Chapter.08
Farming of Cobia and Snubnose Pompano

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Cobia fish is popularly known by the common names- Black kingfish, Black salmon, runner or sergeant fish, crab eater and Sea Murrel. It is considered as a promising candidate species for farming due to its fast growth rate, excellent meatattributes and easy adaptability to farming conditions. Being the only member of the family Rachycentridae, it is found in the warm, temperate to tropical waters of the West and East Atlantic, throughout the Caribbean and in the Indo-Pacific off India, Australia and Japan. To date, research and development of cobia aquaculture has been initiated in over 23 countries and territories, half of them in the Asian-Pacific region. Statistics of FAO (2018) shows that the global aquaculture production of cobia has been increasing rapidly from only 9 tonnes in 1997 to 43,100 tonnes in 2016. Since the late 1990s, cobia aquaculture production has been steadily expanding in Asia, primarily in Taiwan, Vietnam and China and also in other Southeast and Indo-Pacific Asian countries including the Philippines, Indonesia, Iran and Reunion Island. Although the majority of cobia aquaculture production currently comes from China, most of the detailed information about culture and grow-out methods is reported from Taiwan Province of China. The fast growth rate, adaptability to captive breeding are the major attributes which makes cobia an excellent candidate species for mariculture. The meat of cobia is served raw, called as *Sashimi,* at the restaurants in the Southeast

Duration	Length (cm)	Weight (g)
Week – 0	7.1 ± 0.1	2.2 ± 0.1
Week – 1	10.0 ± 0.2	4.2 ± 0.1
Week – 2	12.0 ± 0.1	5.5 ± 0.2
Week – 3	13.5 ± 0.2	13.6 ± 0.6
Week – 4	15.2 ± 0.4	23.3 ± 0.6

The growth recorded during nursery rearing is provided below for reference

Asian countries. India is a late starter in cobia research and the fingerling production of cobia was achieved for first time in India by the Mandapam Regional Centre of Central Marine Fisheries Research Institute (CMFRI) and later the farming protocols in the High Density Polyethylene (HDPE) cages and Galvanized Iron (GI) cages with different stocking densities, feeding strategies were developed, tested and validated. Out of these farming trials an economically viable farming method has been evolved. Farming of Cobia in sea cages was also successfully demonstrated by CMFRI all along the coasts of India. Subsequently, the Rajiv Gandhi Centre of Aquaculture (RGCA) under the Marine Product Export Development Authority of India (MPEDA) also contributed to the cobia fingerling production and farming in India.

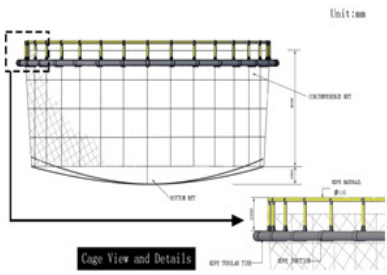
Nursery rearing should be carried out for a period of one month to make the fingerlings into a cage stockable size of 20 grams. The nursery rearing of juveniles could be carried out in 10 tonnes capacity tanks or sea cages (6 meter diameter) fitted with smaller mesh sized nets. If the nursery is carried out in cages, it is pertinent to clean or brush the nets daily to maintain the free flow of seawater. If nursery is carried out indoor, adequate water quality and optimum aeration should be maintained in the tanks. Recommended stocking density in indoor nursery tanks is 1 number per 10 litre with 200% water exchange and for nursery cages it is 1.8-3.0 kg/m3. Suitable sized artificial feeds (800 – 1800 micron diameter) should be provided during nursery rearing. Floating or slow sinking pellet feed with 50 % crude protein and 10% crude fat composition would be more suitable for successful nursery rearing. Such high protein and fat containing nursery feeds are available in India at an affordable price. Storage of such feeds plays a vital role in maintaining the quality during their shelf life period.

Farming in cages

The cobia can be farmed in sea cages made of High density Polyethylene (HDPE) or galvanized iron (GI) pipes. The HDPE cages will last for 10 - 15 years, while the GI cages will last only for a maximum of three years even after good maintenance. But, the initial investment would be much lesser, if the GI cages are used.

Design and structure of cages

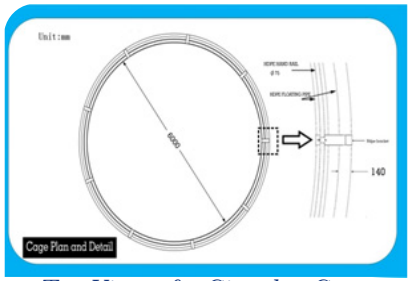
The grow-out culture can be carried out in circular floating sea cages of 6 meter diameter. The cage frames can be made up of HDPE pipes or GI pipes. The handrail has to be fixed at one meter height from the base. The space between the inner and outer rings of the cage could be kept as one meter. The net cages are fabricated with HDPE ropes of 2.5 mm thickness and the mesh size of 20 mm and 40 mm for inner net cage and 60 mm for outer net cage. The depths of the net cages are maintained at 3.5 - 4.0 meters from the base. The shape of the net cages is maintained with a circular ballast. The schematic diagrams with measurements of HDPE and GI cages are given below for better understanding.



Schematic diagram of a circular cage

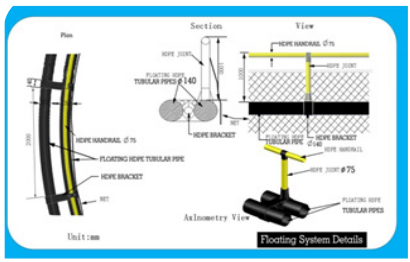
Site selection

Selection of suitable site for sea cage farming is essential for smooth and easy farming operations. A healthy seabed having sandy soil is necessary in keeping satisfactory water quality. Cage farming produces organic wastes like residual fish feed, fish waste and fish carcasses. Under normal conditions, these waste materials are consumed by



Top View of a Circular Cage

wild fishes, crabs, sand dwelling organisms or flushed through the water current. Cages have to be moored at appropriate depth having enough space between the net bottom and sea floor (minimum 2 – 3 meters), so as to allow the waste materials to move from the cage farming area through water currents. When a cage is moored in low depth area with poor planning such



Measurements of HDPE cage frame structures

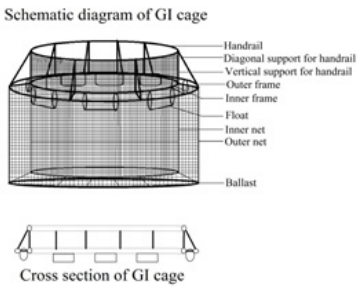
as over density, over feeding or improper disposal of dead fish will increase load of organic matter in the water body and will cause problems like turbidity, anoxia, death of benthic species and increase in bacterial growth. The cage farming site should have minimum depth of 6 meters depth during low tide, when a cage net depth is maintained at 3.5 meters. Dissolved oxygen level is comparatively lower at the sea floor and fishes cultured too close to the sea bed may suffer from anoxia.

Optimal Stocking density

As fishes grow, they need more space for movement however, the space in net cage is limited. Therefore, it is necessary to stock optimum number of fish fingerlings. Overstocking will weaken the fish resulting in higher risk of bacterial, viral or parasitic infection. Higher stocking densities may also lead to insufficient levels of dissolved oxygen to sustain the entire stock. During low tide and poor water current, non-availability of required level of dissolved oxygen leads to anoxia and death. Acage with 6 meter diameter having a net depth of 3.5 meters can be stocked with 900 numbers of cobia fingerlings.

Acclimatization and stocking of fish fingerlings

Cobia fingerlings procured from the hatchery needs to be acclimatized to the new environment to get better survival and growth. If any abnormal behaviour or symptoms of infection are noticed, such fingerlings have to be isolated and reared separately. To avoid spreading of diseases, fingerlings infected with pathogens should be given proper treatment. Approved disinfectants/antibiotics can be used for treating the diseases in consultation with the fisheries officials/ CMFRI scientists. Excessive use of disinfectants or therapeutic drugs will lead to problems like increasing organic matter in the water, excessive drug residues in the fish, drug resistance in bacteria. Further, it is a wastageand may also have adverse impact on both the environment and the health of fish.



Schematic diagram of GI cage with nets and floats

Management of Bio-fouling in net cages

Cage farming activities enrich the sea with nutrients, this coupled with warm water temperature, forms an ideal habitat for fouling organisms like barnacles, mussels, sea weeds and algae to grow on the net and cage surfaces. Proliferating fouling organisms not only consume a great deal of dissolved oxygen, but also block the meshes of nets and impede effective replenishment of dissolved oxygen in sea water inside the cage area. Fouling organisms may also add weight to the cage nets and cause damage to nets and sinking of the cages. To avoid this situation, cage nets have to be cleaned regularly to prevent the colonization of fouling organisms. The cage nets have to be inspected regularly and repairing of torn or damage parts and exchange of nets having more fouling needs to be undertaken. Net cages can be changed based on the subjective assessment of fouling of the net in order to have sufficient water exchange. Normally net cages have to be changed once in 45 to 60 days depending on the intensity of bio-fouling. Nets having high level of fouling needs to be dried under sunlight through prolonged exposure and all the barnacles and algal attachments on the nets need to be cleaned. Repairing of any damage found in the cage unit including mooring system would help to maintain the buoyancy as well as healthy cage frame.

Feed Management

Fish feed forms a major part of the operational expenditure for cage farming of cobia. Proper feed management strategies would help to reduce overall production cost. Optimal use of feed also helps to improve the farming environment and ensures the health of fish stock. Fish feed management includes choosing the right feed, following correct feeding methods, feeding the optimum quantity and cost effectiveness. Feeding of cage farmed cobia fishes with appropriate quantity and quality feeds will prevent the presence of excessive organic matter and mitigate problems like low dissolved oxygen and bacterial growth. Use of extruded formulated pellet feed instead of low value fish/trash fish will help to reduce organic matters in water. If the formulated feeds are not readily available at affordable price, farming can be taken up by feeding with low value fishes and by-catch. The juveniles of cobia have to be fed @ 5 to 10% of total biomass of fish with chopped low-value fishes (sardine, lesser sardine, rainbow sardine, etc.) twice daily up to two months of culture. As a thumb rule, the feed

can be provided initially at the rate of 10 % of the biomass which can be slowly reduced to 8% and then to 5% as the fish grow. The timing of feeding should also be maintained, feed them at about the same time of the day, preferably early in the morning or late in the afternoon as the fishes will automatically get used to the timing and will also come near the surface when they hear the sound of the boat.Feed quantity has to be reduced when the fishes are under stress or during rough weather or during low water temperature. Feeding has to be done slowly to give enough opportunity to all the fishes to feed. In general, marine fishes require high level of protein (35 to 40%) and fat (8 to 10%) for their metabolic activities and growth.

Growth assessment

Random sampling can be carried out at the time of net exchange with the sample size of at least 30 cobia fishes per cage. The entire grow-out culture is carried out for a period of 6-8 months. The growth details of cobia as recorded in sea cages at a stocking density of 8 Nos./m3 are given below for reference:

Duration	Length (cm)	Weight (g)
Month – 1	21.5 ± 0.3	70.8 ± 2.4
Month – 2	22.4 ± 0.6	94.1 ± 1.3
Month – 3	26.0 ± 0.8	125.3 ± 2.5
Month – 4	32.9 ± 1.1	468.5 ± 27.8
Month – 5	46.3 v 1.0	1109.3 ± 87.7
Month – 6	56.4 ± 1.1	1985.5 ± 92.3
Month – 7	73.5 ± 1.0	3316.2 ± 57.6
Month – 8	77.9 ± 1.1	4015.4 ± 74.0
Month – 9	85.7 ± 0.9	4851.1 ± 88.8
Month – 10	90.8 ± 1.2	5622.4 ± 146.5
Month – 11	96.6 ± 1.6	6291.8 ± 138.9
Month – 12	103.0 ± 1.7	7276.6 ± 148.6

Better Management Practices in sea cage farming of cobia

The better management practices need to be adopted to satisfy public demand and expand the market by offering quality aquaculture products that meet food safety standards. Adoption of BMP's also helps fish farmers to achieve greater economic returns. Some of the key factors in BMP includes:-

- Proper acclimatization of cobia fingerlings prior to stocking.
- Avoiding over-stocking of cobia fingerlings
- Care feeding of cobia fingerlings using of dry pellets to allow all the fishes to get equal ration of feed.
- Monitoring the growth rate and sub-dividing cobia fingerlings/juveniles in different cages at appropriate time intervals.
- Cleaning and regular exchange of cage nets for effective water exchange.
- Close observation of fish behaviour while feeding them to assess the health status.
- Proper removal and disposal of dead fishes.
- Usage of approved feed supplements and additives as recommended by the fisheries officials and CMFRI scientists/technical staff.
- Regular prophylactic treatment of fishes with disinfectants and dipping in fresh water.
- Periodic monitoring of dissolved oxygen level, pH value, water temperature, etc.
- Observing the weather conditions, changes in seawater quality, and emergence of red tide etc.

Farming of Pompano

Among the many high value marine tropical finfish that could be farmed in India, the silver pompano, Trachinotus blochii is one of the topmost, mainly due to its fast growth rate, good meat quality and high market demand. This much sought after species silver pompao is caught only sporadically in the commercial fishery and hence its availability is rather scarce and hence the demand can only be met through aquaculture. The aquaculture of pompano has been successfully established in many Asia-Pacific countries like Taiwan and Indonesia. The farming can be successfully carried out in ponds, tanks and floating sea cages. The species is pelagic, very active and is able to acclimatize and grow well even at a lower salinity of

about 10 ppt and hence it is found suitable for farming in the vast low saline waters of our country besides its potential for sea cage farming. This species readily accept artificial feeds and has a rapid and uniform growth rate (Chavez et al., 2011). In India, this fish is known in various vernacular names in various parts of the country like paarai or seevani paarai in Tamil Nadu. And sandhuva paara in Andhra Pradesh. The maximum recorded length for pompano from wild catch is 110 cm FL and weight is 3.4 kg. In culture conditions, the silver pompano gains a weight of around 450-500 gm in eight months, from the initial stocking weight of around 2 gm.

Farming practices

The silver pompano can be farmed either in sea cages or in ponds. The various aspects related to cage design, fabrication and cage management practices are given under the section on Cobia farming which is similar in case of pompano farming also. A stocking density up to 20 nos./ m3 is possible in sea cages. During cage farming, important aspects are the net cage maintenance and changing of nets. The farmers involved in cage farming should practice changing of nets in the sea at the farming site instead of dragging the cages to near shore areas for such exchanges. This might stress the fishes and weaken them. The timing of feeding should also be maintained as the fishes will automatically get used to the timing and will also come near the surface when they hear the sound of the boat. In India, suitable pellet feed for grow-out farming of this species is commercially available now.

Details of feeds and feeding of silver pompano *T. blochii*

Weight of the fish (g)	Feed size (mm)	Crude* protein (%)	Crude fat* (%)	% biomass feed/day	No. of feeding / day
< 1	0.8 - 1.0	50	12	20	4
1 – 10	1.0 - 1.5	45	10	10	4
10 – 100	1.8	45	10	5	3
100 – 250	3.5	40	10	4	3
250 – 500	4.5	40	10	3	3

*Other ingredients of feed includes: Crude Fibre: 2.5-5.0 % Max; Crude Ash: 15.0 % Max; Calcium: 2.0 % Min; Phosphorus: 1.5 % Min; Moisture: 5.0 - 8.0 % Max; Mineral and Vitamin Premix

Pond farming

In pond farming, while it is advisable to stock only 1.5-2 nos./ m3 in ponds. water quality parameters like optimal algal growth, pH and dissolved oxygen content could be maintained by exchanging 10% of the water once a week for the initial period of three months; 20% per week after 3 months and 30% per week after 6 months. If water colour is too dark due to algal bloom, the quantum of water exchange could be proportionately increased. Other water quality parameters can be maintained similar to shrimp culture. Use of paddle wheel aerators is advised when the fishes reach a weight of 150 gm size, whenever it is necessary. Details on feeds, feeding frequencies and growth characteristics, as observed in pond condition, are provided below for ready reference. However, for sea cage farming of pompano, feed with higher percentage of crude protein and crude fat is required to achieve good growth.

Growth of pompano in terms of length and weight during the pond farming (mean ± SE)

Days of Culture (DOC)	Growth (mm)	Weight (g)
1	30.59 ± 0.24	2.00 ± 0.04
15	49.84 ± 0.36	9.05 ± 0.08
30	73.42 ± 0.53	15.08 ± 0.16
45	85.02 ± 0.80	22.59 ± 0.23
60	102.88 ± 1.91	34.60 ± 0.41

75	137.78 ± 1.81	54.72 ± 1.62
90	158.39 ± 2.42	72.54 ± 1.95
105	168.80 ±1.73	80.02 ± 2.67
120	182.30 ± 2.03	101.82 ± 3.11
135	186.02 ± 2.82	138.78 ± 4.49
150	203.71 ± 3.73	172.39 ± 4.55
165	224.17 ± 3.16	220.05 ± 3.54
180	226.51 ± 2.90	258.31 ± 5.76
195	248.13 ± 3.21	303.72 ± 4.49
210	273.07 ± 3.62	375.32 ± 8.07
225	288.36 ± 5.19	416.60 ± 7.72
240	296.88 ± 6.27	464.65 ± 10.25