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DIVERSIFICATION OF FIN FISH & SHELLFISH SPECIES USED IN THE BRACKISH WATER AQUACULTURE IN INDIA

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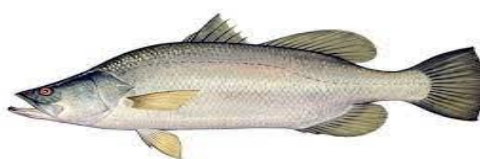
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Brackish aquaculture is playing an important role in all over the aquaculture industry. India has high brackish water resources around 8129km² of coastal length, 2.02million km² of Exclusive Economic Zone (EEZ), backwater & lagoon of about 0.9million ha, 3.9million ha of brackish water area, and 9million ha of salt-affected inland soil in the central highlands in Haryana, Rajasthan, Punjab, Uttar Pradesh, Maharashtra, Gujarat area to be found suitable for use as brackishwater farming. In 1973, under the ICAR-CIFRI about 30 acres of the area were used for the first-ever experimental brackishwater farm in the country, after 1987, CIBA institutes started especially for the brackish water aquaculture in India. It CIBA organizations help invited the new environmentally sustainable and economically viable brackishwater aquaculture in India. About one decade CIBA & CMFRI are developing the breeding and larval rearing technology of finfish like Seabass (*Lates calcarifer*), Milk fish (*Chanos chanos*), Grey mullet (*Mugil cephalus*), Pearlspot (*Etroplus suratensis*), cobia (*Rachycentran canadensis*), Groupers (*Epinephalus sp*), Mangrove red snapper (*Lutjanus argentimaculatus*), etc and shellfish about shrimp (*Penaeus vannamei*, *P. monodon*, *P. merguensis*, *Fenneropenaeus indicus*, *Penaeus semisulcatus*), crabs (*Scylla Serrata* (Mud crab) and *Scylla tranquebarica*) and mussels (*Perna viridis*, *Perna indica*).

Species Used for Culture in Brackish Water

Finfishes

1. Asian sea bass (*Lates calcarifer*)



- ❖ Carnivorous, Protandrous hermaphrodite, Catadromous fish.
- ❖ Broodstock development - 5000 to 10000 brooders at a ratio of 1:3 (Female and Male).
- ❖ Spawn in the lunar cycle during the late evening (6pm - 10pm) and repeatedly in batches for 7 days.
- ❖ In nurseries, ponds are reared with tilapia before the 2-3 months of seabass larval rearing because tilapia fry is eaten by the seabass larvae and grading is needed to prevent the cannibalism.
- ❖ Grow out ponds, in monoculture 10,000 - 20,000 fingerlings per ha fish stocked and the polyculture 3,000- 4,000 fingerlings /ha.
- ❖ Daily feed @ 10% of the body weight
- ❖ Feeding using moist feed, trash fish and mollusks.
- ❖ Grow 500g within 6 months. It fetch 450 rupees per kg.

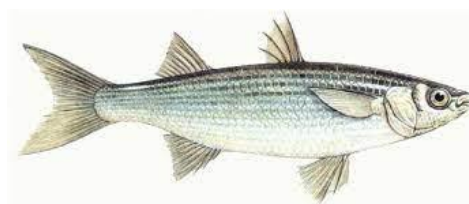
2. Milk fish (*Chanos chanos*)



- ❖ The milkfish is a herbivore fish, with low production cost, and can form an ideal alternate species for shrimp farmers. Showing schooling behaviour.
- ❖ Milkfish can grow in brackish water, seawater, and freshwater ponds and lakes. Its easy adaptability to various salinity and temperature.
- ❖ The feeding input was reduced in the periphyton based nursery rearing in the milkfish culture about 50% of feed input reduced.
- ❖ Sexual dimorphisms - male have two urogenital pores, where as female have three.
- ❖ Milkfish fry of 1-2 cm can be stocked at a density of up to 20-30 no/ m² (2-3 lakhs/ha) and can feed on lab-lab.
- ❖ In pen, Milkfish fingerlings of 40–60 g body weight can be stocked with the stocking density of 30,000–40,000 nos./ ha 10–20 tonnes/ha of Milkfish.
- ❖ In cages, Fingerlings of 40–60 g body weight are reared at a stocking density of 5 - 30 fingerlings/ m³. Milkfish yield in cage culture could be 10-20 kg/m³.

- ❖ Milkfish fingerling of 7-15 cm body size can be stocked with a density of 8,000–12,000 nos/ha to the maximum density of 30,000 nos/ha in ponds.
- ❖ Marketable Milkfish are having a body weight of 200 - 300 g can be harvested after 3-4 months in a monoculture system
- ❖ Milkfish fetches Rs. 120-150/kg in the local market while the production cost is only Rs. 50-60/kg.
- ❖ The small-sized milkfish is also being used as a preferred live bait for the tuna fishing industry.

3. Grey mullet (*Mugil cephalus*)



- ❖ Grey mullets are distributed in tropical and sub-tropical areas, the fastest-growing species, and euryhaline fish can grow in fresh, brackish, and marine habitat.
- ❖ Breeding season - july to september, fecundity varies between 0.5 - 2.0 million eggs per female and oil globule there.
- ❖ Omnivorous feeding habits and acceptance of formulated pellet feed (35% of protein) make a good candidate fish for brackishwater farmer.
- ❖ Stocking density 10–15 g individuals at 6,175–7,410 nos/ha, a harvest of 4.3–5.6/tonnes/ha/crop can be obtained.
- ❖ In polyculture system with tilapia and carp, mullet fingerlings are stocked at 2,470–3,705 nos/ha together with 61,750–74,100 nos/ha 10–15g Nile tilapia fingerlings and 1,850–2,470 nos /ha of 100g common carp juveniles. Total harvests are typically 20–30 tonnes/ha/crop and about 2–3 tonnes are mullet fish only.
- ❖ Production up to 3.5-4 tonnes per ha/crop .
- ❖ Due to the texture, taste, and free of spines, consumer preference is high and fetches a good market price, which is in the range of Rs.350 to Rs.500/kg.
- ❖ It is an ideal candidate species for polyculture and Integrated Multiprophic Aquaculture systems.

4. Pearlsport (*Etroplus suratensis*)



- ❖ Also called green chromite cichlids and “Karimeen” in Kerala.
- ❖ The State fish of Kerala, fast-growing and rapid breeding brackish water fishes.
- ❖ Live in both brackish water and freshwater environments.
- ❖ In Kerala, pearl spot is farmed using wild seeds in traditional ponds . The average production is about 1 000 kg/ha/year over 8-10 month grow-out period.
- ❖ The fish can attain a marketable size of 120-150 g over 8-10 months.
- ❖ Monoculture at stocking densities ranging from 20,000 to 30,000 / ha, with an average production of 1,000 kg/ha/year can be obtained in brackishwater ponds.
- ❖ It attains sexual maturity within a year and shows parental care.
- ❖ This species can grow up to 8 inches (20 cm) in length and weight 1.5 - 1.8 kg.
- ❖ Price of this fish differ in live and dead fish.

5. Cobia (*Rachycentran canadensis*)



- ❖ Distributed in the tropical water of West & East Atlantic Caribbean sea and Indo-pacific region.
- ❖ Spawning period April to September.
- ❖ Opportunistic feeders and females grow faster than males.
- ❖ Eggs - 0.5 - 2.5 million eggs and newly hatched larvae 2.2 - 2.7mm in length.
- ❖ While nursery rearing needs to do grading, because have high cannibalistic.
- ❖ It reaches about 2 – 6 kg in a year.

- ❖ In cages, an average weight of 6 kg has been reported with a stocking density of 13.3 fish/m³, and 3.5 kg recorded with a stocking density of 23.3 fish/m³ within 6-8 months.
- ❖ A lower stocking density would increase fish production with better FCR. The FCR value ranged from 1.3 – to 2.2.
- ❖ Cobia brood stock and breeding technology were standardized by the mandapam center of CMFRI.

Shellfishes

1. Shrimps

Many species are used like *Penaeus vannamei*, *P. monodon*, *P. merguensis*, *Fenneropenaeus indicus*, *Penaeus semisulcatus*, etc.

➤ White leg shrimp (*Penaeus vannamei*)



- ❖ Mostly cultured species, because its seed availability is high and also SPF & SPR seeds also available in the hatchery. Its good disease resistance and high growth shrimp.
- ❖ Mature male and female respectively 20g and 28g at age of 6-7 months.
- ❖ 35 - 45 g female spawn 1-2.5lakh eggs at 0.22mm diameter.
- ❖ 12 larval stages (nauplius 6, protozoa 3, mysis 3).
- ❖ Stocking densities in extensive farms 4-10 PL/m², semi-intensive farms - 10-30 PL/m², Biofloc system at >10: 1 (C:N) for 80-160 PL/ m² and intensive farms at the range of 60-300PL / m².
- ❖ The price of shrimp depends on the count of species per 1Kg.

➤ Giant tiger prawn (*Penaeus monodon*)



- ❖ This is the fastest-growing shrimp of all penaeid shrimp.
- ❖ The giant tiger prawn is more of a predator than an omnivorous scavenger or detritus feeder than other penaeid shrimp. After molting, the new shell is still soft which causes prawns to become vulnerable and they may subsequently be eaten by their predators or companions. Adults are often found over muddy sand or sandy bottoms at 20-50 m depth in offshore waters.
- ❖ *Intensive* - Stocking density ranges from 20 to 60 PL/m².
- ❖ Feeding with artificial diets is carried out 4-5 times per day followed by feed tray checking. Final FCR is normally between 1.2:1 and 2:1.
- ❖ *Semi-intensive* at the rate of 5 to 20 PL/m².
- ❖ PL 15 good stages for stocking its help to reduce the feed waste.
- ❖ Stock PL 15 prawns directly into the grow-out ponds.

2. Crab



- ❖ More economically important species used in the culture was *Scylla Serrata* (Mud crab) and *Scylla tranquebarica* comes under the Portunidae family. These crabs are found in the estuaries and mangroves of India.
- ❖ Mostly they prepare for the muddy and sandy bottom.
- ❖ In aquaculture of this species due to their high demand / price, high flesh content, and rapid growth rates in captivity.
- ❖ This is available worldwide and is mostly sold live in international markets.
- ❖ In India, mud crab farming started during the early eighties and now crab culture is developing very fast in the states of AP, Kerala, West Bengal, and Odisha.
- ❖ RGCA / MPEDA develops the mud crab hatchery in the Tamilnadu state in 2013.
- ❖ Crab fattening - done within 20-25 days, wild-caught crabs are fattened in cages or pen system feed with high feeding intensity. Feeding - @ 10% of body weight fed with trash fish and mollusks to prevent canabolism.
- ❖ In pond need to provide net fencing or a bottom coated with concrete.

- ❖ Culture period - 5-8 months and the survival rate - 30-70% .
- ❖ Harvest done by handpicking, only hard shell crab sold by live condition.

3. Mussels



- ❖ Mussel production is high in Kerala and CIMFRI also helps increase the production of mussels in Vembanad lake.
- ❖ Cultured species - *Perna viridis*, *Perna indica* belonging to the family Mytilidae.
- ❖ Mussel is a culture of two types, the bottom, and off-bottom culture.
- ❖ On bottom culture – The cheapest & simplest method and mussels are live on the bottom substrate. High mortality due to predation and siltation harvest done by handpicking.
- ❖ Off bottom culture - Costly, but high growth rate and production, where the bottom not good for the culture it very useful. It was done by using stake, raft, and rack culture.
- ❖ Food and feeding - No feed input because they are plankton feeders only depend on the phytoplankton.

Other Species Used in Aquaculture

- ❖ Groupers (*Epinephalus* sp) - protogynous hermaphrodites (Serranidae family)
- ❖ Mangrove red snapper (*Lutjanus argentimaculatus*)
- ❖ Silver pompano (*Trachinotus blochii*)
- ❖ Gold Spot Mullet (*Liza parsia*)
- ❖ Yellowfin bream (*Acanthopagrus australis*)
- ❖ Blood clam (*Tegillarca granosa*)
- ❖ Indian backwater oyster (*Crassostrea madrasensis*)

Conclusion

The need of food increasing day by day but there availability of food materials are less because only depends on the agriculture, so we need to increase the fish culture also at mean while and the fish culture also growing fastly. Fish culture used in fresh water and brackish

water area, but freshwater land also decreasing day by day due to the building construction and industrial uses, So need an alternative source to need to focus the brackishwater culture by using advanced technologies. Many other brackish water species there for culturing, but the problem is their less availability of the seed and no breeding & hatchery technology for are these species, nowadays also people are collecting the seed from the wild only. Therefore need of new technology for breeding, larval rearing of cultivable to ensure the seed availability for the throughout the year. Recently many advanced technology are there for the culturing the brackishwater sp like pond system, RAS system, cage system, pen system, IMTAs and biofloc system are help to improving the less input to get high profit by using less culture area and also government also helping by providing subsidies for start the cage system.

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