

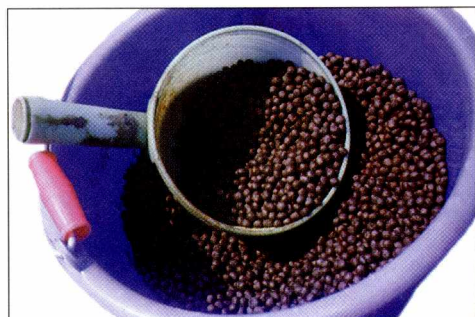
Overview of the marine fish hatchery industry in Taiwan

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*T y p i c a l
broodstock ponds
(right) in Taiwan.
Striped threadfin
broodstock are
held in the pond on
the lower right. At
left is formulated
broodstock diet*

During the Lunar New Year, the grandest of all holidays in Taiwan, images of fish are prominently displayed everywhere. Among the Taiwanese, fish is considered auspicious and a symbol of bounty. This is because the pronunciation of “fish” (yü) is similar to that of “surplus” (yü), indicating abundance and prosperity. A fish specialty, with the fish preferably presented in its entirety, is a constant fare on the dining table during special occasions. And in the true Taiwanese tradition, this most special dish is served as the last course, something truly worth waiting for, and remembered.

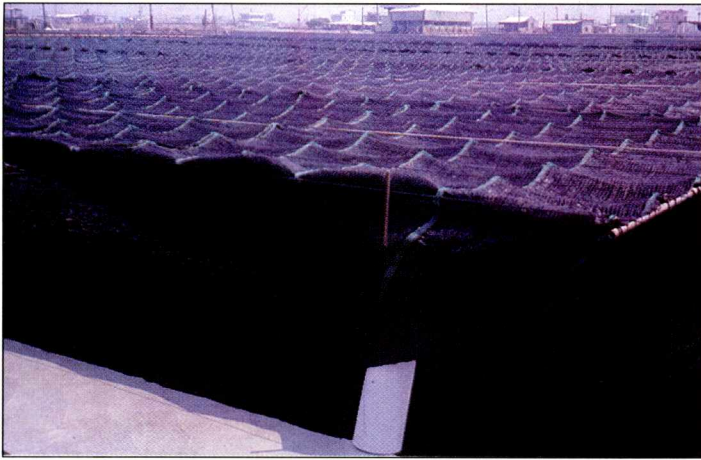
Not surprisingly, fish culture is itself an age-old tradition in Taiwan. Rearing fish in captivity is almost an art form for many Taiwanese aquafarmers who inherited the skill from many of their forebears. Milkfish was the first species to be cultured on a large scale as far back as the 17th century. The second culture species of historical significance made substantial contribution almost three centuries later. Mozambique tilapia was successfully introduced from Singapore after the Second World War by two returning Taiwanese soldiers, Chen-Huei Wu and Chi-Chang Kuo. From the thirteen fish that reached live in Taiwan, a tilapia culture industry flourished, supplying the much needed animal protein of the Taiwanese after the war. Today, tilapia in Taiwanese is known as “Wu-Kuo yü”, in honor of the two soldiers who brought the fish with them to Taiwan.



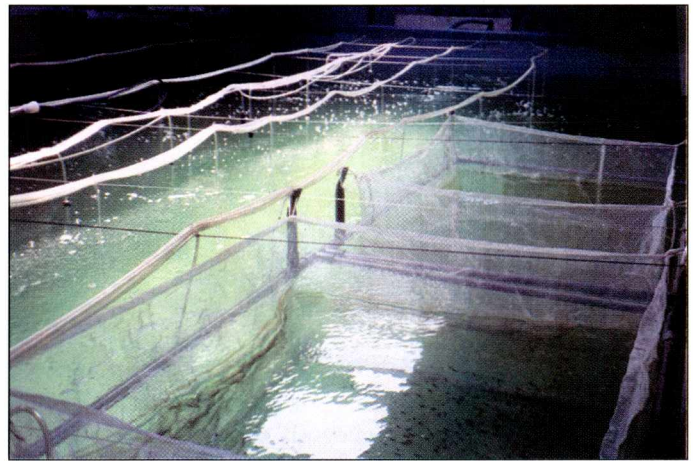
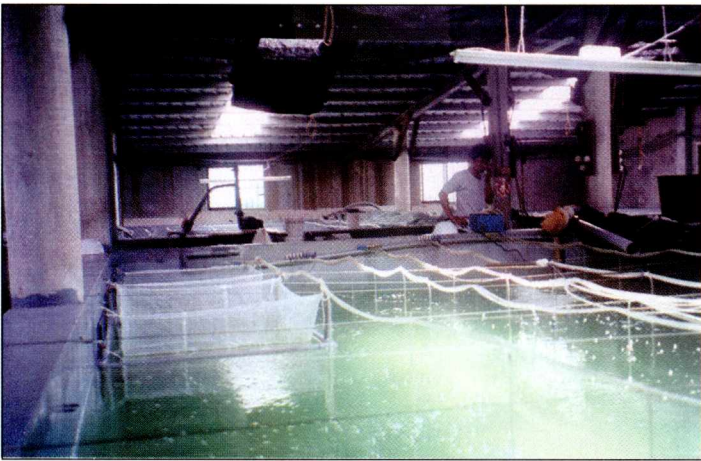
It was in the 1960s that the first successes on artificial propagation were achieved, this time in several species of Chinese carps and other tilapias. Art and science combined, fish propagation in Taiwan took off to a great start.

The first marine fish to be bred in captivity was the grey mullet. Highly valued for its roe, the grey mullet was first induced to spawn in 1968. The completion of its life cycle in captivity was fully achieved in 1976. In the late 1970s, the milkfish and breams were added to the growing list of propagated marine fishes. Recent additions to this list reflect the changing taste of local consumers as a result of economic gains and the requirements of the export market, particularly its high-end sector. Pompano, red drum, cobia, great yellow tail, snappers, groupers, and jacks have, very recently, been successfully propagated on commercial scale.

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Typical outdoor larval rearing pond: black sackcloth is used to reduce sunlight penetration and prevent algal bloom (top, left). A pond being prepared for stocking (top right).



Indoor rearing tanks for grouper in Taiwan. Facilities such as these were formerly used in tiger shrimp hatcheries (above)

Characteristics of the industry

“Division of labor” characterizes the marine fish hatchery industry in Taiwan. A “core hatchery” holds the broodstock, produces the fertilized eggs and sells them to affiliate larval rearing hatcheries, constituting a “group.” In selling the fertilized eggs, priority is always given to the affiliate larval rearing hatcheries before any sale is done outside of the group. At any given time, the core hatchery may hold as much as twenty different species of broodstock.

Natural food may be produced in the larval rearing hatchery. Otherwise, they are obtained from commercial suppliers. For instance, blocks of frozen copepods and tiny shrimps can be easily purchased.

Nursery rearing until the fingerling stage may also be done within the larval rearing hatchery. For species that requires prolonged nursery rearing, such as the groupers, raising until the marketable size may be done by a nursery grower, who buys the larvae from the larval rearing hatchery.

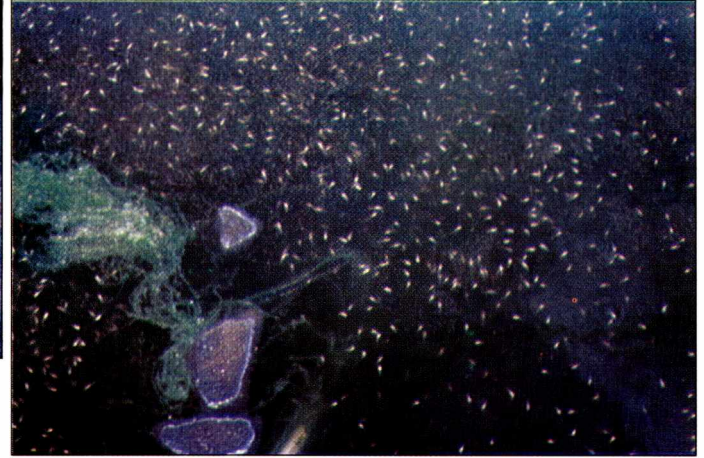
Most fish hatcheries in Taiwan are family-owned. It is not uncommon that within a particular group are relatives or close friends. It is essential that the larval rearing hatchery owner earn the trust of the fertilized egg supplier before admission into the group is allowed. This somehow is an insurance that the fertilized eggs will not go to waste. Group members care for each other, not only on technical matters, but also including marketing of the fertilized eggs, larvae, and fingerlings.

Hatchery type: outdoor ponds vs. indoor tanks

Broodstock are invariably held in outdoor ponds. Larval rearing and nursery facilities are either indoor tanks or outdoor ponds. A typical broodstock and outdoor larval rearing pond has concrete dikes, a sandy bottom, and on the average about 600 m². The water depth in broodstock ponds ranges from 1.5 to 2 m while outdoor larval rearing ponds are 1 to 1.5 m deep. Formerly used for giant tiger shrimp larval production, indoor tanks are concrete and usually less than 100 tons.



Blocks of frozen copepods (above, left) and Acetes (middle photo) are broken into pieces. Being frozen, the pieces float and as they melt slowly, the fish larvae feed on individual copepod or shrimp (right)



Larval rearing outdoors is more popular than larval rearing indoors. In outdoor ponds, natural food organisms grow, water quality does not deteriorate quickly, larval rearing duration may be extended, and operating cost is low. It is also a common observation that larvae reared in outdoor ponds are of better quality. The larvae of some species, such as the red snapper and cobia, are best reared in outdoor ponds. Operation in outdoor ponds is very flexible. Aside from larval rearing, ponds can be used sometimes to exclusively grow natural food, such as rotifers.

Management

Both outdoor and indoor hatcheries have a flow-through water supply system. Broodstock ponds are equipped with as much as three paddlewheel aerators per pond. Outdoor larval rearing ponds may have one to three paddlewheel aerators depending on the stocking density. In order to prevent algal bloom, outdoor ponds are covered with black plastic shade.

Broodstock are fed formulated diets. Larvae are provided a combination of natural food, either live or frozen, and formulated diets. This practice prevents low survival rates that may result from nutritional deficiency.

A hatchery is normally managed by only one full-time staff, although assistants are hired during pond preparation and harvest.

Outlook

When it comes to achievements, the marine fish hatchery industry in Taiwan can speak for itself. Once an importer of marine fish larvae and fingerlings from many of its Asian neighbors, Taiwan now exports them to Japan, China, Viet Nam, Hong Kong, the Philippines, Malaysia, and Indonesia. There are now at least 60 marine fish species in which commercial larval production is possible. Such diversity renders enormous marketing flexibility for the Taiwanese aquafarmer. And speaking of the Taiwanese

aquafarmers, their role in the sustained success of their marine fish hatchery industry is not to be underestimated. They are dedicated more than their task requires. Their homes are erected adjacent to their hatcheries. They are on call twenty-four hours a day, come rain or shine.

Their successes notwithstanding, the marine fish hatchery industry in Taiwan is not totally without pitfalls. Diseases are a threat. Land subsidence is common in areas where hatcheries are concentrated. Overproduction becomes a problem once in a while. These, of course, do not discourage those in the industry and the research community to move even further along. If anything, these challenges inspire them to scale new heights, perhaps in very similar fashion as their oldest milkfish broodstock. Already twenty-eight years old, they endured the early trials of artificial propagation, and up to this time, still spawning strong!

ACKNOWLEDGMENTS

We thank Mr. Henry Wang of Aquaculture Taiwan Resources Co., Ltd. for his very kind and generous assistance during the hatchery tour. We acknowledge Mr. Eddie L.C. Chang of Tung Shin Fish Fry Hatchery and his group for unselfishly sharing their time, insights, and fragrant and flavorful Taiwanese tea.

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