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SITE AND SPECIES SELECTION IN SEA CAGE AQUACULTURE

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Introduction

Cage culture is an utilisation of existing water bodies with little or no economic costs. The selection of a suitable site for a cage farm is indispensible for their effective function, particularly in relation to proper water quality within the cage and reduced environmental impacts around the cage and for the economic viability of the cage farm. The natural tolerance of species should be studied for assessment of suitable site.

Criteria for selecting a site for marine cage culture:

1. The cage site should be of suitable depth, have good tidal flow with optimal conditions and ideally be protected from strong winds and rough weather.

2. Good water exchange is essential at cage farm sites to replenish oxygen within the cages and to prevent build-up of wastes beneath the cages. Sites with a slower water exchange rate may be preferred in cases where nature is relied upon for supplemental feeding.

3. Cages should be placed at some distance from navigation routes as waves created from the wake of passing vessels may pose physical damage to cage structures.

4. Cage sites should be free from waste disposals from industries and from municipal, industrial and agricultural runoff.

5. It is necessary to allow sufficient depth under the cage in order to maximize water exchange, avoid oxygen depletion, accumulation of debris and build-up of some noxious gases generated by decomposition of the deposited wastes.

6. Site with sloping areas from the shore leading to flat bottoms are suitable for cage culture because the waste build-up at the bottom is easily eliminated.

7. Site selection criteria should also include accessibility to the cages and the ability to move them out of potential harmful events such as algal blooms and/or low DO events.

8. Sites with high fouling rate and more frequent toxic algal blooms occurrence should be avoided.

9. Sites in which pathogenic or potentially pathogenic organisms exist prior to establishment of the farm should be avoided.

10. Bays, straits and inland seas are ideal sites for cage culture provided these sites are protected from strong winds and rough weather and have sufficient water movement.

11. Water quality parameters, such as temperature, pH, nitrogenous compounds, dissolved oxygen, etc. in the cage sites should be within the optimal ranges that provide life support and growth for the cultured species.

12. The last criteria that must be addressed are: legal requirements, support personnel and facilities, security, and management strategies.

Table 1: The optimal water quality and tidal parameters in the sea cage culture sites

S.No.	Environmental factors		Optimal range
1.	Temperature (^oC)	:	27–31
2.	Salinity (ppt)	:	< 25 – 40
3.	Dissolved oxygen (DO)	:	5 ppm or more and never less than 4 ppm for pelagic fish or 3 ppm for demersal species
4.	pH	:	7.8 to 8.5.
5.	Suspended solids (ppm)	:	< 10
6.	Optimum transparency (Secchi disk visibility)	:	< 5 m
7.	Total inorganic nitrogen (ppm)	:	< 0.1
8.	Nitrite (NO_2-N) (ppm)	:	< 4
9.	Nitrate (NO_3-N) (ppm)	:	< 200
10.	Total inorganic phosphorus (ppm)	:	< 0.015
11.	COD (Chemical Oxygen Demand) (ppm)	:	< 1
12.	Chlorine (ppm)	:	< 0.02
13.	Total mercury (Hg) (ppm)	:	< 0.05
14.	Lead (Pb) (ppm)	:	< 0.1
15.	Copper (Cu) (ppm)	:	< 0.02
16.	DDT (µg/l)	:	< 0.025
17.	Depth	:	6 – 10 m during low tide

18.	Maximum permissible wind velocity limit	:	10 knots for floating cage
19.	Maximum limit of wave height	:	1m for floating cage
20.	Permissible current velocity range	:	0.05 to 1 m/sec
21.	Tidal amplitude	:	< 1 m

Selection of species for cage culture:

The selection of fish for culture should be based on biological criteria, such as physiological, behavioural characteristics and level of domestication; marketing criteria, for example, demand, price, process and production for its trade; and environmental criteria, for example, temperature, distribution and habitat for growth.

Criteria to be followed to select the species for sea cage farming are

1. Species selected must have a good demand and high market value.
2. Species should be cost - effective for farming.
3. Species should be hardy and tolerant to confined, crowded conditions and to the rigours of handling during net cage changes.
4. Species should accept external source of food under confined conditions.
5. The availability of seed either through wild collection or hatchery produce, has to be considered while selecting the species, otherwise farming becomes unpredictable.
6. Species selected for cage culture should have fast growth rate, efficient food conversion ability and disease resistance.

Conclusion:

To establish a cage culture system, a thorough knowledge of site, where the cages are to be installed, is required, which can be met with the data available with Government organizations, local people as well as extensive field surveys undertaken to understand the topography and water and sediment quality. CMFRI has established sea cage aquaculture farms in 7 maritime states and has technology for broodstock development, breeding, larval rearing and grow out for 5 marine species.

CMFRI Sea Cage Aquaculture farms along West coast of India

S.No.	Cage farms information	Cage sites
1.	Location: **Veraval, Gujarat** Cage: 6 m dia, GI circular floating cage Site: protected by breakwaters Species: *Rachycentron canadum* (Cobia), *Panulirus polyphagus* (Lobster)	
2.	Location: **Srivardhan, Raigad dist., Maharashtra** Cage: 6 m dia, GI circular floating cage Site: Semi enclosed bay Species: *Panulirus polyphagus* (Lobster)	
3.	Location: **Achara, Sindhudurg dist., Maharashtra** Cage: 6 x 6 m, GI rectangular floating cage Site: open sea Species: *Trachinotus blochii* (Silver pompano)	
4.	Location: **Bharadkhol, Raigad dist., Maharashtra** Cage: 3 m dia, GI circular floating cage Site: open sea Species: *Panulirus polyphagus* (Lobster)	
5.	Location: **Karwar, Karnataka** Cage: 6 m dia, GI cage; 3 m dia, GI cage and 15 m dia HDPE cage – circular floating cage Site: Semi enclosed bay Species: Cobia, Silver pompano, Sea bass and *Acanthopagarus latus* (Sea bream)	

6. Location: **Cochin, Kerala**
Cage: 6 m dia, GI cage – circular floating type
Site: Open sea
Species: *Lutjanus argentimaculatus* (Mangrove red snapper)

CMFRI Sea Cage Aquaculture farms along East coast of India

S.No.	Cage farms information	Cage sites
1.	Location: **Balasore , Orissa** Cage: 6 m dia, HDPE cage – circular floating type Site: Open Sea Species: Sea bass	
2.	Location: **Vishakapatnam, Andhra Pradesh** Cage: 6 m dia, HDPE cage – circular floating type Site: Open Sea Species: *Epinephelus malabaricus* (Greasy grouper)	
3.	Location: **Manadapam Camp, Tamilnadu** Cage: 6 m dia, GI cage and HDPE – circular floating type Site: Open Sea Species: Cobia and Silver pompano	

CAGE AQUACULTURE FARMS OF CMFRI IN INDIA

Species cultured in sea cage farms in India by CMFRI

Rachycentron canadum (Cobia)

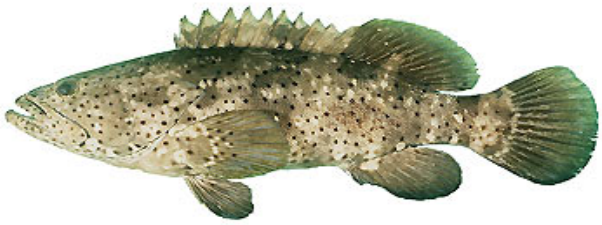
Trachinotus blochii (Silver pompano)

Lates calcarifer (Sea bass)

Lutjanus argentimaculatus (Mangrove red snapper)

Acanthopagarus latus (Seabream)

Panulirus polyphagus (Spiny lobster)



Epinephelus malabaricus (Greasy grouper)

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