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PROGRAM AND BUDGET STATEMENT
OF THE
INTERNATIONAL CENTER FOR LIVING
AQUATIC RESOURCES MANAGEMENT
(ICLARM)

April, 1976

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INTRODUCTORY STATEMENT

It has recently become evident that there is a worldwide need to accelerate the development of aquatic resources if the productivity of food from the oceans, rivers and lakes is to increase beyond the level that it is at the present time. Essentially, there has been no major increase in the offtake of aquatic resources during the past ten years. Food from the sea has stabilized at approximately 70 million metric tons although it is expected that this could increase to in excess of 100 million tons. Aquaculture, although it has a potential for producing approximately 50 million metric tons yearly, is now at the level of only 6 million tons. Means must be found to understand the basic constraints which limit aquatic animal populations and the factors that can be manipulated so that these populations can yield greater numbers. In order to do that we must find mechanisms to tap the technological resources that are to be found disbursed throughout many institutions of the world and bring these to bear on specific, identifiable problems and translate those into development projects. ICLARM has been established to achieve that end.

I. Statement of Rationale

A. Introduction

The important potential contribution of aquatic proteins to world human nutrition appears to be little understood by decision makers. Doubling the world capture fisheries' harvest of aquatic animals and increasing aquaculture production ten-fold could be achieved before the end of the century; yet, there are few plans to realize that potential.

The fact that existing institutions in the U.S. and throughout the developed world have generally failed to allocate resources for fisheries development and management in an effective manner reflects not only the lack of an overall program for increased fisheries development but also the fractionated nature of fisheries research and development organizations.

The weakness of the U.S. fisheries structure is in part a consequence of insufficient concern at the national level regarding world problems and in part a reflection of the historical background of national practice whereby the states were given responsibility and authority for fisheries management out to the limit of territorial waters; the federal government having no authority except where international fisheries are involved. The fragmentation of authority and a general lack of cooperation among the states have made it difficult to implement

effective management within state waters and have frustrated efforts to develop national programs concerned with development of world aquatic resources.

Statements made within this document are drawn from various ICLARM documents as well as from the National Academy of Sciences BARR Report on World Food and Nutrition (1976) and the Rockefeller Commission on Critical Choices Report (1976).

In the case of other nations as well, concern for fisheries development generally has been limited to an interest in home commercial fisheries. International cooperation directed toward an increase in aquatic resources available to all nations, and in particular the developing nations, has been notably inadequate.

In the field of international fisheries conservation, reliance has been placed on international commissions and bilateral agreements to control fishing and to protect stocks. To varying degrees, none of these arrangements has been fully satisfactory, principally because insufficient authority has been given to the management bodies. As a consequence, some international fisheries stocks have been damaged -- in some cases perhaps irreparably.

Most developing countries (and some developed countries) do not have fisheries scientists trained in the techniques of stock assessment, life histories, and other technical procedures necessary to devise satisfactory national management.

However, the developed countries, taken together, have the necessary capabilities to effect important improvement in

all aspects of aquatic resource management and, if appropriate machinery is set up, that capability can be used to the benefit of developing countries where increased sources of animal protein are an increasingly critical need.

B. Size of Resources

At present, fish provide 14% of the world consumption of animal protein with this percentage varying from less than 1% in some land-locked countries. Coastal development nations already use living aquatic resources for significant percentages of their high grade animal proteins, particularly in southeast Asia where capture fisheries and aquaculture account for more than 60% of protein consumption.

With respect to capture fisheries, the present world yield is about 65 million metric tons per year. The maximum potential world harvest is estimated at about double this amount with most of the unexploited stocks existing in the waters or adjacent to developing countries. Direct human consumption of fish (which accounts for about 75% of the total catch) has increased annually by 4% over the past 20 years. At this rate, it is clear that the demand for fish will surpass the natural resource of the world's oceans and lakes well before the end of the century. If the increasing demands for fish protein are to be met significant increases in fish production from aquaculture must be attained.

There is a direct link between aquaculture and capture fisheries. In southeast Asia, for example, pond production of

mullet and milkfish depends on obtaining a supply of juveniles from natural stocks. As aquaculture expands, more and more juveniles are taken and the natural fishery is imperilled. Consequently, a large and dependable supply of cultured "seed" is a prime necessity for increased aquaculture production.

Aquatic foods are highly flexible in their uses. They can be eaten "as is," as fresh table fish and shellfish, preserved by a range of technologies from simple salting or sun drying to blast freezing or processing into meals, or the inherent properties of aquatic proteins permit easy combination with vegetable carbohydrates and proteins. New aquatic food technologies, e.g., minced flesh machines, could turn aquatic animals not culturally acceptable in their natural forms into new, acceptable products.

C. Perspectives

Fisheries authorities are in general agreement that substantially higher levels of aquatic resources production are attainable, but only if a series of innovative and ambitious research and development programs are directed toward the successful solutions of existing problems.

There is a consensus among the experts as to what those problems are. In the case of open ocean fishing, harvesting of food species must be managed so as to insure sustaining the species as a continuing source of food. Presently unused species must be utilized, directly as a food or indirectly as an ingredient in

prepared foods. When possible, as in the case of anadromous species such as salmon, entirely new, managed fisheries must be established. Large scale commercial fisheries must develop techniques that will permit that escape of unwanted fish from trawls and nets. Further research must be directed toward determining the feasibility of methods of open sea mariculture by which food species could be raised and harvested under controlled conditions, but in the open ocean.

Near shore, artisanal fishing, more relevant to food production in developing countries, requires the use of more efficient but at the same time economically practical small fishing boats and highly reliable boat engines. Fishing nets and gear best suited to specific conditions should be introduced in certain regions, notably southeast Asia. In the case of developing countries, any anticipated large increase in fisheries production must be accompanied by improvement in local infrastructures to service that production -- fish preservation methods and facilities, transportation and distribution systems.

With respect to aquaculture of great importance to developing countries, significantly increased production depends on availability of large, dependable and inexpensive sources of "seed" -- juvenile fish for stocking of ponds and enclosures. In order to develop sources of seed, fisheries scientists must better understand the life cycles of aquatic species as the basis for development of

efficient methods for the spawning and larval rearing of juvenile stocks. The concentrated populations of fish required for aquaculture makes important a clearer understanding of fish nutrition and development of methods of disease control practical for use in remote areas. The practice of polyculture should be better understood and improvement must be made in pond and enclosure management. Demonstration projects and the training of fisheries technicians able to assist rural populations in the use of improved techniques designed to increase production are necessary concomitances of these programs.

D. Major Constraints

Failure to date to implement programs such as those outlined above reflects (1) the weak structure of fisheries research throughout the developed world, and, (2) a lack of institutional leadership.

Almost without exception, fisheries institutes throughout the world are government supported and dedicated exclusively to the improvement of national fisheries. The quality of work done in such centers varies; Japan, the USSR and China are considered to have the most highly developed and effective organizations. In the U.S., state and federal laboratories have made valuable contributions to trout and salmon culture and are seeking improved methods of shrimp farming. In this and other developed countries, government support of fisheries' research is related to domestic

commercial interests. Often the scientific competence of those centers is high, but it is not directed toward increasing world food production other than in the sense of more efficient domestic fisheries.

In the private, or non-government, sector, no fisheries institute is known to exist anywhere in the world that could be compared either in scope of interests, size of staff, physical resources or financial support, with the average U.S. agricultural college. Instead, in universities around the world, there may be found isolated individuals or small groups of scientists conducting research projects relevant to the problem areas outlined above. However, no such group can be considered to constitute a critical mass, in the sense that it possesses in itself the resources to seek solutions to major problems. Characteristically, academic research, due to limitations of staff, physical facilities and financial support, is forced to concentrate on relatively limited research objectives.

Taken as a whole, the body of experience represented by fisheries scientists working at centers throughout the world, and the results of research to date suggests that there exists the latent capability to overcome the obstacles to significantly increased aquatic food production. However, that effort must be organized, because the resources -- technical, physical, and financial -- required exceed those possessed by any existing agency concerned with world fisheries.

E. Concept of The International Center for Living Aquatic Resource Management (ICLARM)

ICLARM has been organized to develop that critical mass, or nucleus, of scientific talent that must underlie a rational program to fully develop and manage world aquatic resources. It is an international agency with a single long term objective -- the optimum utilization of the aquatic environment for the production of food, with particular reference to the needs of the developing nations. ICLARM will maintain an inter-disciplinary professional staff of established competence, and through it seek to focus the efforts and augment the capabilities of independent but cooperating fisheries centers, wherever they may be, in a concerted effort to achieve its objective.

It is anticipated that ICLARM will seek the support and cooperation of the international community of fisheries experts as its staff seeks to construct those program thrusts that are beyond the capabilities or outside the franchises of existing fisheries centers. The Center will assist in the organization, and will provide financial support where possible for research programs, and it will seek to bring together, for appropriate periods, international experts in order to make the fullest use of world capabilities in pursuit of program objectives. ICLARM will undertake demonstration and pilot projects and conduct the training of fisheries field technicians. Except for the fact that ICLARM does not intend to establish a large physical plant of

its own, it will operate on the same basic principle as the international agricultural research centers.

It is assumed that ICLARM will constitute an important resource of international assistance agencies such as UNDP and U.S. AID as well as bilateral agencies supported by various governments. ICLARM will seek to cooperate closely with those agencies in order to avoid duplication of efforts and to provide for the effective transfer of technology to the fisheries authorities of developing countries.

ICLARM will be a vital link in the problem solving network related to aquatic resources. It can provide the vehicle through which those institutions in the developed countries or even other developing countries can put their expertise to work wherever needed to resolve major development constraints. Even though national institutions may have no mandate to operate internationally, ICLARM, through cooperative agreements can provide that mechanism. In the U.S., for example, there is expertise at Auburn, the University of Rhode Island, Woods Hole, Oregon, Washington, California, among others. Individuals from some of these institutions already have been contacted to work with ICLARM.

II. Proposed Program of ICLARM

ICLARM will engage in three major activities broadly grouped as follows:

1. Research - to identify and resolve major constraints limiting the development of aquatic resources. The

research staff would draw on information currently available and synthesize that with new research findings for the purpose of developing appropriate production technology.

2. Training - ICLARM would primarily conduct and encourage training at the professional level for individuals who would assume responsibility for research and development programs in their countries of origin.
3. Production, Demonstration and Pilot Operations - ICLARM would undertake to build a body of experience -- some already available -- to assist fisheries development at the village level. It would also undertake to establish expertise to assist national fisheries in the exploitation of their fisheries resources.

In addition, ICLARM would initiate special conference and seminar programs on topics related to its major program thrusts.

What follows is an outline of several programs of major significance in terms of their bearing on our ability to make fuller yet rational use of the aquatic environment. The programs will be implemented as staff and financial resources permit.

A. Seeding the Southern Oceans with Salmon

The initial emphasis of the program on salmon utilizes one of the most manageable of all the major commercial fish stocks. Successful seeding will result primarily in the production of

substantial quantities of desirable fish protein, and economic gains in an underdeveloped region.

The long term benefits will be a valuable new fishery where ocean range management concepts can be tested to meet the challenge of traditional but inefficient fishing practices. The catch of the fishery might, for example, be shared by the coastal nation(s) at a level commensurate with the use of the international open range. The fixed portion set as the fee for use of the range would be available for other nations through open bidding on an international exchange.

Salmon have been selected because of (1) their highly predictable migratory behavior, and (2) the existence of a reliable rearing technology; both of these combine to make them readily susceptible to management.

The program will be centered in a region that can provide suitable range for salmonid species. The eventual coordination for the management of the range will be directed through a Regional Center established in the area. Such a Center will take advantage of existing institutions and facilities capable of addressing problems of salmon range management. Chile, Argentina, the Falkland Islands, and New Zealand might all have immediate interests in such an international center.

Salmonids are not native to the Southern Hemisphere and, except for small stocks of salmon and sea-run trout introduced into New Zealand and Chile, do not occur in significant numbers in the

Southern Ocean. However, the enormous abundance of galatheid crabs in the channels of the Chilean Archipelago, of krill in the waters of the Scotia Sea, of great plumes of freshwater runoff from the Southern Andes mingling with the West Wind Drift and Falkland Current systems, and the general paucity of species that would prey on salmon, all combine to generate conditions that should make the Southern Ocean an ideal range for salmon. The size and vigor of the transplanted sea-run trout in the Strait of Magellan testify to the fitness of that environment for salmonid species. Salmon fisheries could be generated in the subantarctic regions by carefully chosen and timed large-scale introductions like those successfully undertaken by the Americans in the Great Lakes and the Russians in the Barents Sea. Since the fishery would develop on virgin stocks, there would be no established precedents or special interests to inhibit the development of an international system for rational management of a new salmon range in the Southern Ocean. For this reason, and the fact that the southern channels of Chile should prove to be superb nursery grounds for salmon, a Southern Ocean Regional Project is proposed as the first thrust of a global program. Its overall goal will be to develop systems for the rational, international management of ocean ranges to improve quantity, quality, and predictability in the harvests of salmon stocks.

The goals of the program are:

- o Increased production of fish from the Southern Ocean by the controlled introduction of salmon stocks into the channels of Southern Chile.
- o Selection of salmon stocks that will fit the new nursery and ocean ranges without unduly stressing their underlying ecosystems.
- o Development of a rational system of management for the new resource that will include (a) total control of seed production through hatcheries and stream monitoring; (b) high seas monitoring and surveillance of ocean stocks; (c) total control of harvest and escapement emphasizing exclusive use of live capture systems inshore; (d) sharing of portion of catch appropriate to use of international open range by coastal state (Chile) through open bidding in international exchange, with a fractional percentage to support management operations in international waters through the regional center.

ICLARM will undertake to organize the research effort to test the feasibility of the concept. Phase I of the project has been completed and Phase II of the four phase program is now underway.

B. South China Sea Fisheries Management

The need for an international mechanism for the development

and management of the fishery resources of the South China Sea is imperative for three reasons. First, the development plans of the countries of the region all place importance upon increased fishery production and these expectations are frequently based upon the same resources. Second, the fishery resources of the South China Sea tend to be widely distributed and are therefore common to two or more countries. Third, even though the countries bordering the South China Sea are economically developing countries, some of them are highly developed fishing countries and there are already "distant-water fleets" operating in the South China Sea, most notably from Taiwan and Thailand, in areas other than those off their own coasts.

The total marine production for the South China Sea has grown spectacularly in the last decade and is now about 5.0 million metric tons annually. In the South China Sea countries fish is generally cheaper than beef, pork and chicken and per capita consumption of fish is high (up to 48 kg/yr in some countries). Fisheries may account for about 4% of GNP at the ex-vessel level and in some countries as much as 10% of the population may be dependent upon fisheries for support. Major declines in production, or major changes in distribution between countries, will cause dietary and economic hardships and could cause political instability. Some major fishing grounds are already over-capitalized at the production level and are biologically over-fished, i.e., are producing yields below the maximum sustained yields of which they

would be capable under an appropriate management regime. The history of fishery development everywhere in the world clearly demonstrates that the consequences of development in the absence of appropriate management measures leads to economic failure and reduced yields. The essential feature of management is the ability to limit entry, thus avoiding over-capitalization and maximizing yield. This has generally not been possible in the past owing to the common property nature of fishery resources.

In spite of this rather pessimistic prospect, there is now some reason for optimism in the case of the South China Sea; i.e., the present trend of Law of the Sea matters. It now appears certain that there will be a zone of 200 miles (including territorial waters) of exclusive economic jurisdiction associated with each coastal state. In the South China Sea these zones will not be quite 200 miles, since the South China Sea is not 400 miles wide. The important aspect of such extensions is that there will be no remaining area of international waters in the South China Sea insofar as fishery resources are concerned. Thus, the South China Sea fishery resources will no longer be common property resources and it will be possible, for the first time, to devise an effective management regime.

An international management mechanism with functions including research, formulation of regulations, adoption of regulations and allocation could lead to increased aquatic production and an equitable division of resources.

ICLARM proposes to assume the development work leading to the first meeting of the international management body needs to be accomplished. This would involve (1) arranging for the preparation of statistical summaries and review papers by national staffs; (2) the identification of critical problems on which action is needed; (3) the preparation of appropriate draft regulations and (4) the preparation of draft articles and rules of procedure of the management organization. Second, the most acceptable and feasible form and organizational location of the management organization need to be determined. Both of these activities would obviously involve a great deal of consultation with, and cooperation by, the countries involved.

C. Aquaculture -- Controlled Reproduction and Seed Propagation

The husbandry of cultivable fish species, with the exception of carps and salmonids, is dependent on the availability of juvenile fish -- often referred to as "seed" -- collected from coastal areas. The availability of juvenile stocks varies with geographic location, climate, timing and success of spawning, the availability of food supplies in coastal areas, and annual retirement. The inherent variability of seed supply is magnified further by such human influences as over-fishing, pollution and construction, which destroy breeding and juvenile feeding grounds. The demand by culture fisheries for juveniles cannot be guaranteed from natural supplies.

Animal husbandry, either land-based or aquatic, requires control over the full life cycle of the stock; supplies of seed, feed, and suitable management practices are needed. For most cultivable fish species, techniques for the controlled mass production of seed must still be developed.

The controlled production of seed will be dependent on:

1. The breeding of captive adults.
2. Hatcheries for the incubation of eggs and rearing of larvae.
3. Nurseries for rearing juveniles.

In order to counter the present decline in natural seed resources of some species and to augment supplies, immediate measures can be taken to find new supplies in new areas, and improve methods and gear for the collection and distribution of naturally accruing seed to reduce the present high waste. However, these measures are only temporary, and future demands must be guaranteed by controlled fish breeding in captivity.

Furthermore, control over the full life cycle can become the basis for the genetic manipulation of species. The application of genetics to aquaculture can bring about the spectacularly rapid progress that has been achieved over the last fifty years in the production of both cereals and domestic animals.

ICLARM proposes to bring into an effective working relationship research centers in Hawaii, the Philippines, Taiwan and elsewhere, each of which is now actively engaged in related studies but no one of which, taken separately, possesses the resources to conduct the work alone.

D. Aquaculture -- Controlled Breeding of Captive Adults

There is general agreement that priority must be given to the controlled production of seed for milkfish and mullets, based on their wide acceptability, present cultivation, their very efficient mode of feeding, and the fact that present demands for seed cannot be met from natural sources. Of secondary importance is the improvement and standardization of existing seed production practices for Chinese and Indian carps. Other acceptable species not presently cultivated on a large scale should be considered for use in polyculture systems. The cultivation of these species would increase if certain constraints, including the lack of adequate and regular seed supplies, are removed. These species include, among others, airbreathing catfish, bass (Lates spp.), the threadfin or moi (Polydactylus spp.), gourami species, and rabbitfishes.

As in the case of the seed propagation program, ICLARM proposes to construct an effective research thrust by involving several centers of competence in a joint program that would constitute a critical mass capable of effective action. ICLARM will facilitate use by the cooperating institutions of consultants for varying periods of time and will sponsor seminars and workshops as required.

E. Aquaculture -- Development of Hatcheries for Incubating Eggs and the Rearing of Larvae

Successful culture techniques for the important cultivable species remain to be intensified in hatchery production systems.

There are no designs for hatcheries capable of supplying large numbers of seed on an annual basis to fish farmers. Once culture techniques for these fish are refined, demonstrations of regular mass production must be made and integrated with the needs of a specific region or locale.

Hatchery production facilities depend on the characteristics of each species. For example, mullet juveniles need a rearing period of 50 days during which egg and larval requirements are totally controlled. Milkfish larvae are more adaptable to outdoor conditions at a very early age; a rearing period, with minimal facilities, of less than seven days is required. Most of the Chinese and Indian carps are not expected to have demanding hatchery requirements. Rabbitfish and threadfin rearing methods are presently being developed and appear to be less stringent than those of the mullet.

Intensive hatchery production must be demonstrated within a given farming region. Each hatchery should be a complete unit, with brood-stock ponds, incubators, larval rearing facilities, food production systems and holding tanks, together with experienced operators and trainees.

Priority for such a hatchery unit should be given to the mullet. Cultivation of the species is controlled and hatchery technology is ready for development.

Control of the full life cycle of a given species is the basis for the genetic manipulation of that species. The application

of genetic manipulation with respect to aquaculture could provide the base for increased production of fleshier, more rapidly growing specimens. (The aquaculture genetics program is discussed in another section of this document.)

The extent of research and development required for controlled seed production varies with different species of fish. For example, the controlled breeding of milkfish (Chanos chanos) is yet to be achieved; however, such techniques have been developed for grey mullet and Chinese and Indian carps. The latter techniques require refinement and standardization. Other important culture fishes, such as airbreathing catfish and other mullets, require further research and development.

ICLARM proposes to sponsor development of a hatchery design, and, hopefully in association with a regional development bank, to construct a demonstration model in southeast Asia. The model hatchery, in addition to serving as a useful source of seed for fish farmers of the area would serve as a base for the training of technicians from the region in its operation.

F. Aquaculture -- Optimization of Tropical Polyculture Systems

Polyculture may be defined as the simultaneous culture of several species of fish and/or shellfish, each occupying compatible and essentially non-competitive niches, the purpose being to maximize production from a given input. Polyculture is in need of further study, particularly in the case of tropical brackish water and marine environments.

Better understanding and broader use of polyculture could afford important advantages to rural communities. The interdependence of several species growing in a common environment provides more efficient use of feeds and wastes, thus increasing food production. Under some circumstances rural communities may be able to raise valuable cash crops such as shrimp in the same ponds that produce milkfish or mullet for local consumption.

As in the case of other aquaculture programs, ICLARM proposes to bring into an effective working relationship research centers in Hawaii, the Philippines, Taiwan and elsewhere, each of which is now actively engaged in related studies but no one of which, taken separately, possesses the resources to conduct the work alone.

G. Improved Small Boat Design and Development

Many regions of the developing world have developed boat designs adapted to local sea conditions and fishery resources. An analogous situation has not occurred in the Pacific Basin. Increased demand for aquatic protein caused by a rapidly increasing population emphasizes the need to more efficiently exploit nearby pelagic resources; the traditional outrigger canoe is inadequate to the task.

Probably there is no one perfect small fishing boat design for use throughout the Pacific Basin. Boats must be designed for local sea and fishing conditions, yet be compatible with the

technological and financial capabilities of the indigenous population. There are three distinct fisheries for which improved designs are needed: the large atoll-lagoon fishery, the outer reef and near off-shore fishery, and the larger off-shore pelagic fishery.

In conjunction with other interested agencies, ICLARM will seek to involve local fisheries' leaders with experts in boat and power plant design in an effort to evolve appropriate fishing platforms. Factors that must be considered, in addition to the question of the acceptability of any design by the fishermen who must use it, are cost, fuel consumption, durability and range. Despite efforts over the past decade to introduce to the region the use of boats found to be effective elsewhere, no craft has been found to satisfy the criteria for an effective, efficient Pacific fishing platform. Development of such a boat -- or boats -- could provide the impetus to increased fishery production while relieving island economies of burdensome food import expenditures.

H. Gear and Methods Technology

There is general agreement among fisheries experts familiar with the Pacific Basin and southeast Asia that there exist within easy reach of coastal areas sustainable supplies of acceptable food fish adequate to provide nourishment to present populations. The trick is to catch the fish and to distribute the catches -- at reasonable prices -- to the non-fishing sectors of the population.

While practices differ from locality to locality, fishermen of both regions employ methods and use gear that has changed little over the last two hundred years. There is little doubt but that the use of fishing equipment familiar to oriental and western fishermen would permit substantially increased harvests.

Cognizant of the fact that one does not alter custom by ukase, ICLARM has constructed a program that would involve local fishermen with expatriate fishermen in comparative demonstrations of traditional and foreign gear and methods.

III. Organization and Structure of ICLARM

ICLARM is an autonomous, non-profit, international scientific and technical institute under the control of a Board of Trustees composed of persons recognized for their scientific achievements, their familiarity with the regions of concern to ICLARM, or with the operation of other international programs. The professional staff will be made up of scientists and technicians experienced in the disciplines required for the implementation of aquatic resources development programs. Presently, located in Hawaii, the Center intends to move its headquarters to the during 1976.

The specialized techniques necessary for such research places high premiums on qualified research personnel, availability of equipment, and on able research leadership. Mobilization of such resources for fisheries research and development is not in evidence

and is unlikely to be realized under existing institutional frameworks in the countries most concerned. ICLARM could supply not only a much needed sense of direction but could also help to fuse a number of relatively isolated activities into a strongly focused program and at the same time assist with the training of future local leaders in relevant fields.

A. Administration and Governance

ICLARM intends to incorporate as a non-profit corporation under the laws of . That nation is a party to the international conventions facilitating the operations of international programs concerned with humanitarian goals.

The Center will operate in conformity with policies established in its charter and in a manner consistent with by-laws adopted by its Board of Trustees. It will be administered by a Director responsible for its programs and accountable directly to the Board. The Board will approve programs and budgets and the selection of the Director. The Board will also approve the appointment of all senior staff members upon the recommendation of the Director.

B. Board of Trustees

The Board of Trustees will consist of not less than five or more than fifteen members. Trustees will be sought who possess experience in ICLARM's field of interest, or knowledge of regions

in which it intends to operate, or experience in the management of international programs.

Initially members of the Board of Trustees will be appointed for three year terms, with appointments made in such a manner as to permit staggered rotation of membership following a first full three year term for all initial appointees. Thereafter, appointments will be made by the Board of Trustees.

C. Staff

The staff will be headed by a Director appointed by the Board of Trustees. The Director will be responsible for the administration of the Center, the recommendation of programs and projects to the Board, the supervision of programs authorized by the Board, and the drawing up of budgets. The Director will be assisted by an Administrative Assistant and an Accountant. The staff will also include a Director of Research, qualified to monitor research projects supported by ICLARM but operated by cooperating institutions.

In addition, the staff will include:

A Program Coordinator for Capture Fisheries

A Program Coordinator for Culture Fisheries

A Program Coordinator for Education, Training and Information Exchange

A Research Projects Staff (A variable number of professional staff on assignment in various locations where ICLARM will carry out its research and development work

Secretarial support facilities

D. Technical Consultative Committee

A Technical Consultative Committee (TCC) will be nominated by the Director for appointment by the Board. The TCC will be composed of experts familiar with the technologies and problem areas of concern to ICLARM. The Committee will advise the Board, the Director, and senior staff members from time to time on the quality and relevance of programs and how they may be improved. Membership on the TCC will be for an indeterminate period.

E. Headquarters Location

During the initial operational period ICLARM will be located in Honolulu, Hawaii, adjacent to the University of Hawaii and the East-West Center. The location is readily accessible to the Oceanic Institute, the Hawaii Institute of Marine Biology, the Anueue Fisheries Research Center, the Bishop Museum and the National Marine Fisheries Service -- centers of marine science upon which ICLARM has and will continue to rely.

It is believed that the permanent location of the Center should be within the geographic area in which ICLARM intends to initiate fisheries programs. It has been decided that a location in _____ would satisfy that criterion and at the same time would provide access to efficient communications, transportation and support services.

F. Finances

ICLARM will depend for financial support on grants from public and private agencies which share its concerns regarding the development

of increased and improved production of aquatic food resources. Funding will be sought from governments, international bureaus, multi-national assistance agencies, development banks, corporations and private foundations.

It is estimated that the annual budget of ICLARM will approximate \$1,225,000 in 1976; \$2,585,000 in 1977 and \$3,250,000 in 1978. That amount will include provision for staff salaries, rental and maintenance of office facilities, staff transportation, the cost of staff supervised workshops and seminars, compensation of consultants as well as program costs. (See page 29 .)

G. Program Management

With the exception of workshops, seminars and the management of fellowship training programs, the ICLARM staff will depend on independent but cooperating institutes to manage research and development programs. The ICLARM staff will work with their opposite numbers at the various institutes in the definition of projects and the determination of budgets, and the Director will be responsible for the institution of appropriate accounting and reporting systems. When necessary, funds for a given program will be disbursed by ICLARM to cooperating institutions in a manner consistent with accepted accounting practices.

It is anticipated that on occasion there will be a need to employ for periods of varying length persons possessing specialized knowledge or experience who can assist the ICLARM staff or that of a cooperating institute.

IV. ICLARM PROJECTED BUDGET

	<u>1976</u>	<u>1977</u>	<u>1978</u>
<u>I. Sources of Income</u>			
Rockefeller Foundation	\$ 405,400	\$	\$
Noyes	50,000		
Tinker	75,000		
State of Hawaii	20,000		
Others	675,000		
<u>Total:</u>	\$1,225,400	2,585,000	3,250,000
 <u>II. Expenditures</u>			
<u>Core Operation</u>			
Salaries	\$ 183,000	300,000	\$ 500,000
Administration	35,000	50,000	60,000
Travel	35,000	40,000	40,000
Consultants & Trustees	10,000	20,000	25,000
Office Operations (Hawaii)	20,000	--	--
Conferences	--	25,000	25,000
Education & Training	60,000	100,000	100,000
<i>office expenses</i>			
 <u>Research Programs</u>			
Aquaculture Research	143,900	200,000	250,000
Small Scale Fisheries	240,000	250,000	250,000
Shipjack Assessment	23,500	--	--
Salmon Project	175,000	1,200,000	1,500,000
New Projects	300,000	400,000	500,000
<u>Total Expenditures:</u>	\$1,225,400	\$2,585,000	\$3,250,000