

Cage and pen culture of milkfish *Chanos chanos*

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Introduction

The culture of milkfish (*Chanos chanos*) is the largest fish aquaculture industry in the Philippines (Marte 2010). Milkfish continues to be a top aquaculture commodity primarily because they are easy to culture and can be grown in a wide range of environments (Samson 1984). They thrive in freshwater, brackishwater, marine, and even hypersaline habitats. Milkfish production is increasing rapidly with much of the production moving away from the traditional culture in brackishwater ponds to fish cages in coastal marine waters (Gaitan *et al.* 2014).

Milkfish culture has been practiced in the Philippines, Indonesia, and Taiwan for centuries and has been the focus of aquaculture research in a number of institutions for several decades. Innovations in culture practices based on research data and farmers' experiences have been adopted by industry practitioners across Asia (Liao & Leano, 2010). In general, the full production cycle of milkfish from induced spawning and hatchery operations to pond nursery and cage grow-out culture can take 7–10 months (**Table 1**).

Table 1. General stages involved in milkfish aquaculture production

Culture Stage	Larval stage	Nursery stage	Grow-out stage
Days of Culture	1–21 days	60–75 days	4–6 months
Culture System	inland hatchery	earthen nursery pond	floating sea cage or pond
Output Product	fry	fingerlings	market-size milkfish

Recent concerns about the rapid growth of aquaculture, possible environmental impacts, and risks that can threaten the sustainability of this expanding industry have also been the subject of many research. These come with the end view of developing good management practices in marine fish cage culture (Gaitan *et al.* 2014).

Materials and Methods

The project which involves the commercial farming of milkfish, *Chanos chanos*, in floating net cages and pens at the coastal water of Barangay Sto. Domingo, Nueva Valencia Guimaras started in March 2018. Four units of floating net cages were fabricated (15 m dia. x 6 m deep) and set up with concrete moorings at the deeper (15–20 m) area of the bay. Meanwhile, 5 units of bamboo pens (15 m dia. x 6 m deep with net flooring) were installed at the shallow (5–10 m) coast (**Figure 1**). Double layer netting were used to ensure the safety of fish stock from escaping. Milkfish fingerlings (average weight of 25–30 g; 4–5 in long) from the earthen nursery ponds were stocked at 30 fish/m³ in the pens and at 40 fish/m³ in the floating net cages. Stocks were fed with commercially available milkfish feed starting from crumbles, starter, grower and finisher pellets at 6–8 % of body weight per day and gradually decreased to 3 % when fish reached the average body weight of 400 g until harvest. To avoid feed wastage and to ensure that feed ration is consumed, broadcasting of feed is done slowly depending on the appetite of the fish. Replacement of nets was done monthly. One hundred fish were sampled monthly to determine the average body weight (ABW), which was used in adjusting the required feed ration. After attaining an average body weight of 500 g, the milkfish are harvested and sold at the nearby Iloilo Fish Port Complex.



Figure 1. Floating net cages (left) and bamboo pens (right)

Results and Discussion

After two production cycles, growth and survival of fish from the pens started to decline due to the deteriorating condition of sediments as shown by the black and smelly sludge on the substrate. The accumulation of fish waste and uneaten feeds has greatly affected the performance of milkfish culture in pens. The net flooring sits on the bottom substrate, and obstructed the flushing effect of the underwater current. The low water current velocity in the shallow area and the cumulative build-up of sludge may have stressed the milkfish stocks and decreased their feeding rates, thereby lengthening the culture period to 7–8 months.

Moreover, nets get clogged up easily with fouling organisms causing very limited water exchange. Periodic net changes was done at least once a month, although net changing was also difficult in pens because bamboo poles were obstructive. Fouling organisms on the bamboos like barnacles had to be cleaned off every production cycle, which adds to more labor costs.

In addition, pens are fixed and the daily tidal level fluctuations resulted in irregular water depth and volume inside the culture nets which was especially decreased during low tide. This caused additional stress to the fish stock especially when they are approaching marketable size. At low tide, crowding may result to decreased dissolved oxygen levels. In effect, milkfish vigorously moved about and gasped at the water surface for oxygen, and caused some mortalities.

On the other hand, floating net cages have been found to be the best culture system for milkfish in a bay. Growth and survival of milkfish in floating cages at the deeper area of 15–20 m was much better than those in the pens. The economic life of bamboo raft and flotation setup used in floating cages can be much longer (2–3 production cycle) than that of bamboos in pens (one production cycle only). Capital requirements for floating cages was much higher in terms of materials and initial labor costs but eventually be more cost-effective because of longer potential use.

References

- Gaitan, A. G., Toledo, J. D., Arnaiz, M. T., Ayson, E. G. D., Altamirano, J. P., Agbayani, R. F., Salayo, N.D., Marte, C. L. (2014). Milkfish *Chanos chanos* cage culture operations. Aquaculture Department, Southeast Asian Fisheries Development Center.
- Liao, I.C. and E. M. Leaña (Eds.). 2010. Milkfish aquaculture in Asia. Keelung, Taiwan: National Taiwan Ocean University, The Fisheries Society of Taiwan, Asian Fisheries Society and World Aquaculture Society.
- Marte, C. L. (2010). Milkfish aquaculture in the Philippines: an overview. In I. C. Liao & E. M. Leaña (Eds.), Milkfish aquaculture in Asia (pp. 33-46). Keelung, Taiwan: National Taiwan Ocean University, The Fisheries Society of Taiwan, Asian Fisheries Society and World Aquaculture Society.
- Samson, E. (1984). The milkfish industry in the Philippines. In J. V. Juario, R. P. Ferraris, & L. V. Benitez (Eds.), Advances in milkfish biology and culture: Proceedings of the Second International Milkfish Aquaculture Conference, 4-8 October 1983, Iloilo City, Philippines. (pp. 215-228). Metro Manila, Philippines: Published by Island Pub. House in association with the Aquaculture Department, Southeast Asian Fisheries Development Center and the International Development Research Centre.