# Commercialization of Asian seabass, *Lates calcarifer* as a candidate species for cage culture in India

**Kandan, S.**

Marine Products Export Development Authority, Regional Centre (Aqua), Thanjavur
shanmugakandan@yahoo.co.in

## Introduction

Asian Seabass *(Lates calcarifer*) a popular edible marine finfish commands consistent demand in domestic and international markets. It is widely distributed in Indo-Pacific region and extending up to Taiwan, South East Australian coast, Papua New Guinea, Arabian Sea and Bay of Bengal and further to Persian Gulf region. In India, seabass fishery is reported from all along the coast including Andaman & Nicobar Islands. Due to the characteristic catadromous pattern of life cycle, its population occupies a wide range of habitats starting from freshwater lakes, rivers, estuaries and inshore coastal waters. However, the adult fish migrate to deeper inshore sea areas for spawning and as such the early cycle is restricted in seawater areas. Besides, exploiting its natural resources from different environmental conditions, seabass become a compatible species for aquaculture in saline water as well as freshwater conditions.

## Status of seabass culture in India

Asian Seabass in one of the prominent species being cultured in South East Asian Countries, China and Australia. Several commercial hatcheries produce seeds for aquaculture purpose in these countries and also evolved suitable feed for growing seabass in aquaculture systems. Besides, advances have been taken place in addressing health management challenges encountered while farming.

In India, seabass has been cultured in brackishwater and freshwater by stocking wild seed in some part of West Bengal, Tamil Nadu and Kerala. The cage culture of seabass is still in its developmental stages, even though the culture of seabass in different types of cages is now established by MPEDA (in ponds), RGCA (in ponds) and CMFRI (open waters). For the past five years, considerable development has been made in culture of the species in cages in ponds of all bio categories and hi-tech cages in open sea. But, many problems are remaining unsolved. Some problems encountered are:

i) Cannibalism during fingerling production from fry from 1.0-1.5 cm. to 6- 7 cm fingerlings
ii) Lack of availability weaning diet required for nursery rearing
iii) Non-availability of extruded pellet feed for grow-out
iv) Non availability of proper culture techniques in different bio categories.

Despite of all the above problems, the culture of seabass in cages in the pond or in the open water is being initiated and standardized according to the Indian conditions.

**Culture technology for growing fish in cages in pond**

Seabass can be cultured in freshwater or brackishwater ponds; but cannibalism is one of the most serious problems in seabass culture. In order to minimize the chances of cannibalism, culture is carried out in two phases, *i.e.* the nursery phase and grow-out phase.

**Nursery phase**

The main purpose of the nursery is to culture the fry from hatchery (1.5 – 2.5 cm) to juvenile size (6-7 cm). The nursery rearing can be carried out either in earthen ponds or hapas. Nursery pond size ranges from 1000 to 2000 $m^2$ with a water depth of 80 – 100 cm. Pond with separate inlet and an outlet gate to facilitate water exchange is recommended. Pond bottom should be flat and sloping towards the drainage gate. Inlet and outlet gates are provided with a fine screen (1 mm mesh size) to prevent predators and competitors from entering and the fry from escaping the pond. Fry ranging from 1.5 – 2.5 cm are suitable for stocking in nursery ponds. Stocking density is between 20 – 50 individuals per cubic meter. However, it is advantageous to conduct nursery rearing of seabass in hapas because it enables closer monitoring and grading resulting in uniform size stocking and better survival compared to open-pond rearing. It is likewise easy to maintain and require very little capital investment.

**Nursery rearing in cages**

The seabass fry can be grown to fingerlings in net cages measuring 1 M x 1 M x 1 M, made up of HDPE. These net cages can be fixed in PVC frames of floating frame, sinker and top lid. Around 2000 – 3000 fry can be stocked and monitoring of the fries is easy in net cages. Also, the maintenance cost of the net cages is lesser than the hapas. The only constraint is that, a floating feed should be used in cages for rearing seabass. The mesh size of the cage is 2 mm, 4 mm, 6 mm and 8 mm. The fry will grow faster in net cages than hapas as it facilitates more aerations and water circulation movements inside the cages.

**Food and feeding**

During the nursery phase extruded slow sinking feed is preferred. Crumbled feed should be provided according to the requirements and subsequently the pellet size can be increased. The size of the pellet during the nursery phase is highly correlated with the mouth size of the seabass fry (Table 1).

Table 1. Size of the fish and size of the feed

| Size of the Fish(g) | Length(cm) | Size of feed(mm) | Type of feed |
|---|---|---|---|
| 0.05 – 0.08 | 1.5 – 2.0 | 0.3 mm (Dust) | Slow sinking |
| 0.08 – 0.40 | 2.1 – 3.0 | 0.5mm (Crumble) | Slow sinking |
| 0.50 – 0.80 | 3.1 – 4.0 | 0.8mm (Crumble) | Slow sinking |
| 0.90 – 1.65 | 4.1 – 5.0 | 1.0mm (Starter-1) | Slow sinking |
| 1.70 – 2.60 | 5.1 – 6.0 | 1.2mm (Starter-2) | Slow sinking |
| 2.70 – 4.00 | 6.1 – 7.0 | 1.5mm (Starter-3) | Slow sinking |
| 5.00 – 7.00 | 7.1 – 8.0 | 1.5mm (Starter-3) | Slow sinking |

The nursery period lasts for about 32 – 45 days until it reaches the fingerlings size (5 – 7 cm). During this period, water exchange should be done according to the requirements and water quality conditions. It is to be monitored that the minimum feed wastage is occurred so as to get profitable nursery rearing of seabass.

**Grading**

The mechanical grader available in the market can be used for grading the fries. Initially, once in three days and later weekly once the grading has to be done to separate the shooters and the bigger seabass fry. This exercise will give more survival rate with better growth as the seabass

fries are getting the suitable feed according to their mouth size. Also, the cannibalistic characteristics drastically come down due to timely grading.

At the stage, the fingerlings are ready for transfer to grow-out system and this can be harvested from the hapas by scooping and transfer to grow-out ponds after proper counting so as to calculate the daily feeding regime.

**For open sea cage culture, the seabass fingerlings grown to more than 7 - 10 cm or more than 10 – 15 g is ideal.**

**Grow-out phase**

The most common grow-out system is pond culture, in either brackish or freshwater. A pond having minimum water depth of 6 – 8 feet is required for cage culture. Fish are usually maintained in cages within the pond, although cage culture of fish less than 120 – 150 mm TL and free-ranging of larger fish are sometimes combined (Schipp, 1996).

The cages are usually 4 – 5 $m^2$ (water surface area) and 2 – 4 m deep. They may hold 15 – 40 kg/$m^3$, provided they are cleaned off bio-fouling regularly, as poor water flow will stress the fish. Typically, the pond is aerated and receives water exchange of 5 – 10 per cent of pond volume per day, if necessary.

In India, a technology has been developed and perfected for culturing of seabass in cages in pond by RGCA, an R&D, the arm of the Marine Products Export Development Authority. In this method, the pond cages having the dimension of 2 M x 2 M x 1.3 M (approx. 5.0 Cu.M.) using PVC pipe frames of 40 mm (floating frame), 32 mm (sinker), 25 mm (top lid). The cages are fastened to the bamboo or wooden poles of the catwalks fixed in the ponds. The catwalks are provided for the purpose of day-to-day management activities, such as feeding, sampling, grading *etc.*

Seabass cages usually are made of Nylon or Polyethylene or HDPE Netting with varying mesh size depending on the size of the fish grown.

Table 2 Different cage mesh sizes and size of the fish to be stocked

| Total Length of Fish (cm) | Cage Mesh Size (mm) |
|---|---|
| 7 - 9 | 8 |
| 9 - 11 | 12 |
| 11 - 15 | 16 |
| 15 - 18 | 20 |
| 18 - 22 | 24 |
| 22 - 26 | 32 |
| 26 - 32 | 38 |
| 32 and above | 44 |

The stocking densities in the cages vary according to the size of the fish, as the culture progresses and the fish grow in size the density has to be adjusted suitably. The suggested stocking densities are given below:

Table 3 Suggested stocking density in cages based on number/$m^3$

| Size (cm) | Stocking density no./Cu.M. | |
|---|---|---|
| | With aeration | Without aeration |
| 7.0 – 9.0 | 600 | 350 |
| 9.0 – 12.0 | 500 | 250 |
| 12.0 – 15.0 | 400 | 200 |
| 15.0 – 20.0 | 300 | 180 |
| 20.0 – 24.0 | 200 | 140 |
| 24.0 – 28.0 | 150 | 100 |
| 28.0 – 30.0 | 100 | 70 |
| 30.0 – 32.0 | 50 | 30 |
| 32.0 – 34.0 | 30 | 15 |

**Feed**

At present, seabass culture is facing the non-availability of floating extruded pellet feed which is the major constraint. However, few companies in India have come forward to manufacture feed for seabass culture, which is highly suitable for cage culture. Even though, trash fish are given widely for the culture at present in many places for sustainable aquaculture, the pellet feed is the highly recommended. The feed should be given twice

daily in the morning hours, 6 – 7 A.M. and evening 6 – 7 P.M. at the rate of 8 – 10% total biomass in the first 2 months of culture. After 2 months, feeding is reduced to once daily and given during late evening at the rate of 2 – 5% of the total biomass. The floating pellet feed should be given only when the fish swim near the surface to eat. The suggested feeding schedule for extruded pellet feed is given below:

Table 4 Suggested feeding schedule, as % of body wt., type of feed, *etc.*

| Size (cm) | Feed as % of body weight | Pellet Size (mm) | Type of feed |
|---|---|---|---|
| 7 - 9 | 8.0 | 2 | Slow sinking |
| 10 - 12 | 7.0 | 2 | Slow sinking |
| 13 - 15 | 6.0 | 3 | Slow sinking |
| 15 - 18 | 5.0 | 5 | Floating |
| 18 - 20 | 4.0 | 5 | Floating |
| 20 - 22 | 3.5 | 7 | Floating |
| 22 - 25 | 3.0 | 7 | Floating |
| 25 - 27 | 2.6 | 9 | Floating |
| 27 - 30 | 2.2 | 9 | Floating |
| 30 - 35 | 2.0 | 11 | Floating |

**F C R**

For any aquaculture practice, the FCR is the determining factor for the economic viability of the fish culture for domestic or export and also the cost of production per unit. For seabass, 1: 1.2 FCR is recommended by using extruded pellet feed and 1: 5 – 7 is the observed FCR by using trash fish or farm made feed.

**Production, harvest & marketing**

In a 2 M x 2 M x 1.3 M cage, around 80 – 100 nos. is the recommended stocking density (biomass) in pond system. If fish is weighing an average 1 kg weight, around 100 nos. of fish can be stocked in the 5 $m^3$ area. The harvest of the fish grown in the cage can be done with minimum labors and effort. Around 10 tons production can be harvested within 3 – 5 hours from 100 cages. As the fish are grown in the cages is giving good muscle structure, taste and flavor, it is always fetching an average rate of Rs.150 – 180 in India (the price vary according to the local demand) and in export, fetching US$ 4 – 5 per kg.

**Note: For open sea cage culture, the mesh size of the cage is same and only the width of the cage (circular or rectangular) will vary according to the stocking density and environmental conditions prevailing in the open sea. The frame for open sea cage culture, HDPE material is recommended. Stocking density, feed and feeding type and all other aspects are almost similar to the culture of seabass in cages in the pond.**

**Conclusion**

In India, the aquaculture is centric to the shrimp/scampi production and these two species are contributing in total of 52% towards export. The freshwater fish produced through aquaculture is mainly catering to the domestic market only. In Indian seawater many finfish and shell fishes are abundant for aquaculture, which is economically important, the seabass (*Lates calcarifer*) fish is occupying the main role at present as it is a candidate species for cage culture as it has completed a value chain approach from seed production, nursery rearing, grow-out and marketing & export by MPEDA through its R&D Institute – RGCA.

**Note: The above text and results presented here are based on the various demonstrations conducted on culture of seabass in cages in ponds by MPEDA-RGCA.**