THE PROSPECTS OF MARICULTURE

Dr. K. V. SEKHARAN

Central Marine Fisheries Research Institute, Cochin - 11

Mariculture is an exciting field of fisheries research now. We have so far been using the sea mainly as a hunting ground for food, much as the primitive man did in the past. But many scientists have been pointing out that mariculture may ultimately become the main method for developing food for man. A big effort is of course necessary for solving the technological and biological problems involved in mariculture and it requires a multi-disciplinary approach. But we cannot wait for that indefinitely. A beginning has to be made with the available resources and the first responsibility in this direction is that of the fishery scientist.

Some theory

On land, the topmost soil, some 30 cm. thick, which is subjected to vagaries of nature, is what sustains food production. The area is limited in extent, and cannot be increased unless the underground terraces could be constructed for cultivation on economic lines. The surface area of the ocean is about 2½ times that of the land and theoretically all this area is available for mariculture. Moreover, in mariculture, as opposed to agriculture, it is not only the topmost layer that is cultivable but the entire water column down at least to 200 metres depth is available for utilisation. Therefore, the available space for sea farming would be many times the available space for land farming.

As on land, life in the sea has to depend directly or indirectly on plants, which trap sun's energy and make it available to animals and man in various forms. The plants in the sea consist chiefly of minute organisms. These can of course be directly harvested for food but the cost at present would be enormous. A more economic way would be to allow the small animals to eat them. The small animals are consumed in turn by the other animals leading finally to the groups which are harvested by man. The harvest of animals would then depend on the abundance of plant matter and man's endeavour would primarily be devoted to creating, if possible, conditions for its optimum production.

Sunlight, the most essential requirement for plant production, can be a limiting factor not only in the northern latitudes but also at great depths of the ocean in middle latitudes. In clear water, only 10% of the light that falls on

surface reaches up to 10 metres depth; such is the absorbing and dispersing efficiency of sea water. In fact plant production in notable quantities may not take place beneath 200 metres depth. The next requirement of plants, namely nitrates, phosphates and other salts, get into solution in sea water through a process of recycling of wastes. When the marine plants and animals die and sink to the bottom, they are acted on by different types of bacteria, resulting in the release of the different salts. Normally currents bring up the salts into the lighted upper layers. But mariculture cannot depend on natural replenishment alone. The dark depths of the ocean are great reservoirs of these life-giving salts. Why not pump the waters of the depths into the upper layers to enrich them? Will the cost be recoverable by increased production? The results of work now going on may give the answer. In regard to carbon dioxide, which is the other essential requirement for plant production, there can be no dearth in the sea. Which are the animals to be cultured? Here man can choose from the hundreds of desirable species that the sea contains.

Thus we see that the sea itself contains all the material required for mariculture. What is required in the initial stages at least is a manipulation of these resources to produce the desired results.

Theory versus practice

It is of course easy for those who do not have to sink money to talk of mariculture in glowing terms. What would be the input-output ratio in economic terms? There is no ready-made answer. It can only be stated that mariculture is already a thriving proposition in several countries, especially Japan, Spain, France and Netherlands. In the Soviet Union, experimental undersea farms have been set up, which are reported to yield over 20 tonnes of fish per hectare per year. Selection of site, the type of animals chosen for culture, and scientific farming methods, all these three in a proper mixture should give very satisfactory results. Affluent countries find that mariculture may not be as profitable as certain other activities and would therefore prefer to buy their seafood from countries, which can produce it cheaply. In the developing countries the provision of cheap but nutritious diet for the people is also a pressing necessity. Viewed in this context mariculture would seem to offer promising returns to the society in developing countries.

Animals rather low in evolutionary scale and whose food needs are simple, offer the best hope in mariculture at present. Mussels, oysters, clams and prawns have already been experimented upon and found to be suitable for economic culture.

A related field is brackish water culture of prawns and fishes, the profitability of which is already known. In culture, one has however always to be on guard against natural calamities (Cyclones, floods), parasites, predators and diseases. The role of the scientists is very great here. Bays and other protected areas would be a safe bet as farm sites.

Mariculture in India

The need for mariculture under the conditions prevailing in India was emphasised by Panikkar (1952) who advocated the conversion of low-lying areas near the coast, which yield nothing, into fish farms. in the 1950's the Central Marine Fisheries Research Institute initiated a bold programme of mariculture research at Mandapam, which yielded valuable results. An entirely new turn to the work of the Institute in this field was given by the team under the leadership of Dr. Qasim in the last two years. Qasim and Achari (1972) have shown that the technique of rope culture can yield 60—70 tonnes of mussels per hectare per year. Their method also gives very good promise of raising the production of mussels to even greater levels, which would indeed herald a breakthrough in aquaculture in the country.

Culture of prawns in paddy fields near the backwaters has been going on for years in this country, especially in Kerala and West Bengal. The Central Marine Fisheries Research Institute has carried out pioneering research on this and shown that even without artificial feeds, prawn production of 500–2000 kg. per hectare can easily be attained within a period of six months.

The future

Mankind has taken but a few hesitant steps so far in the direction of sea farming. The available techniques allow the utilisation of only the fringe of the ocean for this purpose. Further seaward expansion of fish farms would require international understanding and effort, as otherwise what is sown by a nation can be reaped by another. Such an era would witness international teams of aquanauts operating underwater tractors not only for catching fish but also for releasing the all-important nutrients from the sea bottom, engineering teams pumping sea water from depths to the surface and experimenting on revolutionary methods of creating fish pens in the sea. We may see more and more quantities of aquatic animals produced to order and to suit the changing needs and tastes of man. An era of truly international effort in the field of utilisation of the ocean in the best interests of mankind as a whole would then dawn.

The author thanks Dr. S. Z. Qasim for his suggestions.

References

Panikkar, N. K., 1952 – Possibilities of further expansion of fish and prawn cultural practices in India. *Curr. Sci., 21* (2) : 29-33

Qasim S. Z. and Achari, G. P. Kumaraswamy, 1972– Mussel culture — its potential and implications. *Seminar on mariculture and mechanised fishing. Abstracts:* 13. Dept. of Fisheries, Tamil Nadu.