The Indian marine fisheries are characterized by about 2000 varieties and caught mostly by mechanized trawlers, purse seiners, gillnetters apart from several mechanized and non-mechanized small boats. However in western temperate countries the marine fishery is mainly constituted by few large varieties of fish which will be little easy to manage under quota system unlike ours. In India the marine fish are characterized by short life (2-3 years age) with more generation turn over and caught by multi species gears(nets) making it very difficult to manage in spite of possessing huge scientific data over the years. Nevertheless, when compared to world scenario, the Indian marine fisheries are still showing upward trend in total catch and catch rates.

One of the major management measure adopted in India is the seasonal ban on mechanized fisheries for 47 days both on east coast and west coast with different timings. However the fishing by non-mechanized fisheries is allowed. Thus this has limited impact on conservation.

All the fish in the sea lay eggs which will be drifted close to the coast where the depth of water is less than 20m. This area is the best nursery ground for the larvae that comes out of these eggs as this is highly productive area rich with planktonic food essential for their survival and sustained growth. After their growth to juvenile stage they migrate to their habitats. Hence any fisheries management must address the protection of the nursery areas primarily for sustaining the fisheries.

Under Indian circumstances the best measure is to deploy the artificial reefs along inshore areas at 20 m depth. These are nothing but triangular concrete structures(modules deployed to the bottom of the sea bed. They provide shelter to many brooder fish, juveniles. They also offer surface areas for attaching the eggs. Once the artificial reefs are deployed the area automatically becomes unfit for trawling and purse seine operations and become a natural "Marine Protected Area" (MPA), protecting the biodiversity, habitat, brood stock and help in supplying the younger fish to the fishing areas on a sustainable manner (Recruitment).

It is emphasized here that the major aim of marine fisheries management is mainly to sustain the fisheries with limited scope to increase production. In order to regulate the fishing vessel strength the potential of total wealth of sea is estimated by several methods. The novel method now under progress is assessing the chlorophyll production in the sea through remote sensing and deriving the fish production through a model. This will greatly increase the efficiency of regional management of marine fisheries in India. However, to increase the production of marine fish particularly high valued fish like pomfrets etc., is to grow them in the sea within the artificial reef areas by floating cages under natural conditions and stocking them with seed of high valued fish and feeding them with pellet/natural food.

About 5 Ton of fish can be produced from a 6 meter diameter cage in about 8 months valued about Rs. 7.00 lakhs. This technology is boon to land less people as they can practice this profession in open sea. One cage is equivalent to the production from 1 ha of pond area on land. For this we domesticate the fish as brood stock to lay eggs and seed are produced to be stocked in the floating sea cages. This is the only way of increasing the high valued marine fish production.

(Dr. G. Syda Rao, Director, Central Marine Fisheries Research Institute, Kochi)
FISHERIES AND AQUACULTURE

DR. S. AYYAPPAN

Fisheries in India was recognized as an important allied sector of Indian agriculture only after independence. The vibrancy of the sector can be visualized by 11-folds increase in fish production in just six decades, i.e., from 0.75 million tonnes in 1950-51 to 8.3 million tonnes at present (2011-12). The unparallel average annual growth rate of over 4.5% over the years has placed the country on the forefront of global fish production, only after China. Besides meeting the domestic needs, the dependence of over 14.5 million people on fisheries activities for their livelihood and foreign exchange earnings to the tune of Rs 129 billion (2010-11) from the fisheries produce, amply justifies the importance of the sector on the country’s economy and also livelihood security.

The term ‘fisheries’ in broader sense, includes both capture fisheries and aquaculture. Although the fish production from capture fisheries has witnessed steady increase since independence to reach 4 million tonnes at present, its contribution is overshadowed by the spectacular growth made by aquaculture in the last three decades, which increased from 0.37 million tonnes in 1980 to 4.3 million tonnes at present.

The present production of 3.1 million tonnes from marine fisheries alone 8129 kms coast line is not far behind the fishery potential of 3.93 million tonnes in our Indian EEZ. Marine aquaculture, which is not only a major source of income but also a major source of food, has been the mainstay of the fishery sector.

Aquaculture in India has evolved as a viable farming practice over last three decades with considerable diversification in terms of species and systems, and has been showing an impressive annual growth rate of 6-7%. While the carp-based freshwater aquaculture, mainly constituted by the Indian major carps viz., catla, rohu and mrigal, has been contributing over 90% of the aquaculture production satisfying the domestic need, the shrimp-based coastal aquaculture, with about only 5% share contributes much of the export earnings.

Induced breeding of carps and catfishes, hatcheries for mass-scale spawning, seed rearing and carp polyculture are some of the epoch-making technologies actually guided the freshwater aquaculture development.

The sector also has shown considerable diversification in recent years with adoption of other species like catfishes and freshwater prawns, owing to their higher market demand and economic advantages. While production of 4-5 tonnes under carp polyculture is quite common, farmers of several regions are able to produce 8-12 tonnes/ha/year. Integrated fish farming with livestock and horticulture has not only been able to utilize the byproducts/wastes as principal inputs, but also made the farming practice highly remunerative and farmers’ friendly.

Mariculture in India although was at very low key with farming of mussels and edible oysters undertaken in some coastal regions of Kerala over the years, successful demonstration of sea cage farming in recent years, initially with seabass and most recently cobia, however has shown the prospects of mariculture in the country.

Inland sector, while the rivers, estuaries, backwaters, lagoons, etc., have witnessed higher level of exploitation, the reservoirs and floodplain wetlands possess high potential for enhancing fish production, at least 4-5 folds through culture-based fisheries, with regulated stocking based on the biogenic capacity of the system.

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It is estimated that the fish requirement of the country by 2025 would be of the order of 16 million tonnes, of which at least 10 million tonnes need to come from aquaculture. Therefore, development of road map based on available resources, at least at district levels, necessary to be formulated to achieve this target.

(The writer is Secretary to the Govt. of India and Director General, Indian Council of Agricultural Research, New Delhi)
Established in 1947, the Central Marine Fisheries Research Institute has been addressing research and development issues in marine capture fisheries and mariculture with the objective of ensuring sustainability and food security.

**Our Vision**
Sustainable marine fisheries through management intervention and enhanced coastal fish production through mariculture for improved coastal livelihoods.

**Our Mission**
To develop an integrated Marine Fisheries Management Policy to sustain the marine fisheries and augment production through open sea farming and protect the nursery grounds and habitats.

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Fisheries resource conservation and management, Artificial reefs deployment, Mariculture technologies, Marine ornamental fish hatchery technologies, Open sea cage culture, Fish stock assessment and related computer software, Underwater diving, Sampling methodology, Impact assessments, DNA profiling and Bioprospecting

**Analytical Services**
Water analysis for temperature, salinity, dissolved oxygen, inorganic phosphate, nitrite, silicate, COD, pH, ammonia, BOD, metals and environmental parameters, Mud/Sediment analysis (pH, organic carbon, available phosphorus, available potassium, texture, heavy metals) Taxonomical identification, Feed composition analysis, Shell identification, Electron/Scanning microscopic work and Disease Diagnostics

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- **Green Mussel extract (GMMe)**
- **VARNA: The Marine Ornamental Fish Feed**
- **Cobia broodstock and seed**
- **Brood stock and seed of marine ornamental fishes**
- **Cobia fingerlings**
- **Pompano fingerlings**
- **Harvested Pompano from cage**
- **Open sea cage**
- **Harvested lobsters from cage**
- **Pop Up Satellite Tagging of Yellowfin Tuna**

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