

A REVIEW OF THE RESOURCES OF THE ELASMOBRANCHIATE FISHES OF CHINA, WITH DISCUSSIONS ON THE PROBLEMS OF THEIR UTILIZATION

(ABSTRACT)

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The paper is presented in four parts. The first part is introductory, dealing briefly with the characteristics, geographic distribution, life and habits, and methods of reproduction of the Elasmobranchiate fishes in general.

The second part, which is the main theme of the paper, is intended to give a comprehensive review of the fisheries resources of the Chinese Elasmobranchiate fishes under nine principal divisions as follows:

1. For the Notidanoids or Cow Sharks, particular mention is made of *Notorhynchius platycephalus* which is especially abundant in the Yellow Sea and extensively caught with long lines in the coast of Liaoning and Shantung. Its liver is said to contain comparatively higher vitamin-A potency and hence is much demanded for manufacturing the medicinal oil; its skin furnishes good leather.

2. For the Heterodontoids of Bull-head Sharks, it is remarked that *Heterodontus japonicus* occurs in the Yellow Sea, while *H. zebra* inhabits in the East Sea and South Sea. As they do not occur in sufficiently large numbers, so they are of little importance.

3. The Cat-Sharks (Scyliorhinidae), Carpet-Sharks and allies (Orectolobidae), and Whale Sharks (Rhincodontidae) are treated together. For the first two families we have more than ten genera and species, the majority of which are rather small in size, usually living in shallow waters and exhibiting adaptive coloration or even mimicry. They abound principally in the South Sea, some extend to the Southern part of the East Sea, and only *Cephaloscyllium umbratile* ranges to the Yellow Sea. Although they are numerous in number of species, yet none appears to occur in sufficiently large quantity to be regarded as of great importance. The discovery in recent years of the Whale Shark, *Rhincodon typus*, in the coastal waters of Kwangtung, Chekiang and Shantung at different seasons of the year is of great interest and fisheries importance. The route and time of its migration is now at least partially known.

4. The Galeoid sharks are very richly represented in China, 6 or 7 families, nearly 20 genera and over 40 species having been known. *Isurus glaucus* and *Carcharodon carcharias* occur in the South Sea, but they are seldom taken. The great basking shark, *Cetorhinus maximus*, is of high economic importance to the fishermen of Eastern China, as every year from May to June hundreds of individuals are captured along the coast of Chekiang for the sake of fish-meal, oil and leather. Three species of Tresher Sharks (*Alopias vulpinus*, *A. pelagicus*, etc) exist in our waters, but they are not abundant enough

to be of value. The Sand-Shark, *Odontaspis tricuspidatus*, is especially numerous in Tsingtao and Chefoo. The Carcharhinoid sharks, such as of the genera *Scoliodon*, *Hypopion*, *Carcharhinus*, *Negogaleus*, *Mustelus*, etc. are very numerous in our seas; they chiefly abound in the South Sea, some are also found in the East Sea, but comparatively few frequent the Yellow Sea. *Prionace glauca* and several other larger species of *Carcharhinus* are famous for the production of the expensive "shark-fins". Practically all Galeoid sharks are used as food, fresh or salted, and some are reputed for good tasting. They are usually taken together with the bony fishes by the trawling nets in big quantities and are present the whole year round; sometimes they are captured by pole and line fishing. As regards Hammer-head Sharks, *Sphyrna mokarran*, *S. tiburo* and *S. blochii* are confined to the South Sea, whereas *S. zygaena* is distributed in all seas. They are sometimes gregarious in habit and hence may be taken in good numbers.

5. The Squaloid sharks are rather few in number of genera and species in our waters, due probably to the fact that our deeper waters have not been adequately explored as yet. However, the common spiny dog-fishes, *Squalus fernandinus*, *S. suckleyi* and *S. brevirostris*, are of considerable fisheries importance, especially in the Yellow Sea. There is a single species of Saw-Shark, *Pristiophorus japonicus*, abounding in the Yellow and East Seas in small numbers. With regard to the Angel Sharks, *Squatina japonica* is common in all our seas, but *S. nebulosa* is to be found only in the South Sea. Fishermen of Shantung catch large quantities of *S. japonica* and use the skin in preparing "sand papers" for polishing cabinet works.

6. The rays and skates are very well represented in our seas and they are of fisheries importance. Two species of the Saw-fishes, *Pristis cuspidatus* and *P. microdon* are known in the coast of Kwangtung, Fukien and Chekiang; their flesh is palatable, the skin is renowned for making "sword-covers" and "dagger-cases", and the fins are comparable in quality to the sharks' fins. The Guitar-fishes or Rhinobatoids are represented by three genera and eight species, of which *Rhinobatos hynnicephalus* and *R. formosensis* are very abundant and grow to large size in the South Sea. They yield "shark-fins", "fish-cartilage" and "fish-skin", all being regarded as delicacies. The true rays of the family Rajidae are included in the list of economic fishes, because large quantities of them are caught every year by the popular fisheries co-operative organizations, especially those in the coast of Shantung. The Round Rays (Platyrrhinidae) and the Electric Rays (Torpedinidae) are considered as of low fisheries importance, though they are common and represented by quite a number of species.

7. The Sting-rays (Dasyatidae) are numerous both in number of species and individuals and hence are ranked as of fisheries importance. There are more than ten species of *Dasyatis* inhabiting Chinese waters, of which *D. navarrae* and *D. sinensis* are prevalent in the Yellow Sea, whereas *D. akajei*, *D. zugei* and *D. kuhlii* are very common in the South and the East Sea. The so-called "Broad-Sting-Rays" of the genera *Gymnura* and *Aetoplatea* are also important fisheries items; *G. japonica* is widely distributed, while *G. poecilura* and *A. zonura* are known only from the South.

8. Our resources of the Eagle Rays (Myliobatidae), Cow Rays (Rhinopteridae) and Devil Rays (Mobulidae) are by no means smaller than those of the Sting-rays mentioned above. They mostly inhabit the the Southern waters, only few extending to the Yellow Sea

areas. The stingless *Aetomylus maculatus*, *A. milvus*, *A. nichoffi*, etc., as well as *Aetobatus narinari* are all very common in the coast of Kwangtung and Fukien, and are extensively used as food by the local populace. The huge *Mobula japonica* and *Manta birostris* are seasonally migratory, and in recent years they have become the object of pursuit by the fishermen of Eastern China mainly for manufacturing fish-meals. Every year they come to the East Sea off the coast of Chekiang in June and July, and thence to the Yellow Sea in August and September. The reappearances of *Mobula japonica* in October and early part of November last year near Chusan Archipelago seems to point to the fact that it was then *en route* to its Southern home.

9. The Elephant-fishes or Chimaeras are rather scanty in our seas and at present we have only two genera and two species. The one that is of some fisheries importance is *Chimaera phantasma* which comes to the coastal waters of East China every Winter in concentrated numbers, but when the season is over they are no more to be found.

The third part of the paper is devoted to discussions on the problems of utilization of the Chinese Elasmobranchiate fishes. Firstly, the problems of improving the fishing methods and gears, transportation of fisheries products and fisheries administration are being discussed, and then those pertaining to the processing industries, such as cold storage and quick freezing, canning of fish and fish products, preparations of fish oil, gelatin and leather, are taken up.

In conclusion, it is pointed out that our present knowledge on the Elasmobranchiate fishes is yet inadequate, inasmuch as their faunistic and fisheries investigations were commenced only a few years ago and, furthermore, up to now the more distant and deeper waters have not yet been exploited. We must, therefore, make greater endeavors to promote fisheries researches, so that in the near future we may comprehend more fully our Elasmobranchiate resources and utilize them to the fullest possible extent.