A REVIEW OF THE SOUPFIN SHARK FISHERY OF THE PACIFIC COAST

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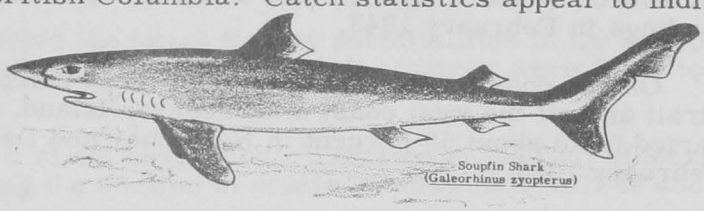
The soupfin shark of the Pacific Coast was discovered in 1883 in California and described as Galeorhinus zyopterus by Jordan and Gilbert. Clemens and Wilby refer to this species as Galeorhinus galeus (Linnaeus) 1758 but general preference appears to be given to the name Galeorhinus zyopterus.

The soupfin belongs to the Carcharinidae family. Other names used in reference to this family are Carchariidae, Galeorhinidae, Galeidae, Triakidae, and Eulamidae. The gelatinous rays of this species are highly prized by the Chinese who use them for making soup, hence the common name.

DISTRIBUTION AND BIOLOGY

The soupfin shark is found along the Pacific Coast and its range extends from Southern California to Northern British Columbia. Catch statistics appear to indicate that this species does not range far out to sea. The fishery is generally confined to waters within 100 miles from shore and usually in waters around 25 fathoms.



Soupfin Shark (Galeorhinus zyopterus)

Very little is known regarding its movements along the coast. However, a female shark tagged six miles south of Ventura, Calif., in July 1943 was recovered at Nootka Sound, west coast of Vancouver Island, in September 1945, and this seems to indicate a coastwise movement.

The discovery that the liver of this species had a high vitamin A content, a reduction of vitamin A imports due to World War II, and an encouraging high price led to an intensive fishery. This led to numerous studies concerning biology, abundance, and vitamin yield.

The soupfin shark belongs in the Elasmobranch group of fishes, having skeletons which are wholly cartilaginous. The species is ovoviviparious. The eggs grow to the size of a golf ball, 4 to 6 centimeters (approximately $1\frac{1}{2}$ to $2\frac{1}{2}$ inches) in diameter, and are fertilized internally and hatched within the body of the parent. Ripley's study in Southern California indicated that fertilization of the eggs takes place during the spring in this area, with a gestation period of one year. By spring of the following year the pups average 28 to 37 centimeters (approximately 11 to $14\frac{1}{2}$ inches) and suggest an average length of 35 centimeters (nearly 14 inches) at birth.

Observations on embryo count from samples taken in the Santa Catalina area revealed a range of 16 to 54 fertilized eggs, with an average of 35 for female soupfins around 175 centimeters (approximately $5\frac{3}{4}$ feet) in length. The number seems to increase progressively with the size of fish, smaller females having less eggs and larger females more eggs.

The soupfin is reported to reach a length of six feet and weighs from 25 to 40 pounds. The species is carnivorous and its food depends upon the availability of other fishes. Stomach analyses have shown that in the California area sardines, midshipman (Porichthys), rockfish, squid, flatfish, herring, mackerel, sculpin, smelt, ratfish, and many other forms make up its diet. Rockfish, midshipman, flatfish, etc.,

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are bottom-living forms, whereas squid, sardines, etc., are pelagic forms. This diversity indicates that the soupfin will pursue food where available.

The species appear to be seasonal, being common at some times and not at others. Also, sex differences are noticeable in the commercial catch. Studies have shown that the catches of Northern California have been predominantly male. In Central California and in the Santa Barbara region males and females seem to occur in about equal numbers, but in the Santa Barbara region females predominate in the catches in waters less than 30 fathoms. In the San Pedro area, investigations revealed an overwhelming preponderance of females (97.8 percent), but the catches did not include any from deep water.

Young soupfin are abundant in the Southern California waters and adult females have been taken in the greatest quantity in this area. The average size of females in Southern California was larger and the percentage of mature females greater than for the rest of the State, seemingly indicating the existence of a nursery area.

In Oregon and Washington males have predominated in the commercial catches. Floater nets which make fishing possible in deeper waters have contributed the major source of shark livers since 1945. Female soupfins made up 1 percent of the landings in February 1943.

Off the coast of British Columbia, large numbers have been caught in Hecate Strait and off the west coast of Vancouver Island. The percentages of females varied from about 50 percent in November and December 1942 to about 1 percent in February 1943.

COMMERCIAL LANDINGS

Encouraged by high prices, fishing effort for soupfin sharks and dogfish increased greatly during the war. Despite this increased effort, the soupfin catches fell off drastically throughout its range, showing a decline in abundance.

In California, the landings of soupfin in 1941 and a few years thereafter composed at least half of the total shark landings. For the period 1938 to 1941 in which the greatest catches of sharks were made (species breakdown is not available), the soupfin shark is believed to have made up the bulk of the shark landings. In 1954, 770,337 pounds of shark livers with a value of $70,210 were landed, but this figure includes sharks in general.

The landing of soupfin shark livers in Oregon reached a peak in 1943 of 270,000 pounds, then rapidly declined to a low of 50,000 pounds in 1948. The landings dropped further and in 1950 were reported to be 6,470 pounds, 134 pounds in 1951, 46,590 pounds in 1952, and 4,750 pounds in 1953. The landings for this four-year period are not identified by species. In June of 1950 no Oregon boats were known to be fishing for soupfin sharks. The landings that were made seem to have consisted of sharks caught incidentally with other fishes.

The State of Washington also showed a sudden rise in soupfin shark liver landings, with a high of 415,300 pounds reported in 1943. The total landings for the four-year period 1942-1945 amounted to 1,196,546 pounds. Landings dropped precipitously in 1946 to 71,258 pounds, held fairly steady until 1949, then dropped to 1,724 pounds in 1952. In 1955, 1,229 pounds of soupfin shark livers were landed.

Similar to a trend experienced by the Pacific Coast States, British Columbia landings of soupfin shark increased tremendously during the war years. Catches dwindled sharply thereafter, although the price per pound of liver remained high for some time. The annual statistical bulletin of the Canadian Department of Fisheries reports dogfish liver landings amounted to 449 pounds in 1956, but soupfin livers are not mentioned.

The vitamin A potency of shark livers fluctuates greatly with respect to the size and sex of the fish, and the locality and time caught. Thus, the price paid for livers fluctuates greatly. The price per pound of liver remained high during the bonanza war years and for several years thereafter.

However, a rise in liver imports coupled with the introduction of synthetic vitamins comparable to those obtained from natural sources contributed to the drop in fish-liver prices, resulting in a decline of the fishery. Commercial fishermen have turned their efforts to harvesting other more profitable species of fish and the catch of sharks appears to be incidental.

SHARK FISHERY IN OTHER AREAS

Walford (1945) reports landings of Eulamia sharks related to the soupfin at San Marcos Island, Lower California. Of 36 whole specimens examined 75 percent were Eulamia lamiella; of shark carcasses on the beach 90 percent were E. lamiella, the remainder mostly hammerheads (Sphyrna diplana). The most important sharks caught in this area seem to consist of these two species which, fortunately, are two of the richest in vitamin A content.

Warfel and Clague (1950) studied the shark fishing potentialities in the Philippine Islands. They sampled 16 different species of shark but most were found to have very low vitamin A content.

Springer (1951) reports that a small shark fishery existed in the Gulf of Mexico but it has been abandoned following the decline in prices of vitamin A in 1949 and 1950.

The Anglo-American Caribbean Commission (1945) reports the existence of eight species of Eulamia which is related to the soupfin of the Pacific Coast, and these sharks are reported to have livers with high vitamin A potential.

UTILIZATION

The drop in fish-liver prices has discouraged commercial shark ventures, but it might be pointed out that sharks have been utilized commercially for other purposes. Shark hides and teeth (as a novelty item) have been in demand to some extent. There appears to be a ready market for shark fins to resident Chinese for making soup, but local markets should be investigated thoroughly first. In addition, sharks can be utilized for human food, fish meal, and fertilizer. The report of the Anglo-American Caribbean Commission discusses shark utilization, prices, and lists companies in the United States and in England dealing in shark hides.

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VACUUM PROCESS FOR REMOVAL OF MOISTURE FROM HERRING BEING CANNED

A vacuum process for removal of some of the moisture from herring that is being canned was tested on an industrial scale. A batch process employing a vacuum chamber was used, vacuum being obtained by a water-jet ejector, supplied with sea water by a centrifugal pump. A much improved firmer product can be obtained by this process.

--Annual Report of the Fisheries Council of Canada, 1954