

SOUVENIR
20th Anniversary
Central Marine Fisheries Research Institute
(Government of India)



ISSUED BY
THE ORGANISING COMMITTEE C. M. F. R. I. RECREATION CLUB
MANDAPAM CAMP

Statistics in Fishery Research and Survey

BY D. CHAKRABORTY

Central Marine Fisheries Research Institute

In the present days of acute food shortage, the necessity of developing and expanding our fisheries need not be over emphasised. India with a coast line of over 3,000 miles and with extensive river systems and a large number of swamps, *bheels* and ponds spread over the country produces only about 1.5 million tonnes of fish a year and there is an immense scope of stepping up fish production.

Any developmental plan will require accurate statistics for depicting the condition of the industry and these may be grouped under three broad categories, namely (i) Potentialities (ii) Production and (iii) Utilisation, demand and supply. The scope of development will depend on the potentialities of fisheries which include the physical production factors like the availability of water resources for exploitation, the number of people engaged in fishing and allied industries and the equipment required for fishing and also the investment of money. Since the ultimate aim of any fishery developmental plan is for the betterment of the living conditions of the fishermen the data on their socio-economics are also necessary. The statistics on production comprises yield from marine and inland waters and also the quantity of manufactured products and by-products like shark liver oil, fish meal, fish manure etc. The contribution of fishery as a source of food could be assessed by production statistics. The statistics on supply, demand, preservation, transport, marketing system and prices will throw light on the mode of utilisation of fishery products. Derived statistics like production index on the basis of these data will judge the growth rate of the fishing industry and will ensure comparability with other industries. These statistics will also be helpful for the calculation of national income from the fisheries sector. These data can be collected either by census method or by sampling method and such collection may either be on an *ad hoc* or on continuing basis.

Apart from collecting data for describing the status of the fishing industry, biological statistics to determine the status of exploitable fishing resources are also essential. For this purpose the knowledge of either the absolute magnitude or some relative indices of abundance of various exploitable stocks is necessary so that the optimum sustained yield may be derived from these stocks, maintaining their level at the same time. Generally it is difficult to ascertain the absolute magnitudes of the different stocks and as such all statistical and mathematical models for studying fishery resources deal with relative indices of abundance. The essential data necessary for estimating these indices are the catch, its age, size composition and the input of effort. Some parallel data on length measurements of fish along with scale and otolith readings seem to be necessary for the purpose of estimating the growth, mortality and recruitment parameters. As has been pointed out earlier the

catch and effort data have to be collected on a continuing basis either by census or sampling method. The data on effort can conveniently be collected in terms of either of the following: the number of persons engaged in fishing, days' absence from port, days or hours fished, number of crafts and tackles used. When, however, a fishery is being exploited by heterogenous group of fishing unit, as is generally the case in India, the effort has to be expressed in terms of a standard fishing unit. For this purpose specialised studies will be necessary to find out the efficiency factor of other fishing units in terms of the standard one. It may thus be seen that the minimum statistics necessary in fishery research may be grouped as follows:

- (a) The independent variables.
 - (i) quantity of fishing (effort).
 - (ii) quality of fishing (selectivity),
- (b) The dependent variables.
 - (i) quantity of catch.
 - (ii) catch per unit of effort.
 - (iii) composition of catch.
 - (iv) division of catch among different types of units

Fishing in India is not a large scale organised industry but is carried on by a large number of people economically and educationally backward for whom it sometimes forms the sole means of livelihood. The unorganised nature of the fishing industry coupled with the backwardness of the fishermen poses main difficulty in the scheme of collecting fishery statistics. No systematic attempt was made to collect fishery statistics on all India level during the pre-independence era and the report on the marketing of fish in the Indian Union published by the Directorate of Marketing and Inspection formed the only source of fisheries statistics in India. The report shows statistics on marine fish landings, marketable surplus of fresh water fish, prices prevailing in some producing and consuming centres for certain popular varieties of fish on a statewise basis. Details on utilisation of fish are also available in this report. But these data are mostly based on the trade enquiries and as such do not promise any high degree of accuracy.

In view of the paucity of data on marine fisheries and the great need for their collection, this Institute on its establishment in 1947 initiated the collection of Marine fishery statistics on scientific lines. The main objectives were as follows:

- (i) estimation of statewise and specieswise landings of marine fish in India.
- (ii) estimation of fishing effort.
- (iii) determination of size/age composition of landings

As it is not feasible to collect data on complete enumeration basis for a vast country like India where marine fishing is carried out in different types of units scattered over more than 1200 landing centres, attempt was made to evolve a suitable sampling scheme within the resources available with the Institute.

In 1948-49 villagewise data were collected on the total fishermen population, active fishermen, fishing units of different types, type of fish caught and general information on matters relating to fishing industry. This for the first time gave a complete list of fishing villages engaged in marine fishing and threw light on the potentialities of marine fishery. To bring about the nature of the changing pattern of fishing industry and its consequent impact on fishermen, surveys of fishing villages were undertaken during the 2nd and 3rd Five Year Plans.

The data collected through the periodic census of fishing villages, fishing population landing centres, craft and gear etc., constitute the frame for the sample survey for the estimation of fish landings and their composition. The sampling design was put into operation by this Institute from 1950 onwards and for the first time reasonably accurate estimates of marine fish landings and their composition were obtained. Initially the coast line of India was divided into 12 zones from the point of fishing practices and fisheries and zonal estimates were made. On the basis of experience gained the programme was gradually intensified and the catch figure with their composition were obtained with greater accuracy and for smaller geographic divisions. In addition, provision was made for the collection of data on effort spent to obtain such catches. Effort is estimated in terms of man hours as well as in number of different types of fishing units. With experience of field trials, it was possible to improve the sample design as time passed on and the present sampling scheme involving space-time stratification was introduced. From 1959 additional data on size composition of the catch of certain commercially important fishes viz, oil sardine, mackerel, Bombay duck and *Hilsa* are being collected. This enables to get the abundance of size and age composition of the catch leading to estimation of mortality parameters. Apart from these, length-data collected at specific centres along with scale and otolith readings are used to estimate the parameters of growth, mortality, recruitment of commercially important fisheries.

Thus from a beginning in 1947 when practically no fishery statistics was available, the Institute has successfully developed sampling design to estimate species wise marine catch and the corresponding effort for each maritime state of India based on uniform concept and definition of various terms and survey items on all India basis. A high degree of accuracy is indicated by the low percentage error in the estimate of catch statistics which works out to the order of 5% at the all India level. Based on these data, some very useful work has already been done to assess the fishery resources of two of our most important fisheries namely mackerel and oil sardine. While calculating the national income from fisheries sector, the Government of India have found that this Institute is the only source from which various items of marine fisheries statistics can be obtained. Apart from catering to the domestic needs, this Institute is supplying fishery statistics to various international agencies. A perusal of FAO Year Book of Fishery Statistics indicates that India is the only country bordering the Indian Ocean which is having diversified data relating to marine fisheries. From the above brief sketch, it will be seen that during the last 2 decades this institute has filled up a great vacuum by building up a statistical system which now can supply most of the essential statistics needed for the development of the fishing industry and for the efficient management of our fisheries resources.
