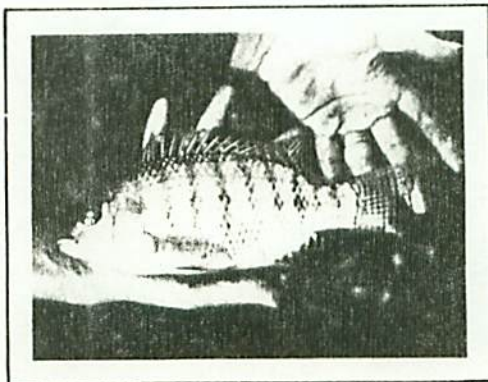


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Philippine Tilapia Broodstock Project

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ATILAPIA BROODSTOCK improvement project, funded by the Rockefeller Foundation, Central Luzon State University (CLSU), and ICLARM started last July at the CLSU Freshwater Aquaculture Center (FAC). The project will run for an initial period of two years. The major investigator is Dr. Rafael D. Guerrero III, Dean of the College of Inland Fisheries of CLSU. Dr. Roger S.V. Pullin of ICLARM is co-investigator, Nestor Jacaban, also of CLSU, is research assistant. The appointment of a fish geneticist is also being considered.

Background

Tilapia culture in the Philippines started in 1950, with the introduction of *Sarotherodon mossambicus* from Thailand. *S. niloticus* was introduced from Thailand in 1972 and from Israel in 1973. The CLSU stock of *S. aureus* came via Auburn University, Alabama in 1977. *Tilapia zillii*, possibly introduced from Taiwan, completes the

four species currently available.

Tilapia culture in the Philippines has prospered. It now ranks second in importance to milkfish culture. In 1976, the tilapia harvest was 13,046 t, or about 17.5% of the total inland fisheries yield, according to statistics of the Bureau of Fisheries and Aquatic Resources (BFAR). *S. mossambicus* is cultured largely in brackish water ponds. *S. niloticus* is used by freshwater pond and cage culture operators. The demand for seed is high and the advent of a massive, nationwide rice-fish culture program will increase it further. It is well known, however, that tilapias produce large numbers of fry in pond culture. The *quantity* of seed supply can, therefore, be increased by broodstock management. Indeed, most research on tilapia reproduction

has been towards elimination of fry production by a variety of methods, including the use of monosex hybrids, chemically-induced sex-reversal, predatory fish, high stocking densities and floating cages. The need to increase seed supply is being studied by a bilateral hatchery project, also located at CLSU, between the US Agency for International Development and the Philippine Government (through BFAR), with experts from Texas A & M University.

The questions of seed *quality* and genetic improvement have received much less attention, however, and require basic research, as well as consideration of hatchery management techniques. Little is known about the genetics of existing Philippine stocks, but it is safe to assume that interbreeding between species has taken place in natural waters. Experimental stocks have rarely been fully described. The *S. aureus* brought from Auburn University to CLSU, exhibit a dorsal fin deformity, termed "saddle-back disease," which appears to be absent from other strains.

Project Outline

The new broodstock improvement project has the following objectives:

1. To establish and maintain pure lines of tilapia strains and species, both from existing Philippine stocks and from new introduction.
2. To evaluate the performance of broodstock (e.g., fecundity and spawning frequency) and of fry, fingerlings and larger fish during growout (e.g., survival, growth rate, disease resistance, etc.).
3. To produce and similarly evaluate interspecific and intraspecific hybrids, with a view to improving growth performance and to developing strains for brackish-water culture.
4. To define suitable broodstock husbandry techniques for fry production.

The first species to be assessed will be *S. niloticus* and *S. aureus*, together with *S. aureus* ♂ × *S. niloticus* ♀ hybrids. New introductions of both species were made in August 1979 from the Fish and Aquaculture Station in Dor, Israel. The fish are now approaching maturity. Future work will include introduction of *S. hornorum* for such hybrid crosses as *S. hornorum* ♂ × *S. niloticus* ♀ and *S. hornorum* ♂ × *S. mossambicus* ♀. The project will aim for a planned transition from mixed sex culture of existing stocks,

which is at present appropriate to the Philippine situation, where fish can be marketed at 60g and wild breeding is an accepted fact, to mixed sex culture of selected strains and, eventually, to the use of high performance monosex hybrids. There will be interesting additional possibilities, including the evaluation of hybrids specifically suited to brackishwater culture and of the colored varieties of tilapias. The project, at present, holds red tilapia strains from Taiwan and the Philippines.

Progress

The first phase of the project, which is development of facilities and acquisition of fish stocks, is largely complete. Standardized procedures have been established for spawning in indoor aquaria and outdoor plastic pools, using unselected *S. niloticus* and *S. aureus*. Selected stocks are held in concrete tanks isolated from the natural water supply. The initial results suggest that frequent and highly productive spawnings will be attainable in the new facilities. The best results so far are three spawnings over 44 days for a 100g *S. niloticus*, with fry production of up to 800 per spawning female.

Sex ratios of spawners will be varied to study the effect of this on fecundity and spawning frequency.

Egg and fry removal, to increase spawning frequency, will also be tried, as will the technique of premaxilla clipping to reduce aggression, a technique developed by Dr. Jen-Chyuan Lee at Auburn University, Alabama.

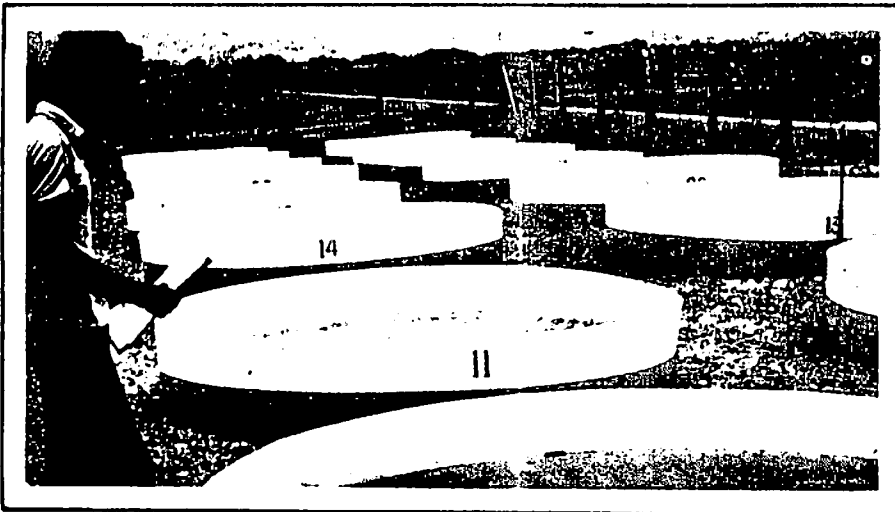
Fry and fingerling survival and growth will be assayed, using standardized procedures, in plastic pools and floating cages. Larger scale trials, using ponds, will be deferred until promising new strains or hybrids have been identified.

Throughout this work, the broodstock and their progeny will be fully described, including the use of electrophoretic genetic markers. This will enable comparison of the Philippine strains with Israeli stocks. It should also facilitate the identification of the various colored tilapias, which cannot yet be clearly identified to species.

Linkages and Collaboration

Linkages with aquaculture research centers and exchanges of information with other researchers are essential to this project. The hybridization of tilapias has received much attention worldwide. But the understanding of tilapia genetics remains very limited and there is much confusion over the identification of strains and species. The lack of critical growth data is also apparent, as this aspect of research has been neglected in favor of research on control of reproduction and production of monosex hybrids.

The project team is in contact with researchers of the Freshwater Fisheries Station of the Southeast Asian Fisheries Development Center at Binangonan, Rizal, Philippines, where a hybridization program is also in progress and growth in net cages and enclosures is being assessed. Guerrero and Pullin have also visited and discussed their project with researchers and culturists in Taiwan and Israel (to be described in a future article). It is hoped that linkages will be developed from these and future visits, to create a cooperative research network that would speed up progress in this important field. ●



Research assistant Mr. Nestor Jacaban checks tilapia broodstock spawning in the outdoor plastic pools used for replication of hybrid crosses.