SEABASS HATCHERY

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INTRODUCTION

The seabass or giant sea perch, *Lates calcarifer* (Bloch) is an economically important food fish in the tropical and subtropical regions of the Pacific and Indian oceans. In view of its easy adaptability to low saline waters including freshwater, this fish has assumed great value for culture in recent years. It is commonly cultivated in Thailand, Malaysia, Singapore, Indonesia, Hong Kong and Taiwan in both brackishwater and freshwater ponds as well as in net cages in coastal waters. Because of its relatively high market value, it has become an attractive commodity of both large and small scale aquaculture enterprises. In India, it is distributed along both the east and west coasts, but is more common in Bengal region where it is cultured in ponds, canals, bheries and paddy fields. However, the major constraint to rapid expansion of seabass culture has been the inconsistent and inadequate supply of seed either from the wild or the hatchery. A more reliable source of seed supply is hatcheries. The Asian seabass *L.calcarifer* is extremely predacious and feeds on small fishes, shrimps, snails and worms. This species tends to be cannibalistic when food is scarce and if the pond is stocked with unequal size groups.

The major activities in seabass breeding and seed production involved are the collection and maintenance of broodstock, maturation, hatchery operations including spawning, incubation and hatching, larval food production, nursery and larval rearing and finally raising brood stock from hatchery bred fingerlings to complete the whole breeding cycle. The shortage of seed, delicate flavoured flesh, fast growth, high market value and scarcity of seabass from the wild have encouraged many countries in Asia to initiate research and development programmes on seabass breeding, seed production and culture.

TECHNOLOGY DEVELOPMENT IN OTHER COUNTRIES

Thailand is the most advanced country in the production of seabass seed from spawners collected from the wild and induced to breed since 1973. Thailand is presently producing more than 100 million seeds annually. Thus, the seabass culture industry in Thailand is now assured of sufficient and consistent supply of seed. In Singapore, the first successful breeding by using hormonal injection has been achieved in 1982 at the Marine Aquaculture Section of the Primary Production Department. Since then, the department has been refining the technique,resulting in an annual production of about ten million seeds in recent years.

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Broodstock Collection and Transport

Since Asian seabass, *L.calcarifer* (Bloch) is a protandrous hermaphrodite, usually younger fish in the age group of 3 to 5 years, 60-120 cm TL and 2-7 kg in weight are males and older fishes in the group of 5-7 years, 110-150 cm TL and 3-12 kg are females. The broodstock for seed production is obtained either by collection from the sea or by raising from young stages in floating net cages in the sea. The hydrological conditions suitable for the stock are: 28 - 31°C temperature, 27-31‰ salinity and more than 5 mg/l dissolved oxygen. The spawners should be healthy, active and free from parasites, diseases and injuries. They are examined once in 3 - 4 months for selection to breeding. In females, the intraovarian ova are sampled by catheterisation and such of those which contain spherical non-adhesive ova with a mean diameter of 0.45 mm or more are taken for induced breeding. Among males, such of those which ooze out white and creamy milt under gentle pressure with hands are suitable ones.

Induced Breeding - Hormonal trreatment

Two hormones are used for induced breeding of seabass viz., Luteinising Hormone - ReleasingHormone (LH-RH a) and Human Chorionic Gonadotropin (HCG), both found to be equally effective, the dosage depends upon the maturity condition and weight of the spawner, lower if the maturity is advanced and vice versa. Generally, the dosage rate for LH-RH a is 6 - 75 µg/kg weight of the fish and for HCG 40 - 250 IU/kg.

Seabass hatchery practices

The experimental seabass hatchery for producing 2,50,000 seeds at a time consists of smaller tanks of fibreglass or concrete of 10 to 40 m^3 capacity in circular or rectangular shape. It has been observed that spawining in larger tanks of 40 - 100 m^3 has produced eggs of better quality than those in smaller tanks. The number of spawners in each tank is so adjusted that for each 1 kg biomass of fish there is 1 m^3 of water. To ensure effective fertilisation, the number of males in each tank should be equal to or preferably one or more than the number of females. Spawning tanks are provided with continuous flow of fresh sea water and moderate aeration. After, hormonal treatment, bulk spawning takes place mostly on the first, second and third days following the day of hormone injection. After spawning, the eggs are collected from the spawning tank by a soft egg collecting hand net (0.2 mm mesh size). These eggs are placed in plastic buckets for separation of unfertilized and fertilized eggs,the former by siphoning them out from the bottom where they sink. For incubating the eggs, small, circular, fibereglass tanks of 1 m^3 capacity provided with moderate aeration are used. The density of live eggs in each tank can be upto 0.2 to 0.3 million. The eggs are 0.80 to 0.85 mm in diameter. The first hatching at a water temperature of 27 - 28°C occurs at about 15-1/2 hours after fertilization and by 16th hour all the eggs are found to hatch out.

Larval rearing

The larvae and postlarvae are reared at first in indoor tanks until they metamorphose into fry, by about the 20th day after hatching. Circular or rectangular tanks of 1 to 40 m^3, provided with a sloping bottom, a drain pipe and moderate aeration are used for this purpose. After cleaning the tanks and the accessories, the healthy eggs are transferred to them about 1 or 2 hours before hatching, at a density of 10,000 to 30,000/m^3. Egg capsules, dead eggs etc are siphoned out. In the after noon of the second day after hatching, the mouth is formed and the postlarvae measuring 2.5 mm TL are ready to feed. To begin with, the postlarvae are fed with the rotifer *Brachionus plicatilis* by adding the latter at a low density of 2 -3/ml of water on the second day. The density is increased to 3 - 5/ml from the 3rd to the 10th days and to 5 - 10/ml from the 11th to the 15th days. By the 11th day the postlarvae measure about 4.5 mm TL and are ready to accept the naupliii of *Artemia*. The rate of supply of the latter is less than 0.2/ml until the 12th day, increased to 0.5 - 1.0/ml from the 13th to the 20th days. The freshwater crustacean *Moina macrura* may also be supplied in small numbers of 0.10 to 0.15/ml from the 18th to the 20th days. To feed the rotifers, the microalgae *Chlorella* and *Tetraselmis* are cultured in plastic bags and are added to the rearing tanks. These algae increase the oxygen content of the water and bring down the concentration of ammonia, thus serving as "water conditioner" for rearing the early stages. In the course of the first 20 days after hatching when they grow to about 8 mm TL, the postlarvae have undergone metamorphosis into fry. They are pigmented dark in colour with vertical stripes and present a brownish appearance.

Fry and fingerlings rearing

On metamorphosis into fry by the 20th day when they measure about 7 - 10 mm TL, they have become stronger and are adaptable to rearing in outdoor tanks and "Hapa" net cages in the sea itself. For outdoor rearing, circular tanks of 1 to 8 m^3 capacity and 0.8 to 1.0 m height are used. Stocking density varies depending upon the size of the fry, 5,000/m^3 for those smaller than 1 cm; 4,000/m^3 for those of 1 - 1.5 cm; and 2,000/m^3 for those of 1.5 - 2.5 cm TL. Generally, hapa cages are used to rear fry of more than 1 cm. These are made of soft, knotless nylon materials with a mesh size of 0.5 to 1.0 mm, in the dimensions of 1.2 m L, 0.6 m W and 0.8 m H. To protect the hapa cages from strong currents in the sea, fibreglass tanks without the bottom are used to enclose them. Survival from the 20th to the 60th day, when the fry attain about 3.5 cm is about 40%. Fry smaller than 1 cm are fed with nauplii and preadults of *Artemia* and *Moina* at rates of 0.25 to 1.0 and 0.15/ml respectively. From the size of 1 to 1.5 cm, they are fed with minced meat of trash fish and *Acetes*. This is done by using a "feeding cylinder", made of nylex and covered with a 3 mm mesh of knotless nylon. The minced food is smeared on the surface of the cylinder and the young ones can be seen pecking at the smeared food. After 1.5 cm the fry can accept minced trash fish alone and they are fed to satiation three times a day, morning, late morning and late afternoon, at a rate of 8% of their body weight. Since

the seabass is cannibalistic, the larger ones eating up the smaller, it is essential to grade them from the fry stage onwards into different size groups. This is effected by using plastic basins with circular perforations of the desired diameter at the bottom, for selecting the larger sizes and for leaving out the smaller ones. The fry are reared in this manner in hapa cages in the sea until they attain about 7 - 10 cm TL, when they are about 2 - 3 months old. At this stage they are ready for stocking in large meshed grow-out net cages and ponds for commercial culture.

Seabass culture practices

Although, net cage culture technologies of this speciess are developed in Hong Kong, Singapore, Malaysia and Thailand, growout culture techniques in ponds have not yet been standardisd. The pilot scale seabass culture in floating netcages under FAO has been established in many Southeast Asian countries such as Malaysia, Indonesia and Thailand since 1976. In Thailand, techniques for the culture of seabass were developed in the early 1970 and considerable progress in the aquaculture techniques for this species has been achieved since that time. Commercial culture of seabass in Thailand produced 300 tonnes of fish in 1981 and 20 million seeds. Since the development of culture techiniques in Thailand, similar operations have been initiated in Philippines, Indonesia, Malaysia, Singapore, Burma, India, Vietnam, Kampuchea, Taiwan and China; and more recently in Australia. Many of these countries are supporting active research in the culture techniques. Indonesia reported 571 tonnes of the product from brackiswater pond culture in 1981. In Malaysia, the cage culture of seabass yielded 2169 kg. In Singapore, the total culture production of seabass from both the netcages and ponds was 1284 tonnes accounting almost 50% of total finfish production from aquaculture in 1986.

In Singapore, net cages are made of synthetic fibres such as polyamide and ployethylene. Depending upon the sizes of seabass stocked, three kinds of net cages are used in intensive culture, viz, Hapa, Nursery and Production net cages. The first two are smaller than the third, measuring from 2 mL x 2 m W x 2 m H to 5 x 5 x 2.3 m H. The hapas are made of knotless netting, while the nursery and production cages are of knotted material. Depending upon the size of the fish to be stocked, meshes of the hapa range from 7 to 10 mm, while those of nurseries from 9 to 25 mm. Production net cages vary from 3 - 5 m L x 3 - 5 m W x 2 - 3 m H, with mesh sizes of 25 to 50 mm. They are either rectangular or square in shape. For setting a net cage, it is lowered in water within its raft frame, the main line is secured tightly to each corner of the raft and each bottom corner is fastened to the lower end of a pipe running through a metal bracket at each corner by a rope system. Anchors used for mooring are of the conventional type such as metal blocks or containers filled with concrete. Fingerlings of 7 to 10 cm TL are stocked in hapa, in the range of 100 - 150/m^3 and reared there for about a month, till they attain the size of 12 -15 cm, TL, weighing 80 - 100 g. In hapa cages the fingerlings are supplied with chopped pieces of trash fishes about 0.3 to 0.7 cm in size, while in nursery cages the size of pieces can be about 1 cm and in prodctuion cages it can

be upto about 25 cm. The rate of feeding in hapa and nurseries is 10% of body weight, while in production cages it is 5 to 8 % of body weight. For fishes of 500g weight or more, only a quantity of about 3 % body weight is needed. Feeding is done once or twice in a day, usually in the morning and/or towards the evening, at slack tides to prevent food particles from being washed off. After 2 to 3 months, the stock measuring 15 - 20 cm TL and weighing about 200 - 250 g is trasferred from the nursery cages in which the stocking density is 45 - 50 m^2, into the production cages the fishes grow to the marketable size of 40 - 50 cm TL and weight of 600 - 800 g. The survival from the hapa stage till harvesting in the production net cages is 90 -95%. A producation net cage of 5 m L x 5 m Wx 3 m H has been yielding 600 kg. after 6 to 7 months of culture. A raft unit of 32 such cages, occupying an area of 5,000 m^2 has been yielding 19.2 tonnes/harvest and 38.4 t/year. After taking into account the expenses, the net profit has been calculated to be Rs.4,50,000/year.

PROSPECTS IN INDIA

In India, seabass can be profitably cultured in ponds, net cages and pens. Most of the traditional culture practices in the country are in ponds. Available information on the culture of this species is scarce with little detail on survival or production rates. Better growth and production results are recorded in the culture of seabass in paddy fields in West Bengal. The estimated production was 2000 - 2760 kg/ha/yr. The experimental culture of seabass in oastal ponds at Tuticorin carried out by the Central Marine Fisheries Research Institute had given encouraging results. In India, successful breeding quite recently achieved by the Central Institute of Brackishwater Aquaculture would go a long way for providing the seeds for commercial culture.