Reprinted from Seafood Export Journal,
Vol. VIII–No. 1, January, 1976.

Culture of Marine Fishes in India:

THE PROBLEMS AND THE PROMISE*

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Introduction

Although it is technically feasible to farm many marine fishes, there has not been much progress in their culture on a commercial scale except in regard to a few species. The most striking development in this field has been the culture of the yellowtail *(Seriola quinqueradiata)* in floating fish pens in Japan, wherein the production has jumped from 1,000 tonnes in 1960 to 100,000 tonnes in 1972, an almost exponential growth rate of 45% per year (Mac Crimmon *et al.*, 1974). Mullets (*Mugil* spp.) and milk fish *(Chanos chanos)* have been cultured traditionally in south east Asia; in Israel also the culture of the mullets is developing rapidly. Recently two salmonids (Atlantic salmon, *Salmo salar* and the rainbow trout, *S. gairdneri*) have been grown commercially in sea water from the fingerling stage in Norway. Experimental rearing of these species is in progress in Scotland and Germany (Mac Crimmon *et al.*, 1974). Commercial culture of some species of marine fishes has also been undertaken traditionally in India especially along the estuarine tracts of Kerala, Goa and West Bengal. But these are still only small scale ventures, without much technological innovations and production is also poor. The present paper sums up the practices and promise of the culture of marine fishes in India.

Traditional culture of marine fishes in India

The areas of cultivation: Culture is undertaken not in strictly marine habitat but in the low-lying estuarine and coastal areas, subjected to tidal influence. The tide is let into or out of the ponds by various devices including sluices. Most of these ponds in Kerala and Goa are only seasonal although a few are also perennial. However the emphasis in these regions is on prawns because of the high unit value offered for these by the exporters.

Species cultured : *Kerala:* The important marine fishes cultured in the ponds are

* Paper presented at the Symposium on Aquaculture held at the 63rd Session of the Indian Science Congress (Zoology Section) at Waltair in January, 1976.

Mugil spp., and *Chanos chanos*. The other fishes found in the ponds include *Stolephorus* spp., *Thryssa* spp., *Etroplus* spp., *Ambassis* spp., *Gerres* spp., *Lates* sp., and *Tachysurus* spp.

Goa: The species cultured are the same as in Kerala. About 60% of the catch from the ponds consists of prawns and the rest fishes (Gopinathan and Dani, 1973).

West Bengal: The *'bheris'* of West Bengal are traditional fish farms. The mullets (*Mugil* spp.) and the cock up (*Lates calcarifer*) are the important fishes cultured in addition to prawns; eels, cyprinodonts, gobiids, *Ilisha* sp., *Setipinna* sp., *Thryssa* sp., *Ambassis* sp., *Therapon* sp., *Scatophagus* sp., and other estuarine fishes are also recorded from these ponds (Pillay, 1954).

Cultural practices: What is interesting to note is that the culture practices are similar in all areas. Stocking is not selective, being dependent on the tidal influx and the fish and prawns that come with it. No artificial feed is given. In other words the culture operation consists in the main of keeping the fishes and prawns in the ponds for varying periods of time. Naturally there is considerable inter-seasonal variation in production. George (1974) has estimated the average annual prawn production in the seasonal and perennial ponds in Kerala as about 900 kg/ha. and 1340 kg/ha respectively. The fish production data are not available. From the data given by Gopinathan and Dani (1973), it would appear that in Goa fish production is about 1,300 kg/ha. and prawn about 2,000 kg/ha annually. In the *bheris* of West Bengal fish and prawn production is 110–170 kg/ha/year (Pillay, 1954).

Research on the culture of Marine Fishes

Chanos culture: The CMFRI has been devoting attention to the culture of marine fishes especially *Chanos chanos* in the marine habitat. The results of the experiments undertaken in the 1950's have been given by Tampi (1967). The experiments were conducted in specially constructed salt water ponds at Mandapam. Despite the poor quality of the soil, the meagre organic content, the low nutrient level and hypersaline conditions for most part of the year, *Chanos* production was of the order of 450 kg/ha per year, whereas from the adjacent inshore area the annual fish catch was of the order of 57 kg/ha. The later series of experiments were conducted in ponds at Tuticorin, in the salt pan area. These were constructed in the general sea water reservoir of the salt pans and stocked with *Chanos* fingerlings. The annual production rate obtained was 850 kg/ha. (Nair *et al.*, 1975).

Culture of *Sillago*: Two small estuarine ponds were stocked with fingerlings of the whiting, *Sillago sihama*, at Mangalore. The growth rate was very encouraging and the fish were kept in the ponds during the period January–May of 1974 and 1975. No artificial feed was given.

Cage rearing of oil sardine and mackerel: The Institute has recently been conducting experimental rearing of oil sardine and mackerel in floating fish cages in the sea as also in the estuary. The oil sardines were kept successfully in the cages for about 4½ months in the estuary at Mangalore. The expriments there were terminated because of the onset of the monsoon. The

studies have shown that technically it is possible to keep these fishes in cages, without resort to artificial feeding. However the increase in growth was not very impressive.

Problems in the culture of marine fishes

The culture site : The first problem met with is that there are very few calm bays in the country where fish farms could be set up. The long and straight coast line with few indentations makes it necessary that construction of suitable holding pens or cages in the sea itself should be taken up as a major technological challenge. On the other hand there are extensive stretches of low-lying areas along the coast which get flooded with sea water during certain periods of the year, and these could form suitable areas for culturing fishes. In fact the experiments conducted at Mandapam have shown that such coastal lagoons could be converted into productive fish farms.

Availability of seed : The seed resources of the culturable marine fishes have not been properly surveyed although about sixty fry collection centres are known on the southern coast of the country. It is apparent that a systematic survey has to be undertaken of fish seed resources.

Growth rate of the cultured fish : The species investigated in India especially the mullets and the milk fish have a satisfactory growth. However it is possible that with more detailed work, species with faster growth rate could be found.

Fish nutrition : The present cultural practices depend on the natural food available in the ponds; for better production artificial feeds will be necessary. There is no doubt that in large scale culture a good part of the expenditure will go for the feed. It has been reported that in yellowtail culture in Japan about 50% of the expenditure involved is for the food of the fishes (Furukawa, 1971). Similarly in trout culture in floating enclosures in Norway, about 50% of the operating cost is for trash fishes used as feed and for labour for fishing these.

Breeding of fishes : Breeding of marine fishes is still a big technological challenge in this country, although in other countries especially USA, Japan and USSR, a number of species including the Pacific salmon are raised in hatcheries. There has however been some success in this country in the breeding of mullets.

Parasites and diseases : Investigations on the parasites and diseases of marine fishes have been sketchy and compared to those on fresh water fishes, considerable leaway has still to be made. It may be noted that control measures can be considered when basic knowledge concerning the course of the parasitic, bacterial and virus diseases becomes available.

Market price : The best marine table fishes in India are the seer fishes, *(Scomberomorus* spp.) and pomfrets *(Pampus argenteus* and *Parastromateus niger.)* The whiting, *Sillago sihama*, commands a very high price in certain regions of the country. Mullets are esteemed fishes. On the other hand *Chanos chanos* does not command as good a price as these fishes.

Remarks

That it is technically feasible to culture a fish is no reason why it should be cultured, unless of course the venture is justifiable on economic grounds. Aquaculture should be looked upon not only as a means to get high profits but also as a means to produce nutritious food for the masses and to generate additional employment avenues. Among the marine animals the culture of which yield high rates of return to entrepreneurs in India, prawns occupy the first rank. George (1974) has shown that the annual expenditure per hectare on prawn culture in the seasonal fields in Kerala during 1969—71 was Rs. 335—407 and on paddy cultivation Rs. 741—865, the income per hectare being Rs. 2600—3600 from prawns and Rs. 1250—1350 from paddy. In respect of the perennial prawn fields, the annual expenditure per hectare was Rs. 500—575 and the income Rs. 1700—2100. In Goa, the net profit from fish and prawn culture is estimated as Rs. 4300/ha. (Gopinathan and Dani, 1973). Estimates of expenditure and income in respect of fish culture alone are not available at present; this is an area where additional research input is necessary.

As stated above the biggest problem in the culture of marine fishes is that of locating suitable sites. Coastal indentations being few and far between, it is necessary even now to think of constructing experimental ponds or pens in the sea itself. That cages could be erected in the sea for culturing fishes at least for a few months in a year has already been demonstrated by the experiments undertaken. The poblem in such cases would be to identify species that would grow fast during a period of 5 to 6 months and give a reasonable rate of return on the investment. Obviously such a species should also have a high market value.

At the same time the question of construction of ponds in the sea itself has also to receive urgent attention. Along certain sections of the coast, the inshore area is rocky where fishing by boat seines or trawl nets would not be practicable. As an experiment, a few ponds could be constructed in such areas. The advantage here would be that since there are rocky outcrops in the sea, the construction of the pond bunds would be comparatively cheap. Once the stability of the ponds and the facilities for letting in and out the sea water are assured, fishes and other animals can be cultured in these.

The culture of euryhaline fishes can of course be undertaken on a mass scale in estuarine areas. The east coast with its vast net work of estuarine and backwater system offers ample scope for it. Even now in the Godavari delta mullets and the milk fish are cultured along with prawns although on a very small scale. The problem here is the construction of ponds with adequate facilities for tidal inflow. The returns, in economic terms, are likely to be encouraging.

Even though sardines, mackerel and other commercially important but cheap marine fishes cannot be cultured economically at present, the development of facilities for keeping them in enclosures in the sea for limited periods of time will have high practical importance. During the

periods of glut the fishermen have to resort to distress sales of the fishes, which could be avoided if the technology for keeping large numbers of these impounded is available. Even now sardine and mackerel are often kept in impoundments near the shore for a few days at a time. But beyond a period of a week the risk of large scale mortality of the impounded fish is very great.

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