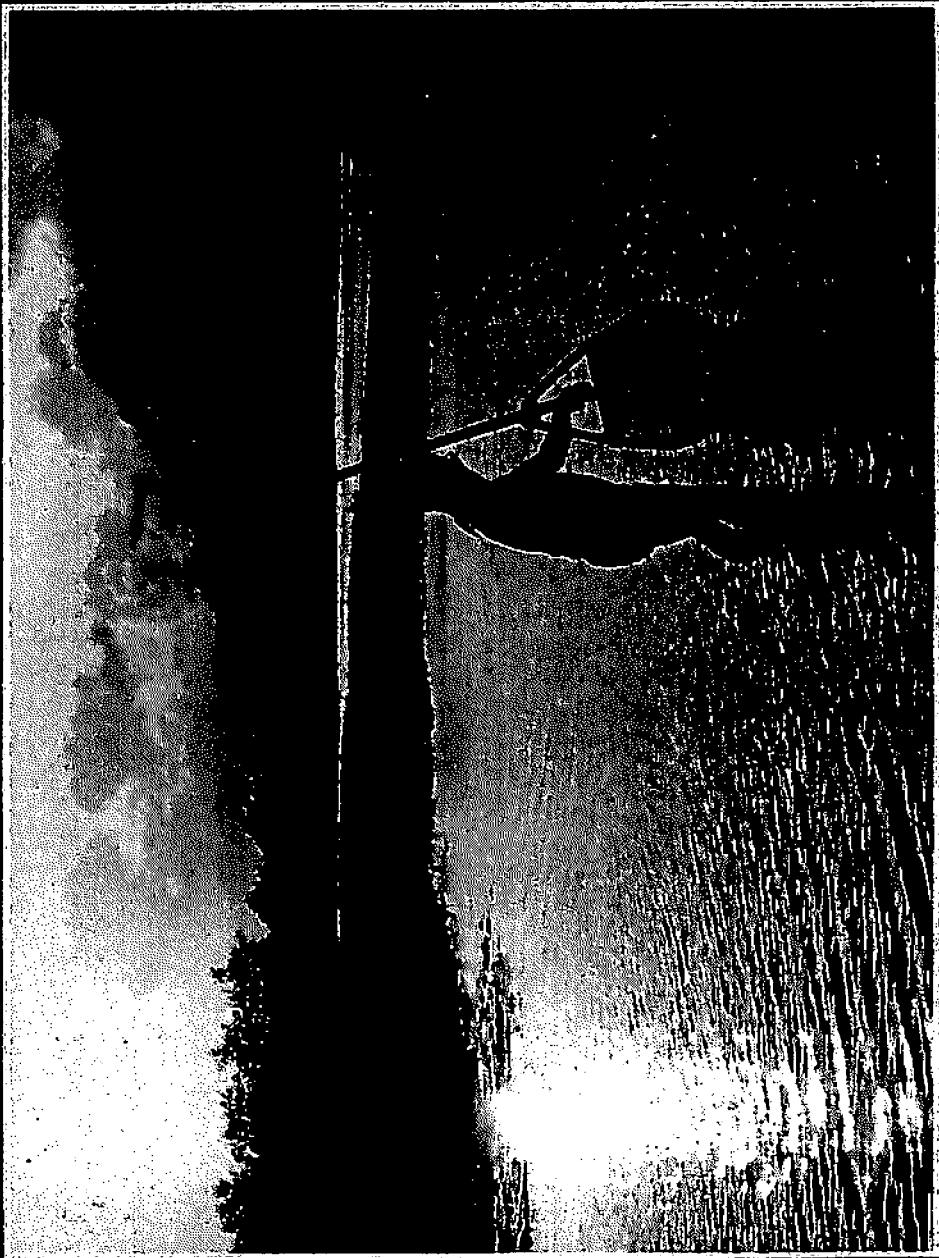


**INTERNATIONAL CENTER
FOR LIVING AQUATIC
RESOURCES MANAGEMENT**



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STATEMENT OF PURPOSE

"... the corporation is organized exclusively for charitable, educational, and scientific purposes; and in furtherance of these purposes, the corporation is to establish, maintain, and operate an international aquatic resources center designed to pursue...the following objectives:

To conduct directly and to assist others in conducting research on fish and other aquatic organisms, on all phases of fish production, management, preservation, distribution, and utilization with a view to assisting the peoples of the world in rationally developing their aquatic resources to meet their nutritive and economic needs;

To improve the efficiency and productivity of culture and capture fisheries through coordinated research, education and training, development and extension programs;

To upgrade the social, economic, and nutritional status of peoples in the less-developed areas of the world through improvement of small-scale rural subsistence and market fisheries;

To work toward the development of labor-intensive systems to aid employment and of low energy systems to minimize capital and cost requirements;

To publish and disseminate research findings and recommendations of the Center; and

To organize or hold periodic conferences, forums, and seminars, whether international, regional, local, or otherwise, for the purposes of discussing current problems."

Articles of Incorporation, International Center for Living Aquatic Resources Management.



WHAT IS ICLARM

The International Center for Living Aquatic Resources Management (ICLARM) is an international, non-profit organization conducting interdisciplinary research on fish and other living water organisms in tropical, developing countries. A young establishment, ICLARM is independent and not affiliated with any government.

ICLARM was organized to provide the technical information required to develop and properly utilize the aquatic resources of tropical, developing countries to supply their food and economic needs. It is engaged in long-term essential research to help address these needs. Overall policy is set by a Board of Trustees consisting of eminent persons from the international community.

Importance of fish. Fish protein comprises a modest 15% of all animal protein intake on a global basis, but in East Asia (including China) fish make up 36% and in Southeast Asia, an astonishing 60% of animal protein intake. It is a surprise to many people that annual world fish production, 75 million tons, is over 50% that of all meat products (140 million tons).

The challenge is to increase the availability of fish protein through rational fisheries management, through resource development and through aquaculture.

Laboratory without walls. ICLARM is unique in many ways. It is a scientific research center, yet it has no research facility of its own. Rather, it conducts research in cooperation with institutions in developing countries usually in the facilities of these institutions. This way, ICLARM is not burdened by the costs of maintaining its own research structure and it can therefore use its funds more effectively where needs are greatest. At the same time, it contributes directly to the research capabilities of cooperating institutions while it trains scientists in developing countries.

Small is beautiful. Because it is small, ICLARM enjoys a great degree of flexibility in the formulation of its policies, its organization and its operations. It has a small, permanent core of highly competent fisheries experts — biologists, economists, and sociologists — who each contribute their expertise to ICLARM's novel approach of integrating the various disciplines into multidisciplinary research programs.

Programs. ICLARM's staff and the Program Advisory Committee plan research in areas that have broad international applications vital to the development of tropical fisheries. Selected for primary emphasis are four interrelated fields: aquaculture, education and training; resource development and management; and traditional fisheries.

In addition to these long-term research areas, ICLARM also undertakes projects on behalf of governments and other agencies, as well as special studies which may substantially benefit food production and economic conditions.

History. The ICLARM idea was conceived by the Rockefeller Foundation because of inadequate technical information on tropical aquatic resources which stood in the way of solving the even graver problem of feeding and employing the rapidly growing populations in developing countries. The numerous international and national projects on fisheries development were often not coordinated, had short-term, limited goals, and left serious gaps in supportive research.

There was a clear need for an independent, international fisheries center similar to the International Agricultural Research Centers.

On 1 January 1975, ICLARM came into existence as a project of the Research Corporation of the University of Hawaii in Honolulu, Hawaii. During the next two years, the foundations for an independent entity were laid. The South Pacific region became the initial target of its research activities.

On 20 January 1977, ICLARM was incorporated as an independent institution with headquarters in Manila, in the center of a region where fish and fisheries have great importance.

Through the seven years since its incorporation, ICLARM has conducted fisheries research with support from many quarters.

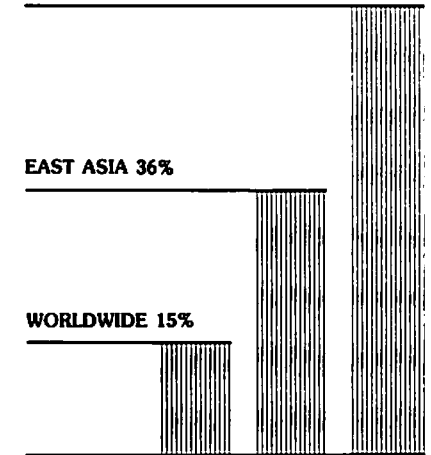
It has relied on core support primarily from the Rockefeller Foundation. Additional support has come from Australia, Canada, Germany and the U.S.A. as well as a number of regional and international agencies.

Today, the institution fills the need for an international, non-governmental research viewpoint in solving aquatic resources problems of developing countries.

SOUTHEAST ASIA 60%

EAST ASIA 36%

WORLDWIDE 15%



Proportion of fish protein of all animal protein consumed.



MESSAGE

In the course of a lifetime concerned with international fisheries research and development, I take particular pride in my association with the work of ICLARM and my recent election as Chairman of its Board of Trustees. In my judgment ICLARM's concepts and its outstanding achievements are not only unique but highly relevant to the current and future needs of the fisheries of developing countries.

The rational management of capture fisheries, especially of the multispecies, multigear fisheries of the semi-tropical and tropical seas, poses major problems for countries which, in most cases, have inadequate human and scientific resources and experience to solve them without assistance. Recent worldwide extensions of national jurisdiction over marine fisheries, usually to 200 nautical miles, have defined and protected the areas within which fishing operations and national management can take place and thus have made feasible, as well as urgent, assistance in solution of management problems. Similarly, worldwide expansion of interest and increasing investment in aquaculture emphasize the problems of research, development and attendant socioeconomic factors involved in innovating and applying new techniques.

As an international non-governmental center concerned with these major problems in modern fisheries, ICLARM is superbly situated and demonstrates an excellent track record of dynamic and applicable research and development.

Both the international and interdisciplinary nature of the research are reflected in the composition of ICLARM's 18-member Program Advisory Committee, which is drawn from a rotating group of internationally recognized experts from various countries.

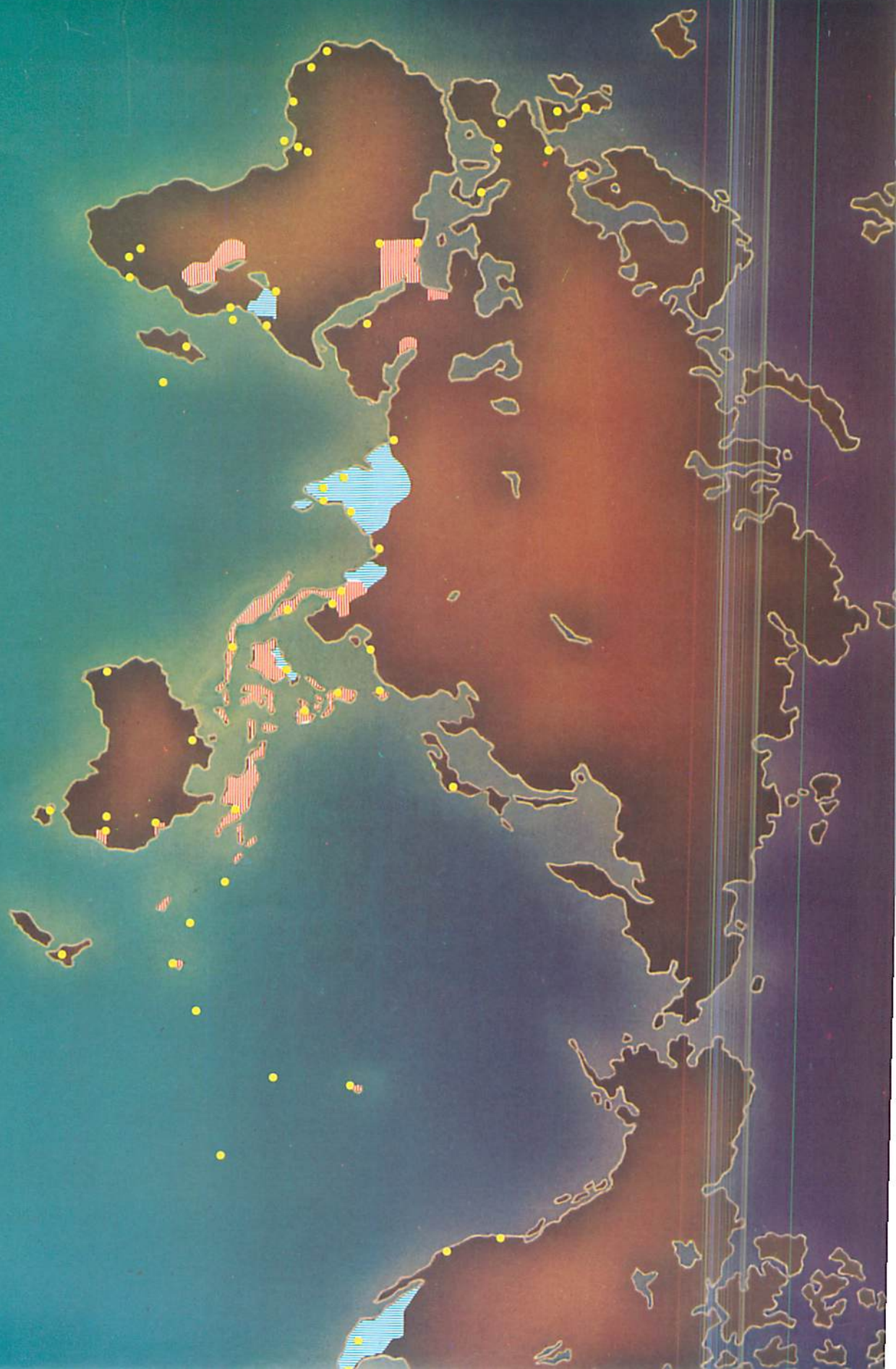
Continued support for ICLARM's activities is earnestly advocated by all who have become familiar with ICLARM's achievements. Throughout the world, the problem of maintaining and augmenting supplies of fish is of great importance to immense numbers of people both directly for employment and indirectly as a constantly renewable source of vital animal protein. The staff of ICLARM and the members of its Program Advisory Committee and Board of Trustees commend the work of this small but dynamic organization and invite your support.




A handwritten signature in black ink, appearing to read 'Roy Jackson', written in a cursive style.

Mr. Roy Jackson is a former Assistant Director-General of FAO for fisheries and presently Chairman of ICLARM's Board of Trustees.

- Members of ICLARM's Network of Tropical Fisheries Scientists
- ICLARM projects and conferences past and present
- Major advisory services to national fisheries organizations



LINKAGES



Part of ICLARM's uniqueness emanates from its method of conducting research in cooperation with national and other international organizations. The implementation of its programs hinges upon the successful formation and maintenance of links with such institutions. Among the organizations associated with ICLARM are:

Agricultural Development Council,
Thailand
Agricultural University, Wageningen,
The Netherlands
Aquaculture Production Technology
Ltd., Israel
Asian Development Bank
Australian Development Assistance
Bureau
Bureau of Agricultural Economics,
Philippines
Bureau of Fisheries and Aquatic
Resources, Philippines
Central Luzon State University,
Philippines
Commonwealth Scientific and
Industrial Research Organisation,
Australia

Council for Agricultural Planning and
Development, Taiwan
Department of Primary Industry,
Australia
Department of Technical and
Economic Cooperation,
Government of Thailand
Directorate General of Fisheries,
Indonesia
Egyptian Academy of Scientific
Research and Technology
Farm Systems Development
Corporation, Philippines
Food and Agriculture Organization of
the United Nations
German Agency for Technical
Cooperation
Institute of Southeast Asian Studies,
Singapore
Instituto del Mar del Peru
International Agricultural
Development Service
International Development Research
Centre, Canada
Israel Oceanographic and
Limnological Research Ltd.
IUCN/WWF Conservation for
Development Programme in
Indonesia
James Cook University of North
Queensland, Australia
Kasetsart University, Thailand
Kuwait Institute for Scientific
Research
Ministry of Agriculture and Fisheries,
Fiji
Ministry of Lands, Energy and
Natural Resources, Solomon
Islands

National Chung Hsing University,
Taiwan
National Inland Fisheries Institute,
Thailand
National Sun Yat Sen University,
Taiwan
New Jersey Marine Science
Consortium
Philippine Council for Agriculture and
Resources Research and
Development
Research Institute for Marine
Fisheries, Indonesia
Resources for the Future, Inc.,
U.S.A.
Rockefeller Foundation, U.S.A.
Southeast Asian Fisheries
Development Center
Southeast Asian Regional Center for
Graduate Study and Research in
Agriculture
Thailand Department of Fisheries
The Asian Institute of Technology,
Thailand
United Nations Development
Programme
United Nations Educational, Scientific
and Cultural Organization
United Nations University
United States Agency for
International Development
University of Hawaii
University of the Philippines
University of the South Pacific, Fiji
University of Papua New Guinea
Universiti Pertanian Malaysia
World Bank

CULTURED FISH OF SOUTHEAST ASIA



Nile tilapia
Tilapia nilotica



Snakehead, Mudfish
Channa striata



Common carp, European carp
Cyprinus carpio



Milkfish
Chanos chanos



Snakeskin gouramy
Trichogaster pectoralis

AQUACULTURE

Aquaculture is the cultivation of fish and aquatic plants, in much the same way as agriculture is the cultivation of crops and livestock for man's use and disposal. In modern day food production, aquaculture is viewed as one aspect of agriculture.

In recent history, there has been an upsurge in interest in aquaculture due to the increasing demand for fish protein by rapidly multiplying populations. Contrary to expectations, there has been a levelling off, rather than a gain, in world production from capture fisheries. People have come to realize that aquaculture is more manageable, less susceptible to natural forces, and therefore, a more reliable source of food than capture fisheries. It has been estimated that if tropical aquaculture, which is still very much a primitive practice handed down through generations or based on the transfer of poorly understood technologies, were supported by scientifically proven methods, the annual world production from aquaculture of about 6 million tons (9% of total fish production) would increase two-or threefold by the end of the century.

In spite of increased interest in aquaculture, however, production growth has been slow, mainly because research support has been poorly focused and only biological aspects have been tackled, leaving research in the technical, economic, institutional, and cultural aspects of aquaculture practically unattended.

ICLARM's Aquaculture Program efforts in biological research are in key problem areas which require long-term investigation. These include studies of reproduction, genetics, nutrition of cultured species, and integrated agricultural-aquacultural food production systems.

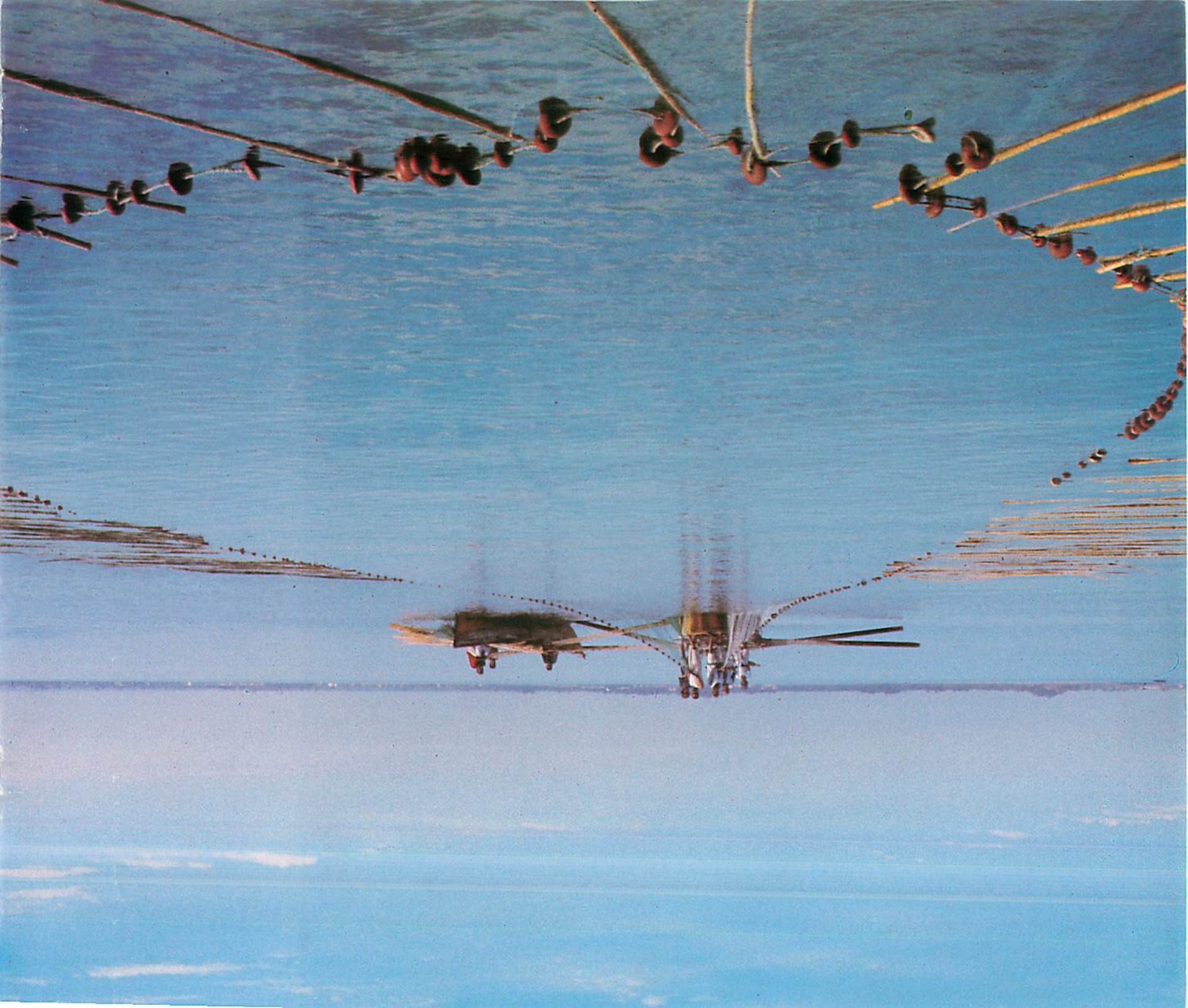
Also addressed are the technical problems and the economic and institutional factors that will determine the future of aquaculture. These non-biological studies concentrate on two areas: country case studies of trends and development prospects of aquaculture; and economic analysis of existing aquaculture production and marketing systems.

At present, the focus of ICLARM's aquaculture development efforts is on low-priced species such as tilapia, carps, air-breathing fish (catfish and snakehead), mullets, milkfish, and bivalve molluscs, which are highly adaptable to a wide range of environmental and culture conditions, both small and large-scale producers, and readily accepted by consumers.

Tilapia, in particular, is recognized as a future major fish protein source — an "aquatic chicken" — and has been made the subject of several research projects, publications and conference themes by ICLARM.

The latest thrust in this Program, an international giant clam culture project, has generated wide interest from institutions around the Pacific.





TRADITIONAL FISHERIES

The primary purpose of ICLARM's Traditional Fisheries Program is to seek solutions to the poverty that characterizes the small-scale fisheries sector. ICLARM's multidisciplinary research takes into account not only the biological conditions of the fish resources but also the socioeconomic environment in which traditional fishing communities exist.

Traditional fishermen contribute well over 50% of the total fisheries catch in many tropical, developing countries, yet they remain among the poorest of the poor. These fishermen, who number close to 25 million worldwide, are increasingly caught between diminishing employment opportunities onshore and increasing competition with large-scale fisheries offshore. The resulting low incomes and standards of living of traditional fishermen have attracted the attention of national and international development agencies, but the problems persist.

Many development agencies place their hopes in technical solutions such as better boats and gear but these often contribute to overfishing. In contrast, ICLARM believes that the solution to the low incomes of traditional fishermen will be found in fisheries management approaches that stress reduced fishing effort and alternative sources of income rather than increased production.

Underlying ICLARM's traditional fisheries research is the encouragement of management approaches that recognize the crucial role and contribution of traditional fishermen to decisionmaking regarding use of the resources upon which they depend.

ICLARM calls attention to this need for a management perspective through two major themes. The first of these, which is directed primarily to an audience of policymakers and researchers, is the exploration of management options for tropical small-scale fisheries. Under this theme, ICLARM staff working in collaboration with other organizations have completed a research framework, several country review and synthesis studies, a workshop on alternative energy sources, and a major case study of a highly competitive coastal fishery in the Philippines.

Because the often sensitive income distribution questions involved in fisheries management must be primarily addressed by national scientists, the second program theme is that of catalyzing the development of national 'centers of excellence'. In 1983, ICLARM and four universities in Malaysia, Thailand, the Philippines and Indonesia launched the Fisheries Social Science Research Network which has major components of training, curriculum development and research.





RESOURCE DEVELOPMENT AND MANAGEMENT

The rapid expansion in fisheries development in the past three decades has created the need to assess attitudes towards renewable living aquatic resources. The problems of conflicts among fisheries, depletion of resources, the effects of the Law of the Sea, among others, should have forced governments to shift fishery policy from development to the management of limited resources. However, in many countries, this has not happened. ICLARM addresses these problems through its Resource Development and Management Program.

The Program's objectives are: to enhance the abilities of fisheries scientists to assess fisheries resources in the tropics; and to translate the results of such assessments into recommendations for the management and conservation of stocks. This research complements the programs in aquaculture and traditional fisheries, as they all deal with interlocking biological, technical, economic, social, and environmental issues.

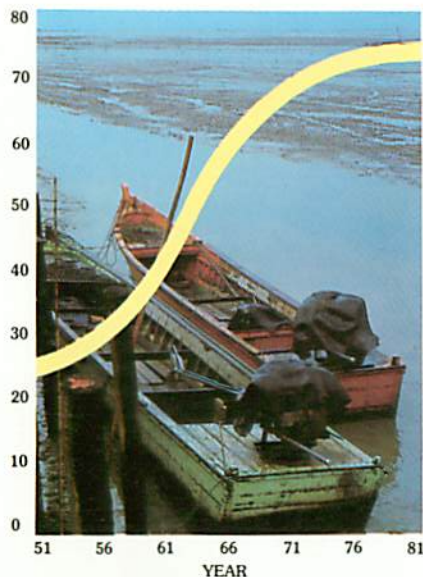
The major areas of activity under this Program are the Tropical Fish Stock Assessment Research Project, the Network of Tropical Fisheries Scientists, the Management-oriented Fisheries Research Project, and the International Giant Clam Mariculture Research Project.

ICLARM's involvement in the Tropical Fish Stock Assessment Research Project began with a review of the applicability of temperate-water stock assessment methods in the tropics. The review proved to be a turning point in this field. It has led to ICLARM's own calculator- and microcomputer-based stock assessment techniques which are currently being evaluated and adopted in both tropical and temperate countries.

A major accomplishment has been the compilation of five length-based stock assessment programs (called Electronic Length-Frequency Analysis or ELEFAN) for microcomputers.

The United Nations Food and Agriculture Organization (FAO) is distributing information on these ICLARM findings in several languages and a manual has been prepared for their use on programmable calculators.

The Network of Tropical Fisheries Scientists, supported by its own newsletter, serves as the major vehicle for disseminating information on appropriate stock assessment methods, while the Management-oriented Fisheries Project has so far enabled improved stock assessment of fisheries in Indonesia, the Philippines and Peru. Other countries are requesting similar projects with ICLARM.



Annual world fish production since 1951, showing the "70 million tonne plateau".





EDUCATION AND TRAINING

Education and training are essential components of all ICLARM programs. In consultation with the Program Advisory Committee, ICLARM is developing an organized Education and Training Program aimed at the following: development of fisheries curricula relevant to tropical, developing countries; specialized, advanced training in all ICLARM's areas of expertise; training seminars to advise fisheries administrators on developments in fisheries policies, technology and related matters; and training of educators, extension officers and vocational trainers.

ICLARM has specialized in advanced "one-on-one" graduate level training of scientists and university educators. Concentrated individualized training designed to strengthen the capabilities of a scientist in specific areas through close collaboration with individual ICLARM staff members has been particularly successful.

ICLARM has conducted training courses in various universities and institutions, such as the integrated farming training seminars held at the International Institute for Rural Reconstruction (IIRR), Philippines; on-site training of research assistants as in the San Miguel Bay,

Philippines project; training of graduate students working on their theses; and participation in the United Nations Food and Agriculture Organization (FAO) training programs.

ICLARM is supporting the Masters in Science in Resource Economics and module program of the Universiti Pertanian Malaysia through assistance in teaching and curriculum development, and providing technical advice and information backstopping through the library and ICLARM's information service. The Center has trained in-house Indonesian officers from the Agency for Agricultural Research and Development (AARD) in information services, while the library regularly accommodates trainees from several colleges in Manila.

An adjunct to this is the technical advisory services provided by the ICLARM staff to national and international organizations. ICLARM's professional staff have served as advisers to national fisheries agencies in many countries, for example, China, Egypt, India, Indonesia, Kenya, Mexico, Peru, the Philippines, Taiwan, Thailand and Zambia, as well as to the United Nations Development Programme (UNDP), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Food and Agriculture Organization (FAO), the United States Agency for International Development (USAID), the International Agricultural Development Service (IADS) and many others.

INFORMATION SERVICE

ICLARM's Information Service is primarily a support arm for the research programs, but it takes part in international information activities and has a Selective Information Service for fisheries researchers.

ICLARM's Publications Unit is responsible for producing six periodical series: the quarterly *Newsletter*, *Studies and Reviews*, *Conference Proceedings*, *Bibliographies*, *Translations*, and *Technical Reports*.

The ICLARM *Newsletter* is distributed all over the world. Of the total circulation of 3,000 about 2,800 newsletters are sent free to subscribers in developing countries. More than 30,000 books from ICLARM's five technical series have been distributed worldwide.

Through its publications, ICLARM disseminates the proceedings of international conferences, commissioned reviews, and research findings, thus serving to further aquatic science education.

To meet the acute need for textbook, manuals and other educational material suitable to tropical fisheries, ICLARM is preparing to build a wide array of educational material on the subject.

The Center's library services not only ICLARM staff but also some 800 students and researchers from various fisheries organizations every year.

In line with its involvement in information retrieval and dissemination in developing countries, ICLARM offers the free use of its online connections with an overseas computer database system for literature searching. The Selective Information Service provides answers to questions within the Center's areas of expertise.

ICLARM's proposal for a regular forum and society for Asian fisheries scientists has been enthusiastically received. ICLARM has helped set up a Foundation Council to prepare for the first meeting of the Asian Fisheries Forum in 1986.



IMPACT

Although ICLARM has remained small, it has achieved much in terms of research accomplishments and impact during its first seven years of existence.

Some of its more important research achievements follow.

In Aquaculture, ICLARM research has:

- Developed and packaged technology for farming fish with pigs and poultry, providing annual yields up to 10 tons/hectare, more than double traditional methods. ICLARM has assisted development agencies in implementing the technology in Africa and Asia.
- Developed an information base on waste-fed aquaculture systems and its dissemination in many countries for use in production and training.
- Improved fishfarming techniques in Asia and the Middle East through research on genetic improvement, saltwater culture in arid lands, hatchery and nursery technology and various growout systems.

- Produced a series of monographs on the major aquaculture commodities that are now used as standard reference works throughout the tropics in research, training, production and policy planning.

In Traditional fisheries, the more important achievements in collaboration with cooperating national institutions are:

- Establishment of a fisheries Social Science Research Network, which includes the first M.Sc. (Fisheries Economics) in Asia, to address the need for trained personnel in the socioeconomic aspects of fisheries management and aquaculture development.
- Basic reviews on tropical fisheries management and traditional fisheries research which have influenced fisheries and social science methodologies and impacted at the policy level in regional banks, national governments, and international agencies.
- First comprehensive multidisciplinary study of an Asian tropical fishery. The research resulted in legislative changes and has spawned numerous other studies patterned after the novel analysis used.

In Resource Development and Management:

“ELEFAN” microcomputer programs developed at ICLARM for the assessment of fish stocks are being applied in various stock assessment research activities in countries such

as Australia, Chile, Denmark, West Germany, Indonesia, Kuwait, Papua New Guinea, Peru, the Philippines, Seychelles, Solomon Islands, and the U.S.A. The Food and Agriculture Organization (FAO) and the Danish International Development Agency (DANIDA) are supporting the dissemination of these new techniques through lecture courses for senior developing country biologists. Development of an international Network of Tropical Fisheries Scientists which has become a most effective instrument for information transfer through its newsletter, *Fishbyte*, that reaches over 300 members in 62 countries.

The Ocean Policy Committee of the U.S. National Academy of Sciences affirms ICLARM's role: “ICLARM is unique among fisheries research and development agencies. It is a private organization (unlike United Nations agencies, for example, which must answer to member governments) and may be able to address problems of living resources management and exploitation with minimal political interference. This is particularly important at this time when governments and industry everywhere are trying to grapple with problems of zones of extended jurisdiction and management of marine resources within such zones. Potentially, ICLARM provides a neutral agency through which project funding from a number of sources could be channelled and coordinated.”

The Future. The “ICLARM Idea” has convincingly highlighted the usefulness of a small, independent, flexible organization of highly qualified scientists directing research efforts toward gaps in our knowledge that are constraints to development. Similarly, the concept of ICLARM's role as contributing to that development and to local research has proven to be sound in practice.

It will continue to pursue its research and development work objectives following the programs mapped out for it earlier. ICLARM's primary activity will be the execution of research that cannot or has not been done by existing groups for various reasons. Networks of several types which have been very effective means for stimulating and catalyzing research and disseminating information will be expanded. Small workshops and the printing and distribution of quality publications on selected topics will continue to be a central part of ICLARM's communications. Finally, ICLARM's training role will be expanded to address needs for advanced and specialized training of researchers, administrators, college professors, and other developing country leaders in the fisheries field.

ICLARM SENIOR STAFF

Permanent Staff

Director General
RICHARD A. NEAL, Ph.D.
(Invertebrate fisheries) University of Washington.
Interests: fisheries development, aquaculture, fisheries research administration.

Director, Traditional Fisheries Program
IAN R. SMITH, Ph.D. (Agricultural economics) University of Hawaii.
Interests: small-scale fisheries and aquaculture economics — allocation of use rights and income distribution; sectoral analysis; management and development policy.

Director, Resource Development and Management Program
JOHN L. MUNRO, Ph.D.
(Hydrobiology) University of London.
Interests: tropical fisheries and fish stock assessment, coral reef ecology, mariculture.

Associate Scientist
DANIEL PAULY, Ph.D. (Fishery biology) University of Kiel.
Interests: population dynamics of tropical fishes, assessment of tropical fisheries, theory of fish growth.

Director, Aquaculture Program
ROGER S.V. PULLIN, Ph.D.
(Parasitology) University of York.
Interests: waste-fed aquaculture, fish reproduction, fish genetics.

Senior Scientist
CHING-MING KUO, Ph.D. (Fish reproduction) University of California.
Interests: induced breeding and larval rearing of fishes, brood-stock husbandry.

Director, Administration
ANGELITO O. del MUNDO, M.S.
(Plant pathology) University of Missouri.

Chief, Information Service
JAY L. MACLEAN, M.Sc. (Fishery biology) University of Queensland.

Project Staff

JOHN A. COLMAN, Ph.D. (Water chemistry) University of Wisconsin
Interests: marine pollution, chemical stressors in aquaculture, biological control of aquatic weeds.

KEVIN D. HOPKINS, Ph.D. (Fish culture) Auburn University.
Interests: integrated animal-fish farming, arid-land aquaculture.

BRIAN A. LOCKWOOD, Ph.D.
(Economics) Australian National University.
Interests: rural development, village livestock, small-scale fisheries and fish marketing.

EDWARD W. McCOY, Ph.D.
(Agricultural economics) University of Tennessee.
Interests: production economics, management of fish ponds, marketing and processing of exotic fishes and underutilized species.

JAN MICHAEL VAKILY, M.Sc.
(Fishery biology) University of Kiel.
Interests: trawl fisheries, aquaculture of molluscs.

WADE WATANABE, Ph.D. (Fish reproduction) University of Hawaii.
Interests: induced spawning of finfish, baitfish rearing.

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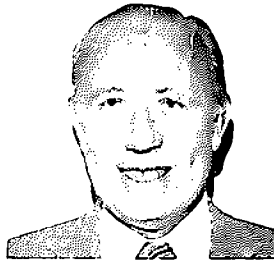
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Natural Resources Consultants, Washington, U.S.A.



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DR. PRIDA KARNASUT
Bangkok, Thailand



DR. RICHARD A. NEAL
Director General, ICLARM

**INTERNATIONAL CENTER FOR LIVING
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