

Vibrio species and occasionally by other bacteria, occurs during peak summer season. Hence, stocking of fish during summer should be avoided and the net depth should be maintained at least 3 to 4 m in water for avoiding heat transmission to the stocked fishes. Bacterial infection in fish could be controlled by the use of medicated feeds and probiotics. Fish mortality due to gill choking by silt accumulation is another major problem and can be avoided by frequent cleaning of the cage net.



Fish harvest and marketing

Cage cultured fish remains in a small confined environment, so harvesting the fish is easier than any other culture methods. Immediately after harvest, washing in clean water and chill killing is suggested to maintain the freshness and quality of the harvested fish. Harvested fishes are packed in plastic trays or thermocole boxes by adding layers of ice in equal quantities at the bottom and top of the fish. Apart from bulk harvest, the estuarine cages are also suitable for batch harvest, based on local market demand. Hence, required amount can be harvested daily based on demand.



The most potential states for marketing the fish are Kerala, West Bengal, and selected pockets in Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra. Some of the selected buyers are Maxwell exporters, Kochin, Kerala; MATSYAFED, Kerala; West Bengal Fisheries Development Corporation, Kolkata.

Economics

The total operational expenditure and profit for culture of the fish in a battery of 10 cages is given in Table 2. Culturing the fish at the stocking density of 15 nos/m³ will support the farmer with net profit of approximately Rs 8.0 lakhs/year.

Sl. No	Particulars	Cost (lakhs)
1	Depreciation value on cage and accessories with an average life of 5 years (Cost of cage and accessories: Rs 1,36,400/unit) and depreciation is Rs 23,700/unit/year	2.73
2	Seed cost - Rs 15750 nos @ Rs 15/seed (Including transportation): 1500 nos/cage and additional 5% to compensate mortalities till nursery rearing	2.36
3	Nursery rearing in hapa	0.5
4	Feed @ FCR 1:1.60; Total of 17.30 tonnes of feed (based on FCR and production from column 8) @ Rs 110/kg	19.03
5	Labour cost @ Rs 12,000/ labour/month (12 months) (Including watch and ward)	1.44
6	Miscellaneous expenditure including electricity and feed medicines and probiotics	1.0
7	Expenditure (Sl no: 1-6)	27.06
8	Production: 10.80 tonnes @ 85% survival with harvest size of 850 g at selling price @ Rs 325/kg	35.1
9	Net profit: (8-7)	8.04

Best Management Practices for Coastal cage culture of Indian pompano

- ☛ Cage should be installed at a location with optimum current speed and the location should be at least 5 km away from sea.
- ☛ Fish fingerlings of > 25g should be stocked to obtain maximum survival
- ☛ Feed mesh of 1 mm mesh size should be attached with inner cage net for avoiding feed wastage
- ☛ Feed should be broadcasted slowly in cages to ensure its accessibility to all fishes and avoiding feed wastage.

☛ Periodical monitoring of fish, cage net and other cage system is essential.

☛ Continuous observation for vibriosis and gill choking to ensure that the fishes are free from the disease, and immediate treatment of the infected fishes.

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Coastal Cage Farming of Indian pompano



Introduction

Cage farming technology is widely recognized as one of the most important culture technologies in mariculture for increasing fish production. High saline estuaries are one of the unified ecosystems, considered for improving livelihood of selected rural population. In India, huge estuarine resources are available bordering the coasts and this potentially available under-utilized high saline waters bodies, could be efficiently utilized by culturing different species of finfishes in cages installed thereof. Different species of marine finfishes can be cultured in high saline estuarine cages and Indian pompano (*Trachinous mookalee*), is one such suitable potential candidate species. Pompano is a preferred species for cage culture with the following characteristics; quick adaptability to different culture conditions, ease of accepting artificial pellet feed, tolerant to wide range of salinity, fast growth rate and high consumer preference. Understanding the culture characteristics of the fish, breeding and seed production technology for the species was developed at Visakhapatnam Regional Centre, Central Marine Fisheries Research Institute (ICAR), under Indian Council of Agriculture Research (ICAR) and subsequently, the coastal cage culture was standardised and demonstrated under Blue Revolution Scheme in different parts of Andhra Pradesh, with financial support from National Fisheries Development Board (NFDB), Government of India. Various steps involved in cage culture of the species are explained below.

Cage site selection

The selected site should be free from pollutants, away from human inhabitants, with optimum water flow, and should be at least 5 km away from sea mouth. Water temperature: 26–30°C, water depth: 4–10 m, continuous water movement for better dissolved oxygen content. The selected place should have easy accessibility for reaching the cage site.



Optimum speed of water current during high and low tides is essential. If the current speed is more, then continuous force will be applied on cage mooring and net structure, which

may lead to frequent shifting of cage positions. Pressure due to water current will affect the net structure, which will impact fish movement and cause stress to the fish.

Cage structure

Square shaped cages made of Galvanized Iron (GI) pipes (B-class) of 1.5-inch diameter with inner dimensions of 5 m long x 5 m wide is preferred. In cage design, the base pipes and handrails are important, the handrail is placed at a distance of 0.8 m above the base pipes for ease of operation. Two base pipes are placed in parallel at a distance of 1 foot apart and working space is created with the help of wooden planks or steel plates for use during feeding and sampling. Air-filled barrels (200 lit) are attached to the cage frame for floatation, and a total of 8 such barrels are used, two each at the four sides of the cage. HDPE braided nets are suitable with outer net of 63 ply, 40 mm mesh (6x 6m size and 4 m depth) and 3 mm twine thickness; inner net of 63 ply, 25 mm mesh (5x 5m size and 4 m depth) and 3 mm twine thickness; bird's net of 80 mm nylon mesh are preferred for fish culture. The cage structure is stabilized in the water with the help of iron anchors (4 numbers; each 50 to 75 kg in weight). The anchors are connected to the cage with the help of 24.0 mm diameter poly propylene ropes or steel chains. As bottom in estuaries is predominantly clayey soil, use of toothed anchor is recommended to have good firm grip on the bottom. Shape and volume of the net is maintained in the flowing water with the help of ballast pipes made of 0.5-inch diameter perforated GI pipes. Ballast pipes should be directly hanged from the base pipe for ease of operation.



Nursery rearing

Optimum size of the fish for stocking is 20 to 25g. The fish stocked at the optimum size takes nearly 10 months to attain the market size of more than 750 g. However, the culture duration could be further reduced if the fish stocked are of bigger sizes. Thus, nursery culture of Indian pompano is considered as an important aspect in cage culture for reducing the culture duration. Three types of nursery systems are suitable for Indian pompano with respect to cage culture:

1. Flow-through based FRP or concrete tank nursery culture.
2. Recirculating Aquaculture System based nursery systems.
3. Earthen pond-based nursery systems.

These nursery facilities should be established near cage site for ease of fish transfer. The nursery reared fish seeds are transported to cages either in oxygen filled polythene bags or in containers supported with oxygen depending on the distance.



Grow-out culture

The optimum stocking density suggested is 15 nos/m³, and thus, the cage can be stocked with 1500 numbers of fish seed. Artificial pelleted floating feed of high nutrient content (40% CP & 10% CF) is recommended for better growth. While feeding, feed should be broadcasted in the middle of the cage to avoid feed wastage due to drifting through net mesh along with wind action. Thus, to avoid feed wastage, feed mesh net of 1 meter depth should be attached in the inner cage net. For better feed digestion and assimilation, a minimum time gap of 3 hrs should be given between two feeding schedules, thus the feeding frequency should be decided accordingly. Feeding frequency of four times daily is found to be good for growth of the stocked fishes and since the estuarine cages are easily accessible, at least four times (6.0 AM, 10.0 AM, 2.0 PM & 6.0 PM) daily feeding is recommended. In grow out culture, fish growth should be monitored fortnightly and feeding rate to be adjusted based on the weight. Based on several demonstrations, if the fish fingerlings of 20 to 25g are stocked at 15 nos/m³, then it takes nearly 10 months for it to reach the size of 750-850 g, whereas if it is stocked at 100g size, it takes 5 months to reach the same size. Most of the estuaries are abundant in small fishes and other small marine organisms; therefore, probability of feeding on these small animals by the cultured fish is more, and resulting in better growth. The fish growth and optimum feeding rate is given in the Table 1. Most of the estuaries are prone to floods during monsoon, thus the fish culture is possible for a maximum of 8-10 months, and hence, grow-out culture should be planned accordingly by efficient management of nursery system to achieve the complete cycle.

DOC	Fish Size (g)	Feed Size (mm)	Feeding Rate (%)	F.F (time/day)
0-30	25 -50	1.2-1.8	8-6	5
30-120	50-200	1.8-3.0	6-5	4
120-180	200-400	3.0-4.0	5-4	4
180-210	400-650	4.0-6.0	4-2.5	4
210-300	650-900	6.0-10.0	2.5-1.5	3

(Note: F.F – Feeding frequency)



Cage structure management

Cage culture of Indian pompano requires culture duration for 10 months, thus the cage structure should be managed well and it includes net exchange, cage frame cleaning and mooring checking. The cage net is the structure which holds the fish, and is prone to barnacles, mussel seed attachment and silt accumulation. Thus the net needs to be exchanged periodically depending on the accumulation. This attachment and accumulation depends on the season and the location. Based on the experience on coastal cages in Andhra Pradesh, silt accumulation is the major problem. On the other hand, in small creeks, cage nets are mostly infested and attached with green mussel seeds. Periodical cage net exchange is required in places where mussel attachment is more, whereas, in places with mostly silt accumulation, washing of cage nets by water spray using jet pipes is sufficient and net exchange is not required. Cage mooring helps to keep the entire cage structure in position, thus the mooring chain requires continuous monitoring, at least once in a month.

Fish management

The cage cultured fish should be periodically checked for its feeding and health status, and thus sampled fortnightly. The major possible health issues in estuarine cages are bacterial infections and gill choking. Bacterial infection is mostly by