

On Judicious Exploitation of Marine Fishery Resources

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The principal aim in marine fisheries research is to find ways and means of obtaining 'maximum sustained yield' from year to year and to practise conservation procedures for realizing such an end. By 'maximum sustained yield' is meant the maximum quantity of fish that can be harvested by man in a given year, without adversely affecting the regenerating or replenishing potentialities of the stock with reference to future fisheries. In taking the maximum sustained yield from a marine fishery resource, not only the quantity of the yield that is taken into consideration but also the income or profit gained out of it. Marine fisheries resources are common property resources and are open for exploitation by anybody. Therefore, the natural tendency of the exploiter is to obtain as much production as possible. But, once the level of maximum sustained yield is crossed, the ensuing overfishing operations shall lead to a decline in the regenerating capacity of the resource and end in its depletion. Although this by itself may not lead to extinction of the species concerned, the quantity of yield might become so low as to make continuous exploitation of the species unrewarding.

A marine fishery resource is a self-regulating, renewable, natural resource denoted as 'dynamic resource', as different from non-renewable, static resources such as minerals, oil, etc. The latter will have to be exploited carefully and with reserve, whereas the former could be exploited without reserve upto the level of maximum sustained yield because if the exploitation falls short of it, the fishes would die of natural causes and become a waste to the fishery. Under the present state of increasing demand for marine fish, it is essential that marine fisheries resources are conserved, managed and exploited most judiciously.

FACTORS INFLUENCING SIZE OF A RESOURCE:-

There are four primary factors that influence the size of a marine fishery resource. These are: (i) recruitment of new individuals to the population; (ii) growth of different year-classes existing; (iii) deaths due to natural causes and (iv) deaths due to fishing operations. By harvesting the resources man directly influences the last factor. In the un-fished state, population levels are balanced by natural causes;

and, as such when fishing begins: most of the yield is derived from the accumulated population. After the fishery has operated for sometime, the lowered natural mortality, accelerated growth resulting from availability of more food, more space to move about and lower disease and parasite infestations, etc bring the population into a new state of equilibrium. If this equilibrium is so lowered as to result in such a state of not having the requisite capacity or individuals to reproduce and replace the biomass removed, then the population would become adversely affected with reference to subsequent fisheries. Therefore, in undertaking fishing operations caution has to be exercised to leave out at least that much of the parent stock which would be able to give rise to the optimum yield. Usually, man has absolutely no control over factors like diseases, parasites, changes in hydrographical conditions, etc. And, the only factor on which man can have some control over a marine fishery resource is his own fishing activities. Under such a circumstance, the management and/or conservation procedures which man can undertake, are also limited.

PROCEDURES OF CONSERVATION:-

The conservation procedures which man can exercise over a marine fishery resource may be considered as below

(a) Reduction of fishing mortality:

The fact that fishing operations are affecting the size of a marine fish population can be recognized when the total yield registers a decline, the catch per unit of effort becomes lower and the mean size of the fish caught is much smaller than during normal times. Under such a condition, the only control that a fishery manager can exercise to

protect future fisheries from failures is to reduce fishing effort. However, in cases where fluctuations in fisheries are caused by fishery-independent factors, reduction of fishing mortality may not have the desired effect.

(b) Selective mortality:

In some fisheries, employing selective types of gear would result in the capture of only larger fish and permit the escape of smaller fish thus affording opportunity for them to grow and replenish the fishable stock. Use of nets with large-sized meshes, selective types of gear such as gill-nets, drift-nets, etc may be resorted to in this connection. Or when small-sized fish are also required to be caught, a maximum proportion or quantity alone per unit may be permitted to be captured.

(c) Closure of nursery grounds:

Usually, fish of small sizes do not tend to shoal with fish of larger sizes. Capture of small sized fish or using gears that are likely to destroy young ones such as trawl nets, are not desirable in such cases. Also, closure of these regions for fishing operations is an effective way of conserving the resources. In the south-east coast of U. S. A., trawling operations of estuaries are prohibited until prawn juveniles reach a specified size.

(d) Protection of spawning grounds:

Protection of spawning grounds is possible only if the spawning grounds are well delineated and defined. As capture of potential spawners would also have the same effect as capturing spawners, spawning grounds may have to be closed for fishing operations

much earlier than spawning time. In case of fishes with demersal eggs, the use of demersal gear like trawls scrapping the substratum will destroy the eggs deposited and hence such gears will have to be prohibited.

LAWS AND REGULATIONS:-

Laws and regulations enacted to conserve marine fishery resources should be aimed at protecting the stock as well as at getting maximum sustained yield. This could be accomplished by either reducing or limiting the catches and by protecting certain sections of populations.

(a) Reducing or limiting catches:

This could be accomplished by lowering the efficiency of individual fishing units, such as size of fishing vessel, size and type of gear, closing areas to certain types of gear, limiting the sizes of bags, restrictions on fishing time, etc. Also, the number of fishing units may be restricted by exercising a quota system for catches as well as by limiting the overall total quantity of fish that could be caught, etc.

(b) Protecting sections of populations:

Protecting sections of populations such as young ones is amply justified by biological evidences. This is achieved by changing the fishing gear to allow the escape of small sizes, by closing spawning grounds, spawning seasons, nurseries, etc. from fishing operations, etc. Protection of specimens based on sex or condition is also resorted to such as the noncapture of lobsters carrying eggs.

LONGEVITY AND CONSERVATION:-

Fishes with a long natural life-span are available for capture for a longer period than those with a shorter life-span. Based on this fact, capture of the specimens could be determined. In the case of long-living and late-maturing species, survival of sufficient spawning stock is effected by maintaining a moderate fishing pressure. In the case of the short-living and early-maturing species, fecundity is usually high and a much less proportion of the total stock can provide enough spawn. And, in fact, in most of the short-lived marine fishes, it has not been possible to demonstrate an absolute correlation between the size of the parental stock and that of the progeny. As only a small proportion of the population would be enough to replenish the exploitable stock, the goal of management in short-lived marine fishes is to harvest each annual brood at such a size and rate as to obtain maximum profit. However, even in such cases, the success of renewal of the exploitable stock differs from year to year, mostly influenced by environmental conditions over which man can have no control. Most of the marine prawns in India, the oilsardine and mackerel can very well be included in this category. Based on these facts, there does not appear to be any cause for concern with regard to their exploitation as much as possible.

POLLUTION HAZARDS:-

By polluting parts of sea with sewage and industrial wastes, man is likely to destroy fish and shellfish resources. As such, efforts will have to be taken and legislation enacted to prevent pollution affecting exploitable stocks as well as critical stages in their

life history. Similarly, marine fish stock will have to be protected from the effects of radioactivity and discharges from nuclear fission power plants.

It may be seen from the foregoing that for judiciously exploiting and managing marine fisheries resources, it

is essential to understand the factors affecting their life history, abundance and availability. And, with the background of a sound knowledge on the biology of the population, it should be possible to devise methods, procedures and laws for their rational exploitation and conservation. ●