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**FISHERIES PROJECTS**  
**UNITED STATES AGENCY**  
**FOR INTERNATIONAL DEVELOPMENT**

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## EXECUTIVE SUMMARY

This report summarizes the activities, plans, policies, interests and issues on fisheries research and development of various AID bureaus, to assist the Office of Science and Technology/Agriculture (S&T/AGR) and other segments of the Agency in planning its fisheries strategy and program.

A list of fisheries projects was compiled from various sources; 180 were identified, but it seems certain that this list is incomplete, in part because some fisheries projects are included in larger agriculture or rural development programs.

Several trends are apparent in the kinds of fisheries projects supported by USAID: (1) There are now fewer projects supporting the growth of offshore fishing fleets, since most oceanic stocks of fish are fully or over-exploited. (2) There is less emphasis on increasing the capacity of inshore fisheries to increase catches, for the same conservation reasons. There is more emphasis on providing facilities for handling and selling the catch, and integrating coastal fisheries with agriculture and rural development projects. (3) There is a marked increase in support for aquaculture. (4) There is substantially more emphasis on environmental protection and conservation of aquatic resources.

Fisheries has been a minor part of AID's agricultural development program. This is the case in Africa, where despite the large and valuable fishery resources, fish have traditionally been a small part of the diet of most of the people. The social structure of African society has not been conducive to the establishment of fish farming. Some fisheries projects are ending in Africa, and no new ones are planned as far as could be determined. In Asia and the Near East AID has had a more active fisheries program, related in large part to traditionally high consumption of fish in Asia and the long experience of Asians in catching and farming fish. But the number of projects has declined sharply in recent years, and only one new project--in Indonesia-- could be identified. In the Near East an Egyptian project in aquaculture has been approved, and so has an extension of the Near East Marine Technology Project involving that country and Israel. A major regional project involving fisheries and agriculture is about to begin in the South Pacific. In Latin America and the Caribbean there has been only small activity in fisheries in the past. In Latin America the high consumption of meat and the poor infrastructure for distributing fish have made this commodity a minor source of food. No new fishery projects could be identified. In the Caribbean use of fish is higher, fisheries projects there have been scarce, and only a few new ones are planned.

S&T/AGR has three fisheries experts, who are supported by cooperative agreements with Auburn University, the University of Rhode Island, and the International Center for Living Aquatic Resources Management (ICLARM). This office supports two strong CRSP (Collaborative Research Support

Systems) programs and one on milkfish culture. S&T/FENR supports a large Coastal Resources Management project, and other AID offices in Washington have smaller fisheries activities.

Among the issues related to fisheries research and development in AID the following stand out: (1) The need for fish as food in developing countries. The fact that fish provide a small proportion of the calories consumed has persuaded some AID officials that other products are more important as food sources for humans; other AID staff regard the protein and other nutrient contributions of fish as of substantial importance. (2) The potential economic impact of fishery projects. A common view is that a case is yet to be made on the economic benefits of such projects, and that more data are necessary here. (3) Understanding the nature and potential of fishery programs. Most AID staff are relatively unfamiliar with fisheries problems and the development strategies that could be applied to overcome them. (4) USAID use of expert and money resources in fisheries programs. The professional fisheries expertise in AID is very small, but it is strengthened by the cooperative agreements with university and other specialized fisheries organizations. The AID system makes it harder for the fisheries experts to maintain useful contact with Mission and country planners. (5) Fish as natural resources. Planners in AID have omitted fishery stocks from their natural resource programs, probably thereby losing some opportunities to enhance food production and ecosystem protection in developing countries. (6) The role of fish in environmental program. The effects of development programs in agriculture, water conservation and environmental protection always impact on fisheries resources, and sometimes very adversely. (7) Support of projects producing food for local consumption or for export. Policy on this point must differ depending local needs.

The following recommendations for priority action by AID are offered: (1) USAID should give priority to the development of small-scale and artisanal fisheries. (2) The Agency should give priority to the development of small-scale aquaculture. (3) The third priority should be on stock assessment and management of fish stocks. (4) The last priority should be on protection of the aquatic environment. In addition, the following recommendations are made: (5) That a formal and sustained program of information be carried out for AID and developing country officials on fisheries matters. (6) That the fisheries staff of S&T/AGR be increased.

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## INTRODUCTION

At the request of the Office of Science and Technology, (S&T/AGR) of the United States Agency for International Development a review of developing country fisheries was prepared by the present author and Dr Virgil Norton of the University of West Virginia. This was to include the "...importance and use of fish, employment in the fisheries sector, status of development efforts, and potential for development in line with new A.I.D. agricultural focus statement..." The report was delivered in February, 1988.

Subsequently, the same Office asked that the review be supplemented by information from "various AID bureaus regarding their activities, plans, policies, interests and issues on fisheries research and development" to assist it in planning its fisheries strategy and program. By meetings with staff members of the Regional Bureaus and other offices of AID the following tasks were to be performed:

- o Review fisheries activities in which the Agency has been involved...[and provide] a summary statement on past Agency activities, and an analysis of trends.
- o Determine the future directions planned by selected Bureaus in the fisheries field, incorporating programs of which fisheries is an integral part (e.g., coastal resources).
- o Analyse the issues identified by various elements of AID.
- o Prepare a new set of recommendations...reflecting the activities and plans of the Agency as a whole...

A list of USAID staff contacted in the course of this study is provided in an Appendix. Most of these contacts were through personal interviews, some were by phone or cable.

## FISHERIES AND AQUACULTURE PROJECTS OF AID

### Introduction

No complete list exists of fisheries and aquaculture projects supported by USAID. The reasons for this are discussed in the report to S&T/AGR by Idyll and Norton that preceded the present one. There it was pointed out that in AID "Only the Science and Technology Office in Agriculture ...has a specific mandate to support fishery development programs. Most other fishery assistance is a component of programs having a great range of objectives, with help to the fisheries sector often being incidental. Because of this and because there is no coordinating group nor central clearing house for fishery programs, no complete list of such programs exists -- nor can an accurate estimate be given of the amount of USAID money spent on the fisheries sectors...Among the the USAID programs there are many fishery projects buried in various agriculture or environmental projects; many of these are small but some are substantial. They may fail to be identified as applying to fisheries ..."

A list of fisheries and aquaculture projects is contained in the National Academy of Sciences 1982 report "An Evaluation of Fishery and Aquaculture Programs of the Agency for International Development". Another list was compiled in 1984 by S&T/AGR and is entitled "Fisheries Projects of the Agency for International Development." A compilation of completed projects and another compilation of active and approved projects were provided as computer printouts in June and August, 1988 by the AID Program and Policy Coordination Center. From these lists and from other information collected in the course of this study a new list of AID fishery projects has been compiled and is included in the Appendix of this report.

In this list the fisheries projects have been categorized using the following labels:

- Marine fisheries, including assessment of stocks (MF)
- Inland fisheries other than aquaculture (IF)
- Fishery development, primarily processing (FD)
- Aquaculture (AQ)
- Technical assistance (TA)

It seems certain that this new list is also incomplete and inaccurate since it is subject to the same errors and difficulties faced earlier. In particular, the amounts of money contributed by AID to the projects listed may sometimes be incorrect in the cases where the fisheries activity is part of a larger agriculture, rural development or other program, since it is often impossible to make a reliable estimate of the amount of the total budget was dedicated to the fisheries component. For this reason no totals are provided for categories of projects since they would probably be more misleading than useful.

A total of 130 AID Mission-supported fisheries projects and 50 "projects" supported by S&T/AGR and other AID/Washington offices have been identified. Not all of these projects are of the same "rank", some having been substantial activities dedicated solely to fisheries research and development, some being small aspects of projects designed primarily for agriculture or other areas of assistance.

A table has been constructed showing the numbers of Mission-supported projects in each category by geographic region: Asia/Near East (ANE), Africa (AF), Latin America/Caribbean (LAC). Projects which ended before 1970 are recorded in the table separately from those completed since that time, in order to compare the kinds of projects supported in the last two decades with those of the 1950s and '60s. Caution must be exercised in drawing conclusions from these data. For one thing, many of the projects included in the count for the later years were started earlier. And some of the designations of type of project may be partially or wholly incorrect since they are derived from titles and summaries which may not call attention to all aspects of a multi-purpose project.

#### FISHERIES PROJECTS BY CATEGORY, REGION AND TIME PERIOD

	1950s-60s				1970s-80s			
	ANE	AF	LAC	Tot	ANE	AF	LAC	Tot
MF	4	5	2	11	6	6	3	15
IF	2	1	0	3	6	4	3	13
FD	4	3	2	9	4	4	7	15
TA	1	1	0	2	6	6	4	16
AQ	6	0	1	7	11	9	12	32
Tot	17	10	5	32	33	29	29	91

### Trends in fisheries projects

Fisheries and aquaculture are in a state of significant transition over the world. As a consequence, notable changes have taken place in the character of fishery assistance programs by USAID (and by other assistance agencies).

1. Fisheries on ocean fish stocks have reached the limits of their yield capacities in an overwhelming number of cases, so that few under-utilized resources remain. The world-wide production of fish has therefore ceased the sharp climb experienced after World War II and is going up only slowly, often at the expense of further damage to stocks through overfishing. As a consequence, the attention of governments and assistance agencies has shifted from efforts to wrest more fish from the resources. Many of the early projects after World War II emphasized construction of fleets of large vessels for offshore fishing, the building of fish harbors, and the training of fishermen and shore workers to handle large-scale fisheries operations. The emphasis in assistance projects for oceanic fisheries now is on conservation of fish stocks and protection of the ecosystem.

2. Inshore, small-scale fisheries were also assisted by projects that emphasized increase in production, as more and larger motorized and better equipped boats were provided, and fishermen were trained. This approach was useful in many instances, but again it became apparent that most near-shore fish stocks were not capable of sustaining increased exploitation. Moreover, many of these projects were one-dimensional, concentrating on bigger catches and not providing facilities for processing, handling and marketing the increased production.

As a consequence, emphasis in development projects in general has moved away from the large-scale, offshore fisheries, and away from concentration only on production increase, to projects that assist artisanal fishermen (who in the aggregate produce more than half of the fish caught in developing countries) and which assist in the development of machinery for preserving, distributing and marketing the catches. These later kinds of projects serve more directly the poorer segments of developing country society.

3. In aquaculture there has been a surge in the production by fish farms, and marked improvement in the efficiency of fish farming systems. This is particularly apparent in certain small and large integrated pond culture systems, such as those in China and elsewhere in Asia, involving fish production with livestock or poultry raising. This has led to what is perhaps the most marked trend in development projects in fisheries: support of aquaculture development, in the sea but particularly in fresh water. This trend is bolstered by the fact that fish farming probably offers the greatest long-term way of increasing world-wide fish production, and is thus the fishery activity most likely to expand, and the one most easily conducted by the rural poor.

4. An increasing number of fisheries and aquaculture projects are being integrated with agriculture and rural development programs. This has come about as the realization has increased that fisheries are food producing and economic activities sharing many of the attributes and problems of agriculture and other segments of rural society. It is being demonstrated that land farmers can supplement their food supplies and incomes with small-scale fish farms. And in many cases fishing in near-shore areas or raising fish in farm ponds are activities which are often easily integrated with small farmer's lives. This trend is becoming stronger.

5. There has been a marked rise in the environmental protection ethic in most western societies, and increasingly in others. New information and insights are emerging from research and experience; in particular the interaction of farming systems with other human activities and with the natural ecosystems is forcing fresh attention to environmental action. The necessity of maintaining viable ecosystems in order to sustain the productivity of farm production on land or in water has made "sustainability", "environmental protection", and "biological diversity" key guiding terms in devising AID policy.

The conviction that the viability of natural resources depends on the maintenance of the the environment has also persuaded leaders in many developing countries of the fundamental importance of (a). the management of fisheries to prevent overfishing, (b). the development of rational and workable coastal zone management programs to reconcile competing uses, and (c). protection against environmental pollution. USAID and other assistance agencies are responding.

## AFRICA

Past and Present Activity

Fisheries development has been a minor part of AID's activities in Africa. This is in spite of the fact that in many coastal areas, especially off West Africa but to a smaller degree off East Africa and on the great lakes of the continent, there exist some of the largest and most valuable fishery resources of the world. This very abundance of fish in these regions may have contributed to the lack of development activity by AID, since there has been a perception by government officials that fisheries assistance is not needed. "The governments in Africa do not look seaward.", according to one AID official.

Fish and other aquatic creatures are regarded by ecologists and others as among the most important and valuable of natural resources, and this is clearly the case for many African countries. It thus comes as a surprise that the recently approved "Plan for Supporting Natural Resources Management in Sub-Saharan Africa" virtually ignores fishery resources. This omission can result not only in lost opportunities for enhancing and increasing the use of fishery resources, but it also poses the threat of damaging them by lack of understanding of their role in environmental/ecosystem complexes.

The vital goal of protecting biological diversity and original gene pools is especially relevant in Africa. The tilapias, one of the groups of species of especially great importance to the development of aquaculture in third world countries, are native to Africa. The urgently needed research now under way on the genetics of these fishes depends to a critical degree on the availability of wild, unmixed brood stock, which are in urgent danger of adulteration by uncontrolled transplantations of fish.

The lack of activity in fisheries is also related to the traditionally small place fish has had in the diet of most Africans. "No African country looks at fish as a major source of food." Yet, in many coastal areas of the sea and of large lakes fish is important as food, and as a source of employment and trade. But the fishermen and others who benefit from the use of these fishery resources "do not play a major role in the political economy" of African countries, in the words of a staff member of AID, and therefore little pressure is put on governments, and thus on USAID, to include this sector in the assistance strategy.

In the area of fish farming, where a major impact could perhaps be made, there is little interest on the part of small farmers. This is undoubtedly to a large degree due to a lack of information that such an activity exists let alone where to start. Moreover, the socio-economic system in most of Africa is not conducive to the communal, cooperative fish culture systems that are notably successful in parts of Asia and other regions.

### Planned Activity

Only two projects with any fisheries component are under way or planned by the Africa Bureau as far as could be determined. These are both small parts of projects on human resources development, in Mauritania and the Sahel. Some fisheries projects in Africa are about to come to an end, but none is scheduled for renewal.

And no new ones are being organized. "It will be hard", according to a senior official in the Africa Bureau, "to rouse interest in any new programs that are not related to the new Natural Resources Management Plan." Yet, as pointed out above, this plan does not include fisheries resources among the natural resources of Africa.

It is therefore apparent that for historical and other reasons fisheries are "not part of the long-term perspective of AID in Africa", and that this is not likely to change if present trends in policy continue. Fisheries projects are actively opposed by some Bureau officials, one of whom stated that his region "Does not and will not have a discrete fisheries program (i.e., a group of new fishery projects)" if he can prevent it. He is afraid that if fisheries is declared by AID policy to be of significant importance "the Agency would have to develop more expertise, and Missions would start to look around for fisheries projects at the expense of other activities." Instead the Agency intends to focus efforts "on a few narrow areas, principally family planning and agriculture policy and research."

In the near future any activity in fisheries assistance in Africa will probably come from integration with agriculture development or environmentally oriented projects, where the fisheries component is logically and clearly linked to other objectives, or from the interest and help of the private sector.

## ASIA/NEAR EAST

Past and Present Activity

In the region under this Bureau's supervision 49 fisheries projects have been identified as completed or under way. Of this total 40 are in Asia, seven in the Near East and two in the South Pacific.

In Asia fish has traditionally been of high importance, with 10 countries depending on fish for over 40% of the animal protein they consume, and with Bangladesh, Indonesia, Sri Lanka and Malaysia relying on it for 50% or more. Linked to this high consumption, Asian countries have large and successful fishing and fish farming industries. Four of the top 10 fishing nations of the world, and eight of the top twenty are Asian. Some countries of the region lead the world in aquaculture production.

In the face of this record it may be surprising that the countries of Asia would seek development assistance, but not all the nations of the region are at the same high level of competence. Moreover, while Asian countries are skilled at catching fish, they are frequently not experienced in the technical aspects of fish stock conservation and management; they have increasingly realized that they must put more effort into preventing declines in production by rational management of their fleets. In the case of aquaculture, while Asian fish farmers often harvest impressive crops, their methods are in many cases by trial and error, without an understanding of the underlying scientific reasons for success or failure that is essential for long-term sustainability. These gaps in knowledge and experience have caused governments to seek expert help, and the areas of fishery management and the scientific aspects of aquaculture are fields in which United States experts are among the strongest in the world.

In the Middle East the use of fish for food or other values is less strong than in Asia, but there has been rising interest in this resource in recent years. And because the Mediterranean Sea is not highly productive, so that efforts to increase catches from its waters are likely to be counter-productive by encouraging overexploitation, both marine and freshwater fish farming have become more important in this region. Further, fisheries and other aquatic sciences have attracted the United States as opportunities to promote cooperative projects in the area, and this has led to a large and generally successful Near East Marine Technology Project involving Israel and Egypt.

The South Pacific, another region under the supervision of this Bureau, also traditionally has depended heavily on fish for its food, partly because so much of the area is ocean, and because the land is often relatively unproductive. Recently the potential of fisheries to produce food from the inshore areas has been reinforced. And the opportunity to gain export commodities from offshore tuna and other stocks

has stimulated governments and AID to design and approve a large South Pacific development project with a significant fisheries component.

#### Planned activity

Fisheries projects are declining in numbers in the Asia/ Near East Bureau. Only one new fisheries project could be identified, in Indonesia. Mention was made of small fishery components of agriculture projects in the Philippines, and some fishery aspects of coastal zone projects in Thailand and Sri Lanka.

The new project in Indonesia is on inland fisheries and pond fish culture. This has been delayed in implementation, and its budget has been sharply reduced from that of the original plan as a consequence of reduced funds available to the Mission.

A fishery-related program on Coastal Resources Management is actively under way under the guidance of the Office of Science and Technology, Forestry and Natural Resources. This involves two Asian nations, Thailand and Sri Lanka, and Ecuador. For Thailand this is a policy-oriented project whose goal is to develop "implementable coastal resources management policies", for protecting and promoting such values as tourism and fisheries. In Sri Lanka the emphasis is to demonstrate the link between the ecological integrity of the coastal zone with other economically important activities such as agriculture and fisheries.

The AID program in the Philippines, which has been active in the past, is presently very small, consisting of fishery components of some agriculture, resource management and rural development projects. There is discussion among AID staff of the possibility of increasing fisheries activity in the Philippines, but nothing definitive has yet emerged.

Extension of the Near East Regional Marine Technology project involving Egypt and Israel has been approved. This includes fishery research and development activities, including lake management studies, inland and brackish water aquaculture, and seafood toxins; other components that are closely related and of vital importance to fisheries are waste water utilization, shoreside protection and planning, and Mediterranean Sea circulation.

Egypt will also be given assistance by USAID in an aquaculture research and extension project, as a continuation of a large aquaculture project in the Nile Delta area.

A large regional project has been approved for the South Pacific, with fisheries as a major component.

## LATIN AMERICA/CARIBBEAN

### Past and Present Activity

Support of fisheries projects by USAID has been less in this region than in the other two. Thirty-four projects have been identified, 24 in continental Latin American countries (half in South America and half in Central America) and 10 in Caribbean countries.

In South America the relatively small attention given to fisheries development is related at least in part to the traditionally small consumption of fish, in a society where beef production is a major industry. This small consumption of seafood occurs in spite of the fact that in some countries of the continent there are notably large supplies of fish: two of them, Peru and Chile, rank among the 20 leading fishing nations of the world.

In other parts of LAC, especially the Caribbean, fish is locally of substantial importance as a source of food, employment and income. But in most of these countries fish handling, distribution and marketing machinery are such that fishery products do not get far from the area of production. As a result people are unfamiliar with fish as food, making the problem of increased consumption more complex than one of merely improving production methods, but also one of introducing new items into the diet--a familiarly difficult task worldwide for any kind of food product.

In the Caribbean, as in other tropical ocean areas, supplies of fish are relatively low, a consequence of the poor productivity of warm waters where surface nutrients are in short supply.

"The food problem in this region is not one of starvation but of malnutrition," according to a senior AID expert. "All the countries of South America have the capacity to increase their food production enough not only to feed themselves but probably to feed the whole region. The limiting factor is not availability of food but small buying power." As a consequence the "strategic focus" of many governments in the area, and therefore of AID, is on the production of items with a good export market, so that personal income can be earned and used for the purchase of other foods; the government also gains by earning foreign exchange.

It is because of this policy that AID fisheries projects have increasingly focussed on high value items, notably shrimp. This activity has been especially strong in Ecuador, where shrimp, including large quantities produced in coastal farms, have become the most valuable agriculture product, and second in value among all exports after oil. USAID shrimp culture projects have also been strong in Jamaica and Panama, and are increasing in Honduras. Assistance in these cases is mostly to middle-income people. Several other governments have expressed interest in AID assistance in shrimp culture.

Other continuing fisheries projects include one in

Honduras promoting small holder farms for shrimp, and in Guatamala on family fish pond development for carp and tilapia.

"There are a few fish farming operations tied to low intensity programs associated with agriculture activities, to promote alternate income sources", in the words of an AID staff member. "AID funding for these has been haphazard."

#### Planned Activity

USAID activity in fisheries in Latin America and the Caribbean is decreasing. In the Caribbean a number of local and regional programs have recently concluded, and in some cases proposals have been made to extend or branch off from these. Such proposals include a regional mariculture (saltwater aquaculture) development program. Fisheries is part of the large High Impact Agricultural Marketing and Production Project started in 1986. A new project has recently been approved to test "Fish Aggregating Devices" as a technique for improving the efficiency of commercial fishing for pelagic species. It is to be conducted in the Caribbean and perhaps in other regions.

The most obvious trends in AID support for fisheries have been a reduced activity overall, and a marked increase in the emphasis on aquaculture projects.

## SCIENCE AND TECHNOLOGY/AGRICULTURE

### Past and Present Activity

The Agriculture Office in the Bureau of Science and Technology includes a small staff of three fishery specialists. One of these is a "direct hire" by AID and the other two are provided by the National Marine Fisheries Service of NOAA, U.S. Department of Commerce, under a Resources Support Service Agreement (RSSA). This group provides the focus and expertise on development needs in USAID for fisheries, aquaculture and related areas. It also provides technical evaluations of fisheries proposals and short-term assistance to AID/Washington, country Missions and developing country governments.

The fisheries group in S&T/AGR administers the following programs:

1. Fisheries Development Support Services. This is a cooperative agreement with the University of Rhode Island; it first came into being in 1969. With this support from AID the University has created an International Center for Marine Resource Development (ICMRD). Its staff complements and expands the work of AID in providing specialized expertise to the Regional Bureaus, the country Missions and developing country governments. URI has become a repository of skills in four areas: management of marine fisheries, post-harvest technology, mariculture (saltwater aquaculture), and the human cultural and social/anthropological factors that affect fisheries development.

Four kinds of assistance in these specialized areas are provided: a. technical assistance, b. information, c. training, and d. applied research. Over the five years of the current agreement:

a. ICMRD has responded to requests from 16 developing countries, in addition to AID staff. The number of requests has increased each year.

b. The Center's library distributes 1300-1700 documents annually, and many information packages on AID projects to participating countries. A data base for fishery documents has been prepared.

c. 23 specialized non-degree training programs were conducted in the U.S., with 116 participants, and eight in-country workshops with 147 participants. Degree training averaged 32 students a year over the last three years, granting 8 PhDs, 20 Master's and 4 Bachelor's degrees.

d. Applied research was conducted in the social sciences (e.g., the role of women in the fisheries industry of Sierra Leone), mariculture (e.g., the use of Artemia as food in fish culture systems in Thailand and Ecuador), and resource utilization (e.g., evaluation of commercial exploitation of portunid crabs in Ecuador).

In 1986 a review team reported that "The International

Center for Marine Resource Development...conducts an important program of training, technical assistance and applied research...The university has a unique combination of capabilities to advance this mission and is responsive to the needs and opportunities in fishery development. The components of training and technical assistance are organized into interdisciplinary programs tied to strong academic programs. The program is sensitive to human factors and the context for development within developing countries."

AID staff has expressed general satisfaction with the URI program, saying that it has become tighter and more productive since a reorganization a short time ago. The Center still does not have fully effective expertise in all four of the areas where it concentrates its efforts, still being relatively unskilled and inexperienced in mariculture and some aspects of tropical problems. Nonetheless, the staff has an impressively broad base of specialized experts.

Concerns of the AID staff about this program are concentrated not on deficiencies of URI's performance but on the difficulty of developing useful fisheries projects under the constraining rules imposed by AID itself. This makes it hard to establish the critically important relationships between the Center and AID scientists and personnel of the Missions and governments of the developing countries.

2. Aquaculture Technology Development. This is a Cooperative Agreement with Auburn University that began in 1967. Through its International Center for Aquaculture (ICA) the University has provided AID/Washington, the Missions, and developing countries with technical assistance, information services, long-and short-term training, and research in freshwater aquaculture. This agreement has greatly extended the ability of AID to respond to the needs of the Missions and the developing countries by providing expert service in aquaculture.

a. Technical assistance activities have included long-term projects in Brazil, Thailand, El Salvador, Panama, the Philippines, Niger, Rwanda and Egypt. The terms of the agreement allows the University to free faculty and specialized staff to respond rapidly to Mission requests for surveys, feasibility studies and other short-term assignments.

b. Over the years a large volume of information has been made available by ICA to Missions and LDCs, including periodic newsletters and technical papers in the ICA Research and Development series. The information system is being notably strengthened by the establishment of a new Information Network, consisting of a cooperating group of aquaculture specialists over the world, many of them Auburn graduates. The publication of ICA Communicae and of working manuals helps to keep workers up to date. Video programs on aquaculture topics have been distributed to 45 Missions and 40 Private Voluntary Organizations for their staffs and for interested persons in the LDCs.

c. A notable strength of the ICA program has been in

training. Over the world an impressive number of the active aquaculture scientists, government program managers and commercial operators in developing countries have been trained by Auburn. Long-term training is conducted both in degree-earning and certificate earning programs. In 1987 there were 54 graduate students in aquaculture from 23 foreign countries. A practical non-thesis Masters degree program is also available, which is particularly appropriate for foreign students.

A non-credit practical course is offered over 16 weeks, during which the trainee is expected to grow a crop of fish. In 1987 11 participants from eight countries took part in this program. Other short-term courses are offered at Auburn and overseas for particular groups.

d. Research has focussed recently on new production methods for tilapia seeds. The tilapias are native to Africa, and have been introduced widely through the developing world as culture species. A major constraint has been limited seed production. Three experiments were conducted to help solve this problem.

Auburn prepares a provisiona1 work plan for the cooperative aquaculture program, and this is modified on the advice of the S&T/AGR fisheries staff. The plan is flexible, and works well. If any criticism is leveled at Auburn for its activities it relates to the total attention given to freshwater aquaculture, with none to marine culture.

A severe constraint is placed on these activities--as on other fisheries programs in AID--by the limitation requiring the Missions to bear the coats of all expertise provided in the countries. The reduced emphasis by AID on training has also adversely affected the the Auburn program.

3. Fisheries Development. Core support has been provided to the International Center for Living Aquatic Resources Management (ICLARM) since 1979. This organization was established in 1977 by the Rockefeller Foundation, which had identified a gap in the services being provided to developing countries in aquatic resource development. In more recent years it has been supported by several international and bilateral assistance agencies in addition to USAID.

ICLARM has its headquarters in Manila, and has until recent years been most active in Asia, but is now working many parts of the developing world including Africa, the South Pacific, Latin America and the Caribbean.

ICLARM has completed 10 years of research and development in fisheries and aquaculture, and has gained a solid reputation among developing countries. Its activities for the next period of time include:

1. Aquaculture. Activities in this area are genetics of freshwater species (principally tilapia and carp), improvement of the efficiency of freshwater farming systems, particularly those employing the Chinese model of integrated farming (e.g., combining livestock and poultry with fish), and culture of the giant clam.

2. Resource assessment and management. This focuses on

stock assessment, economics, and management of small-scale fisheries, especially multi-species models appropriate in the tropics. In the past four years management plans have been developed for six Asian countries and the program will soon be expanded to Africa and Latin America. This program also works on problems of coastal zone management.

3. Social Science Research Network. This focuses on resource management, aquaculture and development issues. This effort, through training and research, has addressed a key restraint to these issues, a lack of qualified social scientists.

4. Education and Training. ICLARM's training activities are done through research under staff supervision and through networks with staff guidance.

5. Information Program. The Center is well known for its information service, which is used by researchers over the world. This includes ICLARM's seven technical publication series and four regular newsletters and magazines.

ICLARM provides USAID with another strong extension of its ability to provide assistance in a wide range of fishery development problems, without the burden of an increased AID staff and infrastructure.

4. CRSP - Efficiency of Pond Culture Systems. This is one of the AID Collaborative Research Support Systems. It funds basic research in aquaculture pond dynamics, the processes that control the productivity of fish pond culture systems in response to various manipulations by the fish farmer. Even the most successful pond culture systems in Asia and elsewhere suffer from apparently erratic production records caused by inadequate understanding of the biological, chemical and physical processes that occur in fish ponds following fertilization, stocking density changes, aeration and other manipulations.

Starting in 1982, this program is managed by Oregon State University. It is a cooperative program among American universities (Auburn, California at Davis, Arkansas at Pine Bluff, Hawaii, Michigan, Michigan State) and developing country scientists in Rwanda, Thailand and Honduras. This program was forced by budget reductions to cut back on the number of collaborating countries and on its original plan of research. But it is developing principles that will be of far-reaching value to pond fish farmers. It has been described by AID/BIFAD staff involved in its management as the most innovative of the existing CRSPs.

5. CRSP - Fisheries Stock Assessment. This supports research on new methodologies for stock assessment and management of small-scale, multi-species tropical fisheries. In years past considerable progress has been made, particularly in the United States and in parts of Europe, in devising theoretical models and applied methods of managing single species fisheries. But the complexity of many multiple species and multiple gear fisheries, including many of those in developing

countries, has made economically feasible management strategies difficult.

This research has made encouraging progress in devising better methods of assessing stocks, which will lead to improved advice to LDC managers.

The program is managed by the University of Maryland, with the collaboration of the Universities of Washington and Rhode Island, and scientists in Costa Rica and the Philippines.

6. Reproductive Studies on Milkfish. This program has been conducted by the Oceanic Institute in Hawaii, to develop methods for the mass production of milkfish seed for ponds in the Philippines and other parts of Asia. The milkfish culture industry depends entirely on the capture of fry from wild populations to stock the ponds, and there are fears that this supply is inadequate and dwindling. This research has not yet succeeded in developing economically feasible methods of producing fry in large numbers.

SCIENCE & TECHNOLOGY/FORESTRY, ENVIRONMENT AND NATURAL  
RESOURCES (S&T/FENR)

Coastal Resources Management.

This is a policy project, managed by the University of Rhode Island, whose objective is to help developing countries design implementable coastal resource management strategies. With much of the world's population living on the sea coast, there are enormous destructive pressures on nearshore ecosystems. This has led in many cases to degraded water quality, shoreline erosion, declining fish resources, and destruction of estuaries, mangroves, seagrasses, and coral reefs. The role of the coastal zone on the sustainability of fish populations has been the hardest concept to bring home to government officials, who find it hard to link the reality of the economic value of ocean fisheries to what many of them regard as an academic interest in the conservation of the nearshore environment.

Three demonstration pilot programs make up this project, which is designed to lead to integrated coastal resource management strategies for balanced development and sustained use of the multiple coastal zone resources.

In Ecuador the project focuses on establishing the link between management practices in the coastal zone and the profitability of the shrimp farming industry, the most valuable agricultural activity of the country and the biggest shrimp farming activity in the world. After years of rapid growth the industry has stagnated, due largely to changes in the abundance of shrimp fry, caused by the depletion of wild stocks and the degradation of coastal zone water quality.

In Sri Lanka 75% of the population is crowded on the coast, and heavy property losses have occurred from erosion of the shoreline. Significant destruction has taken place in coastal habitats, partly through ill-advised mining of coral and sand, and clearing of mangrove forests. Results have been reductions in food fish production, destruction of tourist attractions, loss of fuel and building material.

In Thailand there are rich coastal zone resources of fish, minerals, mangroves and tourist areas. This results in complex competing user groups and multiple responsible government agencies. The project here is developing site-specific plans for tourism and shorefront industries, and is designing a coherent national coastal zone management policy. The task of explaining to government officials the linkages between ecological integrity of the coastal zone and the economic values of coastal resources has been more difficult than in the other two countries.

#### OFFICE OF THE SCIENCE ADVISOR

The program for Science and Technical Cooperation links the United States and foreign scientific institutions (or more rarely involves only the latter) in short-term, small research projects. These are expected to be related to the solution of practical problems faced by developing countries, but not in the immediate future. In this, the program differs from other AID assistance programs, and does not always follow the established AID policy guidelines. To a significant degree these unsolicited research proposals are judged on the degree of innovation ("the cutting edge of science"), as well as on their scientific merit and the sharpness of their focus. These grants are made in a variety of areas, including fisheries and aquatic plants. Support is for individuals and not institutions.

#### OFFICE OF RESEARCH AND UNIVERSITY RELATIONS

This Office provides comprehensive assistance to universities to conduct research in projects of use to AID programs. Small Strengthening and Program Support Grants serve to encourage institutions to become interested in the foreign aid area. The program for Support of Historically Black Colleges and Universities is in this office.

Most of the grants are in the areas of agriculture and health. Of the 91 current Strengthening Grants only three are in fisheries and there are a similarly small number among the Program Support Grants.

#### BUREAU FOR PRIVATE ENTERPRISE

This Bureau assists United States private enterprise firms secure funds to work in developing countries. Only a small number of fisheries firms have been involved in this program. In Antigua, private investment money was found for a shrimp culture project. In other cases the Bureau supplies seed money to development banks. Through the Development Bank a few fisheries projects have been assisted, including one in Kenya for aquaculture and several in Egypt for financing aquaculture businesses. The opportunity exists for greater use of these programs by United States fisheries enterprises.

#### BUREAU OF FOOD FOR PEACE AND PRIVATE VOLUNTARY ASSISTANCE

This Bureau supports partnerships between universities and Private Voluntary Organizations. It has collaborated with S&T/AGR in the Water Harvesting/Aquaculture Project to provide technical assistance and training in aquaculture. The project is coordinated by the Joint PVO/University Rural Development Center (JC) at Western Carolina University and

the technical assistance and training is provided by the International Aquaculture Center of Auburn University. The project has operated in 14 developing countries with the help of six private voluntary organizations. Objectives are to develop a methodology for collaboration between universities and PVOs involving nine field projects, to provide villages with self-sufficiency in water use, including harvesting and aquaculture. The technical aspects of this project have been very successful, but according to the AID managers of the project in this Bureau other objectives, including expected "ripple effects" on improved nutrition and irrigation, have not yet been as well achieved.

## ISSUES

The fisheries program in USAID is small. Always a minor part of the Agency's activities, it is presently diminishing. The fundamental issue is whether AID policies leading to this are appropriate. This question is pursued by discussions of a number of issues, in which views of the staffs of the Regional Bureaus and other components of USAID are summarized.

1. The need for fish in developing countries.

There was a wide divergence of views by AID staff on the need for fish as food or for other values in the countries assisted by AID. A senior official in Policy and Planning stated that "The main task of the USAID agriculture efforts should be to increase the supply of calories", and that since fish contribute a small proportion of calories to human feeding [2-3%] it is not in most cases appropriate to put a high proportion of effort or money into fisheries development.

But he noted that this view concerning the food needs of developing countries is not universally shared. To confirm this, a senior official in the Africa Bureau asserted that "The LDCs have a great need for fish". Others in various offices echoed this with different words and emphasis. Some asserted that the Agency's task is not solely to feed people, but to feed them better, with a balanced diet, so that they function physically and mentally in a more effective and socially rational fashion. Research has demonstrated that "hunger" has several faces, and that full bellies do not necessarily overcome it. Certain amino acids, available to many people only from animal protein, has been shown to be essential not only for physical survival and growth but for mental development and productivity. Nutritionists cite the value of the notably high contribution by fish to human supplies of animal protein --16% world-wide, 20% for Africa, 31% for Asia, 60% for Southeast Asia--and of trace elements.

The need for fish (or for some other source of animal protein, which is nearly always more expensive), varies widely over the world, and is especially high in the developing countries. In 9 African and 10 Asian countries fish are the source of over 40% of the animal protein consumed, and in some countries the proportion is substantially higher. This emphasizes the important point that there are significant differences of need for fisheries development programs over the world. Not only is the supply of fish often important, according to some AID experts, it is urgently necessary.

## 2. The potential economic impact of fishery projects

Substantial differences of opinions were expressed by AID officials concerning the usefulness of fisheries development programs in terms of promoting economic values for developing countries. One Africa Bureau senior official said that "...fisheries projects will probably not have a significant impact on the economies of the LDCs". A senior economist in the Bureau of Science and Technology was among several who thought that fishery projects have had a relatively poor record of economic pay-off. His opinion is that the case has not yet been made that fisheries assistance leads to economic benefits. But others working on problems in various parts of the world expressed more favorable opinions, including some views that regionally appropriate fisheries development, including specific examples in Africa, the South Pacific, Asia and Latin America, have had favorable economic consequences.

And some asserted that economics should not be the only value expected from AID's efforts. Even those who were forthright in the view that fisheries development programs usually offer relatively limited economic benefit often expressed the opinion that many of these projects are valuable in the areas of trade and foreign exchange, viability, sustainability and environmental protection. One official asserted that results should be measured more in terms of consumption than in production. And nearly all of those expressing opinions on either side of the issue added the caveat that the unfavorable opinions regarding the value of fishery projects are not universally applicable, since local conditions can produce different results.

## 3. Understanding of the nature and potential of fishery programs

A recurring pattern was evident in these discussions with AID officials related to the fact that nearly all of the individuals involved were relatively unfamiliar with fishery problems and the development strategies that could be applied to overcome them. Their strong bias is understandable. It is generated by their training and background, which leads them to regard agriculture production--especially the production of grains--as the only or at least the overwhelmingly important and economically significant food production system.

Closely related to this situation is what one AID official called "the innate value sense" of many AID staff that increased production is the only useful outcome of the Agency's programs. While this view is changing, as AID's policies in recent years have included a strong realization that "sustainability"--the assurance that the underlying resource is being protected from overuse-- should be a prime objective of development projects, there is still a strong tendency to make production the dominant theme.

This pattern of views impacts directly on the design of

assistance programs. USAID projects are funded largely on the decisions made in the country Missions, following advice and requests from the governments. Assistance programs are also shaped by the Bureaus and other components of AID/Washington which develop Agency policy, and administer this policy and the directives of Congress. More than once in the course of these discussions it was said by staff who had served in the Missions that fisheries programs suffer because AID/Washington has not provided leadership in encouraging the consideration of fishery activities, and the Catch-22 observe that Missions have not asked for fishery projects to be included in their proposed programs. This mutual lack of attention to fisheries is believed to result significantly from lack of information in both groups on the potentials of fisheries development.

The origin of assistance projects should presumably be, and usually is, with the government aided. Here lack of information and understanding of fisheries issues acts as a deterrent to their inclusion in programs, since most developing countries do not have the experience or expert staff to draw to the attention of government planners the need and potential of fisheries development. Agriculture and policy experts in the governments are advised by agriculture and policy experts in AID and the result is predictable.

In the extreme case there is active opposition among some AID managers to a wide discussion of the value of fisheries within the Agency or with government officials, since if these discussions were to result in pressures for fisheries activities it would further dilute the programs that they have to struggle to keep afloat. One senior official stated that he did not want fisheries declared to be a higher priority in AID than at present since if it were, "Countries and Missions would start looking for projects".

But opposed to this view there was a widely expressed opinion that AID decision-makers need substantially more information about fisheries in order that these activities can be fitted into the overall strategy of the Agency. A "sustained dialogue" between fishery experts and others in AID was suggested as being essential in order that planners can recognize potentially useful fisheries projects, and fishery components of broader programs, including agricultural development and environmental protection initiatives.

#### 4. USAID use of expert and money resources in fisheries programs

There is a perception that the fisheries expertise in USAID is inadequate, that the amount of information available to Regional Bureaus and country Mission planners is deficient, and that this militates against the inclusion of fisheries in country programs.

In respect to the Washington staff a strong argument can be made that there is an insufficient number of fishery experts. Of the large number of professional AID staff in

Washington and abroad only three are assigned to fisheries. And only one of these is a direct hire, the other two being RSSA assignments from NOAA's National Marine Fisheries Service. Their responsibilities are so heavy that they are usually able only to respond and not to initiate or create. External review teams have repeatedly recommended that the central core fisheries staff in AID be enlarged.

Fortunately, the competency of the fisheries staff in S&T/AGR is high. Further, their ability to deal with fisheries problems is greatly strengthened by cooperative agreements with outside academic and other organizations. As described earlier in this report, the AID/Washington fisheries staff is backed up by specialized fishery research and development centers in Auburn and Rhode Island Universities, by the staff of the International Center for Living Aquatic Resource Management (ICLARM), a research organization working world-wide from Manila, and by advisory groups. Together they provide S&T/AGR with an impressive array of fisheries expertise in research, training and information.

The effectiveness of the AID fishery apparatus has been decreased in recent years by the Agency policy that Missions must pay essentially the full cost of assistance provided by AID/Washington. When the government of an AID-assisted country wants help, the Mission must bear the cost from a general Basic Ordering Agreement which assigns a specific and limited amount of money to that country from which it may buy all AID help. This requirement applies to other programs in AID and is not unique to the fisheries sector, but it affects this sector disproportionately. The effect is that governments and Missions are less willing even than before to risk support for fisheries projects about which they might be uncertain for lack of knowledge about them. They tend to turn instead to more familiar kinds of programs where the risks and potential benefits are better understood.

The costs of visits by AID/Washington or other expert staff to developing countries must thus be borne by Basic Ordering Agreement funds. This has to a significant degree severed the vital link between these staffs and the Missions/governments. This connection and the resulting discussions with field people was a major and essential link leading to the development of fisheries programs.

##### 5. Fish as natural resources.

Fish are widely regarded as one of our principal natural resources. They constitute the only significant wild source of food of any kind, and they support economically important commercial fisheries, the last remnant of an economically important hunting culture in our society. Aggressive efforts

are under way to accelerate the shift from this hunting culture to increased control over supplies of fish through aquaculture, but about 85% of fishery products available to humans still comes from wild fish resources. This dominance will prevail for many years.

It therefore comes as a surprise that USAID "natural resources" policy documents usually make scant reference to fish. A significant case in point is the recently approved "Plan for Supporting Natural Resources Management in Sub-Saharan Africa". Essentially no consideration is given in this document to fish, despite the fact that there are large fish populations in the region, that oceanic, nearshore and freshwater fisheries of Africa are of major economic and cultural importance, and that fish culture is a highly promising activity for small farmers.

#### 6. The role of fish in the environmental programs of USAID

The recognition of environmental issues and of their importance to development programs is now at the highest point ever in AID; there is a greatly heightened awareness of the interaction of food production systems with the integrity of the ecological systems involved. But this level of awareness is new, and is still poorly developed. There is still widespread lack of consideration of the possible effects on aquatic ecosystems of AID programs in agriculture, water conservation and other development, and of the realization that agriculture, fisheries, watershed and other development systems do not exist in vacuums. There is a widespread lack of understanding of the role of fish in ecosystems in environmental programs planned by AID. The effects on ecologically and economically valuable fish and invertebrate stocks of some agriculture practices (use of insecticides, herbicides, fertilizers), of land clearing and of other human activities are commonly not taken into consideration.

One excellent example of the possible losses that can occur from neglect of consideration of the ecology of fishes concerns the potential effects of loss of biological diversity--an issue on which AID has a strong mandate. Loss of biological diversity is of special concern in many fishery populations, and one of the foremost of these relates to the tilapia of Africa. These fishes are among the most promising for small-scale farm culture, and offer especially high potential for African small farmers. Realization of the substantial promise of the tilapias depends significantly on success of genetic studies under way and planned, to solve such problems as growth rate and reproductive behavior. But some stocks of wild tilapias in Africa are endangered by prevalent agriculture and other practices, threatening the genetic pool so vital to this kind of research.

7. Support of projects producing food for local consumption or for export.

In its agriculture development programs AID shares with other donor agencies the problem of whether its resources should be concentrated on production of food for local consumption or on products of higher value that can be exported. An economist in S&T/AGR argues that the main justification for fisheries projects is to produce export trade items, which will generate foreign exchange to buy food. This view is shared by some others in the Agency, but there are those who cite the importance of food for local use, the nutritional value of the food produced, employment, and other values.

The strategic focus adopted by AID on this issue is a flexible one which varies regionally. For example, the focus in Latin America and the Caribbean is on high value products that have a good export market. This is because the hunger problem in this region is in general not one of the threat of starvation but of undernutrition caused by low purchasing ability, and increased income appears in most parts of the area to be the most effective way of improving the diets of these people.

In Ecuador shrimp is second only to oil in the value of the country's exports, exceeding all agricultural products. In Honduras shrimp is also becoming a significant export item, and the same situation is developing in other countries, including some in the South Pacific. In parts of Africa and Asia it also appears appropriate to encourage the production of export-oriented crops.

But there are many areas in these regions where the other strategy is encouraged. In some cases this is because food for local consumption can be produced economically and in significant quantities; in other cases other criteria besides economics are significant, including nutrition and local custom.

## RECOMMENDATIONS

### Introduction

The recommendations on future policies and actions by USAID in the fisheries field are based on the assumption that the welfare of most developing countries can be improved by appropriate kinds of fisheries development. Most developing countries need fish. The urgency of this need varies and is for a range of reasons, which differ widely among and within countries depending on their resources and their cultural and dietary customs.

There are thus many different kinds of fisheries development that would be useful to at least some and perhaps to a large number of countries, and there are other kinds that would be highly useful at least to a few. But the fisheries sector is too broad and complex for USAID to offer effective assistance over the whole range of these activities. This study suggests that there are only a small number of fishery-related programs that are needed by essentially the whole developing world to accomplish the following tasks:

1. To increase the amount of food and the nutritional value of food,
2. to prevent serious or catastrophic depletion of natural fisheries resources,
3. to prevent damage or destruction of aquatic ecosystems.

AID can increase its efficiency in fisheries development by limiting its activities to a small number of areas of high priority related to these general needs. The specific kinds of assistance should be restricted to projects where the United States has notable strengths and comparative advantage:

1. Scientific research in the conservation and management of fish stocks: stock assessment and the development of models of fish populations and their dynamics (i.e., changes under exploitation and environmental pressures), and the theory and practice of management.
2. Scientific research in certain technical aspects of aquaculture, including fish genetics and pond dynamics (the biological, chemical and physical changes that occur following farming practice manipulations.)
3. Training and education.

It is therefore recommended that:

(1) USAID should give priority to the development of small-scale and artisanal fisheries. These provide more than half the fish available to the developing world. Their development should include improvement in fishing gear and

methods where the sizes of the fish stocks make this feasible, and should emphasize conservation in all cases.

(2) The Agency should give priority to the development of small-scale aquaculture. In the long run, fish farming is probably the only remaining way (aside from the restoration of stocks damaged by overfishing) of increasing overall supplies of fish. And aquaculture is the most appropriate fisheries activity to integrate into rural and agricultural development programs. The urgent need is for better fish farming practices.

(3) The third priority should be on stock assessment and management of fish stocks. By far the greatest proportion of fish supplies come from wild stocks, and for any fishing nation the impact would be severe if the food, income and other values derived from fish were lost or significantly diminished. It is only through research that appropriate management programs can be devised to prevent resource damage and harvest losses through overfishing, to increase catches by restoring stocks that have been damaged, and to develop systems that promote maximum returns, equitable distribution, and profits.

(4) The last priority should be on protection of the aquatic environment. With the increased knowledge that has come from ecological research and from bitter experience with the effects of ecosystem damage, it is becoming apparent that the environment must be protected if living resources and the harvests they support are to be sustained. The practical impact of the inter-meshing of the multiple and complex components of terrestrial and aquatic ecosystems on the survival and productivity of those systems is becoming obvious: e.g., fisheries resources depend directly on the integrity of near-shore estuarine aquatic systems, and this integrity is prejudiced increasingly by land farming practices.

In order to strengthen the ability of USAID to take part successfully in these programs there must be better agreement among AID managers and planners that these are worthy and achievable goals. This requires that far better information and knowledge be made available on the needs for fisheries-related activities and the techniques for carrying out effective projects on the role of fish as valuable and fragile natural resources. It is therefore also recommended:

(5) That a formal and sustained program of information be carried out for AID and developing country officials on fisheries matters. The fishery experts of S&T/AGR should be responsible for this program. The organizations that now cooperate with S&T/AGR in providing fisheries services (notably the University of Rhode Island, Auburn, ICLARM) could be major resources in such an effort; it was pointed

out earlier in this report that information is a prominent part of the programs of all three of these institutions. This program should include an improved mechanism for the staffs of S&T/AGR and their cooperating institutions to have frequent personal contact with Mission and country officials.

(6) That the fisheries staff of S&T/AGR be increased. This recommendation is made with the realization that it may be impossible for AID to accept it for budgetary reasons. But it is believed that successful performance in the areas of fisheries activity suggested here would have substantial economic and environmental values, perhaps greatly in excess of the relatively small costs of strengthening the fisheries staff.

Obviously it is not possible to put forward a set of proposed AID priorities that are universally valid and applicable, and it is not implied that the recommendations suggesting restrictions on the kinds of fisheries programs should be followed in all cases. Circumstances differ among and within countries at different times, and AID Missions will respond to their needs and wishes in designing the programs. But it is proposed that within these constraints USAID should take the pattern suggested here as an overall guide, and build Agency strengths accordingly.

29.

**APPENDIX**

## FISHERIES AND AQUACULTURE PROJECTS OF AID

<u>Project Number</u>	<u>Time Frame</u>	<u>Country/Region</u>	<u>Project</u>	<u>US Funding in \$1000</u>	<u>Type</u>
1430030	57-58	Iceland	Canning industry	2	FD
1430040	57-58	Iceland	By-prod utiliz	1	FD
1430084	59-60	Iceland	Fish control surv	2	FD
1500001	75-85	Portugal	Fish mktg/exten/tr'g	170	FD
1500002	77	Portugal	National fish'y study	150	FD
1520188		Spain	Inl'd fishing dev	1	IF
1580065	58-65	Yugoslav	Marine fisheries	139	MF
2630064	78-84	Egypt	Aquaculture devel	26500	AQ
2680001	53	Lebanon	Fisheries	1	FD
2720101	82-86	Oman	Fish develop	6600	MF
2770231	54-56	Turkey		17	FD
2900164	63-65	Pers Glf		5	FD
2980610	79-83	Near East	Coop Marine Techn	4260	TA
2980190	83-86	Near East	Coop Marine Techn	1000	TA
3670132	80-85	Nepal	Resource conserv	27498	IF
3860005	52-62	India	Fisheries expan	2901	MF
3910011	53-59	Pakistan	Fish harbor	472	FD
3910054	55-62	Pakistan	West Pak fisheries	560	AQ
3910055	55-62	Pakistan	East Pak fisheries	169	AQ
3910096	55-62	Pakistan	Marine fish devel	99	MF
3910320	68-74	Pakistan	Agricul tech supp	74	MF
4090249	77-80	So. Pac	Tuna survey	450	MF
439006506	63-75	Laos	Fish culture	18880	AQ
4420230	58-67	Cambodia	Fish devel train'g	180	AQ
4840020	55-59	Taiwan	Ocean fisheries	170	MF
4840318	56-60	Taiwan	Fleet rehab	3	FD
4840320	56-58	Taiwan	Fish propagation	7	AQ
4890281	55-64	Korea	Marine fish devel	4662	MF
489059402	63-74	Korea	Rural policy	6000	AQ
4890673	71-76	Korea	Office of Fisheries	1340	FD
4920206	74-80	Philipp	Aquacul prod'n	885	AQ
4920234	70-74	Philipp	Inland fisheries	542	IF
4920260	73-79	Philipp	Bicol R Basin dev	2042	IF
4920266	74-80	Philipp	Aquaculture prod	885	AQ
4920322	79-84	Philipp	Freshwater fish dev	1500	IF
4920366	82-89	Philipp	Resource dev/fish managem	1000	IF
4920368	83-87	Philipp	Coastal zone mgt	4500	TA
4921654	85-88	Philipp	Energy tech for fish	4000	FD
4930012	55-59	Thailand	Fisheries	11	AQ
4930179	64-79	Thailand	Fisheries devel	25185	AQ
49301807	64-79	Thailand	Fish devel	19961	AQ
4930272	77-78	Thailand	Fish farm develop	4500	AQ
4930295	80-83	Thailand	Vocational education	500	TA
4930303	79-82	Thailand	Farm pond develop	442	AQ
4970001	64-79	Indonesia	Expan fishery facil	613	FD
4970042	55-56	Indonesia	Expan inland fisher	27	IF
4970189	69-81	Indonesia	Aquaculture	559	AQ

4970236	75-81	Indonesia	Assist to agric	417	AQ
49702663	79-83	Indonesia	Resource develop	1286	IF
49702664	78-84	Indonesia	Research/training	8000	TA
49702666	79-83	Indonesia	Weather forecaat'g	980	TA
4970286	78-81	Indonesia	Smallscale fish dev	3000	AQ
4980214	69-73	Regional	SE Asia Devel Center	285	MF
4980278	82-84	Regional	Resour dev, incl tuna	350	MF
5000053	55-56	Vietnam	Inland fisheries	75	IF
5000242	67-70	Vietnam	Fish training	280	TA
5090002	81-84	So Pacif	Tuna/billfish asses	300	MF
5040010	60-64	Guyana	Marine fisheries	48	MF
5040041	58-60	Guyana	Snapper fishing	5	MF
		Belize	Conch research		TA
5120247	64-76	Brazil	Fishery devel	3191	FD
5120288	71-75	Brazil	Food fortific'n	-	FD
5122474	66-74	Brazil	Fishery devel	1000	FD
5130277	75-80	Chile	Agr coop devel	1500	FD
5130014	53-63	Chile	Fishery devel	96	FD
5130296	77-79	Chile	Rural devel	2200	AQ
5140191	75-81	Colombia	Fisheries research	2200	TA
5140078	75-78	Colombia	Research inland fish	2000	TA
5150038	63-80	Costa Rica	Agric developm	3232	AQ
5170123	78-82	Domin Rep	Inland fisheries	160	IF
5170162	82-85	Domin Rep	Inland fisheries	277	IF
5190002	58	El Salv	Aquaculture	22	AQ
5190094	67-83	El Salv	Rural commun dev	-	TA
5200290	81-84	Guatamala	Fish pond dev	-	AQ
5210095	78-81	Haiti	Fishing vess dev	-	MF
5220118	73-79	Honduraa	Farm ponds	-	AQ
5220214	76-79	Honduraa	Aquaculture	100	AQ
5250200	79-83	Panama	Regional dev	500	AQ
5250069	64-73	Panama	Private enterpr dev	1895	MF
5250186	77	Panama	Rural dev/farm ponds	-	AQ
5250216	80-83	Panama	Aquaculture	992	AQ
5250245	84	Panama	Aquaculture	2000	AQ
5270144	77-81	Peru	Freshw aquascult	465	AQ
5270924	44-57	Peru	Fish dev	119	FD
5320038	76-80	Jamaica	Inland fish	455	IF
5320059	79-83	Jamaica	Aquaculture	4527	AQ
5380016	78-82	Caribbn	Inatit dev	-	FD
5380023	78-82	Caribbn	Fish dev	-	FD
5380045	78-82	Caribbn	Fish dev	-	FD
		E Caribn	Fish sector assessm	-	MF
		Caribbn	King crab culture	-	AQ
6030002	79-83	Djibouti	Fish dev	3011	MF
6030015	83-	Djibouti	Fish dev -phase 2	2998	MF
6150130	65-70	Kenya	Inland fisheries	222	IF
61806492	69-80	E Africa	Freshw fisheries	2234	IF

6200212	60-74	Nigeria	Ag advis serv	4492	FD
6200704	62-68	Nigeria	Fish dev	561	FD
6250617	76-83	Sahel Reg'l	Envir effects of developm	-	TA
6250888	74-81	Sahel Reg'l	Envir effects of a dam	-	TA
6310022	80-84	Cameroon	Small farmer fish prod	600	AG
6350211	80-81	Gambia	Market feasibility	-	FD
6410013	57-66	Ghana	Fisheries	389	MF
6410023	68-71	Ghana	Volta Lake	60	TA
6410072	77-82	Ghana	Fisherm associations	-	TA
6490006	65-67	Somali R	Fish freezing plant	829	FD
6490066	57-66	Somali R	Fisheries dev	389	FD
6570006	79-83	Guinea Bissau	Small scale fish	500	MF
6600056	76-80	Zaire	Fishing coopa	79	FD
6600080	78-84	Zaire	Fish culture	486	AG
6600082	78-81	Zaire	Integr rural dev	118	AG
6630030	57-60	Ethiopia	Fish dev	26	FD
6640001	57-62	Tunisia	Commercial fishing	126	MF
6690003	51-67	Liberia	Freshw fisheries	328	IF
6690188	84-86	Liberia	Ag research/exten	-	IF
6760004	77-80	Central Afr Rep	Fish culture	118	AG
6760015	82-85	CAR	Marine fish	1000	MF
6790001	65	Congo	Int Inves Trop At	9	MF
6810005	62-67	Ivory C	Fish training cen	277	TA
6850208	77-85	Senegal	Bakel crop prod	-	AG
6850240	79-82	Senegal	Fish culture	180	AG
6850254	81-84	Senegal	Fish resource assess	150	MF
6880220	79-82	Mali	Fish culture	323	AG
6930016	62-66	Togo	Sea fisheries	726	MF
6950102	79-81	Burundi	Highland fish dev	540	IF
6960112	81-85	Rwanda	Fish culture	2450	AG
6980407	79-86	Africa Reg	Improved rural techn	-	AG
6980454	85-88	Africa Reg	Fish Comm/E Cen Atlan	960	TA
6980620	62-66	Africa Reg	Guinean trawling surv	728	MF
8790002	81-85	So Pac Reg	Tuna/billfish assess	400	MF
8790251	81-86	So Pac Reg	PVO Integr rural dev	-	FD
9310042	74-77	Brazil	Fisheries training	290	TA
9310113	69-79	U Rhode Ia	Small scale fisheries	1375	RE
9310120	70-79	Auburn U	Internl Cen for Aquac	1558	RE
9310242	76-88	NOAA	Advisory Serv	2358	RE
9310459	66-78	S&T	New protein sources	592	FD
9310481	67-75	S&T	Nut value protein food	1191	FD
9310482	67-78	S&T	Eval fish protein conc (FPC)	331	FD
9310526	76-78	Oceanic In	Artif propgn milkfish	1268	RE
9310787	67-73	Auburn U	Fish culture	821	RE
9310845	69-74	S&T	Evaluation of FPC	34	FD
9311050	79-83	ICLARM	Fish devel conference	46	RE
9311050	79-85	ICLARM	Fisheries dev	1740	RE
9311155	79	URI	SE Asia Fish Dev Can	56	RE
9311155	80	URI	Workshop Stock Assess	91	RE

9311156	78-79	SEAFDEC	SE Asian Fish Dev Cen	49	RE
9311157	80	URI	Postharvest losses	35	RE
9311157	80	UCDavis	Air bladder inflation	30	RE
9311306	77-78	CRSP	Rept Title XII fish res	702	TA
9311314	77-88	Auburn U	Aquacul Tech Dev	3759	RE
9311314	78-79	Auburn U	Aquacul Tech Dev	1478	RE
9320004	76-82	Coop Leag	Cooperatives	-	TA
9364020		URI	Fish dev support	462	RE
9364024	80	CRSP	CRSP in fisheries	80	RE
9364024	80-83		Fish tech asia serv	80	TA
9364026	82-83	CRSP	CRSP planning	7507	RE
9365542	83-	Nepal	Tribhvan Univ	198	RE
9365543	82-	Thailand	U of Michigan	200	RE

## CURRENT AND APPROVED PROJECTS

2630064	78-87	Egypt	Aquaculture dev	27500	AQ
2720101	80-90	Oman	Tech assis	50000	TA
3670132	80-88	Nepal	Resource dev	27498	TA
3980158	88-92	Near East	Coop Marine Tech	3203	TA
4920366	82-91	Philipp	Resource dev	44200	MF
4970352	86-92	Indonesia	Resource dev	7105	MF/IF
5200351	86-89	Guatemala	Aquacul extensaion	500	AQ
	86-	Guatemala	Shrimp culture	-	AQ
	88-	Guatemala	Partners of America	-	TA
5220292	89-93	Honduraa	Land use produc enhan	-	AQ
5380125	(Prop)	Carib Reg	Mariculture	900	AQ
5380140	86-91	Carib Reg	Hi Impact Ag Mkt/Prod	40000	AQ
6030015	84-88	Djibouti	Fisheries dev phase 2	3298	MF
6250977	86-93	Sahel Reg	Human res dev	-	TA
6820233	84-90	Mauritania	Human resources dev	6591	TA
8790006	85-89	So Pac Reg	Tuna/billfish assess	2750	MF
8790009	86-91	So Pac Reg	Fisheries dev	5000	FD
9311051	(Prop)	ICLARM	Fisheries dev	150	RE
9364023	82-88	CRSP	Aquacul Pond Dynam	4750	RE
9364024	82-88	URI	Fish Dev Support Serv	4000	RE
9364146	85-88	CRSP	Fisheries Stock Assess	3350	RE
9364161	84-89	Oceanic Instit	Reprod stud milkfish	4850	RE
9364180		Auburn U	Aquacul Research/Supp	2550	RE
9365518	83-90	Ecuador, Sri Lanka, & Thailand	Coastal Resourc Mgt	8000	RE
9380240	-87	Auburn U	Water Harvesting/Aquac	-	AQ
9380268	85-88	Wld Wildl Fund	Watershed protec	-	RE
	88-	Global	Fish aggregat'g dev	-	MF

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