

NOTES ON PHILIPPINE SHARKS, I

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ONE PLATE

Throughout the ages sharks have been of well-nigh universal interest. Without the gorgeous colors or flowerlike brilliancy of some fishes or the superb symmetry and grace of others, they yet irresistibly attract attention. Though as a rule of a dull uniform gray or bluish cast and without beauty of form, by their size, speed, greediness, and ferocity they have aroused curiosity from earliest times. Though a few sharks are notable for singularity of shape, it is their more degenerate and less-active kindred, the skates and rays, that have developed the strangest forms and the most uncanny powers.

Although some sharks attain a length of only a few inches, even when fully matured, as a whole they are of large size, and certain sharks and rays are the largest of all fishes. Many species of sharks are very ferocious when hungry and do not hesitate to attack any other animal in the water, regardless of its size. Sharks are no worse in this regard than many other fishes, as any very large carnivorous fish may be dangerous to man. Barracuda and the giant sea basses of the East Indies and Polynesia are more dreaded in some localities than are sharks. No shark is more ferocious or dangerous to man than are the small and apparently insignificant caribe fish of the South American rainy tropics.

The sharks and their allies represent an entirely distinct and divergent line from that of the bony fishes. They have no air bladder, no true scales, and no membrane bones, the operculum being always absent in the living species, while the skeleton not only presents a number of peculiarities but also is much less specialized both in form and in material, always remaining more or less cartilaginous. The shoulder girdle is not fastened to the skull but to one of the vertebræ some distance behind it, so that there is a neck similar to that in higher animals. The males of all living species have attached to the ventral fins a pair of claspers or copulatory organs. These serve as a penis

by whose agency the semen is transmitted into the oviducts, impregnation being therefore internal in all sharks except those of the genus *Somniosus*, which includes two species of arctic and subarctic seas.

The eggs are few and large and may be developed externally when, with the exception of those of *Somniosus*, they are covered with a thick leathery or horny skin, or case, or they may be developed within the body of the mother. The cases of some shark eggs are spirally twisted, others are quadrangular with each of the four corners produced into a long filament. The egg cases of rays are wheelbarrow-shaped, with four "handles." These handles and stringy filaments serve to attach the eggs to fixed objects. In some species of rays the egg cases contain several eggs, each of which may develop.

In many sharks, and in some rays, a part of the oviduct becomes enlarged into a uterus, and in some of the sharks a placenta is formed similar in appearance to that of mammals but different in development.

The skin of sharks and rays may be naked, or it may be provided with bony or horny plates, but usually it is covered with placoid scales. These scales are minute, closely set spines situated on a broader base, each spine consisting of dentine covered with enamel; the base is composed of bone and the whole scale therefore has the same essential structure as a tooth. Placoid scales are usually so firmly attached to the skin that it is very difficult to remove them, while they are so hard they will take a stonelike polish. Formerly large quantities of shark skins were used for polishing wood and ivory; their fineness, hardness, and durability made them far superior to any other abrasive available for work of the highest quality. Even in spite of the great improvements in making emery and sand paper, cabinet makers still use some shagreen.

The principal use made of shark skins for many years has been in the manufacture of sword grips and sheaths, card cases, jewel boxes, and other small articles. Within the past five years improved methods of removing the scales and of tanning shark skins have been perfected and a rapidly increasing shark leather business is being developed. Shark skins are nonporous and therefore make a leather practically water and air proof. The last-named quality is a serious defect in the manufacture of shoes, but does not impair the value of the leather for many other purposes.

Sharks and skates are of world-wide distribution and occur from the upper Silurian deposits onward. Although most species are more or less solitary in habit, a few sometimes occur in vast schools and are distinctly gregarious at all times.

Though sharks and skates are but little eaten by Europeans and their descendants, practically all are edible and a few species are really very good food, ignorance and prejudice alone preventing them from being extensively used as food. To an extent little realized they are being increasingly utilized in the United States. Many of those caught in traps along the Atlantic coast are cut up so as to be unrecognizable and are marketed under the name of "deep water swordfish." Certain sharks make an acceptable canned product, though owing to the prejudice against shark meat they have been marketed under another name.

In the Philippines several species of sharks and rays are commonly seen in the markets and are esteemed as food. In some parts of the Islands, especially in the Sulu Archipelago, large numbers of sharks are caught for the fins alone, little use being made of the rest of the fish. The dried fins are exported to China, where they are in great demand as the basis for a delicious soup. The liver of sharks and rays is very rich in oil and in some parts of the world fisheries have been maintained for generations for the purpose of obtaining the oil, the rest of the animal being thrown away. Most of the oil is used in soap making, tanning, and other industries, but the best grade is refined and used as "cod-liver oil."

No systematic shark fisheries are conducted in the Philippines, but in the Sulu Archipelago many sharks are caught with hook and line or speared. Many others are captured in the fish traps which line the coasts, though their presence there or their capture in nets is more or less accidental.

In the modern method of developing shark fisheries the sharks are caught in specially designed gill nets, as ordinary nets are ruined by them. The hides are made into leather, the fins are prepared for the Chinese trade, and the oil is extracted from the livers; the meat and bones are cooked and ground into stock food and fertilizer. There are many localities in the Philippines where a large and profitable business in sharks could be developed. The preparation and export of shark fins is a business capable of great expansion. The choicest varieties fetch a very high price but Filipino fishermen make no systematic effort to get the better kinds, while the Chinese merchants who dry and

salt fish have such slipshod methods that their product is often inferior.

Most kinds of sharks are harmless to man, and they are not a serious menace to bathers in the Philippines; nevertheless, they are a factor to be considered in many places. Occasionally some one is either killed outright by a shark, so badly bitten as to die shortly afterward, or is seriously wounded. Bathing beaches having a reef or bar in front of them are usually safe, but bathers should never venture alone into deep water in the Philippines.

There are no authentic records of rays attacking man, though the gigantic rays known as mantas or "sea devils" are greatly feared by pearl divers. The sting rays, which have one or more large barbed spines on the long and flexible tail, inflict dangerous wounds when stepped upon. The jagged spine causes frightful injury and, due to the slime and dirt forced into the wound, infection usually follows.

Sawfish never attack man intentionally, but due to their size, strength, and terrific weapon they are greatly and justly dreaded when entangled in nets or caught in traps.

The sharks and rays of the Philippines are very imperfectly known, not more than half of the species being listed or represented in existing collections. Although they form a group of considerable economic importance in the Philippines this lack of knowledge is not surprising, since it is very difficult to collect and preserve the large adult forms.

In the present paper is described a new species, the type of a new genus, obtained at Dumaguete, Oriental Negros, in March, 1922. With it were also caught two other sharks, small dogfish, reported only once before from the Philippines. These three sharks were captured in a fish corral a few meters off shore, in water not over 6 meters deep.

Genus *HEMITRIAKIS* novum

This genus is distinguished from *Triakis*, to which it is most closely related, by the differences in the teeth, in the shape of the snout, in the lobe of the nasal valve, in the shape of the body, and in the subcaudal lobe.

Head much depressed anteriorly, flattened beneath except beneath the moderately long and pointed snout, where it is slightly convex; eyes with prominent nictitating membrane over lower portion; spiracles very small, behind eyes; nostrils very

far apart, without nasoral groove; mouth arched, with prominent labial folds; teeth of medium size, two transverse rows functioning in upper jaw and three in lower; in upper jaw are a few (two or three rows) very small erect median teeth with a central sharp-pointed cusp and usually two smaller ones at each side of its base; the remaining teeth are much larger, strongly oblique, with a longer sharp-pointed cusp directed outward toward the angle of the mouth, and with two or three much smaller denticles on the outer side; in lower jaw the teeth of the six median rows are larger than the upper median teeth, are erect or nearly so, and have a central cusp with from no denticles to three small ones on each side of base; the remaining rows are of teeth smaller than the opposing upper teeth, strongly oblique, with a larger cusp directed toward angle of mouth and one to four minute cusps or denticles on outer side; the fifth pair of gill slits is the smallest and is over the pectoral; the first dorsal is over the space between pectorals and ventrals, but much nearer the former; origin of second dorsal in advance of anal; caudal rather short, without a pit at its base, with a notch in the subcaudal lobe, and a moderately developed anterior lobe.

Body not compressed; lateral line noticeable, rather high up, beginning on head.

*Hemitriakis leucoperiptera*¹ sp. nov. Plate 1.

Head 4.775 in length, its greatest breadth a trifle more than half (50.4 per cent) of its own length; snout $3\frac{1}{13}$ in head; eyes $6\frac{1}{4}$ in head and a trifle less than twice in interorbital space; spiracles $5\frac{1}{3}$ in eyes; depth 7.95 in total length and 6.31 in length without caudal fin.

Head long, its profile descending very sharply from predorsal region, its anterior portion very low and depressed, with flattened crown and interorbital space; eyes large, much elongated, with a broad shagreen-covered nictitating fold; the small, slit-like spiracles just behind eyes; snout rather long and pointed, with a slightly rounded tip; nostrils as far apart as possible and nearer mouth than tip of snout; each anterior valve has an outer triangular pointed flap near inner angle of nostril and under and at right angles to it a smaller dividing fold or flap; each posterior valve has a slight fold, or ridge, near inner angle; mouth crescentic, its transverse length equal to interorbital space, with well-developed labial folds, the outer parallel with contour of head

¹ *Leucoperiptera* from λευκος, white; πεπι, around; and πτερόν, wing, or fin, in allusion to the white margin of the fins.

and half again as long as inner which parallels lower lip; teeth in $\frac{18}{34}$ rows, their description given under that of the genus.

Third gill slit largest and contained 8 in length of head; fifth smallest, being approximately three-fourths as large as third; in the type specimen margin of second gill slit on right side is curiously modified, running above and beyond third gill slit, as shown in the figure; this is evidently a congenital malformation.

Inner margin of pectorals four-fifths as long as outer margin, which is 0.8 the length of head; origin of first dorsal above posterior margin of pectorals; rear margin of both dorsals and anal crescentic, inner angle of each produced in a long pointed tip; origin of anal opposite middle of second dorsal; caudal rather short, a trifle less than the length of head; subcaudal narrow with a pointed and moderately long lobe near its origin and a notch near its extremity, the lobe 2.44 in length of caudal, with a deeply concave posterior margin; supracaudal rather thick, low, very little elevated.

Body very deep just before first dorsal, with a low dermal ridge between the dorsals and on the long caudal peduncle; trunk and tail rounded, not at all compressed; tail longer than head and trunk together, or 52.3 per cent of the entire length; scales small, very rough except on head where they are smooth, those on caudal smaller, five keeled, the central one terminating in a strong sharp point; numerous conspicuous mucus pores on top of snout and extending back as far as crown.

Color nearly uniform dark gray above lateral line, darkest on crown and snout and in front of first dorsal; paler below, becoming whitish or with a yellowish cast beneath; all the fins have a narrow white posterior margin.

Here described from the type specimen, a pregnant female, 955 millimeters long over all, obtained by me at Dumaguete in March, 1922, and containing twelve young nearly ready for delivery.

There are six females, varying in length from 202 to 218 millimeters, and six males, five ranging from 200 to 208 millimeters and one 220 millimeters long. All vary in certain particulars from the mother. The head is contained from 4.3 to 5 times in the total length; the extreme elevation of the predorsal region is wanting, the depth being contained from 9.3 to 10 times in the total length; the crown and interorbital region are also slightly convex. There is a black blotch on both dorsals and on the tip of the supracaudal, and two black blotches on the caudal peduncle

behind the second dorsal. As in all young the eyes are larger than in the adult, being contained 4 times or less in the head, while the spiracles are more open and about 4 in the eye. The subcaudal lobe is very slightly developed, its elongation evidently being a post-embryonic development.

Squalus fernandinus Molina. DOG FISH.

Squalus fernandinus MOLINA, Saggio sulla storia nat. Chili (1782);
 GARMAN, The Plagiostomia, Mem. Mus. Comp. Zool. Harvard
 College 36 (1913) 195.

Squalus philippinus SMITH and RADCLIFFE, Proc. U. S. Nat. Mus. 41
 (1912) 677, pl. 51, fig. 1.

The genus *Squalus* is typically one of cool, temperate waters and is primarily distinguished by the conspicuous stout sharp spine in front of both the first and the second dorsal fins, and by the teeth which are alike in both jaws, with oblique cusps and cutting edges nearly parallel with the edge of the jaw.

Smith and Radcliffe described a small male *Squalus*, 325 millimeters long, from the west coast of Luzon, under the name of *Squalus philippinus*. It was dredged off Sombrero Island, at a depth of 236 fathoms.

It is therefore a matter of considerable interest to find two more specimens, this time in shallow water, the species being apparently not considered rare by the Dumaguete fishermen.

My specimens are both females; they measure, respectively, 645 and 655 millimeters long over all. I follow Garman in placing *philippinus* under the synonymy of *S. fernandinus*.

Measurements.

	mm.	mm.
Length without caudal	515	530
Length over all	645	655
Head	140	153
Width of head	84	85
Snout from mouth	61	61
Snout from eye	47	47
Eye	30	31
Interorbital space	52	54
Mouth	45	45
Snout to origin of first dorsal	197	185
Origin of first dorsal to origin of second dorsal	210	235
Base of first dorsal	45	55
Base of second dorsal	30	45
Second dorsal to origin of caudal	70	70
Widest gill opening	15	15



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