Nursery rearing and stocking of Asian seabass for cage culture

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Introduction

The increasing demand for fish in domestic and export markets indicate good prospects for large scale sea farming and coastal mariculture. The open sea cage culture has been expanding in recent years on a global basis and it is viewed by many stakeholders in the industry as the aquaculture system of the millennium. Cage culture has made possible the large-scale production of commercial finfish in many parts of the world and can be considered as the most efficient and economical way of rising fish. It is well known that availability of seed in adequate quantities is one of the major constraints in the development and expansion of mariculture. The increasing exploitation pressure on the wild stocks of many major marine fisheries has led to over exploitation and consequent decline in their catch and hence the only sunrise sector to augment seafood production is through marine farming.

Though seed production technologies have been developed for many marine finfish and shellfish species, many of these technologies have not been scaled up to commercially viable levels. The seed production of the commercially important species by development of viable technologies is essential for development of sustainable mariculture practices, however many of these technologies are still in the emerging state and may take several years for standardization on a cost effective way. The most common cultivable candidate species of marine finfishes include the rabbitfish (Siganus spp.), sea bass (Lates calcarifer), groupers (Epinephelus spp.), snappers (Lutjanus spp.) and sea breams (Lethrinus spp., Sparus spp.). Currently mariculture of finfishes is almost entirely supported from the seed collected from the wild, except for sea bass, pompano (Trachynotus spp.), and cobia to some extent. The hatchery seed production of many high value marine finfishes and shellfishes is complex and expensive due to the high costs involved in the establishment of broodstock and hatchery facilities and also to the complicated larviculture procedures involving culture of proper live feeds, their nutritional enrichment, feeding protocols, grading, water quality maintenance, nursery rearing and disease management. From the available hatchery technologies and seed production techniques it is understood that the entire process, very complicated and diverse as broodstock development and spawning is very difficult and completely different from larval rearing and larviculture practices. The requirements as well as the techniques are extremely different and different sets of man power, techniques, and infrastructural facilities are required. Similarly the nursery rearing is another step in the seed production particularly if it is for cage culture. Nursery rearing can be done as the primary steps in case of pond culture in the same culture conditions; whereas in cage culture it is entirely different, it requires comparatively larger seeds in for culture as the fish culture in cages were in different culture conditions of open water systems.

Nursery rearing of Sea bass fry

Nursery rearing is usually carried out in three different systems; 1) tank systems, 2) in ponds 3) in hapa in ponds.

Tank: Nursery rearing of Asian seabass in indoor cement tanks was under taken. Immediately on arrival, the fishes were given a freshwater dip and placed in four cement tanks each of size 10′ x 6′ x 5′ containing 7000 l of seawater (2500 fingerlings/ tank) with continuous aeration. The juveniles were reared in nursery rearing tanks upto 45 days before they were shifted to open sea

cages for further experiments. From second day onwards, the fish were fed commercial fish feed with a pellet size of 0.5 mm diameter at 4% of the body weight, four times a day (6.00 am, 12.00 pm, 6.00 pm and 12.00 am) for the first 15 days. Then the pellet size was increased to 1 mm for next 15 days while the feeding rate and frequency remained unchanged. For the remaining 15 days, the fishes were fed with a pellet size of 2 mm. Eighty per cent of the water was replaced 5 min after feeding with 20 min flow -through thereafter. It was confirmed that the feed was consumed immediately after feeding with no visible feed pellets settled at the bottom. The fishes were graded every 15 days with an automatic grader and grouped into three different sizes. After grading, representative samples were collected for studying growth parameters.

In Floating net cages: Floating net cages system is used in China where net cages are hunt on wooden rafts and kept afloat with cylindrical plastic containers or Styrofoam. The average net cage is 3x3x3 m, and depending on the size of the raft, 6 -16 cages are secured together per raft. The cage unit is stabilized with zinc-placed pipe and anchored to the bottom. During the nursery period, size grading should be conducted every 15 days to avoid cannibalism. At the same time, the net cages should be checked for damage to insure that fish do not escape. In the early stage of net cage culture, fishermen collect 1 – 2.5 cm fry form the wild and stock them for one to two months at a density f 2,000 seeds/net cage. Beyond the nursery period, juveniles are size graded and stocked into separate grow out net cages. It has been recorded that in terms of growth, survival and economic results, nursery reared juveniles perform better than those stoked directly into cages.

In hapa in Pond: The hapa usually used are 2x1x1.5 m and are usually set in open waters one day before stocking to remove the contaminants if any. Stock of 2,000–3,000 fry are raised to the fingerling size in these cages. Two sets nursery rearing trials comprising 5 to 6 hapa each were carried out in two different locations for cage culture works. In the first set the fries were small ranges from 15 to 20 mm in length were stocked in a stocking density of 1500 to 2000/ hapa and fed with live feeds like mysids and small prawns for initial two weeks and gradually changed to chopped fish and prawns. The growth was very fast and growth difference was high at this stage and therefore grading was done every fourth day. The survival was around 90% and cannibalism was very less. After two weeks the feed changed to chopped fishes/prawns. During this stage also very good growth and survival was observed. However there were little problems due to low water quality especially in the early morning hours. The excess feeds caused high algal growths in the ponds and that led to the lower oxygen levels in the pond water during early morning hours. This was mainly due to the water exchange in the pond where the hapa was installed was less. This could be controlled by providing additional aeration to the hapa. The excess feeds remained in the hapa attracted crabs towards the hapa were damaged as the crabs bites the nets. The rearing was done for a period of 45 days and the fries reached 8 to 12 cm in size with a an average body weight of 60 g were transferred the cage.

In the second trial the initial size of the fries varied from 25 to 30 mm in length. So feeding started with chopped fish/shrimps. The hapa were installed in a pond with good water exchange. Here also cannibalism was negligible and survival was very good (90 %). The growth was encouraging and fishes reached a size of 10 to 15 cm in three months with a body weight of 90 -120 g with three months. Here also 6 to 7 hapa were used at a time; were fixed to poles at corners and tied in parallel row as shown in the figure. Grading was done in every 3rd day by hand picking. The growth difference was comparatively less compared to the first set of experiments may be due to the good water quality.

Salinity acclimatization: Seabass is a euryhaline species except in its early larval stages. The fish can be easily acclimatized from sea water to fresh water within short periods of time without any mortality. It can easily adjust 5- 10 ppm at a time and again it can be changed after a period of 1 hr. Like that with one day itself it can be changed from sea water to fresh water and vice versa.

Collection and Conditioning of Fry before Transport: Fry are collected from the rearing tanks and placed in smaller receptacles. Fry are treated with 5 ppm of acriflavine solution or 0.5 ppm of copper sulfate solution for 5–10 minutes. There should be no feeding within 1–2 hours be-

fore packing. Plastic bags of 40 × 60 cm of proper gauge are filled with 6–7 litres of fresh seawater and saturated with oxygen; 10–12 litres of oxygen gas are used for packing. The amount of transportable fry depends on size of fry, water temperature in plastic bags and duration of travel and handling from source of fry to its destination.

Transport: In transporting by truck, a mixture of crushed ice and sawdust is needed to control the water temperature in the plastic bags during transport. The mixture is spread uniformly on the floor of the truck before the plastic bags are laid upon it. The proportion of crushed ice and sawdust is 1:1 for long period transport (12-16 h) and 1:2 for short periods (4-5 h). Transportation should be carried out at night time. By this method, it is possible to control the water temperature between 19–23° C. Transport for short distances can be done with the aerators in tanks in low temperature at a density of 250 juveniles/tonne water up to 5 -6 h.