

Grow out culture of seabass in cages

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Aquaculture of *Lates calcarifer*, known as seabass, was commenced in the 1970s in Thailand, and rapidly spread throughout Southeast Asia. In India also it is a sought after fish in many states. The grow-out phase involves the rearing of the seabass from juvenile to marketable size. Marketable size requirement of seabass vary country to country e.g. in Malaysia, Thailand, Hong Kong and Singapore, the normally accepted marketable size of seabass is between 700–1200 g while in the Philippines, marketable size is between 300–400 g. The culture period in grow-out phase also vary from 3–4 months (to produce 300–400) to 8–12 months. The success of marine cage culture of seabass and its economical viability have contributed significantly to large scale development of this aquaculture system

Among the attributes that make Seabass an ideal candidate for aquaculture are:

- It is a relatively hardy species that tolerates crowding and has wide physiological tolerances.
- The high fecundity of female fish provides plenty of material for hatchery production of seed.
- Hatchery production of seed is relatively simple.
- Seabass feed well on pelleted diets, and juveniles are easy to wean to pellets.
- Seabass grow rapidly, reaching a harvestable size (350 g – 3 kg) in six months to two years.

Today Seabass is farmed throughout most of its range, with most production in Southeast Asia, generally from

small coastal cage farms. Often these farms will culture a mixture of species, including Seabass, groupers (Family Serranidae, Subfamily Epinephelinae) and snappers (Family Lutjanidae). Australia is experiencing the development of large-scale Seabass farms that reflect the industrialized style of aquaculture seen in Europe, where Seabass farming is undertaken outside the tropics, recirculation production systems are often used (e.g. in southern Australia and in the north-eastern United States of America).

Most seabass grow out is undertaken in net cages. The cages are either floating or fixed and range in size from 3 x 3 m up to 10 x 10 m and 2 -3 m deep. The mesh sizes of these cages ranges from 2-8 cm. Seabass are reared from juvenile to marketable size varies depending on water quality and the environmental conditions of the culture site. Floating cages can be stocked more than stationary cages. This is because floating cages are usually set in sites with better aquatic environmental conditions such as deeper water, smaller fluctuation of water salinity, more rapid circulation and further away from sources of pollution.

Suitable site for seabass cage culture

Criteria for selecting a suitable site for cage culture of seabass include:

- a. Protection from strong wind and waves. The cage culture site should preferably be located in protected bays, lagoons, sheltered coves or inland sea.

- b. Water circulation. The site should preferably be located in an area where influence of tidal fluctuation is not pronounced. Avoid installing cages where the current velocity is strong.
- c. Salinity. Suitable site for seabass culture should have a salinity ranging from 13–30 ppt.
- d. Biofouling. The site should be far from the area where biofoulers abound.
- e. Water quality. The site should be far from the sources of domestic, industrial and agricultural pollution and other environmental hazards.

The optimum temperature for Seabass culture is 28°C, with acceptable growth rates between 26–30°C. Temperatures below this range will result in decreased metabolism and growth. Seabass generally stop feeding at temperatures below 20°C. At optimum temperatures, Seabass can be raised to market size (500g) between 6–12 months.

The water quality parameters which are considered of minimum range for cage culture of seabass

The suitable water quality for cage culture of seabass.

Parameters	Ranges
pH	7.5–8.3
Dissolved Oxygen	4.0 – 8.0 mg/L.
Water salinity	10 – 31 ppt.
Water temperature	26 – 32 °c
Ammonia – nitrogen	less than 0.02 mg/L.
Hydrogen sulfide	none

The stocking densities used for cage culture generally range from 15 to 40 kg/m³, although densities may be as high as 60 kg/m³. Prior to stocking seabass juvenile in cages, fish should be acclimatized to the ambient temperature and salinity prevailing in the cages. The fish should be graded into several size groups and stocked in separate cages. The stocking time should be done in the early mornings (0600–0800 hours) or late in the evening (2000–2200 hours) when the temperature is cooler.

Stocking density in cages is usually between 40–50 fish per cubic meter. Two to three months thereafter, when the fish have attained a weight between 150–200 g, the stocking density should be reduced to 10–20 fish per cubic meter. Generally, increase in densities results in decreased growth rates. Higher stocking densities require more monitoring of water quality and fish health, additional aeration and higher water exchange rates.

There should be spare cages as these are necessary for transfer of stock and to effect immediate change of net in the previously stocked cage once it has become clogged with fouling organisms. Changing cages allows for grading and controlling stock density.

The choice of netting mesh size of fish

Mesh size	Size of fish
0.5 cm	1–2 cm
1 cm	5–10 cm
2 cm	20–30 cm
4 cm	bigger than 25 cm

Feeds and feeding

Due to the carnivorous nature of Seabass, a high protein diet is required for efficient growth. Commercial diets are readily available from a number of feed manufacturers and are generally produced in a floating or sinking pellet. Food conversion ratios (FCRs) for Seabass should be in the range of 1.5–2:1 (kg of food: kg of weight growth), however lower FCRs have been reported by some industry members.

Trash fish is the main feed for seabass culture. Trash fish should be fresh and clean. Trash fish used in Thailand are sardines and other small marine fish. The trash fish should be chopped and fed twice a day, in the morning and afternoon. The size must be suitable for the size of the mouth of the fish. The farmers should give the feed slowly and watch the fish. Feeding should be stopped when the fish no longer come up to the surface; it shows that the amount of feed is enough for them.

Feed is the major constraint confronting the seabass culture industry. At present, trash fish is the only known feed stuff used in seabass culture. Chopped trash fish are given twice daily in the morning at 0800 hours and afternoon at 1700 hours at the overall rate of 10% of total biomass in the first two months of culture. After two months, feeding is reduced to once daily and given in the afternoon at the rate of 5% of the total biomass. Food should be given only when the fish swim near the surface to eat. Vitamin premix may be added to the trash fish at a rate of 2 percent, or rice bran or broken rice may be added to increase the bulk of the feed at minimal cost. Food conversion ratios (FCRs) for Seabass fed on trash fish are high, generally ranging from 4:1 to 8:1.

Growth

Growth is highly variable and depends on various factors including temperature, feeding rate, feed quality and stocking density. Generally fish grows from fingerling to 300-500g in 6-12 months and to 3kg in 2 years.

Stocking larger size seed fish attains greater individual and total weight per cage than smaller ones. Seabass size ranges from 10-17cm in length are suitable for culturing in cages with grow out at 6- 7 months.

Monthly growth (g) of seabass at different stocking densities in cages (Sakaras, 1982)

Culture Period	Stocking density		
	16/m	24/m	32/m
0	67.8	67.8	67.8
1	132.3	137.5	139.2
2	225.2	229.1	225.5
3	262.9	267.5	264.1
4	326.2	332.0	311.5
5	381.1	384.9	358.8
6	498.6	487.1	455.4

Main problem in grow out culture are feeding and prevention of cannibalism in young fishes. In order to reduce losses due to cannibalism, grow out is performed in two phases, viz. nursery phase up to a size of 20g in nursery ponds/cages and grow out phase. The size of the feed must be suitable for the size of the mouth of the fish. The farmers should feed fish slowly and watch them. Feeding should be stopped when the fish no longer come up to the surface which indicates that the amount of feed is enough for them. Food conversion rates of seabass also depend on the quality and quantity of trash fish. Normally, seabass can grow at an average of 1 kg/yr. Survival rates for marketable fish culture are about 80-95 percent in normal culture conditions.