Pauly, D. 1984. ICLARM's stock assessment activities in the Southeast Asian and Western Pacific region. Presented at the 4th Session of the Standing Committee on Resources and Development of the Indo-Pacific Fisheries Commission, Jakarta, 23-29 August 1984, Jakata, IPFC:RRD/84/ Inf.8,8 p.

ICLARM's Stock Assessment Activities in the Southeast Asian and Western Pacific Regions[a)]

by

D. Pauly[b)] and J.L. Munro[b)]

In March 1977, shortly after ICLARM commenced in Manila, its Program Advisory Committee formulated the guiding principles for the Resource Development and Management Program, which is one of the four program areas of ICLARM (the others are Aquaculture, Traditional Fisheries and Education and Training). These emphasized research as the basis for managing tropical multispecies fisheries and were translated into a more detailed research program by Pauly (1979).

From June 1979 to February 1982, the Program was staffed only by the first author and emphasis was on the in-house development of appropriate research methodologies, particularly

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a) Shortened and adapted from Pauly, D. and J.L. Munro. 1984. ICLARM's activities in tropical stock assessment: 1979-1984, and beyond. ICLARM Newsletter, July 1984, p. 7-10. Presented at the 4th Session of the Scientific Committee for Resources Research and Development of the Indo-Pacific Fishery Commission, 22-29 August 1984, Jakarta, IPFC:RRD/84/Inf. 8.

b) International Center for Living Aquatic Resources Management, MCC P.O. Box 1501, Makati, Metro Manila, Philippines.

on microcomputer-based methods for the analysis of length-frequency data. Additionally, time was spent on organizing a workshop on tropical multispecies stocks, which examined the models used to assess such stocks, and on preparing a set of recommendations for future research (Pauly and Murphy 1982).

The research on microcomputer-based methods yielded its first major result in mid-1980 when the ELEFAN I (Electronic LEngth Frequency ANalysis) microcomputer program, a radically new approach for the estimation of growth parameters from length-frequency data was completed (Pauly and David 1980).

By the end of 1983 an integrated suite of ELEFAN programs was available:

ELEFAN 0: for the creation and maintenance of files for use with the ELEFAN system

ELEFAN I: for estimation of growth parameters from length-frequency data

ELEFAN II: for estimation of total mortality from a length-converted catch curve, and for the derivation of seasonal patterns of recruitment

ELEFAN III: for performing two different types of length-structured Virtual Population Analysis using monthly catch information and length-frequency data from the fishery, and

ELEFAN IV: for estimation of natural mortality from catch length-composition data and the selection curve(s) of the fishing gear(s).

The ELEFAN I and II programs, according to the results of a recent survey, are being used by over 40 users in over 20 countries, notably in Southeast Asia and in Papua New Guinea, and some 15 reports and papers have been published based on the ELEFAN programs (not counting those produced at ICLARM) with a similar number in preparation.

A manual by the first author, containing 30 fully documented programs for HP 67/97 and HP 41C calculators, has also been published (Pauly 1984). It embodies the essential parts of the multitude of published methods and models used to assess fish stocks, with emphasis on those approaches that have limited data requirements and can be applied to tropical stocks. The book demonstrates that programmable calculators are sufficient to implement most models used to assess single-species stocks and includes program listings and computed examples, for which complete keystroke sequences are given.

The microcomputer and calculator-based methods mentioned above, plus a number of "paper-and-pencil" methods also developed at ICLARM (see Pauly 1983) do fulfill the criteria of being rather simple, robust and easily applicable to tropical stocks.

The problems linked to the dissemination of these methods to the people who need them was effectively tackled by

establishing the Network of Tropical Fisheries Scientists, first announced in 1982 at the 3rd session of SCORRAD in Sydney (Pauly and Munro 1982. It has now over 300 members (128 in Southeast Asia and the Western Pacific area alone-see Table 1) in 65 countries, all linked by Fishbyte, the Network's newsletter.

The Network of Tropical Fisheries Scientists, which is presently partly supported by the FAO/DANIDA Fish Stock Assessment Training Project allows for improved communication between individual members, and also enhances the identification of groups of scientists at institutions in various countries who are interested in setting up "country modules" within the framework of the other major project, the "Management-Oriented Fisheries Research Project", also initiated in 1982. There have been four such modules to date, two of which are based in Southeast Asia:

- o a Philippine module, with the College of Fisheries of the University of the Philippines, concerned with the relationship between monsoon wind patterns and the recruitment of Philippine fishes; the project is now concluded, with two scientific papers produced (Pauly and Navaluna 1983, Navaluna and Pauly, in press),
- o an Indonesian module, with the Marine Fisheries Research Institute in Jakarta in which a microcomputer and ELEFAN programs supplied by ICLARM are being used to analyze

the large amount of length-frequency data collected in the last few decades by Indonesian fisheries biologists.

Table 1. Membership of ICLARM's Network of Tropical Fisheries Scientist in Southeast Asia and the Western/South Pacific Area (as of August 1984, worldwide membership - 350).*

Australia	31	New Caledonia	1
Brunei	1	Papua New Guinea	16
Burma	5	Palau	2
Fiji	5	Philippines	23
Hong Kong	1	Solomon Islands	1
Indonesia	20	Singapore	2
Kiribati	1	Vanuatu	1
Malaysia	18	Total for region	128

The country modules of the "Management-Oriented Fisheries Research Project" have several objectives. Foremost is the training of fishery scientists in the interpretation of fishery data (see also Table 2). They also provide in-country training of additional workers, for improvement of university curricula and for interaction with fisheries administration.

*Note added after presentation of this paper.
Thailand was inadvertently ommited for this Table; the 12 members from that country bring the Network membership for the region considered to 140.

The country modules should also help determine the basic information requirements for stock assessment and fisheries management in participating countries and produce well-documented reviews of the various fisheries investigated as well as original studies on tropical fish population dynamics.

Other training activities have included national training courses in the Philippines and international training courses, such as the FAO/DANIDA courses in Kenya and India as well as supervising M.Sc. students and assisting numerous colleagues on extended visits to ICLARM (Table 2).

Additionally, major publications ranging from the "Theory and Management of Tropical Fisheries" (Pauly and Murphy 1982) to a series of detailed reports on the fisheries of San Miguel Bay in the Philippines (e.g., Pauly and Mines 1982) have provided well-documented examples of the theory and practice of tropical fish stock assessment. More details on ICLARM's activities in stock assessments and related areas may be found in Maclean and Dizon (1984).

Table 2. Fisheries biologists trained at ICLARM in the use of the ELEFAN programs and other methods for tropical stock assessment (April 1980 to June 1984).

Visitor	Institution	Dates of visit
Mr. J. Ingles	College of Fisheries, University of the Philippines	April 1980 to March 1982
Mr. R. Regalado	Bureau of Fisheries and Aquatic Resources, Research Division, Manila	Sept. 1980 to March 1982
Dr. Yap Siaw-Yang	Dept. of Zoology, Universiti Malaya, Kuala Lumpur	May-June 1981
Mr. Paul Dalzell	Division of Fisheries, Kavieng, Papua New Guinea	Sept. 1982
Dr. Sann Aung	Sea Fisheries Survey and Research Unit, Rangoon, Burma	June-Oct. 1983
Mr. Mohd Zaki Mohd Said	Faculty of Fisheries and Marine Science, Univ. Pertanian Malaysia, Kuala Lumpur	Nov. 1983
Mr. Mohd Azmi Ambak	Faculty of Fisheries and Marine Science, Univ. Pertanian Malaysia, Kuala Lumpur	Nov. 1983
Mr. G. Tampubolon	Balai Pengembangan Penangkapan, Ikan, Semarang, Indonesia	Nov.-Dec. 1983
Mr. L. Pinto	Department of Biology, De La Salle University, Manila	Dec. 1983
Dr. K. Sivasubramaniam	Bay of Bengal Programme, Colombo, Sri Lanka	February 1984
Mr. Abdul Rehman Abdul Ghaffar	Kuwait Institute of Scientific Research, Kuwait	February-April 1984
Mr. Aye Pyo	Sea Fisheries Survey and Research Unit, Rangoon, Burma	April-May 1984
Ms. Anette Juinio	Marine Sciences Center, University of the Philippines, Manila	May 1984
Ms. Chan-Eng Heng	Faculty of Fisheries and Marine Science, Univ. Pertanian Malaysia, Kuala Lumpur	June 1984
Mr. Liew Hock Chark	Faculty of Fisheries and Marine Science, Univ. Pertanian Malaysia, Kuala Lumpur	June 1984
Mr. R. Matipa	Department of Fisheries, Chilanga, Zambia	June 1984
Ms. A.S. Cabanban Ms. E. Cortes-Zaragoza Mr. I.D. Mangaoang Mr. C.R. Pagdilao Mr. N.A. Navaluna and Ms. D.P. Tandog	M.Sc. students, University of the Philippines, Manila	Various dates

FEEDBACK

The continued relevance to the Region of ICLARM's work in stock assessment depends critically on feedback by colleagues; we hope that this note will encourage colleagues to write, and to comment on how to make our work and theirs more effective.

One way that this can be achieved is by increasing the membership in the Network of Tropical Fisheries Scientists. Membership, which is free and includes subscription to Fishbyte and other benefits, is personal (not institutional) and readers who are, or wish to be, actively involved in stock assessment and management are encouraged to seek nomination by writing to the Director, Resource Development and Management Program, ICLARM, MCC P.O. Box 1501, Makati, Metro Manila, Philippines.

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