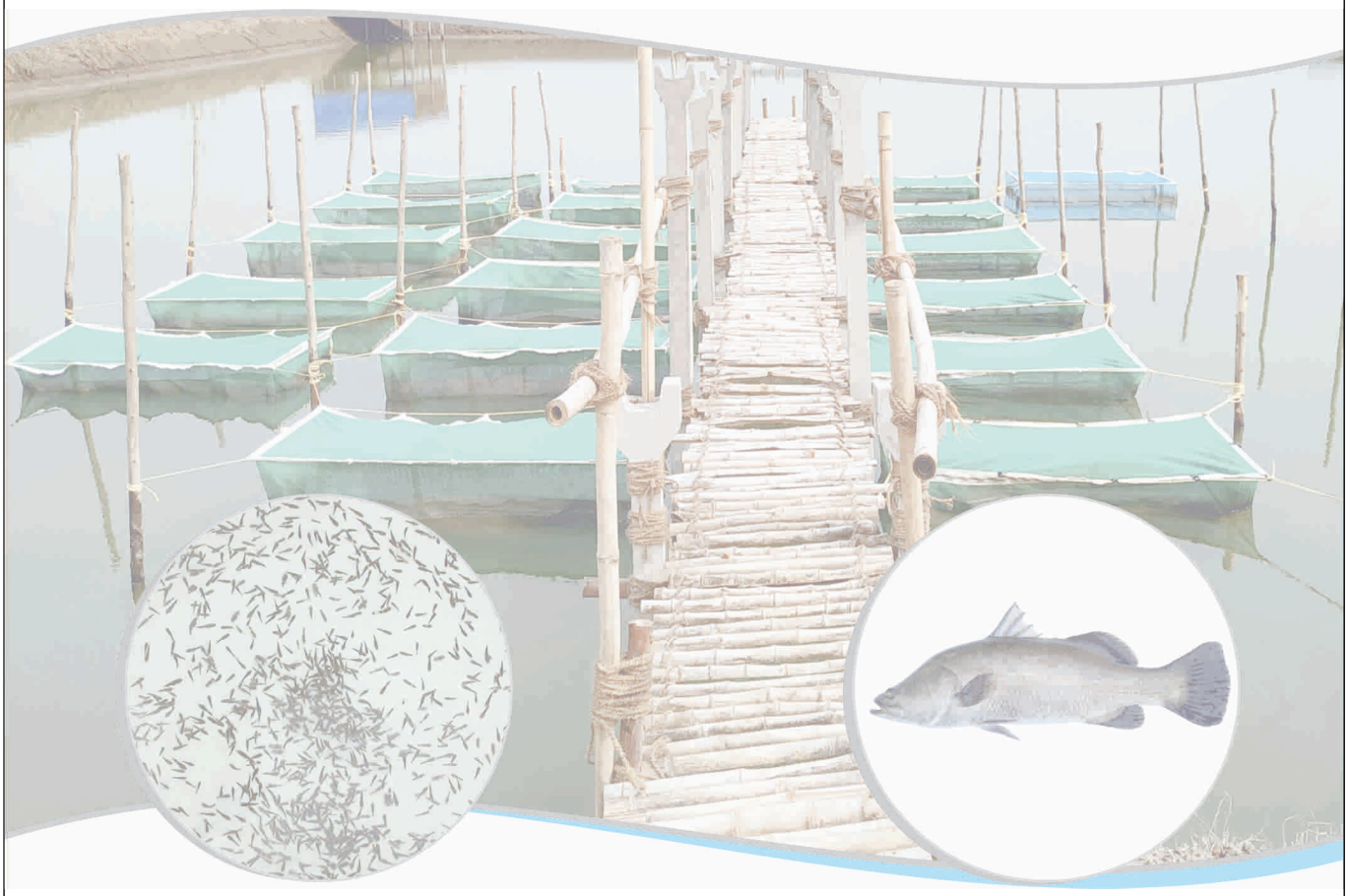
ICAR-CIBA Extension Series No. 85

Nursery rearing of Asian seabass, *Lates calcarifer* in hapa as livelihood activity for coastal communities of Gujarat

Pankaj A. Patil, Tanveer Hussain, Jose Antony, Babita Mandal,
R. Subburaj, P. Mahalakshmi, M. Kailasam, K.P. Jithendran

NAVSARI-GUJARAT RESEARCH CENTRE
ICAR- CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE
(Indian Council of Agricultural Research)
1st Floor, Animal Husbandry Polytechnic,
Navsari Agricultural University Campus,
Eru Char Rasta, Navsari, Gujarat - 396 450.

Nursery rearing of Asian seabass, *Lates calcarifer* in hapa as livelihood activity for coastal communities of Gujarat



Pankaj A. Patil, Tanveer Hussain, Jose Antony, Babita Mandal,
R. Subburaj, P. Mahalakshmi, M. Kailasam, K.P. Jithendran

NAVSARI-GUJARAT RESEARCH CENTRE
ICAR- CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE
(Indian Council of Agricultural Research)
1st Floor, Animal Husbandry Polytechnic,
Navsari Agricultural University Campus,
Eru Char Rasta, Navsari, Gujarat - 396 450.

FEBRUARY, 2022

Published by

Dr. K.P. Jithendran
Director,
ICAR-CIBA, Chennai

Prepared by

Pankaj A. Patil
Tanveer Hussain
Jose Antony
Babita Mandal
R. Subburaj
P. Mahalakshmi
M. Kailasam
K.P. Jithendran

February, 2022

ICAR-CIBA Extension Series No. 85

Citation:
Patil, P.A., Hussain, T., Antony, J., Mandal, B., Subburaj, R., Mahalakshmi, P., Kailasam, M., Jithendran, K.P., 2022. Nursery rearing of Asian seabass, *Lates calcarifer* in hapa as livelihood activity for coastal communities of Gujarat. CIBA Extension Series No. 85, ICAR-Central Institute of Brackishwater Aquaculture, Chennai, pp.14.

1. Introduction

India is bestowed with number of locally important cultivable brackishwater finfishes for aquaculture such as Asian seabass, milkfish, grey mullet, pearlspot, scat and estuarine grouper. Diversification assumes significance for the sustainability of Indian coastal aquaculture as currently the aquaculture scenario is largely synonymous with shrimp farming. The brackishwater finfish aquaculture production from India chiefly originates from small stakeholders owning relatively smaller farming areas. In India, the coastal states have huge scope for brackishwater aquaculture since every state is bestowed with vast resources of brackishwater areas including the mangrove based creeks, canals and backwaters. Presently, the percentage area utilized for brackishwater aquaculture is very low and the figures emphasizes the underutilized potential of brackishwater aquaculture to bring about a significant difference in fish production and livelihood generation in different coastal states of India.

The tidal amplitude of Gujarat coast is higher than other states of West coast. This natural phenomenon had created vast stretches of marshy and saline lands all along the coast. The estimated brackishwater area in Gujarat is around 3,76,000 ha with the potential brackishwater area suitable for brackishwater aquaculture is about 83,340 ha. Navsari district of Gujarat is blessed with plenty of potential open brackishwater water resources which can be utilized for brackishwater farming for livelihood of coastal communities of Gujarat. However, still the most of the areas inhabited by the coastal is under developed.

Government of India has initiated a number of steps to develop socio economic conditions of coastal population in the country. Similarly ICAR- Central Institute of Brackishwater Aquaculture (CIBA), Chennai, have developed different brackishwater technologies model as an alternative livelihood for coastal communities of India. In this background Navsari-Gujarat Research Centre of CIBA (NGRC of CIBA), Navsari, have initiated the developing of different culture models for livelihood generation of coastal community. Under this work CIBA-NGRC, Navsari team is demonstrating the different nursery rearing technology of candidate brackishwater finfishes such as seabass & milkfish seed nursery in hapa, pearlspot and scat polyculture, etc as an alternative livelihood option for coastal community of Navsari, Gujarat. This initiative resulted in keen interest

among the coastal community to adopt the technology on nursery rearing of seabass in hapa. This technology is customized to suit to the coastal farmers in Navsari area and will be transferred to the different coastal farmers of Gujarat as one of the alternative livelihood.

2. Asian seabass, *Lates calcarifer*

Asian seabass, *Lates calcarifer* known as bhetki or barramundi in India is one of the commercially important finfish species caught from inshore areas, estuaries, backwaters, lagoons and fresh water ponds. Seabass is a fast growing species with ability to tolerate wide fluctuations in environmental conditions and gaining rapid popularity as a candidate species for diversification in coastal aquaculture in India. Seabass is carnivorous and opportunistic predator, whose diet changes at different ages of various size groups. It feeds mainly on zooplankton in early stages and as they grow changes to feeding on young fishes and shrimps. They show preference for pelagic fish rather than benthic crustaceans as the prey is large. However, juvenile seabass even consume smaller sizes of seabass of the same age group as whole and can cause reduction in the survival rate. It is one of the fastest growing fish, can grow to an average size of 1.0 - 1.2 kg in 8 - 10 months and fetches good price in the domestic and international market. It is considered as a potential candidate species for farming in saline or freshwater environments in ponds and cages. The culture of seabass involves nursery rearing in hapa, pre grow-out culture and grow-out culture in ponds and cages.

Asian seabass, *Lates calcarifer*

3. Nursery rearing

In aquaculture, seed being one of the major inputs for a sustainable and viable farming. Similarly, the traditional method of collection of seed from natural sources and farming may not be sustainable in the long run. Considering these problems, CIBA, Chennai has developed a comprehensive technology for sustainable and viable farming of seabass, which can be adopted by farmers. Technologies on production of fry under controlled conditions in hatcheries, rearing of fry to fingerlings in hatcheries and farm sites (nursery phase), rearing the fingerlings to juveniles (pre-grow out phase) and culturing juveniles to marketable size (grow out phase) have been developed by CIBA, Chennai. The most important part in the culture technology of seabass is the nursery rearing because it reduces the culture period and increases the survival. Nursery rearing is the intermediate phase between hatchery and grow out system. Nursery rearing can be done in hatchery using FRP or cement tanks, fixing hapa in ponds and stocking in small nursery ponds. However, nursery rearing in hapa is a low venture setup which can be adopted in closed pond or open water bodies. The nursery rearing phase is of 60-75 days depending upon the environmental conditions of the culture system. This type of nursery rearing is gaining importance amongst the small farmers, Self-Help Groups (SHGs), coastal communities as livelihood options in Andhra Pradesh, Tamil Nadu, Maharashtra, Kerala, etc

4. Steps to be followed during seabass hapa nursery in pond

4.1. Pond preparation

Small pond with size range of 500 - 2,000 m^2 is used for nursery rearing with provision of water to retain at least 1.0 - 1.2 m. Suitable sized mesh screen nets (normally 1 mm) should be provided in the inlet side and outlet side to avoid entry of unwanted fishes, crabs and escape of the stocked fish respectively. Prior to stocking of the seed, the pond can be disinfected by using organic or inorganic chemicals for removal of unwanted predatory fishes, crabs, etc. After pond preparation, water can be fertilized with organic fertilizers for maintaining the natural food in abundant. The water quality of the pond plays an important role in culture and survival of seabass nursery as seabass growth is affected by acidic and turbid water. If the pond water or bottom is acidic, neutralization is done with lime application. The optimum water quality required for seabass nursery culture

in the pond are such as salinity: 15 - 35 ppt, pH: 7.5 - 8.5, temperature: 28 - 32 °C, dissolved oxygen (DO): >5 ppm, ammonia: <0.2 ppm, nitrite: <0.05 ppm and nitrate:<1 ppm. Daily water parameters like pH, temperature, DO and salinity needs to be monitored for good survival and production of seabass fingerlings.

Water pumping in nursery pond

Monitoring of seabass nursery pond water salinity and dissolved oxygen

4.2. Hapa size and design

The HDPE knotless net hapa of 2 m x 1 m x 1 m with the mesh size of 2 mm, 3 mm and 5 mm respectively are used for the seabass nursery culture. The hapa net is stitched from all the sides and loops are provided at each corner of hapa for tying to the bamboo poles installed in the ponds. The hapa has provision for opening with the zip from the top. This would facilitate handling and feeding. The hapa need to be installed in pond in such way that the metabolites and the excess uneaten feed will be washed away by the flow of water. Hapa is fixed in earthen pond or open water bodies with the help of bamboo or casuarina pole (6 feet height). Between the hapa minimum distance of 3 m is maintained for easy feeding, hapa cleaning and other maintenance work.

Bamboo installation and hapa fixation

Seabass nursery unit

4.3. Stocking

Hatchery produced seabass fry (1.5 - 2.0 cm) can be procured and transported under optimal oxygen packing by air lifting or train up to 14 - 15 hrs without any mortality. On arrival, acclimatization has to be done to the prevailing local conditions. This is done by slowly adding the rearing pond water by sprinkling in order to bring to the prevailing temperature/salinity. The uniform size fry can be stocked @ 500 - 750 nos/m^2

Seed distribution to women SHG members

Seed acclimatization and stocking in hapa

Stocked seabass seed

4.4. Preparation of farm made feed

CIBA have developed farm made feed in powder and pellet form for feeding during the nursery period. The powder feed is mixed with boiled deboned fish meat and the feed is made into moist dough. Dough is steam cooked for 30 min and cooled. Vitamin & mineral mixture along with cod liver oil is added to the dough after cooling. Small balls are made from the dough and used for feeding. This can be prepared fresh daily for feeding the seabass larvae until it grows to size of 4 - 5 cm. After this, the seabass fry can feed with slow sinking pellet feed of size ranging from 0.6 -1.2 mm @ 8 - 10 % body weight daily in two rations.

Seabass feed ball preparation by women SHG members

Feed balls for feeding seabass

4.5. Feeding

For small seed (1.5 - 4.0 cm) the feed ball can be kept in feeding tray which is tied inside the hapa while for fry size seed slow sinking pellet feed is sprayed slowly in hapa. Feeding is done twice a day (morning and evening). Feed requirement is calculated based on the biomass. Feeding rate vary from 8 - 10 % of total biomass. Over feeding need to be avoided which leads to poor water quality of the culture system.

4.6. Seed grading

Seabass is highly cannibalistic fish and if proper timely feeding, cleaning and management care is not taken then it affects the survival as well as sustainability of the culture. Hence, seed grading is one of the important steps in nursery rearing of seabass. This is very much essential to reduce the cannibalism and improve the percentage survival during the nursery rearing. Size grading is done at 4 - 5 days intervals. During the grading, all seed is removed from each hapa and taken in grading containers where shooters are separated from the small size seed group and kept separately according to their sizes as smaller one, medium one and larger one (shooter) in different hapa.

Seed removal from hapa for grading

Seabass seed grading by women SHG members

Resizing and re-counting of graded seabass seed by women SHG members

Restocking of graded seabass seed

4.7. Hapa cleaning and maintenance

Hapa cleaning is done after the grading and hapa is checked for damage if any. After repairing and cleaning they are re-fixed with the pole. Daily cleaning of hapa with soft hand brush is viable to avoid the clogging of hapa. This would ensure good health due to free circulation of water in the hapa.

Hapa cleaning with hand brush

4.8. Harvesting and marketing

Generally seabass fry reaches the size of fingerlings (3 - 4 inch) in 60 - 75 days of nursery rearing depending upon the environmental conditions of the culture system, water quality parameters and management. The fingerlings can be harvested and sold to the local farmers @ ₹40 - 50/piece for grow-out culture in pond or cages. On an average four-five cycles of seabass nursery can be undertaken in one year.

Harvested seabass fingerlings

5. Benefits of nursery rearing of seabass

- Seabass nursery rearing in hapa can be cultured in brackishwater canal, cage and aquaculture ponds.
- This method has advantages over other methods since the management is easier and installation of rearing facility requires less space and capital investment.
- It is a potential alternative livelihood options for aqua and coastal farmers of coastal communities of India.
- Always demand will be available for seabass fingerlings for grow out and polyculture.
- No marketing problem in coastal region of India.
- Seabass fingerlings price will be fixed as per the size. So farmers will get good economic benefit.
- Seabass is best alternative option for the species diversification and hence always demand will be available for seabass fish because coastal community prefers more marine fishes as compared to freshwater fishes.

6. Conclusion

The coastal communities required an alternative option for livelihood and income generation. Brackishwater areas like creeks, lagoons, estuaries, small natural ponds, etc can be well utilized for taking up for nursery rearing of different candidate brackishwater finfishes. If such type of nursery rearing technologies is adopted up by coastal communities of Gujarat then it can be very effectively become a sustainable enterprise for their livelihood.

Details of the material required for setting of one unit of Asian seabass nursery

Sl. No.	Material	Qty (Nos)	Sl. No.	Material	Qty (Nos)
1	Weighing balance	1	19	Big tea sieves	3
2	pH indicator	1	20	Medium tea sieves	3
3	Alkalinity kit	1	21	Small tea sieves	12
4	Ammonia kit	1	22	Seating stool	4
5	Nitrite kit	1	23	Mugs	2
6	Turbidity kit	1	24	Big hand brush	2
7	Hardness kit	1	25	Silpaulin sheet - 24 ft x 18 ft	1
8	Refractometer	1	26	Tarpaulin sheet -15 ft x 12 ft	1
9	Register	2	27	Cement poles 8 ft	8
10	Electric material - 1 set	1	28	Bamboo poles - 18 ft	110
11	Hand net	2	29	Medium basin - 30 l	3
12	Hapa - 2 mm mesh	10	30	Small basin - 15 l	3
13	Hapa - 3 mm mesh	10	31	Air stones	25
14	Nylon rope bundle	2	32	Air pump	1
15	Bucket - small	1	33	120 l barrel	3
16	Bucket - big	2	34	Feed tray	15
17	Round tubs - 50 l	3	35	Seabass seed	10,000
18	Round flat big tubs - 70 l	3	36	Seabass feed	100 kg

1. Estimated capital cost and operational cost required for nursery rearing of Asian seabass in pond

Sl. No..	Item	Qty (Nos)	For 1 culture cycle/year (₹in lakhs)	For 3 culture cycles/year (₹ in lakhs)
A. Capital cost				
1	Set of hapa - (2 m x 1 m x 1 m) - 2 mm & 3 mm mesh @ ₹1,850/-	20	0.37	
2	Bamboo (110 nos) & cement poles for platform, shed materials	1 Set	0.15	
3	Grading accessories set	1 Set	0.10	
4	Water parameter kit, weighing balance, refractometer, air blower, plastic tanks, plastic sheets	1 Set	0.38	
Total (A)			**1.00**	
B. Operational cost				
1	Seabass fry - 2 cm (10,000 nos) for one cycle	₹08/seed	0.80	2.40
2	Nursery feed (approx.100 kg)	₹200/seed	0.20	0.60
3	Seed, feed, material transportation	Lump sum	0.10	0.30
4	Miscellaneous expenses (pond preparation, electricity charges, ropes, electric material, etc)	Lump sum	0.20	0.60
Total B			**1.30**	**3.90**
C. Grant total (A+B)			**2.30**	**4.90**

2. Expected output: Farmers employment and income through seabass nursery culture/year

Sl. No.	Particulars	1 Culture cycle	3 Culture cycles/year
1	Farmers per unit (nos)	7	
2	Culture duration (days/cycle)	60 - 75	210 - 240
3	Seed stocking (nos)	10,000	30,000
4	Density/hapa (nos)	500 - 750	500 - 750
5	Seed survival (%)/cycle	70	70
6	Expected size of fingerlings at harvest (cm)	10 - 12	10 - 12
7	Expected seabass fingerlings production (nos)	7,000	21,000
8	Seabass fingerling selling price (₹/nos)	50/-	50/-
9	Revenue from sale of seabass fingerlings (₹In lakhs)	3.50	10.50
10	**Total revenue (₹in lakhs)**	**10.50**	

3. Economics & revenue

Sl. No.	Particulars	Amount (₹in lakhs)
A	Capital cost*	0.50
B	Operational cost	4.90
C	Total expenditure	5.40
D	12% Interest on total expenditure	0.65
E	Total cost/year (A+B)	6.05
F	Revenue from sale of fingerlings/year	10.50
G	Net profit/year (E-F)	3.95
H	**Net profit/7 farmers (2 - 3 hrs work/day)**	**0.50**

**Capital cost is used for two years*

Brackishwater aquaculture for food, employment and prosperity

For more information, contact

Director

ICAR - Central Institute of Brackishwater Aquaculture
(Indian Council of Agricultural Research)
#75, Santhome High Road, M.R.C. Nagar, R. A. Puram,
Chennai, Tamil Nadu - 600 028.
E-mail: director.ciba@icar.gov.in
Phone: +9144 24617523 (Office)
Fax : +9144 24610311
Web : www.ciba.res.in

Office In-Charge

Navsari-Gujarat Research Centre of CIBA
1st Floor, Animal Husbandry Polytechnic,
Navsari Agricultural University Campus,
Eru Char Rasta, Navsari, Gujarat - 396 450.
Phone: +912637 283509

/ icarciba