M A C K E R E L

- an important fish in the seas around India

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Among the fishes of the sea which are important as food fishes and popular in the trade and commerce is the fish called the mackerel, the name being given to certain closely related species belonging to the family Scombridae in different parts of the world. The European and Atlantic mackerel belong to the species Scomber scombrus; the Japanese and Pacific mackerels belong to a different genus, Pneumatophorus, in the same family. The [illegible] may be called the Indian or Indo-Pacific mackerel is again an entirely different form and goes under the scientific name of Rastrelliger kanagurta. One other species of mackerel is also known to occur in the Indian region but it is not of any importance for us.

The mackerels have a very high digestibility in the human system; for Scomber scombrus it is estimated that 93.1 per cent of the protein content and 95.2 per cent of the fat content are digestible in terms of fresh flesh. The true mackerels should not of course, be confused with the horse-mackerel like Caranx crumenophthalmus which are different fishes altogether, of another family.

Rastrelliger kanagurta or the mackerel of our country is one of the two most important food fishes occurring in the seas around India. It is called bangada in Marathi and Kannada, ayila in Malayalam, kumbala in Tamil and kanagurtulu in Telugu. This species is widely distributed outside India also, from the African coasts to the coasts of Australia and extending even into the Pacific Ocean. In India the quantity may be said to vary from about 3 to 20 per cent of the total fish landings; during the ten years from 1950 to 1959 the average catch of mackerel per year was about 11 per cent of the total marine fish catch. For the period 1960 to 1966 the annual percentage figure was about 7 in the total marine catch.

The West Coast Fishery

In our country it is really the west coast that is important for the mackerel fishery, about 97 per cent of the annual average catches being from this coast alone, only the remaining three per cent being from the east coast (mainly from Tamil Nadu and Andhra regions). The west coast fishery extends from Ratnagiri to Cape Comorin, the important centres being Ratnagiri, Malwan, Karwar, Malpe, Cannanore, Calicut, Tanur, Cochin, Quilon and Vizhingam, along with their neighbouring fishing villages; the main fishery may be said to be really restricted to the region from Cochin to Ratnagiri, the more northern centres after Tanur giving usually the higher yields. The southernmost region around Vizhingam is important not so much because of any large landings of the fish but because of certain biological peculiarity and uniqueness of the area here which is part of the water-mass linking the west and east coasts of India with the sea off the north of Ceylon.

The mackerel fishery of India is at present largely confined to the inshore areas only; small quantities have been recorded in the offshore regions occasionally, in the trawl catches off Bombay and Gujarat, and rarely also off Mangalore further south. But there are no sustained or reliable indications of a potential bottom fishery for the mackerel in any region off the Indian coast. The existence of unexploited stocks far off in the sea cannot be completely ruled out but we have no clear knowledge about such stocks, if any, at the present time. The mackerel fishery is of a seasonal nature and the fish itself is of a migratory habit, the regions of the sea occupied by it during the off-season being mostly a matter of guess only. The fishing is done still mostly by the traditional nets which have evolved through the ages as a result of the practical experience and ingenuity of the fishing community. The common nets in use are forms of castnet, gillnet, shore-seine and boat-seine, with local modificatinns according to the requirements of the seasons and the situation. A special type of seine-net known as the Pattenkollivala has yielded considerable quantities of both mackerel and sardine along the Kerala coast during recent years.

/ region

The depth of fishing for mackerel as at present practised varies from two to twenty fathoms, and the best catches are still obtained inward of the ten fathom the trawl catches mentioned above would, however, be from deeper areas of the water Generally, changes in fishing depth are dependent on the season, gear and the natu

of the coastline, the most important factor being of course the occurrence of the fish itself. When the mackerel comes to the inshore grounds in large numbers, the fishermen will easily see them as they are invariably at the surface as shoals; offshore ma[illegible]can, however, go normally unnoticed and needs special search.

Along the Kanara and Ratnagiri coasts a very large shore-seine known as the rampan is operated in the shallow waters very near the shore. A smaller shore-seine known as the kairampan or yendi is also operated in these areas, when the shoals are not large. A similar but somewhat intermediate-sized net is used in some of the southern centres, for miscellaneous fisheries. On the Malabar coast, mackerel fishing is not so near the shore, and the main nets used here for the mackerel are the gill-net ayilachalavala, the seine-net ayilakollivala, and also the pattenkollivala mentioned above.

Ecology and Biology

Studies have been going on, on the fishery and biology of the mackerel in a small way for some time past in our country and as a result we now have some basic knowledge about the fish though there is still a big lot more to be done. For any fishery a knowledge of the ecology and biology of the species is an essential pre-requisite for any attempt at a scientific utilization of the resource itself. Fishery biology studies are usually designed to collect facts relating to life-histories, growth-rates, feeding habits, reproduction rates and spawning intensities, recruitment and mortality trends and various allied parameters, a thorough knowledge of the environmental factors being also equally important. In the case of the mackerel, the assessment of the spawning season is made on the basis of observations on the gonadial maturity stages and also the occurrence of juveniles in the fishery. It may be stated that, leaving apart the Ratnagiri and the Vizhingam areas, the rest of the west coast presents the major spawning period for this species during the months of the south-west monsoon, i.e. from June to September. Evidence is present here and there of some limited spawning activity outside the season also but this is not intensive enough to cause a distinct second spawning period that can be recognized as such. At Vizhingam near Trivandrum, post-larvae were reported to have been noticed once in the past, much earlier than the commencement of the season for spawning in the northern areas. The juveniles are also encountered here regularly every year, about two months earlier than in the northern centres. The Vizhingam region has characters in this respect, of a biological transitional zone between the west coast and the east coast, for at Waltair further north on the east coast spawning seems to be indefinitely prolonged and juveniles have been seen all the year round. In the past it was believed that the west coast mackerel had a single spawning ground at the southern end near Vizhingam and that larvae, juveniles and even adults might be migrating from there to the regions further north. The recent data, however, seem to indicate that spawning may be taking place all along the coast. The details of the movements of adult mackerel are also almost completely unknown at present, the fishery being practised during the season when large shoals of the species appear in the inshore waters. Large-scale tagging experiments have been recently started by the Central Marine Fisheries Research Institute and the results may throw some new light on various aspects such as movements, growth as well as longevity and mortality.

Spawning Survey

A line of investigation which is very usefully undertaken frequently in fishery biological studies is what is called the spawning survey, that is, studies to assess the intensity of spawning at different places and during different periods, the population density of the eggs and larvae having naturally some relation with the adult population densities also. Such studies could not be undertaken so far in the case of the Indian mackerel mainly because we had no clear way to recognize the eggs and larvae, particularly the latter. Very recently, however, a scientist of the National Institute of Oceanography has broken an important new ground by clearly identifying the early larval stages and it may not take much longer for a workable field-key to be evolved for the identification of the stages, so that the larval survey can be easily undertaken.

Knowledge of the age and growth-rate of fishes are of interest, both from the
[s]cientific and the practical point of view. For most fishes the main available
[d]ata in this line would be those relating to length-frequencies. It is a common
procedure in such studies to measure large enough samples periodically from differ-
ent selected centres and to evaluate the emerging pattern of size [dist]ribution
from time to time and place to place; under ideal conditions this [me]an of [a] wilde[r]
reflect the trends of ~~growth in the species if th~~ [class] and also growth-rates, both subject
[prolonged] ...
in the catches can be analysed from such data, and also growth-rates, both subject
to certain limitations. In fishes like the mackerel which are migratory and pelagic,
these limitations are considerable; nevertheless, the data available so far in the
different regions have given us a general picture of the seasonal size and age
trends which are as follows: (1) juveniles below 10-12 cm in total length occur
mostly during the July-September period; (2) this July-September group of juveniles
almost completely disappears soon, and when the fishery starts in October-November
the prevailing sizes/gradually increases and the dominant sizes will be around
22-24 cm in total length by the following April; (4) larger sizes up to 26 cm are
also occasionally found in most of the centres, usually in the later months, but
sometimes earlier also; (5) still larger sizes are very rare in the fishery, but
at Vizhingam and also around Mandapam on the east coast, specimens up to 31 cm are
sometimes found; good quantities of such large sizes have sometimes occurred at
Vizhingam, such sizes being extremely rare further north on the west coast.

Another study which is of help in determining the age and growth in the
mackerel is from scales: some growth-rings are noticed in the scales of this
species in the larger sizes and seem to be formed as a result of the physiological
strain experienced by the fish during the process of the maturation of the gonads
and also the spawning activity. The first spawning in the species occurs at a
size of above 22 cm length and it is at this size that the first ring is found
in the scales. Two growth-rings are common in specimens of the 25-27 cm group. In
the still larger specimens, up to four rings are suspected but, in these, one or
more rings are frequently resorbed or covered up during later growth, thus causing
some difficulty in reading the age accurately in such cases. Considering all the
data together, it has been provisionally concluded that the West Coast mackerel
grows to a length of 21-24 cm by the end of the second year, the length at the
end of the first year being 12-16 cm; by the end of the third and fourth years
the length is about 25-27 cm and 28-29 cm; the mackerel is around 30 cm in length
at the end of five years. The longevity of the species may be well over six to
seven years.

Environment

The nature of the environment is one of the most important factors that
control the behaviour of any fishery. The adult mackerel is at present being
caught almost exclusively in the inshore waters. A backwater fishery has been noti-
ced at Cochin and an estuarine fishery off Mangalore; the fish has also been
collected in the freshwater of the Kali river off Karwar. *R. kanagurta* can occur
in as low a salinity as 2.04 °/₀₀, though this is not a general occurrence. Good
quantities of the fish have been taken in the estuarine salinity ranges of 29.7 °/₀₀
and 34.6 °/₀₀. It seems probable that increase in temperature and salinity affect
the fishery adversely, whereas low values have a less pronounced effect. It is
also probable that the mackerel is more susceptible to temperature changes than
salinity changes and also that the tolerance ranges for these factors depend on the
size of the fish.

It is not yet possible to say clearly whether there is an offshore element
as well as an inshore element in our mackerel stocks while the same species occur-
ring in the Java Sea seems to have these two different kinds of forms, there being
clear food differences also. Off Philippines the same species is said to be mainly
an open sea form feeding mainly on macroplankton such as larval shrimps and fishes.
Some data are already available about the feeding habits of our mackerel on the
west as well as the east coasts, and it has been found that the zooplankton
especially the copepods dominate the food, some phytoplankton being also found

/ are at least around 18-19 cm in length, the size being
often slightly higher; (3) the prevailing size

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some times though not in such dominance. A recent reviewer [illegible] food of young mackerels is influenced by the abundance of planktonic elements in the environment and that there is no conclusive theory available on the possible use of any planktonic food indicator to forecast the commencement, extent or magnitude of the fishery. Further detailed quantitative studies are still needed on the food and feeding in this species.

The main problem in all sea fisheries is about the same as they are all capture fisheries, that is, they are resources whose exploitation is to be made merely by regulating the capture policies, there being no scope for any cultivation or culture as in the case of the inland or freshwater fisheries. All that can be attempted by biologists in the case of the capture fisheries is to study the natural phenomena involved - a continuing programme of many-faceted studies; the results are to be used in evolving scientifically correct methods of using the resources.