering and marketing, baitfish production, and market size rearing and marketing. A constant elasticity of substitution (CES) production function is used to estimate the input-output relationship for baitfish and market-size production systems, with all inputs classified into labour and capital. An important finding is that the elasticity of substitution between labour and capital exceeds unity indicating rather easy substitutability between the two inputs. Likewise, the study reveals that the rates of return to marketing intermediaries are high for both fry and market size milkfish.

Sevilleja (1982) analyzes the feasibility of integrating fish with backyard and commercial pig operations in the Philippines using fish yield from experimental pig-fish trials as the basis. The basic intention is to develop appropriate technologies involving the use of pig manure in tilapia production. Using partial budgeting techniques, it is estimated that the integrated fish production would increase the income of both backyard and commercial pig operations. The author concludes that the additional capital requirements reduce the rate of return on investment and that the larger operation is expected to benefit more than the small ones.

Librero (1985) examines productivity, costs and returns for various types of boat motorization and fishing gear in eight regions in the Philippines. The study indicates that motorized boat users can be more or less productive than

non-motorized users, while the gear employed in motorized boats gave better production than when used in non-motorized boats except for beach seine and other minor nets. The author concludes that due to large fuel costs, non-motorized boats realized a higher net income.

Navaluna et. al (1982) examines the economics of small and medium-sized trawlers in San Miguel Bay, Philippines. The study presents the investment and operating costs for each type and the various sharing systems used to determine the income of owners and crewmen. Incomes are compared with the respective opportunity costs. Small trawler fishing units are found to be earning significant profits over and above opportunity costs. The paper discusses the means by which trawler owners attempt to increase their profits and minimize risks through crew selection and management, choice of landing site and ownership of the optimum number of fishing units.

Wong Poh Kam et al (1991) provide a general framework for the use of GIS as a tool for physical resources assessment and planning of coastal zones. They stress that, in spite of some development in the scientific literature on the use of GIS, the application of such a tool in the socioeconomic area has been less advanced especially in the developing countries.

In the article by Mitra et.al (1989), the social acceptance and economic returns of tilapia culture in West Bengal are discussed. The paper states that the people of Calcutta initially rejected tilapia when it was first introduced. Due to its low price and tasty nature and the comparatively high price of other species of fish, tilapia gradually became widely accepted. The paper also touches on the culture process, growth, economics, and social impact of the culture of tilapia in the sewage-fed bheries and paddy cum fish culture fields.

Chowdhury (1989) presents the results of an econometric study of the socio-economic status of fishing households in 4 selected villages in the Kamrum and Dhubri districts of Lower Assam, India. The study reveals that income and family size are directly correlated as family size, expenditure on food, clothes and fuel have direct bearing on the total monthly expenditure of fishermen household.

In the People's Republic of China, Monfort (1988) presents discussions of fishery activities covering marine and freshwater fisheries, marine and freshwater aquaculture, processing and trade of aquatic products. Monfort explains that the lack of appropriate technologies and funds impedes the process of modernization. Nonetheless, he concludes that the introduction of new economic policies in 1979 have favorably influenced aquatic production.

Liao et.al. (1990) examine in detail technology transfer in aquaculture development, particularly the role played by a consulting engineer in aquaculture technology transfer in Asia (Indonesia, China and India). The authors consider the transfer of technology, especially in a rural situation, as being the most difficult and critical area. The success of the entire process depends upon the people who must be convinced of the benefits. Nonetheless, when effectively done, technology transfer can minimize the gap between the developed and developing countries. The paper stresses that both the consultant and the recipients must carefully and realistically evaluate cultural conditions and social, educational and industrial standards of the recipient country before a meaningful/useful technology can be effectively and timely transferred.

Ingmanson (1984) assesses the needs for marine technology development in the Pacific Ocean which he considers to be complicated by a number of factors. First, marine technology is a broad field ranging from remote sensing to fisheries. Second, the distance between countries and between the resources and the location of use are very great. Third, the languages and culture of the region are diverse, making communication and cooperation difficult. Fourth, there is a great range in the level of economic development between the countries of the region. Lastly, the UN Law of the Sea will affect vast areas of the region. The paper lists a number of proposals to foster basic economic growth and development through marine technology.

Veravat (1987) examines the impact on fishery resources and small-scale fishermen of technological innovations in Southeast Asia. His paper cites the ongoing declining trend of small-scale fisheries while industrial fisheries are facing some difficulties in increasing their production in the traditional

fishing grounds. The author then stresses the need for fishery planners to design a new fishery development and management plan in order to provide sustainable ways and means of exploiting fishery resources.

2.1.10 Financing of Fisheries Activities

It is important to stress in this section that there are a number of studies on marketing which are directly related to the aspect on credit. The studies of Szanton (1972), Librero (1985), Fernando (1985), Pomeroy (1989), Saeffudin (1979), Mudiantono (1983) and Sajo (1986) are included in this category. Some of the studies cited below belong to the above group.

Lawson's (1972) study focuses on the determination of credit needs of artisanal fishermen in Southeast Asia covering the countries of Ceylon, Hongkong, India, Indonesia, Malaysia, Philippines, Singapore and Thailand. The field of inquiry is confined to artisanal fisheries, the development of which appears to be greatly constrained by various institutional and marketing conditions. Primarily, the paper is intended to provide information and guidance necessary in establishing and operating credit systems.

In the Philippines, Octavio et al (1986) assess the nature, extent and procedure involved in various fishery credit programs with emphasis on two major government credit interventions. The authors conclude that unless immediate policy reforms and effective recoupment measures are installed, the current fishery credit programs are bound to fail.

Lohani (1991) discusses the Asian Development Bank's commitment to promote socioeconomic progress that is supportive of the environmental concerns of its developing member-countries. He cites the Fisheries Sector Program in the Philippines as a manifestation of this commitment.

Mammo (1987) surveys the ownership, income, indebtedness and savings patterns in two Orissa fishing villages, Udayapur and Gopalpur in India. The author concludes that the data collected will help small-scale fisheries development activities in general and rural financial institutions, in particular.

In Sathiadhas and Venkataraman's (1983) study, an investigation of the financial state of fishermen is undertaken on the extent of indebtedness of the fishermen. The role of institutional and non-institutional credit agencies in providing financing to the fishermen, and the utilization of credit by the fishermen of various income groups, are examined. The authors conclude that despite modernization and mechanization plus credit facilities, the standard of living of fisherfolk has not risen significantly.

Milkius (1987) analyzes options for Pacific island governments to develop and finance shore bases for tuna fleets operating in the region. Options discussed range from government-owned facilities to privately owned bases.

Details of financial aid given to the Indian fisheries industry, with particular reference to the role played by the National Bank for Agriculture and Rural Development in both capture and culture sectors, are provided in a paper by Dandekar (1989). Strategies for future financing of the fisheries sector are also considered.

In Indonesia, Townsley (1988) provides an account of the artisanal fisherfolk of North Sumatra and the role credit plays in the fishing system. The fisherfolk depend heavily on the "toke" who acts as a fish buyer/trader, dictating prices and controlling access into the marketing chain. The author stresses the need to motivate the fisherfolk to request credit from banking institutions as opposed to going to the toke.

In the Philippines, institutional fisheries credit and development of rural fisheries are discussed in a paper by Dickson and Tietze (1989). A loan fund for enhancing the role of women in fishing communities is also described taking into account the existing marketing arrangement in the country.

Platteau's (1986) paper attempts to show that credit transactions can play important insurance functions in agrarian village societies exposed to various kinds of risks and uncertainty, as shown in the case of two maritime fishing communities of South Kerala, India. The paper examines three specific features of insurance-motivated systems of credit: 1) loans are given only if the debtor

agrees to enter into a broader relationship with the creditor and to commit himself to fulfilling certain obligations that lie beyond the initial loan transaction proper; 2) the time for repayment of the loans is uncertain and the repayment may even be conditional upon the decision of the debtor to stick to or to break out of the broader relationship he has engaged into with the lender; and 3) the price of credit is either formally zero, or it is blurred in a way that renders its assessment especially difficult. The author states that the policy implications of the analysis is that any attempt at replacing old personalized credit arrangements by new mechanisms and institutions ought to give primary attention to the insurance functions which these arrangements possibly perform. If this is not done, various efficiency losses might result from the de-linking of credit and other relations. He also stresses that the economic theory of market interlinkages has shown that by reducing information and transaction costs, improved allocative efficiency can be expected. He concludes that if sufficient attention is not paid to the risk-reduction aspects of "quasi-credit" transactions, the interests of the poorer sections are likely to be hurt in view of their strong need for quick credit.

Anbarassan and Fernandez (1986) evaluate the impact of loans provided for fisherfolk under a BOBP coastal village development project. The paper concludes that a significant rise in income is unlikely to result from a single loan.

Rao (1980) reviews credit facilities for the development of small-scale fisheries in India. The study reveals that in spite of the many credit facilities available for fisherfolk, slow development in the countryside is often attributed to lack of credit. The author looks at reasons for this and suggests the need for functional credit and a loan system linked to technology, production systems and output price, to stimulate growth and development.

The paper by Steina (1973) deals with credit facilities required for modernization of the Indonesian fishing industry. The paper also reviews government plans and policies for fisheries development. Due to special regulations in Indonesian banking institutions, conditions for investment credit are reviewed separately from the issues of production and liquidity credit. The author concludes that priority should be given to attracting more capital for modernization and capitalization.

2.2 Synthesis

2.2.1 Research Rationale, Trends and Goals

The focus of this section will be on Southeast Asian social science research. Although at least one sociological/anthropological classic has been based on the study of Southeast Asian fisherfolk communities (Firth, 1966), what little management of small-scale fisheries developed from the 1950s to the late 1980s was almost exclusively based on advice derived from biological, resource oriented studies. One result of this is that the managers (mostly government officials) ended up knowing little of the economic aspects of small-scale fisheries and virtually nothing of the sociological/anthropological aspects of life of the fisherfolks affected by their decisions.

Moreover, the resource oriented disciplines were themselves also guided by imported paradigms appropriate to the colder climes where they were formulated, but which were, as it now turns out, often misleading when applied to Southeast Asian fisheries resources.

Fisheries development programs in Southeast Asia were generally premised upon economic and social objectives. Almost all development programs sought to produce more low-cost protein for the people, particularly the poor, improve the incomes of fishermen, increase employment, increase exports and generally contribute to the economic development of the country. Yet for a very long time, little consideration was given to the economics of the systems that were being tampered with and their links to other parts of the economic system. The repeated failure of development projects to live up to optimistic expectations forced some changes upon the politicians, technocrats and biologists who had been at the forefront of fisheries development policy and program formulation. Economic advice and counsel was sought in preparation of development plans and

sometimes in their evaluation. This planted the seeds of interest that have been slowly growing into a community of fisheries economists which today includes over one hundred practitioners.

It has always been convenient to explain away the results of bad economic planning, program design and execution as the consequence of having neglected the overpowering social and cultural constraints on development. This may be convenient, but not often true. Failure to assess correctly economic and biological realities has been chiefly responsible for most development and management failures.

The region has some of the greatest concentrations of people in the world and economies which were, until recently, almost entirely agriculturally based. Population growth has continued to be very rapid (2-3% per year) and places extraordinary demands upon agriculture to produce sufficient food. Agriculture has met the challenge quite effectively in most of the countries. Fish output has also increased substantially as private and public initiatives have introduced new manpower, technologies and capital into the fisheries systems.

With all of the advances in agriculture and increasing industrial development there have come serious economic dislocations. The most obvious disruption has been the extraordinary growth of cities with rural migrants seeking opportunities when agriculture can no longer absorb them. A less obvious change has been the entry of many workers with few skills and little or no capital into the fishing sector. The result has been a great increase in the numbers of small-scale fishermen.

The consequences of these economic changes is that many coastal resources are overexploited. There is, however, nothing really new in the phenomenon of small-scale fishermen overfishing coastal resources. What is new is the extent to which coastal resources have been placed in peril. In an earlier age, there were pockets of overfishing in the neighborhoods of many villages. Increased mobility and range of small-scale fishermen have allowed them to fish in places once protected by distances too great to bridge.

The links between overfishing of coastal resources and poverty among fishermen are now obvious as is fishing as an occupation of last resort. However, it is not clear that all small-scale fishermen in Southeast Asia are worse off than their predecessors of two or three decades ago.

When individual productivity has declined, prices have often increased. Economic opportunity has attracted capital into the fisheries of the region and the common property condition of the resource has resulted in overfishing. Thus, one does not need poverty to explain resource depletion in fisheries, although it certainly exacerbates the problem. The low labor costs associated with poverty increase the capital share in returns and induce investments in labour intensive technologies, not all of which are small-scale.

Nevertheless, one cannot be sanguine about the income level of fishermen and their families; in some countries such as the Philippines, real income levels of fishermen have declined. Also the very low productivity of many fisheries has induced dependence on a variety of destructive fishing methods designed to capture what meagre resources remain available.

It has been easy to underestimate the power of the market place in generating fishing pressure. As most economies in the region have grown and incomes decreased, the demand for fish and other protein foods has increased. The upward pressure on prices will continue to induce entry into fishing and fish resources will be subjected to more pressure.

From thirty or more years ago, when economic analyses and inputs were first felt necessary for community development, the substance of economic research and evaluations has shifted from an emphasis on the cost and earnings potential of fishing and collateral enterprises, to marketing, to measures of development benefits and finally to the management of the fisheries resources. The transitions have not been simple and are far from complete. Research in all these fields continues today.

Most economic research in the region has been directly and indirectly concerned with small-scale fisheries. Much marketing research has its roots in suspicions of market manipulation which depress prices to small-scale fishermen and raise prices to consumers. The costs and return research was largely

dedicated to demonstrating that the fishermen were indeed poor if not poorer than most others in society. Production economics studies have often been designed to determine whether or not there are economies of scale in fishing. The objective of many studies has been to demonstrate that many small-scale units are economically efficient. Also there has been a predisposition on the part of the economists to justify the labour intensive nature of small-scale fisheries systems. Under current wage conditions in the region, this is not difficult to do.

The conflicts that have arisen between larger fishing units like trawlers and large purse seiners and the near shore small-scale operations has also been a matter of considerable concern economically, socially, politically, and biologically. Efforts to obstruct the operation of large trawlers and to create productive habitats for fish to be exploited by the small-scale fishermen have also attracted attention. Very little current research in fisheries economics strays far from a concern with the small-scale fishery. However, whether or not the research itself contributes to an understanding of these complex issues is not so clear.

Compared to economic research, research by other social science disciplines, such as sociology, anthropology, and political science, has not been as prevalent in the literature. While anthropologists pioneered social science fisheries research in Asia and the Pacific, very few studies have been published recently as compared to economics. This is due, in part, to more emphasis being placed on fisheries economics research by national academic and research institutions in the region. Several excellent descriptive studies of fishing communities have been published by non-economist social scientists, but there is a need for more specific research to complement interdisciplinary management and development programs and policy strategies.

2.2.2 Country Reviews

There are several studies in the bibliography which provide a broader view of fishery socioeconomics at the country-wide level. Although some papers may have focused their discussion on specific subject areas, discussed above, it is proper to mention some of these studies here to consolidate country review papers as part of the socioeconomic literature.

Agbayani et.al (1992) review completed and on-going socioeconomic research in the fishery sector of the Philippines. The paper identifies data gaps and researchable areas for purposes of determining future research directions. The authors conclude that overall, the social and economic studies included in the review address the contemporary issues confronting the fishery sector from 1980 to the present and that the contribution of social scientists in policy making is apparent in terms of focus and relevance of the research studies.

The objectives of the paper by Delos Angeles et. al (1990) include a review of the literature on the Philippine experience in fisheries and aquatic resources management, identification of data gaps, and prioritization of issues where more research is necessary. The paper characterizes completed research as being done from the private perspective, usually in the form of description of fishery household and communities, and fishing technologies, albeit with little documentation of destructive practices. Consideration of social concerns imply that there is a need to go beyond mere descriptions of fishery problems; measurement is needed for looking into social consequences of FARP use; and priorities for research should include quantification of the incidence of impacts, the time dimension involved and the effects on the resource systems.

Panayotou and Jetanavich (1987) describe the economics and management of the marine fisheries in Thailand. The study documents the profitability of trawl fishing, the poverty of small-scale fishermen, the heavy overfishing of the Gulf of Thailand, and the discrepancy between the catching power of the Thai fishing industry and the management and enforcement capabilities of Thailand and its neighbors. The study concludes that an effective strategy for the solution of Thailand's fisheries-related problems would involve an immediate halt to the construction of new trawlers, licensing and control of the activities of existing vessels, assistance to small- and large-scale fishermen through fisheries

enhancement projects, such as artificial reefs, community fishing rights, conclusion of more joint fishing venture arrangements and development of alternative sources of animal protein, income and employment.

Smith et al (1980) review research findings related to the technology and socioeconomics of small-scale municipal fishermen in the Philippines and the "open-access" resources they exploit. They stress the encouraging shift in government programs from a resource "development" orientation to one of resource "management".

In Thailand, Reintrairut (1985) deals with the development of small-scale fisheries with particular reference to coastal, marine and culture fisheries. The study indicates that, even in the absence of conclusive evidence, it is observed that those who reside in the Northern coastal provinces have, on the average, better living conditions than those in the south. Income differentials are attributable to geographic location, type of fishing gear, and the degree of competition in input and output markets.

Indonesia's Soesanto (1985) assesses the current status of small-scale fisheries in his country. He indicates that, although there have been improvements due to motorization of fishing vessels, development of aquaculture, and infrastructure facilities, the small-scale fishery is not expected to develop within a short period of time.

Bailey et.al (1987) examine the policies and programs of marine fisheries management and development in Indonesia. He concludes that protection of inshore fisheries resources and maintenance of access to these resources by small-scale fishermen have been the primary concerns of policymakers. This can be shown by the issuance of a series of regulations designed to restrict medium scale trawlers from operating in coastal waters.

Nuruzzaman (1988) presents a clear description of the current state of small-scale fisheries in Bangladesh. He analyzes the various factors affecting the fishery sector and investigates the impact of the different government policies on the development of small-scale fisheries.

Isvilanonda et. al (1990) analyze current management policies for capture fisheries in Thailand and discuss the impact of these policies on the development of the fishery sector. They suggest various policy recommendations on how the development can be carried out effectively.

Guan Rui-Jie and Chen Vi-de (1989) describe the People's Republic of China's growth and development during the past decade. The fisheries sector has undergone significant development. Changes in organizational structure have given more incentives to producers and have led to average annual growth rates of around 12% during the period. They note the growth in inland aquaculture production, the growth in exports and the increases in income of fishermen. Recent reforms and institutional arrangements in the organization of production and distribution are also described for both capture fisheries and aquaculture.

Guerrero (1991) reviews the performance of the fisheries sector in the Philippines focusing on its contribution to the economy. He also analyzes the reasons behind the decline in the productivity of the country's marine fisheries resources which he attributes to environmental degradation and ineffective natural resources management. He then suggests priority research and development programs and strategies for improving institutions and other support services.

Thuy San (1988) describes the fishery industry in Vietnam. Most fishing methods are small-scale, with low productivity. Current development efforts for the sector are also discussed.

The anthology of papers dealing with traditional resource management in the Pacific edited by Ruddle and Johannes (1989) is intended to contribute to the growing body of documentation on traditional systems of fisheries management which is an essential prerequisite to any comparative problem-oriented study. The authors contend that further research is aimed at distilling general principles underlying sea tenure systems as well as highlighting the processual aspects of sea tenure in their continual adaptation to constantly evolving socio-economic, biological and physical environments, that together add up to global change.

The Forum Fisheries Agencies (FFA) (1990) in its anniversary publication captures the issues and directions of South Pacific fisheries cooperation as seen by regional and international authorities, FFA member countries and staff. The

report is a compendium of papers reviewing country-specific, fishery-sector related activities as part of the FFA's overall activities and performance. The report indicates that the Pacific island nations have demonstrated their ability to manage their fisheries by having recognized the complexity of the fishery problems and identifying the need for cooperation in seeking solution to common problems. It, likewise, suggests the strong need to re-examine the institutional framework for research and management in the region.

2.2.3 Inland Fisheries

There are very few socioeconomic studies conducted on inland fisheries in Asia since most inland bodies of water are now primarily being used for aquaculture purposes. Notwithstanding this, the articles compiled in this bibliography do provide some insights into the importance of inland fisheries as well as the issues and problems prevailing on the topic.

Baluyot (1985) describes the various developmental activities in the Agno River Basin in the Philippines and how these are putting considerable stress on the resources in the area. Subsistence fishing is being carried out in the lower Agno especially during floods. She indicates that the two reservoirs have good fisheries potential though only minimal effort was spent on their development. The study identifies the current effort of the government to develop fisheries in the two reservoirs, although it concludes that brackishwater aquaculture will continue to dominate the inland water fish production.

Bhukaswan (1985) cites the significant positive effect on fishing of the construction of the dam which closed the Nam Pong River in Thailand, which has considerably improved the diet and income of a number of farmers. The paper describes fisheries management practices, which have included stocking of 19 species of fish. Socio-economic evaluation of fisheries indicates differences in profit in different areas.

Costa Pierce and Soemarwoto (1990) present the results of research conducted to help resettle the displaced families from the construction of Indonesia's two dams in the Citarum River. The report discusses the inland reservoir fisheries and the alternative livelihood sources and fisheries technologies which resulted from the project.

Smith (1983) outlines the major characteristics of most inland fisheries - open-access, dissipation of resource rents and externalities - that provide the rationale for managing them. The case of Laguna de Bay in the Philippines is cited to highlight the detrimental effects that overfishing and competition between capture and culture fisheries, with no effective restrictions on the use of the lake, can have on the distribution of benefits from the fisheries.

Pantulu (1983) describes the Mekong River scheme as an example of an international project where an effort has been made to include fishery development into the early stages of planning and to assess the impacts on the fishery. The study focuses on the Uboltratana Dam on the Nam Pong River in Thailand which provides hydropower production, irrigation and transport services. The author concludes that all these services have impacts, positive or negative, on power supply, fisheries, agriculture, flood patterns, transport, growth of urban and other settlements, changes in income levels, health and other environmental and social conditions.

In its 1992 report, the Interim Committee for Coordination of Investigations of the Lower Mekong Basin examines the role of fisheries in the Lower Mekong Basin, identifies issues, and recommends research and development needs. The review covers Cambodia, the Lao PDR, Vietnam and Thailand. The paper describes the importance of fisheries in each of the economies of these countries. Some of the issues identified include: the overall current shortfall in fish in the Basin to satisfy minimal nutritional needs; the decline in capture fisheries catch and the corresponding declining catch per household in relation to the total catch; and the observed environmental degradation in terms of quality and changes in the distribution and availability of water resources. The review contends that the development of the fisheries sector must be based on a better understanding of the different resource systems and associated socio-economic settings. In capture fisheries, the main task should be to maintain or

improve productive environments. Once better understanding of the systems is achieved, direct development interference in production and distribution become relevant. The paper suggests building the capacity of riparian institutions to adopt the above-discussed approach, though its most immediate task is to improve the data base and its level of understanding and to ensure that fisheries aspects are considered in developments external to the sector.

Sreenivasan's (1986) paper provides information directed to engineers, planners and decision makers, including fisheries specialists, interested in optimizing inland fisheries under constraints from other users of land and water resources. The purpose of this information is to assist in reaching correct decisions in discussions between various specialists during planning, design, implementation and management phases of major river basin development projects with fisheries potential.

De Silva (1985) discusses the status of fisheries in Mahaweli River Basin in Sri Lanka. The paper indicates that, in spite of the considerable contribution of the basin to inland fish production, development of the fisheries sector was not taken into account in the planning and execution of the project. The study suggests ways for optimizing the fishery in reservoirs and irrigation channels.

Aguero (1989) reviews the basic characteristics of inland water in Bangladesh. He highlights the socio-economic importance of inland fisheries and analyzes the main management problems related to the sector. He also discusses the new government strategy for licensing fishing access.

3. RESEARCH METHODOLOGY AND CONSTRAINTS

3.1 Methodological Considerations

While there is a growing recognition of the importance of social science research in fisheries and aquaculture in the region, it is important to take into account the obstacles to efforts to develop social science research and methods. A large proportion of countries within the Asia-Pacific region have little budget to support strategic socioeconomic research or to collect data necessary for planning and policy development purposes. The selection/development of research methodologies which would suit the budget, capabilities and needs of researchers in the region is a critical concern. A large amount of the research conducted in the region has been done by scientists from developed countries (although in recent years much more research is being conducted by scientists from within the region). While good research was conducted, many of the researchers within the region were not directly involved in the research design and analysis and thus were not fully exposed to the methodologies used. In the last 10 years, a relatively large number of social scientists from the region have received advanced degrees and returned to their nations to take up the research challenge. Many still lack financial support to develop a long term research agenda.

Many methodologies formulated in developed countries are too complex or require more data than is available. For example, many economic valuation methodologies are not suitable for use due to the different social and cultural context of developing countries. Likewise, data is not available to conduct highly quantitative bioeconomic modeling of fisheries.

Other important methodological concerns are as follows:

- there is a need to translate applied research methods into policy-relevant management and development research methods;
- to adequately and effectively tackle the relatively wide range of social science issues, the strengthening and the integration of other social science disciplines, such as sociology, anthropology and political science, is imperative;
- in view of the complex nature of fishery management and development issues, the integration of social science and biological methods is an important aspect of research development, such as in bio-socio-economic modeling;

- there is a need to publish "gray literature" from the region in regional and international publications in order to share and open dialogue on methodological issues;

- the availability of updated, relevant and reliable statistics seems to be a perennial problem throughout the region;

- regional and in-country cooperation in methodological development must be forged to test, refine/verify, and share knowledge.

3.2 Data Considerations

There is an observed lack of continuity in the completed research. Most research efforts seem to be totally independent of each other, although some authors have cited related research in their work. This can be attributed to the fact that most of the studies are either "funding-source driven" or are addressing only country-specific issues not related to previous studies. Furthermore, the use of completely different sampling designs as well as survey instruments would make the comparison of studies difficult.

The apparent lack of long term developmental thrusts and directions focusing on fishery issues in most Asia-Pacific nations is contributing to this data problem. The adoption of "stop-gap" measures to address the most urgent issues would require data that would support the planned activities for that particular period. The adoption of long term development plans would justify the need for maintaining a fishery data base which would serve as the basis for formulating such plans.

It is evident that there is a rather loose coordination between and among the relatively few social scientists in the Region. This has led to fragmentation and subsequent lack of unified direction in both local and regional social science research. Coordination may result in exchange of expertise and shared data. Consequently, there would be a need for infrastructural support to institutionalize the sharing of methods and data and to collaborate on research.

Other important concerns are:

- There is inadequate support for continuous data and information collection and analysis of critical parameters and issues;

- While most research institutions now have access to computers, there is a need for a system to share data within and outside the region;

- Based on the volume of research available within the region, it can be concluded that there is already a lot of data which can be used for subsequent research activity. There is, however, a need to test the reliability and accuracy of these data. Such can be achieved through formation of regional/local networks the function of which, among others, is to evaluate/validate the available set of information.

- One major constraint is the inadequacy of funding support to social science research. This can be attributed to a number of factors although the most dominant one is the lack of interest by government planners and policy makers in putting emphasis on fishery-related issues compared to other equally important regional/local issues.

3.3 Research Infrastructure and Institutional Constraints

The complex nature of issues affecting the fishery sector around the world necessitates a multi-disciplinary approach. Natural scientists, acting independently, will not be able to provide lasting solutions to these issues. The same applies to the social scientists in addressing only the socioeconomic aspect of the issues. There is a need to integrate their efforts. The integration process requires both physical infrastructural and institutional support. Research facilities, organizational structure and networking are

important to support the process of integration. These are required to motivate scientists to work together as a collegial group. The integration, both disciplinary or multi-disciplinary, is lacking in many institutions throughout the Asia and Pacific regions.

Within the social science circle, the apparent lack of coordination between and among the few fishery social scientists in the region has resulted in their being unable to positively contribute to the effort of addressing the fishery sectoral issues in their respective countries and within the region. There is an urgent need for an integrating mechanism which will put all these experts together but on a regular basis, draw up social science research agendas, share expertise and whatever research resources they have at their disposal, and coordinate with other non-social scientists on the fishery sectoral agenda in their country or in the region. The formation of country-specific or regional networks of social scientists, similar to the existing Asian Social Science Research Network (AFSSRN) based at ICLARM, is a move in this direction. AFSSRN, however, is not a permanent network although there are proposals to make it so.

The lack of interest of some governments to place the fishery sector high on its development agenda has led to the inadequacy of administrative, political and financial support in addressing the vital issues in the sector. This may translate into low budget allocations not only for research but also in providing the required physical and institutional infrastructure to develop the sector. This is partly due to the lack of awareness on the part of government policy makers of the importance of the sector not only in terms of its contribution to the economy but also in providing employment - a major source of livelihood to many - and a source of cheap protein on a continuing basis.

In some countries, there is an apparent need to institutionalize fishery social science curriculum in existing academic institutions in view of the shortage of locally-bred social scientists. Another major concern is that, compared to other regions, there are few fishery social scientists in the Pacific. One alternative is to develop short-term programs of continuing education and training on fisheries social science for non-social scientists in countries where the curriculum has not yet been incorporated in the existing academic institutions. Academic institutions are expected to play a very vital continuing role in putting human dimensions in the analysis of fishery issues.

4. DISCUSSION

While the state of socioeconomic research varies from country to country, it is possible to examine research priorities on a regional basis and to include individual country needs. A recent report by the Asian Fisheries Social Science Research Network (AFSSRN) coordinated by ICLARM (in the Philippines) provides a beginning focus. At a late-1992 meeting of participants from 14 academic and research institutions in Thailand, Malaysia, Indonesia and the Philippines, each team leader presented their institutional and national research priorities. The highest ranking research priorities in the region were: 1) integrated coastal fisheries management and community-based management 2) integrated agriculture-aquaculture farming systems; 3) policy analysis for fisheries, aquaculture and coastal zone management and development; and 4) socioeconomic tools and methods for analyzing capture fisheries, aquaculture and coastal management.

A 1992 review of social and economic research for the fishery sector of the Philippines (Agbayani et.al. 1992) identified a number of recommended research priorities in three areas:

A. Municipal Fisheries

1. Studies of community-based coastal resource management and the effectiveness of participating institutions i.e. local government units and non-government organizations (NGOs) as partners of development of peoples organization (POs).
2. Studies of resource-use conflicts and the process of resolving such conflicts.

3. Studies of the effectiveness of cooperativism as a system of fisherfolk organization.
4. Studies of credit and financing for organized fisherfolk for use in sustainable fishing and non-fishing livelihood activities.
5. Studies of coastal fishery management strategies i.e. territorial use rights in fisheries (TURFs), deployment of artificial reefs, closed seasons, licensing, sanctuaries.
6. Baseline and post-evaluation socioeconomic studies of organized fishing communities under the Fishery Sector Program and other areas of development.
7. Studies of the effectiveness of people's organization (POs) in self-regulating the utilization of coastal resources.
8. Studies of the effectiveness of fishery law enforcement.

B. Commercial Fisheries

1. Studies of the effectiveness of the adoption of regulatory schemes, i.e. closed seasons, closed areas, license limitations and taxation.
2. Studies that explore ways of effectively improving law enforcement programs and penalty structures of the government.
3. Economic viability studies of marine fishing in other unexploited areas and the determination of Maximum Economic Yield (MEY) which would serve as the basis for assessing the level of exploitation of fishery resources.
4. Social equity studies of the equitable distribution of output and revenues among fishermen.

C. Aquaculture

1. Social desirability studies of aquaculture projects.
2. Studies of the aquaculture farm estate concept for agrarian reform beneficiaries and other resettlers.
3. Economic studies of new culturable high-valued species, i.e., grouper, seabass, snapper.
4. Economic studies of mariculture as an alternative livelihood for coastal fishermen.
5. Economic studies of other environment-friendly culture methods i.e. crop rotation, fallowing, and biofiltration.
6. Economic valuation of environmental degradation of waterways caused by pond effluents.

A 1990 review of the economics of Philippine fisheries and aquatic resources by delos Angeles et.al. stated that the focus of the socioeconomic research community should be on:

1. Follow-up research is needed on the significant number of site-specific, socio-economic studies, and a set of socio-economic criteria that should be used as a guide in the allocation of access to municipal fishing grounds.

2. In the case of commercial fisheries, there is a need to conduct studies on the private and social profitability of this sector, with due account given to linkages to downstream activities. Existing domestic resource cost studies and measures of comparative advantage need to be modified to allow for proper pricing of the fishery resources as well as the effects of non-tariff barriers.
3. With respect to culture fisheries, research is needed on the allocation mechanisms to allow government appropriation of economic rent. Most studies on aquaculture focus on pre-project feasibilities. Subsequent studies should validate measures of feasibility as well as yield information needed for estimating economic rent, and should cover both inland and marine aquaculture.
4. Evaluation is needed of alternative schemes for managing fishery and aquatic resources. Such evaluation should examine limited entry schemes, as well as various uses of aquatic resources such as fisheries and water-based recreation, among others. Site specific research of alternatives is required; ex-post analysis should be conducted on critical areas while ex-ante studies for unutilized/underutilized sites should be implemented.
5. There is a general need to continuously monitor the effects and evaluate the impacts of government intervention specific to aquatic resource-based activities (including the fisheries sector) as well as non-sector-specific policies which affect water and fishery-based development. Information needs to be generated are the following:
 - a) welfare conditions of intended beneficiaries;
 - b) state of resources (e.g., whether pressure on overexploited fishing grounds, mangroves, etc., is reduced, whether pollution is increased, etc.)
 - c) impacts on marketing and delivery mechanisms and ultimately, the consuming public.

Economic and societal perspectives are required for these assessments, which shall need more information and data processing than those generated by socio-economic surveys. Coverage should include successful and unsuccessful projects as well as conservation-oriented and destructive activities.

6. There is a need to conduct more research on the factors that lead to variations in the adoption of specific technologies. Such studies would allow initial identification of the early adopters of conservation-oriented technologies as well as evaluate the importance of intervention mechanisms such as subsidized credit (whether from government, NGOs or traders).
7. Site-specific evaluation of alternative activities needs to be conducted to allow empirical evaluation of trade-offs among various aquatic-based activities such as mariculture, tourism, waste-disposal for mining effluents, etc. Valuation should allow estimates to be made of the private marginal costs of complementary factors of production, marginal user costs and marginal environmental costs of using natural resources.
8. Since the state of information does not yet allow estimation of the parameters of economic sustained yield, or implementation of multi-species fishery management, and since some allocation of access to fishery resources must be conducted despite minimal information on optimum quotas, fish stock data should continuously be gathered to minimize the un-

certainties involved in the iterative processes of fishery management, and provide some safeguards on the possible irreversibility of certain decisions.

In Malaysia, a report by Ishak (1992) on a socioeconomic research agenda for fisheries management and policy in the country identified the following priority topics:

- development of alternative livelihoods for fishers and their families;
- analysis of the use of fish aggregating devices and artificial reefs to increase fish production;
- study of consumer price dynamics, especially the link between consumer prices and fishing incomes;
- better information and data on the fisheries;
- establishment of marine parks; and
- better fishery policy and fisheries management.

Socioeconomic research priorities for the 1990's identified by the Forum Fisheries Agency for the Pacific (Hen 1990) include:

- effects of human migration within nation-state and across national boundaries;
- effects of inequitable income structure;
- labor activities within households, nations, and region;
- structure of the family and community;
- environmental accounting;
- production and marketing of aquacultural development;
- impact of fish aggregation devices;
- traditional tenure systems and use rights;
- fishermen's associations and resource management; and
- marine reserves.

Additional research priorities in social sciences for the Asia and Pacific region, as concluded from various publications, include:

- the institutional and organizational arrangements for small-scale fisheries management, including community based management, co-management and centralized management;
- management of common property resources;
- gender and equity issues in fisheries production, marketing and management;
- kinship and community as it relates to use rights and tenurial issues;
- social organizations at household, kinship, community, tribe and societal levels for fisheries and aquaculture management and development;

- microeconomic and social analysis of fishing and aquaculture production systems at household levels;
- intersectoral linkages and externalities in fisheries and coastal resource management;
- policy impacts of the fisheries sector at national and international levels such as trade, pricing laws and legislation, and aid and donor agency development policies;
- sectoral reviews of fisheries at the country level;
- analysis of the structure, conduct and performance of the markets for fisheries commodities and associated factors of production;
- fishermen - middlemen relationships;
- resource use conflicts and valuation of coastal resources;
- analyses of domestic and international trade flows in fisheries and aquaculture products;
- alternative livelihood development for fishers;
- microeconomic and social analysis of integrated farming/fishing systems;
- the social, economic and ecological conditions and context affecting small-scale fisher group behaviour in resource use and management; and
- institutional structure and arrangements for improved intersectoral coordination of multiple resource use.

In general, socioeconomic research in the Asia-Pacific region is more developed and advanced than that in Latin America and Africa. There exists a broad range of socioeconomic studies within the region covering the descriptive to the highly quantitative. In the past decade, there has been much more attention paid to social, economic and institutional issues in fisheries. However, to support fishery management and development efforts in the region, there is a need to develop more direction and structure in the socio-economic research agenda. In many institutions, particularly in Asia, a critical mass of social scientists is already in place although there is still a need for additional advanced degree scientists to sufficiently cover all areas of needed research. At the country level, it is important for national fishery research centers to shift their socioeconomic research activities to applied research rather than mere data collection and report writing. It is evident, however, that social sciences in the region are playing more of a role at major fisheries research centers, as in the case of the Southeast Asian Fisheries Development Center.

It is important to stress that the implied need to refocus the direction of research in the region is borne out of the apparent absence of substantial impact of various research output in adequately addressing some major policy issues. There are two levels of assessing the impact of any research output: (1) the ability of the research to properly define the socioeconomic issue and thereafter provide appropriate policy options towards addressing the issue, and (2) the utility of the research output in terms of its accessibility to its targeted clientele and the subsequent adoption/implementation of the suggested options.

While it is indisputable that the majority of socioeconomic research in the region has been directed toward addressing one or a combination of priority concerns, much of the research has only been successful in providing a description of the issue and not in providing solutions to the problem. In short, while research has been accurate in identifying the problem, it has had

limited success in prescribing the proper solution. As an example, it can be concluded from the literature that there are several studies on the deteriorating socioeconomic conditions of small-scale fishermen. Some of these studies pushed for programs which would make the fishermen compete more effectively with commercial fishers. The proposed program may have achieved a short term success but it oftentimes made the condition of the fishermen worse in the long run.

On the issue of accessibility, it can be stated that the best solutions to some of the fishery issues may be found in the library, in the bookshelves of the scientists, or in the archives, or in a form which is not readily understandable to some of the intended users. While there is a number of good studies on fisheries socioeconomics as shown in this review, many of these are not accessible to key users of the research output, i.e., the policy makers, the fishermen and the development managers, and thus have had limited, if any, impact.

Considering these two important impacts of research, there is a need to establish two types of linkages - backward and forward. Backward linkages are necessary to ensure the proper focus of the research which will lead to relevant and well-directed output. The need for "ground truthing" of secondary information and study site "immersion" will ensure better appreciation of the issues being analyzed. Forward linkages require the adoption of "extension research" which would allow interaction between the researcher and research output users. All these form part of what is now called "fishing systems research" which considers all horizontal and vertical aspects of research activities. This is based on the existing farming system research and extension methodology. The system takes into account all phases of research from the time of conception to the adoption of research output and includes the ultimate user of the research in the research program.

There is a growing demand for more multidisciplinary and intersectoral studies on fisheries. This is an area where collaborative effort between biological and social scientists can be realized. Likewise, many studies have concluded that the solution to some of the major problems within the fishery sector can be found outside the sector. In fact, some non-fishery sectoral activities have both positive and negative impacts on the fishery and hence must be incorporated in the analysis of the sectoral issues. A good example of such a research approach is the ICLARM's study of San Miguel Bay in 1982 which covers both the biological and socioeconomic aspects of the Bay. Social scientists must start working together within their discipline and with other non-social scientists in an effort to provide more lasting solutions to problems confronting the fisheries sector.

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Chapter 5.

SOCIOECONOMIC INFORMATION NEEDS AND RESEARCH PRIORITIES

T.R. Brainerd

Decisions in fisheries management and development have always been based on socioeconomic factors. Even where these factors have not been made explicit, the decisions would not have been taken except in response to demands for the enhancement (or protection) of socioeconomic benefits. In recent years, the need for socio-economic information has increased greatly due to the effects of extended fisheries jurisdiction, a growth in awareness of resource constraints, and an increased interest in artisanal fisheries, amongst other reasons. This chapter discusses in general terms the demand and supply of socioeconomic information, and the amount and kind of such information needed for management and development. (Note that in the case of the Asia/Pacific region, more specific analyses of research priorities were described in an earlier chapter.)

1. The Demand for Socioeconomic Information

Fishery managers and planners are faced with a wide variety of decisions that have social and economic implications, including questions regarding:

- determining priorities to be placed on the various objectives that can be pursued in the fishery
- allocating access to the resources, in particular determining whether and how to limit entry in the domestic fishery, and how much foreign fleets can be charged for access
- determining the desirability of management controls and regulations, and their means of implementation, relative to desired distributional and efficiency goals
- maintaining or increasing income and employment levels of artisanal fishers
- resolving or reducing conflicts between artisanal and industrial fishers
- extracting economic revenues from the fishery to meet societal goals, while minimizing enforcement costs
- estimating the value of shared transboundary stocks
- determining mechanisms for the formulation and negotiation of joint ventures

For these, and many other decisions, a wide range of socio-economic information would be useful. Consider as an example a specific management decision -- say that of determining a limited entry mechanism oriented toward increasing the income levels of artisanal fishers.

This already assumes that a political decision has been made to increase the income levels of artisanal fishers, and that a choice has been made to do this by limited entry. It should be noted, however, that the choice could have widely different results depending on the make-up of the artisanal community. Limiting the number of fishers in a community where there are no alternative opportunities for employment would have quite a different social impact than the same action on a community where many alternatives are available. A decision to limit the number of fishers in the absence of information on opportunity costs of labour could lead to socially damaging consequences.

Assuming, however, that an appropriate decision has been made to limit entry, the next decision is to determine the kind of limited entry technique that might be used. This requires an evaluation of the different techniques (limited fishers, vessel or gear licences; fishers or vessel quotas; spatial or resource

property rights), the appropriate variations on these techniques, and the significant factors requiring consideration (the means for allocation, transferability or non-transferability of rights, extraction of economic rents). Evaluation of the alternatives requires analyses of the alternatives, making use of subsidiary information and of basic socioeconomic data.

(a) Analyses may be undertaken with regard to the effects of the alternatives on:

- employment
- average incomes
- amount, kind and returns to capital
- distribution of assets and incomes
- markets, product prices and consumption
- social and cultural factors
- enforcement capacities and costs
- legal and institutional frameworks.

(b) Subsidiary information useful for the analyses would include:

- mobility of labour into and out of the fishery
- opportunity costs of fishing and employment alternatives
- price and income elasticities of demand for products
- concepts of property rights
- community income distribution systems.

(c) Basic socioeconomic data which would be important as inputs to the analyses would include:

- numbers of fishers, full-time, part-time
- educational levels of fishers
- levels of employment in general
- prices received by fishers and share systems
- non-fishing sources of income
- non-monetary benefits of fishing
- debt levels and costs
- costs of gear, vessels and fuel
- relevant laws and institutions.

The lists of analyses, information and data in the above illustration are neither comprehensive nor definitive. They are simply suggestive of the kinds of information that would be desirable for decision-making. Similar lists could be prepared for numerous other kinds of management and development decisions.

2. The Supply of Socioeconomic Information

Socioeconomic information in fisheries will likely remain imperfect and uncertain. There is no reason to believe that fisheries economists and sociologists will be able to do any better than those concerned with national economic growth. Nevertheless, as with the national economy, decisions are being, and will continue to be made, despite the imperfections and deficiencies in information. The objective of socioeconomic research is to improve the information available to, and usable by, decision makers. Yet there is clearly tremendous room for improvement. Deficiencies in the available socioeconomic information in fisheries can be traced to a number of reasons:

(1) The product of fishing is not a homogeneous commodity like wheat or rice, but instead varies across hundreds of different commodities -- by species, size, kind of processing, and end use.

(2) Given the common property nature of most fisheries, fishers are reluctant to divulge information that may benefit their competitors, a situation that is

reinforced by the fact that many fishers operate outside the range of observation of domestic tax collectors or of enforcement officials.

(3) For some artisanal fisheries, the isolation nature of fishing communities presents considerable difficulties for the collection of socioeconomic data.

(4) Socioeconomic data is sometimes difficult to define and quantify. Even with a data item as seemingly straightforward as "price", it can be difficult to determine whether the price refers to ex-vessel value, value of the landed product or of the processed product, value to the wholesaler, the retailer or the consumer? As another example, the concept of opportunity cost is difficult to quantify if intangible benefits are derived from the act of fishing or if cultural barriers exist to the mobility of labour.

(5) The emphasis of fishery research institutions in the past has been placed on biological, rather than socioeconomic, research. While undoubtedly the relatively great demand for biological information derives in part from the need for measuring an unseen resource in order to manage it, this has tended to lead to a serious shortage of socioeconomic analysis.

(6) Fisheries, not being particularly important to the developed economies which can afford research investments, have attracted relatively little attention from academic economists. The academic research that has taken place has often been based on sophisticated and abstract common property models, which are not yet generally capable of producing socioeconomic information readily usable by decision-makers. On the other hand, non-academic economists working for fishery administrations and international institutions have done some relevant socioeconomic research. However until recently, the impetus for this research has come from development objectives, so it has focused on investment opportunities and marketing problems. Although important, it has not generally taken into account the consequences of open access, and thus provides only a small part of the information that would be helpful for decisions on management controls and regulations.

3. The Process of Acquiring Socioeconomic Information

The use of the terms "demand" and "supply" in this discussion indicates that the needs for socioeconomic information are relative rather than absolute and that decisions on investments in socioeconomic research must take into consideration both the value of the information and the costs of acquiring it. It is clear from the discussion of the demand for socioeconomic information that attempts to conduct all the analyses and obtain all the data that are suggested would be extremely costly and would greatly outweigh the benefits resulting from the improved decisions. On the other hand, it is clear that some increased investments in socioeconomic research would produce benefits that greatly outweigh the costs.

In economic terms, the optimum investment in socioeconomic information would occur where the cost of acquiring the last unit of information equals the additional benefits it produces. This concept of marginality is important as a general guideline but it has little practical applicability because of the difficulties of measuring costs and benefits. The benefits, for example, would be measured in the degree to which the information improves the decisions that are being made - a measurement that cannot be made except in the broadest, most general terms.

In spite of these difficulties, there is a need to deal with the issue, and to provide approximate answers and guidelines for socioeconomic research and data collection. At the global level, international organizations like the UN Food and Agriculture Organization (FAO) certainly have a variety of responsibilities in this regard. These organizations provide global statistics and respond to requests from governments for advice on the kinds of decisions mentioned above. However, the onus lies on national governments, who have to set their priorities

and then determine their information needs based on the resources available to them.

4. Socioeconomic Research Priorities.

This section attempts to broadly identify critical areas for socioeconomic research, focusing on the case of Africa. No attempt is made to identify research areas for any particular country, but rather it is hoped that the questions addressed here could act as a guide for future studies. Perhaps the most important issue is how to manage fisheries for the benefit of society; this involves first defining management objectives and identifying the relative roles of the various fishery participants. Once these are defined, the researchers are able to determine information needs and prioritize their work accordingly.

4.1 Domestic vs. Foreign Fisheries.

If both foreign and local fishing are involved, or potentially involved, in a given fishery, it may be necessary to tradeoff (a) revenues obtained from fishing licences and other fees paid by foreign fishers, and (b) contributions to the economy from local domestic fisheries. Thus, research should incorporate both aspects, with the net benefits of local fishing calculated and compared to the net benefits derived from foreign fishing.

The coastal state has to conduct studies to assess the fees to charge foreign fishers, taking into account their alternative opportunities. If the country wishes to receive in-kind benefits, such as training, development of port facilities, or landings of fish for domestic processing, these benefits have to be measured against the potential revenues that could be achieved through the fee system. Also, calculations of benefits should take into consideration the costs associated with monitoring, control and surveillance, as well as the costs of negotiating agreements with the foreigners. Thus, the research should provide information that will enable authorities to make decisions on all of these aspects.

With respect to the development of new domestic fisheries, research should identify and evaluate all possible constraints or impediments to the active involvement of fishers, including:

- the level of skills or knowledge about fishing techniques, boat handling and processing of fish
- cultural impediments such as the status of fishing or its being contrary to religious beliefs
- issues of income distribution, alternative employment or income earning opportunities
- structural problems such as availability of foreign exchange for importing fishing equipment; communications, transport or market facilities; demand for fish products; or adequacy of certain factor markets, such as credit systems for financing fishing activities.

Once the various constraints and impediments have been identified, the costs of overcoming them and the likely benefits that could be produced must be examined. Changes may be relatively costless, or major investments in infrastructure may be needed. In some situations cultural opposition to fishing could be strong, or potential incomes from fishing may be low relative to other employment.

4.2 Domestic Fisheries.

In domestic fisheries, research and management resources must be allocated between small- and large-scale fisheries, between inland and marine areas, and between aquaculture and the capture fisheries. Studies that will aid the

decision process include thorough analyses of the nature of the resources, the current means of exploiting them, the types of changes and/or improvements necessary to be efficient in production, the relative costs associated with each type of fishery, the socioeconomic profiles of different groups exploiting the resources, post-harvest activities, distribution and market conditions, and constraints that could impede further fishery development. There is also a need to determine the level of resources that should be put into managing and developing each fishery. Such studies should be guided by the overall national development objectives and the nature of the resources.

It is often important to conduct comparative research on the net benefits of large- versus small-scale fishing operations (in both marine and inland areas), as well as socioeconomic studies on the impacts of large-scale fishing operations in the overall context of national development and in local areas where fishing operations are taking place. Large-scale fisheries may be favoured where economies of scale are important, but could lead to a net drain on foreign exchange or could have socially damaging spillover effects on small-scale fisheries. Large-scale fishing is sometimes justified on the assumption that technological constraints prevent small-scale fishers from fully exploiting certain stocks, but this assumption should be examined through objective research. In terms of the benefits of small-scale fisheries, such as their low use of scarce capital and energy resources, this has often been stressed to justify their development, but empirical evidence to make this claim legitimate is lacking.

Research is needed to understand in depth the nature and characteristics of small-scale fishing communities and the rules under which they operate. It is also necessary to assess the present and likely future costs associated with overexploitation. Research work done on these topics are scanty. Over the years, fishers have developed significant knowledge of the fisheries in their communities, including knowledge of the resources and the operational rules within which they operate. Research in these areas is critical to understand how small-scale fishers respond to resource constraints.

This is particularly the case given that some fisheries are being fully exploited or overexploited by small-scale fishers alone. For example, some inland water bodies in Africa are showing declining catch rates, the major socioeconomic reasons for which appear to be: (1) conditions of open access and a lack of effective management systems; (2) high levels of demand for fish products, (3) technological choices promoting more efficient gear, (4) limited alternative opportunities for labour and capital, (5) breakdown of traditional fishery management systems and of barriers to entry, and 6) high population growth within fishing communities. These research topics must be examined in greater detail.

4.3 Fish Prices, Post-Harvest, and Aquaculture.

One basic reason for the high level of exploitation of fisheries resources, at least in the case of Africa, has been the increase in real prices of fish, particularly high value species that are exported. Thus, it is important to analyze trends in real fish prices, projections of price changes in the future, and the effects of such price changes. The increase in real prices of fish not only leads to greater pressure on conventional stocks, but can also increase the economic feasibility of developing fisheries on other stocks, as well as aquaculture. For example, shellfish culture is developing rapidly due to increased real prices. On the other hand increased real prices could force low income consumers to turn to lower quality products or to reduce their consumption of fish protein. Thus, the importance of conducting studies on the effects of price changes cannot be overemphasized.

Recently, aquaculture development has received significant attention from both national governments and international agencies. This is evident, for example, in the 20% average annual increase in African aquaculture production from 1984 to 1988; this increase is generally attributed to efforts made to make fish more available to the rural populace. However, it is important to ensure that the technology used in aquaculture systems actually produces fish at prices affordable to the rural people.

It is important to examine the relative advantages and cost effectiveness of capture fisheries, aquaculture and other sources in providing animal protein for the population. It is also useful to investigate whether improved post-harvest handling, distribution and marketing systems will increase the flow of fish to rural areas at reasonable costs. Finally, the possibility of developing a viable export industry for other types of products, and using part of the resulting foreign exchange to import fish, should also be explored by these countries.

5. Summary.

The above discussions show that comparative analyses are needed to analyse the relative benefits and costs of managing and developing different types of fisheries. At the national level, research should deal with such factors as the implications for foreign exchange, the effects on employment, urban migration, nutrition and income distribution, among others. Given the wide array of research topics suggested above and the limited resources available to most developing countries, priority has to be given to those that are critical for basic decision making, and researchers from various disciplines should cooperate to avoid duplication of efforts. The setting of priorities is a big task by itself and requires considerable thought and input. However, there is no quick fix if these countries want to ensure that their fisheries resources are utilized efficiently and in consonant with their development objectives.

Chapter 6.

INTRODUCTION TO THE ANNOTATED BIBLIOGRAPHY

The bibliography presented in the enclosed diskette represents the bulk of this report, whether measured by physical extent or by the time required for its preparation. It is divided into four sections, with a total of 1180 discrete references, distributed as follows:

(1) General:	41 references
(2) Africa:	268 references
(3) Latin America and Caribbean:	283 references
(4) Asia and Pacific:	588 references

TOTAL: 1180 references

The first section of the bibliography contains a limited number of "general" references, relevant to the theme of fisheries socioeconomics in the developing world, but generally lacking specific regional connections. Two points should be noted in regard to this section. First, while many of the entries originate in Northern countries, there is no attempt here to present a complete listing of such publications, since the report as a whole is focused on the developing world. Accordingly, many important "general" publications on social science theory, conceptual analysis and/or common property research in fisheries are not included. Second, while many of the references included have clear broad-based usefulness, and some are "classics", the collection in this section as a whole should be viewed not as a compilation of the most important references, but rather as a sampling of general research in the area.

The next three sections of the bibliography are geographically-based sections based on three broad regions: Africa and the Middle East, Latin America and the Caribbean, and Asia and the Pacific. The reader will find variations in the coverage between regions and the balance of references within each region. This is due to inherent differences between regions, as well as differences in the physical location, emphasis and background of those compiling the bibliographies (as noted at the start of each of the following sections). In the end, more complete coverage of publications was obtained from Africa, Latin America and Asia, with relatively less coverage of the Middle East, the Caribbean and the Pacific. It is hoped that subsequent compilations will provide fuller coverage of these areas.

Within each of these bibliography's four sections, references are listed in alphabetical order, by the surname of the first author. References are numbered consecutively within each section; this numbering is used in the Index (immediately following this Introduction) to provide for each region a country-by-country listing of all entries, as well as lists of those entries dealing with (a) aquaculture and (b) inland/freshwater and estuarine environments. (Note that general references, from the first section, are not included in the Index.)

The range of information provided for each entry in the bibliography, where available, is as listed below.

1. Bibliographic information, including author name(s), date of publication, title, and source (e.g. publisher, journal name, discussion paper series).
2. The first author's mailing address (in square brackets); this appears in generic form as [institution, city, country.] but will appear simply as [,,.] if no information is available.
3. A summary of the publication, which may be drawn from material in the abstract, executive summary or actual text of the publication, or may be written entirely by those responsible for compiling the particular bibliography.

4. A line of geographical information, providing the region and country (or countries) represented in the publication. The 3-digit regional codes that are used throughout the bibliography are based on "AF" for Africa, "AP" for Asia / Pacific, and "LC" for Latin America / Caribbean. Codes for the specific regions are as follows:

AFA = All of Africa	APA = All of Asia	LCA = All of Latin America
AFC = Central Africa	APH = Southeast Asia	LCL = Central America
AFE = East Africa	APS = South Asia	LCS = South America
AFN = North Africa	APE = East Asia	LCN = Caribbean
AFS = Southern Africa	APP = Oceania/Pacific	
AFW = West Africa		
AFM = Middle East		

Note that "N/A" is used to indicate "Not Applicable" in relevant cases. Clearly, knowledge of the regional code is not particularly useful when the specific country is also known, but in many cases this is not the case (i.e. when the country is listed as "N/A" or is left blank). Furthermore, use of the above codes, together with a copy on diskette of the database or the bibliography, makes it possible to conduct computer searches for entries dealing with a particular region.

5. A line indicating (a) the type of fishery system referred to in the entry, namely capture fishery, aquaculture, both of these, or a "general" (non-specific) topic, and (b) the type of environment considered, whether this is marine, estuarine, inland and freshwater, a combination of these, or a "general" (non-specific) topic.
6. A listing of the principal subject areas dealt with in the publication, given as code numbers (1-9), based on the following classification (which is described in much greater detail in Chapter 1):
1. Philosophy and objectives in fisheries.
 2. Income distribution, social benefits and costs, human well-being.
 3. Fisheries management and regulations, human behavioral responses.
 4. Property rights, common property, traditional use, cooperatives.
 5. Fishery labour markets, labour mobility, opportunity costs.
 6. Fishing communities, post-harvest activities, land-based issues.
 7. Women in fisheries and aquaculture.
 8. Socioeconomic information and research assessments.
 9. Innovation, technology transfer and adoption of new methods.

One final point should be emphasized concerning this bibliography. While to our knowledge, the more than 1100 references included herein represent the most complete compilation to date on the subject of fisheries socioeconomics, nevertheless limitations on the project's budget and time span have meant that undoubtedly many other publications did not come to the attention of those compiling the report, and thus were not included. We apologize to readers, and particularly to the relevant authors, for these omissions. Hopefully, future updates of this report will improve its degree of completeness. To this end, it would be appreciated if one copy of any relevant publication (or the complete bibliographic information, together with a summary) be sent to the first-listed author of this report.

Chapter 7.

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5. INLAND/FRESHWATER/ESTUARINE INDEX

This index lists, on a region-by-region basis, entries dealing with inland and/or freshwater environments (including those which deal with these environments in conjunction with the marine environment). Note that entries solely concerning marine topics comprise the vast majority of the bibliography; in the interests of space, these are not similarly indexed here.

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About the Institution

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