dorsal and anal similar, placed posteriorly and opposite each other; caudal fin with round margin; pectoral fins short and broad, 1.85 to 2.35 in head.

Color pale to yellowish green; orange to white underneath (sometimes brownish to blackish n young); upper parts with 12 to 16 dark brown or blackish longitudinal stripes; a large, black ocellus above pectoral and another behind it and still another on side of base of dorsal; side below dorsal sometimes with a black blotch; a small specimen (90 millimeters) with roundish black spots on lower part of side; fins pale green to yellowish or pale orange.

This species is represented by 11 specimens, ranging in length from 90 to 225 millimeters (3½ to 9 inches). This spiny puffer differs from the only other spiny puffer (the porpupine fish) recorded from Chesapeake Bay, in having proportionately shorter, blunter spines, which are immovable. The spines of its relative are long, sharply pointed, and movable.

The food in the stomachs of six specimens of this spiny puffer, which were examined, consisted wholly of hermit crabs. Small hermit crabs were swallowed inclosed in the shells that they occupied, and in case of larger ones the shells apparently were first broken. In one specimen 30 undigested hermit crabs, with their shells, were present. Smith (1907, p. 351) says: "The strong, bony beak enables the fish to crush and eat mollusks and crustaceans, which are its principal food."

Nothing definite is known about the spawning of this fish, nor of the rate of growth. Some of the specimens taken at Ocean View, Va., during October, 1922, had nearly mature gonads. A maximum length of about 10 inches is attained.

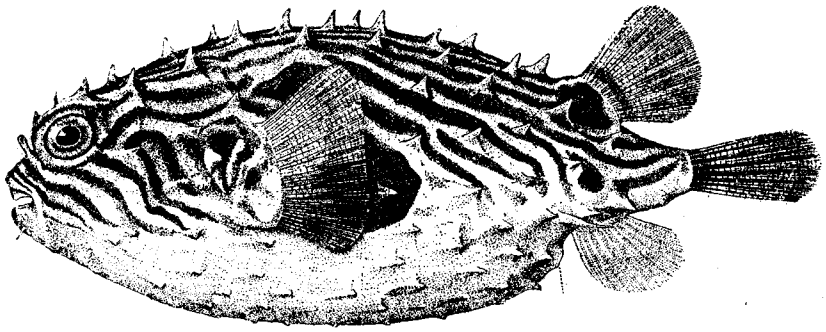

FIG. 210.—*Chilomycterus schœpfi*

The species was found during the present investigation only in the lower part of the bay, where it is rather uncommon. At Ocean View, Va., in 1,800-foot haul seines, 21 fish were caught from October 2 to October 23, 1922. Fishermen in this region said that occasionally as many as a dozen are caught in one day. All the fish seen were caught in May and October. The species has no commercial value.

Habitat.—Massachusetts Bay to Florida; rather common from Chesapeake Bay southward.

Chesapeake localities.—(*a*) Previous records: "Not uncommon along the coast (Maryland), entering bays" (Uhler and Lugger, 1876), and Cape Charles city, Va. (*b*) Specimens in collection: Mobjack Bay, Cape Charles, Lynnhaven Roads, and Ocean View, Va, Uncommon. Specimens at hand were taken with a beam trawl by the *Fish Hawk* and in pound nets and haul seines.

Order PEDICULATI

Family XCII.—LOPHIIDÆ. The anglers

Body broad anteriorly, diminishing rapidly in size from the shoulders backward; head large, very broad, depressed; mouth excessively large and broad; jaws, vomer, and palatines with bands of sharp teeth of uneven size; gills 3, the opening large, placed in lower axil of pectoral; gill rakers wanting; pseudobranchiæ present; scales wanting; head and sides with prominent dermal flaps; dorsal fins 2, widely separated, the spinous portion consisting of three separate tentaclelike spines on the head and three smaller ones connected by membrane; soft dorsal forming a normal fin; anal similar to soft dorsal; pectorals large and fleshy; ventrals jugular, far apart, with I, 5 rays.

158. Genus LOPHIUS Linnæus. Anglers

Body anteriorly very broad; mouth exceedingly wide, superior; lower jaw much in advance of the upper; upper jaw protractile; first dorsal spine expanded at tip, overhanging the mouth, and forming a lure or bait for prey; gill openings below and behind the pectorals; size large; vertebræ 27 to 32.

200. Lophius piscatorius Linnæus. All-mouth; Angler; Goosefish.

Lophius piscatorius Linnæus, Syst. Nat., ed. X, 1758, p. 236; seas of Europe. Jordan and Evermann, 1896-1900, p. 2713, Pl. CCCLXXXVIII, fig. 952.

"Head as wide as long, and longer than body; eyes small, separated by a space about equal to snout; head very spinous in young, becoming less so with age; skin smooth; the head surrounded by a fringe of short dermal flaps, similar flaps on sides of body; a three-pointed humeral spine; dorsal rays III+III+10, the anterior spine with an expanded tip; anal rays 9, caudal margin straight; pectorals rounded, their bases constricted.

"Color above mottled brown, below white; caudal and pectorals black-edged." (Smith, 1907, p. 399.)

Only larvæ with yolk sac attached (probably just hatched) and a few others, taken at the same time and place but kept alive until the yolk was absorbed, are at hand. A single adult, 1,060

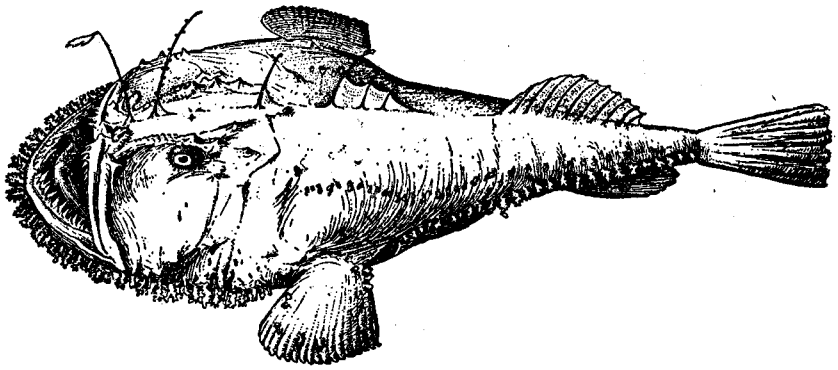

FIG. 211.—*Lophius piscatorius*

millimeters (41¾ inches) in length, was actually observed. This fish was regarded as too large for preservation. The following measurements, given in millimeters, were taken: Total length, 1,060; standard length, 835; distance between bases of pectoral fins, 780; width of mouth, 297; interorbital space, 100; distance from tip of snout to eye, 106; length of the first dorsal spine with "bait," 88; length of the second spine, 210. The color of upper parts was variegated, principally light and dark brown, lower parts were white to dusky. The all-mouth is easily recognized by its large size, smooth skin, broad, flat head, and the enormous mouth, to which the common name has reference.

The food consists of fish, crustaceans, water birds, and, in fact, any animal of suitable size. It is of record that a goosefish may contain food at one time half as heavy as the fish itself. One of us (Schroeder) observed a large goosefish swimming at the surface on Nantucket Shoals, Mass., August 23, 1925. This fish was easily captured and in its stomach was found a haddock 31 inches in length, weighing about 12 pounds. This meal was so large that the fish apparently was unable to leave the surface of the water. It has also been observed that this species uses its tag or "bait" (at the tip of the first dorsal spine) to lure fish close to its large mouth, which are then easily engulfed. For a complete account of the food eaten and of the insatiable appetite of this fish, see Bigelow and Welsh (1925, pp. 526 to 528).

The spawning period occurs during the summer and is reported to last a long time. Recently hatched young, with yolk sacs attached, were taken in the mouth of the bay by the *Fish Hawk* on June 10, 1916. The eggs float near the surface and are inclosed in a gelatinous substance that

forms a sheet or veil often 20 to 30 feet long and 2 or 3 feet broad. It is supposed that each sheet is the product of a single female, and it has been estimated that one ovary may contain considerably more than 1,000,000 eggs. The eggs are spherical or slightly oval and 2.13 to 2.5 millimeters in diameter. The length of the period of incubation is not known. The recently hatched larvæ that are at hand (preserved in alcohol) are only about 3 millimeters long. Six days later larvæ of this same collection and age had dissolved the yolk sac and were 5 millimeters long (after preservation). These larvæ show a dorsal fin ray or spine in the finfold at the nape; the ventral fins, too, are present as a long membranous fold. Considerable dark pigment is present on the head, and three dark areas, about evenly spaced, appear on the axis of the body. For an extended account and illustrations of the embryology and larval development the reader is referred to Bigelow and Welsh (1925, pp. 528 to 532).

This fish is reported to reach a maximum length of 4 feet and a weight as great as 70 pounds. The single adult observed in Chesapeake Bay during the present investigation, as already stated, was nearly 42 inches long. The goosefish is regularly marketed in northern Europe, and its meat is reported to be white and of good flavor. It probably finds no sale in this country because of its repulsive appearance. Although previously not recorded from Chesapeake Bay, the species is not especially rare there. According to the fishermen of the southern sections of the bay, a few are taken each year in pound nets in late fall and early spring. It is probable that it occurs in this part of the bay in limited numbers throughout the winter. However, as no fishing is done there in the winter this can not be stated definitely.

Habitat.—Both coasts of the northern Atlantic; in shallow water on the American coast, from Newfoundland Banks and the Gulf of St. Lawrence to North Carolina, and in deep water as far south as the Barbadoes.

Chesapeake localities.—(*a*) Previous records: None. (*b*) Specimens in collection: From off Cape Charles, Va.; specimen observed in Lynnhaven Roads, Va.; also reliably reported by pound-net fishermen at Buckroe Beach, Va.

Family XCIII.—ANTENNARIIDÆ. The frogfishes

Body and head compressed; mouth large, vertical or very oblique; premaxillaries protractile; lower jaw projecting; teeth in the jaws in villiform bands; gill arches 2.5 or 3; gill openings very small, near the lower axil of pectorals; pseudobranchiæ wanting; spinous dorsal consisting of one to three detached, tentaclelike spines; soft dorsal long and high; anal similar but smaller; pectorals large; ventrals jugular, close together. This family is composed of small pelagic fishes, chiefly of the tropics, usually living among floating seaweed and becoming widely scattered by winds and currents.

159. Genus HISTRIO Fischer. Sargassum fishes; Mouse fishes

Body short, somewhat compressed; mouth small, oblique; palatine teeth present; skin smooth or with minute tubercules and with dermal tentacles; soft dorsal preceded by three spines, the first spine slender and expanded at tip, forming a lure or bait; ventral fins well developed, rather long; wrist and pectoral fins slender. This is a group of oddly shaped fishes that live in dense vegetation, to which the individuals attach themselves by means of their handlike pectorals. Two American species have been recognized; one of these occasionally drifts northward along the coast.

201. Histrio histrio (Linnæus). Sargassum fish; Mouse fish.

Lophius histrio Linnæus, Syst. Nat., ed. X, 1758, p. 237; open sea.
Pterophryne lævigata Uhler and Lugger, 1876, ed. I, p. 93; ed. II, p. 77.
Pterophryne histrio Jordan and Evermann, 1896–1900, p. 2716.

"Head 2¼; depth 1⅘; D. III–14; A. 7; V. 5. Skin of head and body as well as dorsal fins with fleshy tags, which are most numerous on the dorsal spines and abdomen. Wrist slender; ventrals large, nearly one-half as long as head. Dorsal and anal with the posterior rays not adnate to caudal peduncle; first dorsal spine bifurcate at tip. Yellowish, marbled with brown; three dark bands radiating from eye; vertical fins barred with brown; belly and sides with small white spots." (Jordan and Evermann, 1896–1900.)

No specimens of this species are at hand, nor was it observed by collectors or reported by fishermen during the present investigation. This account is included because of a record by Uhler and Lugger (1876), who mention a mouse fish, under the name *Pterophryne lævigata*, as occurring in the "oyster regions of Chesapeake Bay." It is difficult to understand what connection this pelagic fish could have with oyster regions. It probably was taken in such areas quite by accident. The mouse fish is recognized by its naked body, small oblique mouth, projecting lower jaw, handlike pectoral fins, and its yellowish color, which is marbled or blotched with brown.

The habits of the sargassum fish are not well known. It is usually found among floating seaweed, to which it attaches itself by means of its handlike pectorals. In this way it is drifted far and wide by winds and currents. In the aquarium it is cannibalistic, attacking its fellows, biting off their fleshy appendages and swallowing its smaller companions. It is probably safe to conclude from such a display of voracity that it is naturally carnivorous in its habits.

The following account relative to the spawning of this fish is quoted from Smith (1907, p. 400). Nothing, so far as we are aware, has been added to our knowledge of this fish since this was written.

> Our knowledge of the spawning habits and eggs of the species depends almost entirely on observations at the Government laboratories at Woods Hole and Beaufort. The spawning season is from July to October, and a number of captive specimens have laid their curious egg rafts while in aquaria. The eggs are deposited in a bandlike or ribbonlike mass, from 1.5 to more than 3 feet long, about 3 inches wide, and 0.25 inch thick; they are only one-fortieth inch in diameter and very numerous, and are held together by a transparent jelly, which is buoyant. Nothing is known about the embryology, as eggs have not been fertilized. On July 25, 1903, a fish 3.5 inches long, which had been at the Beaufort laboratory for seven weeks, laid a mass of eggs three times as large as the fish.

The maximum size attained by this fish is reported to be 6 inches. It is not taken in large numbers anywhere along the coast, and because of its peculiar shape, handlike pectoral fins, and bright color it is usually regarded as a curiosity. It has no commercial value. In Chesapeake Bay it evidently is extremely rare, and it does not occur there except as it may rarely be drifted into this water by favorable winds and currents.

Habitat.—Tropical Atlantic; occasionally drifted northward, probably in the Gulf Stream, on the coast of America as far as Woods Hole, Mass.

Chesapeake localities.—(*a*) Previous record: "Occurs in the oyster regions of Chesapeake Bay, but is perhaps quite uncommon" (Uhler and Lugger, 1876). (*b*) Specimens in collection: None.

Family XCIV.—OGCOCEPHALIDÆ The batfishes

Body depressed, the trunk short and slender; head very broad, much depressed; snout more or less elevated, usually projecting; mouth not large, usually inferior, the lower jaw included; teeth pointed; gill openings small, above and behind axils of pectoral fins; skin covered with bony tubercles or spines; a rostral tentacle, retractile into a cavity under the rostral process, usually present; dorsal and anal small; ventrals present; pectorals well developed, with strongly angled base. Peculiarly shaped fishes, most of them apparently sluggish in their movements. Some of the species live along the shores in very shallow water and others inhabit the deep sea.

160. Genus OGCOCEPHALUS Fischer. Batfishes

Body depressed; head broad, triangular or more or less disklike in form, not broader than long; snout provided with rostral projection, varying greatly in length; eyes rather large, lateral; mouth moderate, inferior; teeth in villiform bands on jaws, vomer, and palatines; gill opening small near inner axil of pectoral; gills 2½; skin rough, with bony tubercles; a dermal tentacle present under the rostral process, retractile into a well-developed cavity; ventrals I, 5, well separated; pectorals large, placed horizontally.

202. Ogcocephalus vespertilio (Linnæus). Batfishes.

Lophius vespertilio Linnæus, Syst. Nat., ed. X, 1758, p. 236; American seas.
Malthe vespertilio Uhler and Lugger, 1876, ed. I, p. 92; ed. II, p. 77.
Ogcocephalus vespertilio Jordan and Evermann, 1896–1900, p. 2737, Pl. CCCXCII, figs. 958, 958a, 958b.

"Head to gill opening 1.93; depth 5; D. 4; A. 4.

"Body rather robust, tapering backward, the caudal peduncle broader than deep; head broad, depressed, triangular, the greatest width equal to distance from tip of rostral process to inner angle of wrist of pectoral; snout acute, with long pointed process, 5.7 in head, 11 in body; eye wholly lateral, 7.4 in head; interorbital 9.15; mouth rather broad, mostly transverse; maxillary 6.7 in head; teeth small, villiform, in bands on jaws, vomer, and palatines; gill opening small, situated at inner angle of base of pectoral; skin with bony protuberances, varying in size, smallest on belly where the skin is shagreenlike, largest on back of tail, ventral surface of tail with bony plates; a large depression, longer than broad, under rostrum; this depression provided with a dermal tentacle, which has a stocklike base and a more or less definite triangular expansion at tip; dorsal fin small, its origin at vertical from posterior margin of wrist of pectoral; caudal fin round; anal fin small, its origin about equidistant from vertical of origin of dorsal and base of caudal; ventral fins rather long and narrow, inserted about midway between mouth and vent; pectoral fins with distinct wrist, inserted on posterior margin of the disklike head, the fin without wrist, 2.2 in head.

"Color very dark brown above, somewhat lighter brown below. There is a black area on snout below rostral process and two black areas over disk at shoulders; the distal part of the spiny processes on body paler than the ground color; a series of short dermal flaps on upper jaw and on lower margin of disk pale. Dorsal, caudal, anal, and pectorals very dark brown to nearly black, the caudal with greenish-yellow crossbar on middle of fin; ventral fins greenish." (Meek and Hildebrand, 1923–1927, p. 1018.)

This fish was not seen or taken during the present investigation. It is included in the present work on the general record of Uhler and Lugger (1876), who state that it is "rare in the southern part of Chesapeake Bay." The batfish is very readily recognized by its broad body, which has broad, winglike expansions anteriorly, to which the pectoral fins are attached. These winglike expansions give it an appearance somewhat resembling a bat, and this similarity gives origin to the name "batfish." Other peculiarities of this fish are the long-pointed snout and the rough skin beset with bony protuberances of various sizes.

Little is known of the habits of this fish. Its shape, of course, suggests very strongly that it lives and feeds on the bottom. Among the Florida Keys we have observed it rather frequently lying on the bottom, usually among marine growths, in very shallow water along the immediate shores. It swims sluggishly and frequently can be pursued and captured with a dip net.

The maximum size attained by the batfish is given in current works as 12 inches. The species is nowhere of commercial value.

Habitat.—Shallow waters of the Atlantic coast of tropical America, ranging from North Carolina (probably to Chesapeake Bay) to Brazil; rare northward of the Florida Keys.

Chesapeake localities.—(*a*) Previous record: "Rare in the southern part of Chesapeake Bay" (Uhler and Lugger, 1876). (*b*) Specimens in collection: None; not known north of Beaufort, N. C., except from the record of Uhler and Lugger.

GLOSSARY OF TECHNICAL TERMS

Abdomen.—The belly; the cavity containing the digestive and reproductive organs.

Adipose fin.—A peculiar fleshy fin, without rays but occasionally with a spine, occurring on the back behind the dorsal fin of most catfishes, salmons, etc.

Air bladder.—A sac filled with gas, lying beneath the backbone and in or behind the abdominal cavity; also known as swim bladder.

Anal.—Pertaining to the anus or vent.

Anal fin.—The fin on the median line behind the vent.

Antrorse.—Turned forward.

Anus.—The external opening of the intestine; the vent.

Articulate.—Jointed; said of soft fin rays.

Barbel.—An elongate, fleshy projection, usually about the head; also called whiskers; present in most catfishes.
Bicuspid.—Having two points.
Branchiæ.—The gills.
Branchiostegals.—Slender bones forming the support for the branchiostegal membranes, lying under the head and below the opercular bones.
Canines.—Long, conical teeth.
Cardiform.—Coarse, sharp teeth in the jaws of fishes.
Carinate.—Keeled; having a single ridge along median line.
Catadromous.—Running down; said of fish that descend to the sea to spawn.
Caudal.—Pertaining to the tail.
Caudal fin.—The fin on the tail.
Caudal peduncle.—The region between the anal and caudal fins.
Cephalic.—Pertaining to the head; as cephalic fins, meaning fins on the head; as in some of the rays.
Cirri.—Fringes.
Claspers.—Organs attached to the ventral fins of male sharks and skates.
Cæcum (*plural cæca*).—An appendage in the form of a blind sac, connected with the posterior end of the stomach or pylorus.
Compressed.—Flattened from side to side.
Ctenoid.—Rough-edged; said of scales when the posterior margin is spinous or pectinate.
Cycloid.—Smooth-edged; said of scales when the posterior margin is not rough; scales showing concentric lines or striations.
Deciduous.—Falling away or out.
Decurved.—Curved downward.
Depressed.—Flattened vertically.
Distal.—Remote from the point of attachment.
Dorsal.—Pertaining to the back.
Dorsal fin.—The fin on the median line of the back.
Emarginate.—Slightly notched at the end.
Falcate.—Scythe-shaped; long, narrow, and curved.
Filament.—Any slender, threadlike structure.
Filiform.—Thread form.
Fontanel.—An opening between the bones of the skull.
Foramen.—A hole or opening.
Frontal bone.—Anterior bone on top of head, usually paired.
Fusiform.—Spindle-shaped; tapering toward both ends.
Ganoid.—A group of fishes characterized by having the body more or less completely covered with bony platelike scales.
Gape.—Opening of the mouth.
Gill arches.—The bony arches to which the gills are attached.
Gill openings.—Openings reaching to or from the gills.
Gill rakers.—A series of bony projections placed along the inner edge of the gill arch.
Gills.—Organs for breathing the air contained in water.
Hæmal spine.—The lowermost projection of a caudal vertebra.
Heterocercal.—Term applied to the tails of fishes when vertically unequal, the backbone being deflected upward, as in the sharks.
Homocercal.—Term applied to the tails of fishes when equal, the backbone extending to the middle of base of caudal, as in most common fishes.
Imbricate.—Overlapping; said of scales that overlap like shingles in a roof.
Incisors.—Cutting teeth, usually in front of jaws.
Interorbital.—Space between the orbits or eyes.
Isthmus.—The region between the lower part of the gill openings.
Jugular.—Pertaining to the throat; said of ventral fins when attached in advance of the pectorals.
Keeled.—Having a ridge along the median line.

Lamellæ.—Thin plates or layers.
Lateral.—Referring to the side.
Lateral line.—A series of mucus pores along the side of the fish and containing sense organs; often appearing either as a colored or white stripe.
Mandible.—The lower jaw.
Marbled.—Variegated; clouded.
Maxillaries.—The outermost bones of the upper jaw, joined to the premaxillaries in front, and usually extending farther back than the latter.
Molar.—A broad grinding tooth.
Nape.—The back of the neck.
Nares.—Nostrils.
Nasal.—Pertaining to the nose.
Nuchal.—Referring to the nape.
Obtuse.—Blunt.
Occipital.—Relating to the occiput.
Occiput.—The back of the head.
Ocellated.—Having an ocellus or ocelli.
Ocellus.—An eyelike spot; a dark spot with a lighter border.
Opercle.—The thin, flat bone, one on each side of head, covering the gills; also called gill covers.
Orbit.—Eye socket.
Osseous.—Bony.
Oviparous.—Reproducing by means of eggs laid and hatched outside of the body.
Ovum (plural ova).—Egg.
Palate.—The roof of the mouth.
Palatines.—Bones of the roof of the mouth, one on each side of the vomer, often provided with teeth.
Papilla.—A small fleshy projection.
Papillose.—Covered with papillæ.
Parietal.—Bone of the side of the head.
Pectinate.—Having teeth like a comb.
Pectoral.—Pertaining to the breast.
Pectoral fins.—The anterior or uppermost paired fins, corresponding to the anterior limbs of the higher vertebrates.
Peritoneum.—The membrane lining the abdominal cavity.
Pharyngeal bones.—Bones behind the gills and at the beginning of the œsophagus, usually provided with teeth.
Plicate.—Folded; showing folds or wrinkles.
Plumbeous.—Lead colored; dull bluish gray.
Postorbital.—Behind the eye.
Premaxillaries.—The bones, one on each side, forming the front of the upper jaw, usually bearing most of the upper teeth.
Preopercle.—A thin bone lying just in front of the opercle.
Preorbital.—The bone lying just in front of the eyes.
Protractile.—Capable of being drawn forward.
Pseudobranchiæ.—Small gills developed on the inner side of the opercle.
Punctate.—Dotted with fine points.
Ray.—One of the bony or cartilaginous supports of a fin. Rays are either spiny or soft, the latter are either simple or branched.
Recurved.—Turned backward or toward the point of origin.
Reticulate.—Marked with a network of lines.
Retrorse.—Turned backward.
Rugose.—Rough, wrinkled.
Scute.—An external bony or horny plate.
Serrate.—Notched like the edge of a saw.
Setiform.—Having the form of a bristle.
Snout.—The portion of the head which projects beyond the eyes.

Spiracles.—Respiratory opening in the sharks and rays, corresponding to the nostrils in ordinary fishes.
Spinous.—Stiff or composed of spines.
Striate.—Striped or streaked.
Suborbital.—The bone immediately below the eye.
Supplemental maxillary.—A small bone, placed superficially on the upper part of the maxillary in many fishes.
Suture.—The line of union of two bones, as in the skull.
Symphysis.—The tip of chin; point of juncture of the two bones of lower jaw.
Synonymy.—A list of technical names applied to a certain genus or species.
Tail.—In ichthyology, the part posterior to the anal fin.
Temporal.—Referring to the region of the temples.
Thoracic.—Pertaining to the thorax; said of the ventral fins when attached beneath the pectorals.
Trenchant.—Compressed to a sharp edge.
Truncate.—With a square or straight margin.
Tubercle.—A small projection, like a pimple.
Type.—The particular specimen upon which the original description of the species was based or the species upon which was based the genus to which it belongs.
Type locality.—The particular place or locality at which the type was collected.
Vent.—The posterior opening of the alimentary canal.
Ventral.—Relating to the abdomen.
Ventral fins.—The paired fins behind, in front of or below, the pectoral fins, corresponding to the hind limbs in the higher vertebrates.
Ventral plates.—The plates lying on the belly.
Vertical fins.—The fins on the median line of the body; the dorsal, caudal, and anal fins.
Villiform.—Slender, minute teeth crowded into compact patches or bands.
Viviparous.—Bringing forth living young.
Vomer.—A bone in the center of the roof of the mouth, just behind the premaxillaries, often bearing teeth.

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