

ICLARM

REPORT

1982



ICLARM REPORT

1982

Edited by

Jay L. Maclean

and

Leticia B. Dizon

1983



**INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT
MANILA, PHILIPPINES**

ICLARM Report 1982

**Edited by JAY L. MACLEAN
and LETICIA B. DIZON**

1983

**Published by the International Center for Living Aquatic Resources
Management, MCC P.O. Box 1501, Makati, Metro Manila, Philippines**

Printed in Manila, Philippines

**Maclean, J.L. and L.B. Dizon, Editors. 1983. ICLARM Report 1982.
International Center for Living Aquatic Resources Management,
Manila, Philippines. 95 p.**

Front cover: Children in Thailand with small tilapias (*Oreochromis mossambicus*) used for feeding seabass (*Lates calcarifer*). Photo: Roger Pullin. *Back cover:* Fish dealer's "jeepney", Philippines. An important element in the economics of the tilapia industry. Photo: Noel Morales.

ISSN 0115-4494

ICLARM Contribution No. 154

CONTENTS

Introduction	1
Resource Development and Management Program	
Background	5
Progress of Work	5
Advisory Services	7
Training	7
Publications	8
Meetings Attended, Papers Presented	9
Program Plans for 1983	9
Project Summaries	11
Aquaculture Program	
Background	19
Progress of Work	19
Advisory Services	25
Publications	26
Meetings Attended, Papers Presented	27
Program Plans for 1983	27
Project Summaries	29
Traditional Fisheries Program	
Background	57
Progress of Work	57
Advisory Services	59
Training	60
Publications	60
Meetings Attended, Papers Presented	60
Program Plans for 1983	61
Project Summaries	64
Education and Training Program	70

Information Service.	71
Contribution Series.	75
Linkages and Agreements	83
Staff	87
Program Advisory Committee	92
Members of the Corporation and Board of Trustees	94
Financial Statement	95

INTRODUCTION

During 1982, ICLARM has grown stronger, expanded its activities slightly and has continued to gain recognition as an established part of the scientific community working to support and strengthen tropical fisheries management and development. ICLARM's scientific contributions and accomplishments have included a wide variety of specific, carefully targeted research activities conducted in cooperation with other institutions and planned to complement and supplement the work of development organizations. Research results from the "first generation" of studies conducted by ICLARM together with cooperating institutions are now largely available. The increasing flow of ICLARM publications reflects the importance placed on the Center's primary means of communicating research results to user groups. Demand for ICLARM publications is strong from all parts of the developing world and sales are brisk.

To an increasing extent fisheries scientists are looking to ICLARM for guidance, assistance and ideas. The flow of visiting scientists through ICLARM's office continues to increase. Presentations and lectures by staff members at conferences, workshops and training courses have increased in number and have had a significant impact in ICLARM's areas of expertise.

As nearly every institution, national and international, interacting with ICLARM has received budget cuts, demands for ICLARM to step forward in a stronger role have come from many directions. ICLARM's funding limitations have prevented rapid expansion but opportunities and needs for such expansion are abundant, and the Center is responding positively within its capabilities.

The integration of ICLARM's various research activities continues to be a distinctive feature which enhances the effectiveness and the applicability of its work. Small staff size permits a high level of interaction and cooperation, and individual projects in one program are often designed to utilize expertise of scientists in other programs. Examples of these linkages in 1982 are:

- Socioeconomic appraisal of the constraints to increased productivity of milkfish farms.
- Stock assessment as related to studies of traditional fishing communities.
- Planning for interaction of fishery management and clam cultivation in reef resources utilization.
- Role of aquaculture as an employment alternative for low-income fishermen.

- Marketing studies as a part of the molluscan bivalve production project.
- Possible stocking-fishery interactions for mullet and other migratory species.
- Interaction of economics and biology on fishery management options.

Activities expanded during 1982 include the Resource Development and Management Program with the hiring of Dr. John Munro in February as Program Director. New aquaculture projects have been initiated in Kuwait (January) and Taiwan (July), with one or two ICLARM staff members stationed in each country. A Fisheries Social Sciences Network is rapidly taking shape involving key universities in Malaysia, Thailand, Indonesia and the Philippines and funding from IDRC of Canada. A differently designed network, the Management-Oriented Tropical Fisheries Research Network has begun to function. New cooperative agreements have been signed during the year with the Department of Fisheries in Sabah, the University of the Philippines in the Visayas, Universiti Pertanian Malaysia, the National Inland Fisheries Institute in Thailand and the Council for Agricultural Planning and Development in Taiwan. ICLARM has taken initial exploratory steps toward establishment of a fisheries forum in Southeast Asia. The level of interest in this activity is high.

Interaction with other institutions is both the primary mode of operation and the key to ICLARM's research-catalyzing and stimulating role. Relationships with other institutions and scientists reflect expansion of this mode of operation. ICLARM scientists are also invited to participate in an increasing number of conferences and workshops, and a large number of spontaneous compliments have been received on our newsletter, scientific publications, conferences and other initiatives, reflecting broad interest in ICLARM's work. Requests for assistance or collaboration on research projects also are increasing and far exceed our capacity to participate. The U.S. Agency for International Development reviewed ICLARM's program in March 1982, and the review team was highly complimentary.

The 12 months of 1982 were eventful ones for developing-country fisheries. Passage of a new Law of the Sea treaty offers to stabilize many aspects of international fisheries relations. Continuation of the world fisheries catch at the "70 million tonne plateau" is an ominous knell that should be recognized as a major "event" (Fig. 1). Tuna fishing is undergoing changes involving fish-attraction devices, purse seining and the harvest of juveniles that will certainly have far-reaching, albeit presently unknown, effects. Rapidly expanding bans on trawling in Southeast Asian countries are recognition both of the competition between modern, efficient harvesting methods and small-scale fishermen and of the conflicting goals of fishery management. The year 1982 may be remembered as the year many developing-country fishery managers first recognized that their country's fish harvests had levelled off or were declining and that increases projected to satisfy needs of growing populations would not be met from capture fisheries.

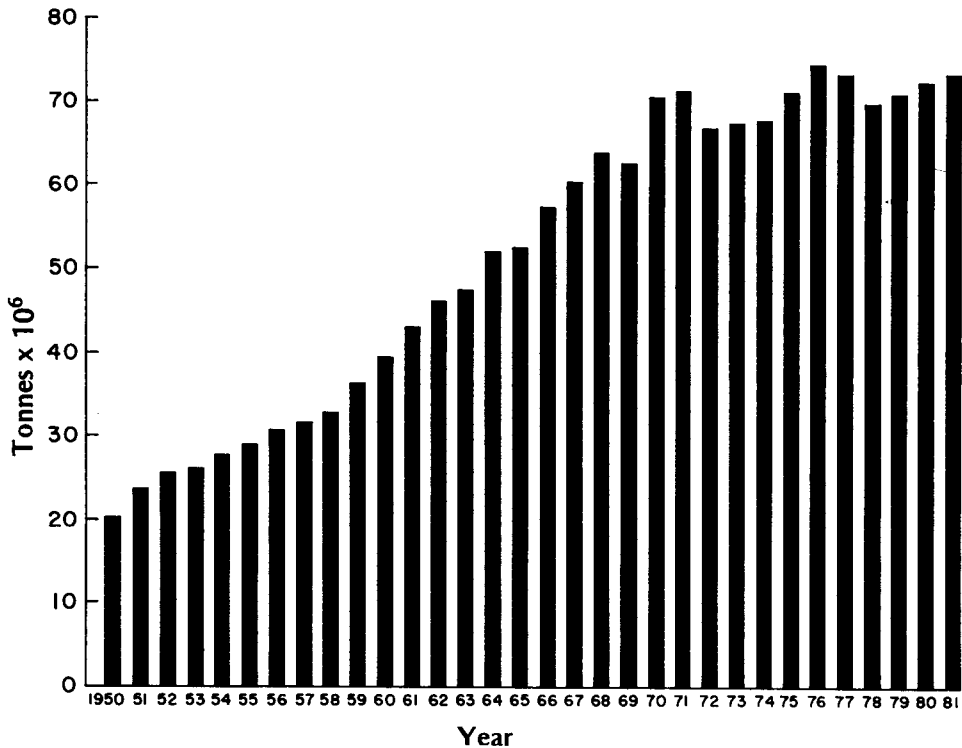


Fig. 1. Annual world fish production since 1950, showing the "70 million tonne plateau."

A fault in the strategy of international donors regarding fisheries development is becoming particularly apparent to the ICLARM staff. This fault is that donors are willing to continue to contribute large sums to demonstration and extension projects even though they have only a mediocre record of follow-on success. The logic followed is that short-term technology transfer is so urgently needed that research cannot be afforded. Donors do not seem to recognize that, in fisheries as opposed to agriculture, this mediocre record is often due specifically to the absence of the required knowledge base, because of inadequate research. Outstanding examples are: (1) fisheries "management" without knowledge of the size of stocks; (2) aquaculture without adequate seed production methods, disease control or suitable strains and species; (3) continual "development" of fishing communities using superficial methods such as loan programs and cooperatives that have been consistently unsuccessful because of insufficient understanding of local socioeconomic and institutional circumstances.

The typical fisheries situation observed is one of a continually deteriorating resource base, maintenance of yields by shifting to smaller fishes (lower on the food chain), decreasing profits for fishermen, conflicting management goals, and growing conflicts among fishermen competing for limited resources. Aquaculture is in only a slightly better position as evidenced by agreement

at a recent SEAFDEC meeting that seed supply for aquaculture on a regional basis was inadequate for expansion being planned.

During 1982 several internationally recognized scientists have spoken quite eloquently in support of continuing research on food production in developing countries. Research is certainly an essential component of rational fisheries development. ICLARM seems, thus far, to have failed to convey this message to the fisheries world. Increasing the awareness of research needs for tropical fisheries development and management will be a specific goal for 1983.

Overall 1982 has been a year of progress and accomplishment for ICLARM as is revealed in the following pages. The goals of increasing incomes and employment opportunities and improving nutrition of the poor through wise resource use have been followed rigorously. The social and economic aspects of fishery development have been explored along with the biological elements, and training and education have become increasingly important parts of the ICLARM approach. Organizations that are responsive to needs of a changing world must be dynamic themselves, and the Center has clearly demonstrated the importance of its flexibility, scientific versatility and independence in 1982.

RICHARD A. NEAL
Director General

RESOURCE DEVELOPMENT AND MANAGEMENT PROGRAM

Background

The basic objective of the Resource Development and Management Program is to enhance the abilities of fisheries scientists in the tropics to assess the fisheries resources for which they are responsible and to translate the results of such assessments into recommendations for the management and conservation of the stocks.

Progress in stock assessment work on tropical fisheries has been very slow and there are still few examples of tropical fisheries which are managed on the basis of options formulated as a result of management-oriented research. The reasons for this situation relate to the biology of the fishes, the nature of the fisheries and the institutions responsible for research and management in the tropics, as well as to educational opportunities available to scientists.

The greatest constraint is that scientific personnel attached to tropical fisheries institutions are often not well versed in matters relating to stock assessment. The few universities teaching stock assessment techniques are mainly located in temperate countries; the training courses available through the offices of various international agencies are not always satisfactory and the number of possible participants is always limited. To this end the thrust of the program since its inception in 1979 has been towards the elaboration of theories relevant to the assessment and management of tropical multispecies, multigear fisheries, the development and dissemination of appropriate stock assessment methodologies, and the training of young fisheries scientists.

Progress of Work

In March 1982, Dr. John L. Munro joined the program as its first formal Director, with a mandate to implement the existing strategies and formulate new directions and goals. For 1982, the program's activities were consolidated under four projects. These include the ongoing Tropical Fish Stock Assessment Research Project, the completed ICLARM/CSIRO Workshop on the Theory and Management of Tropical Multispecies Stocks, and two new projects aimed at improving fisheries management in tropical, developing countries.

Stock assessment in tropical waters is in many cases far more difficult than the same exercise undertaken in temperate regions, for reasons relating

to the complex and little-understood interactions in multispecies, multigear fisheries and to the difficulties of ageing fishes. ICLARM's research efforts in this field are through the Tropical Fish Stock Assessment Research Project. A variety of work has been carried out in this project, the most important of which has been the completion by Dr. Pauly of a manual entitled "Fish Population Dynamics in Tropical Waters: A Manual for Use with Programmable Calculators." This book has now been refereed and will go to press in 1983. Additionally, the proceedings of the ICLARM/CSIRO workshop were prepared for publication by Dr. Pauly and Dr. G. Murphy of CSIRO.

Investigations by Dr. Munro have covered the elaboration of a technique for estimating growth rates from mark and recapture data, analysis of data on the biology of tridacnid clams, reviews and data analyses of coral reef fisheries. The skeletal draft of a textbook entitled "Tropical Fisheries Science" by J. Munro and D. Pauly has also been completed.

The new projects are the Network of Tropical Fisheries Scientists and the Management-Oriented Fisheries Research Project. These two projects are closely integrated and much of the work of the program is now centered around the Network of Tropical Fisheries Scientists—which was formally announced at the meeting of the IPFC's Standing Committee on Resources Research and Development (SCORRAD) in Sydney in April 1982.

The objective of the Network is to identify fisheries scientists who are working on stock assessment problems in relative isolation in tropical countries, enroll them as members and bring them into contact with fellow scientists with common or similar problems in management-oriented fisheries research. Membership of the Network is on a personal basis and not institutionalized. The principal vehicle for communication will be a newsletter which will contain exchanges of informal notes, news and views on tropical fish stock assessment and management. Members of the Network are offered assistance in data analysis, including periods spent in Manila or visits by ICLARM staff to the institutions concerned to formulate plans and devise appropriate methodologies. The Network will organize training workshops on such topics as length-structured stock-assessment methods and of mesh-selection phenomena. ICLARM assistance will also include the development of data-acquisition strategies where no database exists. This is particularly important in circumstances where difficulties are encountered in identifying which data should be collected, when, how and in what quantities. Great expenditures of time and effort have quite often proven abortive because the scientists omitted certain vital observations.

The Network is presently funded internally by ICLARM but FAO has announced its intention to support the project from 1983. Membership of the Network is rapidly increasing and already stands at 60 members in 18 countries.

Throughout the tropics, and indeed throughout the world, the realization that fisheries need to be managed on a continuing basis has caught most nations almost totally unprepared. This has been forced upon many nations

by the declaration of exclusive economic zones and the implicit expectation that the resources in those zones will be managed on a rational scientific basis. This has, in turn, brought into focus the urgent need for skilled scientific personnel able to generate management options on the basis of fishery investigations.

The Management-Oriented Fisheries Research Project addresses this problem. It is designed to augment the number of fisheries personnel, skilled in the assessment of tropical fish stocks, in the context of management-oriented fisheries research and training programs for selected countries. This is seen as a key step in the process of strengthening the capabilities of developing countries to manage their own fisheries. The approach proposed here differs from conventional fisheries development projects in that, rather than generate a large body of new data, the projects will normally concentrate upon in-depth analysis of data presently available and/or routinely collected by the participating countries. Where no previous database exists, methodologies for data acquisition will be investigated.

In the Management-Oriented Fisheries Research Project, two country modules, the Philippines and Peruvian modules are operational. The necessary groundwork for the Indonesian module has been completed and the project should get underway early in 1983. The Program Director visited a number of countries in Oceania and attended the Regional Fisheries Technical Meeting of the South Pacific Commission in July and August with a view to ascertaining the possibilities of developing modules within various South Pacific countries. He also visited Zimbabwe in December to investigate the possibility of a module focussed upon reservoir fisheries.

A visit of Dr. Pauly to the Instituto del Mar del Peru in November/December 1981 provided the opportunity to initiate a Peruvian module of the Management-Oriented Fisheries Research Project. This module concentrates on the analysis, using ELEFAN I, II and III, of 20 years' detailed catch-at-length data for Peruvian anchovy. The data, which are currently being analyzed at ICLARM, allow for precise estimation of the growth, mortality and recruitment rates of one of the most important fish stocks in the world.

Advisory Services

Dr. Pauly visited FAO, Rome and the Danish Institute for Fisheries and Marine Research from 28 September to 10 October 1982 for consultations on development of materials for the FAO/DANIDA training courses in fish stock assessment in which Dr. Pauly will participate in 1983.

Training

Drs. D. Pauly and J. Munro contributed to the teaching program of the Fishery Resources Assessment Training Course which was held at the Ateneo

de Manila University, 3-15 May 1982. Dr. Pauly took a major part in the organization of the course which was jointly sponsored by BFAR, ICLARM, PCARRD and the SCSP/FAO. Thirty young scientists employed by BFAR were given basic training in the elements of stock assessment during the course.

Additionally, Dr. Pauly held a 10-day training course at Silliman University in which he taught a selection of staff and graduate students the basics of stock assessment, based upon his "Selection of Simple Methods for the Assessment of Tropical Fish Stocks".

Dr. Pauly taught a one-semester course on "Aquatic Resource Management" from October 1981 to March 1982, at the Zoology Department, University of the Philippines. Two of the participating students successfully defended MS theses in Marine Biology. One of the theses was on the biology of the pomfret, *Formio niger*, while the other, using data on the croaker, *Otolithes ruber*, from San Miguel Bay, was the first thesis in fish population dynamics ever presented at a Philippine university.

Publications

- Bakun, A., J. Beyer, D. Pauly, J.G. Pope and G.D. Sharp. 1982. Ocean sciences in relation to living resources. *Can. J. Fish. Aquat. Sci.* 39(7): 1059-1070.
- Hopkins, K., D. Pauly, E.M. Cruz and J.H. van Weerd. 1982. An alternative to predator-prey ratios in predicting recruitment. *Meeresforsch.* 29(3): 125-135.
- Ingles, J. and D. Pauly. 1982. Raw data and intermediate results for an atlas on the growth, mortality and recruitment of Philippine fishes. xv + 224 p. (mimeo)
- Munro, J.L. 1982. Training in tropical fisheries science. *ICLARM Newsletter* 5(4): 3-4.
- Munro, J.L. and D. Pauly. 1982. The ICLARM network of tropical fisheries scientists. *ICLARM Newsletter* 5(4): 5.
- Pauly, D. 1982. A method to estimate the stock-recruitment relationships of shrimps. *Trans. Amer. Fish. Soc.* 111(1): 13-20.
- Pauly, D. 1982. Reprints as a neglected resource. *ICLARM Newsletter* 5(2): 18-19.
- Pauly, D. 1982. Notes on tropical multispecies fisheries, with a short bibliography on the food and feeding habits of tropical fish, p. 30-35 and 92-98. *In* Report of the regional training course on fisheries stock assessment, Samutprakarn, Thailand, 1 Sept.-9 Oct. 1981. South China Sea Fisheries Development and Coordinating Programme, Manila. SCS/GEN/82/83.
- Pauly, D. 1982. Studying single-species dynamics in a multispecies context, p. 33-70. *In* D. Pauly and G.I. Murphy (eds.) Theory and management of tropical fisheries. ICLARM Conference Proceedings 9, 360 p. International Center for Living Aquatic Resources Management, Manila, Philippines and Division of Fisheries Research, Commonwealth Scientific and Industrial Research Organisation, Cronulla, Australia.
- Pauly, D. and J. Ingles. 1981. Aspects of the growth and mortality of coral reef fishes. *Proc. Fourth International Coral Reef Symposium* 1: 89-98.
- Pauly, D. and J.L. Munro. 1982. On the development and dissemination of new methodologies for tropical stock assessment, p. 79-87 (Annex 3). *In* Indo-Pacific Fishery Commission (IPFC) Report of the Third Session of the Standing Committee on

- Resources Research and Development. Sydney, Australia. April-May 1982. FAO Fish Rep. 275. 135 p.
- Pauly, D. and G.I. Murphy, Editors. 1982. Theory and management of tropical fisheries. ICLARM Conference Proceedings 9, 360 p. International Center for Living Aquatic Resources Management, Manila, Philippines and Division of Fisheries Research, Commonwealth Scientific and Industrial Research Organisation, Cronulla, Australia.
- Venema, S. and D. Pauly. 1982. Training courses in fish stock assessment: the past and the future. ICLARM Newsletter 5(4): 13-14.

Meetings Attended, Papers Presented

Third Session of the Indo-Pacific Fishery Commission's (IPFC) Standing Committee on Resources Research and Development (SCORRAD), Sydney, Australia, 28 April-4 May 1982 (J.L. Munro and D. Pauly).

Paper presented:

D. Pauly and J.L. Munro. The development and dissemination of new methodologies in fish stock assessment.

14th Regional Fisheries Technical Meeting of the South Pacific Commission (SPC), Noumea, New Caledonia, 2-6 August 1982 (J.L. Munro).

International Council for the Exploration of the Sea. 70th meeting. Copenhagen, 11-14 October 1982 (D. Pauly).

35th Annual Gulf and Caribbean Fisheries Institute, Nassau, Bahamas, 7-12 November 1982 (J.L. Munro).

Papers presented:

J.L. Munro and G. Heslinga. Prospects for the commercial cultivation of giant clams (Bivalvia: Tridacnidae).

J.L. Munro. Some advances and developments in coral reef fisheries research; 1973-1982.

Program Plans for 1983

It is planned that the Network, the Management-Oriented Fisheries Research modules and the in-house Tropical Fish Stock Assessment Research Program will continue in 1983 and beyond.

The emphasis in the Network will be on the acquisition of members, the dissemination of new simplified approaches to stock assessment and management (via the proposed newsletter) and the identification of possible participants in various workshops. The last-mentioned aspect will depend very much upon the acquisition of external support. The Network will, of itself, generate possibilities for identification and development of country modules.

We will have operational country modules in the Philippines, Indonesia and Peru in 1983. There are prospects, not yet developed, for modules in elsewhere in Asia, Africa and the South Pacific. The full development of country modules will depend very much upon the identification of specific

objectives for each module, tailored to the needs of each country, and the acquisition of suitable levels of bilateral funding.

Present plans call for commitment of funds to the Philippine module to support an investigation of climatic and oceanographic features in relation to recruitment and an investigation of the operating characteristics and possible use of portable fish traps in the western Pacific environment. The Indonesian module centers upon the analysis of length-frequency and catch data on file at the Marine Fisheries Research Institute, Jakarta.

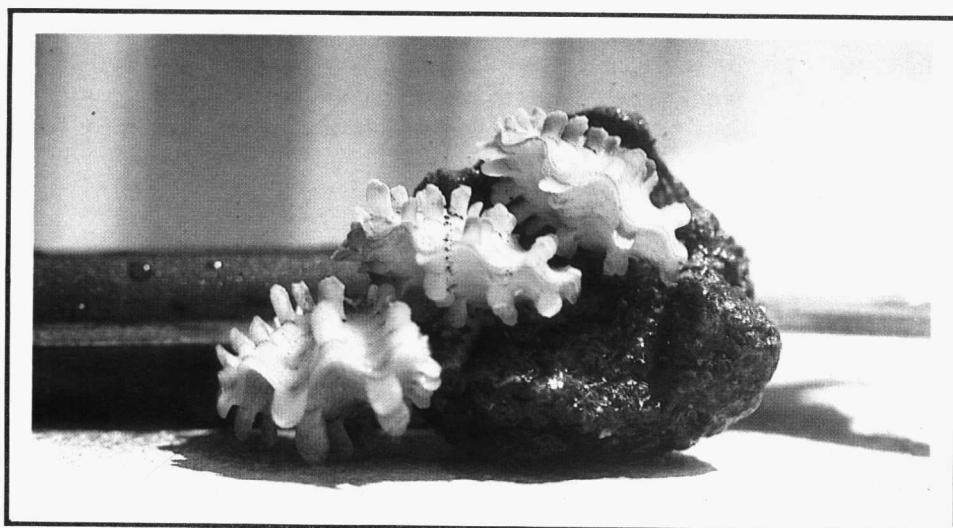
The Peruvian module will sponsor attendance of two scientists from the Instituto del Mar del Perú (IMARPE) at the FAO consultation on neritic fish stocks to be held in Costa Rica in April 1983, at which meeting the results of analysis of data on the northern stock of anchoveta will be presented.

The major new initiative proposed in the program for 1983 is the development of a project for rehabilitation of fisheries for giant clams (Tridacnidae) through a program of support of research on hatchery techniques and juvenile rearing, reef restocking or extensive mariculture, biological and socioeconomic studies. The tridacnid clams are a major traditional food resource throughout the Indo-Pacific, particularly in Oceania. The stocks have been decimated by the combined effects of increasing human populations and the attentions of fishermen from Southeast Asia operating under the incentive of the high value of the dried adductor muscle (US\$120/kg). There is ample evidence that these animals form a significant component of the undisturbed reef ecosystem. They constitute one of the few harvestable resources for which the exploitation and/or cultivation for export markets and local consumption is largely compatible with the life style and aspirations of the people of Oceania. The project as envisaged would cut across the entire range of ICLARM's programs including socioeconomic aspects, aquaculture and conventional reef fisheries.

Resource Development and Management Project Summaries

Active

Tropical Fish Stock Assessment	
Research Project	12
Network of Tropical Fisheries Scientists	14
Management-Oriented Fisheries	
Research Project	15



Juvenile giant clams (*Tridacna squamosa*) attached to a gravel substrate at the Micronesian Mariculture Demonstration Center, Palau. ICLARM is developing a broad project on giant clam research (see p. 10). Photo: John Munro.

- Project Title* : Tropical Fish Stock Assessment Research Project
- Cooperating Institutions* : Predominantly in-house study, with informal linkages with various research institutions
- Duration* : Continuous from July 1979
- Key Personnel ICLARM* : Dr. Daniel Pauly
Dr. John L. Munro
Mr. Noel David

Objectives

This project has as its principal objective the understanding of the dynamics of exploited tropical fish communities. However, the dearth of information is such that it is also necessary to direct considerable attention to the development of stock assessment methods which are straightforward, are readily applicable to tropical stocks and which do not require costly hardware for their implementation.

Results

Dr. Pauly has developed three integrated approaches based, in increasing order of sophistication, on the use of "paper and pencil methods", the use of programmable calculators and the use of microcomputers. The "paper and pencil methods", which include mainly methods for the analysis of growth and mortality and of catch and effort data, were packaged in 1980 in the form of a FAO circular entitled "A Selection of Simple Methods for the Assessment of Tropical Fish Stocks." This document, which has now been reprinted several times, has also recently been translated into French and Spanish by FAO for distribution in West Africa and Latin America, respectively.

The methods for use with programmable calculators have been incorporated into the manual, presently being edited, entitled "Fish Population Dynamics in Tropical Waters: A Manual for Use of Programmable Calculators". This manual, which covers the whole field of fish population dynamics, and which includes a number of new methods is built around 30 pro-