

Role of Mangrove Swamps in Brackish-water Fish Culture

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Brackish-water aquaculture has been given an importance to increase the fish production in India, a bulk comes from inshore waters and small-scale fisheries sector (Silas, 1986).

About 2.2 million hectares of brackish-water area is available for aquaculture purposes in India (George, 1980) in the form of bays, estuaries, lagoons, lakes, swamps etc.

The role of mangrove swamps in brackish-water fish culture besides in erosion control, is very significant and has received considerable attention (Heald, 1971; Odum, 1971; Macnae, 1974). It has been shown that a number of commercially important fishes directly or indirectly depend on mangroves. Mangroves are among the highly productive coastal ecosystem (Mann, 1982) and the major part of production in mangroves is contributed through their litter fall. The bulk of fallen litter decomposes in mangrove waters transferring to detritus on which the food-chain evolves. The trophic structure of the faunal community of mangrove waters, indicates that at least one-third of them are detritus consumers (Odum and Heald, 1975). Because of the high productivity and the shelter they provide, mangrove forests act as feeding and nursery grounds for a range of estuarine and coastal water species. The prawns after spawning, migrate towards the nearby mangroves where salinity is relatively lower (Achuthankutty and Nair, 1983). Thus, the high production rate, along with easy accessibility of the mangroves render them as ideal sites for aquaculture and the species cultivated are *Penaeid* shrimps, *Macrobrachium* sp., *Chanos-chanos*, *Mugil* spp. etc. Conversion of mangroves for paddy and coconut cultivation along

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with the fish ponds is an old practice which covers 45,000 hectares of area (Parulekar and Dalal, 1978). For example *bheries* in West Bengal, *chemeen kettu* in Kerala, *gazanies* in Karnataka, *khajaan* in Goa and Khar lands in Maharashtra. The average yield of *bheries* and *bhasabada* in Sundarbans is 700 to 1,000 kg per hectare and in Kerala it is around 78.7 to 2,135 kg per hectare per year. About 72.8 hectares of area in mangroves has been estimated to be utilised for fish farming (Parulekar and Verlenar, 1984) and the fish yield is estimated to be 24.3 tonnes per year earning a revenue of about Rs. 300,000. As a result of hatchery technique developed, it is possible to earn Rs. 20,000 or more per hectare per year by way of fish and prawn culture (Dwivedi, 1982) considering the significance of mangroves in brackish-water fish culture, it is felt essential to study the ecological and economical role and the methods of proper management of Indian mangroves.

Out of 7,000 sq km of mangrove area (Sidhu, 1963), about 88 per cent occur along the east coast including Andaman and Nicobar Islands, and the remaining 12 per cent occur along the west coast of India (Untawale, 1987). Out of 59 species, *R. mucronata*, *R. apiculata*, *Avicennia officinalis*, *A. marina*, *Ceriops*, *Excoecaria* sp., *Arostichum* sp. are the most dominant and uniformly distributed along both the coasts of India. Indian mangroves are at present in a degraded condition as a result of increased population pressure, modern developments and industrialisation. Mangroves have also suffered a loss from reclamation, deforestation and pollution, which in turn has adversely affected coastal and estuarine fisheries.

The present situation certainly calls for urgent measures of conservation, either by total preservation (which is unsuitable for India) or by evolving management guidelines. Management options include legislation for water and land use, regularisation of deforestation, restriction on reclamation, prevention of dumping of pollutants, declaring mangroves as parks and reserves, re-forestation of denuded areas and afforestation of new areas. Creating an awareness of the importance of mangroves among local population is very essential. The second important aspect is afforestation, since the only way to bring back the degraded mangroves is large scale plantation—both re-forestation and afforestation.

Mangrove Afforestation: Selection of suitable areas with soft muddy substratum on the basis of aerial photographic studies followed by ground fruiting is very important. For the large scale collection of seeds/propagules' knowledge of phenology is very essential—generally maximum number of fruits fall during the monsoon—ranging from May to June in *R. apiculata*, June to July in *R. mucronata*, *A. officinalis* July to August and in *S. alba* fruit fall is from May to June and again September to October (personal observations).

It is necessary to know the position of each mangrove spp in the natural intertidal region. Depending on the salinity tolerance and requirement of tidal inundation, mangroves grow in different zonations for

example sps like *Rhizophora* and *Avicennia* can tolerate a wide range of salinity and grow near the mouth region. The species like *Sonneratia*, *Kandelia*, *Heretiera* require low salinity and hence grow in the upstream region (Fig. 1). Plantation of seedlings may be undertaken according to the length of the propagules. *R. apiculata*, *R. mucronata* which can tolerate more wave action with their long propagules may be planted towards the water front, followed by *Kandelia ceriops* etc. The plantation technique has been described in detail by Untawale (1986).

Afforestation in Goa: Mangrove afforestation in Goa has been tried with the forest department with three different methods:

1) Naturally grown seedlings of two to six months ages were uprooted to replant in a desired site.

2) Marine fruits/propagules were collected to plant directly.

3) Mangrove nurseries were maintained to raise a large number for large scale plantation (Untawale, 1987). By this type of programme, about 1 lakh of seedlings of *R. mucronata*, *A. marina*, *S. alba*, *K. candel* have been raised in about 115 ha of area in Chorao Island (Untawale, 1987). Along Maharashtra coast, three nurseries of 70,000 seedlings have been established at five different sites covering about 25 hectares of area.

Conclusion

Afforestation in denuded or open mud-flats will help to recover the degraded areas with new vegetation which in turn will help in the fisheries aspects.

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