

## Role of Research in Fisheries Development

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The ocean food resources have been attracting greater attention during last few decades. Man has been planning to obtain increased quantity of food from the sea. Apart from augmenting exploitation of the traditional food items, newer items are being looked for. Valuable food items which are available but not fully exploited are receiving greater attention. In view of this, research and management is stressed for gathering increased knowledge of the food resources of the sea.

As elsewhere, in the past, research and management has greatly helped in the development of Indian Ocean fisheries. The growth rate of over 4% per annum during last three decades which exceeds the growth rate of human population, is an outcome of the exhaustive research and development work in the field of fishery science and technology, marine biology and biological oceanography.

### **Demand and Need**

Indian Ocean countries, where human population continue to increase and protein is in short supply, a primary need of these countries is to increase the supply of fish by all possible means, seeking out unused or little used resources, extending fisheries, increasing mechanization, improving gear etc.

On one side, there is requirement to increase production as rapidly as possible, while on the other side, one expanding fishery after another (for example, the trawl fishery in Thailand) finds itself in difficulties as catches fall to uneconomical levels, and it is found that the stock of fish on which countries were relying for increased

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catches are already fully exploited and can only yield less weight of fish and fish of smaller average size, if the fisheries continue to expand.

Thus in the development of fisheries, there are two quite distinct basic needs. One is to know which stocks of fish are capable of yielding more fish, which are currently yielding their maximum, and which are overfished. The other is to know what can and should be done to increase the catches from those stocks which are capable of yielding more, that is, what form should development take to achieve these increased yields. The first need defines the major role of fisheries research in most countries, the evaluation of the resources within the countries EEZ and the determination of the degree to which the potential yields of fish and shellfish are being realised and therefore where development could be successful.

Such evaluation provides, essential information for the planning of development programmes, but in fisheries approaching full exploitation or already overfished, other information is needed in order to make the best use of the resources. The important requirement is to know the amount of fishing that will obtain the maximum yield, or slightly lower total yield which will give a higher catch per boat, larger average size of the fish caught and a more stable fishery. Furthermore, the apparent maximum yields from any stock may be capable of being increased by appropriate management of such fishing activities as the adjustment of the meshes of the net used, closed seasons or closed areas; and it is the responsibilities of fisheries research to evaluate the effectiveness of such actions so that the maximum yields can be achieved. While control of fishing effort is normally the key to obtaining close to maximum yields from any stock or stocks, such control is often difficult and other measures may help alleviate the evils of overfishing.

Fisheries involving this exploitation of natural self-regenerating resources, do not lend themselves to experimentation and therefore when there is a definite plan to develop particular fishery, for instance by increasing the number of vessels or by improved or new fishing methods, much can be learned for future development and also for the understanding of fisheries dynamics if the proposed development is specifically maintained. This would require observations on the fishing fleets and the fish caught.

Thus, the main thrust of research will be in resource evaluation, assessment of the degrees to which the stock is fully exploited and their potential yields, the evaluation methods of maximizing yields and the monitoring of development.

The development of fisheries requires a totally different approach. Different fisheries requires quite different activities for their development. No fishery will develop, unless it proves to be economically sound.

In many cases, the appropriate action for the development of a fishery found to be capable of expansion is first to identify the constraints to that expansion and to deal appropriately with these. An outward-looking approach is required, taking all factors into account, and in the sphere of improved technology, the emphasis will be on the increased use of methods already established elsewhere, rather than an attempt to develop quite new approaches in these fields. Socio-economic studies will

also play an important role to ensure that development relate to the real local need and the actual local situation.

The relationship between research development and management is that the research provides the directorate with information on the extent of resources and their potential for further exploration and on the merits of management methods. The directorate uses this information together with that provided by its economists and by reports from its local coastal staff who are in day to day touch with the fisherman to formulate its policy for development or control of the fisheries.

### **Priorities in Research**

Priorities in research, in each country will differ, depending on the degree of level of exploitation and existing state of knowledge of resources under its jurisdiction. For a country, with little traditional fishing, the emphasis is likely to be on exploratory surveys to establish the potential resources, while for the country with most of its resources are well known and exploited heavily, the priority will be for research to aid management and for more detailed biological research to maximize yields or economic returns. However, most fish stocks are already exploited to some extent and the objective is therefore, to establish the potential for future expansion of the fishing.

The first method of establishing the potential is to understand the biological processes in the sea. The data and information on (1) quantitative and qualitative aspects of marine food web with particular emphasis on rate, quantum and magnitude of organic production, grazing rate, generation time, growth dynamics, mortality rate and transfer efficiency, (2) role of microbes in the formation and fate of organic matter and (3) dynamics of phytoplankton, zooplankton and benthos in the marine ecosystems.

This method will provide the basic data and information for management not only for future development of fisheries but also for its conservation. The other methods of identifying the potentials is to identify the various stocks in the given area and examine for each the data for annual catch and fishing effort for as many past years as possible and, by drawing the yields curves, to establish the relationship between annual catch and fishing effort. Such data, even it is quite crude, can show whether a fishery is in the phase of expansion and can be further developed or whether it is near full exploitation or overfished.

This method is more suitable for Indian Ocean Countries, where determination, growth rates, feeding rates and mortality rates are often almost impossible to obtain, thus rendering more difficult to use the method mentioned above.

The establishment of the yield curves for the various stocks of fish is a continuing process, starting with any data available to estimate the fishery's probable position on the curve and thus to decide whether development is to be encouraged from then on, the reasearch is increasingly devoted to confirming or modifying the original assessment of the shape and position of the curve and refining it by assessing

and taking into account other factors which may influence the estimated position of the curve and thus altering the predicted potential and corresponding fishing effort.

### Essential Statistics

The collection of accurate fishery statistics is necessary pre-requisite for exploitation and development of fisheries. The work of collection of statistics may not be considered to be scientific research in the strictest sense, and much of it may well be undertaken as a part of the general responsibility of non-scientific staff. However, the data requirements, its decision and method of collection is to be specified by scientist only. Unless scientists are closely associated with the planning and execution of this essential data collection work, the quality of data and hence, that of scientific studies will suffer.

The importance of relevant statistics at an adequate level and its accuracy cannot be overstressed, FAO has prepared a number of documents to aid in the establishment of national fisheries statistics suitable for national use, but also coordinated on a world wide basis. So that they are comparable for regional and world use.

The focusing of attention on the determination of resources and assessment of the state of exploitation of the stocks helps to identify the priorities among the many aspects of the biology of the species that need to be investigated. Particularly important is determination of the limits of distribution of the various pelagic species and breaking of their over distribution into stocks units. Possible byproducts of such experiments will give information on growth rates and indication of mortality rates.

The determination of spawning areas and times, seasonal migration, average size for maturity and length-weight data are all important in the interpretation to catch data and decision on minimum sizes, closed season and closed areas. The priority of these aspects depends on the level of exploitation of each area.

Surveys need to be undertaken, where valuable shrimp fisheries occur in the adjacent more coastal waters, to collect the information on the effect on the catches of shrimp and use of the different sized meshes and distribution of shrimps to determine whether the closing of areas to certain sizes of vessels or other measures can meet, what has become a very serious problem in countries such as Malaysia, where highly profitable shrimp fishery has over fishing on the coastal waters and apparently starving the more offshore grounds of recruits.

The focusing of attention on resource evaluation and assessments of the states of the fisheries not only sets the priorities in the biological work generally, but provides a sound basis for answering the majority of ad hoc questions which arise from government and industry.

### Scale of research effort

The scale of research required depends on the size and complexity of both resources and exploited fisheries. As the collection and analysis of statistics regarding the fisheries is so basic to this work, the statistics service should be considered as contributing the required research effort and there is little doubt that the cost of collection is closely related to the size and complexity of the fisheries.

Any country with substantial fisheries will need an adequate research staff. The useful output from the research effort will depend on the quality and effectiveness of the people concerned. One good scientist is worth many poor ones, and while money alone will not ensure good scientists, there is no doubt that money spent on pay to ensure comparability with other employers, will result in more effective research work.

A major expense in the research in fisheries is often the cost and maintenance of research vessels, and it is therefore most important that their size and number are related as closely as possible to research needs. Presently there is much routine work going on the evaluation of fisheries resources. Although a break-through is achieved in some fields, there is lot to be understood regarding the flux energy flow through different compartments and thereby the production of each compartment of the biological process in the sea. A more effort on this line is required.

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