

SCOPE FOR BRACKISHWATER FISH CULTURE IN INDIA WITH SPECIAL REFERENCE TO KARNATAKA

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Introduction

It has been estimated that an area of about 2 million ha of brackishwater and a long coast line including estuaries, brackishwaters, mangrove swamps and lagoons is available for fish culture, but the traditional system exploits only about 3,000 ha of this water area. National Commission on Agriculture has recommended a production of 1 tonne/ha from brackishwaters which amounts to 2 million tonnes of fish from the total area. Thus, fish production from brackishwater alone would be about equal to the total fish production of India, which at present ranges between 1.90 and 2.5 million tonnes. However, in brackishwater fish culture a maximum of about 2.5 t/ha/yr has been achieved against an average of 450 kg/ha.

At present, several agencies such as I.C.A.R. Research Institutes, various State Governments and Agricultural Universities are engaged in conducting brackishwater research and development work involving fish, prawns, crabs, clams, oysters and prawns. Most of these research centres have also succeeded in breeding commercially important prawns, and even commercially viable projects have been taken up for supplying prawn seed to fish farmers. Success in breeding and production of seed on large scale has not been achieved, and efforts are afoot in several institutes.

The brackishwaters of immediate concern for fish cultural purposes are estuarine basins, backwaters, tidal creeks, brackishwater lakes, and coastal lagoons. Most of the brackishwater systems in our country are characterized by a strong monsoon rainfall regime that follows freshwater discharge during a limited period of the year although the intensity of this-influence tends to decrease from north to south. Similarly, there is

decrease from north to south in tidal oscillations, which are well eloped in the northernmost estuary (the Hooghly) but are comparatively small in the southern-most ones like the Cauvery. Such phenomena ult in drastic variations in the estuarine environment from region to ion.

Brackishwater fish culture in India

Brackishwater fish culture of a high order is practised since time memorial in the States of West Bengal and Kerala exemplified by the hasabadha system of West Bengal and the prawn filtration technique the Pokkali fields of Kerala.

The present state of brackishwater farming is based on modern identifiic concept of the principle of animal husbandry and involves eding, feeding, disease control and the harvest with the aim to attain a oduction rate higher than in nature. New concept of fish culture in ges, pens, is also being tried. Efforts are also made to diversify the additional fish culture activities by culturing the unconventional species fishes, viz., eels, rabbit fishes, whiting, rock cod, edible molluscs and a weeds. New methods for transportation of larvae of culturable fish nd shell fish are tried. Laboratory production of shell fish is also done rough hatcheries to provide shell fish seed for culture.

In modern brackishwater culture, mono and polyculture of fish alone with prawn is in vogue. Different stocking rates at different stages of ulture have been evolved in each type of culture. The culturable fish ecies are *Mugil parsia*, *M. tade*, *M. cephalus*, *chanos chanos*, *Lates ilcarifer*, *Eleutheronema tetradactylum*, *Megalops Cyprinoides* and *Etioplus ratensis*. The important culturable species of prawn are : *Penaeus monodon indicus*, *Metapenaeus monoceros*, *M. brevicornis* and *P. styliferus*.

Researches conducted by the ICAR Fisheries Institutes have revealed at it can be safely assumed that, if brackishwater fish husbandry is lopted on modern lines, an average production of 800-1,000 kg/ha yr of awns can be obtained through single or multiple cropping. In the former, ortality rate is higher than in the latter. A production of 1,500 to 2,500 g/ha/yr is possible by doing polyculture of fish and prawn.

For the purpose of developing brackishwater fish culture in India, the vo essential prerequisites are a survey of potential areas, and the

production and or collection of seed of culturable species of brackishwater finfish and shellfish. Until such time as production of brackishwater seed is achieved by induced breeding, and hatchery techniques are developed, collection of seed from natural sources is a *sine qua non* and has to be depended upon exclusively.

Fortunately, most of the brackishwater systems in the country have been found to be dependable sources of fish and prawn seed. Detailed data on seed resources have been collected from Hooghly-Matla estuarine systems in West Bengal, Chilka Lake in Orissa, Pulicat Lake in Tamil Nadu, and the backwaters of Kerala. In addition, data on the annual collection of milkfish fry and fingerlings from different regions of Tamil Nadu are also available.

The mangrove ecosystems are usually highly productive. Scanty information is documented on the hydrobiological aspects of mangroves when compared to other biotopes. In India, mangrove biotopes are spread in an area of 7,000 km² in Maharashtra, Andhra Pradesh, Gujarat, Tamil Nadu, Kerala, West Bengal, Goa and Andaman-Nicobar Islands.

Though the system is productive, it is characterized by unsuitable environmental conditions viz., loose soil, high organic debris, low oxygen and varying salinities. On account of this, the mangrove ecosystem remains derelict till present. It is used in coastal metropolitan cities as waste dumping ground, creating pollutional hazards. It is only, in the last two decades that scientists have paid attention for development of brackishwater fisheries in this system.

Low-lying mangrove areas are feeding grounds for juveniles of prawns and fish due to presence of material which contains 6% of protein and protein contents are enhanced to 20% on account of putrefaction and decomposition.

Scope for brackishwater fish culture in Karnataka

Karnataka has about 8,000 ha of brackishwater area. The major brackishwater bodies of the State are the Netravathi-Gurupur estuary near Mangalore, the Mulki estuary, the Udyavara estuary, the Hangarakatta estuary, the Gangolli estuary, the Sharavathi estuary and the Kali estuary.

The most significant feature in the environmental characteristics is the large fluctuations in the salinity (0.5 to 33‰) of the water during the course of an year. The coastal regions experience a heavy rainfall of about 3,500 mm in a year, mainly during July-September. Because of the wide fluctuations in the salinity, there are marked changes in the quality and quantity of fish fauna. The migration of fish into the estuary and out to the sea from the estuary takes place in certain periods. Several species of prawns of both marine and freshwater origin are found in the estuaries, the estuaries also serve as nursery ground for these species during the postmonsoon months. A few typically marine fishes like the mackerel, sardines, ribbon fishes, white fish, lizard fish and whitebaits enter estuaries during high periods of salinity.

Seed resources of grey mullets, sand whiting, pearlspot and milk fish are the most important in the backwaters of Karnataka. Others of lesser importance include the juveniles of Indian tarpon, glassy perchlet, lady fish, ponded grunter, silver biddy, spotted butter fish, spinefoot, catfishes, flat fishes, lizard fishes, half-beaks and gar fishes.

Abundance of mullet seed has been observed in the estuaries of Dakshina Kannada. The grey mullets are hardy fishes capable of tolerating low salinities for prolonged periods. They can be used for polyculture along with milk fish or freshwater carps. It is also known that survival rate of mullet in polyculture with freshwater carp is very high. Since large quantities of grey mullet seed are available in the Mulki estuary and Netravathi-Gurpur estuary, there is considerable scope for farming of mullets.

The sand whiting is caught from all the estuaries of Karnataka throughout the year. Its seed is abundant in all the estuaries. Youngones can be collected during low tides. The areas of collection are close to the mouths of the estuaries. Compared to all the estuaries of Dakshina Kannada, the Gangolli estuary appears to be the richest in the seed of the sand whiting. Because of the fairly fast growth and demand coupled with good market price, this species can be rightly considered the most important culturable fish in brackishwater. Large scope exists for the culture of this species in coastal ponds, net enclosures and cages.

The seed of pearlspot is known to be abundant in the estuaries of Mulki and Udyavara. It can be collected during low and high tides. The pearl-spot is a hardy fish capable of tolerating wide ranges of salinity.

Since this species is a detritus feeder, it can be used for polyculture along with other suitable fishes.

The seed of milk fish occur in good quantities along certain stretches of the backwaters of the Karnataka, especially near Kundapur, and in the Kali estuary. Since this species grows well in very low salinity, it is possible to culture the species through south-west monsoon months also. Further, two crops can be raised from a farm during a year. The other species of finfish which occur in certain places have only limited importance as far as culture operations are concerned.

The larvae and post-larvae of several commercially important marine and freshwater prawns occur in large quantities in the backwaters of Karnataka. The species of seed prawns available are *Metapenaeus dobsoni*, *M. monoceros*, *M. brevicornis*, *M. affinis*, *M. burkenroadi*, *Penaeus indicus*, *P. monodon*, *P. semisulcatus*, *P. canaliculatus*, *P. merguensis*, *Parapenaeopsis stylifera*, *Macrobrachium equidens*, *M. idella* and *M. idae*. Of these the seed of a few species such as *M. dobsoni*, *M. monoceros*, *M. affinis*, *P. indicus*, *P. monodon*, *M. equidens* and *M. idae* are available in good quantities at certain localities in the estuaries.

The seed of *M. dobsoni* is the most abundant prawn seed in the estuaries of Karnataka. In view of this, this species qualifies as a potential species for selective stocking in the coastal regions. Next to *M. dobsoni*, *P. indicus*, is the most abundant seed prawn available in the Karnataka estuaries. The fast rate of growth and the large size attained make this a very promising species for brackishwater culture. Although *P. monodon* is known to occur in the region, seed resources of the species have not been investigated in detail. Good quantities of seed of *Macrobrachium* species are known to occur in the backwaters of Karnataka.

Two species of crabs, namely, *Scylla serrata* and *Thalamita crenata* occur in the estuaries of Karnataka. However, the seed of these species are not available in large quantities. The possibilities are to collect berried females, hatching of eggs and rearing of larvae for stocking purposes.

Several species of clams, mussels and oysters inhabit the backwaters. Large quantities of seed clams of the species *Meretrix meretrix*, *M. casta*, *Katelysia opima* and *Villorita cyprinoides* occur in certain regions of the estuaries. The green mussel, *Perna viridis* occurs in small quantities near the

mouth of the estuaries at Mulki and Malpe. Two species of edible shellfish occur in the region. *Crassostrea madrasensis* occurs in some quantities in all the estuaries. The other species is *Saccostrea tuberculata* the seed of which is available in good quantities all through the year except during the peak of the south-west monsoon.

Thus the mullets, the sand whiting, the milk fish, the pearlspot, *P. dobsoni*, *P. indicus*, species of *Macrobrachium*, clams and oysters are most suitable for brackishwater farming in the coastal regions of Karnataka in view of the abundant availability of the seed of these species.

The low lying brackishwater areas or Kharlands in Karnataka are used for cultivating semi-resistant paddy (Kagga) and for prawn cultivation. The growing demand for such lands for manufacture of salt, ownership by tenant farmers who lease out for prawn culture and resulting difficulties in getting finance from Banking Institution are problems which need attention in Karnataka.

Recommendations

The present utilization of the brackishwater resources of India (estimated at about 2 million ha) is negligible, urgent steps are required to develop such fisheries.

Seed prospecting investigations using a standard methodology should be conducted in all the important estuarine systems and in natural brackishwater lakes such as Chilka, Pulicat and the backwaters of Kerala, where great scope for developing brackishwater farms exist.

To help solve the problem of availability of brackishwater seed, hypophysation of prime culturable brackishwater fishes, viz., *Lates calcarifer*, *Mugil cephalus*, *M. tade*, *M. parsia*, *M. macrolepis*, *Eleutheronema tetradactylum*, *Polydactylus*, *indicus* and *Chanos chanos*, should be attempted on priority basis.

Suitable methods for the transport of the seed of culturable brackishwater fishes and prawns may be developed by experimentation. This will lead to the establishment of a brackishwater fish seed industry.

As development of brackishwater pond management practices cannot brook any further delay, work on the formulation of such practices should

be accentuated in well planned brackishwater experimental farms.

Research programmes should be intensified for development of artificial feed for prime culturable brackishwater fishes and prawns.

To safeguard the expanding foreign trade as well as to cater to the demand within the country, pilot projects on exclusive farming for prawns may be set up in selected areas.

It is necessary to reclaim swamps and marshes into brackishwater farms at a rapid rate.

Farming of edible oysters and mussels in brackishwaters has to be taken up along scientific lines, and it is necessary to set up pilot studies in this direction at suitable locations.