

- Optimum size for culture of locally demanded fishes-pearlspot, mullet and milk fish - more than 4-5 cm, red snapper and seabass-10-20 cm.
- For cage size of 2m\*1.5m\*2 m, omnivorous and algal feeders can be stocked about 600-800 nos and carnivorous fishes can be stocked at a rate of 250- 500 nos (depends of size of initial stock)
- For algal feeders, it will be better to keep spilt bamboo inside the cages for algal development
- Carnivorous fishes can be fed with chopped discards (ghost crabs, small weed fishes and molluscs etc) obtained in normal fishing activities
- Mussels will feed on the plankton available in the water and organic materials near the cages through filter feeding.
- Either monoculture or polyculture of pearlspot, mullet and milk fish in combination with mussel.
- For carnivorous fishes, monoculture with intense feeding will give better growth rate within 6-8 months. Mussel ropes can be attached to the poles of the cage.
- It is a continuous stocking and harvesting system; hence, according to the local market demand, farmers can harvest the fishes.
- Stocking will be carried out during October-November and final harvesting is carried out during the month of May - June (trawl ban period) for getting for more price from nearby resorts.

### Harvesting and marketing

The harvesting is carried out before the onset of monsoon. The range of average weights obtained by red snapper/seabass, Etroplus and mussel will be 0.8 to 1 kg, 0.15 to 0.3 kg and 0.03 to 0.045 kg respectively. These produce can be marketed in fresh form at the local whole sale markets, retail markets and resorts and restaurants.

**Table 1. Economics of the low cost cage culture system involving three cages (Pearlspot- 2 cages and red snapper 1 cage)**

Particulars	Amt.Rs.
<b>Capital Investment</b>	
Land	12500
Bamboo poles	1500
Nylon rope	1800
Coir rope	500
Nylon cages	6000
Others	1000
<b>Total</b>	<b>23300</b>
<b>Annual fixed cost</b>	
Lease value of land	3000
Interest @10% per annum	2330
<b>Depreciation</b>	
Bamboo poles (50% per annum)	750
Nylon rope (50% per annum)	900
Coir rope (50% per annum)	250
Nylon cages	3000
Others (50% per annum)	500
Total depreciation	5400
<b>Total</b>	<b>10730</b>
<b>Operating Cost</b>	
Labour for Rack construction	1500
Muslin cloth	375
Mussel/finfish seed	720
Harvesting and Marketing	2000
Feed	1000
Others	1000
Transportation	3000
Total	9595
Total cost	20325
<b>Returns</b>	
Production (kg)	201.1
Average farm gate price (Rs./kg)	265.66
Income	53425

**Table 2. The species wise survival, production and returns from aquaculture systems.**

Number of cages/ropes	1 cage	2 cages	15 ropes	Total
Species	Red snapper	Pearlspot	Mussel	
Number of seeds	100	400	3500	
Survival rate (%)	70	72	70	
Total survival (no)	70	288	2450	
Average individual weight at harvest (Kg)	1	0.2	0.03	
Total production (Kg)	70	57.6	73.5	201.1
Unit price (Rs./kg)	400	250	150	
Total Returns (Rs.)	28000	14400	11025	53425

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## Low cost cages for capture based aquaculture in coastal waters



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## Low cost cages for capture based aquaculture in coastal waters

### Introduction

Goa state encompasses huge potential for coastal fishery enhancement with the unutilised coastal water bodies. Thus, there is ample scope for coastal aquaculture to improve coastal fish production in Goa. However, there is a lack of adaptive culture systems and techniques for coastal aquaculture in Goa. To address this situation, ICAR-CCARI has standardized a technology of low-cost cages for capture based aquaculture involving multispecies in coastal waters off Goa.

### Technology standarised for coastal waterbodies

This aquaculture system is a continuous stocking and harvesting system where nylon cages are used. The finfishes like red snapper (*Lutjanus argentimaculatus*) and pearlspot (*Etroplus suratensis*) were cultured in combination with a shellfish species, Green mussel, *Perna viridis* for a period of eight months. These species are selected on the basis of availability of seeds and marketability. These types of culture systems are suitable for the coastal khazan areas (Manas- sluice gate operating areas). Normally the traditional fishermen are operating bag nets attached to sluice gates during low tide. Finfish seeds obtained as a by-catch during the fishing operations (Average size: Pearlsport: 40-50 mm, Red snapper:100-200 mm) were separately stocked in nylon cages of dimension 2m\*1.5m\*2 m positioned using bamboo poles. Mussel seeds (Average size 32 mm) collected from the wild were stocked (1kg/bag) in pre-stitched cotton mosquito net bags centred with nylon rope (Length-1m, diameter-14 mm).

The bags were hung from the bamboo poles used for fixing the hapa. In finfishes, red snapper was



fed with chopped discards (ghost crabs, small weed fishes and molluscs etc. depends on body weight) and pearlspot utilised the periphyton developed on the split bamboo pieces kept inside the cages. Mussels have utilised the plankton available in the water through filter feeding.

### Species suitable for the culture technology



Green mussel (*Perna viridis*) – Xinnaneo



Mullet (*Mugil cephalus*)--Shevto



Seabass (*Lates calcarifer*)--Chonak



Milk fish (*Chanos chanos*)- Kere



Red snapper (*Lutjanus argentimaculatus*)-- Tamso



Pearlsport (*Etroplus suratensis*)-- Kalundhar

## Culture conditions suitable for capture based culture systems in Manas (Sluice operated areas) areas of coastal waters

- Salinity suitable for coastal aquaculture is 18-32 ppt
- Depth should be minimum 1.5-2.5 m for fixed cages and 2.5-5m for floating cages



- Selected site should be free from industrial pollution as well as with adequate local seed availability.
- Estuarine areas free from strong waves action may be selected for farming
- Sites with constant water supply and provisions for regulation of water flow are ideal.
- Water temperature between 21°C to 31 °C and dissolved oxygen from 3.8 to 5.5 ppm
- Favourable period for culture usually from September to May

### Seed collection, stocking and feeding

- Normally the traditional fishermen are operating bag nets attached in sluice gates during low tide.
- Finfish seeds obtained as a by-catch during the fishing operations are used for cage culture.

