Biofouling by M*ytella Strigata* in cages

- Fouling restricts exchange of water
- Fouling communities harbour disease-causing microorganisms into the culture system
- Smaller the mesh size of net, fouling will be more rapid
- Smaller mesh size nets (less than 2.5cm) should be cleaned within 1 or 2 weeks whereas the larger size nets need to be cleaned in 30 to 90 days.
- Fouling organisms are removed by a high pressure water jet.
- The net is dried and repaired before it is used again.

Harvesting

Pearl spot harvest from GI cage

Seabass harvest

Red snapper harvest from cages

Onsite marketing of seabass

Economic performance of cage farming of seabass (Cage Dimension 3x3x3m (27 m^3) Culture period: 8 months):

Particulars	Amount (Rs.)
I. Capital Investment	
1. Cost of cage frame (1.25 inch B class pipe with ISI)	25,000.00
2. Cost of nets	30,000.00
3. Cost of floats (8 nos for each cage) and accessories	10,000.00
4. Mooring (2 nos of 20 kg GI anchors) and installation charges	5,000.00
5. Deep freezer	15,000.00
Total fixed cost (1+2+3+4+5)	**85,000.00**
6. Depreciation (20%)	17,000.00
7. Interest on fixed capital (12%)	10,200.00
Annual Fixed cost (6+7) (A)	**27,200.00**
II. Operating costs	
8. Seed (Cost of 300 numbers of seabass seeds @ Rs. 30/ Seed & Transportation charges)	9,000.00
9. Feed (Trash fish) 1085 kg@ Rs. 20/kg and 60 kg pellet feed	28,000.00
10. Labour 2 hrs/day @ Rs.1200/month for 8months	9,600.00
11. Harvesting & Miscellaneous Expenses	2,000.00
Total operating cost (7+8+9+10) (B)	**48,600.00**
Total cost (A+B)	**75,800.00**
III. Returns	
12. Production	300 KG
13. Gross revenue @Rs. 500/kg for 300 KG	**1,50,000**
14. Net profit	74,200
15. Cost/ kg of fish (Rs.)	252
16. Price/ kg of fish (Rs.)	500
17. Operating ratio	0.32
18. NPV	2,31,256
19. BCR	1.92
20. IRR	99.5%

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CAGE CULTURE: FEED MANAGEMENT & HEALTH MANAGEMENT PRACTICES

Feed management in cage culture operations

- Feeding cost accounts for 40-60% of total cost in cage farming
- Feed should contain (i) Protein, (ii) Carbohydrate, (iii) Fat, (iv) Minerals and (v) Vitamins
- Marine fishes require higher protein (35-40%) feed
- A feed with FCR of 1:2 is advisable
- Overfeeding leads to wastage and environment pollution

Nutrient requirements of marine carnivorous fishes (in %)

Size of fish	Moisture	Crude protein	Crude fat	Crude Fiber
Fingerling (1-20 g)	<12	>42	>5	<4
Juvenile (20-50 g)	<12	>40	>5	<4
Grower (50-300 g)	<12	>38	>5	<4
Marketable size (> 300 g)	<12	>35	>5	<4

Types of feed

- Types of feed 1. dry feed, 2. semi-moist feed and 3. moist feed
- Dry diet are less polluting, stable in water, nutritionally complete, available in floating and sinking forms, etc. but, they are expensive
- Feed bags should be stored in safe and dry place
- Cold storage is ideal for low - value fish storage
- Feeding rate is calculated based on the percentage body weight of the fish
- Juvenile fishes require high feeding rates (5-10%) and the adult require 3-4% of its body weight
- Quantity of feed is equally divided in 3 portions and are fed in the morning, afternoon and evening
- Increasing the feeding frequency helps in reducing feed loss

Floating pellet fed to fishes

Low value fish fed to fishes

On-site fish feed storing facility

Watch shed for monitoring

Feeding rate adopted for Asian seabass based on body weight

Month	Fish size (g)	Feeding rate (%)	Feed Size (mm)
1st	10-20	15	1.2 mm
2nd	25-50	12	1.2 mm
3rd	50-100	10	1.8 mm
4th	100-200	9	1.8 mm
5th	200-500	8	3.0 mm
6th	500-700	7	3.0 mm
7th	700-1000	5	6.0 mm
8th	1000-1500	4	8.0 mm
9th	1500-2000	3	8.0 mm

Stocking density of different marine fishes

Species	Stocking size (g)	Stocking density (nos./m3)
Seabass	15 cm/35 g	25-30
Pompano	10 cm/35 g	30-40
Cobia	15 cm/35 g	8-10
Grouper	15 cm/40 g	15-20

Guidelines for effective feed management

- Reduced feed intake indicates some problem (disease, poor water quality etc.) within the culture system
- Feeding rate to be reduced with sudden reduction in atmospheric temperature
- Check the quality (free from fungus, rodents etc.) of feed before procurement
- Feed must be utilized within three months of manufacture
- Freshness of trash fishes is important in case of moist feeds

Transportation and stocking of fish fingerlings:

Seabass seeds packed in oxygen filled polythene bag for transportation

Transportation of seeds to cage site in insulated van

Seabass seeds acclimatized in stocking water body before releasing to cages

Counting and stocking of fish seeds in cages

- To reduce feed wastage, install feeding trays for sinking feed and feeding rings for floating feeds
- Maintain proper feeding schedule to avoid overfeeding
- Feeding frequency should be atleast 3 times per day
- Regularly assess stocking density and fish weight for calculating the exact feed requirement
- Reduce feeding rate if the fishes are not consuming feed
- Grading of fishes is important at regular intervals (especially in case of Seabass (*Lates calcarifer*)

Health management practices to be followed in cage culture operations

- Proper quarantine measures to be followed
- Selection of healthy hatchery-raised fingerlings
- Stocking at optimum density
- Remove excess suspended particles and uneaten food
- Increase the frequency of net cleaning depending on the severity of fouling
- Remove dead or moribund fish on a daily basis
- Keep record on daily mortality, feed consumption, growth rate and water quality parameters

Cage maintenance

- Settlement and growth of barnacles, tunicates, tube worms, mussels, bryozoans and algae on cages results in fouling