

SHARKS AND SHARK-LIVER OIL

BY

PROF. R. GOPALA AIYAR
(University of Madras)

SHARK-LIVER OIL is rapidly taking the place of cod-liver oil in this country, owing to war conditions. It is well, therefore, to direct the attention of everyone interested, to some of the problems that have to be solved, if this valuable indigenous industry is to be built up on sound lines, so that, after the war, the need for importing foreign oil would have ceased to exist.

Attempts are being made by the Government of India and some of the maritime Indian States like Baroda and Travancore to encourage and foster production of shark-liver oil. A considerable amount of oil can be obtained from a single liver and the manufacture of sufficient quantities of liver oil and vitamin concentrates is well within the range of practical realities, provided the opportunity now afforded by the war is utilised to the fullest extent to place this industry on a firm footing.

Though correct data are not available, there is every reason to believe that there is an abundant supply of elasmobranchs on the Indian coast. The commonest forms are species of the genera *Scoliodon*, *Carcharinus*, *Hemigaleus*, *Carcharius*, *Sphyrna*, *Galeocerdo* and *Cestracion*, mentioned in the order of their relative abundance. Livers of other elasmobranchs such as skates and rays, belonging to the genera *Pristis*, *Rhynchobatus*, *Rhinobatus*, *Dasybatus* and *Trygon* are also tapped for oil.

Much work has already been done on the analysis of the vitamin A content of these fish oils, particularly at the Nutrition Research Laboratories, Coonoor. Potency for vitamin A has been shown to be very high for several species. Sharks like *Carcharinus gangeticus* yield as much as 97,500 I.U. of vitamin A per gramme of oil, while in others it may be as low as 150 I.U. The average value of a number of samples of oil has been found to be 12,000 I.U. per gramme. Compared to this, its vitamin D potency is rather low. The oil that is placed on the market is a standardised product having a vitamin A potency of 1,500 I.U., and a vitamin D potency of 100 I.U. per gramme, the latter being made up by the addition of synthetic vitamin D in the form of calciferol.

While everyone would agree that the industry should be developed with all rapidity, it is at the same time also highly desirable that the biological aspect of the question should not be lost sight of. The demand for elasmobranch livers has greatly increased recently. A visit to the great fishing centres like Pamban, Tuticorin and Calicut gives ample evidence of this. Elasmobranchs which afford material for this valuable oil, are mostly viviparous, i.e., they, like the mammals, bring forth their young ones alive. Several young ones may be borne at a time. Some species of *Scoliodon* give birth to as many as 13-14 embryos. Larger forms of shark like *Galeocerdo* may give birth to as many more embryos. But, here there is no comparison with the millions of eggs produced by the bony fishes.

Fertilisation is internal and the period of gestation is pretty long, lasting for several months, and in some cases even extends to over an year, the embryos being retained in the uteri till they are considerably advanced in development. These are characters which set a natural limit on their multiplications. The question, therefore, should be asked whether it is not wise, even at this stage, to start thinking as to the ways and means necessary to ensure a steady supply of these fishes. In doing so we shall only be profiting by the experience of other countries—experience gained at considerable loss and expenditure. It will be obvious that considering the viviparous condition and the long period of gestation, if female sharks with their young ones are destroyed, wholesale mortality will result. Such destruction, irrespective of sex, size and condition of the animals would spell disaster to the industry, sooner or later.

There is very little liver in the young ones to be of much use, and such livers are very poor in their oil contents. It would, therefore, be agreed that, as far as possible, destruction of fully developed young ones, about to be born, should be avoided. If at the time of capture the period of gestation is very nearly over, the parent readily drops her burden into the sea. *Ætobatis narinari* actually jumps out of water and drops back with a splash to facilitate

emergence of embryos. If, therefore, during the process of handling the captured fish, embryos drop into the boats they should be immediately returned to the sea. There is then a fair chance of several of them surviving, even though birth has been slightly premature.

It is known that these fishes attain maturity only after reaching a definite size, and most of them grow even after maturity, with the liver size and quantity of oil increasing with age and size. We know, for instance, that *Scoliodon sorrakowah* becomes sexually mature when it attains a length of 15" to 18". Similarly *S. dussumieri* reaches a length of 20" to 23" at sexual maturity. Maturity size is not the same for all species of elasmobranchs. Thus, species of *Galeocerdo* grow to a length of 12 to 15 feet and maturity size is correspondingly high. Hence, if it is possible to find a minimum size which will approximate with the first maturity size, destruction of undersized fish can be prevented by legislative restrictions, and, if the minimum marketable size is fixed at a slightly higher level than the first maturity size, it will enable the fish to shed their first brood into the sea, thus automatically ensuring a supply. But our knowledge in regard to the rate of growth and age at sexual maturity of the different elasmobranchs is meagre, and extensive investigations will have to be carried out in biological stations and by the fisheries departments in the country, to make such information available for all the species. A true conception of their age, growth-rate and movements can only be obtained by marking experiments involving co-operation between fishermen and workers in biological stations. Again, we are almost completely in the dark regarding the breeding grounds and the breeding season of the different species. It can only be said that, like many other tropical marine animals, some of them have an extended reproductive period.

Europe and America, where intensive fishing has led to depletion of certain species of fish, have resorted to legislation for conservation and this has resulted in the restoration of such fisheries. A well-known example is the northern Pacific halibut fishery. In Malabar, indiscriminate fishing of *Sardinella longiceps* has given a setback to the supply of sardine oil. On the east coast, *Trichiurus savala* is another which is caught wholesale, many of them in

a very immature condition. In India fishing operations are not carried out in any such intensive scale as in the Western countries and Japan, and the problem of overfishing may not be pressing for the bony fishes. But the need for conserving our shark supplies stands on a different footing on account of their viviparous habits, the limited number of young ones produced and the long period of gestation—habits which make them peculiarly liable to quick depletion if indiscriminate methods are adopted.

Any attempt to bring any sort of control on fishing methods must largely depend on the data available in regard to the life-history of the fishes in question. Improved methods of fishing must be employed and active propaganda conducted. Even such a detail as failure to choose a suitable name for a commercial fishery product might lead to prejudice in the public mind. The United States Bureau of Fisheries converted the spiny dog-fish of the Atlantic coast into a valuable asset by changing the name of the fish for trade purposes. People might eat "cat-fish", but are prejudiced against "dog-fish" and so the Bureau changed the name of the latter, into "grey-fish", which is 'descriptive, not pre-occupied and altogether unobjectionable'.

There is a vast field for research to acquire further knowledge in regard to the life-histories of the various species of elasmobranchs, their growth-rate, size at maturity and migratory movements. A systematic study of the various forms in regard to their vitamin potencies during different parts of the year and during different phases of their life-history has to be made. There is no doubt that such investigation will result in valuable information which will be helpful in solving the problems that confront us to-day. In this work the Biologist, the Biochemist and the Fishery-Expert can play an equal and honourable part. It will entail long and planned research and meanwhile, the statement of Dr. E. S. Russell "that upto a point you can increase yield by increasing fishing but after this maximum has been reached the more you fish the less weight of fish you catch and that there must be for every fishery an optimum rate of fishing" might well be borne in mind by Government officers and others interested in the welfare of the shark-liver oil industry.