

Approaches to Turtle Culture

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The aim of this article is to compare two extremes of approaches taken to turtle culture projects. At one extreme is the capital-intensive operation aimed at realizing a profit, e.g., that of Mariculture Ltd. on Grand Cayman Island. At the other end of the scale is the small, village-industry operation which has been tried or is still being tested in several developing regions. While commercial viability may also be an aim of this latter approach, other considerations seem to be important in assessing success, e.g., the provision of employment.

On visiting Mariculture Ltd.'s establishment in mid-1975 I observed a very large, streamlined operation with minimal labor input. There was heavy reliance on modern technology such as the seawater circulation system, a specially developed pelletized diet (one for young turtles, another for older turtles), and meat-processing facilities.

In 1975/1976 I was involved in investigating the feasibility of turtle culture (*Chelonia mydas*) in Torres Strait, Northern Australia, where, since the early 1970's, experimental culture projects had been established. Despite the small scale of our operation (starting with less than 1,000 green hatchlings), we found ourselves highly dependent on several pieces of equipment: two petrol-motor driven pumps, a boat plus outboard motors, a diesel generator and an electric freezer. A breakdown of any of these could lead to extensive setbacks to the project.

Fish was the only available local source of high protein food suitable for turtles. Although two of our men went fishing on most working days, weather permitting, the turtle food supply nevertheless failed on two occa-

sions. If a dry, pelletized food were imported, many problems would be avoided (for example, there would be no need to maintain a boat, outboard motors, generator, and freezer) and a more reliable food supply would be provided. Such an innovation would, however, conflict with any stated aim of providing employment for local people, as at least 75% of our time was spent catching and preparing fish (cleaning, filleting, skinning, weighing, freezing).

The idea of each "turtle-farmer" being responsible for the feeding and pond maintenance of a specific group of turtles was considered unworkable; instead, various tasks were divided among the group on a roster system and the turtles were kept in a centralized pondage area. Such organization required a relatively high level of management of the project on a day-to-day basis.

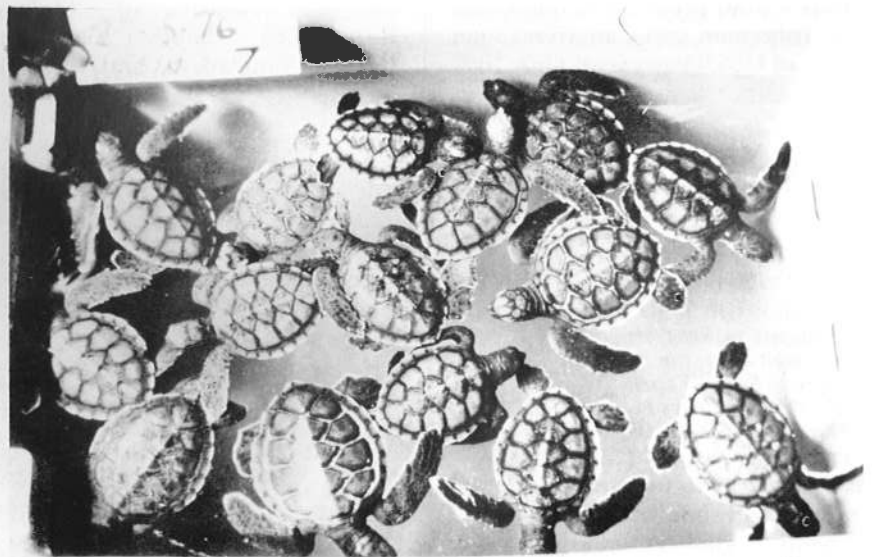
Large-scale turtle culture appears to be a more economical proposition than small village-level schemes because a similar level of technology and management are required for both approaches. However, as the size of any turtle culture project is increased, the attention of conservation bodies focuses more sharply on the scheme; there could be concern that:

- (i) in stocking the project, wild turtle populations would be depleted,
- (ii) there could be harmful direct or indirect side effects such as the over-exploitation of fish species used in feeding turtles, or the stimulation of the world market by the sale of cultured turtle products which would place additional pressure on already threatened wild populations.

If the main aim of a project is to provide employment opportunities, it is legitimate to ask how turtle culture compares to other forms of animal production. In my opinion turtle culture is not particularly suited to remote regions (such as Torres Strait) for the following reasons:

- (a) Maintenance of the aquatic environment needed in turtle culture requires higher management skills than

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Turtles were mass reared from age 5-164 days in plastic-lined pool in one experiment and in 40-litre plastic tanks in a second experiment. Culture conditions varied included stocking density, degree of crowding, and daily water turnover rates. Results of the experiments were published in 1977 in article entitled, *Culture trials of young green turtles, Chelonia mydas, in Torres Strait, Northern Australia*; *Aquaculture* 11: 197-215.

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Fresh siganids ready to be popped into the pan can be purchased daily beginning in late afternoon at the FMO port in Songkhla.

The Fish Marketing Organization was created in 1953 to foster prosperity in the fishery industry and wholesale markets for fish and agents, and to promote welfare of fishermen, fishing villages, and fishing cooperatives. The FMO operates two wholesale markets (Bangkok and Samut Sakhon) as well as eight fishing piers, and contributes to construction of landing quays and jetties with funds it receives from the two markets (1% of gross sales). Sales at the fish markets are by auction by licensed fish agents who receive 5% of the gross sale for their services. In ports lacking FMO wholesale markets, sales are by negotiation or contract.

The Cold Storage Organization was established in 1958 and provides service in the cold storage industry to the State and public, as well as assistance, advice, and technical research services concerning general operations of cold storage plants. It presently operates three plants, and its primary activities are ice sales, freezer and cold store rental and fish trading.

Other countries and international organizations aid in development and management of the Thai fishery sector by providing monetary and technical assistance. Technical assistance has come from Canada, Denmark, Germany, Japan, New Zealand, and the United States. Perhaps the most striking aid of all was provided by Germany, whose introduction of trawlers

revolutionized the Thai fishing industry. International organizations operating in Thailand include the Southeast Asian Fisheries Development Centre (SEAFDEC) whose Training Department and Secretariat are both in Bangkok, the UNDP/South China Sea Fishery Development and Coordinating Programme (SCSP), the Indo-Pacific Fishery Commission, the Indian Ocean Fishery Commission, and the FAO Regional Office for Asia and the Far East. IPFC was responsible for establishing the SCSP in 1973 which has subsequently conducted broad studies to identify constraints and needs in the region as well as provided specific services in vessel design and fishery library development. The Mekong Committee of the Economic and Social Commission for Asia and the Pacific conducts studies and projects relating to the Mekong Basin, and the Asian Development Bank funds fisheries development projects from time to time.

Statistics and information in this article have been obtained from the following sources:

Fisheries Record of Thailand. 1975. Department of Fisheries, Ministry of Agriculture and Cooperatives, Fisheries Economics and Planning Subdivision, No. 6/1977. 104 p. (Some figures also from 1976 Record, currently being compiled).

Marr, J.C., G. Campleman, and W.R. Murdoch. 1976. An analysis of the present and recommendations for the future development and management policies, programmes, and institutional arrangements, Kingdom of Thailand. FAO/UNDP South China Sea Fisheries Development and Coordinating Programme, Manila. Doc. SCS/76/WP/45.

National Plan for Aquaculture Development in Thailand. 1976. Department of Fisheries, Ministry of Agriculture and Cooperatives, Bangkok, Thailand. 25 p.

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those needed for pigs or chickens, and the problems inherent in such maintenance are exacerbated by the remoteness of the region.

(b) The comparatively long period before turtles reach marketable size (3 to 4 years under good conditions), and the even longer period before they reach reproductive maturity, mean that any one self-contained project would have to maintain a number of different year groups simultaneously. This would be a considerably more complex task than with animals where there is maternal care of the young and/or marketable size is achieved within year.

(c) Details of turtle culture are yet to be fully worked out, in contrast to the wealth of information available on

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Locally caught fish is prepared for turtle food in labor-intensive operation in the Torres Strait turtle culture project.

production of conventional agricultural animals.

(d) It appears that the food requirements of turtles are generally more restricted and possibly more expensive than those of other animals.

(e) The argument that local people are more likely to succeed with the culture of an animal with which they are already familiar does not apply in the case of turtle culture in Torres Strait. While it is true that turtles are hunted and form a traditionally important part of the diet of Torres Strait Islanders, the people are very familiar with chickens and pigs, both of which are kept by most family groups.

ICLARM Staff Profile

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USAID as a member of a team assessing the fisheries sector in the Philippines (1977) and as a member of an aquaculture design team in Egypt (1978).

In addition to having authored many scientific papers and receiving various academic awards and grants, Dr. Shehadeh holds membership in the American Fisheries Society, American Society of Zoologists, American Association for the Advancement of Science, American Institute of Fishery Research Biologists, Sigma Xi, and the World Mariculture Society.

Dr. Shehadeh and his wife Maha reside in Manila.

Consultants Lend Expertise to ICLARM

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sure to developing countries has been extensive and broad; in addition to having lived in several during his earlier years, he conducted field work in Muncar, East Java, in 1977. Most recently he has completed a study on socioeconomic development of artisanal marine fisheries in tropical Asia for the World Bank, a lecture tour of Asia sponsored by the U.S. State Department, and a 3-month visit to the Netherlands Institute for Advanced Study in Humanities and Social Sciences.

IDRC Offerings for Your Bookshelf

The International Development Research Centre (IDRC) has large stocks of two publications which it wishes to distribute in developing countries. These are:

Tropical Oyster Culture, A Selected Bibliography. 1975. By D.B. Quayle, 40 p. IDRC-052e. (Includes listing of 267 papers on oyster culture in developing and developed countries.)

Stable Tropical Fish Products. Report on a Workshop Held in Bangkok, Thailand. 1975. By Marilyn Campbell, 27 p. IDRC 041e. (Workshop was held to discuss possibilities of producing low-cost, stable tropical fish products from underutilized species; topics discussed were traditional products, nontraditional and industrial products, consumption patterns, available resources, bycatch use, product handling

problems, and practical steps for product development. The general outcome of the meeting is summarized.)

These publications are available free, either singly for individuals or in bulk quantities for use by fisheries schools and research institutions. Request from Publications Division, Unit L, IDRC, Box 8500, Ottawa, Canada K1G 3H9.

IDRC also disseminates results of mission-oriented research which it supports in 80 developing countries. The Centre produces a wide variety of printed and audio-visual material ranging from scientific monographs, specialized bibliographies, and technical reports, to general interest publications, films, and slide shows dealing with current development issues. In addition, it publishes a quarterly, nontechnical review, *The IDRC Reports*. For current list of publications and price list, contact the Publications Division at the above address.

ASCA/UNESCO Promote Taxonomy in Indo-Pacific

Taxonomic studies of marine fauna and flora in the Indo-Pacific region were endorsed recently when representatives from Australia, Indonesia, Malaysia, Singapore, Thailand, and the Philippines gathered in Manila for a Preparatory Meeting of Specialists on Marine Fauna and Flora. The meeting, held 4-8 July 1978, was sponsored by the Association for Science Cooperation in Asia and the United Nations Educational, Scientific, and Cultural Organization in recognition of the fundamental nature of taxonomy and its role in underpinning biological and ecological studies of living marine resources. Convened by the Philippines as the lead country, the meeting represented the first step toward making a comprehensive inventory of marine fauna and flora of the Indo-Pacific region and toward recommending conservation measures and plans for rational resource development and management.

The waters of the Indo-Pacific support a richly diverse assemblage of

marine species, but as countries in the region continue to develop, they will exert increasing pressure on marine communities. Exploitation of commercially important products such as sponges, corals, shells, sea urchins, and snake skins will escalate; tourist trade will intensify, necessitating protection for reefs through creation of marine parks and sanctuaries. The specter of marine pollution also hangs in the background, ready to strike areas not already afflicted. If Indo-Pacific fauna and flora is to be preserved, then a catalog of species and their distribution is needed as a prelude to formulating guidelines for their management.

The meeting participants recognized the need to compile information on existing reference collections, especially as pertaining to economically important species; to intensify efforts to collect, identify, and exchange marine specimens; to identify and develop regional depositories for marine collections; to develop indigenous competence in taxonomy through scholarships and exchange of scientists; and to launch a journal to accommodate scholarly articles in systematics and taxonomy. A plan for implementing the programs has been drawn up and will be executed in due course.