MILKFISH CULTURE IN FRESHWATER PENS

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The culture of milkfish in fish pens in Laguna de Bay was introduced by the Laguna Lake Development Authority (LLDA) in 1970. This method of culture has the following advantages: (1) an annual potential yield of about 4000 kg/ha or over ten times the open water catch; (2) abundance of natural food in the lake which makes supplemental feeding unnecessary; (3) areas between pens serve as refuge and breeding grounds of fish; and (4) source of livelihood of people in the lakeshore towns and barrios.

In 1972, fish pens proliferated in Laguna de Bay, with some 15 percent in Rizal and 17 percent in Laguna. As of 1973, about 993 fish pens were constructed in the lake with a total area of 4802 ha (Delmendo and Gedney, 1974). Of the 993 pens, 793 or 80 percent are located in Rizal and 207 in Laguna. Later figures show that about 7000 ha of fish pens exist in the lake (Guerrero, 1977). This was reduced by typhoons in 1977 to about 2600 ha (LLDA, 1978). The pens vary in size from less than one ha to more than 100 ha, with those in Laguna having a median size of 5-10 ha and those in Rizal being in the 10-20 and 20-50 ha size categories. This reflects larger investments in fish pens per unit of ownership in Rizal (LLDA, 1973).

The fishpen industry in Laguna de Bay has an investment of about ₱100-M (Mane, 1976). A total milkfish fishpen production from Laguna Lake amounting to 20-25 million kg was reported in 1975 (Guerrero, 1977). Fishpen owners in Laguna de Bay are said to derive some ₱24,863 in annual income while the caretakers received ₱8,085/yr (Nicolas, et al., 1976). Fishpen operators in San Pablo Lakes earn a relatively small annual income of ₱2,252 due to the small sizes of their pens.

In a 1974 study on the costs and returns of milkfish production in fish pens (Guerrero, 1975), the highest average net income of ₱1,941/ha was obtained from fish pens of 1-5 ha. Fish pens of less than 1 ha and those of 6-10 ha had net losses.

The present fishpen hectarage of about 3000 ha is estimated to produce some 16,000 MT of fish annually or 16-20 percent of the total milkfish production in the country, and supplies about 60 percent of the consumption of Metro Manila (Mane, 1979, personal communication). The LLDA (1973) claims that with improved methods, the lake fishpen industry can grow to about 15,000-20,000 ha or a total lake fishery production of 80,000 MT annually.

Cultural Practices

Prior to the arrival of fingerlings, the nursery and grow-out pens are checked, repaired, and cleaned to eliminate predators and competitors.

Fingerlings for stocking are usually purchased from Dampalit, Malabon, Metro Manila, or from Obando, Bocaue, Malolos, Caloocan, and Navotas. The quantity of fingerlings purchased depends on the frequency of stocking or cropping. Most fishpen operators purchase fingerlings only once a year, at the time when the supply is abundant. Other factors being considered include: pen capacity, weather conditions, anticipated demand, expected mortality, and available capital.

Fingerlings are usually transported from source to fish pen in water by means of a live fish boat ("pituya") or on land by busses or jeepneys. The stock transported by land is placed in oxygenated, water-filled plastic bags in buri baskets.

Mortality of fingerlings in transport is due mainly to stresses in catching, handling, and counting. Under good transport conditions, mortality is nil. However, when conditions are rough or stressful, mortality rate may be as high as ten percent.

Milkfish fingerlings transported via the "pituya" are gradually acclimatized in freshwwater with the entrance of lake water into the boat and its free circulation once inside. Fingerlings transported in plastic bags are kept in the nursery pens for 5-6 hours or for as long as 2-3 weeks after transport to prevent further stress and reduce the chances of predation. Mortality in the nursery pens immediately after transport may vary from 1-3 percent during fine weather to 20-30 percent in inclement weather.

From the nursery pen, the fingerlings are stocked at 30,000/ha in the rearing pen where they are grown to marketbale sizes. Mortality rates of 20-40 percent are usually obtained after transferring the fingerlings from the nursery to the rearing pen.

Supplemental feeding is not practised in the majority of the fish pens. Some operators however resort to giving bread crumbs, rice bran, broken cones, fish meal, egg yolk in small quantities, ipil-ipil (Leacaena leucocephala) leaves, or kangkong (Ipomoea reptans) leaves.

Loss of stock in the grow-out ponds may result from predation by "bid-bid" (Elops hawaiiensis) and "buwan-buwan" (Megalops cyprinoides) or by minor destructions of the pen caused by floating poles or similar objects. Thus, only about 40-50 percent of the stock is recovered upon harvest.

Fishpen operators differ in number of croppings per year. Some stock their pens once a year, usually in May or June, and harvest the fish in May or June of the following year. Others stock twice a year -- the first stocking is done in March and April and harvesting in July or August; and the second stocking in July or August (immediately after the first harvest) and harvesting after eight months in February or March. The number of croppings depends on capital and availability of fry or fingerlings. Partial harvest during the rearing period may be done to catch up with the high price of fish.

Harvesting of marketable-sized fish is done by the use of seines ("pukot") or gill nets or both. Seines are usually used for total harvest of fish while gill nets are used in selective or partial harvest.

Problems of the Milkfish Fishpen Industry

The major problems that hold back the full development of the Laguna de Bay fishpen industry include:

(1) Fry shortage or scarcity of seed stock. There is an annual milkfish fry shortage to meet the annual stock requirement (1300 M fry) of the 176,000 ha of fishponds in the country. The annual fry catch levels are estimated to be 60 percent below annual stocking requirements.

(2) High mortality rates in transport and storage. Improvements on the traditional methods of handling, transporting, and rearing of milkfish have to be made to reduce mortality in nursery and grow-out pens.

(3) Destructive typhoons. Severe financial losses have been experienced by fishpen operators as a result of typhoons that pass the Laguna de Bay area. Typhoons in 1976 reduced the total fishpen area by about 50 percent. In 1978, a series of strong typhoons wrecked havoc on the majority of existing fish pens, causing a loss of ₱80 M worth of fish and a sizable amount in infrastructure. Col. Nicanor Garcia (1978) reported that 70 percent of the destroyed fish pens could salvage only 20-30 percent of the bamboo poles and nets.

FFS Research Findings Relevant to Milkfish Freshwater Culture

The SEAFDEC Freshwater Fisheries Station has successfully evolved the technology of acclimating milkfish fry in fresh water. Gradual and continuous acclimation and gradual acclimation by removal of brackish water gave high survival values of 88 percent and 83.6 percent, respectively. The application of these methods on a commercial scale would enable the fishpen operators to cut down on production cost by

by raising their own fingerlings instead of buying them from brackish water nurseries. Moreover, percentage of survival in fish pens is expected to improve because of the acclimation process prior to stocking.

Preliminary studies on milkfish fingerling production in cages in Laguna de Bay gave the following results:

(1) Survival rates and mean weight and length of fingerlings reared in Diablo Pass ("amihan") were higher than those reared in Tapao Cove ("habagat").

(2) Survival rates and mean weight and length of fry stocked at 1/L were higher than those at 5/L.

(3) Faster growth rates and higher percent survival were shown by fry reared to fingerling size during the warm months (June to July) as compared to those reared during the cold months (December to January).

Experiments on growth of milkfish fingerlings reared to marketable size in cages gave the following initial results:

(1) Body weight and length measurements after two culture months increased with a decrease in stocking density from 10 to $2/m^2$. Comparatively high mean body measurements and survival rates were obtained at densities of 2 and $6/m^2$.

(2) Faster growth rates were exhibited by fish stocked in cages with substrate.

(3) Decreasing weight and length measurements were obtained with increasing depth, except a stocking density of $10/m^2$. (There seems to be an interaction between depth and stocking density).

Exploratory studies on the development of a seed bank for milkfish in fresh water gave the following results:

(1) Fingerlings stocked in plastic-lined ponds at 1 fry/L and given supplemental feeds (Scenedesmus sp. comprised 80 percent of the bulk) produced a mean weight and length of 1.5 gms and 58 cms, respectively, and a survival rate of 42 percent.

(2) No considerable increases in weight and length of fry were observed after a 31-day stunting period in marine tanks at densities of 10 and 14 fry/L. Survival rates were 51.02 and 44.48 percent, respectively.

Stunted milkfish fry when grown to fingerling size in the lake at stocking densities of 10 and 14 fry/L showed comparable body measurements and survival rates after 28 culture days.

FFS Proposed Studies on Milkfish Freshwater Culture

Among the FFS research proposals for implementation in 1979, the following deal with various aspects of freshwater culture of milkfish in Laguna de Bay:

(1) Observation study of the transport and handling of milkfish fingerlings by live fish boat ("pituya").

(2) Acclimation of milkfish fry in fresh water.

(3) Milkfish fry to fingerling production in fresh water

  (a) Effect of stocking density and length of holding period on survival of milkfish fry;

  (b) Effect of stocking density, culture season, and location on growth and survival of milkfish fry reared to fingerling size in cages; and

  (c) Growth compensation of milkfish after stunting in cages

(4) Growth of milkfish in fish pens

  (a) Bottom soil cultivation
  (b) Effect of stocking density, location, and season
  (c) Selective and periodic harvesting

(5) Supplemental feeding of milkfish

Conclusion

Innovations and continuing efforts towards the improvement/refinement of technology on milkfish are all designed to increase the production of this fish. With multi-agency efforts injected into the technology-oriented development process, bright prospects for milkfish culture in the Philippines are assured.

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