Coastal Pond Farming Technology for Orange Spotted Grouper

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Introduction

Groupers are popular carnivorous fish in the global Live Reef Food Fish (LRFF) trade. The culture of some grouper species is being carried out around the world, and they have the potential to become an important aquaculture species because of high market price, consumer demand, good taste, fast growth, efficient feed conversion, and hardiness. Grouper is a high-value species like tiger shrimp and with the best aquaculture management practices, it is easier to culture without much operational difficulties. The pond culture of the fish is mostly developed in Southeast Asian countries, mainly because of high commercial value in the live markets particularly in Hong Kong, Singapore, and Taiwan. Orange spotted grouper, *Epinephelus coioides* is one of the important farmed grouper species. Coastal pond farming method was developed for orange-spotted grouper by ICAR – Central Marine Research Institute and various methods involved in coastal farming of the species are detailed below.

Pond preparation and water quality

Groupers can be cultured in earthen ponds of 500 m^2 to 1 ha water area. Usually, rectangular shape with 1-2 m depth and uniform pond bottom is suggested for easy harvesting. The pond site should have enough water sources with salinity ranging from 15 to 35 ppt. Pond site selected near to areas with sufficient source of live tilapia will have added advantage for the fish culture. General pond preparation and water treatment followed is more or less similar to the shrimp culture.Water fertilization is to be done by applying either organic or inorganic fertilizers for enhancing the growth of natural food in the pond. Organic fertilizers like cow dung or chicken manure are applied at the rate of 1 ton / ha. Inorganic fertilizers like urea and di-ammonium phosphate are applied at the rate of 50 Kg/ha. However, the dose may be increased or decreased depending on the pond fertility. Stocking of

adult tilapia at 2500 to 5000/Acre is recommended in grouper culture pond, as once this stocked tilapia starts reproducing; they will serve as natural food or prey for the grouper.

Nursery culture of orange spotted grouper in coastal pond based hapa

The optimum stocking size of grouper in grow out culture is 25 to 30 g, and if the available size is small (1-2 inch), then nursing of the fry should be done before stocking in the grow-out pond. Pond based nursery culture in hapa/cage is recommended in the same grow-out pond or in separate nursery culture pond. Rectangular cages/hapas are installed in the pond and are supported with bamboo or casuarina poles. The sizes can vary from 4 x 2 x 1.5 m to x 3 x 1.5 m with mesh sizes of 0.5 mm. The stocking density varies from 200 to 250/m^3. Grading of stocked fry based on size is to be followed on a weekly basis, to minimize the cannibalism.

Fig.1: Nursery rearing of orange spotted grouper in hapa based coastal pond

Feed with higher nutrient content (45% Crude Protein & 10% Crude Fat) is suggested, although chopped or minced trash fish is the most preferred by the fish. The recommended feeding rate in the nursery is 8 to 7% and 15 to 13% for pelleted feed and trash fish, respectively. The fish fry stocked at 2 to 3 g usually takes 60 days to reach 25 to 30 g in size. Adequate aeration should be provided in the nursery pond as the fish fry are stocked at high densities in the hapa. Maintaining a dissolved oxygen level of 4 to 6 ppm is recommended through the use of paddle wheel aerators.

Grow-out culture of Orange spotted grouper in coastal ponds

The grow-out culture phase involves the rearing of grouper juveniles from 25-30 g to marketable size (>1000 g). Nursery reared grouper fingerlings are transferred, a month after tilapia brooders have been stocked in the grow-out pond. This ensures abundant availability of tilapia seeds when grouper fingerlings are stocked. The ideal stocking density for juveniles is 3500/acre. Apart from the live tilapia available in the pond, the fingerlings should also be fed with either dead chopped fish @ 5% of biomass or pelleted feed @ 1% of the biomass.

Table.1: Growth and feeding of orange spotted grouper in grow-out farming

DOC	Fish Size (g)	Feed Size (mm)	Feeding Rate	Feeding Frequency (times/day)
0-60	25-75	1.8 to 3.0	8%	4
60-120	75-150	3.0 to 5.0	6-5%	4
120-180	150-275	5.0 to 6.0	5-4%	3
180-240	275-450	6.0 to 10	4%	3
240-300	450-650	10 to 15	3-2.5%	2
300-360	650-850	10 to 15	2%	2

(Note: When live tilapia available in the pond and the feeding could be reduced 50%)

The feeding rate should be 50% of the usual feeding rate for the fish fed with pelleted feed alone (Table.1). The total feed should be divided and given at the feeding frequency of 2-3 times per day and feeding should be done at the same place to acclimatize the fish for feeding. When chopped fish are provided as feed, adequate care should be taken to avoid the deterioration of water quality parameters. Determining the feeding rate depends on the fortnight growth. Grouper, during sampling, can be collected by a cast net. Based on the weight gain, subsequent feeding should be determined. Though the fish accepts artificial pelleted feed well, but it needs bigger pellet since the fish is having bigger mouth size. The fish being demersal in nature, use of aggregating substratum is recommended during grow-out culture, where the fish can hide and can also be fed at the particular location.

However, at times, it may lead to increase in cannibalism if size difference exists. The fish growth, feeding frequency and feed used is given below.

Fig.2: Grow-out farming of orange spotted grouper in coastal pond

Disease management in coastal ponds

Three major disease-causing agents; parasites, bacteria and virus are mostly responsible for disease in orange spotted grouper culture. All diseases are associated with stress and the stressed fish are easily affected by the pathogens. Therefore, stress during culture should be minimized by maintaining good water quality, optimum feeding and stocking density. Among all, the virus infection can occur from hatchery produced larvae itself, so selecting active seed is an important measure to control the infection. Bacterial infection in the grouper culture can be managed by medicated feeds with admissible antibiotics or use of probiotics in the culture.

Fish harvest and marketing

Orange spotted grouper, being demersal, mostly remains in the bottom. Our observations indicated that the bigger fishes make pits in the pond bottom and remains in the pit. Few methods are employed for harvesting the fish based on the market demand. However, as size variation in the fish is more, phased manned fish harvest would be ideal. If an entire pond is planned for harvest, then the majority are harvested with help of a dragnet and the remaining in the pond bottom, by draining out the entire pond. For phased harvest, hideouts made of PVC pipes or small branches are used. The hideouts are placed usually where feed is given, and the fish congregates in the hideout, then, through the use of cast net or lift net, the fish is harvested. Bigger fishes are collected and smaller fishes are released back for

further growth. A type of production net cage of 6 x 3 x 1.5 m size can be installed in the pond, and the bigger fish collected through the cast net can be stocked in the net cage and fed till marketing. To maintain the freshness and quality of harvested fish, washing in clean water and chill killing is suggested. Harvested fishes are stocked in plastic trays or thermocole boxes by adding layers of ice in equal quantities, both below and above the fish. It is suggested to harvest in the morning hours to maintain the freshness.The fish is highly popular for international trade in live and chilled conditions. South East Asian countries and United Arab countries are the major buyers for the fish. Groupers with their popularity for live fish trade in South East Asian countries, the live fish fetches premium price of 3-4 time higher than the trade, chill fish is another major mode of export to other countries.

Fig. 3: Harvesting and packing of orange spotted grouper cultured in coastal ponds

Economics:

The total operational expenditure and profit for culture of the fish in 1 acre water spread area is given in Table-2. Culturing the fish for one year at the stocking density of 3500 nos/acre will support the farmer with net profit of approximately Rs. 1.5 lakhs with a price realization of Rs. 285/kg.

Table.2: Economics for coastal pond farming of orange spotted grouper

Sl. No.	Particulars	Cost in (INR) (Rs.)
1	Pond preparation and water treatment	40,000.00
2	Seed cost - 3500 nos @ Rs 15/seed	52,500.00
3	Nursery rearing (hapa)	25,000.00
4	Live tilapia culture	25,000.00
5	Feed @ FCR 1:1 (for 2.4 tonnes of fish, approx. 2.5 tonnes of feed @ Rs 110/kg is required)	2,75,000.00
6	Electricity	50,000.00
7	Miscellaneous expenditure (labour for grading)	50,000.00
8	Expenditure (Sl no: 1-8)	517,500.00
9	Production: 2400 kg @ 80% survival with selling price @ Rs 280/kg	6,72,000.00
10	Net profit : (8-9)	1,54, 500.00

Best Management Practices (BPM) for pond culture of orange spotted grouper

The following steps are recommended for the coastal pond farming of orange spotted grouper for better economic returns

- Transportation of fingerlings of 10-15g size in polythene bags should be avoided
- Seed stocking during winter season should be avoided
- Grading in nursery is essential for reducing cannibalism
- Hide –out should be used in grow-out culture pond
- Mixed feeding (artificial and low value fish) helps for better growth

Suggested readings

Ranjan, R., Xavier, B., Santosh, B., Megarajan, S., Ghosh, S., 2018. Copepod parasite *Lepeophtheirus kabatai* (Ho &Dojiri, 1977) infestation in orange spotted grouper, *Epinephelus coioides* (Hamilton, 1822) and its control in captivity. Indian Journal of Fisheries 65 (3), 122-125.

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