ICAR-CIBA Extension Series No. 73

Hapa based Nursery Rearing of Asian Seabass, *Lates calcarifer* as Livelihood Activity for Tribal Communities of Gujarat

(Under Tribal Sub-Plan)

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February 2020

Published By
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Citation:
Patil, P. A., Hussain, T., Antony, J., Mahalakshmi, P., Subburaj, R., Kailasam, M., Balasubramanian, C. P., Ambasankar, K, and K. K, Vijayan, 2020. Hapa based nursery rearing of Asian Seabass *Lates calcarifer* as livelihood activity for tribal communities of Gujarat. ICAR-CIBA Extension Series No. 73. pp20.

India is bestowed with number of locally important cultivable brackishwater finfishes for aquaculture such as Asian seabass, Milkfish, Grey mullet, Pearlspot, Scat, Estuarine grouper and Cobia. Diversification assumes significant importance in coastal aquaculture in India as coastal aquaculture is limited to the shrimp aquaculture. Tidal amplitude of Gujarat coast is higher than other parts 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 3,76,00 hectare with the potential brackishwater area suitable for brackishwater aquaculture is about 83340 hectares. 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.

Tribal communities are known to be the autochthonous folks of the land. After Africa, India has the second largest tribal population in the world and they are the integral segment of Indian culture and society. India, with a variety of ecosystems, presents a diverse tribal population throughout country depicting a complex cultural mosaic. India's population includes nearly one hundred million tribal people. However, still the most of the areas inhabited by the tribal is under developed.

Government of India has initiated a number of steps to develop socio economic conditions of tribal population in the country. Similarly ICAR-CIBA, Chennai have developed different brackishwater technologies model as an alternative livelihood for coastal tribal communities of India. In this background CIBA-NGRC, Navsari have initiated developing of different culture models for development of tribal community under Tribal Sub Plan (TSP) project. Under this project CIBA-NGRC, Navsari team is demonstrating the different nursery rearing technology of candidate brackishwater finfishes such as seabass & milkfish seed nursery in happas, pearlspot and scat polyculture, etc as an alternative livelihood option for tribal community of Navsari, Gujarat. This initiative resulted in keen interest among the tribal community to adopt the technology on nursery rearing of seabass in hapas. This technology is customized to suit to the tribal farmers in Navsari area and will be transferred to the different tribal farmers of Gujarat as one of the alternative livelihood.

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 in nature. However, juveniles are omnivores. Seabass is an 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 1.5 kg in 10 to 12 months and fetches good price in 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 happas, pre growout culture and growout culture in ponds and cages.

Asian Seabass *Lates calcarifer*

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, Central Institute of Brackishwater Aquaculture 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 hapas 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, tribal communities as livelihood options in Andhra Pradesh, Tamil Nadu, Maharashtra, Kerala, etc

Steps to be followed during seabass hapa nursery in pond

Pond preparation

Small pond with size range of 500-2000 m^2 is used for nursery rearing with provision of water to retain atleast 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 disinfected by using organic or inorganic chemicals for removal of unwanted predatory fishes, crabs, etc

Water quality management

After pond preparation, water can 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 pond is Salinity: 5-35 ppt, pH: 7.5-8.5, Temperature: 28-32 ^{0}c, Dissolved oxygen (DO) : > 5 mg/l; Ammonia: 0.25 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.

Monitoring of pond water salinity and dissolved oxygen

Water pumping in nursery pond

Hapa size and design

The HDPE knotless net hapa of 2 x 1 x 1 m with the mesh size of 2, 3 and 5 mm respectively are used over 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.

Installation of hapa

Hapa is fixed in earthen pond or open water bodies with the help of bamboo or casurina 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

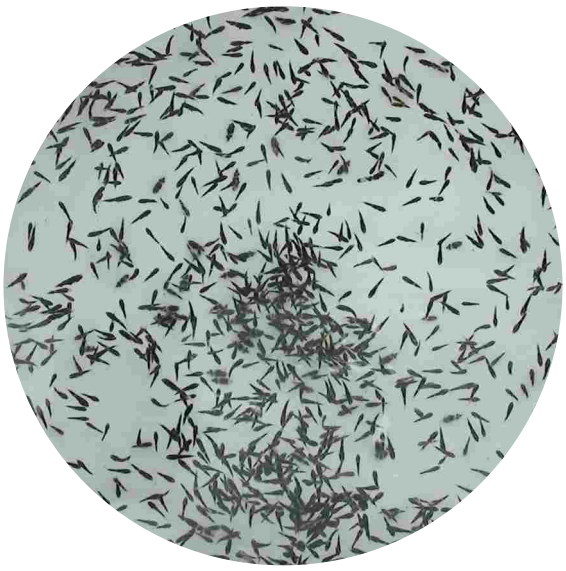
Seabass nursery unit

Acclimatization and 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 tribals

Seed acclimatization and stocking in happa



Stocked seabass seed

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 semisolid 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.

Feed preparation

Feed ball

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.

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 reduces 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 happa and taken in grading containers where shooters are separated from the small size sed group and kept separately according to their sizes as smaller one, medium one and larger one (shooter) in different hapas.

Seed removal from hapa for grading

Seabass seed grading

Resizing and counting graded seabass

Re-stocking of graded seabass

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 happa 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 brush

Harvesting and marketing

Generally seabass fry reaches the size of fingerlings (3 - 4 inch) in 75-90 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 for grow out culture in cages @ Rs. 35-40 per piece. On an average four-five cycles of seabass nursery can be undertaken in one year.

Harvested seabass fingerlings

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 tribal 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 economic benefit.
- Seabass is best alternative option for the species diversification and hence always demand will be available for seabass fish because people prefer white flesh fish compared to red meat.

Conclusion

The tribal communities required an alternative option for livelihood and income generation. Brackishwater areas like creeks, laggons, 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 tribal communities of Gujarat then it can be very effectively become a sustainable enterprise for their livelihood.

Details of the material required for setting of Asian seabass nursery

S.N	Equipments/Material	Qty (Nos.)	S.N	Material	Qty (Nos.)
1	Weighing Balance	01	19	Big Tea Sieves	03
2	Ph Indicator	01	20	Medium Tea Sieves	03
3	Alkalinity Kit	01	21	Small tea Sieves	12
4	Ammonia Kit	01	22	Seating Stool	04
5	Nitrite Kit	01	23	Mugs	02
6	Turbidity Kit	01	24	Big Hand Brush	02
7	Total Hardness Kit	01	25	Shed Silpaulin Sheet-24 x 18	01
8	Refractometer	01	26	Tarpaulin Sheet-15 x 12	01
9	Register	02	27	Cement Poles 8 ft	08
10	Electric Material-1 Set	01	28	Bamboo Poles-18 Feet	110
11	Hand Net	02	29	Medium Basin-30 L	03
12	Happas-2mm Mesh	10	30	Small Basin -15 L	03
13	Happas-3mm Mesh	10	31	Air Stones	25
14	Nylon Rope bundle	02	32	Air Pump/Blower	01
15	Bucket-Small	01	33	120 L Barrel	03
16	Bucket-Big	02	34	Feed Tray	15
17	Round Tubs-50 L	03	35	Seabass Seed	10000
18	Round Flat Big Tubs-70L	03	36	Seabass Feed	50 Kg

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

S. N.	Item	Qty (nos.)	For 1 culture cycle/year (Rs. In Lakhs)	For 3 culture cycles/year (Rs. In Lakhs)
1	Set of hapas - 20 x (2 x 1x1 m)- 2 & 3 mm mesh @ Rs. 1350/-	20	00.27	-
2	Bamboo (110 nos.) & cement poles, for platform, shed materials	1 set	00.14	-
3	Grading accessories Set	1 set	00.09	-
4	Water parameter kit, refractometer, weighing balance, air blower, plastic tanks, plastic sheets)	1 set	00.50	-
Total (A)			**01.00**	
B. Operational cost				
1	Seabass fry-2 cm (10,000) for one cycle	Rs. 05.00/ seed	00.50	01.50
2	Nursery feed (approx. 50 kg)	Rs. 160/kg	00.08	00.24
3	Seed, feed, material transportation	Lumsum	00.10	00.30
4	Miscellaneous expenses (Pond preparation, pond rent, ropes, electric material, etc)	-	00.32	00.96
Total (B)			**01.00**	**03.00**
C Grant total (A+B)			**02.00**	**04.00**

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

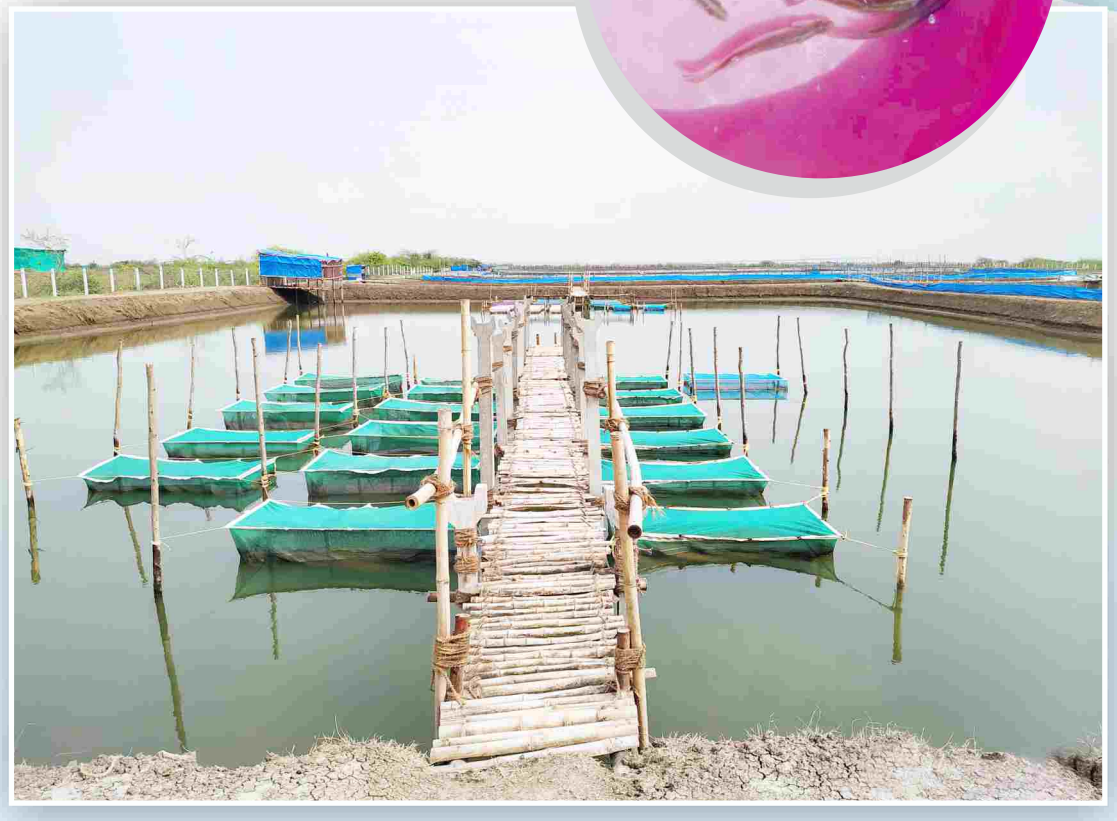
S. N.	Particulars	1 Culture cycle	3 Culture cycles/year
1	Farmers per unit (nos.)	08	24
2	Culture duration (Days/cycle)	75-90	240-280
3	Seed stocking (nos.)	10000	30000
4	Density/happa (nos.)	500-750	500-750
5	Seed survival (%)/ cycle	60	60
6	Expected size of fingerlings at harvest (cm)	08-10	08-10
7	Expected seabass fingerlings production (nos.)	6000	18000
8	Seabass fingerling selling price (Rs./nos.)	40/-	40/-
9	Revenue from sale of seabass fingerlings (Rs. In Lakhs)	02.40	07.20
10	Total Revenue (Rs. In Lakhs)	07.20	

3. Economics & revenue

Sr. No	Particulars	Amount (Rs. Lakhs)
A	Capital cost	*05.00
B	Operational cost	03.00
C	Total expenditure	03.50
D	12% Interest on total expenditure	00.36
E	Total cost / year (A+B)	03.86
F	Revenue from sale of fingerlings / year	07.20
G	Net profit / year (E-F)	03.34
H	Net profit / 08 farmers	00.42

*Capital cost is used for two years

Brackishwater aquaculture for food employment and prosperity



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