

THE SQUALOID SHARKS OF THE PHILIPPINE ARCHI-  
PELAGO, WITH DESCRIPTIONS OF NEW GENERA AND  
SPECIES.

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No sharks of the family of Squalidæ have up to this time been recorded from the Philippine Islands. The *Albatross* collection contains numerous specimens representing six species: two of them are Japanese and the remaining four are undescribed. Two of the latter belong in known genera, while each of the other two necessitates the erection of a new genus for its accommodation. All of the species herein noted inhabit rather deep water and are of small size.

The genera of squaloid sharks represented in the Philippine fauna may be diagnosed as follows:

*Key to genera of Philippine squaloid sharks.*

- a. Both dorsal fins well developed and elevated, and each with a conspicuous antecedent spine; caudal fin more or less elongate; snout not conical.
- b. Snout of moderate breadth and depressed but not flat.
- c. Teeth in upper jaw simple, without basal cusps.
- d. Teeth alike in both jaws, with laterally deflected point and horizontal or oblique cutting edge..... *Squalus*.
- d<sup>1</sup>. Teeth unlike in both jaws, those in upper jaw erect or nearly so, those in lower jaw oblique, with laterally deflected point..... *Lepidorhinus*.
- e<sup>1</sup>. Teeth in upper jaw with two or four basal cusps..... *Etmopterus*.
- b<sup>1</sup>. Snout very broad and flat..... *Nasisqualus*.
- a<sup>1</sup>. Both dorsal fins small; second dorsal very long and low, without vestige of spine; caudal fin comparatively short and broad; snout conical..... *Squaliolus*.

SQUALUS PHILIPPINUS Smith and Radcliffe, new species,

Plate 51.

Body rather slender, moderately compressed, back somewhat elevated; caudal peduncle long, depressed, .5 head, least depth .25 length, a depressed keel on either side; tail not bent upward head;

<sup>1</sup> In the study of this collection the writer has been assisted by Mr. Lewis Radcliffe, who becomes joint authority for the new genera and species described.

broad, 4.33 in total length, its width more than .5 its length; snout short, obtusely pointed, .33 head; eye large, lateral, rather shorter than snout and .66 interorbital space; mouth broad, very slightly curved, its width less than .33 length of head and its distance from end of snout equal to distance to first gill slit; nostrils small, midway from tip of snout to middle of pupil; spiracles small, immediately above posterior corner of eye and separated therefrom by a narrow fold of skin; skin soft to touch, the denticles small, dense, and consisting of a long, pointed spine and two smaller lateral spines on a flat base.

First dorsal fin placed well forward, its origin midway between tip of snout and second dorsal, the spine more than .5 height of fin;

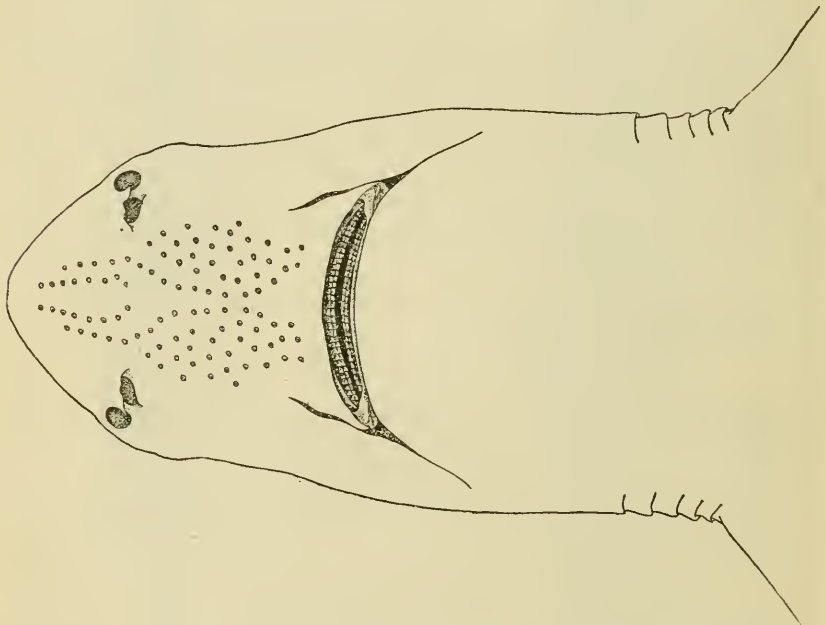


FIG. 1.—*SQUALUS PHILIPPINUS*. UNDER SIDE OF HEAD. ENLARGED ABOUT ONE-FOURTH.

second dorsal much smaller, its origin much nearer to origin of first dorsal than to tip of caudal, the spine more curved and rather stouter than the other and .75 height of fin; caudal fin rather large and spreading, longer than head, lower lobe broad, more than .5 total length of fin; ventrals small, their origin nearer to spine of first dorsal than to spine of second; pectorals broad, posterior margin slightly incised, tips extending to posterior end of dorsal base.

Color: Above dark gray, below light gray; outer part of dorsal fins black, base pale; middle of caudal black, the lobes light yellowish gray; a small light spot on base of pectoral immediately behind the last gill opening.

*Type*.—Cat. No. 70256, U.S.N.M., a young male specimen 32.5 cm. long, taken with a beam trawl January 16, 1908, at station 5111 (lat.  $13^{\circ} 45' 15''$  N.; long.  $120^{\circ} 46' 30''$  E.), off Sombrero Island, west coast of Luzon, at a depth of 236 fathoms.

This species appears to differ from *S. mitsukurii* from Japan in the much more anterior insertion of the ventral fins, longer caudal fin, larger lower caudal lobe, larger anterior dorsal fin, much larger pectorals, and greater arching of back. The drawing and the description<sup>1</sup> of that species do not harmonize; and not having access to the types we are unable to verify the differences between the two species. *S. megalops* from Australia may apparently be distinguished from this species by the more posterior insertion of ventrals and shorter pectorals, shorter snout, etc.

LEPIDORHINUS FOLIACEUS Günther.

A specimen 31 cm. long was taken with a beam trawl on August 3, 1909, between the islands of Leyte and Mindanao, at a depth of 960 fathoms. It is a male with very feeble development of claspers, and agrees closely with the description and figure of the type<sup>2</sup> from Japan, except that the second dorsal fin is lower and the pectorals are a little longer.

ETMOPTERUS LUCIFER Jordan and Snyder.

This species, described from Japan and heretofore known only from that locality, appears to be common in moderately deep water in various parts of the Philippines. The collection contains 21 specimens from 14 dredging stations in 9 localities, 10 of the specimens being from 5 stations in Mindanao Sea off the northern coast of Mindanao and 2 others from 2 stations between the islands of Negros and Siquijor. Other specimens are from Balayan Bay, Luzon; Verde Island Passage, between Luzon and Mindoro; off east coast of Mindoro; near Malavatuan Island, between Lubang and Luzon; off west coast of Jolo Island; and between Jolo and Tawi Tawi. The depth range of the specimens taken is 170 to 318 fathoms, and the size limits are 11 to 28 cm. Males with fully developed claspers are 22.5, 24, and 27 cm. long; young males, with evident but undeveloped claspers, are 11 cm. long. Another specimen, a fully developed male 29.5 cm. long, has become separated from its label, and no locality or other data can be given for it.

ETMOPTERUS BRACHYURUS Smith and Radcliffe, new species.

Plate 52.

Form slender; body compressed; head broad, moderately depressed, .25 total length, its width at spiracles about .5 its length, its depth at spiracles .33 its length; snout short, broad, slightly

<sup>1</sup> Proc. U. S. Nat. Mus., vol. 26, pp. 629-630, fig. 3.

<sup>2</sup> Challenger Deep-Sea Fishes, p. 5, pl. 2, fig. B.

decurved, obtuse, its sides forming an angle of about 45 degrees, its length 3.5 in head and 1.5 in distance from its tip to mouth, its breadth 2.5 in head and equal to distance from its tip to mouth; eye lateral, .25 head, .66 interorbital, equal to space between spiracles, the center of pupil midway between nostril and spiracle; nostrils large, separated by a space somewhat greater than their diameter; mouth slightly curved, very broad, .8 width of snout, .3 head, anterior margin slightly posterior to pupil; teeth in upper jaw small, pentacuspoid, the cusps lanceolate and evenly graduated; the unicuspid teeth in lower jaw larger, the point sharp and oblique; spiracles rather large, nearly midway from tip of snout to last gill open-

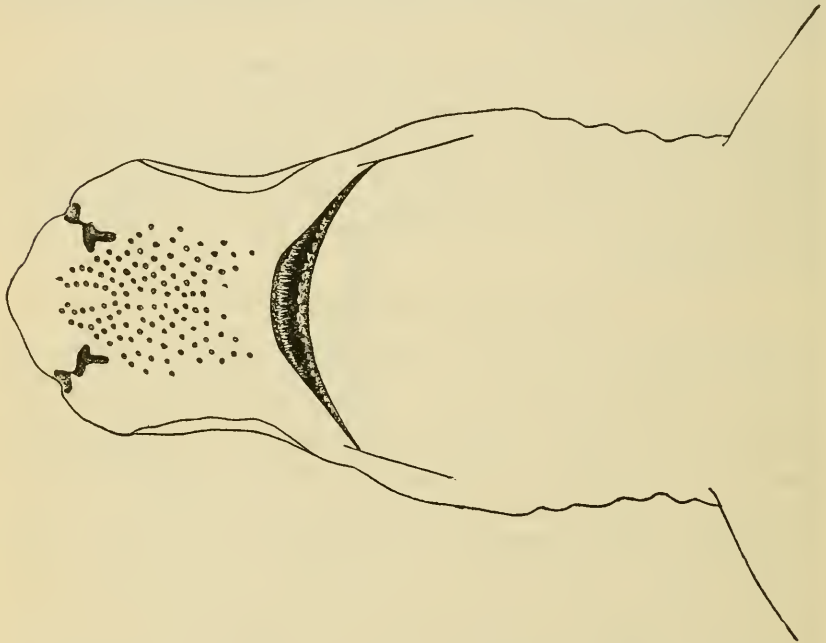


FIG. 2.—ETMOPTERUS BRACHYURUS. UNDER SIDE OF HEAD. ENLARGED ABOUT THREE-FOURTHS.

ing, space between spiracles equal to .5 distance from spiracles to tip of snout; gill openings very narrow; entire upper surface of body, top of head, caudal peduncle, and bases of fins covered with well-marked longitudinal lines of overlapping spiniferous denticles separated by relatively wide naked spaces, the spines longest and the rows most marked on the tail; abdomen, breast, and under side of snout densely covered with rough denticles without regular arrangement; under side of head for a considerable distance before and behind mouth naked, with numerous large pores.

Each dorsal fin with a spine that is naked nearly to its base; first dorsal very short, its origin nearer to posterior base of second dorsal than to tip of snout, the spine about .5 height of fin; second dorsal



entirely behind ventrals, rather high, the posterior rays much produced, the spine very strong and about height of fin; space between dorsal fins seven times length of base of first dorsal without spine; caudal fin short and broad, the lower lobe .6 total length; distance from base of second dorsal to upper caudal lobe .5 distance from first dorsal spine to posterior base of second dorsal and .66 length of peduncle; pectorals short, broad, their length less than .5 head and their tip barely reaching vertical from first dorsal spine; origin of ventrals about midway from first dorsal spine to middle of base of second dorsal.

Color: Above light brown, below darker; all fins pale yellowish brown.

*Type*.—Cat. No. 70257, U.S.N.M., a fully developed male specimen 22.7 cm. long, taken with a beam trawl on September 17, 1909, at station 5550 (lat.  $6^{\circ} 02' 00''$  N.; long.  $120^{\circ} 44' 40''$  E.), off Jolo Light, island of Jolo, at a depth of 263 fathoms, on a bottom of sand, globigerinæ, and foraminifera.

The claspers are short and provided with 4 long, sharp spines. In order to accommodate those organs, the fins cross one another at right angles.

This species is most closely related to *E. lucifer* Jordan and Snyder, differing therefrom in the broader head; shorter, more obtuse snout; wider mouth; and shorter, broader caudal fin.

#### NASISQUALUS Smith and Radcliffe, new genus.

Squaloid sharks having a strongly compressed body; broad, depressed head; a broad, flat, elongate snout, with a conspicuous lateral angle and rounded tip; a well-marked median cartilaginous keel on upper and lower surfaces of snout; a wide, slightly curved mouth, with a straight oblique fold at each angle; unicuspid teeth in both jaws, those in upper jaw triangular, those in lower jaw very strongly deflected laterally, the cutting edge nearly horizontal; large subequal dorsal fins with a conspicuous exposed spine; a postanal median keel; and dense squamation, each denticle consisting of three slender spines on a short base.

*Genotype*.—*Nasisqualus profundorum*.

#### NASISQUALUS PROFUNDORUM Smith and Radcliffe, new species.

Plate 53.

Form elongate, body and caudal peduncle greatly compressed, tail bent slightly upward; head long, broad, flat, its length (to posterior gill slit) contained 3.75 times in total length; greatest width (at spiracles) .5 length, depth .6 width; body rather deep, back elevated, depth under first dorsal spine contained seven times in total length, thickness of body less than diameter of eye; caudal peduncle

short, its depth .6 diameter of eye; snout very long, 2.8 in head, flat, foliaceous, pointed in profile, width in front of eyes nearly equal to length, the sides parallel, knife-like, the tip very thin, flat, and broadly rounded, a well-marked lateral angle occurring at the nostril, a distinct median cartilaginous keel on upper and lower surfaces; eye large, lateral, the length of orbital slit about equal to distance from eye to lateral angle of snout and 1.75 times in interorbital space, pupil about half way between last gill slit and end of snout; mouth broad, moderately curved, its width equal to distance from eye to first gill slit; a long, straight groove as long as eye at angle of mouth, the groove inclined obliquely forward and inward, and if produced meeting its fellow at a point opposite anterior third of eye; preoral space long, more than .5 head; nostrils large, inferior, oblique, extending to margin of snout at angle, width of each nostril

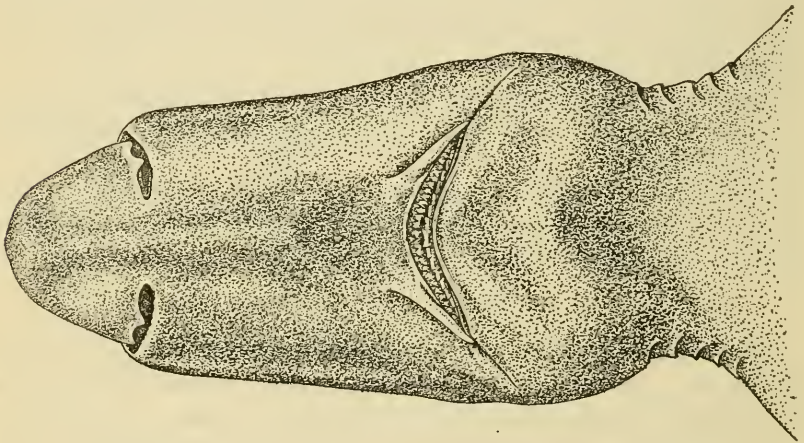


FIG. 3.—*NASISQUALUS PROFUNDORUM*. UNDER SIDE OF HEAD. SEVEN-EIGHTHS NATURAL SIZE.

nearly one-third width of snout; teeth as indicated in generic description; spiracles large, about diameter of pupil and separated from eye by a space greater than their diameter; skin velvety, densely scaled, each denticle consisting of three slender spines in the form of a trident, the denticles deficient on margin of fins.

Dorsal fins nearly equal in length; origin of first dorsal midway between second dorsal and anterior angle of orbit, length of base (exclusive of spine) equal to distance between center of spiracles, the spine one-third exposed and .6 height of fin; second dorsal fin higher than first, beginning behind base of ventrals, its base longer than that of first dorsal, its posterior rays slightly produced and nearly reaching caudal fin, the spine long, .5 expose, .75 height of fin; caudal fin, from anterior edge of lower lobe, equal to distance from snout to first gill slit, lower lobe .5 total length, its distance behind ventral base equal to .5 length of head; middle of ventral base midway from

tip of caudal to middle gill slit and well in advance of second dorsal spine, the modified rays (claspers) long, straight, and acutely pointed; pectorals large, broad, length from last gill slit .5 head, the posterior margin straight, the rays reaching vertical from base of dorsal spine.

Color: Uniform dark brown.

*Type*.—Cat. No. 70258, U.S.N.M., a male specimen 44 cm. long, taken with a beam trawl on August 1, 1909, at station 5491 (lat.  $9^{\circ} 24'$  N.; long.  $125^{\circ} 12'$  E.), between the islands of Leyte and Mindanao, at a depth of 736 fathoms, on a bottom of green mud and coral.

The collection contains six additional specimens, as follows, all taken with the beam trawl in water from 392 to 976 fathoms deep: Station 5219, between Marinduque and Luzon, April 23, 1908, 530 fathoms, one female specimen 44 cm. long; station 5491, between Leyte and Mindanao, August 1, 1909, 736 fathoms, one female specimen 50.5 cm. long; station 5495, between Leyte and Mindanao, August 1, 1909, 976 fathoms, one female specimen 59 cm. long; station 5511, off Camp Overton Light, northern Mindanao, August 7, 1909, 410 fathoms, two specimens 21 and 33.5 cm. long; station 5527, between Siquijor and Bohol Islands, August 11, 1909, 392 fathoms, one specimen 22.5 cm. long.

#### SQUALIOLUS Smith and Radcliffe, new genus.

Squaloid sharks with subcylindrical body, much contracted caudal peduncle; cylindrical head, conical snout; erect lanceolate, unicuspid teeth in upper jaw, oblique teeth with laterally deflected points in lower jaw; small first dorsal fin with naked spine; long, low second dorsal without vestige of spine; very short and broad caudal fin with straight tail; ventral fins far behind middle of body and under origin of second dorsal; entire body covered with flat, widely separated quadrate denticles.

The presence of a spine in the anterior dorsal fin and the entire absence of one in the posterior dorsal necessitate a modification in the current definition of the Squalidæ, and perhaps justify the institution of a new subfamily when taken in connection with other characteristic features of this genus—form of head, second dorsal and caudal—that are possessed by no other members of the family. The peculiar shape of the caudal is approached, but not attained, by *Lamna* and other large typical sharks.

*Genotype*.—*Squaliolus laticaudus*.

## SQUALIOLUS LATICAUDUS Smith and Radcliffe, new species.

Plates 50 and 54.

Form very elongate, graceful, cigar-shaped, body moderately compressed, caudal peduncle much constricted and slightly depressed; head long, cylindrical, 3.2 in total length, its depth at spiracles equal to its breadth and 3.1 in its length; body deepest under first dorsal fin, the depth 2.7 in head and equal to distance from spiracle to fourth gill slit; eye large, lateral, the upper margin of orbital opening slightly arched, the lower margin nearly semicircular, the width but slightly greater than depth and contained 7 times in head, 2 times in interorbital space, and 2.25 times in snout; snout conical, 3 in head, acutely pointed, the breadth somewhat greater than depth; nostrils lateral, nearer to tip of snout than to anterior margin of eye; interorbital space very wide and convex; spiracles large, above level of upper margin of eye and separated from eye by a space nearly equal to diameter of eye; gill openings very narrow, occupying a

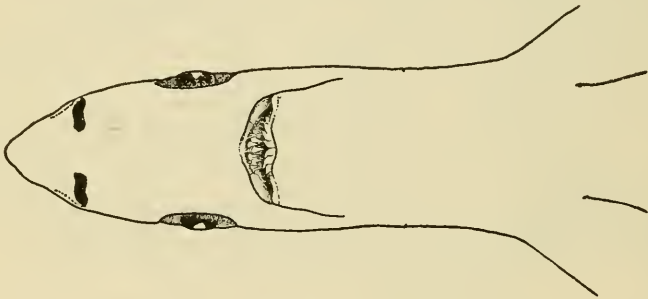


FIG. 4.—SQUALIOLUS LATICAUDUS. UNDER SIDE OF HEAD. ENLARGED ONE-HALF.

shallow groove that extends from pectoral through the entire series; mouth rather small, nearly horizontal, its width 1.5 times diameter of eye, distance of mouth from tip of snout less than .5 head, a deep groove as long as width of mouth extending backward from each angle; teeth in upper jaw unicuspid, erect, lanceolate, and curved backward; those in lower jaw larger, oblique, with sharp point and long, oblique, cutting edge, resting on a broad quadrangular base; entire body and head covered with flattish denticles consisting of a circular center resting on a square base, with a ridge extending from each corner of the square.

First dorsal low, with small but stout spine exposed for about half its length, the posterior rays somewhat produced, the dorsal origin midway between second dorsal and anterior margin of eye; second dorsal very long and low, without vestige of spine, the length of base more than .3 length of head, the posterior rays produced and reaching halfway from base of fin to base of caudal, original of fin over ventral



base; caudal fin short and broad, its length equal to distance from mouth to tip of snout, its breadth about .75 length; the tail not inclined upward, expanded posterior to the contracted peduncle, and terminating in a sharp point on the posterior margin of the fin; ventrals short, the base thickened, the ends expanded into broad plates, as large as eye, directed backward, while from the anterior and outer base of each plate there extends forward a long, slender spine bifid at its tip; pectorals short and broad, their base well in advance of dorsal origin and their tip reaching to a point under middle of dorsal base.

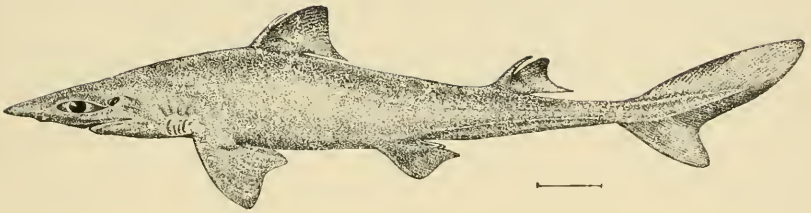
Color: Uniform jet black; first dorsal brownish at base, margin white; second dorsal white; caudal lobes brownish, posterior margin white; ventral rays and plate-like expansions white; pectorals white, with black area at upper extremity.

*Type*.—Cat. No. 70259, U.S.N.M., a male specimen 15 cm. long, taken with a beam trawl on June 8, 1908, at station 5268 (lat.  $13^{\circ} 42'$  N.; long.  $120^{\circ} 57' 15''$  E.), in Batangas Bay, Luzon, at a depth of 170 fathoms, on a bottom of sand, shells, and pebbles.

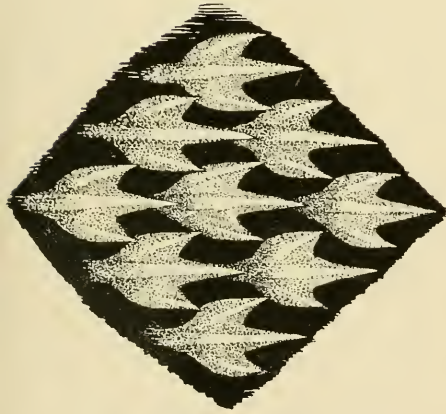
Another specimen, 11.5 cm. long, taken with a beam trawl on July 24, 1909, at station 5297, in the same locality, agrees with the type in all respects, except that it has no modification of the ventral fins and is apparently a female.

This is one of the smallest known sharks, the fully developed male specimen which is the type being only 6 inches in length.

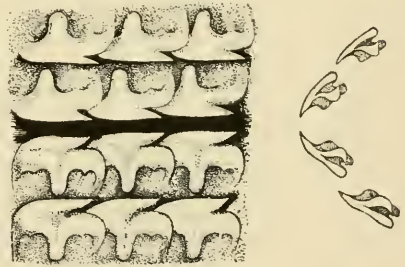




From the type. One-third natural size.



Dermal denticles from flank, enlarged.

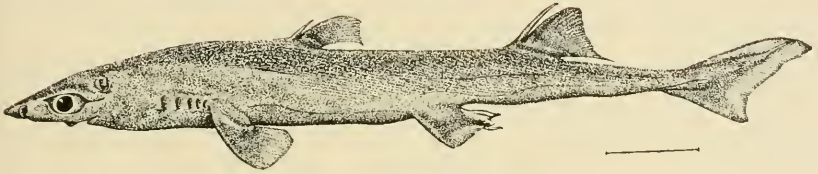


Front and side views of teeth of upper and lower jaws, enlarged.

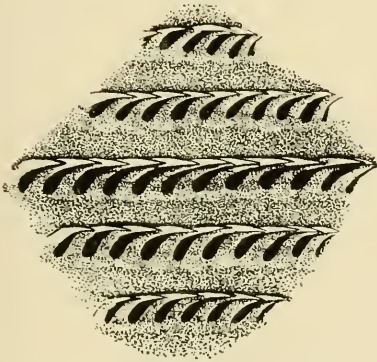
SQUALUS PHILIPPINUS.



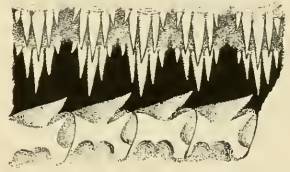




From the type. One-half natural size.



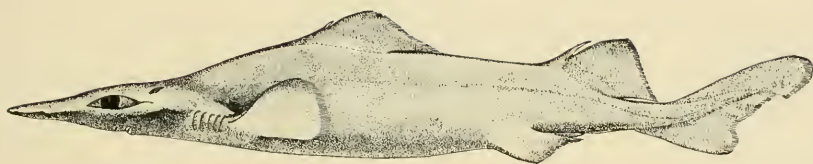
Side view of lines of dermal denticles, enlarged.



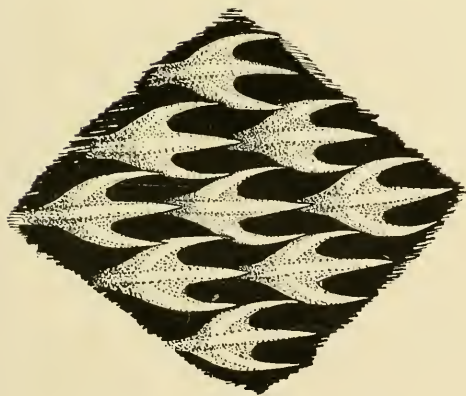
Teeth of upper and lower jaws, enlarged.

ETMOPTERUS BRACHYURUS.





From the type. One-fourth natural size.



Dermal denticles from flank, enlarged.



Teeth of upper and lower jaws, enlarged.

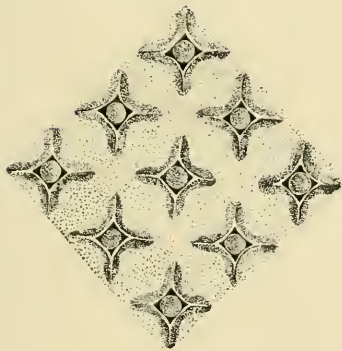
NASISQUALUS PROFUNDORUM.



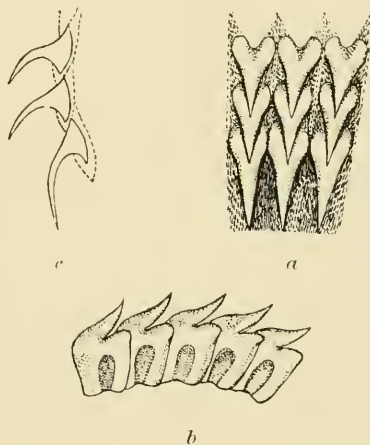




From the type. Three-fourths natural size.



Section of skin from flank, showing dermal denticles, enlarged.



Teeth, enlarged. *a*, front view of teeth in upper jaw; *b*, same, lower jaw; *c*, side view of teeth in upper jaw.

SQUALIOLUS LATICAUDUS.

