

## The Need for an International Experimental Center for Tropical Aquaculture for Latin America

C. RICHARD ROBINS, *Chairman*  
*Division of Biology and Living Resources*  
*Rosenstiel School of Marine and Atmospheric Science*  
*University of Miami*  
*Miami, Florida 33149*

### RESUMEN

Aun cuando hay gran interés en la acuicultura, tanto marina como fluvial, muy poca investigación fundamental se ha hecho en relación a los trópicos. Las instalaciones existentes son del gobierno o de la industria y están orientadas para producción o negocio. Poco se ha intentado en lo que a iniciativas de investigación se refiere. Las personas involucradas parecen más interesadas en transferir la tecnología existente de países lejanos (tales como Israel (cultivo de *Tilapia*), China (carpas), o los Estados Unidos (bagres de canales=channel catfish), principalmente de regiones templadas en vez de experimentar con especies tropicales o nativas.

Se propone el establecimiento de centros de acuicultura tropical, internacionalmente sufragados y bajo la dirección, mediante arreglos, de consorcios, a fin de estudiar un conjunto de especies tropicales, tanto marinas como fluviales, con el propósito de determinar su factibilidad para la acuicultura. Serían tópicos propios para esta investigación, experimentos de policultura, cultivo en estanques hipersalinos, selección genética y características de crecimiento y resistencia a enfermedades.

Los resultados serían accesibles a todos para su posible adopción en centros gubernamentales o comerciales.

Se describen varios ejemplos para indicar el valor y la necesidad de tales centros.

Although there has been great interest in aquaculture, most effort to date has centered on temperate species. The culture of trouts (Salmonidae) and carps (Cyprinidae) goes back centuries. Much is known concerning their nutrition, their diseases, and their care and breeding. In the case of the carps the successful polyculture of species which utilize different parts of the food chain is also very old. The intensive breeding of the channel catfish (*Ictalurus punctatus*), although much more recent, still is based on decades of experience with the species and there is a broad data base on its nutrition, age and growth, and diseases. Among tropical fishes only the African cichlids of the genus *Tilapia* have been intensively studied, and only since World War II, with regard to fish culture. It is not the intention of this report to summarize the history of aquaculture. It is important to record that the culture of organisms, both marine and freshwater, in the tropics is a recent development except at the artisanal level. In tropical America, the culture of fishes has especially lagged. Despite the fact that this region harbors the world's most diverse freshwater fish fauna and a rich coastal fauna, officials have been more prone to look to Israel, Japan, Indonesia or the United States rather than to initiate imaginative programs with their own fishes. This report emphasizes needs in tropical America, although the need for truly experimental centers in tropical aquaculture is scarcely confined to the Americas.

Growth of tropical aquaculture and pond management, especially in freshwater, has depended on importation of existing technology, and such technology is based largely on studies in temperate regions. Exotic, temperate species have been imported while local species have been ignored. Thus, centrarchids (bass and bluegills) are dominant in Lake Atitlan, Guatemala, grass carp are raised in Mexico, and channel catfish have been looked at from the standpoint of possible introduction by virtually every country from Mexico to Ecuador. Government sponsored operations like those in Brazil have emphasized tilapias with only minimal attention to local fishes such as the tambaqui (*Colossoma*).

Tropical mariculture has been more innovative especially with regard to shrimp and shellfish. Nonetheless, all efforts to date are so program-oriented that there is no deviation from a target species. Many operations, initiated to yield a high priced food fish such as pompano, have failed financially.

The increased use of nuclear energy has resulted in extensive impoundments of warmed waters so that, even in temperate regions, managers of such installations are searching for tropical species to introduce. They are especially interested in the use of their waters for recreational fishing. Few data exist concerning the basic biology of fishes which might be valuable for this purpose and there is no experience with their culture under artificial conditions.

In contrast, agriculture has been much more sound in its approach. The experimental rice institutes have had programs in selective breeding of new strains better suited to the various sites and local conditions.

The intent of this paper is to promote the need for the establishment of experimental and training centers for tropical aquaculture, both freshwater and marine. Funding for such centers would be from foundations, industry and government agencies. In most instances we are talking about a rechanneling of existing funds rather than new monies. Such centers or institutes could be developed through a consortium arrangement of Latin American institutions and institutions in the United States and Canada, with priorities in research and training determined and directed by an advisory panel. Non-governmental organizations like the Gulf and Caribbean Fisheries Institute and ICLARM may be especially appropriate groups through which to channel support. Development of such centers would in no way interfere with existing commercial operations or artisanal aquaculture. On the contrary, such centers would provide the expert knowledge and facilities to solve problems posed by commercial operators. In some cases existing facilities could be used, modified or expanded to serve as an experimental center, but the center could not achieve its objective if it were subservient to commercial operations or existing programs with more limited objectives.

I wish next to discuss a number of specific programs which I believe will clarify, by way of example, the type of research that should be undertaken at such centers.

Many tropical islands experience dry climates and have limited amounts of fresh water but are well suited for work with ponded marine and hypersaline waters. Bonaire is an island ideally suited for such work. Although tilapias and other cichlids are thought of as freshwater fishes many of them grow well highly saline conditions. *Tilapia mossambica* breeds in waters as saline as 40‰. It is a primary feeder and is suitable both as a forage species and as a food fish. In the Salton Sea, where *T. mossambica* was accidentally established, it has had two effects. It has

diminished the population of *Bairdiella icistia*, a small sciaenid forage fish, and in turn it has become a major food item for the orangemouth corvina *Cynoscion xanthula*, another sciaenid that reaches 30 lbs. Polyculture involving tilapia and desirable marine predatory species such as snooks, *Centropomus*, would be worthwhile. The possibility of rearing small tilapia or algae-eating mollies (*Poecilia*) as a bait for pelagic fisheries also needs increased attention. The use of waterfowl in conjunction with fish production needs increased study.

Polyculture involving shrimp and non-predatory species like mullets has been too long ignored. Conch rearing is in its initial stages and too little attention has been given to the culture of land crabs using algal pellets as a prime and inexpensive food source. Altering and controlling salinity may result in faster growth for species that we do not associate with high salinity environments. Very few species have been tested for possible breeding or rearing under hypersaline conditions. Not only marine fishes like *Sparus auratus* but "freshwater" species like many cichlids may be fruitful subjects for experimentation under saline or hypersaline environments. Hypersaline areas usually are otherwise little utilized.

A second example involves a continental situation with a large native freshwater and estuarine fish fauna. For the purpose of this discussion I have selected Venezuela, but any tropical nation with a large native fish fauna would merit attention. For generations aquarists have bred strains of characins and cichlids from South America and gouramies and loaches from southeastern Asia relative to fin size, bright colors and other features of interest to that industry. That such species are genetically pliable is established. Even though related species reach large size and are used as food by native peoples or fished from a recreational standpoint, the use of these native tropical groups in aquaculture has been minimal. To my knowledge no one has tried to selectively breed such tropical fishes with regard to rate of growth, maximum size, resistance to disease and other such parameters.

The catfish fauna of South America is the world's richest. It is astounding that with more than a thousand native species of catfishes, many of which grow rapidly and reach sizes where they offer meaningful potential for commercial harvest, that agencies in the United States should continue to promote the export of channel catfish (*Ictalurus punctatus*) from temperate waters of the United States and that agencies or groups in Latin American countries should continue to seek to import it. In fact, we should be carefully studying tropical species for use in our artificially heated waters.

Among other tropical American fishes, freshwater and estuarine sciaenids particularly deserve attention for possible culture in saltwater ponds.

To a considerable extent the billion dollar aquarium industry still depends on wild caught tropical fishes rather than on cultured fishes. The separation in our thinking of mariculture, of freshwater aquaculture and of the aquarium fish industry has prevented an integrated look at common problems.

If we are to undertake studies fundamental to the mass culture of tropical species, it must be at centers where the day-to-day operations are aimed not only at product and profit but at the uncovering of new techniques, development of new and better stocks, and the solution of problems of disease and nutrition of the study species. As with the agricultural research centers, results would be made available for adoption by governments and the private sector alike.

Such centers would also serve as international training centers for technicians, scientists and managers throughout the region. Such programs are now too scattered, too diffuse and in institutions in regions whose climate does not really permit the gaining of experience that can be related to the students' future work in tropical nations.

Such centers should be cost efficient. They would allow for concentration of research and training programs. It is more effective to bring technical personnel to one center for training than to have many small programs and installations in various countries, states and provinces. The most experienced scientists should be willing to participate in research and training at such centers whereas they do not do so with the more local programs now in operation. Such coordinated, carefully planned centers would replace scattered ineffective and expensive efforts now in place.

As I reviewed materials for the preparation of this report I quickly became convinced that the question was not really should such a center be established, but how many and where. I am incredulous that with so much interest in aquaculture this has not come to pass. With the signing in the United States of the National Aquaculture Act of 1980 this seems a propitious time for the attendees at this convention to initiate the planning of such centers.