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PRESENT STATUS OF MOLLUSCAN FISHERIES AND CULTURE IN INDIA

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India has extensive molluscan resources along both the coasts, in the numerous islands, bays, backwaters and estuaries and also in the seas around the Sub-continent. A good quantity of mussels, oysters, pearl oysters, different species of clams, Trochus, Turbo, chanks and cephalopods are regularly fished throughout the year at various places. These have been exploited from time immemorial for food, pearls, and the shells for commercial purposes mainly for making curios and in the preparation of lime.

Out of the total fish landings of the world, reported by the F.A.O., the molluscan landings amount to only 5%. So far as the Indian Sub-continent is concerned the marine fish landing figures furnished by the CMFRI indicate a total of 1.4 million tonnes. Of this, the percentage of molluscan landings is meagre and comes only to about 1%. The picture that emerges would apparently indicate that molluscs are not very important for their fishery value which is contrary to fact. The reason for this anamoly is not far to seek; while the figures for the landings of commercially important species of cephalopods have been included, the actual landings of various species of clams, mussels, oysters, pearl oysters and heavy shelled forms such as chanks, Trochus and Turbo have not been estimated and included due to lack of precise data. In terms of weight landed, the above forms contribute substantially to the total landings and would give much higher figures of total landings of molluscs in India. Some of the above mentioned forms are fished not for the meat but for industrial utilisation. However, a proper assessment of the total landings of these forms appears essential.

The available literature on molluscan fisheries in India, past as well as recent publications, enables us not only to get a fairly

comprehensive idea of the immensely rich resources of molluscs but also indicates the present status of the different molluscan fisheries. However, specific information in respect of many species is far from complete thus calling for a thorough coverage to give us upto-date details on the fishery, biology, population density and ecology of important species.

MOLLUSCAN FISHERIES

Mussels (Regionally)

Mussels occur all along the coastal region, wherever rocky or submerged hard substrata are present. Two species of mussels are found along the Indian coast, the green mussel Perna viridis and brown mussel P. indica: whereas the former is found along the east and west coasts the latter is confined only to the southern part of the peninsular India. At present, regular exploitation of mussel is limited to certain regions like Goa - Karwar, Cannanore - Kozhikode, Varkala - Vizhinjam, and Colachel - Cape Comorin on the west coast and Chinna Muttom, Madras and Kakinada on the east coast. Green mussel P. viridis is reported from Gulf of Kutch and scattered beds are present from Ratnagiri to Mangalore. South of Cannanore upto Calicut this species is abundant. The Green mussel is found upto Varkala on the south west coast. In the east coast, green mussel is found at Porto Novo, Madras, Kakinada, Waltair and Sonapur, Brown mussel P. indica has a restricted distribution from Quilon in the south west coast up to Cape Comorin. Although there is a regular seasonal mussel fishery of considerable local importance along certain areas on the east and west coasts, it still remains an insignificant fishery of minor magnitude. Mussel flesh is popularly eaten, even considered a delicious item of food by the people of west coast. Since there is no authentic record of mussel-landings from various landing centres, it is difficult to give a correct estimate of the annual landings. It is, however, estimated that 20 tonnes are

are landed from Ratnagiri to South Kanara, 900 tonnes from Cannanore-Calicut area, 180 tonnes at Vizhinjam, 325 tonnes from Colachel - Cape Comorin and in the east coast about 2.4 and 7 tonnes from Madras and Kakinada respectively per annum which gives the total annual landings of mussels as 1435 tonnes.

Edible oysters

Edible oysters are found all along the coastal strips, estuaries and backwaters wherein suitable hard substrata are available for their young ones to settle down and grow. Oysters are collected from such natural beds by a good number of fishermen in the west coast, especially in the coastal regions of Karnataka and Maharashtra and sold in the local market. The edible oyster, C. madrasensis is a form which grows abundantly in a wild state forming extensive beds in the tidal creeks and backwater areas of the east coast. C. gryphoides and C. discoidea are mostly found in the northwestern coast of India. Nowhere in the east coast this valuable resource is commercially fished for edible purpose, except for a limited exploitation by the Tamil Nadu Fisheries Department arranging to collect a few thousand oysters every year from the wild stock at Pulicat lake and Ennore estuary for supply to a few western style hotels and for westerners in Madras. It has reported from Bombay (Rai, 1932) that oyster fishery was a regular feature during the twenties and more than 5000 persons were engaged in collecting oysters from the natural beds all along the erstwhile Bombay Presidency. Because of continued irrational and indiscriminate fishing by local fishermen the oyster pupulation was wiped out. The under-exploited oyster population in many estuarine regions of the east coast on the other hand are periodically subjected to large-scale destruction on account of freshwater admixture during N.E. monsoon. In the rest of the areas they settle down season after season forming thick and rugged bed formations and the individuals in the bed become so overcrowded and stunted and perish without being exploited.

Pearl oysters

The pearl oysters are the most thoroughly exploited for the pearls and mother of pearls from time immemorial. In the Indian region pearl oysters exist in the Gulf of Mannar and in the Gulf of Kutch and recently it has also been reported from Trivandrum coast. Six species of pearl oysters are reported in the Indian coastal waters. Of these, P. fucata is the most important.

Clams

Among clams, those belonging to the family Veneridae are the most important found all along the Indian coasts in the bays, estuaries and backwaters. The important species which contribute to the fisheries are Meretrix spp., Paphia spp., Katelysia spp., Villorita spp., and Gafrarium sp. Among others Mesodesma glabratum (Lamarck), Solen kempi Preston, Sanguinolaria diphos (Gmelin) and Donax spp., are also found to occur in certain places all along our coast. The true cockles Cardium assimile Reeve and C. asiaticum Bruguiere, though occurring at several places, are not of much commercial importance. The ark-shell Anadara granosa (Linnaeus) which is referred to as cockle in some countries, forms a minor fishery in Kakinada. A detailed account on the clam cockle and oyster resources of the Indian coasts has been given by Alagarswami and Narasimham (1973). Meretrix meretrix is the main species which constitutes the fishery along the Maharashtra, Goa and North Kanara coast though it occurs all along the east and west coasts. Ranade (1964) has estimated that 3600 persons are engaged in the fishery and collect 24,03,000 pounds of clams annually valued at Rs. 2,88,000. In Goa it is estimated that more than 400 persons are engaged in clam fishery. In the Karwar region also the clam fishery is good and more than 450 persons are engaged in this fishery for the collection of M. meretrix and P. malabarica. Along the Kerala coast M. casta is found to occur in most of the estuaries and backwaters and forms a fishery but the magnitude of the same has not been estimated properly. On the east coast clam

occurs in most of the estuaries and in addition to the live clam fishery at most of the centres there are certain places from where sub-fossil deposits are being regularly removed. In Ratnagiri area Solen kempi is being fished. Over 3 tonnes are fished annually. The window pane oyster Placenta placenta, known for its seed pearls it produces, has been under exploitation in the Gulf of Kutch where it occurs in abundance. In Kakinada more than 4000 tonnes of shells are fished annually which is valued at about Rs. 1,00,000/- Katelysia opima and K. marmorata are also fished in large quantities in Maharashtra State and in certain places the density of population is over 4,00,000/km ^{2}.

There exists a good fishery of Gafrarium tumidium in Palk Bay area and about 5 tonnes of clams are annually fished.

Donax sp. is also widely distributed along the sandy shores of Indian coast but there does not seem to be a well organised fishing for these clams.

The ribbed ark shell A. granosa is found in a few places. In Kakinada Bay a good fishery exists (Narasimham (1968)) and a total quantity of 1000 tonnes valued at Rs.50,000/- are fished annually and used in the manufacture of lime.

Chanks

Xancus pyrum, the common chank is abundant on the east coast of India from Cape Comorin to Madras although the density of its occurrence appears to thin out north of Point Calimere. On the west coast good number of chanks are fished from the Gulf of Kutch coast, but southward of this no chank is found till the southern coast line of Kerala State where it forms a small fishery. It is also found around Andaman islands to some extent. A detailed account of the chank fishery of India has been given by Nayar and Mahadevan (1975). On an average about 12,000 chanks are fished from Gujarat per annum.

From Kerala coast, about 17,000 chanks from trawl catches at Quilon, and from Vizhinjam area about 6,200 chanks by hooks and line are fished annually. In Colachel, Enayam and Kadayapatnam regular chank diving is being done and on an average land about 2,000 chanks annually. On the east coast Tuticorin is considered to be the best chank fishing ground from where over 1 mollion chanks were fished during 1978-79. More than 900 divers are engaged in this fishery at Tuticorin. Kannirajapuram to Tirupalakudi in the Palk Bay is also a very productive area and on an average 3,00,000 chanks are fished every year. From the other centres on the south-east coast such as Tanjore, South Arcot and Chingleput a total of 40,000 chanks are landed annually.

Trochus and Turbo

Trochus niloticus and Turbo marmoratus are the other commercially important gastropods fished all along the Andaman and Nicobar Islands for the past several years. Appukuttan (1977) has given an account about the Trochus and Turbo fishery in Andamans. It has been estimated that on an average 400 - 600 tonnes of Trochus and 100 - 500 tonnes of Turbo shells are fished annually from Andaman and Nicobar waters. Trochus shells fetch a price of Rs.4000/- per tonne whereas Turbo shells are sold not less than Rs.10,000/- per tonne. Shell craft industry is well established and a good number of artisans are regularly engaged in cleaning, polishing, cutting and carving these shells and various articles are made out of them. Of late the Turbo fishery is showing a decline perhaps due to over fishing. Apart from the detailed study made by Rao (1939) no other work seems to have been made in recent years. In 1978 two teams of Scientists of the CMFRI visited almost all the Andaman and Nicobar Islands during the period January - May to make general survey to find out suitable places for extending mariculture activities in and around the islands. During the survey the potentialities of the molluscan fisheries were also studied in detail. But a detailed study extending over a few years is absolutely essential to make a proper assessment of these commercially

important fisheries in and around the Andaman and Nicobar islands.

Cephalopods

Cephalopods comprising of squids, cuttle fishes and octopi are fished in appreciable quantities in India. 15,931 tonnes of cephalopods were landed during the year 1978 out of which 4,557 tonnes were from Maharashtra State, 6,516 tonnes from Kerala State, 1959 tonnes from Gujarat State, 1,346 tonnes from Karnataka State and 1,042 from Tamil Nadu. The important species are Sepia rouxii, S. aculeata, S. rostrata, Sepiella inermis, Seipioteuthis arctipinnis, Loligo duvauceli, L. hardwickii, Octopus rugusus, O. octopodia and O. favonia. The cephalopod catches are got incidentally only in shore-seines, boat seines and trawl nets operated for fin-fishes. The cephalopod resources of the offshore waters are practically not exploited. Studies conducted a decade ago (Silas, 1968) have shown that a number of species such as Symplectoteuthis oulaiensis, Sepia aculeata, S.pharaonis, Sepiella inermis and Loligo duvauceli are available in the offshore waters of west coast. Systematic exploratory fishing should be carried out on the continental shelf and beyond to locate new grounds in the Indian Ocean and in the Arabian Sea. The method of jigging used in other countries for fishing squids and cuttlefish should also be employed here to improve the cephalopod fishery.

MOLLUSCAN CULTURE IN INDIA

Molluscan culture is of very recent origin. Attempts have recently been made to culture mussels, edible oysters, pearl oysters, clams and also cephalopods by CMFRI.

Mussels

Investigations on the culture of the brown mussel (Perna indica) were carried out from the Research Centre at Vizhinjam from 1971 following the rope culture method using coir ropes for suspending the the mussels. The initial results were so encouraging that the work

was extended to a few more centres such as Kozhikode, Madras and also Vizagapatnam, to find out the feasibility of culturing Perna viridis (green mussel). The open sea green mussel culture work at Kozhikode has given positive results.

Edible oysters

The importance of oyster culture was visualized as early as in 1910 by Hornell. He initiated oyster culture work on lines followed in France and established a farm at Pulicat, 40 km north of Madras city. The follow up programme was not carried out with the result, the progress was very much hampered. Similarly as early as in 1920's a good beginning was made by some of the fishermen of Bombay (Rai, 1928) to collect the young oysters and transfer them to suitable shallow regions in Mahim, on the Maharashtra coast where they allowed the oysters to grow to marketable size. Periodical monitoring and cleaning of the oysters were also carried out. Fairly large quantities of oysters were collected from all the available natural beds and sold in the market as there was great demand for them. These efforts were not backed by the Fisheries Department, or any other research organisation, with the result that the fishermen who did this work could not make much headway and improve their techniques, and they had to give up this line of work in due course. The need for utilization and augmentation of resource led the Central Marine Fisheries Research Institute to take up oyster culture work at Tuticorin in the year 1975. Various aspects of oyster culture such as spat collection from natural environments, hatchery development of seeds, growth of spat by following different techniques, control, purification of oysters, shucking and processing are being studied in a detailed way. Initial results obtained indicate a production of 150 tonnes of oysters per hectare. Some interested fishermen have taken up oyster culture.

Experiments on culture of clams such as Anadara sp., Villorita spp., are also being tried at present from Mangalore, Cochin, Kakinada and Waltair. The results are being watched. Attempts are also being

made to collect the egg masses of squids and cuttlefish and rear them so that the initial mortality of the young ones by predators could be minimised to a very great extent.

Pearl oysters

The first attempt at culturing pearl oysters in captivity was made at Tuticorin as early as in 1864. A lot of work was carried out initially at Tuticorin and later on the culture work was shifted to Krusadai Island wherein it was continued for a number of years by the Tamil Nadu Fisheries Department. Attempts were also made in Gujarat to produce cultured pearls. But all these attempts did not yield results. In 1972 pearl culture work taken up by the Central Marine Fisheries Research Institute at Tuticorin at Veppalodai enabled production of perfectly spherical cultured pearls in the year 1973. Various other aspects of work such as production of oyster spat by hatchery method, improving the techniques of growing the oysters etc., are being pursued. Although pearl oyster beds have not been located at Vizhinjam area, a good settlement of young oysters had taken place during 1974 spat setting season. The young oysters thus collected were also grown to adult size oysters which promoted the Kerala Fisheries Department to take up pearl oyster culture on a pilot scale in 1978.

Farming or culture practice involving molluscs is as yet to be taken up on a commercial scale in India. Steps in this direction has been initiated to involve small-scale traditional fishermen. This is being followed up by a programme of financial assistance and loans under Integrated Rural Development Programme. It is envisaged that within the next decade India will figure as one of the important countries with established farms for oysters, mussels and clams.