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IV.

A History of the Fishes of Massachusetts.

BY DAVID HUMPHREYS STORER, M. D., A. A. S.

As one of the Commissioners on the Zoölogy of Massachusetts, in the year 1839, I prepared a Report on the Ichthyology of the State. From the brief time occupied in its preparation, it was necessarily imperfect, and, not being accompanied by figures, was comparatively useless, except to scientific men. Since the appearance of that communication, much information has been obtained respecting several of the most common and valuable fishes, and quite a number of new species have been ascertained to exist in our waters.

Having carefully re-described all the species, I trust the following paper will present an accurate history of the fishes of our State. Considering this as the completion of my former Report, I have kept in view the primary object of the commission, — to ascertain the value of our Fauna in an economical point of view, rather than to prepare labored scientific descriptions.

To all who have aided me since this paper was commenced, or rather since my attention was first directed to our ichthyology, I would return my grateful acknowledgments. The following gentlemen, to whom in my previous Report I remarked I was under peculiar obligations, I cannot pass by unnoticed : —

Thomas Kidder, Esq., of the General Inspection Office, Boston, for his polite attention in furnishing me with all the statistical information in his power regarding the quantities of fish inspected in the State ;

C. R. Vickery, Esq., of Taunton, for his very acceptable remarks respecting the fisheries of Taunton River ;

Hiram Hosmer, M. D., of Watertown, for his numerous and valuable facts concerning the fisheries of Charles River ;

Elisha Bartlett, M. D., of Lowell, for his interesting account of the fisheries of the Merrimack River ;

J. B. Forsyth, M. D., of Chelsea, formerly of Sandwich, for much useful information respecting the fishes taken along " the Cape " ;

Jonathan Johnson, Jr., of Nahant, for several very rare species, and many valuable observations concerning more common fishes.

To Captain Nathaniel Blanchard, a veteran fisherman of Lynn, and Leroy M. Yale, M. D., of Holmes's Hole, I am most deeply indebted ; — to the *former*, for his constant and unwearied efforts to serve me amid the fatigues of his arduous occupation, during the entire period I was engaged in the State Survey, and for many judicious remarks and valuable details imparted to me, respecting the fishes and fisheries of the northern shore of Massachusetts Bay ; and to the *latter*, for his *invaluable aid*. To him I am not only obliged for specimens of nearly *one fifth* of all the species I have described, and which, but for him, I could not have procured, but also for many specimens of more common species, and much valuable information respecting them. Since these observations were made, my excellent friend, Dr. Yale, while in the faithful discharge of his professional duties, contracted a malignant disease, the attack of which he survived but a few days. By his death, science has lost an enthusiastic votary, and his profession a most honorable member.

During the last six or eight years, no individual has rendered me such essential assistance as Captain Nathaniel E. Atwood, of Provincetown. For nearly thirty years a practical fisherman, thoroughly acquainted with the habits of most of our fishes, and willing and ready to do all in his power to advance my wishes, he has placed me under obligations which I cannot express. For several fishes never before described, and for much acceptable information respecting each of our marketable species, I am indebted to him, the best practical ichthyologist in our State.

To Professor Agassiz my thanks are due for many valuable suggestions in the preparation of this work, and to his accomplished draughtsman, Mr. Sonrel, for the admirable plates which illustrate it.

In my nomenclature, I have been guided, as far as possible, by the principle which would give the credit of a species to the author who first placed it under its appropriate genus. This plan, I am led to understand, is about being adopted by our most eminent naturalists.

In addition to the works mentioned in my "Synopsis of the Fishes of North America," the following have been consulted in the preparation of this paper : —

- Richardson.* Report on North American Zoölogy. London. 1837.
Schomburghk. History of Barbados. London. 1848.
Zoölogy of Beechey's Voyage to the Pacific. 4to. London. 1839.
Magasin de Zoölogie, par Guérin de Méneville. 8vo. Paris.
Agassiz. Lake Superior. 8vo. Boston. 1850.
Storer, H. R. Observations on the Fishes of Nova Scotia and Labrador, in Boston Journal of Natural History, Vol. VI. 1850.
Perley. Catalogue of the Fishes of New Brunswick and Nova Scotia. Frederickton. 1837.
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CLASS I. OSSEOUS FISHES.

SKELETON bony, the osseous matter being deposited in fibres. Sutures of the cranium distinct, with maxillary or intermaxillary bones, always one, and generally both, present. Gill-membrane with rays.

ORDER I. ACANTHOPTERYGII. SPINE-RAYED.

They are known by the spines which represent the first rays of the dorsal fin, or which alone sustain the anterior fin of the back, when they have two. Sometimes, instead of an anterior dorsal fin, they have nothing but a few free spines. Their anal fin has also some spines instead of the first rays, and there is, in general, one to each ventral.

FAMILY I. PERCIDÆ.

Comprehends fishes with an elongated body, covered with hard or rough scales, in which the operculum or preoperculum, and frequently both, have indented or spinous edges, and in which the jaws, the front of the vomer, and almost always the palatines, are furnished with teeth.

GENUS I. PERCA, Cuv.

Two dorsal fins distinct, separated; the rays of the first spinous, those of the second flexible; tongue smooth; teeth in both jaws, in front of the vomer, and on the palatine bones; preoperculum ^{notched} ~~notched~~ below, serrated on the posterior edge; operculum bony, ending in a flattened point directed backwards. Branchiostegous rays. Scales roughened, and not easily detached.

PERCA FLAVESCENS, *Cuv.**The American Yellow Perch.*

(PLATE II. FIG. 1.)

- Bodianus flavescens*, *Yellow Perch*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., i. p. 421.
La Perche jaunatre d'Amérique, *Perca flavescens*, CUV. et VAL., Hist. Nat. des Poissons, II. p. 46.
Perca flavescens, *American Perch*, RICH., Fauna Boreal. Americ., III. p. 1, pl. 74.
 " " *Common Perch of Massachusetts*, STORER, Massachusetts Report, p. 5.
Bodianus flavescens, *Yellow Perch*, KIRTLAND, Rep. on Zool. of Ohio, pp. 168, 190.
Perca flavescens, *Yellow Perch*, KIRTLAND, Bost. Journ. Nat. Hist., v. p. 337, pl. 27, fig. 2.
 " " *American Yellow Perch*, DEKAY, N. Y. Report, p. 3, pl. 1, fig. 1.
 " " AYRES, Bost. Journ. Nat. Hist., IV. p. 256.
 " " *American Yellow Perch*, LINSLEY, Cat. of Fishes of Conn.
La Perche à opercules grenues, *Perca serrata-granulata*, CUV. et VAL., II. p. 47.
Perca serrata-granulata, GRIFFITH'S CUV., x. pl. 39, fig. 1.
 " " DEKAY, N. Y. Report, p. 5, pl. 22, fig. 64.
 " " *Common Perch*, THOMPSON, Hist. Vermont, p. 129.
La Perche à tête grenue, *Perca granulata*, CUV. et VAL., VII. p. 48, pl. 49.
Perca granulata, JARDINE, Nat. Lib., I. p. 92, pl. 1.
 " " DEKAY, N. Y. Report, p. 5, pl. 48, fig. 220.
 " " LINSLEY, Cat. of Fishes of Conn.
La Perche à museau pointu, *Perca acuta*, CUV. et VAL., II. p. 49, pl. 10.
Perca acuta, *Sharp-nosed Perch*, RICH., Fauna Boreal. Americ., III. p. 4.
 " " *Yellow Perch*, DEKAY, N. Y. Report, p. 6, pl. 68, fig. 222.
La Perche grêle, *Perca gracilis*, CUV. et VAL., II. p. 50.
Perca gracilis, RICH., Fauna Boreal. Americ., III. p. 4.
 " " *Slender Yellow Perch*, DEKAY, N. Y. Report, p. 6.
Perca flavescens, STORER, Mem. of Amer. Acad., New Series, II. p. 269.
 " " STORER, Synopsis, p. 17.
 " " AGASSIZ, Lake Superior, p. 291.

Color. Above of a greenish-yellow; sides golden-yellow, crossed by seven transverse dark bands, all broader above than below, and those upon the middle of the body broadest. Abdomen white; lower jaw tinged with pink. Centre of operculum of a deep green. Head darker than rest of body. Pupils back; irides golden. Dorsal and caudal fins yellowish-brown; pectorals yellow; ventrals and anal a bright scarlet.

Description. The length of the head is less than one fourth of the entire length. Top of head broad and flattened; that portion of it between and in front of eyes is naked, and covered by a smooth membrane; the portion back of eyes is bony, and roughened by raised, radiating striæ. The preoperculum is scaled, and serrated along its entire edge, save a small portion of its superior posterior angle, which is naked and smooth. The operculum is a subtriangular bone, covered at its upper part by a few scales, but otherwise almost entirely scaleless, and exhibiting numerous raised lines diverging to its outer edge, which presents in some instances a few serrations, and terminates posteriorly in a sharp angle or spine. The subopercle is scaled above, naked beneath, and minutely denticulated along its edge. The scapular bones are

slightly corrugated by striæ. The humeral bones are strongly denticulated. Eyes of moderate size, preceded by several mucous pores. The anterior nostril much in advance of the posterior, which is the larger. The lateral line commences at the humeral bone, and, assuming the curve of the body, is continued to the base of the tail.

The first dorsal fin arises nearly on a line with the pectorals; its height is equal to one third of its length. The rays are very stout, their naked extremities projecting above the transparent membrane connecting them; fin rounded posteriorly. I have seen several specimens in which the fourth and sixth rays of this fin were about one half the height of the third and fifth rays, and the connecting membrane was continued directly above their extremities, as if they were absent. The membrane stretching from the last ray of the first dorsal fin extends to the first of the second dorsal.

The second dorsal is subquadrangular, rounded above; it is more than half the length of the first. The first ray is very minute, and, as well as the second, is spinous; the third ray is simple: all the soft rays are articulated.

The pectorals arise just beneath the humeral bone. They are quite long; fan-shaped; their rays are bifurcated and articulated.

The ventrals are subtriangular; they arise at a distance back of the pectorals equal to one third their height; their outer ray is a strong spine, the others are multifold.

The anal is higher than long, and arises about opposite the middle of the second dorsal; its first two rays are spinous, the first less than one half the height of the second.

The caudal is deeply emarginate.

The fin rays are as follows:—B. 7. D. 13. 2–13. P. 15. V. 1–5. A. 2–8. C. 18. Length 12 to 15 inches.

In this species, as in many others, I have represented two scales, one from the lateral line, and one from above it, whose characters will sufficiently distinguish them.

Remarks. This species is universally distributed throughout the State. In the spring and autumn, it is frequently found in the market, and is readily sold. When young, it usually swims in extensive shoals, while the larger ones remain in the deepest water, and by themselves. It does not take its food timidly, but seizes it instantly without nibbling. It is not only caught with the hook in summer, but also through the ice in winter, with pickerel, and in pretty large quantities in brooks while netting for alewives. Individuals are seldom taken which measure more than twelve or fifteen inches in length. Mr. Ayres has seen a specimen weighing two and a half pounds, and

Dekay has caught them weighing nearly three pounds. This species has been repeatedly transported from one pond to another with complete success. Dr. Mitchell transferred them a distance of forty miles.

It has been noticed in Maine, Massachusetts, STORER; New Hampshire, H. R. STORER; Vermont, THOMPSON; Connecticut, AYRES; New York, MITCHILL, DEKAY; Pennsylvania, HALDEMAN; Ohio, KIRTLAND; and in all the ponds and streams of the great lakes, RICHARDSON, AGASSIZ; New Brunswick and Nova Scotia, PERLEY.

GENUS II. LABRAX, Cuv.

Distinguished from the Perch by the scaly opercula, terminating with two spines, and by a tongue covered with prickles.

LABRAX LINEATUS, Cuv.

The Striped Bass.

(PLATE I. FIG. 4.)

Sciæna lineata, BLOCH, pl. 304.

Perca Mitchilli, *Striped Bass or Rock-fish*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 413, pl. 3, fig. 4.

Rock Bass, MEASE, Trans. Lit. and Phil. Soc. of N. Y., I. p. 502.

Le Bar rayé (ou Rock-fish) des Etats-Unis, *Labrax lineatus*, CUV. et VAL., II. p. 79.

Labrax lineatus, GRIFFITH'S CUV. X. p. 103.

" " RICH., Fauna Boreal. Americ., III. p. 10.

" " STORER, Report, p. 7.

" " AYRES, Bost. Journ. Nat. Hist., IV. p. 257.

" " DEKAY, N. Y. Report, p. 7, pl. 1, fig. 3.

" " LINSLEY, Cat. of Fishes of Conn.

" " STORER, Mem. of Amer. Acad., New Series, II. p. 273.

" " STORER, Synopsis, p. 21.

Color. The upper part of the body is silvery brown, with a greenish-blue tinge; the sides are lighter; the abdomen of a beautiful, clear silvery color; the opercula are more or less golden. Eight or more longitudinal black bands pass from behind the operculum towards the tail; the upper bands are lost just back of the termination of the second dorsal fin; the three or four central ones extend to the caudal fin; while the lower ones reach only the posterior portion of the anal, or are even lost anterior to that fin. Sometimes these bands are all entire; in other specimens, more or less of them are interrupted at intervals; while in others still, instead of being straight throughout, frequent undulations or curves are observed. It sometimes happens that all the bands on one side of the fish are perfect, while all on the other side of the same specimen are broken or irregular. Pupils black; irides golden.

Description. The form of this species is cylindrical. Length of head to entire

length of fish is as 1 to 4. The scales on the body are large and quadrangular, less than one third of scale attached, marked by concentric lines upon their sides; numerous very delicate striæ diverge from the centre of the attached base to the entire extent of the free edge. Sixty-two scales along the lateral line; ten scales in an oblique line from the origin of the dorsal to the lateral line. The whole head is covered with scales, including the intermaxillary bones, save the suborbital bones and the portion in front of and between the nostrils. The scales are largest on sides of body; smaller towards tail and on anterior back, smallest on top of head. The eyes are circular, their diameter equal to about one third the distance between them. The nostrils are situated anterior to eye, at a distance about equal to diameter of eye; the posterior is circular and the longer; the anterior is larger. The lower jaw is the longer. Teeth in jaws numerous and very small; the largest are at the middle of the upper jaw. Teeth upon the palatine bones. Tongue rough at its base and upon its sides, smooth in its centre. The *operculum* at its posterior angle is armed with two spinous processes, the lower of which is the larger and more acute; they are margined with a dark-colored membrane. The *preoperculum* at its posterior edge is very delicately and minutely serrated; these serrations are larger at its inferior margin.

The *lateral line*, which is very distinct, arises just above the superior spinous process of the operculum, and is continued in a straight course through the middle of one of the longitudinal bands, to the centre of the tail, upon the rays of which it is lost.

The first dorsal fin arises on a line with the posterior half of the pectorals; it is twice as long as high; the first ray is one sixth the height of the fourth and fifth, which are the longest rays in the fin.

The second dorsal is not as long as the first. The first ray is spinous; the second ray, which is the longest, is two thirds as high as the length of the fin.

The pectorals are situated just beneath the inferior spine of the operculum; their length to their height is as 1 to 5.

The ventrals are situated just back of the pectorals; their first ray is spinous, and three fifths as long as the second ray, which is the longest of the fin; the rays are multifid. They are of the same length as the pectorals.

The anal arises on a line with the middle of the second dorsal; its first three rays are spinous; the first of these is one fourth the height of the third. This fin is shorter than the second dorsal; it is one fifth longer than high.

The caudal at its base is equal in depth to the length of the pectorals; it is as wide again at its extremity, when expanded, as its depth at base. Fin quite deeply forked.

In each of the fins, the scales are more or less continued upon them.

The fin rays are as follows:—D. 9. 1–12. P. 18. V. 1–5. A. 3–11. C. 18. Length, 3 to 4 feet.

Remarks. This fine species is taken in considerable numbers upon our coast. It is generally found upon shoals near the land, where frequently a dozen or more may be seen at a time beneath the water, quietly lying upon the rocky bottom. Large quantities of small bass are caught with nets near Chelsea and Nantasket beaches. Captain Atwood writes me, that at Provincetown a few are caught in the summer with hook and line, by men standing upon the shore; and that in the months of September and October, when this fish is passing by, on its way to the South, large quantities are sometimes taken with nets, in the following manner. Several men put off from the Race in a boat, with a net from seventy to eighty fathoms long and from three to four fathoms deep; when the boat is at a short distance from shore, a line attached to the net is thrown ashore, and secured by some of the fishermen there in waiting, and a portion of the net is dragged from the boat. As soon as the fish are seen swimming along, near the bottom, the rest of the net is let out of the boat, which is now rowed ashore, while the other extremity of the net is drawn thither by the rest of the gang. In this way hundreds are taken at a haul; but as a large number of men is required, and considerable time is necessarily expended, this business is not very profitable, and is not attended to, unless it be at times of leisure from other pursuits. At Buzzard's Bay they are speared by torch-light to some extent, in the month of May.

In the winter, this species goes up into the rivers and arms of the sea. It is most common in Boston market in autumn and winter. At some seasons of the year it is taken in large numbers in seines, while at others the market is partially supplied by those taken with the hook, and consequently its price varies, from three to twelve cents per pound. It is most readily taken by the hook, when it is baited with the Squid (*Loligo illecebrosa*). The larger individuals feed voraciously upon this animal, and are hence called "Squid-hounds." The flesh of this species, particularly of the larger ones, is rather coarse, but meets with a ready sale when fresh. In 1836, a small number of barrels (67) was packed and inspected. Bass of considerable size are often taken in Boston harbor. In July, 1837, I saw a specimen weighing 36 pounds, which had been taken from one of the city bridges over Charles River; and I have been told that another, weighing 77 pounds, had been taken from the same bridge. The largest individual I have known to be taken by any of our fishermen weighed 34 pounds.

New Brunswick, PERLEY. Maine, New Hampshire, and Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY.

LABRAX RUFUS, *Dekay*.*The White Perch.*

(PLATE I. FIG. 1.)

Bodianus rufus, Red Perch, MITCHELL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 420.*Le petit Bar d'Amérique*, *Labrax mucronatus*, CUV. et VAL., II. p. 86, pl. 121.*Labrax mucronatus*, Small American Bass or White Perch, STORER, Report, p. 8.*Labrax rufus*, Ruddy Bass, DEKAY, Report, p. 9, pl. 3, fig. 7.*Labrax mucronatus*, AYRES, Bost. Journ. Nat. Hist., IV. p. 257.

" " White Perch, LINSLEY, Cat. of Fishes of Conn.

Labrax rufus, STORER, Mem. of Amer. Acad., New Series, II. p. 274.

" " STORER, Synopsis, p. 22.

Color. A silvery gray, darker above the lateral line. The sides and gill-covers exhibit metallic reflections. Lips, intermaxillaries, and tongue minutely dotted with black. Dorsals, pectorals, and caudal brown; ventrals and anal rose-colored at their base; throat also rosaceous. Pupils black; irides silvery.

Description. Body much compressed, a perceptible convexity in front of the first dorsal fin. The depth of the body across from the first dorsal is to the length about as $3\frac{1}{2}$ to 10. The length of the head to the whole length of the body is as 1 to 4. The gill-covers, intermaxillary bones, and the space between the eyes are scaled; the portion in front of the eyes and nostrils is naked. The eyes are circular; their diameter is to the distance between the eyes as 3 to 5. The nostrils are situated just in advance of the superior anterior angle of the eye; the posterior is oval, the larger, and placed obliquely, pointing backwards; the anterior is circular. The upper jaw is protractile; both jaws are armed with numerous very minute teeth. The tongue has a row of very delicate teeth upon its sides. The preoperculum is serrated posteriorly and inferiorly, the serrations upon the inferior edge being much the larger. The operculum has at its posterior edge a sharp spinous process, and above this, separated by an emargination, is an obtuse point.

The scales upon their exposed surface are covered with minute dots, like those of the lips and tongue; they are denticulated at their edge. Seven scales are found in an oblique line from the lateral line to the origin of the first dorsal fin. The lateral line, which is very distinct, commences just beneath the subscapular bone, and, rising a little at first, pursues nearly a straight course, from a line opposite the commencement of the first dorsal, to the tail, including 55 scales.

The first dorsal fin arises opposite the anterior half of the pectorals, and is entirely composed of spinous rays; the first of these is the shortest, and the fourth the longest; the fin is about half as long as high. The membrane of the last ray of this fin is continued to the base of the first ray of the second dorsal, which is nearly quadrangular,

and is composed of soft rays, with the exception of the first, whose height is about two thirds that of the next. This fin is longer than high.

The pectorals are quite broad when expanded; in height they are equal to the length of the second dorsal.

The ventrals are just back of the pectorals; their height is equal to that of the pectorals.

The anal arises on a line with the fifth ray of the second dorsal. Its height and length are equal. It terminates on the same plane with the second dorsal. The second spinous ray is very stout.

The caudal is considerably emarginated; the depth at its base is equal to half the depth of extremity when expanded.

The fin rays are as follows: — D. 9. 1–12. P. 15. V. 1–5. A. 3–9. C. $17\frac{3}{4}$. Length 12 to 15 inches.

Remarks. This species is brought to Boston market in the spring and autumn, from the mouths of the neighboring rivers, and the ponds to which the sea has access.

By the fishermen it is known as the “White Perch.” Its usual weight is about half a pound. December 12th, 1837, I saw a specimen in Boston market which measured fifteen inches in length, and weighed one pound and three quarters, and its stomach contained a specimen of the shiner, *Leuciscus chryssoleucas*, more than five inches long.

Found in New Brunswick, PERLEY; Maine, Massachusetts, STORER; Connecticut, AYRES, LINSLEY; New York, MITCHILL, CUVIER, DEKAY; South Carolina, DEKAY.

Although the *Labrax pallidus* of Dekay was introduced in my “Synopsis” as belonging to this State, I am inclined to think the two species above described to be the only ones we possess; and that perhaps the *pallidus* and *rufus* may prove to be one and the same.

GENUS III. CENTROPRISTES, Cuv.

A single dorsal fin; branchiostegous rays seven; all the teeth small and crowded; no canines. Their preoperculum is dentated, and the operculum spinous.

CENTROPRISTES VARIUS, Storer.

The Black Sea-Bass or Perch.

(PLATE II. FIG. 4.)

Perca varia, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 415, pl. 3, fig. 6.

Centropistes nigricans, GRIFFITH'S CUV., x. p. 117.

Le Centropiste noir, *Centropistes nigricans*, CUV. et VAL., III. pp. 37, 44.

Centropristes nigricans, Règne Animal, ed. VAL., pl. 9, a, fig. 1.

" " *Black Perch, Black Sea-Bass*, STORER, Report, p. 9.

" " *Black Sea-Bass*, DEKAY, Report, p. 24, pl. 11, fig. 5.

" " LINSLEY, Cat. of Fishes of Conn.

" " STORER, Mem. Amer. Acad., New Series, II. p. 237.

" " STORER, Synopsis, p. 35.

(*Lutjanus trilobus*, LACÉP.?)

Color. Of a dark brown, almost black, above; lighter beneath; of the head, sea or bronze green. In some specimens, after death, there is a greenish tinge upon the abdomen, and a bluish one upon the top and back of head. The dorsal and anal fins are white; the former crossed by black bars, the latter marked by fuliginous blotches. The pectorals are of a leaden color, varied with dark brown; the membrane of the ventrals is white, while the rays are nearly black.

Description. Body elongated, compressed; convex in front of the dorsal fin. Greatest depth of body equal to one fourth the length of the fish. Length of head to the posterior angle of the operculum equal to rather more than one third the length of the fish. Head, between and in front of eyes, without scales. Scales upon the sides of the body large; small upon the preopercle, and at the base of the tail. Eyes of moderate size. Nostrils double, situated just anterior to the superior anterior angle of the eyes; the anterior is tubular; the posterior much the larger. Jaws equal in length, armed with a great number of minute, sharp, card-like teeth; upper jaw protractile. Lips fleshy. The whole posterior edge of the preoperculum is denticulated; the inferior edge is serrated. A flat, sharp spine is situated at the posterior angle of the operculum, below which is a broad, fleshy elongation projecting beyond it, the posterior portion of which is destitute of scales. By the union of the opercle and interopercle, a slight notch is produced. Humeral bone denticulated. The lateral line, which is of a dark color, arises at the lower edge of the humeral bone, and assumes the curve of the body.

The dorsal fin arises on a line with the base of the pectorals; its first ten rays are spinous. At the posterior portion of each of these spines, suspended from the upper edge of the connecting membrane, is a small fleshy tentacle. The first ray is shortest, the fourth longest. The eleven fleshy rays are higher than the spinous ones, articulated and bifid; this portion extends farther back than the anal fin.

The pectorals arise just below the fleshy projection of the operculum; they are fan-shaped, quite broad when expanded, and rounded posteriorly.

The ventrals are just in front of the pectorals; the middle rays are longest; their length equal to that of the pectorals.

The anal fin commences back of the soft rays of the dorsal; the first three rays are spinous. Fin higher than long.

The caudal is slightly convex at its centre, and its upper portion projects beyond the lower. It is scaled quite high upon its rays, which are bifid and articulated.

The fin rays are as follows:—D. 10–11. P. 17 or 18. V. 1–5. A. 3–7. C. 17 or 18. Length about one foot.

Remarks. This species, which is known among our fishermen as the “Black Bass” and “Black Fish,” is taken in large numbers in the months of May, June, and July at Holmes’s Hole, and carried to the New York market, where it is considered one of the most valuable fishes, and meets with a ready sale. While visiting Gay-Head in August, 1846, I learned that this species had become much less abundant there than formerly. Thirty years since, it was not an uncommon circumstance for sixty sail of vessels to be fishing about Gay-Head at a time. And even fifteen years ago, this species was quite numerous; but several years since it disappeared almost entirely. They are beginning to reappear again within the last two or three years, but are quite small. They are taken about ledges in deep water, and weigh from five to eight pounds. They seldom wander into Massachusetts Bay; the few that are met with in Boston market are brought from New Bedford. July 1st, 1846, a specimen was taken at Nahant.

Massachusetts, STORER. New York to Florida, DEKAY.

This is evidently Mitchill’s *Perca varia*, and I have therefore retained his specific name.

GENUS IV. POMOTIS, Cuv.

A few denticulations, more or less obvious, on the borders of the preoperculum. Palatines and tongue smooth, and without teeth. Minute teeth on the jaws, vomer, and pharyngeals. Branchial rays, six. A membranous elongation at the angle of the operculum.

POMOTIS VULGARIS, Cuv.

The Bream.

(PLATE III. FIG. 1.)

Le Pomotis Commun, Pomotis vulgaris, Cuv. et VAL., III. p. 91, pl. 49, et VII. p. 465.

Pomotis vulgaris, Règne Animal, ed. VAL., pl. 10, fig. 3.

“ “ *Northern Pomotis*, RICH., Fauna Boreal. Americ., III. p. 24, pl. 76.

“ “ JARDINE, Nat. Lib., I. p. 162.

“ “ *Fresh-water Sun-fish, Pond Perch, Bream*, STORER, Report, p. 11.

“ “ AYRES, Bost. Journ. Nat. Hist., IV. p. 258.

“ “ *Sun-fish, Roach*, KIRTLAND, Report on Zool. of Ohio, p. 191.

“ “ *Harlequin Roach*, KIRTLAND, Bost. Journ. Nat. Hist., III. p. 470, pl. 28, fig. 2.

“ “ THOMPSON, History of Vermont, p. 130.

“ “ *Common Pond-fish*, DEKAY, Report, p. 31, pl. 51, fig. 166.

“ “ LINSLEY, Cat. of Fishes of Conn.

“ “ STORER, Mem. Amer. Acad., New Series, II. p. 292.

“ “ STORER, Synopsis, p. 40.

“ “ AGASSIZ, Lake Superior, p. 293.

Color. Greenish-brown above, with irregularly distributed rusty blotches; in some specimens a certain regularity is observed in the arrangement of these blotches, producing longitudinal bands along the sides. Beautiful, undulating, longitudinal deep-blue lines across gill-covers. Opercular membrane black, with a bright scarlet blotch at its posterior portion. Abdomen whitish. Dorsal, anal, and caudal fins dark brown. Ventrals and pectorals yellowish.

Description. Body compressed, oval. The back curves very gradually as far as the posterior extremity of the dorsal fin, then abruptly gives place to the fleshy portion of the tail. Head less than one fourth the length of the body. Eyes large, circular. Nostrils double, the anterior tubular. Mouth small; teeth very minute and sharp. The edge of the preopercle very finely denticulated. The lateral line arises at the upper posterior edge of the operculum, and, assuming the curve of the body, is lost at the base of the caudal rays. Scales upon the body large, dentated at their bases; those at the base of the fins, small.

The soft portion of the dorsal fin is highest and rounded posteriorly. The extremities of the spines of the anterior portion of this fin project above the connecting membrane; attached to them are small tubercles. The first dorsal spine is shortest; the fourth and fifth spines are the longest.

The pectorals are long, when extended reaching the soft portion of the dorsal fin.

The anal terminates on a line with the dorsal.

The caudal is emarginate.

The fin rays are as follows: — D. 10–12. P. 13. V. 1–5. A. 3–10. C. 17. Length rarely exceeds eight inches.

Remarks. As Agassiz, in his work on Lake Superior, considers our species as distinct from that which is known in the Southern States by the same scientific name, I have omitted several references in my list of synonymes which were retained in my "Synopsis." It is a common species in the ponds of the various portions of the State, and is taken with the *Perca flavescens*, *Leuciscus chrysoleucas*, *Esox reticulatus*, &c. By many it is considered a very sweet fish, although it is but seldom brought to market. It is known by the names of "Bream," "Ruff," "Pumpkin-seeds," and "Kivers."

They build circular nests by removing the weeds from the bottom, and excavating the sand or gravel to so great an extent that they are often two feet in width and a half foot in depth. They are commonly placed near each other, and sometimes in so shallow water that the usual falling of the river in summer will leave them dry. In this way, besides the ordinary chance of falling a prey to the appetite of other fishes, a

large proportion of the species is yearly destroyed. In its care of the nest, it is very assiduous, and at this time it can be not only closely observed, but sometimes even handled, without its deserting its charge.

New Brunswick, PERLEY. Massachusetts, STORER. Vermont, THOMPSON. Connecticut, AYRES, LINSLEY. New Hampshire, H. R. STORER. New York, MITCHILL, DEKAY. Ohio, KIRTLAND. Kentucky, RAF. The Great Canadian Lakes, RICHARDSON.

POMOTIS APPENDIX, *Dekay*.

The Red-tailed Bream.

(PLATE III. FIG. 4.)

Labrus appendix, *Black-eared Pond fish*, MITCHILL, Supp. to Amer. Month. Mag., 11. p. 247.

Pomotis appendix, DEKAY, Report, p. 32.

" " LINSLEY, Cat. of Fishes of Conn.

Pomotis rubri-cauda, *Red-tailed Pomotis*, STORER, Bost. Journ. Nat. Hist., iv. p. 177.

" " LINSLEY, Cat. of Fishes of Conn.

Pomotis appendix, STORER, Mem. Amer. Acad., New Series, 11. p. 294.

" " STORER, Synopsis, p. 42.

Color. When alive, of a general rusty brown, or in some specimens golden brown, more strongly marked above the middle of the body by ferruginous spots being densely distributed along the scales; these spots are more sparse and more distinct below the lateral line; the body, beneath and in front of the ventral fins, of a blood-red color; the throat is bluish-white. A bluish-white undulating line runs from the upper jaw just beneath the eye, across the operculum and beneath the opercular membrane to its posterior extremity; a second line of a similar character arises just above this, and, interrupted by the eye, again commences back of it, and passes over the opercular membrane; so that the membranous appendage of the operculum, which is broad, rounded posteriorly, and of a uniform black color, is between these lines. Beneath the undulating lines just spoken of are bluish-white blotches irregularly distributed upon the preoperculum, some of them passing downwards towards its lower edge. Pupils black, irides red. The dorsal fin is anteriorly of a dark-brown color; its posterior membranous portion is red. The ventrals are red at their base and black at extremities. The pectorals are of a yellowish-brown color. The anal is yellowish at its base and fuliginous at its margin. The caudal is of a blood-red color. After death, the body becomes of a bluish-gray color; the abdomen changes to orange; the extremities of the ventrals are purple; and the tail is rust-colored, livid posteriorly.

Description. Length of head, including the opercular membrane, equal to about one third the length of the body; greatest depth of fish, exclusive of the dorsal and anal fins, equal to more than one third the length of the body. The head, between

and in front of the eyes, is naked. The eyes are circular; their diameter less than the distance between them. Gape of mouth large. The posterior nostril is the longer. The lateral line commences above, and in front of, the base of the opercular membrane, and assumes the arch of the body.

The dorsal fin commences above the posterior portion of the opercular membrane; its first and second spines are the shortest; the membranous portion is rounded above and posteriorly.

The pectorals are broad and rounded.

The rays of the ventrals are multifid.

The soft portion of the anal is rounded along its entire margin.

The caudal fin is somewhat emarginated.

The fin rays are as follows:—D. 10 to 11—9 to 11. P. 11 to 12. V. 1—5. A. 3—9 to 10. C. 18. Length about six inches.

Remarks. The specimens I have seen of this species were sent me from Concord, by Mr. Edward S. Hoar; they were taken with *P. vulgaris*. Although Mitchill, in his description of the *Labrus appendix*, makes no mention of the color of the fins, which is a striking character, it agrees in other particulars so nearly with the species before me, that I cannot but think they are identical; and therefore suppress here, as I have previously done in my Synopsis, my specific name of "*rubri-cauda*."

Massachusetts, STORER. New York, MITCHILL.

The Genus *Sphyræna*, which has usually been included in the Family *Percidæ*, will be introduced hereafter in a different group.

FAMILY II. TRIGLIDÆ.

Contains a numerous series of fish, to which the singular appearance of their head, variously bristled and covered with armor, gives a peculiar physiognomy. Their general character consists in having the suborbital bone more or less extended over the cheek, and articulated behind with the preoperculum.

GENUS I. PRIONOTUS, Cuv.

Pectorals very large, with numerous rays. A band of even teeth on the palatines.

PRIONOTUS LINEATUS, *Dekay*.*The Banded Gurnard.*

(PLATE V. FIG. 4.)

Trigla lineata, Gurnard or Sea-Robin, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 430, pl. 4, fig. 4.*Le Prianoë strié*, *Prionotus strigatus*, CUV. et VAL., IV. p. 86.*Prionotus strigatus*, Règne Animal, ed. VAL., pl. 20, fig. 2." " *Sea-Robin*, Gurnard, Grunter, STORER, Report, p. 12.

" " AYRES, Bost. Journ. Nat. Hist., IV. p. 258.

" " LINSLEY, Cat. of Fishes of Conn.

Prionotus lineatus, Banded Gurnard, DEKAY, Report, p. 45, pl. 4, fig. 12.

" " STORER, Mem. Amer. Acad., New Series, II. p. 302.

" " STORER, Synopsis, p. 50.

Color. The recent specimen is of a reddish-brown color above, and the entire surface, including the head, is covered with numerous black dots. The gill-covers and intermaxillaries in some specimens are orange. The dead fish is of a slate-color above the lateral line, with a few black dots irregularly distributed over its surface, the sides are lighter, with a reddish tint; abdomen white. Beneath the lateral line, and parallel to it, runs a broader brownish line, which arises under the humeral spine; this line is broken at its posterior extremity with interrupted points or spots. Beneath the anterior portion of this line are several broken brown bands. The first dorsal fin is of a light reddish tint, with a black blotch upon the upper portion of the membrane between the fourth and fifth, or third, fourth, and fifth rays. The anterior edge of the first three rays barred with black. The second dorsal is reddish. The pectorals are fuliginous beneath and reddish above; fuliginous also in centre of upper portion, with numerous transverse black lines, which are more obvious at the base of the fin. The ventrals are white.

Description. Head broader than the body; its length rather less than one third the length of the fish; its depth equal to more than half its length, and made up of seven distinct bony plates, which form a perfect helmet of defence. The whole upper part of the head, the occiput, the space between the eyes, and the portion anterior to the snout, are composed of one plate; this portion is roughened throughout its whole extent by irregular corrugations, and terminates posteriorly in two strong, very acute spines; at the upper anterior and posterior angles of the eyes, minute spines are also observed. This plate is emarginated anteriorly, deeply truncated posteriorly. The operculum is a distinct plate, of an irregularly triangular form, having two spines at its posterior extremity; the lower larger and pointing directly back, the upper pointing obliquely upwards; this plate is covered with elevated striæ radiating from the anterior portion towards the circumference, and is separated from the preopercle by a membrane,

which renders it movable; its margin is bordered by a wide membrane. The preoperculum is rather small and is triangular, slightly movable, and divided at its lower portion by a horizontal, serrated, bony ridge, which terminates posteriorly in a naked spine; beneath this ridge, the inferior portion is corrugated and granulated; from the base of the preopercle, radii diverge to its upper portion. Suborbital bones roughened like the top of the head; cheek-bones covered with elevated striæ, slightly serrated upon their whole lower margin, and strongly serrated anteriorly on each side of the snout. A strong ridge upon the humeral bone, serrated on its under edge, terminating in a naked spine. All the spines upon the head are much more acute in young specimens. In front of the emargination of the frontal bony plate is a naked membranous portion, equal in width to the distance between the eyes; in this space, half way between the eyes and the extremity of the snout, are situated the nostrils, the posterior of which is the larger. Eyes oblong; longest diameter equal to the distance between the eyes. Jaws armed with numerous, small, card-like teeth; upper jaw projecting beyond the lower. Tongue colorless, fleshy. The lateral line arises above the posterior angle of the operculum, and, curving slightly downwards to a line opposite the space between the dorsal fins, thence pursues a straight course to the tail.

The first dorsal fin is situated in a groove which partially receives it when closed, and arises just back of a line with the termination of the occipital spines; it is longer than high. Its first ray is spinous, and serrated upon its entire anterior edge; the second and third rays are serrated at their upper anterior portion; the third and fourth rays are the longest. It is composed of ten spinous rays; the three posterior are exceedingly small, and look like isolated spines, between the fins.

The second dorsal is one third longer than high; its rays are bifid, and their tips slightly project beyond the connecting membrane.

The pectorals are very broad when expanded, and are one third the length of the body. On a line with the base of the pectorals, beneath them, are three fleshy appendages, somewhat similar in their appearance to the fin rays, though larger, and of equal size throughout their entire length; the upper, which is the longest, is equal to half the length of the pectorals.

The ventrals are situated beneath the base of the pectorals; their longest rays are equal to two thirds the length of the pectorals; the connecting membrane is emarginated between the tips of the rays. The first ray is spinous, and shorter than the others.

The anal fin arises back of, and terminates posteriorly to, the second dorsal, which fin it equals in length.

The caudal is composed of stout articulated rays, and is nearly straight at its extremity.

The fin rays are as follows:—D. 9 to 10 – 12 to 13. P. 12 to 13. V. 6. A. 10. C. 12 $\frac{1}{4}$. Length, a foot to 18 inches.

Remarks. This pretty species, which is much more common than the *P. Carolinus*, is frequently taken in the Vineyard Sound while fishing for Scapaug (*P. argyrops*), but is not used as an article of food.

Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY.

PRIONOTUS PALMIPES, Storer.

The Web-fingered Gurnard.

(PLATE V. FIG. 1.)

Trigla Carolina, LIN., p. 528, CUV. et VAL.

Trigla palmipes, *Web-fingered Gurnard*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 431, pl. 4, fig. 5.

Le Prionote de la Caroline, *Prionotus Carolinus*, CUV. et VAL., IV. p. 90.

Prionotus Carolinus, *Web-fingered Grunter*, STORER, Report, p. 14.

" " AYRES, Bost. Journ. Nat. Hist., IV. p. 258.

" " *Web-fingered Gurnard*, DEKAY, N. Y. Report, p. 46, pl. 5, fig. 15.

" " LINSLEY, Cat. of Fishes of Conn.

" " STORER, Mem. of Amer. Acad., New Series, II. p. 303.

" " STORER, Synopsis, p. 51.

Color. When first taken, the body above is of a reddish-brown color, with irregular blotches and shadings of a darker brown appearing like indistinct transverse white bands across the dorsum; beneath nearly white. Branchial membrane fuliginous; margined anteriorly and posteriorly with white. The connecting membrane of the first dorsal is transparent, slightly dusky, marked by oblique white lines, and has a large dark-brown spot, the greater portion of which is between the fourth and fifth rays; in young specimens this spot is confined *entirely* to the space between the fourth and fifth spines. The second dorsal is of a dull white color, marked by interrupted longitudinal orange bands. The pectorals are reddish-brown above, slate-colored beneath, with the exception of the two posterior rays, which are white. The pectoral appendages are reddish-brown at their base, and orange at extremities. The ventrals are reddish-white above, white beneath. The anal is of the same general color as the second dorsal.

Description. Length of head rather less than one fourth the length of the entire fish; width of head more than half its length. The armature of the head is very similar to that of *P. lineatus*, and yet there are striking differences; the several bones

are less deeply furrowed and ridged, appearing more like shagreen; at the anterior angle of the eye are three distinct spines. The occipital spines are not so acute as in *P. lineatus*, but are the terminations of carinæ in two arrow-shaped plates of bone; in *P. lineatus*, there is a small spine at the posterior angle of the eye; in this species are two elevated ridges which run posteriorly; these ridges are not prominent in the immature fish. Nostrils of moderate size; the anterior the larger. Eyes high up on the head. Sides of snout strongly serrated. Jaws armed with numerous card-like teeth; the upper jaw the longer. The lateral line, arising between the occipital spine and the posterior superior edge of the operculum, is very indistinct throughout its whole course, but more so at its origin, and is continued in a straight line to the middle of the base of the tail.

The first dorsal fin is situated in a deep groove. The whole anterior edge of the first three rays is serrated, and the upper portion of the fourth.

The second dorsal is nearly straight upon its margin.

The pectorals are large, broad, rounded, and about one third the length of the body. Just in front of and beneath the pectorals are three fleshy appendages, widened at extremities; the posterior the largest. The anal commences just back of, and terminates upon the same plane with, the second dorsal.

The caudal is lunated.

The fin rays are as follows: — D. 9 or 10–13. P. 13 or 14. V. 6. A. 12. C. 12 $\frac{1}{4}$. Length 15 to 18 inches.

Remarks. This species is much more rare than the *P. lineatus*. It was well described by Mitchell, who makes no mention of its infrequency in the waters of New York; but Dekay remarks, that in the course of twenty years he had not met with more than six or eight specimens. As one of its names implies, it is a Southern species. Individuals are not unfrequently taken in the Vineyard Sound, during the entire summer, while fishing for Tautog. It is caught in deeper water than *P. lineatus*. Dr. Yale informed me that he had eaten this species, which, when skinned and boiled, is quite palatable. Occasionally this species is captured north of Cape Cod. In September, 1840, I received from Captain Nathaniel Blanchard of Lynn a specimen twelve inches in length, taken in a net at Green Island; and Henry Sheafe, Esq., of this city, the next year sent the Boston Society of Natural History two specimens which were captured at Phillips's Point, Lynn. I have also seen two or three other individuals in the market, which have been caught in Massachusetts Bay. The specimen here described is the largest of those I had the good fortune to procure while on a visit at Tisbury, in August, 1846. Mr. Ayres, in his enumeration of the Fishes

of Brookhaven, L. I., contained in the fourth volume of the "Boston Journal of Natural History," when speaking of this species, says: "When at rest, they lie on the bottom, with their broad pectorals sometimes spread and sometimes closed; in swimming, however, the pectorals are closed and flat upon the body. If alarmed by the approach of a boat or any other object, they bury themselves so completely in the sand, that a very close observation is necessary to detect them. This concealment is effected by a rapid lateral movement of the body, which displaces the sand from beneath, and causes it to fall upon their sides and back, covering them entirely, except the eyes and top of the head. Probably they often resort to this manœuvre when approached by the large fish which feed upon them."

Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY. Carolina, CUVIER.

Although this species was supposed by Cuvier to be the *Trigla Carolina* of Linnæus, I am compelled to reject his specific name, as his description is altogether too indefinite to identify the fish. He makes no mention of the characteristic palmation of the pectoral appendages.

PRIONOTUS PILATUS, *Storer*.

(PLATE VI. FIG. 1.)

Prionotus pilatus, STORER, Proceedings of Bost. Soc. of Nat. Hist., II. p. 77, 1845.

" " STORER, Mem. of Amer. Acad., New Series, II. p. 522.

" " STORER, Synopsis, p. 270.

Color. Upper part of body a reddish-brown; head a lighter red; body beneath yellowish-white; throat color of pectorals; pectorals dark blue; ventrals color of abdomen. First dorsal fuliginous, crossed by two transverse white lines, one near its base, and the other through its centre; the upper membranous portion between the fourth and fifth rays is marked by a large black blotch. The second dorsal of the same color as the first, with undulating whitish lines crossing the connecting membrane from its base to its margin, presenting a marbled appearance. Anal fin of a dirty white color. Caudal fin colored like the pectorals, but rather lighter.

Description. Body oblong, cylindrical. Head one fourth the length of the body; depth of head nearly equal to two thirds its length. Width of snout equal to nearly twice the distance between the eyes. Eyes moderate, oblong, their longest diameter equal to one sixth the length of the head. Nostrils small, nearer to the tip of the snout than to the eyes. Jaws, palatines, and pharyngeals armed with numerous small, card-like teeth. Upper jaw the longer.

The lateral line commences just beneath the occipital spine, and pursues nearly a straight course to the caudal fin.

The first dorsal arises between the posterior projections of the occiput; the first spinous ray is serrated throughout its entire anterior portion; the second is serrated only on its right side; the third only on its left; the remaining rays are smooth; the third and fourth rays are longest. Fin one half as high as long.

The second dorsal rather more than a third as long as the first dorsal; its rays are bifid and slightly projecting at their extremities.

The pectorals when expanded are equal in their depth to one half their length.

Anterior to and beneath the pectorals are three fleshy appendages, tapering at their extremities, the anterior two thirds the height of the posterior.

The longest rays of the ventrals are nearly two thirds as long as the pectorals; the anterior ray is short and spinous, the other rays are multifid at their extremities.

The anal fin commences on a line just back of the second dorsal, and terminates opposite the extremity of that fin.

Caudal fin deeply emarginated; the outer rays projecting beyond the others.

The fin rays are as follows: — D. 10 – 13. P. 13. V. 6. A. 12. C. 12½.

I have seen but one specimen of this species, which was taken in Massachusetts Bay. Massachusetts, STORER.

In the "Proceedings of the Boston Society of Natural History," Vol. II. p. 77, I stated that the *Prionotus punctatus* had been found in our waters. Thinking it possible I may have been mistaken, and that the specimen belonging to the Boston Society of Natural History was not taken in Massachusetts Bay, as it was said to have been, I prefer not to admit it in this communication.

GENUS II. DACTYLOPTERUS, LACÉP.

The rays under the pectorals are numerous and large; and instead of being free, as in the preceding genera, they are united by a membrane into a supernumerary fin, larger than the fish itself, and which supports it in the air for some length of time. The muzzle, which is very short, appears to be cleft like the lips of a hare; the mouth is situated beneath; there are, in the jaws only, certain rounded teeth, arranged like pavement; the head is flat, rectangular, and granulated; the preoperculum is terminated by a long and strong spine. All the scales are carinated.

DACTYLOPTERUS VOLITANS, *Cuv.**The Sea-Swallow.*

(PLATE VI. FIG. 5.)

Trigla volitans, *Flying Gurnard*, L., SHAW'S Gen. Zoöl., IV. p. 622, pl. 91.*Morcielago*, PARRA, p. 25, pl. 14.*Polynemus sex-radiatus*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. pl. 4, fig. 10.

" " MITCHILL, Supp. Amer. Month. Mag., II. p. 323 (?).

Le Dactyloptère commun, *Dactylopterus volitans*, CUV. et VAL., IV. p. 117.*Dactylopterus volitans*, GRIFFITH'S CUV., I. p. 138.

" " RICH., Fauna Boreal. Americ., III. p. 40.

" " WILSON, Encycl. Brit., art. Ichthyology, p. 173.

" " *Sea-Swallow*, DEKAY, Report, p. 49, pl. 17, fig. 46.

" " LINSLEY, Cat. of Fishes of Conn.

" " STORER, Mem. Amer. Acad., New Series, II. p. 304.

" " STORER, Synopsis, p. 52.

" " *Bat-fish*, SCHOMBURGK, Hist. of Barbados, p. 667.

Color. The specimen now described is of a slate-color above, with indistinct darker blotches; top of head darker than back; upper jaw yellowish-white, with several dark-brown spots beneath the eyes. Abdomen yellow. Dorsal fin white, banded with brown; pectorals dull brown, irregularly spotted with darker blotches, lighter beneath, white at their inferior base; caudal yellowish, transversely banded with black.

My specimen, however, having been preserved in spirits, and its colors consequently being in a great measure destroyed, I shall avail myself of this portion of Dr. Dekay's description: "Light brown above, (darker on the summit of head,) with irregular darker spots. Sides silvery with flesh-color, which latter is predominant beneath. Dorsals gray, with brown spots on the membrane of the first, and the rays of the second annulated alternately with brown and lighter. The posterior pectorals blackish, with bluish iridescent spots; the anterior dark brown varied with black. Ventrals and anal flesh-colored. Caudal light brown, with irregular brownish bands."

Description. Body cylindrical anterior to vent; abdomen flattened posterior to vent; sides compressed at posterior extremities. Head flattened above. Back and sides covered with rows of fixed raised scales; the six or eight rows upon the sides are most elevated, sharp with minutely denticulated edges, and their summit with more marked denticulations. There are fifteen rows of scales, passing longitudinally on the sides, between the origin of the second dorsal and the abdomen. Posterior to the second dorsal, these rows are less marked than anterior to it; the rows back of the head and beneath the pectorals are much more numerous than posteriorly; these gradually approximate, and, as it were running into each other, are for the most part lost, so that at the termination of the second dorsal fin there remain but about twelve rows, and at

the fleshy portion of the tail but four; two of these elevated, bounding the edge of the back and abdomen, and the others, much less raised, between them.

The length of the head to the termination of the subscapular spine equal to more than one third the entire length of the fish. Head above bony, very broad, granulated throughout, deeply emarginated behind, concave between the eyes, and terminating posteriorly on each side in very pointed subscapular bones, which have an elevated ridge passing through their centres. Suborbital bones emarginated posteriorly; their posterior superior angle passing upward and backward to the centre of the orbit of the eye; their posterior inferior angle is continued backward in a sharp point to the preoperculum; the inferior edge of this inferior portion is slightly denticulated, the teeth looking forward.

A branch of the preoperculum marked with vertical striæ passes upward above the termination of the posterior superior angle of the suborbital bone; its posterior angle terminates in a long spine, which passes backward to the posterior half of the subscapular bone; this spine is strongly serrated upon its outer edge, denticulated upon its lower edge, and granulated along its base. The operculum small, triangular, scaled. The eyes are large and circular. The nostrils are double, and of nearly equal size; the anterior and inferior is tubular. The mouth is small; the lips are fleshy. The lower jaw is the shorter. Both jaws armed with several rows of small conical teeth; minute teeth exist also in the pharynx. Snout blunted.

Just anterior to the spinous rays of the first dorsal, and higher than they, are two membranous rays opposite to each other and connected at their bases.

The first dorsal is of a triangular form, the posterior rays being higher than the first. This fin, when closed, is received into a groove.

Between the first and second dorsal fins is a short, stout, triangular spine. Directly back of this spine arises the second dorsal, which is quadrangular, and has its rays connected together by an exceedingly delicate membrane. Its six anterior rays are simple.

The pectorals are very broad when expanded; and reach, when closed, the fleshy portion of the caudal fin. The shortest rays are the six which are separated at the anterior portion from the fin, save at the base, where they are connected to it by a membrane. The central rays of this fin are the longest.

The ventrals are beneath the pectorals; their height is about equal to that of the first six rays of the pectorals; the third and fourth rays are the longest.

The anal is situated beneath the second dorsal.

The caudal is deeply concave; with two elevated scales, looking like finlets, approximating each other at its base.

The fin rays are as follows : — D. 2 - 4 - 1 - 8. P. 30 - 6. V. 1 - 4. A. 6. C. 10 $\frac{1}{4}$. Length about 6 inches.

Remarks. The accompanying description and figure are prepared from a specimen sent me by Dr. Yale from Holmes's Hole ; it is the only individual I have seen.

This species was very well described by Dr. Mitchill in his supplement to his fishes in "The American Monthly Magazine and Critical Review," and still better by Dekay in his New York Report.

Newfoundland, CUVIER. Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY. Gulf of Mexico, PARRA. Caribbean Sea, CUVIER, SCHOMBURGK.

GENUS III. COTTUS,* ARTEDI.

Inhabiting only fresh water. But one small spine at the angle of preoperculum ; sometimes another still smaller, always hidden under the skin and perceptible to the touch only, at the lower margin of the suboperculum. Head very depressed, more or less truncated in front, generally broader than high, but always very uniform, being scarcely detached from the body unless by its more considerable breadth. Second dorsal always higher than first. Ventrals with three or four soft rays. Lateral line usually interrupted.

COTTUS GRACILIS, *Heckel.*

The River Bull-head.

(PLATE IV. FIG. 3.)

Uranidea quiescens, *Little Star-gazer*, DEKAY's Report, p. 61, pl. v. fig. 914.

Cottus gobio, AYRES, Bost. Journ. Nat. Hist., v. p. 121, pl. xi.

" " STORER, Synopsis, p. 52.

Cottus gracilis, HECK., GIRARD, Proceedings of Bost. Soc. Nat. Hist., III. p. 189.

Color. Light green mottled with irregular dark-brown blotches, which are larger on the posterior part of the body.

Description. Length of the head about one fifth that of the body ; much broader than the body ; flattened above back of the eyes. Preoperculum armed at its posterior superior angle with a sharp spine curving upwards, and below this upon its edge

* The genus *Cottus* has heretofore been composed of two separate groups, consisting of fluviatile and marine species. Mr. Girard, after having devoted much attention to the subject, has formed from these two distinct genera, and gives as his reason for not accepting Dekay's *Uranidea*, that, according to the principles of nomenclature, *Cottus* must be retained for the fresh-water group, having been at first applied to them. It remains, however, to be seen whether these changes will be accepted by succeeding ichthyologists.

with another very minute spine. Eyes prominent, obliquely oblong. Jaws equal, with numerous exceedingly minute teeth. Gape of mouth moderate.

Lateral line commences at the superior posterior angle of the operculum, and is continued in a straight line to just below the extremity of the second dorsal fin, where it curves, and ends at the centre of the caudal rays.

The first dorsal fin arises just back of the origin of the pectorals; its length is equal to about one third that of the second dorsal.

The second dorsal, which arises directly back of the first, is of equal height throughout, a little higher than the first dorsal, and is of a quadrangular form.

The pectorals are broad, higher than the length of the head.

The ventrals are composed of three rays of nearly equal length, and united at their base.

The anal fin commences back of the second dorsal, and terminates anterior to the termination of that fin.

The caudal fin is about the length of the head, and is straight at its extremity.

The fin rays are as follows: — D. 8–7. P. 14. V. 3. A. 12. C. 12. Length of fish $2\frac{1}{2}$ inches.

Remarks. The individual from which my description has been drawn up was sent me from Shirley, by Dr. C. D. Dowse.

Mr. Horatio R. Storer caught two specimens near the source of the Saco River, in the town of Bartlett, New Hampshire, among the White Mountains, where the water was about three inches deep. When first seen they were lying under little stones, with the head and expanded pectoral fins alone visible, and so motionless that he would have overlooked them, had he not been carefully examining the bottom in search of salamanders. When disturbed, they immediately darted under the stones, and were only secured by cautiously placing the hand before them so that they could not escape, on which they would dart directly into it. On account of their viscid secretion, they are retained by the hand with difficulty.

Massachusetts, STORER. New York, DEKAY. Connecticut, AYRES. New Hampshire, H. R. STORER.

GENUS IV. ACANTHOCOTTUS, GIRARD.

Always marine. Spines upon each of the opercular bones. Surface of head and often circumference of orbits either armed with spines, serrated, or notched. Mouth more deeply cleft than in Cottus. Lateral line uninterrupted.

ACANTHOCOTTUS VARIABILIS, *Girard.**The Greenland Sculpin.*

(PLATE IV. FIG 1.)

Cottus scorpius, FABRICIUS, Fauna Groenlandica, p. 156, No. 113.*Le Chaboisseau du Groenland*, (*Cottus Groenlandicus*), CUY. et VAL., IV. p. 185.*Cottus Groenlandicus*, *Greenland Bull-head*, RICH., Fauna Boreal. Americ., III. pp. 46 and 297, and admirably figured, pl. 95." " *Greenland Sculpin*, STORER's Report, p. 16." " *Greenland Bull-head*, DEKAY, Report, p. 54, pl. 4, fig. 2.

" " STORER, Mem. Amer. Acad., New Series, II. p. 305.

" " STORER, Synopsis, p. 53.

Cottus quadricornis, SABINE, App. to PARRY's First Voyage.*Cottus variabilis*, AYRES, Proc. Bost. Soc. Nat. Hist., I. 1842, p. 69.

" " AYRES, Bost. Journ. Nat. Hist., IV. 1843, p. 259.

Acanthocottus Groenlandicus, GIRARD, Proc. Bost. Soc. Nat. Hist., III. p. 185.*Acanthocottus variabilis*, GIRARD, Bost. Journ. Nat. Hist., VI. p. 248.

Color. Upper part of the body dark brown, with large clay-colored blotches on the top of the head and upon the gill-covers, with a few smaller ones on the back and sides, and small circular yellow spots on the sides towards the abdomen. Large perfectly white ocelli upon the abdomen, beneath the pectorals. Abdomen yellow tinged with red, throat of a dull white color. The first dorsal fin of a dark-brown color, variegated with yellow; the second dorsal is brown, with several transverse yellowish bands; the pectorals are marked with irregular transverse brown bands and yellow spots; the rays of this fin are orange-colored; the ventrals are white, with three transverse dark-brown bars; the anal is marked like the second dorsal; the rays of the caudal are black, while their connecting membrane is yellowish.

Description. Body oblong; very stout anteriorly; tapering towards the tail.

The sides, both above and beneath the lateral line, are roughened by granulated tubercles which feel like spines when the finger is drawn towards the head.

The length of the head, measured to the posterior extremity of the occiput, is equal to about one fourth the length of the body; its width across the occiput equal to its length; its greatest depth equal to two thirds its length. The head is armed with several spines; those upon its top are blunted, those on the gill-covers are longer, with projecting, sharp points. The nasal spines are sharp and recurved; at the posterior superior angle of the eye is a strong, slightly recurved, short spine, stouter than the nasal spine. Upon the occiput are also situated two strong, blunt, and somewhat recurved spines; between these and the former is a quadrangular depression. The preoperculum has three spines, naked at their extremities, two of which are situated at its superior angle; the upper of these spines is much the largest, and points upwards; the second is smaller and nearly straight; the third and smallest, at its inferior angle, points directly downwards. The operculum

is armed with two spines; the larger at its superior angle; the second, much the smaller, at its inferior angle.

Eyes circular, their diameter equal to one sixth the length of the head. The gape of the mouth very large; the distance between the tips of the jaws, when distended, is equal to one third the length of the head; the upper jaw the longer; both jaws are armed with numerous, very small, card-like teeth; similar teeth on the vomer and pharyngeals. Nostrils tubular, just in front of the eyes.

The first dorsal fin commences on a line above the pectorals; it is rounded above, about as long again as high.

The second dorsal commences at the termination of the first; appearing almost to be united with it.

The pectorals are very broad when expanded; their length at base is less than the height of the first rays; roughened granulations may be perceived beneath several of the rays of these fins; the inferior rays are much the shorter and stouter.

The outer ray of the ventrals is very stout.

The anal commences just posterior to the second dorsal, and is shorter than that fin.

The caudal stout, with the rays bifurcated at their posterior extremities.

The fin rays are as follows:—D. 9 or 10—16 or 18. P. 17. V. 3. A. 13. C. 12½. Length about a foot.

Remarks. In a monograph of the Genus *Cottus*, which he published in the "Proceedings of the Boston Society of Natural History," Vol. III., Mr. Charles Girard considered the *Cottus variabilis* of Ayres as the young of the *Groenlandicus*. At a subsequent period, having received from Mr. Horatio R. Storer a species of *Cottus* from Labrador, he was enabled to decide that it was not the same as the species on our coast which is known as the *Groenlandicus*, and consequently has retained Ayres's specific name for the Massachusetts fish. So that what has been known by us as the *Groenlandicus* is now to be called *variabilis*, and the fish so called by Ayres is the young.

This beautiful fish is much less common than the *Virginianus*. Though the other species is said to be a favorite food of the Greenlanders, this is not used with us. It is frequently seen swimming upon the sandy bottoms of the numerous small coves of Massachusetts Bay, and is taken with the hook while fishing from the rocks for the Conner. Specimens of the young of this species were presented to me by Mr. Desor, who procured them at the South Shoals, fifteen miles from Nantucket, with the dredge, in eleven and a half, fifteen, and eighteen fathoms of water respectively, from a bottom abounding with barnacles and membranipora. It is exceedingly voracious, devouring all kinds of Crustacea, Mollusks, and Echini. In the stomach of one I found

three entire specimens of the *Portunus pictus* of considerable size; in others I have seen large quantities of the *Echinus granulatus*, and several species of Algæ.

Maine, Massachusetts, STORER. Connecticut, AYRES. New York, DEKAY.

ACANTHOCOTTUS VIRGINIANUS, Girard.

The Common Sculpin.

(PLATE IV. FIG. 2.)

Scorpius Virginianus, WILLOUGHBY, Hist. Pisc., App., p. 25, pl. 10, fig. 15 (?).

Cottus octodecimspinosus, Eighteen-spined *Cottus*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 380.

Le grand Chaboisseau à dix-huit épines de l'Amérique du Nord, *Cottus octodecimspinosus*, CUV. et VAL., IV. p. 181.

Cottus octodecimspinosus, *Sculpin*, RICH., Fauna Boreal. Americ., III. p. 46.

" " GRIFFITH'S CUV., X. pl. 43, fig. 4.

Cottus Virginianus, *Common Sculpin*, STORER, Report, p. 18.

" " *Common Bull-head*, DEKAY, Report, p. 51, pl. 5, fig. 13.

" " LINSLEY, Cat. of Fishes of Conn.

" " STORER, Mem. Amer. Acad., New Series, II. p. 305.

" " STORER, Synopsis, p. 53.

Acanthocottus Virginianus, GIRARD, Proc. Bost. Soc. Nat. Hist., III. p. 187.

" " H. R. STORER, Bost. Journ. Nat. Hist., VI. p. 250.

Color. While alive, some individuals of this species are of a greenish-yellow color, with four transverse dark-brown bars, which extend from the dorsum to the lower part of the sides; the anterior of these is nearly as wide at its base as the first dorsal fin at which it commences; the second is situated at the anterior half of the second dorsal; the third, which is narrower than the second, is at the posterior half of the second dorsal; the fourth band crosses the fleshy portion of the tail. In others the general color is of a greenish-brown, the bands are very indistinct and appear rather like large blotches. Abdomen white. The first dorsal is fuliginous, and crossed by distinct dark-brown bands. The second dorsal is crossed by three longitudinal bands of dark brown. The pectorals are of a light-yellow color; broad when expanded; the inferior rays are flesh-colored; these fins are crossed by six dark-brown concentric bands of different widths. The ventrals are yellowish-white; the intermediate membrane clouded by indistinct bands of dark brown. The anal is yellowish, crossed by indistinct dark bands. The caudal is yellowish-white, with five very distinct bands. Pupils bluish; irides reddish, with a coppery hue when alive.

Description. Length of head equal to one third the length of body; its greatest width equal to two thirds its length. Twenty spines are seen upon and about the head, ten on each side; all these are naked at their extremities. The nasal spines are small and recurved; the post-orbital spines are a little longer than the nasals; they are barely elevated above the top of the head, and point directly backwards; the occipital spines are erect and slightly recurved; they are rather stouter than the post-orbitals;

three spines are situated upon the preoperculum ; that at the posterior angle is the largest of any upon the head ; it is very stout, is naked throughout its greatest extent, and is partially covered by a loose membrane as a mere sheath, which is readily recurved to its very base ; this spine extends backwards nearly to, and in some specimens as far as, and I have seen it continued even beyond, the posterior extremity of the opercular spine. Directly under the base of this spine is situated a second very small one, pointing obliquely backwards and downwards ; at the inferior angle of the preopercle is a third spine, pointing downwards and forwards. Two spines are seen upon the operculum ; the larger passes from its upper anterior portion to the posterior angle, pointing obliquely backwards ; the other, which is quite small, is at the inferior angle, and points directly downwards. Just above the origin of the pectorals is a strong scapular spine, directed upwards and backwards. And above the commencement of the posterior fleshy membrane of the operculum is seen the humeral spine, which is but little longer than the occipital spines.

The head is flattened above and furrowed by ridges which are the continuations of the spines ; a slight ridge passes from the nasal spines backwards to the eyes ; another extends from the post-orbital to the occipital spines, and exterior to this is another ridge ; the whole upper portion of the head is dotted with minute granulations. The gape of the mouth is large ; the jaws, pharynx, and palatine-bones are armed with numerous sharp, compact teeth, like those of a card ; the upper jaw is the larger. The eyes are very large and prominent. The nostrils are small ; the posterior is just back of the nasal spine ; the anterior is tubular, and on a line with the base of the nasal spine exterior to it. The lateral line is very prominent, resembling an interrupted series of tubercles. It commences at the scapular spine, and is continued to the caudal rays, being much less marked at its posterior extremity.

The first dorsal fin, which is composed of nine spinous rays, is longer than high. The third ray is the longest ; the first ray is about half the height of the second ; the extremities of the first six rays project beyond the connecting membrane. Dr. Dekay, in speaking of this fin, says, " the second ray longest." He omits mentioning the first very short ray ; and it does not appear in his figure.

The second dorsal arises just back of the first, at the termination of a membrane extending from the first dorsal. It is nearly as long again as the first dorsal ; its rays are articulated.

The pectorals are large and rounded.

The ventrals arise beneath the lower rays of the pectorals ; simple. Rays free at extremities ; first ray quite strong.

The anal commences back of the second dorsal, and is shorter than that fin.

The caudal is even at extremity.

In some specimens the membrane connecting the rays of the second dorsal, anal, and caudal fins extends to their extremities, causing the fins to appear even at their edges; while in others the extremities of the rays project like those of the pectorals and ventrals.

The fin rays are as follows:—D. 9–16. P. 17. V. 3. A. 14. C. 12. Length 10 to 18 inches.

Remarks. This is our most common species of *Cottus*. As the “Sculpin” or “Toad-fish” it is well known, and is the pest of the numerous boys and idlers who at certain seasons of the year are constantly fishing from the wharves and bridges for more marketable species.

Mitchill described this species in his “Fishes of New York,” under the name of *octodecimspinosus*; but as it has the same number of spines as the *Cottus scorpius*, its specific name alone cannot distinguish it; and as it was previously called by Willoughby *Virginianus*, from a specimen sent him by Lister from Virginia, I have no hesitation in prefixing his specific name to my description.

Newfoundland, RICHARDSON. Massachusetts, STORER. New York, MITCHILL, DEKAY. Virginia, WILLOUGHBY. Labrador, H. R. STORER. New Brunswick and Nova Scotia, PERLEY.

The *Acanthocottus æneus* I now omit, thinking I have previously mistaken for it a variety of *A. variabilis* of Girard.

GENUS V. BOLEOSOMA, DEKAY.

The form of the body is that of a dart; the head is very short, rounded like an arc of a circle, below which the mouth, generally small and slightly protractile, opens horizontally; the upper jaw sloping over the lower. The neck and the sides of the skull compressed. The opercular apparatus and the cheeks covered with scales.

BOLEOSOMA OLMSTEDI, *Agassiz*.

The Tessellated Darter.

(PLATE IV. FIG. 4.)

Etheostoma Olmstedii, STORER, Bost. Journ. Nat. Hist., IV. p. 61, pl. 5, fig. 2.

“ “ AYRES, Bost. Journ. Nat. Hist., IV. p. 257.

Percina minima, HALD., Journ. Acad. Nat. Scien., VIII. p. 330.

Boleosoma tessellatum, *Tessellated Darter*, DEKAY, N. Y. Report, p. 20, pl. 20, fig. 57.

Perca minima, DEKAY, N. Y. Report, p. 7.

Etheostoma Olmstedii, *Ground-fish*, LINSLEY, Cat. of Fishes of Conn.

" " STORER, Mem. of Amer. Acad., New Series, II. p. 271

" " STORER, Synopsis, p. 19.

Boleosoma Olmstedii, AGASSIZ, Lake Superior, p. 304.

Color. Yellowish-green, with blackish blotches upon the sides like interrupted bands. A large dark-brown blotch is seen upon the occiput, and back of this, upon the dorsum, six broad similarly colored transverse bands; the first, just over the pectorals; the second, at the anterior portion of the first dorsal; the third, between the first and second dorsal; the fourth, at the middle of the second dorsal; the fifth, at the termination of the second dorsal; and the sixth, at the base of the tail. These bands all usually disappear at death. Pupils black, irides golden. A narrow deep-black band runs from the tip of the upper jaw to the anterior superior angle of the eye, and a second band passes upwards from the lower anterior angle of the preoperculum to the middle of the lower edge of the eye, and thence to the upper edge of the orbit, interrupted by the globe of the eye. The preoperculum is golden. The first dorsal is almost colorless; the rays of the second dorsal, as well as those of the pectorals, ventrals, and caudal, are elegantly crossed transversely by reddish lines.

Description. Form cylindrical. The head is less than one sixth the length of the body; it is flattened above, between, and back of the eyes. The operculum is scaly above, and terminates posteriorly in a sharp spine. Jaws furnished with very minute teeth. The orbits of the eyes are very prominent.

The first dorsal fin commences some distance back of the opercular spine; it is rounded posteriorly.

The second dorsal, of a quadrangular form, commences just posterior to the first; the extremities of its rays bifurcated.

The pectorals are situated just back of the posterior portion of the opercula. Their length is equal to one fifth their height.

The ventrals are situated just back of the base of the pectorals.

The anal arises just posterior to the commencement of the second dorsal; it is rounded at its extremity.

The caudal is slightly emarginated.

The fin rays are as follows: — D. 9 – 13. P. 15. V. 6. A. 11. C. 15. Length three inches.

Remarks. This species is not uncommon in the small streams of the western portion of the State.

Massachusetts, STORER. Connecticut, OLMSTED, AYRES. New York, DEKAY. Pennsylvania, HALDEMAN.

GENUS VI. ASPIDOPHORUS, LACÉP.

Body octagonal, covered with scaly plates; head thicker than the body, with points and depressions above, flattened below; teeth in both jaws only, none on the vomer; snout with recurved spines; branchiostegous rays, six; body tapering to the tail; one or two dorsal fins distinct.

ASPIDOPHORUS MONOPTERYGIUS, Cuv.

The Aspidophore.

(PLATE VIII. FIG. 1.)

Cottus monopterygius, BLOCH, 178." " *Single-finned Bull-head*, SHAW, Gen. Zool., IV. p. 265.*L'Aspidophore à une seule dorsale*, *Agonus monopterygius*, BL., SCHN.*Aspidophoroide Tranquebar*, LACÉP., CUV. et VAL., IV. p. 224; VI. p. 554.*Cottus (Aspidophorus) monopterygius*, CUV., *Aspidophore with one dorsal*, RICH., Fauna Boreal. Americ., III. p. 50.*Aspidophoroides monopterygius*, *Bull-head*, STORER, Report, p. 22, pl. 1, fig. 1.

" " CUV., Règne Animal, ed. VAL., pl. 21, fig. 3.

Aspidophorus monopterygius, *American Aspidophore*, DEKAY, Report, p. 62, pl. 2, fig. 6.

" " STORER, Mem. Amer. Acad., New Series, II. p. 309.

" " STORER, Synopsis, p. 57.

Color. Above, a light brown, with six indistinct transverse black bands extending from the head to the tail; those upon the anterior portion of the body the broader. Beneath lighter.

Description. Body elongated, gradually tapering to the tail; divided longitudinally by eight rows of scaly plates. Those which are situated just back of the head are much the largest. Above, from just back of the eyes to the dorsal fin, are two rows of these plates; two rows on each side for some distance, and two rows beneath; making the fish anterior to the dorsal fin octagonal, and posterior to that fin, hexagonal. The angles of the large scales upon the back form prominent ridges, and between them is thus formed a groove, which extends from the snout between the orbits of the eyes to the posterior extremity of the dorsal fin. Back of this fin is seen a dorsal ridge, instead of the furrow, which is continued to the tail.

The length of the head is equal to about one seventh the entire length of the body; width of head less than that of body. The whole head is bony; the eyes are very large; the orbital bones prominent. The snout has two recurved spines at its extremity, and a third and smaller one back of them, curving forwards. Mouth small; numerous minute teeth are observed in both jaws.

The dorsal fin is situated upon the posterior half of the body, at the extreme portion of the dorsal furrow.

In this specimen, as well also as in those I previously examined, it is almost impossible to make out the number of fin rays; but the following, if not perfectly accurate, is a near approximation:—D. 5. P. 10. V. 4. A. 4. C. 16. Length 5 inches.

Remarks. This species was first described by Bloch as the *Cottus monopterygius*, and afterwards more minutely by Cuvier as the *Aspidophorus monopterygius*, in the fourth volume of the "Histoire Naturelle des Poissons." Lacépède formed the genus *Aspidophoroides* to receive the species above described, it being the only known *Aspidophorus* with a single dorsal fin. At the time this genus was formed, the species of which we have been speaking was supposed to have been brought from the East Indies. Cuvier, however, in his description, says he has not received it from the East Indies in any of his numerous collections from that quarter of the world; and finally, Richardson, in his "Fauna Boreali Americana," observed, "that it has lately been discovered to be an inhabitant of the Greenland seas, so that this sub-genus belongs entirely to the Northern hemisphere, and chiefly to the higher latitudes." Early in May, 1838, Mr. Jonathan Johnston, Jr., sent me three specimens of this species, which he had taken from the stomachs of haddock just caught within two miles of Nahant. They were each more or less mutilated; from one of them, however, my friend Jeffries Wyman, M. D., was enabled to sketch the plate contained in my "Report on the Ichthyology of Massachusetts." In 1848, Captain Nathaniel E. Atwood sent me a specimen taken from a cod's mouth at Provincetown. This specimen, although somewhat injured when received, has furnished me with the accompanying figures, and given me an opportunity to revise my former description. Besides the specimens above referred to, Mr. William O. Ayres procured two others, in February, 1851, from the stomach of a halibut taken at Cape Cod; and Mr. Stimpson one in May, from the stomach of a haddock caught in Boston Bay. These are the only individuals I have ever known to be taken south of Greenland.

Massachusetts, STORER. Greenland, RICHARDSON.

GENUS VII. CRYPTACANTHODES, NOBIS.

Body elongated, very much compressed, and gradually tapering to the tail. Destitute of scales. Head broad, with no projecting spines; the scapular and humeral spines, and the inferior edge of the preoperculum, prominent to the touch. Numerous depressions in frontal, suborbital, inferior maxillary, and preopercular bones; branchiostegous rays, seven; mouth oblique; a single dorsal fin, composed of strong spinous

rays enveloped by a common membrane, runs nearly the entire length of the fish, and unites, as well as the anal, with the tail. No ventral fins.

C. MACULATUS, *Nobis*.

Spotted Wry-mouth.

(PLATE VIII. FIG. 6.)

Cryptacanthodes maculatus, *Spotted Wry-mouth*, STORER, Report, p. 28.

"	"	DEKAY, Report, p. 63, pl. 18, fig. 50.
"	"	LINSLEY, Cat. of Fishes of Conn.
"	"	STORER, Mem. Amer. Acad., New Series, 11. p. 310.
"	"	STORER, Synopsis, p. 58.
"	"	H. R. STORER, Bost. Journ. Nat. Hist., vi. p. 254.

Color. Body a dark reddish-brown tinged with violet. Abdomen and throat a dirty grayish-white. A row or two of moderate-sized dark-brown blotches above the lateral line, and another row immediately beneath it, extend throughout the greater part of its length to the tail. Tip and sides of head, snout, and anterior portion of under side of lower jaw, marked with smaller spots of the same color as those on the sides. Pupils black; irides golden.

Description. Length of head about one sixth the entire length; greatest breadth about one half the length of the head. On each side of top of head, two prominent bony ridges run directly back from posterior angle of eye to occiput. The posterior angles of operculum and preoperculum; the lower edge of preopercle; the scapular bones, — all seem like sharp points and edges concealed by the skin. The operculum is large and triangular, covered by the skin, as is also the preoperculum, which presents to the touch two sensible carinæ. Eyes circular, deeply sunk in the projecting orbits; diameter of orbit about equal to distance between eyes. Nostrils tubular, situated on the side of the prominent snout, just at the edge of the intermaxillary bones. Lips fleshy; lower jaw projecting beyond the upper; mouth slanting obliquely downwards; numerous teeth in jaws and upon the vomer and palatine bones, — those on the back part of the jaws recurved, while those in front are smaller and nearly straight. Gape of mouth moderate. Branchiostegal membrane extended along and connected with the sides for a short distance. Lateral line straight and interrupted.

The dorsal fin arises above the posterior half of the pectorals, and is continued to and united with the caudal; all its rays are spinous and strong, concealed by a stout and fleshy membrane; the first few rays are shortest.

The pectorals arise beneath the membrane of the branchiæ; they are fleshy, small, and rounded.

The anal arises upon the anterior half of body ; it is similar in its form and the character of its rays and their enveloping membrane to the dorsal, and is also, like that fin, connected with the caudal.

The caudal is rounded, and appears like the prolongation of the dorsal and anal fins.

D. 78. P. 15. A. 50. C. 15. Length three feet.

Remarks. This is a very rare species. I have known of only seven individuals being taken. One of these Mr. Jonathan Johnson, Jr. sent me from Nahant ; one was found by Dr. Henry Bryant of this city, at Commercial Point, Dorchester ; one I received from Captain Atwood of Provincetown ; three of the remainder were said to have been taken in Massachusetts Bay ; and the last was found by Horatio R. Storer on a beach in Nova Scotia. The finest specimen, taken by Captain Atwood, has served for the above description.

GENUS VIII. HEMITRIPTERUS, CUV.

The head depressed ; two dorsals, as in *Cottus* ; no regular scales on the skin, but teeth in the palates. The head is bristly and spinous, and has several cutaneous appendages. The first dorsal is deeply emarginate, a circumstance which has led some authors to believe there were three dorsal fins.

HEMITRIPTERUS ACADIANUS, *Storer.*

The Deep-water Sculpin.

(PLATE VII. FIG. 4.)

Cottus Acadianus, *Acadian Bull-head*, PENN., Arc. Zoöl., II. p. 118.

Scorpena flava, *Yellow Scorpena*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 382, pl. 2, fig. 8.

Scorpena purpurea et *S. rufa*, MITCHILL, Amer. Month. Mag., II. p. 245.

L'Hemitriptère de l'Amérique, *Hemitripterus Americanus*, CUV. et VAL., IV. p. 268, pl. 84.

Hemitripterus Americanus, RICH., Fauna Boreal. Americ., III. p. 50.

" " Règne Animal, ed. VAL., pl. 22, fig. 1.

" " GRIFFITH'S CUV., X. p. 141, pl. 53, fig. 3.

" " *Sea-Raven*, *Deep-water Sculpin*, STORER, Report, p. 23.

" " *American Sea-Raven*, DEKAY, Report, p. 56, pl. 6, fig. 16.

" " LINSLEY, Cat. of Fishes of Conn.

" " STORER, Mem. Amer. Acad., New Series, II. p. 310.

" " STORER, Synopsis, p. 58.

Color. Varies exceedingly. Some specimens are of a deep blood-red ; others of a pinkish-purple ; while others still are of a yellowish-brown, darker on the back ; each, however, variegated on the head, sides, and fins with irregularly defined markings. Abdomen yellow. A large female, weighing five pounds and measuring twenty-six

inches in length, had the whole upper part of the body of a dark brown, elegantly variegated with white and dark-brown markings; this appearance most striking upon the head, about the eyes, and along the upper jaw; it is also observable beneath the chin and lower jaw. The branchial rays, as also the rays of the dorsal, pectoral, and caudal fins, marked with transverse white lines, and the intervening membranes very minutely dotted with black. Abdomen white. In still another specimen of a reddish-brown color, transverse broad bands of sub-quadrangular form were noticeable upon the back; one of these occupied the space between the first and fifth dorsal rays; a second commenced at the seventh ray, and was continued to the fourteenth; a third, between the fifteenth and sixteenth rays; a fourth, between the eighteenth and twenty-second; and a fifth, from the twenty-sixth to the twenty-eighth; in the intervening spaces was a whitish marking beautifully edged with black. The orbits of the eyes were marked with white vertical lines. Pupils black; irides yellowish-brown.

Description. Body oblong, cylindrical. Surface granulated, and studded with innumerable tubercles, which are quite large upon the back, and very small or almost entirely disappearing beneath the lateral line. Head large, spinous, hideous in appearance. The length of the head, measuring to the posterior extremity of the operculum, is about one fourth the entire length; width of head across opercula equal to its length. Twelve more or less prominent, blunted, spinous tubercles on each side of the median line of the head; the sharpest-pointed, which in some instances is naked, is just back of the nostril; the largest are at the posterior angles of the eyes, and just in front of the dorsal fin. From several of these prominences, such as those at the anterior and posterior angles of the eyes and about the snout, are suspended fleshy digitated cirrhi; those hanging over the eyes appear like a broad fringe. Orbital cavity large. Eyes moderate in size; the distance between the posterior superior angles of the eyes rather less than one fourth the length of the head; space between them deeply depressed. The suborbital bone presents an irregularly elevated ridge. The preoperculum at its posterior angle is armed with two strong spines; the upper curves upwards and backwards; the inferior is directed backwards and downwards. The operculum is small, triangular, with an elevated longitudinal ridge at its superior part. The jaws are of equal length; from the edge of the lower jaw are suspended about a dozen fleshy prolongations, similar to those attached to the prominences upon the head, but considerably larger. Mouth very large. The teeth in the jaws, pharynx, upon the vomer and palatine bones, numerous, sharp, and recurved like those of a card. The lateral line, which is tubercular, commences just above the posterior angle of the operculum, and, curving with the body, terminates at the base of the caudal rays.

The first dorsal fin arises just back of the posterior spines of the head. The first three rays of this fin are longest; the seventh, eighth, ninth, and tenth rays are next in length; from the extremities of the rays are suspended delicate tentacula.

Just back of the first dorsal arises the second, appearing as if connected with it; and hence described by Mitchill as *one* fin. It is of a somewhat quadrangular form, rounded above when expanded, and having the extremities of the rays projecting beyond the connecting membrane. Height of the fin one third of its length.

The pectorals are very large; when expanded resembling a wing. The rays are uncommonly distinct; the eight anterior are stout and unequal in their length, the anterior one being much the shorter; the ten posterior are rounded posteriorly when expanded; the four anterior of these latter, the larger. These fins arise from the entire lower edge of the branchial aperture; their height to their length is as four to two and a half.

The ventrals arise just back of the first rays of the pectorals. They are composed of three rays, the first of which is shorter and much stouter than the second. In some specimens, however, the first ray is the longest of the three.

The anal commences and terminates on the same plane with the second dorsal. The first nine rays of this fin are deeply divided at their extremities. This is much more marked in some specimens than in others. The length is to the height as three and a half to one and a half.

The length of the caudal is two thirds of its height.

The fin rays are as follows: — D. 16–13. P. 18. V. 3. A. 15. C. 12½. Length two feet.

Remarks. This species is frequently taken by the cod-fishermen in deep water in the neighborhood of ledges in Massachusetts Bay.

Nova Scotia and Gulf of St. Lawrence, CUVIER, RICHARDSON. Maine, Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

Inasmuch as authors generally suppose this to be the *Acadianus* of Pennant, I am compelled to assume his specific name. It is to be regretted, however, that his description should have been so meagre; and that, while he described well enough the dorsal fins, he should have utterly neglected mentioning the characteristic cirrhi of the head; this can only be accounted for upon the supposition that he never saw a recent specimen.

GENUS IX. SEBASTES, Cuv.

Body oblong, compressed, covered with scales; all the upper parts of the head also covered with scales. Eyes large; preoperculum and operculum ending in three or more spines; branchiostegous rays, seven; teeth small, numerous, equal in size, placed on both jaws, the vomer, and palatine bones; a single dorsal fin, partly spinous, partly flexible; inferior rays of the pectoral fin simple.

SEBASTES NORVEGICUS, Cuv.

The Norway Haddock.

(PLATE VII. FIG. 1.)

Perca Norvegica, FAB., Fauna Groenl., p. 167.*Perca marina*, Sea-Perch, PENN., Brit. Zool., p. 226.*Serranus Norvegicus*, FLEM., Brit. An., p. 212, sp. 140.*Scorpena Norvegica*, Northern *Sebastes*, JEN., Brit. Vert., p. 347.*Sebastes Norvegicus*, GRIFFITH'S CUV., x. p. 144.*La Sébaste septentrionale*, *Sebastes Norvegicus*, CUV. et VAL., IV. p. 327, pl. 87.*Scorpena (Sebastes) Norvegica*, Northern *Sebastes*, RICH., Fauna Boreal. Americ., III. p. 52.*Sebastes Norvegicus*, Bergyll, Norway Haddock, YARRELL, Brit. Fishes (2d edit.), I. p. 87.

" " Norway Haddock, Rose-fish, Hemdurgan Snapper, STORER, Report, p. 26.

" " Northern *Sebastes*, DEKAY, Report, p. 60, pl. 4, fig. 11.

" " STORER, Mem. Amer. Acad., New Series, II. p. 312.

" " STORER, Synopsis, p. 60.

Color. In the recent fish the entire body, together with the fins, is of a beautiful bright red, with the exception of a black blotch upon the posterior portion of the operculum. After death the color partially disappears upon the throat and abdomen, and the space beneath the ventrals becomes nearly white; and at the posterior base of the soft portion of the dorsal a dull blotch is observed. Pupils black; irides yellow.

Description. Body oblong, compressed, covered with small rough scales. Length of the head, from the tip of lower jaws when closed, to the posterior angle of the operculum, about one third the entire length; head flattened above, between the eyes and upon the occiput. The operculum is armed with three spines; one pointing upwards and backwards at its posterior superior angle; a second beneath this, directed obliquely backwards and downwards; and a third, much smaller, at its inferior angle. The preoperculum is rounded at its edge, and furnished with five spinous processes; the three posterior of which are the larger. Two spines upon the scapular bones, and two upon the suborbitals. Four spinous projections upon the supra-orbitals, all of which are pointed backwards; one at the upper anterior angle of the eye; a second with its base continued along the greater portion of the ridge; and two smaller ones behind.

Two elevated sharp ridges upon the occiput, which bifurcate posteriorly into spinous points. Eyes circular, very large; the diameter of the orbit nearly equal to one third the length of the head, when the jaws are closed; the distance between the eyes equal to five eighths the diameter of the eye. The nostrils are just in front of the eyes; the posterior is much the larger. The jaws, pharynx, vomer, and palatine bones are armed with numerous minute, sharp teeth; the upper jaw is very protractile, and has an emargination at its centre, into which the extremity of the lower jaw shuts, when the mouth is closed. The chin is prominent. The lateral line arises above the operculum, and, taking the curve of the body, terminates at the caudal rays; about thirty-six tubes are seen in the course of the line, which are more nearly approximated at the posterior portion of the body.

The dorsal fin commences on a line with the upper opercular spine. Its anterior half is composed of spinous rays; the length of its highest rays is equal to about one third the length of the fin; the connecting membrane does not extend to the summit of the rays, and they are thus left naked and projecting. The posterior half of this fin is composed of membranous rays which are higher than the spinous ones; the length of this portion, which is rounded above and posteriorly, is less than one half the length of the spinous portion.

The pectorals commence on a line with the third dorsal ray; they are rounded when expanded. The rays project beyond the connecting membrane; the length of these fins is equal to one third their height; the middle rays are the longest.

The ventrals are fan-shaped, and situated just back of the pectorals; their first ray is a strong spine; the second membranous ray is the longest.

The anal has three strong spines; the posterior the longest. The first membranous ray is equal to the length of the fin.

The caudal is slightly emarginated at its tip; its length less than one third its height.

The fin rays are as follows:—D. 15–15. P. 18. V. 1–5. A. 3–7. C. 19. Length one foot.

In the specimens I have seen, the preopercular and opercular spines are much more developed than they appear in Cuvier's figure of this species. Yarrell's and Dekay's figures are copies from that of Cuvier.

Remarks. This species is known to our fishermen by the names of "Rose-fish," "Hemdurgan," and "Snapper." It is not common in Massachusetts Bay; it is occasionally taken during the winter, and rarely in the summer, while fishing for cod, near shoal ledges contiguous to deep water. It is not a marketable fish with us, although

it is freely eaten by the Norwegians. Captain Atwood informs me that he never saw a specimen of this fish on the southern shore of Massachusetts Bay. The fishermen have an erroneous opinion that the spines of this species are very poisonous. It weighs from one to five pounds.

Greenland, FABRICIUS. Gulf of St. Lawrence, RICHARDSON. Maine, WOOD. Massachusetts, STORER. New York, DEKAY.

GENUS X. GASTEROSTEUS, Cuv.

Body without scales, more or less plated on the sides; one dorsal fin with free spines. Ventral fin with one strong spine, and no other rays; bones of the pelvis forming a shield, pointed behind; branchiostegous rays three.

GASTEROSTEUS BIACULEATUS, *Mitchill*.

The Two-spined Stickleback.

(PLATE VIII. FIG. 2, 3.)

Gasterosteus biaculeatus, *Two-spined Stickleback*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 430, pl. 1, fig. 10.

"	"	"	"	DEKAY, Report, p. 65, pl. 3, fig. 8.
"	"	"	"	STORER, Mem. of Amer. Acad., New Series, II. p. 314.
"	"	"	"	STORER, Synopsis, p. 62.
"	"	"	"	H. R. STORER, Bost. Journ. Nat. Hist., VI. p. 260.

Color. The living fish is of an olive-green color above, lighter upon the sides, silvery beneath. Gill-covers silvery, spotted with fuliginous. Pupils black; irides silvery. Fins colorless; in the dead specimens yellowish.

Description. Body oblong, compressed, becoming abruptly very slender at the base of the tail. On each side of the body are about thirty transverse horny plates, the posterior of which are the narrower; these plates are indistinctly striated. The lateral line is situated high up on the back; it takes the curve of the body, and is lost in the carina on the side of the tail. The head is less than one fourth the length of the body; above it is bony and granulated, as in the *Prionoti*, and flattened. The mouth is protractile. The jaws are equal, and furnished with numerous minute teeth. The eyes are large and circular. The nostrils are large, and situated about half way between the eye and the snout. The opercula are covered with radiating striæ, as in the *Syngnathi*. A broad silvery plate bounds the branchial orifice posteriorly. On each side of the base of the tail is a distinct membranous carina. There are two distinct spines of about equal size situated upon the dorsum anterior to the dorsal fin; these spines are broad at their base, strongly serrated on their sides, very acute at their extremity,

slightly recurved, and capable of being elevated or depressed at the will of the fish ; the anterior of these is situated over the silvery plate back of the branchial orifice ; the posterior is above the middle of the pectorals. Just anterior to the origin of the dorsal fin, and almost connected with it, is another very minute spine, which is naked throughout the greater portion of its extent.

The dorsal fin is longer than high ; its posterior rays are very short.

The pectorals are elongated, broad, and fan-shaped when expanded. In front of the pectorals two prominent, acute, serrated spines, with a bony process at their external base, are observed in place of the ventrals. Between these spines is situated a bony plate formed like the head of a lance, granulated upon its surface, serrated at its edges, with a central carina. (Plate VIII. Fig. 3.)

The anal commences posterior to the dorsal, and terminates on a line with that fin. Like the dorsal, it is preceded by an exceedingly minute spine.

The caudal is scarcely emarginated.

The fin rays are as follows : — D. 2 – 1 – 11. P. 10. V. 1. A. 1 – 6. C. 12. Length two inches to two and a half.

Remarks. Specimens of this species were brought me by my son, Horatio R. Storer, from small pools of water left at low tide on the rocks at Nahant, and also from the marshes at Brookline. Captain Atwood has likewise sent me individuals from Provincetown.

Massachusetts, STORER. New York, MITCHILL, DEKAY. Nova Scotia, H. R. STORER. New Brunswick, PERLEY.

This species may perhaps have been the one referred to by Forster and Pennant ; but it does not seem to be the Northern Two-spined Stickleback, which has been lately described by Girard from specimens brought from Labrador by my son, under the name of *G. Cuvieri*.

GASTEROSTEUS QUADRACUS, *Mitchill*.

The Four-spined Stickleback.

(PLATE VIII. FIG. 4.)

Gasterosteus quadracus, *Four-spined Stickleback*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 430, pl. 1, fig. 11.

L'Épinoche à quatre aiguilles (*Gasterosteus quadracus*, MITCH.), CUV. et VAL., IV. p. 504.

L'Épinoche à bassin fendu (*Gasterosteus apelles*, CUV.), CUV. et VAL., IV. p. 505.

Gasterosteus apelles, *Bloody Stickleback*, STORER, Report, p. 31.

Gasterosteus quadracus, *Four-spined Stickleback*, DEKAY, Report, p. 67, pl. 6, fig. 18.

“ “ “ “ STORER, Mem. Amer. Acad., New Series, II. p. 315.

“ “ “ “ STORER, Synopsis, p. 63.

Color. When alive, greenish-brown above the lateral line ; beneath this line, which is very perceptible, the color is darker, and is broken irregularly by the extension of the whiteness of the abdomen. In young specimens the color is distributed in four or five transverse bands, which are indistinct in the mature fish. The membranous portion attached to the posterior inferior part of the ventral spine is of a bright scarlet color, which causes this part to appear as if covered with blood, when the fish is suddenly darting through the water, with the spine projecting.

Description. Body slightly convex in front of the first dorsal spine. Length of the head equal to nearly one fifth the length of the body. Three or four movable spines are situated in front of the dorsal fin, with a membrane at their base. Directly before the dorsal fin, and connected with it by a membrane at its base, is a fifth spine, which is equal to about two thirds the height of the rays of this fin. Commencing at the base of the first spine, and terminating at the spine of the dorsal fin, is situated a groove, into which the larger spines are received when recumbent. The first and second spines are each equal in length to one third of the head ; when erect, one or more of these spines frequently project outward from the straight line ; the others are shorter ; the fourth, when there are five, is the shortest.

The rays of the pectorals are very delicate.

The ventral spine is serrated on its anterior edge.

The os innominatum extends, on each side, almost to the anus. At the origin of the anal fin is situated a recurved spine, rather larger than that at the origin of the dorsal fin.

The first rays of the anal fin are the highest. This fin terminates opposite the dorsal fin.

The caudal fin is slightly rounded, when expanded.

The fin rays are as follows : — D. 3 or 4, 1–12. P. 11. V. 1. A. 10. C. 13. Length one to two inches.

Remarks. This species, which Mitchill concisely described and badly figured in his paper on the Fishes of New York, is found in large numbers in creeks to which the sea has access, from Boston to Provincetown, and also in the mouths of rivers.

Massachusetts, STORER. New York, MITCHILL, CUVIER, DEKAY.

In this species, as in others of the genus, the number of dorsal spines varies. Cuvier's *Noveboracensis* is probably a variety with three spines, and my son has taken specimens with five spines in salt marshes at Cambridge.

GASTEROSTEUS DEKAYI, *Agassiz*.*The Many-spined Stickleback.*

(PLATE VIII. FIG. 5.)

Gasterosteus pungitius, *Ten-spined Stickleback*, STORER, Report, p. 32.*Gasterosteus occidentalis*, *Many-spined Stickleback*, DEKAY, Report, p. 68, pl. 42, fig. 135.

" " " " STORER, Mem. Amer. Acad., New Series, II. p. 315.

" " " " STORER, Synopsis, p. 63.

Gasterosteus Dekayi, AGASSIZ, Lake Superior, p. 311.

Color. When alive, this fish is of a grayish-yellow color, with from six to ten transverse dark bands upon its sides, which are very distinct in some specimens, while in others they are scarcely visible. In the same individual, these bands are much more apparent at some moments than at others, as the fish is excited by fear or other causes. The opercula and abdomen are silvery. Pupils black; irides metallic. After death the color of the fish is much lighter, and the bands, in a great measure, disappear.

Description. Body much elongated. Greatest depth of the fish rather more than one eighth of its length. Length of the head one fifth the length of the entire fish. The mouth opens obliquely downwards; the jaws are armed with great numbers of minute teeth. The eyes are circular; the diameter of the eye is equal to about one quarter the length of the head. The lateral line commences at the posterior superior angle of the operculum, and pursues a slightly declining course to a line over the anus, from which it passes in a straight line to the tail. A strongly marked carina upon each side of the tail, which is crossed by twelve or more plates.

Upon the dorsum are situated from eight to ten incurved spines, inclining to the right and left. The first of these spines arises on a line midway between the opercula and pectoral fin.

The dorsal fin arises on a line directly above the anal spine, and gradually diminishes in height, until its rays are scarcely perceptible.

The ventral spines are stout, sharp, somewhat incurved, serrated upon their upper edge, with a membrane at their base. A bony plate is situated between the ventral spines, which terminates posteriorly in a point.

The anal fin is similar in its form to the dorsal; its spine is recurved.

The caudal fin is rounded.

The fin rays are as follows: — D. 8 or 9 or 10. 1–7. P. 11. V. 1. A. 1–9. C. 13. Length one to two inches.

Remarks. This pretty species, which is less common than the *quadracus*, is found

in the salt marshes along the sea-coast in company with that species and the different killifish.

Agassiz considers this species distinct from the *occidentalis* of Cuvier, and has accordingly named it for Dekay, who had previously expressed doubts of its identity.

Maine, H. R. STORER. Massachusetts, STORER. New York, DEKAY.

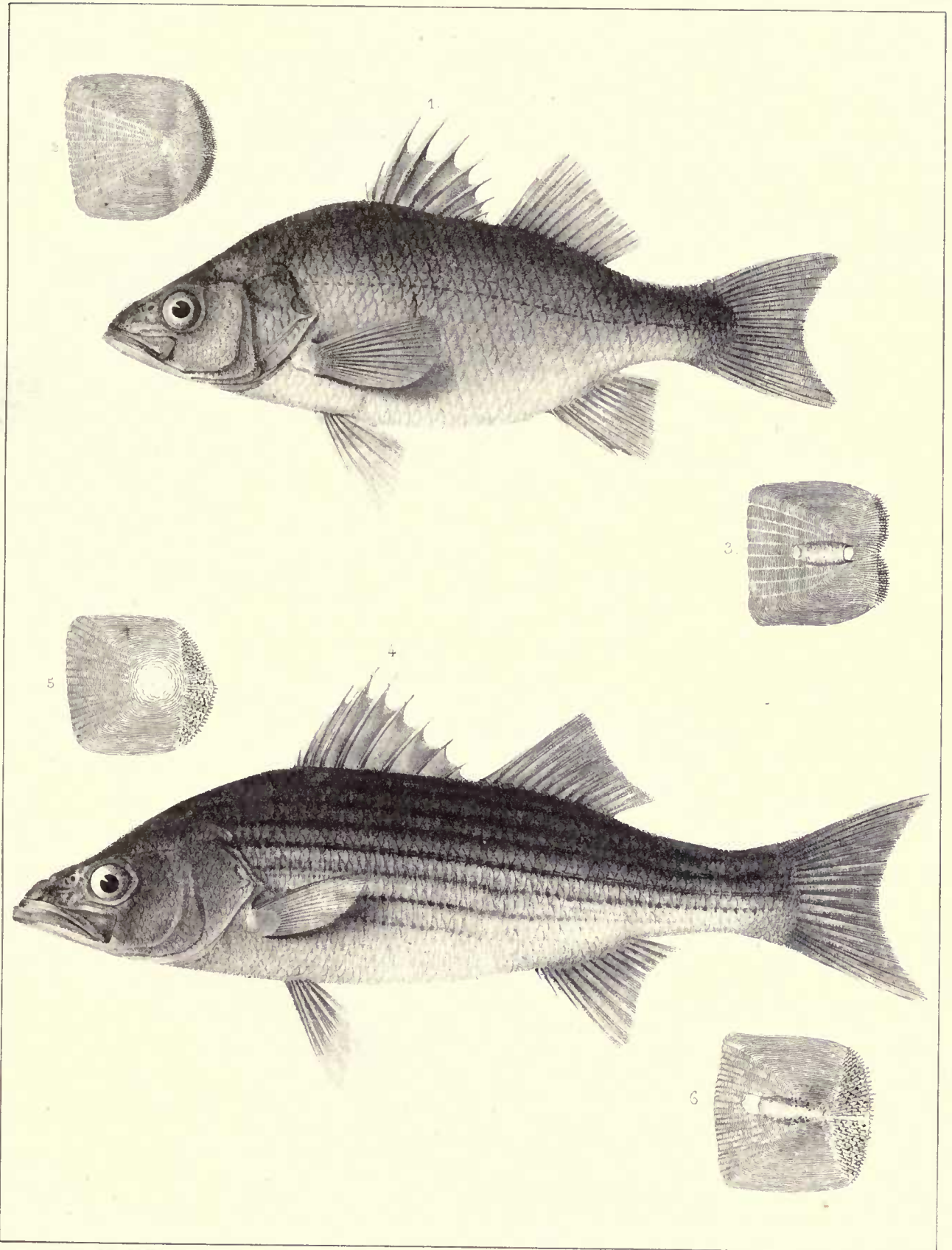
FAMILY III. SCIÆNIDÆ.

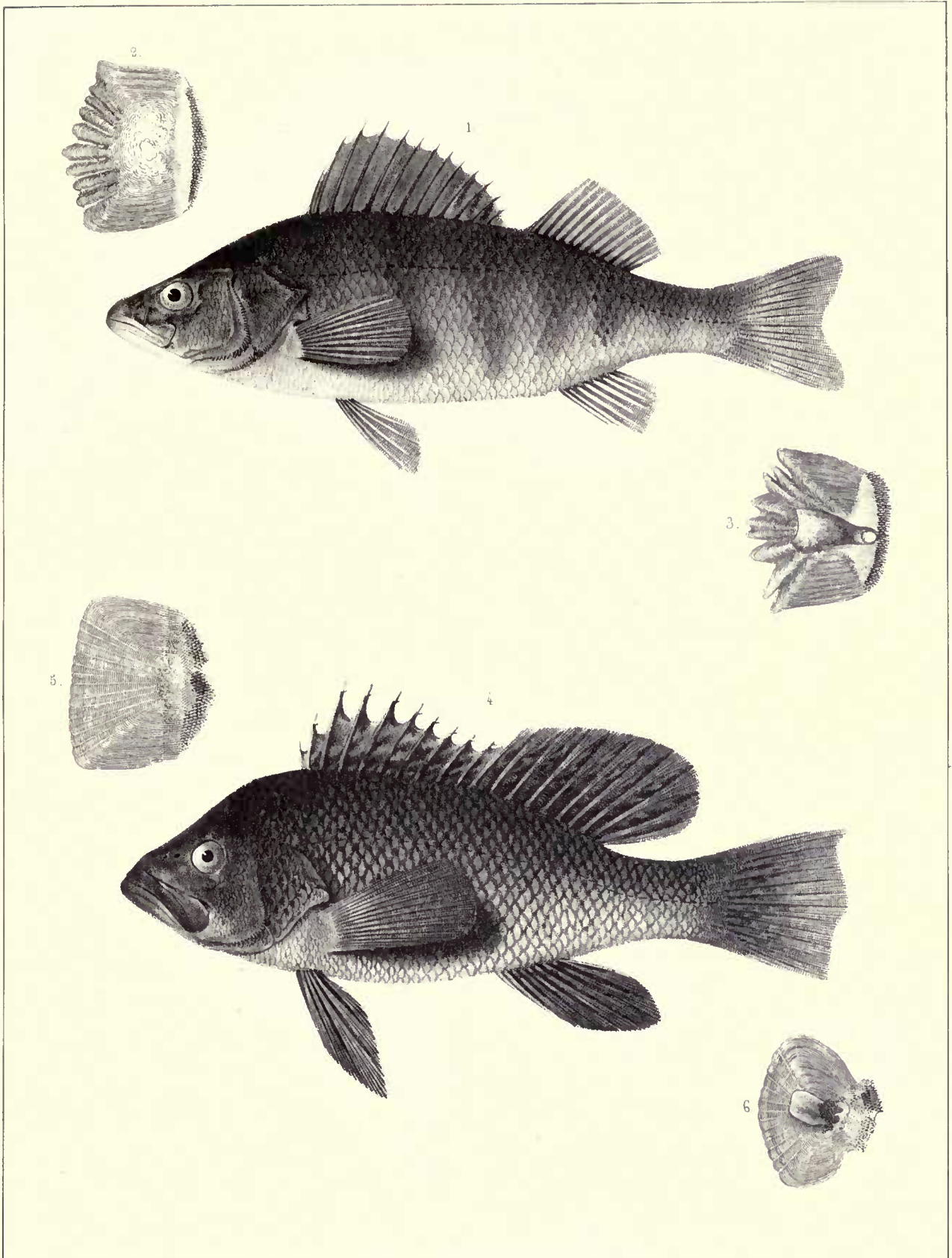
This family is very similar to that of the Percoids, and presents nearly all the same combinations of exterior characters, especially the denticulations of the preoperculum, and the spines of the operculum; but it has no teeth, either on the vomer or palatines; in general, the bones of the cranium and face are cavernous, and form a snout more or less rounded. It often occurs in this family that the vertical fins are rather scaly. Some of the genera have two dorsals, others but one.

GENUS I. OTOLITHUS, Cuv.

The bones of the anal fin are weak, and there are no barbels; some of the teeth terminate in elongated hooks, or are of the canine form. Their natatory bladder has a horn on each side, projecting forwards.

(To be Continued.)



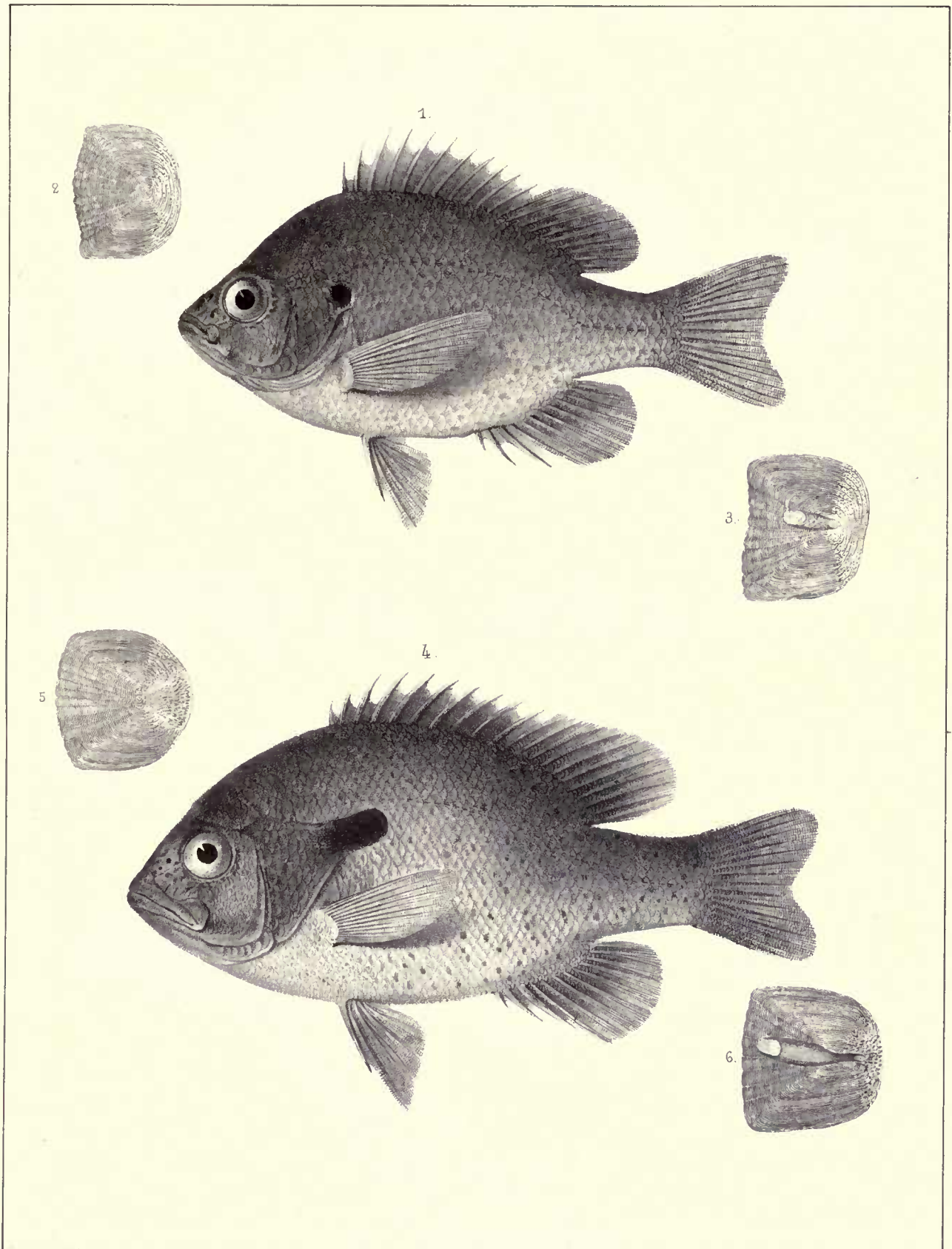


Tappan & Bradford's lithy

A. S. S. on stone

1-3. PERCA FLAVESCENS Cuv.

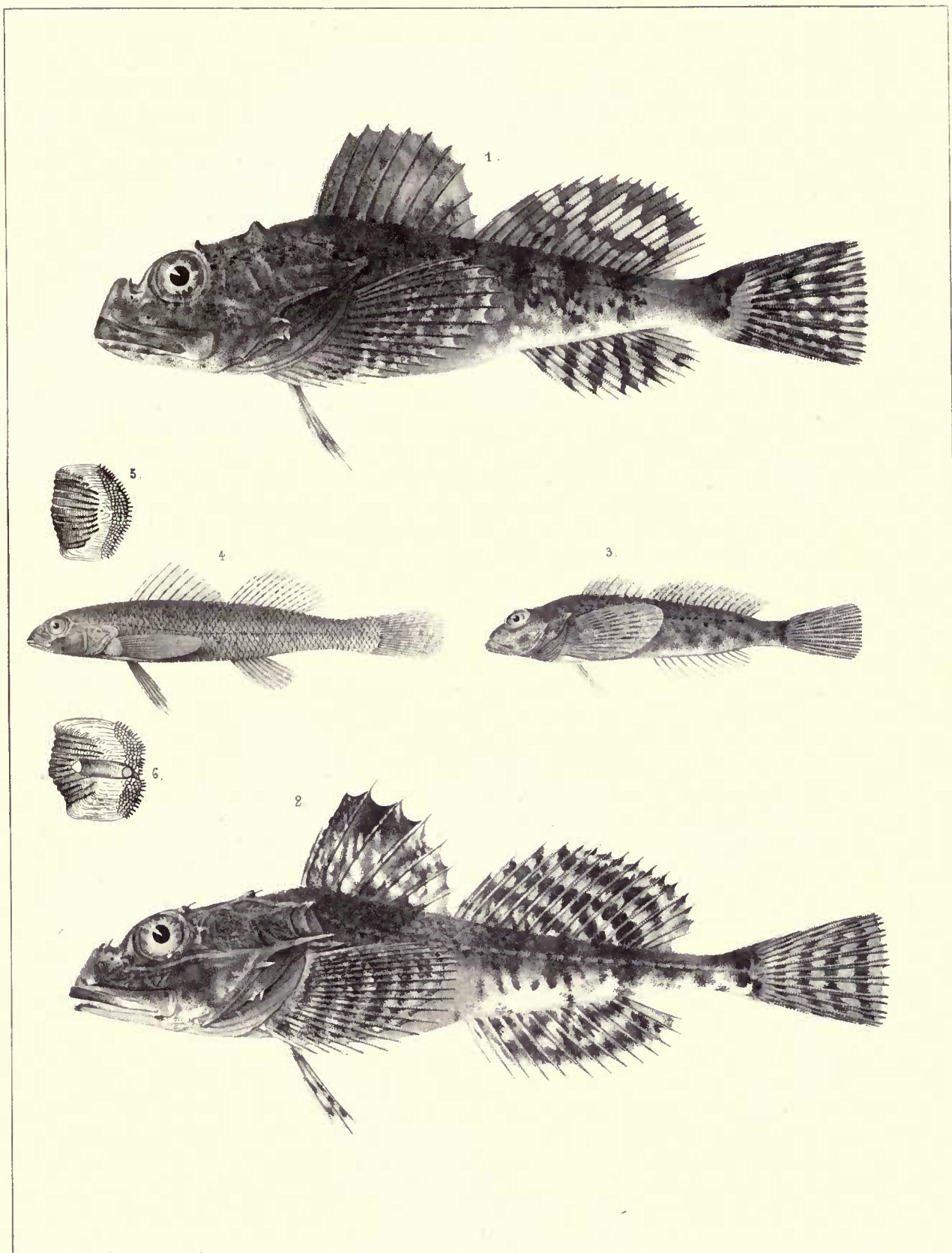
4-6. CENTROPRISTES VARIUS Storer.



Tappan & Bradford's lith.

A. Sonnet on stone

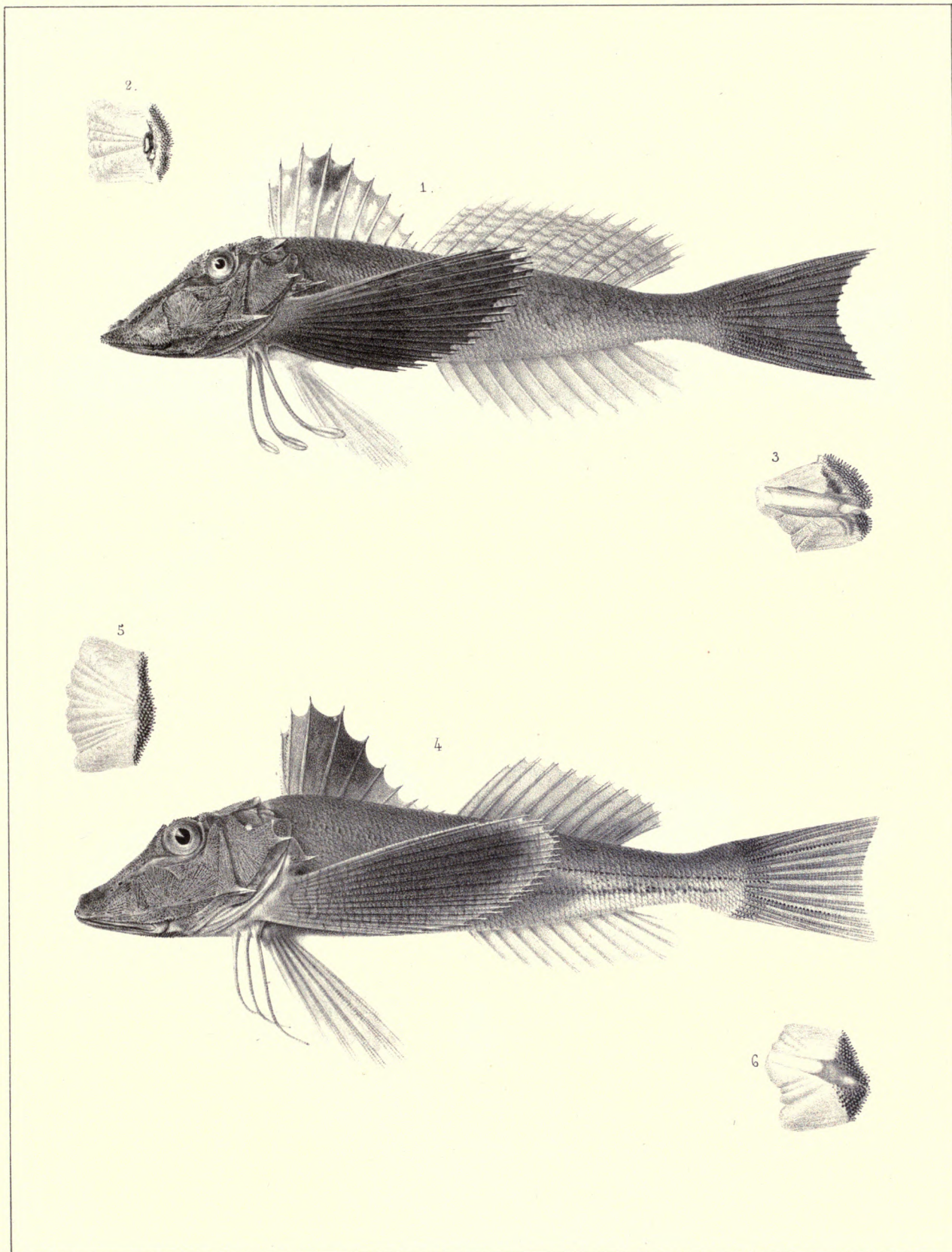
1-3. POMOTIS VULGARIS Cuv - 4-6. POMOTIS APPENDIX Dekay.



A. Sonrel.

Printed by Tappan & Bradford.

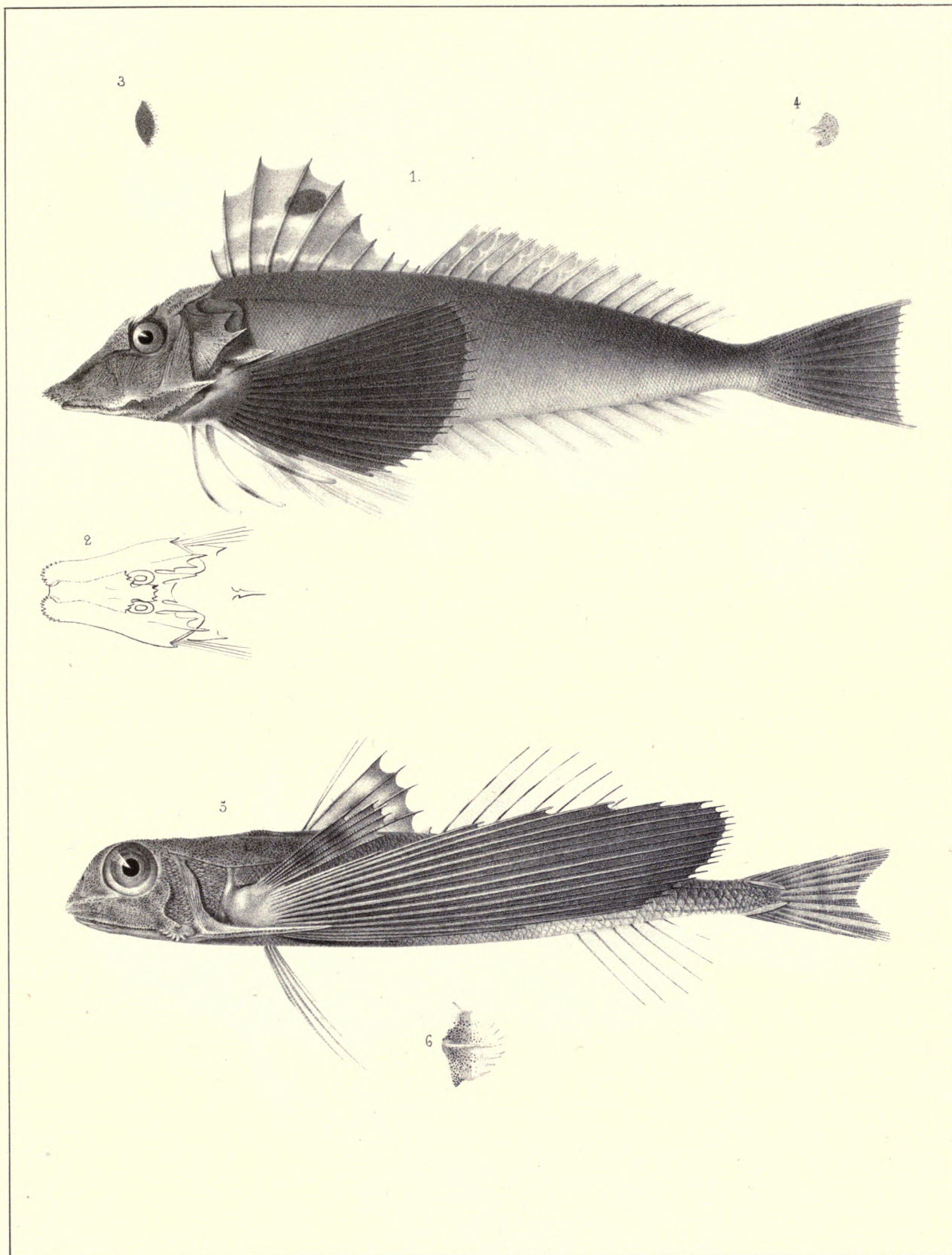
1. ACANTHOCOTTUS VARIABILIS Girard. — 2. A. VIRGINIANUS Girard.
 3. COTTUS GRACILIS Heckel. — 4-6. BOLEOSOMA OLMSTEDI Ag.



A. Sonrel.

Printed by Tappan et Bradford.

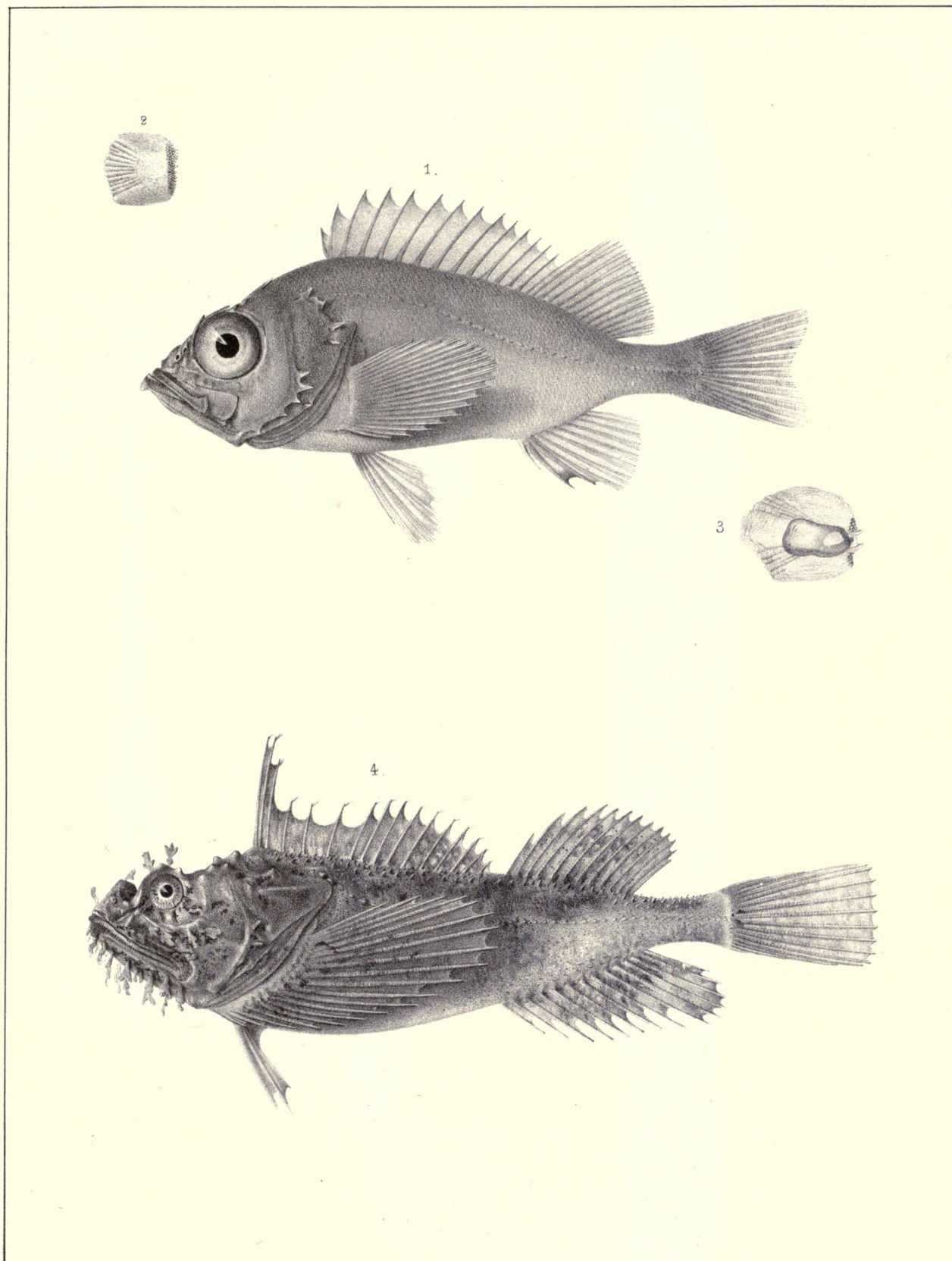
1-3. PRIONOTUS PALMIPES Storer. - 4-6. PRIONOTUS LINEATUS Dekay.



W.H. Tappan & A. Sonrel from nat.

Printed by Tappan & Bradford.

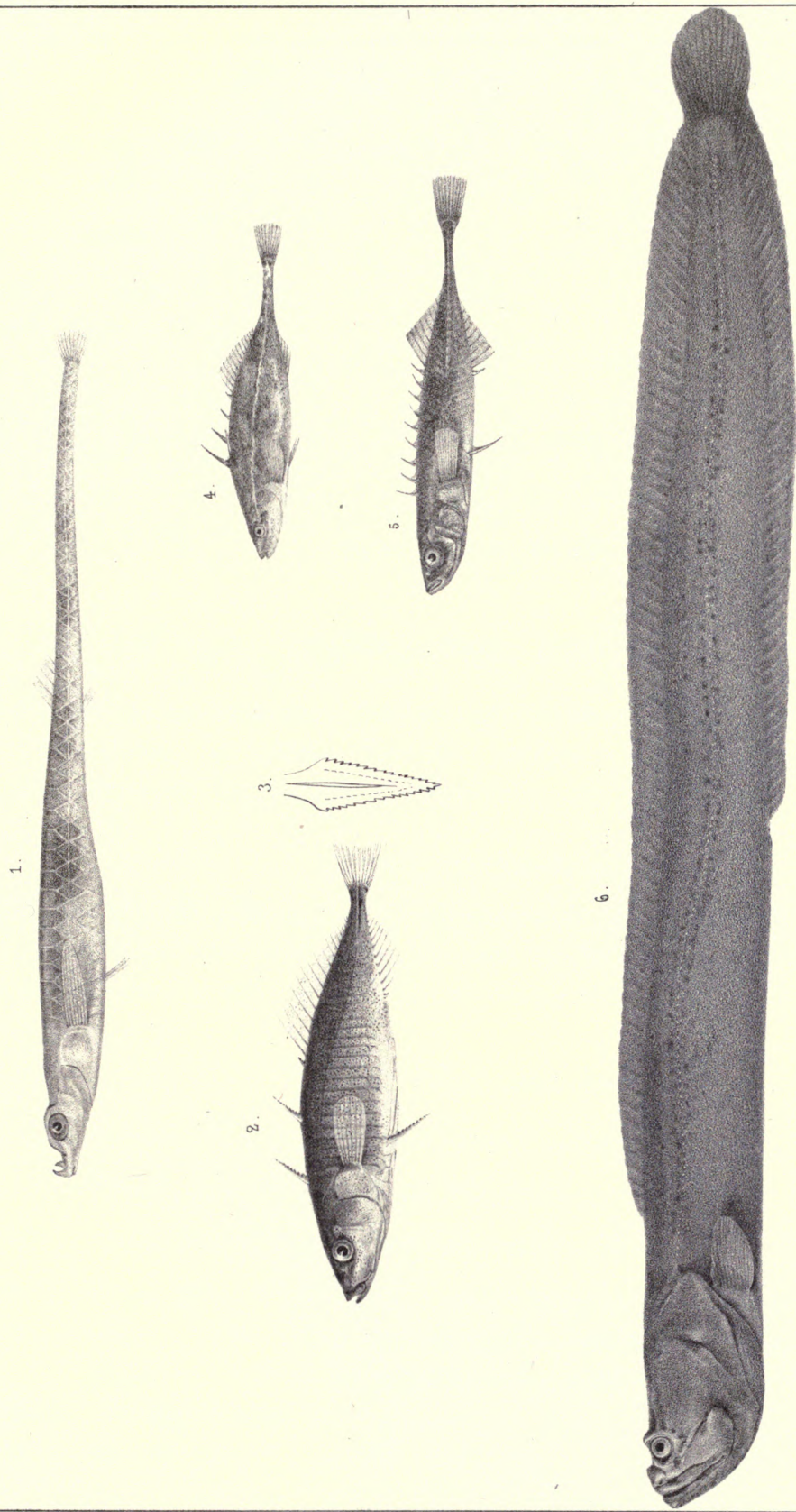
1-4. PRIONOTUS PILATUS Storer.— 5,6. DACTYLOPTERUS VOLITANS Cuv.



A. Sorel from nat.

Printed by Tappan & Bradford.

1-3. *SEBASTES NORVEGICUS* Cuv. — 4. *HEMITRIPTERUS ACADIANUS* Storer.



W. H. Tappan & A. Sorel from nat.

Printed by Tappan & Bradford.

1. ASPIDOPHORUS MONOPTERYGIUS Cuv. ~ 23. GASTEROSTEUS BIACULEATUS Mitch. ~ 4. G. QUADRACUS Mitch.

5. G. DEKAYI Ag. ~ 6. CRYPTACANTHODES MACULATUS Storer.

XII.

A History of the Fishes of Massachusetts.

By DAVID HUMPHREYS STORER, M. D., A. A. S.

(Continued from page 168.)

FAMILY VIII. GOBIDÆ.

Body more or less elongated. Scales small or entirely wanting. The spines of the dorsal fin slender and flexible. Branchial aperture small. Ventrals, when present, placed in advance of the pectorals. Many viviparous.

GENUS I. BLENNIUS, Cuv.

Head rounded and blunt; body smooth, unctuous, compressed; a single elongated dorsal fin; ventral fins placed before the pectorals, and containing generally but two rays, united at their base; teeth slender, in a single row.

BLENNIUS SERPENTINUS, Storer.

The Snake-shaped Blenny.

(PLATE XVII. FIG. 1.)

Blennius serpentinus, STORER, Proceedings of Bost. Soc. Nat. Hist., III. p. 30, April, 1848.

Color. Upper part and sides, of a yellowish-brown, with intervening colorless spaces. Abdomen white. The dorsal fins are brownish, with broad, oblique, white bands. Pectorals white, the outer ray brownish. Anal and caudal white with a tinge of yellow. Ventrals white.

Description. Body very much elongated and compressed. Length of head about one tenth the length of the body; convex upon its posterior portion; blunted anteriorly; compressed upon sides. Gape of mouth moderate; upper jaw the longer; a single row of minute teeth in each jaw. Lips fleshy. Nostrils tubular, directly in front of eye. Greatest depth of body about one twentieth its length. Eyes obliquely oblong; their longest diameter equal to one sixth the length of the head.

The first dorsal fin commences on a line above the pectorals, and is continued to the second dorsal, to which it is connected by a membrane, and terminates anterior to the middle of the fish. Its anterior three spines are the shortest. Posterior to the fifth ray, the fin is of a uniform height throughout, with the exception of the two last rays, which are shorter.

The second dorsal, which is of nearly a uniform height throughout, terminates at the fleshy portion of the tail.

The pectorals, when closed, are lanceolate; rounded when expanded. The rays are branched and free at their tips.

The ventrals are situated beneath and in front of the pectorals. The inner ray the longer.

The anal commences on the anterior third of the body, and terminates on a line with the second dorsal.

The caudal is rounded.

The fin rays are as follows: — D. 37 – 50. P. 13. V. 2. A. 66. C. 22.

Length of specimen, sixteen inches.

Remarks. The preceding description is drawn up from the only specimen of this fish that I have ever seen. It was brought me by Captain Nathaniel E. Atwood, who took it from the stomach of a cod-fish in Massachusetts Bay, early in April, 1848.

GENUS II. PHOLIS, FLEMING.

Neither cirrhi nor fleshy crests upon the orbits.

PHOLIS SUBBIFURCATUS, *Storer*.

The Radiated Shanny.

Pholis subbifurcatus, *Subbifurcated Pholis*, STORER, Report, p. 63.

" " *Radiated Shanny*, DEKAY, Report, p. 150.

" " STORER, Mem. Amer. Acad., New Series, II, p. 370.

" " " Synopsis, p. 118.

Color. General color of the body, reddish-brown; several lighter-colored circular

patches along its upper part, at the base of the dorsal fin; the spaces between the rings darker than the rest of the body, presenting the appearance of bars. From beneath the eye a broad black band, wider at its base, crosses the operculum obliquely; two other bands of the same color extend from behind the eye backwards, in nearly a straight line, the distance of from one to two lines. Body beneath the lateral line lighter colored; abdomen yellowish-white. Head above, brownish; opercula and preopercula yellow. Numerous black spots upon dorsal fin. Those upon the five first rays larger. Pectorals light, with some darker shades. Edge of anal dark-colored. Small dark-colored spots upon caudal.

Description. Length, including tail, five inches five lines; depth across on a line with the anus, one inch; body much compressed. Body smooth, scales very minute. Length of head, from tip of snout to posterior angle of the operculum, is to the entire length of body, as one to three; entire surface destitute of scales; jaws somewhat protractile, armed with prominent sharp teeth; lips large and fleshy; over nostrils a minute filament one third of a line in length; circumference of eye two lines.

The lateral line commences just above the angle of the operculum, and having extended two lines, subbifurcates; passing down in a gradual curve a little more than a line, it is continued in a straight course to the base of the caudal fin; while the upper portion abruptly terminates opposite the fourteenth ray of the dorsal fin.

The dorsal fin, commencing on a line with the posterior angle of the operculum, is continued to the caudal fin; the first five rays of this fin are shorter than the sixth; the rays become again shorter as they approach the tail.

The pectorals are rounded; they arise on a line with the posterior angle of the operculum.

The ventrals are situated two lines in front of the pectorals; the rays are united throughout the greater portion of their extent; extremities free. The anus is situated two and a half inches from the extremity of the jaws.

The anal fin commences just half-way between the tip of the snout and the extremity of the tail.

The caudal fin is rounded.

The number of fin rays are as follows: — D. 43. P. 13. V. 3. A. 30. C. 14.

Remarks. I have seen but a single specimen of this fish; it was found at an unusually low tide among the sea-weed at Nahant, in 1838, and brought to me by my brother-in-law, Thomas M. Brewer, M. D. It was placed in the collection of the Boston Society of Natural History, and has been destroyed, compelling me to introduce here my former description, and preventing me from giving a figure.

GENUS III. GUNNELLUS, FLEMING.

Body elongated, much compressed. Head oblong. Mouth small. Teeth velvet-like, or in cards. Dorsal rays spinous throughout. Ventrals excessively small, and reduced often to a single spine.

GUNNELLUS MUCRONATUS, Cuv.

The Butter-fish.

(PLATE XVII. FIG. 2.)

Ophidium mucronatum, *Spinous Ophidium*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., i. p. 361, pl. 1, fig. 1.

Le Gonnelle épineux, *Gunnellus mucronatus*, CUV., CUV. et VAL., XI. p. 427.

Blennius (Centronotus) gunnellus, LIN., *Spotted Gunnelle*, RICH., Fauna Boreal. Americ., III. p. 91.

Muraenoides guttata, *Spotted Gunnel*, LACEP., STORER, Report, p. 65.

Gunnellus mucronatus, *American Butter-fish*, DEKAY, Report, p. 153, pl. 12, fig. 36.

" " STORER, Mem. Amer. Acad., New Series, II. p. 374.

" " " Synopsis, p. 122.

" " H. R. STORER, Bost. Journ. Nat. Hist., VI. p. 261.

Color. The living fish is of an olive-brown color, with numerous transverse, indistinct, darker bands upon the sides; about twelve black ocelli along the base of the dorsal fin, each surrounded by a yellow ring. Fins yellow; the anal barred with white. Pupils black; irides golden. Abdomen yellowish. An oblique black band passes from beneath the eye to the throat.

Description. Body elongated, compressed, scaleless; and so translucent, that when the fish is held to the light, the vertebral column is distinctly seen. Head about one tenth the length of the body, convex above, blunted anteriorly. Gape of mouth nearly vertical. Jaws equal. Minute sharp teeth upon each jaw, and upon vomer.

The dorsal fin, which is composed of spinous rays entirely concealed, save their points, by the membrane, is but slightly raised above the back, and commences on a line above the posterior angle of the operculum, and is continued nearly to the tail, to which it is attached by a membrane.

The pectorals, which are situated just beneath the posterior angle of the operculum, are small and delicate.

Two small spines, attended each by a delicate filamentous ray, directly in front of the pectorals, take the place of the ventrals.

The anal fin, which is rather higher than the dorsal, commences on the posterior half of the body, and is continued nearly to the tail, to which it is attached by a membrane, as the dorsal. The first two rays are spinous, the remainder flexible.

The caudal is rounded when expanded.

The fin rays are as follows:—D. 75–78. P. 11 or 12. V. 1. A. 2, 36–40. C. 16–18.

Length four to twelve inches.

Remarks. This pretty species is common at Nahant, Provincetown, and Holmes's Hole, and probably along our entire sea-coast. At low tide it is found upon the beaches beneath stones and sand. On account of the mucus with which it is covered it is known as the Butter-fish. From being enveloped in this secretion, it is with difficulty retained in the hand after it is captured. It is frequently found in the stomachs of other fishes. My son has detected it on the shores of Nova Scotia, and thence southward as far as our own waters.

Bay of Fundy (Island of Grand Menan), Nova Scotia, Maine, New Hampshire, H. R. STORER. Massachusetts, STORER. New York, MITCHILL, DEKAY.

GUNNELLUS MACROCEPHALUS, *Girard.*

The Big-headed Gummel.

(PLATE XVII. FIG 3.)

Gunnellus macrocephalus, GIRARD, H. R. STORER, *Fishes of Labrador*, Bost. Journ. Nat. Hist., vi. p. 263.

Color. Marbled, and banded transversely. Base of dorsal with the generic dark spots, in number twelve or more.

Description. Body elongated, compressed, attaining its greatest depth just posterior to opercular angle. Head quite large, abrupt, triangularly prismatic, the base downward, flattened, however, on occiput; its length one eighth that of body, and just equal to greatest depth of body. Cheeks protuberant. Gape of mouth large, obliquely upward, so that lower jaw, projecting when open, does not equal the upper when mouth is closed. Teeth in two rows in front of jaws; the principal row being the inside one on lower jaw, and the outside one on upper jaw. Eyes moderate, their horizontal diameter double the distance between them. Scales moderate, of nearly equal size throughout body; when covered with mucus, giving the appearance of granulation. Lateral line straight, running along middle of body.

The dorsal fin commences above posterior angle of operculum, and is connected to the caudal by a membrane of less height than its own. Its first rays nearly straight, its posterior ones strongly curved. Its height greatest on a line above tips of pectorals. Membrane stoutest posteriorly.

The pectorals are of moderate size, somewhat fan-shaped.

The ventrals are strongly marked, both the spine and filamentary ray, situated anteriorly to pectorals.

The anal commences about on median line, connected with caudal by a low membrane, and is of nearly equal height throughout. First two rays spinous, the anterior the stouter. Its posterior rays longer than corresponding ones of dorsal.

The caudal is quite large, circular when expanded.

Length, eight inches.

The fin rays are as follows: — D. 76. P. 12. V. I. 1. A. II. 41. C. 20.

Remarks. The specimen from which I have drawn the above description was taken alive, in 1848, by Mr. Girard, from a sand-pool on Chelsea Beach at low tide. It is the only specimen of which I have knowledge, and has since been in the possession of Professor Agassiz, from whom I have it. Its specific value was detected by Mr. Girard while comparing the Labrador species of my son, *Gunnellus ingens*, with the *mucronatus* of our own shores. It most nearly resembles the former, of which there is an accurate and beautiful plate in Vol. VI. of the Boston Journal of Natural History, but is clearly distinct from both.

“Its size is nearly that of *G. ingens*, and is consequently much greater than that of the average *G. mucronatus*. It differs from *G. ingens* in having a proportionally larger head, whence a larger mouth and larger teeth. These last are longer than those of *G. ingens*; their tip is club-shaped in both. Profile of head very convex above eyes, whereas in *G. ingens* the convexity of the head is in advance of the eyes, thus giving to it a more rounded appearance. Body more compressed than that of *G. ingens*; height also greater. Lateral line straighter than in that species. The vent, placed under the thirty-fifth dorsal ray, is at an equal distance from the snout and the tip of the caudal, whilst it is a little farther back in *G. ingens*, and rather nearer the head in *G. mucronatus*.

“The dorsal and anal are much higher than in either *G. ingens* or *mucronatus*. The dorsal begins a little farther back than in *G. ingens*. The pectorals are larger; their tip reaching beyond a line with the seventh dorsal spine.

“The rays of the anal show the remarkable peculiarity of having at their anterior and convex margin several small rays converging in an acute angle from the tip to the third or half of the length of the principal ray itself, in imitation on a small scale of the finlets of Scomber and Polypterus, with this difference, however, that in these last the additional small rays are on the posterior margin. In *G. ingens* these rays are dichotomized; in *G. mucronatus* they are simple.”

The ventrals also are larger and placed more anteriorly than in the *G. ingens*.

Massachusetts, GIRARD.

GENUS IV. ZOARCES, Cuv.

Body elongated, and covered with a mucous secretion, in which are imbedded very small scales. Dorsal, anal, and caudal united; no spinous rays in the dorsal, except on its posterior part. Ventrals jugular, small. Vent with a tubercle. Teeth conical, in two or three rows in front, in a single row on the sides; none on the palate or tongue. Branchial rays, six.

*ZOARCES ANGUILLARIS, Storer.**The Eel-shaped Blenny.*

(PLATE XVII. FIG. 4.)

Blennius anguillaris, PECK, Mem. Amer. Acad., II. pt. 2, p. 46, fig.*Blennius labrosus*, *Large-lipped Blenny*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 375, pl. 1, fig. 7.*Le Zoarces à grosses lèvres*, *Zoarces labrosus*, CUV. et VAL., XI. p. 466, pl. 342.*Zoarces anguillaris*, *Eel-shaped Blenny*, STORER, Report, p. 66." " *Thick-lipped Eel-pout*, DEKAY, Report, p. 155, pl. 16, fig. 45." " *Eel-shaped Blenny*, STORER, Mem. Amer. Acad., New Series, II. p. 375.

" " " " " Synopsis, p. 123.

" " H. R. STORER, Bost. Journ. Nat. Hist., VI. p. 263.

Color. The living fish is of a light salmon-color, mottled with irregular olive blotches, darker towards the head. The front and top of the head are of a light brown; two indistinct oblique bands upon the operculum, one back, the other in front, of the eye, on each side of the head. Body beneath white; neck flesh-colored. The dorsal fin is almost white, salmon-colored at its edge. The pectorals are of a true salmon-color, lighter at their origin. The ventrals are salmon-colored. The anal fin is flesh-colored at its base, salmon-colored at its edge, with seven distinct white blotches in its length. The dorsal, pectoral, and anal fins are perfectly transparent.

In the dead specimen the colors are deeper; the general tint is a yellowish-brown or fawn color, sprinkled with darker patches. The front and top of the head are livid; the gill-covers are lighter, but rather dull. The dorsal and anal fins are greenish tinged with yellow.

Description. Body very much elongated, tapering to a point, compressed posteriorly. Its entire surface, with the exception of the head, exhibits innumerable minute cup-like depressions. Head large, compressed at its sides, broad and flat above as far as the angle of the eyes, convex at forehead. Cheeks protuberant. Lips exceedingly fleshy; the upper lip is very large, projecting beyond the lower, and in some individuals even an inch beyond it; the under lip is less fleshy than the upper, and is suspended at its angles like those of a mastiff. The upper jaw slightly projects beyond the lower.

The teeth are large and conical; those in the back of the jaw the sharper; a single row from the entire angle of the upper jaw the extent of four teeth; then a double row of three teeth; then to the middle of the jaw a row of three teeth deep; the front teeth of this triple row are the largest in the jaw. From the outer angle of the lower jaw towards the middle, a single row of eight teeth exists; then a double row of five to six teeth to the middle of the jaw; three rows of sharp teeth in the upper pharyngeals; two rows in the lower pharyngeals. Tongue large, fleshy, smooth. Nostrils tubular, situated about half-way between the eyes and the snout; the distance between the eyes is equal to about one sixth the length of the head. The lateral line, which is most perceptible in immature specimens, commences above the operculum, at a distance in front of its posterior angle equal to the distance between the eyes, and, passing just beyond the posterior angle of the operculum, makes a slight curve downwards, and then passes on towards the posterior extremity of the body in a straight course. The fins are all enveloped in a fleshy membrane.

The dorsal fin commences some distance anterior to the posterior angle of the operculum, and is continued to the tail; previous to reaching which, however, about seventeen of its rays lose their fleshy portion, and exhibit only their spinous bases. The first ray of the dorsal is quite low; the succeeding three or four gradually become higher, making the commencement of the fin to appear rounded when expanded; it gradually diminishes in its height, so that the posterior rays are about two thirds the height of the anterior portion.

The pectorals are broad, rounded at their extremities; the extremities of the inferior rays are slightly scalloped.

The ventrals, appearing like little warts, are situated in front of the pectorals; they are composed of two rays, but, being enveloped in a tough membrane, appear as one.

The anal fin is about half the height of the dorsal; terminating in the caudal, it runs off to an acute point; the rays of these two fins cannot be distinguished from each other.

The fin rays, as far as practicable to be counted, are as follows:—D. 118 or 120. P. 19 or 20. V. 2. A. 100.

Length, three feet.

Remarks. As early as the year 1804, Professor Peck wrote a very good description of this species, and accompanied it with a figure, in the Memoirs of the American Academy.

It is occasionally taken at all seasons of the year, but more frequently in the spring and summer. It sometimes attains the size of three and a half feet, and weighs from one to twelve pounds.

It feeds upon the Mollusca and Testacea, and the flesh of the young fish is sweet and very palatable. The following shells I have found in its stomach: *Buccinum undatum*, *Fusus corneus* and *pleurotomarius* and *turricula*, *Turbo inflatus* and *obscurus*, *Natica triseriata* and *consolidata*, *Bulla tritacea*, *Tellina sordida*, *Nucula minuta*, *Trichotropis borealis*, *Turritella erosa*, *Venus gemma*, *Pecten Islandicus*; and a species of *Pectinaria*.

It is seldom met with in Boston market; occasionally, however, it is brought in by the cod-fishers of Massachusetts Bay, by whom it is known as the *Ling* and *Conger-Eel*.

Captain Atwood informs me that it is not taken so often at Provincetown of late years as formerly.

My son observed it on the coast of Labrador in 1849.

Labrador, H. R. STORER. New Hampshire, PECK. Maine, Massachusetts, STORER. New York, MITCHILL, CUVIER, DEKAY.

GENUS V. ANARRHICAS, LIN.

Head smooth, rounded, muzzle obtuse; body elongated, covered with minute scales; dorsal and anal fins long, distinct from the caudal; no ventral fins. Teeth of two kinds; those in front elongated, curved, pointed; the others on the vomer, as also on the jaws, truncated or slightly rounded; branchiostegous rays, six.

ANARRHICAS VOMERINUS, Agassiz, MS.

The American Wolf-fish.

(PLATE XVIII. FIG. 1. { 1. a. head in front.
1. b. teeth as seen in front.)

Anarrhicas lupus, Sea-Wolf, MITCHILL, Amer. Month. Mag., v. p. 242.

" " " STORER, Report, p. 69.

" " " DEKAY, Report, p. 158, pl. 16, fig. 43.

" " " STORER, Mem. Amer. Acad., New Series, II. p. 376.

" " " " Synopsis, p. 124.

Anarrhicas vomerinus, AGASSIZ, MS.

Color. Of a purplish brown, with ten or twelve transverse nearly black bars passing from the abdomen high upon the dorsal fin. Beneath lighter. One large specimen was of a light flesh-color, thickly spotted with moderately sized black ocelli. Rays of dorsal black, intervening membrane dark gray or slate; pectorals and anal leaden-gray; caudal slate-color, reddish at extremity.

Description. Body elongated, subcylindrical, compressed posteriorly, covered with an extremely viscid secretion. Head large, compressed at sides, rounded, slightly flattened above. Length of head more than one fourth the entire length of the body. Rows

of circular mucous pores are seen passing from the snout backwards beneath the eye to the occiput; also irregularly distributed upon the cheeks and along the upper portion of the operculum; a few are observed upon the lower jaw. Eyes moderate in size, the distance between the eyes equal to one fifth the length of the head. Nostrils tubular, situated about half-way between the tip of the snout and the eyes. Jaws equal, armed with long, strong, pointed teeth. The six in the intermaxillary above are much the largest, and diverge outwards; back of these on each side are six smaller, conical, sharp-pointed teeth. Four large recurved teeth in the lower jaw; back of these are about half a dozen sharp-pointed teeth of various sizes, irregularly disposed; a double row of rounded molars, some of them having a pointed summit. Vomerine teeth perfectly united together, forming a solid mass. Two rows of palatine teeth, the outer much the larger. Two rows of sharp teeth in the pharynx. Tongue large, fleshy, fuliginous. Lips loose, fleshy.

The dorsal fin arises in front of the base of the pectorals; it is slightly higher at its anterior portion, and is continued nearly to the tail, appearing as if almost united to it by the prolongation of the membrane of the fin.

The pectoral rays are very large; these fins are rounded when expanded, and slightly scalloped at their margin.

The anal fin arises immediately back of the anus, which is very large, and terminates on the same plane with the dorsal; it is about half the height of the dorsal.

The depth of the caudal at its base is less than one third the height of its rays.

The fin rays are as follows:—D. 74. P. 20. A. 46. C. 16.

Length, three to five feet.

Remarks. Mr. Agassiz considers this a distinct species from the European, basing his opinion upon a difference in the number and disposition of the vomerine tubercles.

This ferocious fish, weighing from five to thirty pounds, is captured about rocky ledges at all seasons of the year, although greater numbers are taken in winter than at any other time.

The Cusk rocks between Boston and Cape Ann are one of its favorite resorts. It feeds upon crustaceous animals and shell-fish. Its hideous appearance renders it an object of such disgust, that it is not unfrequently thrown away as soon as caught. By many of our fishermen, however, it is considered very delicate, the smaller specimens weighing from five to ten pounds are quite palatable when fried, boiled, or broiled, the skin having been previously removed. It is also occasionally split and salted, or dried, or smoked, and is said to be, when thus prepared, very good.

Greenland, FABRICIUS. Maine and Massachusetts, STORER. New York, MITCHILL, DEKAY.

FAMILY IX. LOPHIDÆ.

Scales usually absent, or replaced by bony plates, or by small grains armed with spines. The two carpal bones elongated, and forming a kind of arm to support the pectoral fin. Branchial aperture round, or a vertical slit behind the pectorals. Sub-orbital bone wanting, except in the genus *Malthea*.

GENUS I. LOPHIUS, ARTEDI.

Head enormously large, broad, and depressed. Mouth large, armed with slender conical teeth on the jaws, palatines, vomer, and pharyngeals. Tongue smooth. Branchial rays, six; branchial arches, three. Dorsal fins, two; the anterior rays distant, detached, forming long filaments supporting fleshy slips.

LOPHIUS AMERICANUS, Cuv.

The American Angler.

(PLATE XVIII. FIG. 2.)

Lophius piscator, *Bellows-fish* or *Common Angler*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 465.

Lophius piscatorius, *Angler*, *Frog-fish*, *Sea-Devil*, *Goose-fish*, *Wide Gab*, STORER, Report, pp. 71, 404.

La Baudoire d'Amérique, *Lophius Americanus*, CUV. et VAL., XII. p. 380.

Lophius Americanus, *American Angler*, DEKAY, Report, p. 162, pl. 28, fig. 87.

" " " " STORER, Mem. Amer. Acad., New Series, II. p. 381.

" " " " " Synopsis, p. 129.

Color. All the upper part of the body, in the living fish, is of a dark-brown color, caused by minute irregular markings somewhat resembling reticulations, which occasionally appear like blotches; breast of a dirty white color. Cirrhi of a light brown. Pupils black, irides yellowish-brown.

Description. Body compressed, orbicular anteriorly, elongated and attenuated posteriorly. Its width in front of the pectoral fins is rather less than one half of its length. The length of the head from the tip of the snout to the occiput is equal to about one fourth the length of the entire fish. Numerous fleshy cirrhi are arranged along the lower jaw, edging it to its angles; beyond these, they are continued to, and upon, and back of, the pectoral fins, to the base of the tail: beneath the jaw these cirrhi are much larger than they are upon the sides of the body; on the posterior portion of the body they are smallest. The branchial apertures are large, and situated under and back of the pectorals. The vertical gape of the mouth, when expanded, is very large; the distance across the head, from the outer angles of the jaws, is less than

one third the length of the fish ; the tip of the lower jaw projects beyond the upper. The intermaxillary bones are capable of being protruded considerably beyond the maxillaries, and are armed with a single row of small, pointed teeth upon each side, and two rows of much larger teeth in their centre, the innermost row being the larger ; one of these is upon the edge, the other within and beneath, very incurved. Upon the upper jaw at its tip is a space of one and a half inches destitute of teeth ; on each side of this space is one quite large tooth, and a second much smaller ; about half an inch outside of these is a single row of eight or ten teeth, the first three or four of which are much the largest. On each side of the pharynx are three rows of sharp incurved teeth resembling spines ; these rows are arranged directly above each other, and are double. The lower jaw has a single row of numerous, very sharp teeth : the tongue has a broad, bony, triangular plate upon each side, armed with two rows of teeth which are recurved. The distance from the margin of the upper jaw to the eye is about equal to the distance between the eyes. Several spines are situated upon the head : two just back of the snout on each side ; a bifurcated one over the middle of the eye, and another similar one at its posterior angle ; and a small one on a line back of these, at the posterior portion of the head. A spine pointing forwards is situated just back of the angle of the jaws, and three straight spines are seen back of this. The eyes are oval. Just back of the snout are two elongated, naked tentaculæ, of the fineness of bristles, with the extremities free. As the tentaculæ are depressed, directly at their posterior extremities is situated a third, with about half of its extent only naked ; all the tentaculæ are capable of being elevated at the pleasure of the animal.

The first dorsal fin is situated a short distance back of the third tentaculum ; it is composed of three small rays, the posterior of which is the shortest, connected at their bases by a dark-colored membrane.

The second dorsal fin is composed of stout, fleshy rays ; it is rounded posteriorly, and is as long again as high.

The pectorals are rather higher than long, slightly digitated at their extremities, and ciliated.

The ventrals are stout and fleshy ; their anterior ray is bifurcated at its base.

The anal fin arises back of the commencement of the second dorsal ; its posterior portion is the higher.

The caudal fin is stout, fleshy, and digitated at its extremity.

The fin rays are as follows : — D. 3 - 11. P. 24 or 25. V. 5. A. 9. C. 8.

Length, four feet.

Remarks. This fish, which weighs from fifteen to seventy pounds, is not a common species in Massachusetts Bay, although it is taken throughout its whole extent from Lynn to Provincetown during the months of September, October, and November, and is met with in great numbers at its mouth. It is captured with the hook, while fishing for other species, and also in nets. Among the fishermen in some parts of the Bay, there is a common saying, "When you take a goose-fish, look out for an easterly storm." It is exceedingly voracious, feeding upon all kinds of fish, and the capacity of its mouth enables it to swallow species as large as itself. Captain Atwood, of Provincetown, tells me he has repeatedly seen one swimming towards the shore with another of the same species as large as itself in its mouth. And both he and Captain Nathaniel Blanchard, of Lynn, assure me, that, when opened, entire sea-fowl, such as large gulls, are frequently found in their stomachs, which they supposed them to catch in the night, while they are floating upon the surface of the water. I was informed by Captain Leonard West, of Chilmark, that he had known a goose-fish to be taken having in its stomach six coots in a fresh condition. These he considered to have been swallowed when they had been diving to the bottom in search of food. No use is made of this fish, as its liver contains but little if any oil; and its flesh has no fat. This is a singular fact, as most, if not all, other fish have either fat in their livers or in their flesh. It is seldom that fat is found both in the liver and in other parts of the body of a species. The dog-fish, however, supplies the fishermen with oil from its liver, and its body when dried will burn, to use a fisherman's words, "like fat pine." This is considered a very stupid fish; thousands run ashore at Provincetown every season, and are thus destroyed. They frequently swim towards the shore in the day-time, and if pushed into the water by a passer-by are as likely to turn again to the shore as from it.

Maine, Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY. Delaware, DEKAY.

GENUS II. CHIRONECTES, Cuv.

Head vertically compressed. Three free rays on the summit of the head. Mouth cleft more or less vertically, opening to the gills by a round aperture behind the pectorals. Tongue edentate. Intermaxillaries, lower jaw, vomer, palatines, and pharyngeals with minute, card-like teeth. Dorsal long.

CHIRONECTES LÆVIGATUS, Cuv.

The Smooth Mouse-fish.

(PLATE XVIII. FIG. 3.)

Chironectes lævigatus, CUV., Mém. du Muséum, III. p. 423, pl. 16, fig. 1.*Le Chironectes uni*, *Chironectes lævigatus*, CUV. et VAL., XII. p. 399.*Chironectes lævigatus*, *Smooth Chironectes*, STORER, Report, p. 73." " *Smooth Mouse-fish*, DEKAY, Report, p. 165, pl. 27, fig. 83.

" " STORER, Mem. Amer. Acad., New Series, II. p. 382.

" " " Synopsis, p. 130.

Color. Brownish, with irregularly distributed lighter-colored blotches margined with white. Besides these blotches, numerous yellowish spots are scattered over the entire surface. The markings upon the dorsal, anal, and caudal fins form irregular transverse bands. Pectorals and ventrals marked with white dots.

Description. Body smooth, much compressed laterally, tapering to the tail; thickest at pectorals. Greatest depth less than half its length. Between and above the eyes is situated a dark-colored flexible ray, terminated by a slight filament. Behind this are ten rays connected by a strong membrane, which is continued posteriorly; one of these rays is quite large and stout; a filament is suspended from its extremity. Minute cuticular processes are observed beneath, and along the edge of, the lower jaw; one exists at the base of the ray, between the eyes. Eyes small, circular. Jaws armed with numerous minute teeth. Branchial orifice, a small aperture beneath the pectorals.

The dorsal fin, which is longer than high, commences on a line above the origin of the pectorals, and is continued to the fleshy portion of the tail.

The pectorals are stout, expanded, and digitated at their extremity.

The ventrals are situated in front of the pectorals, and are digitated like those fins.

The anal fin commences opposite the posterior portion of the dorsal; it is higher than long, and is rounded.

The caudal fin is rounded.

The fin rays are as follows: — D. 12. P. 10. V. 5. A. 6. C. 9.

Length, from two to four inches.

Remarks. The only specimens of this species I have known to be taken in this State were sent me several years since from Holmes's Hole, by the late Dr. Yale of that place.

Massachusetts, STORER. New York, DEKAY. South Carolina, CUVIER.

GENUS III. BATRACHUS, SCHNEIDER.

Head depressed, broader than body. Ventrals jugular, with three rays; the first elongated. First dorsal small; second low and long. Base of the pectorals elongated. Branchial aperture small, with six rays. Subopercle as large as the opercle, and both spinous. No suborbital. Teeth on the jaws, front of the vomer and palatines.

BATRACHUS TAU, *Lin.**The Common Toad-fish.*

(PLATE XIX. FIG. 1, 2, young and adult fish.)

Gadus tau, LIN., Syst. Nat. (twelfth edition), p. 440.

" " BLOCH, II. p. 150, pl. 67, fig. 2 and 3.

" " *Toad Gadus*, SHAW, Gen. Zool., IV. p. 159.

Lophius bufo, *Toad-fish*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 463.

Batrachoides variegatus, var. a. b., LESUEUR, Journ. Acad. Nat. Sc., III. pp. 399, 401.

Batrachus variegatus, *Toad-fish*, STORER, Report, p. 74.

Le Batrachotide tau, *Batrachus tau*, CUV. et VAL., XII. p. 478.

Batrachus tau, *Common Toad-fish*, DEKAY, Report, p. 168, pl. 28, fig. 86.

" " STORER, Mem. Amer. Acad., New Series, II. p. 384.

" " " Synopsis, p. 132.

Color. Yellowish, the entire surface of the head, sides, and abdomen marbled with black spots, which are confluent upon the sides, presenting the appearance of irregular bands. All the fins also barred with black. The dorsal bands oblique, those of pectorals and caudal concentric, five or six in number.

Description. Shape of fish broad anteriorly, laterally compressed posteriorly; its width gradually diminishing to extremity of caudal fin. Length of head one third that of entire fish; its breadth equal to its length. Greatest depth equal to one fourth its length. Body entirely covered by a copious viscid secretion, which flows from numerous mucous pores distributed over its surface, those on the head being much the largest. Head large, compressed above, rounded anteriorly. Mouth very large. Lower jaw the longer. Jaws covered with strong, conical, and distinct teeth, disposed in several rows in front and in a single row behind in each jaw. Teeth also, but smaller and crowded, on intermaxillaries and vomer; none on palatine bones. Tongue scarcely perceptible. Lips large and fleshy. Nostrils double. Four small and blunted cirrhi on chin; on each side of these, along the margin of the lower jaw, a series of five or more larger ones sometimes palmated at tips. Also a very large cirrus over each eye, preceded by a much smaller one. Eyes moderate, slightly oblique, guarded by a thick, gelatinous membrane. Preoperculum armed with three distinct concealed spines, the middle the smallest. Branchial aperture of same width

as base of pectoral fin. The lateral line, marked throughout its whole extent by very distinct mucous pores, arises just back of upper spine of operculum, and runs nearly a straight course high up on the back to the tail.

The dorsal fin arises just back of the head, and is continued to the tail. Its first three rays are spinous, the central one being much the longest; these are united to the fleshy rays by a deeply emarginated membrane. Fleshy portion of nearly uniform height. Rays multifid. Terminates abruptly at base of tail, to which it is connected by a membrane.

The pectorals, stout and fleshy, arise at the lower edge of the branchial opening; rounded and fan-shaped when expanded.

The ventrals, of very irregular shape, originate some distance in front of pectorals; the first ray, which is stout and falciform, is enveloped in a thick, fleshy membrane. Fin tied down to abdomen posteriorly.

The anal fin commences beneath the anterior third of the dorsal, and terminates on a line with the posterior extremity of that fin; the fleshy margin is strongly digitated.

The caudal fin is broad and rounded posteriorly.

The fin rays are as follows: — D. 3-27. P. 16. V. 3. A. 24. C. 14.

Remarks. The Toad-fish is an inhabitant of our entire Atlantic coast, extending its residence also even as far as into the Gulf of Mexico, and to some of the West India Islands. It lives generally in shoal water, being seldom taken at any great distance from the shore. The particular situations which it chooses vary with the nature of the coast. Thus along our Southern shores it is found in the shallow bays. The sandy or muddy bottom of these is overgrown with Eel-grass (*Zostera marina*), under cover of which it lives in security, and finds abundant sources of food. Where the coast, on the contrary, is more or less rocky, we meet with it chiefly under stones. Examining the places where the water is but a few inches in depth at low tide, we see that, under many of the stones and smaller rocks, the sand on one side has been removed, leaving a shallow cavity, perhaps a foot in width, and extending back beneath the stone. If we approach this cautiously, we shall probably distinguish the head of a Toad-fish, very much in the position of that of a dog as he lies looking out of his kennel. The fish is at rest, and might be overlooked by a careless observer. A closer attention, however, readily distinguishes the curve of its broad mouth, the delicate lacinated processes with which its jaws and other parts of its head are ornamented, its truly beautiful eyes, and sometimes the anterior portion of its body. At the slightest alarm, it retreats beneath the stone, but presently reappears. It is lying here, perhaps merely as in a safe resting-place, perhaps on the watch for its prey.

But during the months of June, July, and August, we shall in many instances be able to discover another purpose, — it is apparently guarding its eggs or young. We shall then find, on the inferior surface of the stone, the young Toad-fish adhering, to the number of several hundreds. They will be in different stages of development, according to the season of our examination. We may see the eggs, not larger than very small shot; a little later they are increased in size, and the young fish plainly visible through their walls; a little later still, the young have made their escape, but are still attached to the stone. The attachment now, however, is accomplished in a different manner. The yolk, not being yet absorbed, occupies a rounded sac protruding by a narrow orifice from the abdomen, and the part of this sac near its outer border, being constricted, leaves external to it a disc, by means of which, acting as a sucker, the young fish adheres so firmly as to occasion difficulty in detaching it. They remain thus until they have attained the length of half or three quarters of an inch, or until the yolk-sac is entirely absorbed. During this period an adult fish occupies the cavity beneath the stone, and if driven from it speedily returns. That this is, in all cases, the mother of the young ones, and that she is there for the purpose of guarding them, we have no means of determining: we can only infer it. Although the assertion, that fish have no affection for their young, has long been considered universally true, yet exceptions to it are now well known to exist. Our common Cat-fish, or Horned Pout, furnishes an example, and the habit of the *Batrachus* here described appears to give another illustration bearing on the same point.

During the winter months, in our colder latitudes, the Toad-fish in some instances, perhaps, retire into deep water; it is true, however, that many of them become nearly torpid. They are found buried beneath the mud, in the same manner as the Eels, and are sometimes taken with the spear thrust down in search of their more valued neighbors. One which was caught in this way was nearly as vigorous and capable of motion after twenty-four hours of removal from the water, as when first taken.

The Toad-fish is not commonly employed as an article of food. Its slippery, slimy surface, and its generally repulsive aspect, cause it to be looked on rather with disgust. That its flesh, however, is delicate and good, can scarcely be questioned, though the small size which it attains, — eight inches to a foot in length, — and the fact that it is never taken in any large quantities, prevent it from being of much economical value.

The specific name *tau*, given to this species by Linnæus, is derived from a character not discernible until the fish is dead and his integuments have become dry. The bones on the upper surface of the skull are then seen to present a transverse ridge met by another in a longitudinal direction, thus resembling the Greek letter T (*tau*).

For the beautiful living specimen, from which my description and drawing have been made, I am indebted to John Manchester Smith, M. D., of Tisbury; and the notes upon the habits of this species were furnished me by my excellent friend, William O. Ayres, M. D., a very accurate observer, of East Hartford, Connecticut, now established in San Francisco, California.

Maine, Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY. Gulf of Mexico, CUVIER.

FAMILY X. LABRIDÆ.

Body oblong and scaly; a single dorsal is supported in front by spines, each of which is generally furnished with a membranous appendage; the jaws are covered with fleshy lips; there are three pharyngeals, two upper ones attached to the cranium, and a large lower one, all three armed with teeth, sometimes *en pavé*, sometimes in points or laminae, but generally stronger than usual; an intestinal canal without cœca, or with two very small ones, and a strong natatory bladder.

GENUS I. CTENOLABRUS, VAL.

Body elongated. Preopercle denticulated. A band of velvet-like teeth in front; behind, the conical teeth, in the jaws. Three spinous rays to the anal fin.

CTENOLABRUS CERULEUS, *Dekay*.

The Common Conner.

(PLATE XX. FIG. 1.)

Tautoga cerulea, Blue-fish or Bergall, MITCHILL, Report in part, p. 24.

Labrus chogset, Bergall of New York, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., i. p. 402, pl. 3, fig.

Crenilabrus burgall, SCHOEPPF, Griffith's Cuv., x. p. 258.

" " Conner, *Blue Perch*, Chogset, STORER, Report, p. 78.

" " " " " AYRES, Bost. Journ. Nat. Hist., iv. p. 263.

Le Ctenolabre chogset, *Ctenolabrus chogset*, CUV. et VAL., XIII. p. 237.

Ctenolabrus ceruleus, *The Common Burgall*, DEKAY, Report, p. 172, pl. 29, fig. 93.

Ctenolabre mouché, *Ctenolabrus uninotatus*, CUV. et VAL., XIII. p. 239.

" " " " " DEKAY, Report, v. 174, pl. 29, fig. 90.

Ctenolabrus ceruleus, STORER, Mem. Amer. Acad., New Series, II. p. 386.

" " " Synopsis, p. 134.

Color. This species varies exceedingly in its coloring: some specimens being of a deep-blue color; others, of a uniform brown or rust color; while the ground of others is greenish, with copperish spots; or red, with black points or dots sprinkled over

their entire surface, including oftentimes the fins. Irregular bluish lines, appearing like hieroglyphics, are distributed over the head; these are more strongly marked between and in front of the eyes than on the neck. The pupils are black, the irides a beautiful silver.

Description. Form elongated. Its height measured across to the anus, including the dorsal fin, is not quite equal to one third of its length; its thickness is about equal to half of its height, not measuring the dorsal fin. The length of the head to the length of the entire fish is as one to four: it is slightly flattened upon its top, and on the back of the neck, in front of the dorsal fin, is a perceptible convexity. The portion of the head between the eyes, and in front of them to the angle of the jaws, is destitute of scales, as well as the lower portion of the opercula. The scales upon the operculum are larger than those upon the preoperculum. The preoperculum is finely denticulated upon its posterior edge, throughout its whole length: the posterior edge of the operculum is bordered by a fleshy membrane.

The jaws are equal, and are armed with numerous teeth; the six front teeth in either jaw larger than the others; the front teeth in the upper jaw larger than the corresponding ones in the lower. The upper jaw is very projectile. The lips are large and fleshy. The eyes are circular; the diameter of the eye is equal to one fifth the length of the head.

The lateral line arises just back of the superior angle of the operculum, and curves with the body until about opposite the termination of the dorsal fin, whence it pursues a straight course to the tail.

The dorsal fin arises on a line with the posterior angle of the operculum, and terminates within about an inch of the tail. It has eighteen strong spinous rays, the extremities of which are naked; the upper portion of their connecting membrane is free, presenting the appearances of small filaments or tentacles; the eleven posterior rays are membranous. The spinous rays gradually increase in height from the first to the membranous rays, which are still more elevated. The first spinous ray is very short, being only one seventh the height of the last spinous ray. The membranous portion of this fin is rounded when expanded.

The pectorals arise on a line with the dorsal; their height is to their length as three to one.

The ventrals are just back of the pectorals; the first ray is a strong spine. The length of these fins is to their height as one to three.

The anal fin has three spinous rays; from the extremities of these spines, as well as from that of the ventral fins, filaments are suspended as in the dorsal fin.

The caudal fin is nearly even at its posterior extremity; its rays are longer than high.

The fin rays are as follows: — D. 18 – 11. P. 15. V. 6. A. 12. C. 16.

Length, from six to fourteen inches.

Remarks. This very common species is taken from the middle of June until late in October, and is brought to market in immense quantities. Being considered an excellent fish for the table when fried, it meets with a ready sale. It is caught with the hook along our entire coast, from the rocks and bridges and boats; and is taken along the shores of the islands in great numbers in nets. It is kept alive for the market in large cars, which are located in the neighborhood; these cars, which are about three feet deep and twelve or fifteen feet in length, are closed beneath, and latticed at their sides; being anchored in deep water, the tide is constantly flowing through them and changing the water. Sometimes as many as five thousand fish will be contained in a single car; this car will be daily called upon for the supply needed in the market, and is replenished each week or fortnight, as may be required.

Newfoundland, CUVIER. Maine, Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY.

GENUS II. TAUTOGA, MITCH.

Jaws with a double row of teeth. Opercle and preopercle without spines or denticulations, and with few or no scales.

TAUTOGA AMERICANA, *Dekay.*

The Tautog.

(PLATE XX. FIG. 2.)

Labrus Americanus, BLOCH, SCHN., p. 261.

Tautoga niger, MITCHILL, Report in part, p. 23.

Labrus tautoga, *Black-fish* or *Tautog*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 399.

Labrus Americanus, *Black-fish* or *Tautog*, STORER, Report, p. 76.

" " " " AYRES, Bost. Journ. Nat. Hist., IV. p. 263.

Le Tautogue noir (*Tautoga nigra*, MITCH.), CUV. et VAL., XIII. p. 293.

Tautoga Americana, *New York Tautog*, DEKAY, Report, p. 175, pl. 14, fig. 39.

" " STORER, Mem. Amer. Acad., New Series, II. p. 389.

" " " Synopsis, p. 137.

Color. This species varies considerably in its markings. Generally, however, it is of a bluish-black above, diversified with bands and blotches, mottled with darker spots towards the abdomen, which is whitish. Pupils black, irides silvery.

Description. The body is regularly arched from the tip of the snout to the

extremity of the dorsal fin; its height across the base of the ventrals, not including the dorsal fin, is about equal to the length of the head. The length of the head, to the posterior angle of the operculum, is equal to about one fourth the length of the body, including the tail. The head is naked, with the exception of a patch of small scales upon the upper part of the operculum, and a vertical band of similar scales upon the preoperculum, just back of the eyes. The lips are large and fleshy; the jaws have two rows of conical teeth: those of the first row are strong, the front teeth being the largest; those of the second row scarcely project above the flesh of the jaws. Teeth in the pharynx. The eyes are circular, the diameter equal to half the distance between them. The nostrils, which are small and double, are situated in front of and above the anterior angle of the eyes. The lateral line arises just above the operculum, and curves with the body.

The dorsal fin rises just back of the pectorals; the first seventeen rays terminate in naked spines, at the base of which are small floating tentaculæ; the posterior, fleshy rays of this fin are nearly as high again as the spinous rays, and this portion of the fin is of a rounded form. This fin extends to within a short distance of the tail. The base of the rays is scaled.

The pectorals commence just in front of the posterior angle of the operculum; they are rounded at their extremities. Their length to their height is as one to three.

The ventrals are situated a short distance back of the pectorals; their length is equal to about one fourth of their height. The outer ray is spinous, and is about half as high as the middle ray.

The anal fin arises opposite the last spinous ray of the dorsal fin, and terminates on the same plane with that fin; the first three rays are spinous; the fleshy portion is of the same form as the corresponding portion of the dorsal fin; this fin is longer than high.

The caudal fin is even at its extremity; its rays are covered with scales for about one half of their height.

The fin rays are as follows:—D. 28. P. 15. V. 6. A. 11. C. 15.

Length, six to eighteen inches.

Remarks. Although a few years only have passed since this species was brought into Massachusetts Bay, it is now taken along a large portion of the coast. At Plymouth, Nahant, and Lynn, at some seasons, it is found in considerable numbers, and is frequently caught from the bridges leading from Boston. A specimen was taken from one of these bridges a year or two since which weighed eleven pounds and three

quarters. The Boston market is for the most part supplied by Plymouth and Wellfleet. At the former place they are taken at Monument Point. I am told that two or three families reside at Billingsgate Point, Wellfleet, who pursue no other avocation than that of taking Tautog, and are thus enabled to support themselves. Many of the fish are carried to New York from Wellfleet.

The Tautog fishery continues from April to November, and the fish is taken by the hook alone. Besides the large number of Tautog sold in the recent state, they are also pickled, and may be kept in a weak brine for a long time. In this state they are considered by epicures a great delicacy. When fresh, this species sells in the market for from eight to twelve cents per pound. Its ordinary size is from one to two pounds, although they often exceed that weight. Mr. Henry Blood, of New Bedford, informed me that a specimen of this fish was taken in Rochester harbor which weighed fourteen pounds and three ounces. The largest individual of which I have any accurate knowledge weighed sixteen pounds. Dekay states that he had "heard of one which weighed twenty pounds, but the largest he had seen did not exceed twelve pounds."

Maine, Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY. South Carolina, DEKAY.

ORDER II. MALACOPTERYGII. SOFT-RAYED.

All the fin rays soft and cartilaginous, with the exception sometimes of the first in the dorsal and the first in the pectoral fins. These rays are of an articulated structure, and generally more or less branched at their extremities.

ABDOMINALES.

The ventrals behind the pectorals, and not attached to the humeral bone.

FAMILY XI. SILURIDÆ.

Skin naked, and covered with a mucous secretion. In some genera the body is nearly covered by osseous plates. Head depressed, and generally enlarged, with several fleshy filaments. A second adipose dorsal often present. The intermaxillaries,

suspended under the ethmoid bone, from the edge of the upper jaw. First ray of the dorsal and pectoral fins usually a strong, articulated spine, with a complicated movement.

GENUS I. PIMELODUS, Cuv.

Palate smooth and without teeth. Barbels varying from six to eight. Casque occasionally present.

PIMELODUS ATRARIUS, *Dekay*.

The Horned Pout.

(PLATE XX. FIG. 3.)

Pimelodus nebulosus, STORER, Report, p. 102.

Pimelodus catus, STORER, Mem. Amer. Acad., New Series, II. p. 402.

" " " Synopsis, p. 150.

Pimelodus atrarius, DEKAY, Report, p. 185, pl. 36, fig. 116.

" " STORER, Mem. Amer. Acad., New Series, II. p. 404.

" " " Synopsis, p. 152.

Color. The living fish is of a fuliginous color, darker upon the head and back, approaching to black; lighter upon the sides, which are tinged with a cupreous shade; white beneath in front of the ventrals; yellowish beneath the lower jaw and the under portion of the branchiæ. Irides silvery. Pupils blue. All the fins are dark-colored. In the dead specimen the coloring matter readily rubs off; and the individual, even if untouched, rapidly becomes of a lighter color.

Description. Body elongated, compressed posteriorly; head flattened above; a convexity anterior to the dorsal fin. Length of the head to the posterior angle of the opercular spine, to the entire length of the fish, about as one to four. Greatest width of head equal to about one sixth the length of the fish; greatest depth of the fish greater than the width of the head. Upper jaw the longer, both jaws furnished with numerous small teeth; eight cirrhi about the head; that at the angle of the upper jaw, on each side, much the longest. Two others are situated back of, and above these, on each side; beneath the lower jaw are also four cirrhi, two on each side of its middle, the outer the longer; all the cirrhi of the same color. The eyes are circular and very small; distance between the eyes equal to about one half the length of the head. Two blunted spines or processes on the humeral bones, the upper much the smaller. The lateral line arises above the posterior angle of the operculum, and runs a very slightly curved course to the tail.

The dorsal fin is situated on the anterior third of the fish; its length is equal to half its height. Its first ray is spinous, and shorter than the central rays. A small adipose fin is situated within a short distance of the tail.

The pectorals arise on a line a short distance in front of the posterior angle of the operculum; their length is equal to about one third their height; their outer ray is spinous and serrated upon its outer edge; it is naked at its point, and shorter than the first fleshy rays. When taken, great caution is necessary in removing this species from the hook, it having the power to erect this spine to defend itself.

The ventrals arise on a line just back of the dorsal fin; the length of these fins is equal to about one third their height. Anus large, oblong, beneath the posterior half of the ventrals.

The height of the anal fin is equal to about half its length.

The caudal fin is concave; the upper lobe slightly the longer.

The fin rays are as follows: — D. 1–6. P. 1–8. V. 8. A. 20. C. 19.

Length, seven to nine inches.

Remarks. This is quite a common species in the ponds throughout the State, and is familiarly known as the *Horned Pout* and *Minister*. Specimens are occasionally taken weighing three quarters of a pound. By many, it is highly esteemed as an article of food, and preferred to any other fresh-water fish save the Pickerel. It is generally fried, the skin having been previously removed.

Maine, New Hampshire, Massachusetts, STORER. Connecticut, AYRES. New York MITCHILL, CUVIER, DEKAY.

FAMILY XII. CYPRINIDÆ.

Mouth moderately or but slightly cleft, terminal, subterminal, or inferior; upper margin formed by the intermaxillaries. Jaws rather weak and without any teeth. A pharyngeal arch of curved and sometimes hooked teeth, disposed upon one or a double row. Branchial rays not very numerous. Top and sides of head generally smooth, and always without any scales. Body scaly. No great disparity in the fins between the sexes. Stomach without cul-de-sac; no cœcal appendages to the pylorus. Least carnivorous of all fishes.

GENUS I. CYPRINUS, LIN.

Body covered with large scales; a single elongated dorsal fin; lips fleshy; mouth small; teeth in the pharynx, but none on the jaws; branchial rays, three.

CYPRINUS AURATUS, LIN.

The Golden Carp.

(PLATE XXI. FIG. 1.)

Cyprinus auratus, LIN., Syst. Nat.

" " BLOCH, III. pl. 93, 94.

" " *Gold Carp*, PENNANT, Brit. Zoöl., III. p. 490." " *Golden Carp*, JENYNS, Brit. Vert., p. 403." " *Gold Carp*, YARRELL, Brit. Fishes (2d edit.), I. p. 361." " *Golden Carp*, *Gold-fish*, GRIFFITH'S CUV., X. p. 377.

" " " " STORER, Report, p. 82.

" " " " DEKAY, Report, p. 190.

Le Carpe dorée, *Cyprinus auratus*, CUV. et VAL., XVI. p. 101.

" " STORER, Mem. Amer. Acad., New Series, II. p. 407.

" " " Synopsis, p. 155.

Carrassius auratus, HECK., in Russ. Reise, II. p. 1014.

Color. All the upper part of the body a bright orange; sides lighter; beneath, silvery. Fins color of the back. Occasionally the larger species are dark-colored above, and the fins are margined with black.

Description. Body convex in front of dorsal fin. Its greatest depth is equal to rather less than one fourth its length. Scales large, striated. The lateral line pursues nearly a straight course to the tail. The head is flattened between the eyes; its length is equal to the greatest depth of the fish. Eyes prominent; their diameter is equal to one half the distance between them. Mouth small, very projectile. Nostrils large.

The dorsal fin commences on the anterior half of the body, and is as long again as high. The first two rays are spinous; the first is very short and slightly roughened behind; the second is much longer, and is strongly serrated posteriorly. The first two membranous rays are higher than the others, which gradually diminish in height to its posterior extremity.

The pectorals arise just back of the opercula, and extend beyond the origin of the ventrals.

The ventrals commence on a line beneath the origin of the dorsal fin, and are of the same length as the pectorals.

The anal fin is higher than long; its first two rays are spinous, serrated behind like those of the dorsal.

The caudal fin is deeply lunated.

The fin rays are as follows: — D. 15. P. 15. V. 9. A. 7. C. 18.

Length, six to ten inches.

Remarks. This beautiful species, which is a native of China, was introduced many

years since into this country, and is now extensively known among us. It thrives in quite a number of ponds in the neighborhood of Boston, connected with country-seats, bearing well the rigors of our winters, and breeding freely. This species varies exceedingly in its appearance in different individuals. Yarrell, in his "History of British Fishes," observes: "M. de Sauvigny, in his *Histoire Naturelle des Dorades de la Chine*, published at Paris in 1780, has given colored representations of eighty-nine varieties of the Carp, exhibiting almost every possible shade or combination of silver, brilliant orange, and purple." It is a very common circumstance to observe an abnormal condition of one or more of the fins in this fish. Yarrell says: "These fishes are sometimes seen with double anal fins, and others with triple tails; when this occurs, it is generally at the expense of the whole or part of some other fin: thus the specimens with triple tails are frequently without any portion of the dorsal fin, and such specimens have been figured by Bloch and others. Among two dozen Gold-fish for sale in London, were some with dorsal fins extending more than half the length of the back; some, on the contrary, had dorsal fins of five or six rays only, and one specimen without any dorsal fin whatever."

Massachusetts, STORER. New York, DEKAY.

GENUS II. LEUCOSOMUS, HECK.

Body very much compressed, flattened laterally, and deepest at the middle of its length. Head proportionally small, and compressed like the body. Mouth small, terminal, unprovided with cirrhi or barbels of any kind. Eyes very large. Caudal fin forked. Body covered with large scales appearing higher than long when observed imbricated, but which are in fact as long as high and even longer than high when examined in an isolated state. Lateral line forming a very open curve upon the abdomen, convex downwards. Dorsal and anal fins without strong and spiny rays at their anterior margins. Insertion of ventrals in advance of the anterior margin of the dorsal. Pharyngeal teeth conical, pointed, and slightly curved at tip, and disposed upon a double row.

This genus is allied to *Hypsolepis*, from which it differs by its flattened body, small head and mouth, the shape of its scales, and the insertion of the ventral fins.

LEUCOSOMUS AMERICANUS, Girard.

The Shiner.

(PLATE XXI. FIG. 2.)

Cyprinus Americanus, LACEP., v. pl. 15, fig. 3." " *American Carp*, SHAW, Gen. Zööl., v. p. 204.*Cyprinus chrysoleucas*, *New York Shiner*, MITCH., Trans. Lit. and Phil. Soc. N. Y., i. p. 459.*Leuciscus chrysoleucas*, STORER, Report, p. 88.*Stilbe chrysoleucas*, *New York Shiner*, DEKAY, Report, p. 204, pl. 29, fig. 91.*Leuciscus Boscii*, *L'Able de Bosc*, CUV. et VAL., Hist. Nat. Poiss., xvii. p. 313.*Leuciscus Americanus*, STORER, Mem. Amer. Acad., New Series, II. p. 408.

" " " Synopsis, p. 156.

Leucosomus chrysoleucas, HECK., in Russegger's Reise, II. p. 1042.*Leucosomus Americanus*, GIRARD, in Lit.

Color. General color of the back and upper part of sides greenish. Scales with golden reflections; lower portion of sides golden. Abdomen, yellowish-white; opercles golden. Pectorals reddish-yellow. Ventrals and anal red, tinged with black. Dorsal and caudal yellowish-brown. Pupils black, irides golden.

Description. Body very much compressed; its greatest depth rather less than one fourth its entire length; the length of the head equal to about one sixth the length of the body. Head naked, above somewhat depressed. Eyes circular, their diameter equal to one fourth the length of the head.

The lateral line, consisting of about fifty-six scales, commences just back of the superior angle of the operculum, and, passing obliquely down over about eighteen scales, opposite the posterior extremity of the pectoral fins very gradually passes up again towards the posterior extremity of the body, assuming nearly a straight course, which is pursued to the middle of the caudal rays.

The dorsal fin, which is situated upon the middle of the dorsum, is triangular and partly shuts into a groove at its base when not expanded. The first two rays are simple, the remainder multifold. The first ray is very short; the second is as long as the head.

The pectorals commence at the posterior inferior angle of the operculum; they are less high than the dorsal.

The ventrals are fan-shaped, and their rays are multifold.

The anal is quadrangular, and commences on a line opposite the termination of the base of the dorsal; it is emarginated above. Its first three rays are simple.

The fin rays are as follows: — D. 9. P. 17. V. 9. A. 13-16. C. 19-22.

Length, seven inches.

Remarks. This species is very common in the ponds throughout the State. It is seldom found in Boston market, although it is said to be a delicate fish for the table. It is generally used as bait for Pickerel, and is considered the best bait for that fish.

Massachusetts, STORER. New York, MITCHILL, DEKAY. Ohio River, KIRTLAND. Pennsylvania, South Carolina, CUVIER.

GENUS III. HYPSOLEPIS, BAIRD, MS.

Body rather short, compressed, much the deepest upon the middle of its length. Head very large, sub-conical. Mouth of medium size and terminal; no cirrhi nor barbels of any kind. Jaws equal. Eyes large. Tail tapering. Caudal fin forked. Body covered with very large scales, much higher than long. Lateral line running beneath the middle of the flanks, very conspicuous from the head to the base of caudal fin, and slightly bent downwards upon the abdomen. Dorsal and anal fins without strong and spiny rays at their anterior margins. Insertion of ventrals beneath the anterior margin of dorsal. Pharyngeal teeth disposed upon a double row; external row composed of a few teeth only. Skull twice as broad upon the occiput as between the eyes.

HYPSOLEPIS CORNUTUS, Girard.

The Red-fin.

(PLATE XXI. FIG. 3.)

Cyprinus cornutus, Red-fin, or Rough-head, MITCH., Amer. Month. Mag., II. p. 324.

Leuciscus cornutus, Red-fin, STORER, Bost. Journ. Nat. Hist., IV. p. 182.

" " " " Mem. Amer. Acad., New Series, II. p. 409.

" " " " Synopsis, p. 157.

" " " DEKAY, Report, p. 207, pl. 29, fig. 92.

Hypsolepis cornutus, GIRARD, in Lit.

Color. Above, blackish-brown with metallic reflections. Sides brilliant, cupreous. After death, the appearance of a broad longitudinal band upon sides. Dorsal and caudal fins dark brown, sometimes mottled with darker color; ventrals and pectorals light-colored; all the fins and the opercles margined with crimson.

Description. Body cylindrical, quite deep anterior to dorsal fin. Greatest depth of fish more than one fifth its entire length. Lateral line commences at the posterior superior angle of operculum, and, curving downwards to posterior extremity of

pectorals, pursues thence a straight course to tail, including in its course fifty scales. Length of head equal to one fifth the length of the fish. Head naked upon its sides, covered upon its top, the sides of the snout, and along the edge of the lower jaw, with numerous pointed horny tubercles, broad at their bases, and acute at their tips, which are larger along the edge of the jaw and quite small upon the top of the head. Very small asperities are felt back of the occiput, upon the dorsum, which to the eye appear like minute white dots.

Eyes moderate, circular; beneath them a series of mucous pores. Nostrils large, tubular; the posterior much the larger. Gape of mouth moderate; the lips slightly project when the mouth is closed. Scales upon sides of body large, very small beneath pectorals. Eight scales in an oblique line above lateral line, and seven below it.

The dorsal fin is situated upon the anterior half of the body; it is quadrate, rather higher than long; the first rays the highest.

The pectorals are broad, rounded when expanded.

The ventrals are fin-shaped; they commence on a line just back of the dorsal fin.

The anal fin is slightly emarginated.

The caudal fin is forked.

The fin rays are as follows: — D. 8. P. 15. V. 8. A. 9. C. 19.

Length, five inches.

Remarks. This beautiful little species is found in many of the streams throughout the State.

GENUS IV. CHEILONEMUS, BAIRD, MS.

Body elongated, subfusiform, compressed. Head stout; its shape being that of a truncated cone, owing to the bluntness of the snout. Mouth very large, subterminal, the snout slightly protruding beyond the tip of the lower jaw. A minute barbel at the angle of the mouth. Eyes of medium size. Tail tapering; caudal forked. Body covered with very large scales, which are a little longer than high, subrounded or irregular in their outline. Lateral line conspicuous for the whole length of the body, and slightly inflexed downwards upon the abdomen, and nearer to the insertion of the ventrals than to the base of the dorsal. Dorsal and anal without stout and spiny rays at their anterior margins. Insertion of ventrals situated a little in advance of the anterior margin of the dorsal. Pharyngeal teeth as in the *Hypsoplepis*. Skull proportionally broader between the eyes than in the latter.

CHEILONEMUS PULCHELLUS, *Girard*.*The Beautiful Leuciscus.*

(PLATE XXII. FIG. 2.)

- Leuciscus pulchellus*, *Beautiful Leuciscus*, STORER, Report, p. 91.
 " " STORER, Mem. Amer. Acad., New Series, II. p. 412.
 " " " Synopsis, p. 160.
 " " *Roach Dace*, DEKAY, Report, p. 208.
 " " *L'Able gentil*, CUV. et VAL., Hist. Nat. Poiss., XVII. p. 320.
 " " AYRES, Proc. Amer. Assoc. Adv. Sc., II. p. 402.
 " " HECK., in Russ. Reise, II. p. 1039.
Leuciscus Argenteus, *Silvery Leuciscus*, STORER, Report, p. 90.
 " " *Silvery Dace*, DEKAY, Report, p. 208.
Leuciscus Storeri, *L'Able de Storer*, CUV. et VAL., Hist. Nat. Poiss., XVII. p. 319, pl. 505.
Leucosomus argenteus, HECK., in Russ. Reise, II. p. 1043.
Cheilonemus pulchellus, GIRARD, in Lit.

Color. Above, of a dark brown; upper portion of sides brassy green; lower portion of sides and abdomen of a beautiful flesh-color, tinged with golden reflections. Head black above; gill-covers cupreous, with flesh-colored tints, and edged posteriorly with a brown, membranous prolongation. Color of dorsal fin similar to that of the back, the firmest portion of the rays reddish. The pectorals are of a reddish-brown above, lighter beneath. The ventrals above are the color of the abdomen.

Description. Body elongated, dorsum slightly arched in front of dorsal fin. Scales upon the body large, transparent, rounded at their summit, truncated at their base, exhibiting numerous striæ; at the base of each scale is seen a dark-colored membrane, which, projecting as far as the apex of the preceding scale, gives the appearance of indistinct oblique bands across the fish; scales smaller upon the back, and smallest upon the throat. The lateral line commences at the superior angle of the operculum, and, curving downwards nine scales, pursues nearly a straight course to the tail. The lateral line is composed of fifty-one scales; nine are situated above the lateral line in an oblique line from the origin of the dorsal fin, and six below the lateral line.

The head is naked; its length is less than one fourth the length of the fish. Diameter of eye about one sixth the length of the head; distance between the eyes equal to one third the length of the head. Nostrils situated in front of the eyes; the posterior orifice the larger, the anterior tubular. Jaws without teeth; the upper jaw projects slightly over the inferior.

The dorsal fin, which is subquadrangular, arises on the anterior half of the body. The first two rays are simple, the others multifid. The first ray is one fourth the height of the second.

The pectorals arise beneath and just anterior to the posterior angle of the operculum.

The ventrals, which are fin-shaped, arise opposite the origin of the dorsal fin. They are not as high as the pectorals.

The anal fin arises opposite the posterior extremity of the dorsal fin when it is closed; it is similar in form to the dorsal. Its first two rays are simple, the remainder multifold. The first ray bears the same proportion to the length of the second, as the first ray of the dorsal to its second ray.

The caudal fin is large, deeply forked. The height of its middle rays is equal to half the height of the outer rays. Width of the tail at extremities when expanded, to height of middle rays, is as three to one.

The fin rays are as follows:—D. 9–10. P. 16–17. V. 8. A. 9–10. C. 20–22.

Length, fourteen inches.

Remarks. This beautiful species is found in many of our rivers, and is known under the names of Roach, Dace, Chivin, and Cousin Trout. It attains the length of about fourteen inches, although the specimens usually met with are much smaller.

GENUS V. ARGYREUS, HECK.

General physiognomy resembling that of *Catostomus*. Snout more or less protruding beyond the upper jaw, thus giving the mouth an inferior position. The mouth itself is rather small, bordered with quite narrow and smooth lips, and provided at its angles with a small barbel, not always easily recognizable, especially in immature specimens preserved in alcohol. The pharyngeal teeth are disposed upon a double row.

This character of a barbel at the angle of the mouth, as well as the structure of the lips and the disposition of the ventral fins, which are inserted in advance of the anterior margin of the dorsal, indicates in these fishes a much greater affinity with *Cheilonemus* than with *Catostomus*. Indeed, the only conspicuous generical differences which can be traced between *Argyreus* and *Cheilonemus* consist in a more cylindrical body and very small mouth in *Argyreus*, and the tendency of the snout to elongate and project in some instances considerably beyond the jaws.

ARGYREUS ATRONASUS, *Heck.**The Black-nosed Dace.*

(PLATE XXI. FIG. 4.)

Cyprinus atronasus, *Brook Minnow*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 460." " *Black-nosed Dace*, DEKAY, Report, p. 205, pl. 33, fig. 69.*Leuciscus atronasus*, *L'Able à Nez noir*, CUV. et VAL., Hist. Nat. des Poiss., XVII. p. 376, pl.

" " STORER, Mem. Amer. Acad., New Series, II. p. 408.

" " " Synopsis, p. 156.

Rhinichthys atronasus, AGASSIZ, Lake Sup., p. 354.*Argyreus atronasus*, HECK., in Russ. Reise, II. p. 1040.

" " GIRARD, in Lit.

Argyreus rubripinnis, Mus. Par. fide Heck. in Russ. Reise, II. p. 1040.

Color. Above, of a reddish brown; abdomen of a silvery white with minute brown blotches. A broad black band, commencing at the snout, passes through the eyes along the whole length of the fish and is lost upon the caudal fin. A narrow lighter line arises at the operculum and runs along the upper edge of the former. Pupils black. Irides golden. The dorsal and caudal fins are of a dark-brown color. The anal is nearly colorless. The pectorals are orange.

Description. Body oblong, tapering to the tail. The greatest depth of this species is equal to the length of the head. Head flattened above; the length of the head is equal to about one sixth the entire length of the fish. The eyes are moderate. The nostrils are large. The upper jaw projecting.

The dorsal fin, which is situated upon the middle of the dorsum, is subquadrangular and emarginated above.

The fan-shaped pectorals are situated just beneath the posterior angle of the operculum.

The ventrals are very delicate.

The caudal fin is deeply forked.

The fin rays are as follows: — D. 8. P. 14. V. 8. C. 19.

Length of fish three inches.

Remarks. This pretty little species, which seldom if ever exceeds three inches, is found in many of our rivers.

Massachusetts, STORER. New York, MITCHILL, DEKAY.

*ARGYREUS NASUTUS, Girard.**The Long-nosed Dace.*

(PLATE XXII. FIG. 1.)

Leuciscus nasutus, AYRES, Bost. Journ. Nat. Hist., iv. p. 299, pl. 13, fig. 3.

" " STORER, Mem. Amer. Acad., New Series, II. p. 415.

" " " Synopsis, p. 163.

Rhinichthys nasutus, AGASSIZ, Lake Sup., p. 354.*Argyreus nasutus*, GIRARD, in Lit.

Color. Dorsum and upper part of sides dark brown. Beneath, white. Dorsal and caudal fins brownish. Pectorals lighter than dorsal. Ventrals and anal colorless.

Description. Body elongated; cylindrical in front of the dorsal fin, compressed posteriorly; its greatest depth equal to about one eighth of its entire length. Head equal in length to one fifth of the fish; flattened above and destitute of scales, terminating in an obtuse snout, having the mouth beneath. Eyes circular, equal in diameter to one sixth the length of the head. The nostrils are directly in front of the eyes, the posterior the larger. The lateral line pursues nearly a straight course to the caudal fin.

The dorsal fin is situated on the anterior half of the dorsum, and is subquadrangular.

The pectorals are just beneath the posterior angle of the operculum; they are large and rounded.

The ventrals arise opposite a line just in front of the dorsal fin.

The anal fin is of a similar form with the dorsal, and arises opposite the termination of that fin.

The caudal fin is lunated.

The fin rays are as follows: — D. 8. P. 16. V. 9. A. 8. C. 19.

Length, four inches.

Remarks. This species was first described by William O. Ayres, M. D., in the Boston Journal of Natural History. He had received specimens from West Hartford, Connecticut, from Mr. Charles P. Turner of Hartford, and others from Blanford in this State, from Mr. C. H. Olmstead. From this latter gentleman, we learn that "they inhabit rapid streams, hiding most commonly under stones, from which they often dart out with great speed." When taken, "they struck at the bait with all the quickness and vigor of Trout, and might be taken in almost any numbers." It has also been found by Mr. S. F. Baird in Nichols Brook, a tributary of the Connecticut River.

Massachusetts, OLMEAD, BAIRD. Connecticut, AYRES.

GENUS VI. CATOSTOMUS, LESUEUR.

Back with a single dorsal fin. Gill-membrane three-rayed. Head and opercula smooth. Jaws toothless and retractile. Mouth beneath the snout, lips plaited, lobed, or carunculated, suitable for sucking. Throat with pectinated teeth.

CATOSTOMUS BOSTONIENSIS, *Lesueur*.*The Sucker.*

(PLATE XXII. FIG. 3.)

Cyprinus catostomus, FOSTER, Mem. Amer. Acad., II. pt. 2, p. 55, pl. 2, fig. 4.

Catostomus Bostoniensis, LESUEUR, Journ. Acad. Nat. Sc., I. p. 106.

" " STORER, Report, p. 84.

Le Catostome Bostonien (*Catostomus Bostoniensis*, LES.), CUV. et VAL., XVII. p. 432.

" " STORER, Mem. Amer. Acad., New Series, II. p. 423.

" " " Synopsis, p. 191.

Color. Above of a light-brown; the sides of a reddish-brown, presenting beautiful metallic reflections; opercula golden. Head, dark-olive above; beneath, white. Pupils black, irides golden. The pectorals, ventrals, and anal fin are reddish-yellow; the dorsal and caudal fins are brown; the latter fin is the darker.

Description. Body subcylindrical, elongated; rounded in front of the dorsal fin, compressed posteriorly; the dorsum is broad in front of the dorsal fin. The scales on the anterior portion of the body are quite small; they increase in size towards the posterior portion, and back of the dorsal fin are much larger; they exhibit at their exposed extremity a few very distinct longitudinal striæ, which are crossed by minute concentric lines; more numerous longitudinal striæ are seen at the concealed extremity, which is rounded at its centre.

Head naked; its length is rather less than one fifth the length of the body. A series of mucous pores extends across the occiput to the gill-covers on each side, and from the termination of this series a second passes forward to the posterior superior angle of the eye, downward back of the eyes, then curves forward and is lost about the snout. Another series passes forward, from the occipital series between the eyes, which extends to the snout. Eyes moderate in size, oblong; distance between the eyes equal to less than one third the length of the head. Mouth small, very protractile, lips carunculated. Lower lip bilobate. Nostrils double, the anterior quite small, the posterior much the larger and partially covered by a fleshy valve. The lateral line, which seems to be a continuation of the series of mucous ducts upon the head,

commences at the posterior superior angle of the operculum, and, curving downwards and backwards a few scales, pursues a straight course to the tail.

The dorsal fin is subquadrangular; it arises at the middle of the body, not including the caudal fin. The first rays are simple.

The pectorals are just back of the inferior posterior angle of the operculum; their height is less than the length of the head.

The ventrals are situated beneath the middle of the dorsal fin; they are as high as the pectorals.

The anal fin is equal in height to the pectorals; it is rounded when expanded. The first two rays are simple; the others are branched; the posterior rays are the shortest.

The caudal fin is deeply lunated; the rays are articulated.

The fin rays are as follows:— D. 14–16. P. 18. V. 10. A. 9. C. 18.

Length, fifteen inches.

Remarks. During the spring and autumn this species is frequently met with in Boston market, and in a mild winter they may be found there at almost any time. They are most commonly brought here from Charles River, Watertown; and sometimes attain the weight of five pounds. They are of but little value. Occasionally they are brought into the city by the cart-load, and sold as the Mullet.

New Hampshire, PECK. Massachusetts, LESUEUR, STORER. New York, Pennsylvania, CUVIER.

CATOSTOMUS GIBBOSUS, *Lesueur.*

The Chub Sucker.

(PLATE XXII. FIG. 4.)

Catostomus gibbosus, *Chub Sucker*, LESUEUR, Journ. Acad. Nat. Sc., I. p. 92, fig.

" " *Gibbous Sucker*, STORER, Report, p. 88.

" " CUV. et VAL., Hist. Nat. Poiss., XVII. p. 443.

" " STORER, Mem. Amer. Acad., New Series, II. p. 420.

" " " Synopsis, p. 168.

Labeo gibbosus, *Gibbous Chub Sucker*, DEKAY, Report, p. 194, pl. 32, fig. 101.

Catostomus tuberculatus, LESUEUR, Journ. Acad. Nat. Sc., I. p. 92, fig.

" " STORER, Report, p. 85.

" " *Horned Sucker*, DEKAY, Report, p. 199, pl. 31, fig. 97.

" " CUV. et VAL., Hist. Nat. Poiss., XVII. p. 444.

Color. The back and upper portion of the sides of this species, when first caught,

are of a dark-brown, which, after death, changes to a greenish hue. Head of a dark slate-color above; opercula, a pale dull yellow. Sides of a greenish-yellow, with golden reflections. Abdomen in front of ventrals nearly white, towards anal fin slightly pinkish. Body marked with four or five faint transverse bands. Dorsal and caudal fins color of the back. Pectorals and ventrals reddish, edged with dark-brown. Anal fin in some individuals color of pectorals and ventrals, in other specimens of a bluish or purplish brown.

Description. Body compressed laterally, convex in front of dorsal fin; this convexity commences suddenly at the occiput, and is greatest at the origin of the dorsal. Greatest depth of fish equal to about one fourth its length. Scales with very distinct striæ; when plucked from the fish, they are quadrangular and exhibit concentric lines passing across the striæ; exceedingly delicate concentric lines are seen over the entire scale. The head, which is smooth, is less than one fifth the length of the fish. Snout short, rounded. Eyes moderate. Nostrils double, separated by a loose membrane, the posterior the larger. Mouth small, lunated. At some seasons of the year, between the eyes and snout on each side of the head are four prominent spines having broad fleshy bases; the upper anterior prominences the largest, and the upper posterior the smallest. Beneath the first spine a smaller one is seen; and directly back of it a third nearly as large as the first. These first three form a triangle. Just above the third prominence and in front of the upper anterior angle of the eye, and between the nostrils and the eye, is a fourth prominence smaller than the others. In some individuals, the spinous parts are removed and the bases remain as hard tubercles; sometimes the bases themselves are removed, and while the points from which they were thrown off in some specimens are scarcely perceptible, in others a distinct excavation is seen. Sometimes one or more tubercles are missing in the same individual. Dekay remarks that this species has "three to five tubercles on each side." I have never met with more than four.

The quadrangular dorsal fin commences upon the anterior half of the body.

The pectorals arise just back of the posterior inferior angle of the operculum; they are rounded when expanded.

The ventrals, which are very nearly as high as the pectorals, are situated opposite the anterior half of the dorsal fin.

The anal fin is deeply emarginate; its third and fourth rays are the longest.

The lower lobe of the caudal fin is slightly longer than the upper.

The fin rays are as follows:—D. 16. P. 16. V. 9. A. 10. C. 18.

Length, seven to twelve inches.

Remarks. This species, which is known under the name of "Barbel" and "Chub Sucker," is found in many of the ponds throughout the State.

Massachusetts, LESUEUR, STORER. New Hampshire, Connecticut, New Jersey, DEKAY. Pennsylvania, LESUEUR.

FAMILY XIII. CYPRINODONTIDÆ.

The mouth is constructed upon the same plan as in the Cyprinidæ; but there are teeth upon the jaws. Instead of a pharyngeal arch, bearing recurved and hooked teeth, the Cyprinodonts have the surface of the posterior portion of the hyoidal apparatus paved with short teeth; and opposite to the latter, in the back part of the roof of the mouth, there are patches of velvet-like teeth. There are neither vomerine nor palatine teeth. The upper surface of the head is generally covered with scales to the tip of the snout. The dorsal fin, in most instances, is situated upon the posterior half of the body, and opposite the anal fin.

GENUS I. FUNDULUS, LACÉP.

Upper surface of head, structure of mouth, and maxillary teeth similar to the same parts in *Hydrargyra*. Lower pharyngeal teeth sub-conical, more slender than in the latter. Branchial rays five on either side. Dorsal similarly opposed to the anal. Caudal posteriorly rounded. Upper surface and sides of head covered with scales as in *Hydrargyra*.

The genera *Fundulus* and *Hydrargyra* are closely allied. The chief differences are, a more flattened head in *Hydrargyra*, giving it some resemblance to *Pæcilia* or *Molinesia*; six branchial rays instead of five; the pharyngeal teeth shorter and stouter, with a more conspicuous crown. Finally, the caudal is sub-truncated posteriorly, instead of being rounded as in *Fundulus*, — a character, however, of minor importance, since we find in the same family genera including species with a rounded, and others with a truncated, caudal fin.

FUNDULUS PISCULENTUS, *Cuv. et Val.**The Ornamented Minnow.*

(PLATE XXIII. FIG. 3. Male. 4. Female.)

Esox pisculentus, *White-bellied Killifish*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., 1. p. 441.*Esox pisciculus*, *Yellow-bellied Killifish*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., 1. p. 441.*Esox zonatus*, *Banded Killifish*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., 1. p. 443.*Fundulus fasciatus*, VAL., in Humboldt and Bonpland, II. p. 162, pl. 62, fig. 1, 4, 5.*Fundulus viridescens*, *Big Killifish*, DEKAY, Report, p. 217, pl. 31, fig. 99.*Fundulus zebra*, *Barred Killifish*, DEKAY, Report, p. 218.*Hydrargyra pisculenta*, AYRES, Bost. Journ. Nat. Hist., IV. p. 267.*Hydrargyra fasciata*, AYRES, Bost. Journ. Nat. Hist., IV. p. 266.

" " STOREY, Mem. Amer. Acad., New Series, II. p. 432.

" " " Synopsis, p. 180.

Hydrargyra ornata, LESUEUR, Journ. Acad. Nat. Sc., 1. p. 131." " *Ornamented Minnow*, STOREY, Report, p. 94.

" " DEKAY, Report, p. 221.

" " STOREY, Mem. Amer. Acad., New Series, II. p. 433.

" " " Synopsis, p. 181.

Fundulus pisculentus, CUV. et VAL., Hist. Nat. Poiss., XVIII. p. 190.

" " GIRARD, in Lit.

Fundulus zonatus, CUV. et VAL., Hist. Nat. Poiss., XVIII. p. 190.

Color. Female of a uniform brown color.

Male, lighter at intervals upon the sides, the appearance being presented of transverse bands. Dorsal and anal fins with black dots. Anal fin slightly emarginated posteriorly.

Description. Body oblong, stout, compressed posteriorly. Top of head and back flattened. Head one fourth the entire length of the fish. Scales upon top of head very large. Diameter of eyes equal to one fourth the length of the head. Eyes distant from each other. A series of mucous pores on each side of head above eyes, extending also in front of eyes to the anterior inferior edge; a series is also seen along lower edge of operculum. The nostrils are situated just in front of the anterior superior edge of the eye. Mouth protractile, vertical when jaws are closed. Very minute, numerous teeth in both jaws.

The dorsal fin is situated upon the posterior half of the body; it is rounded above.

The pectorals are broad and fan-shaped.

The anal fin is situated beneath the dorsal.

The ventrals are small, their rays are multifid.

The caudal fin is broad, rounded posteriorly.

The fin rays are as follows: — D. 12. P. 15. V. 6. A. 9–10. C. $20\frac{3}{4}$.

Length, one to five inches.

Remarks. This is the most common Minnow found in the salt marshes around Boston, and is known generally by the boys under the name of *Cobler*. It is taken in

large quantities with hand nets, being excellent bait for other fishes, more particularly for Smelts.

I have also seen a flock of the domestic duck swallowing it with the greatest avidity when thrown to them in the same manner as grain, with other species of Killifish.

Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, DEKAY. Delaware river, LESUEUR. Carolina, DEKAY.

FUNDULUS NIGROFASCIATUS, *Cuv. et Val.*

The Banded Minnow.

(PLATE XXIII. FIG. 1.)

Hydrargyra nigrofasciata, LESUEUR, Journ. Acad. Nat. Sc., I. p. 133.

" " *Banded Minnow*, STORER, Report, p. 94.

" " DEKAY, Report, p. 221.

" " STORER, Mem. Amer. Acad., New Series, II. p. 434.

" " " Synopsis, p. 182.

Fundulus nigrofasciatus, CUV. et VAL., Hist. Nat. Poiss., XVIII. p. 193.

" " GIRARD, in Lit.

Color. Above, yellowish-green, with numerous minute black dots; beneath, silvery white. From ten to fourteen narrow black bars cross the sides transversely; the anterior pass to the abdomen, the posterior cross the fleshy portion of the tail entirely; opercula cupreous; a yellow spot exists at the origin of the base of the dorsal fin. Pupils black, irides silvery. In the male fish, the bars are broader.

Description. Head compressed above; its length is equal to one fourth the length of the fish. The eyes are small and circular. The distance between the eyes is equal to one half the length of the head. Jaws projectile.

The dorsal fin is situated upon the posterior portion of the body.

The pectorals are just back of the opercula.

The ventrals are very small.

The anal fin is similar in form to the dorsal, and situated opposite that fin.

The caudal fin is slightly rounded.

The fin rays are as follows: — D. 12. P. 18. V. 6. A. 12. C. 17.

Length, two to three inches.

Remarks. This species is much less common than the *pisculentus*. It is found in the vicinity of Boston, in Fresh Pond, Cambridge.

Massachusetts, STORER. Rhode Island, LESUEUR.

FUNDULUS MULTIFASCIATUS, *Cuv. et Val.**The Barred Minnow.*

(PLATE XXIII. FIG. 2.)

Hydrargyra multifasciata, LESUEUR, Journ. Acad. Nat. Sc., i. p. 131." " *Barred Minnow*, DEKAY, Report, p. 220.

" " STORER, Mem. Amer. Acad., New Series, II. p. 433.

" " " Synopsis, p. 181.

Fundulus multifasciatus, CUV. et VAL., Hist. Nat. Poiss., XVIII. p. 200.

" " GIRARD, in Lit.

Color. The living fish is of an olive upon its whole upper portion; the sides are lighter; the lower portion of the opercles silvery; the throat and posterior portion of the abdomen are of a bluish-gray color; the body is transversely marked with numerous bluish bands, and dotted with darker minute points; the pupils are black, the irides silvery. When dead this species changes to a yellowish-green, darker above; and the transverse bands are scarcely perceptible.

Description. Body cylindrical anteriorly, more compressed posteriorly; dorsum slightly convex just anterior to the dorsal fin; its greatest depth equal to one sixth its length. The head is broad and flattened above. Its length is greater than the greatest depth of the fish, and less than one third its entire length. The distance between the eyes is equal to one third the length of the head. The eyes are large, somewhat oblong. The jaws are equal, and are armed with very minute teeth. The nostrils are large, and are situated just anterior to the upper edge of the eyes.

The indistinct lateral line is nearly straight.

The dorsal fin, which is quadrangular, commences upon the anterior half of the body.

The pectorals are fan-shaped, and are equal in height to the length of the dorsal fin. They extend just beyond the origin of the ventrals.

The ventrals are small; they commence on a line with the posterior extremity of the pectorals; their third ray is the longest.

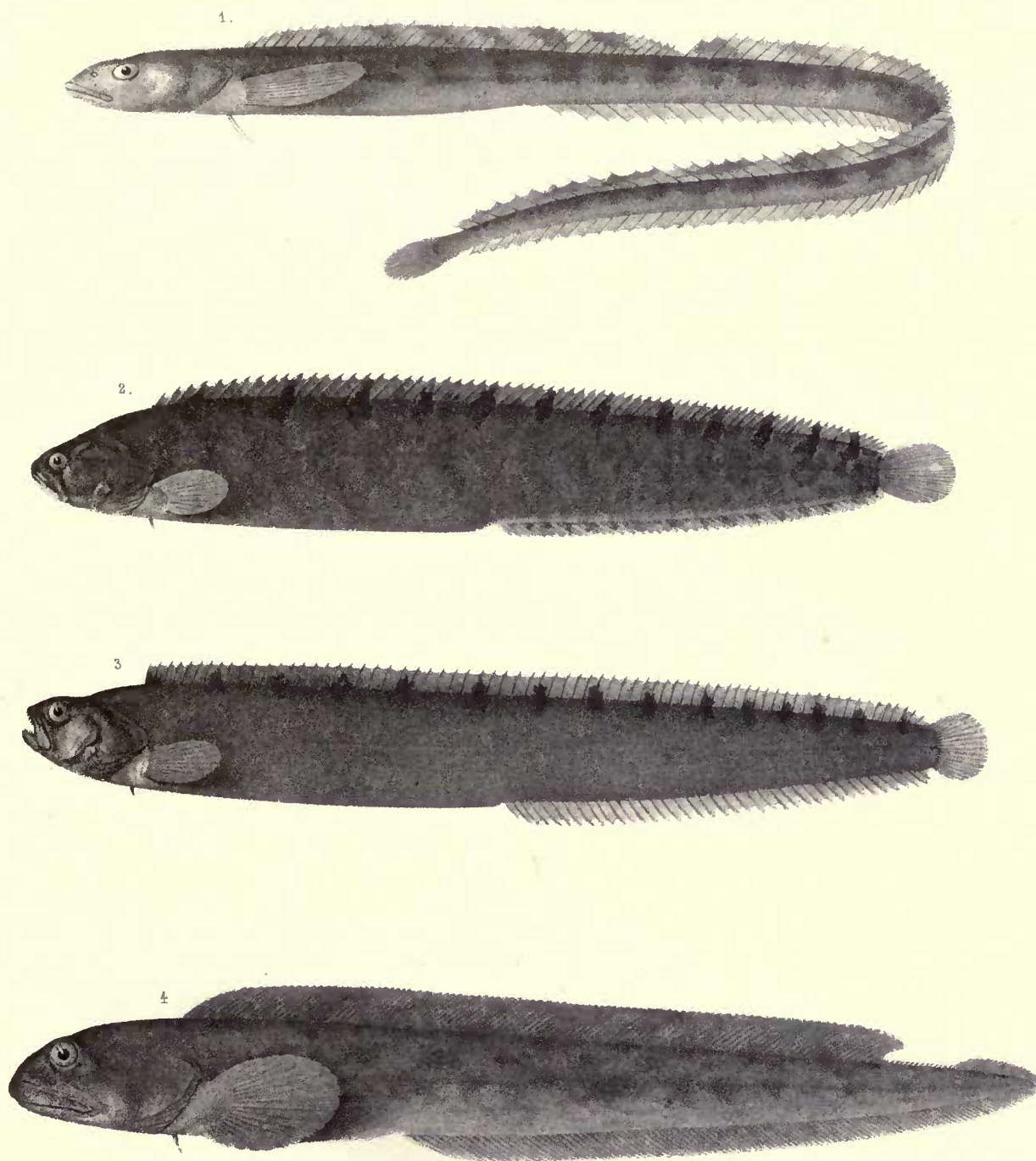
The anal fin is shorter than the dorsal, and terminates just in front of the posterior extremity of that fin.

The caudal fin is broad, and nearly straight at its termination.

The fin rays are as follows: — D. 13–14. P. 18. V. 5. A. 12–13. C. 16.

Remarks. Professor Agassiz kindly lent me a specimen of this fish taken at Concord; and a second taken at Lowell has been sent me by my friend, Mr. Charles Girard, of the Smithsonian Institute, to whom I would express my most grateful acknowledgments for his invaluable aid in the preparation of the Cyprinidæ for the press.

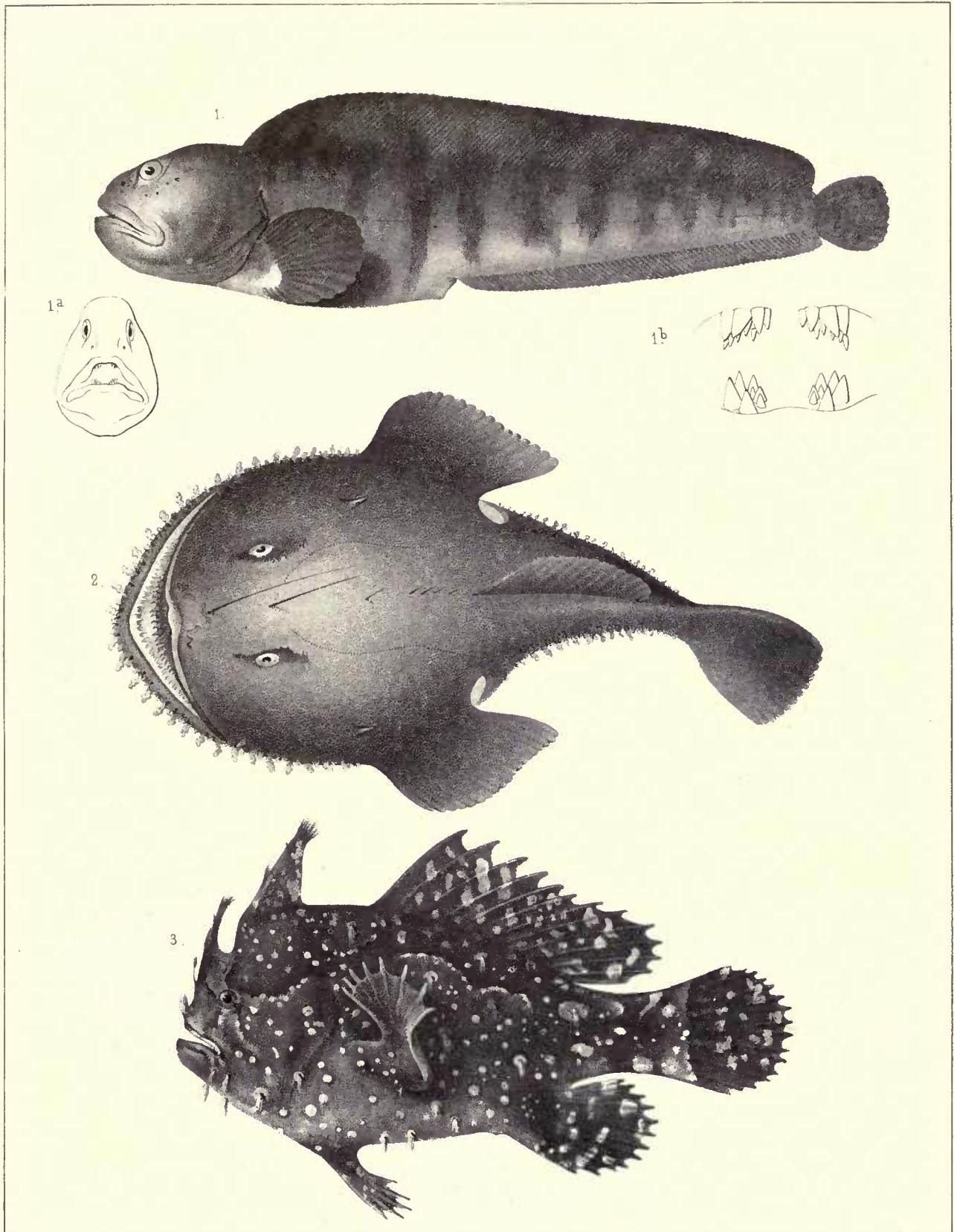
Massachusetts, AGASSIZ, GIRARD. New York, LESUEUR.



Tappan & Sonrel.

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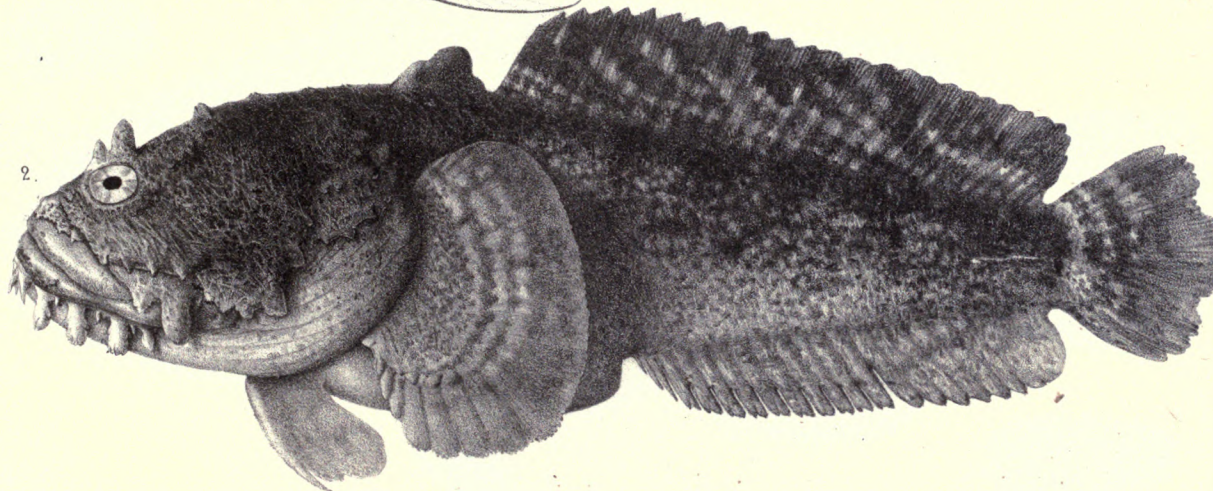
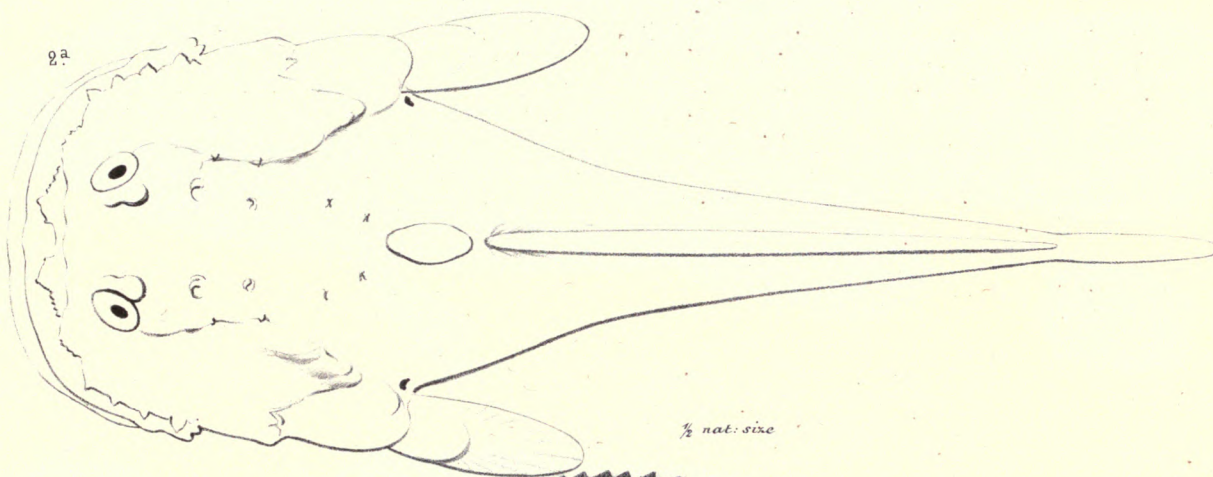
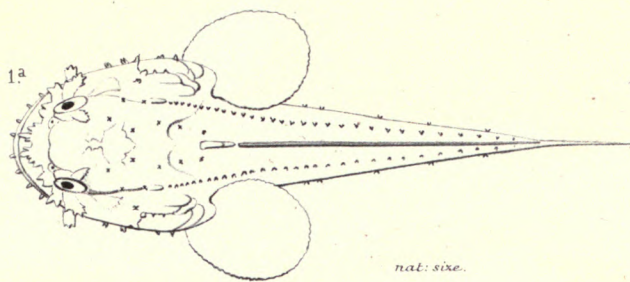
1. *BLENNIUS SERPENTINUS*, Storer.2. *GUNNELLUS MUCRONATUS*, Cuv.3. *G. MACROCEPHALUS*, Girard.4. *ZOARCES ANGUILLARIS*, Storer.

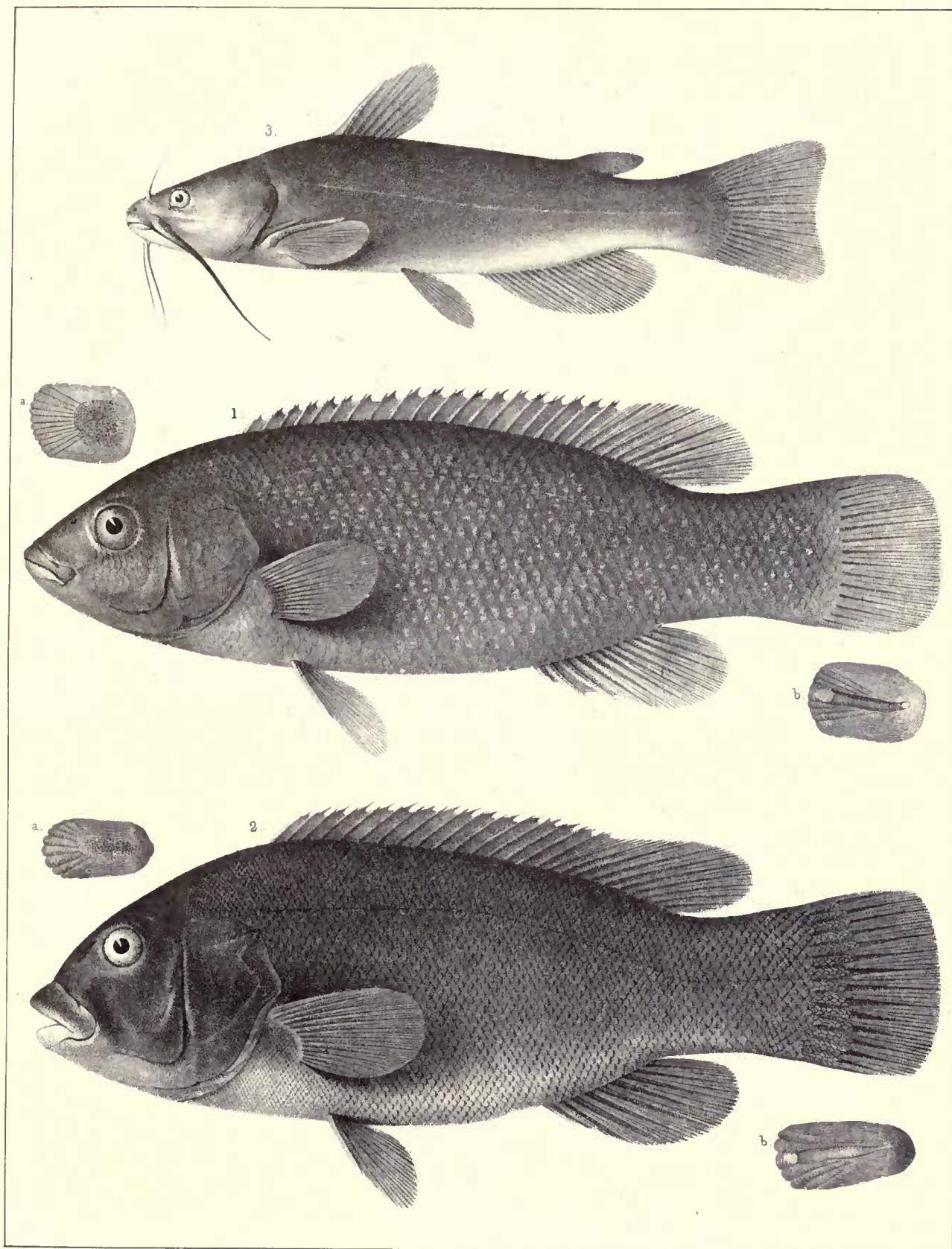


Teppan & Sonrel

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1. ANARRHICUS VOMERINUS, Agass. 2. LOPHIUS AMERICANUS, Cuv. 3. CHIRONECTES LAEVIGATUS Cuv.





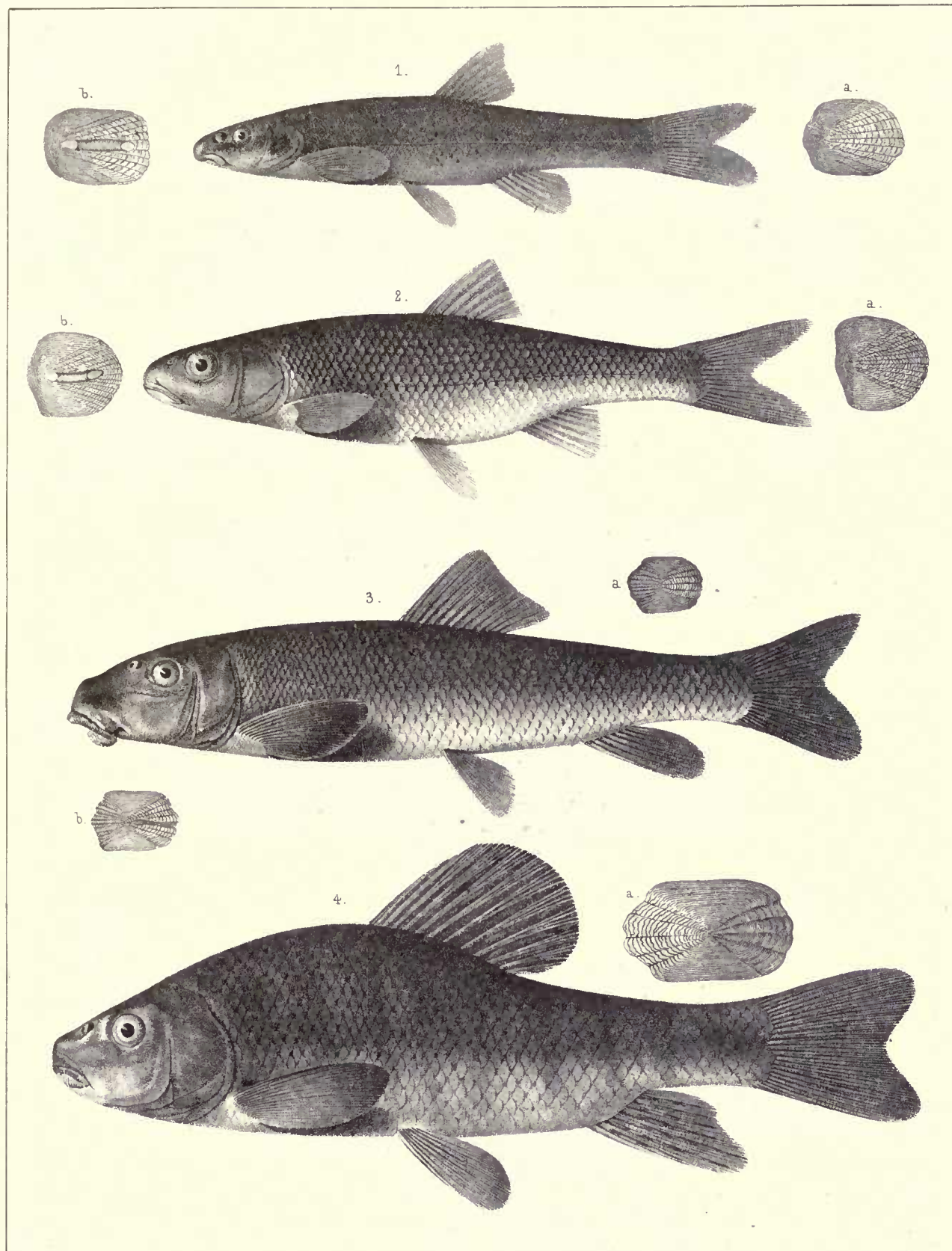
1. CTENOLABRUS CERULEUS Dekay. 2. TAUTOGA AMERICANA, Dekay. 3. PIMELODUS ATRARIUS, Dekay.



A. Sonrel.

Print by L. H. Bradford & Co.

1. CYPRINUS AURATUS, Lin. 2. LEUCOSOMUS AMERICANUS, Girard
3. HYPSOLEPIS CORNUTUS, Girard 4. ARGYREUS ATRONASUS, Heck.



A. Sauer.

Print. by L. H. Bradford & Co.

1. ARGYREUS NASUTUS, Girard 2. CHEILONEMUS PULCHELLUS, Girard
3. CATOSTOMUS BOSTONIENSIS, Lesueur. 4. CATOSTOMUS GIBBOSUS, Lesueur.



A. Sonrel.

Print. by L.H. Bradford & Co.

1. FUNDULUS NIGROFASCIATUS, Cuv. & Val. 2. F. MULTIFASCIATUS, Cuv & Val
3 & 4. F. PISCULENTUS, Cuv & Val. 5 & 6. HYDRARGYRA FLAVULA, Storer

an accumulation of disturbances, of which the absence of inequalities lessens the probability, bring the rings together, the velocities at the point of contact will be very nearly equal, and the two will coalesce without disastrous consequences.

If in its normal condition the ring has but one division, as is commonly seen, under peculiar circumstances it might be anticipated that the preservation of their equilibrium would require a separation in some regions of either the inner or outer ring; this would explain the fact of occasional subdivisions being seen. Their being visible for but a short time, and then disappearing, to the most powerful telescopes, is accounted for by the removal of the sources of disturbance, when the parts thrown off would reunite.

Finally, for a fluid ring, symmetrical in its dimensions, there is not the same necessity for a state of unstable equilibrium, with reference either to Saturn or to the other rings, which obtains in the case of a rigid coherence of its particles.

VIII.

A History of the Fishes of Massachusetts.

By DAVID HUMPHREYS STORER, M. D., A. A. S.

Continued from page 92.

OTOLITHUS REGALIS, Cuv.

The Weak-fish.

(PLATE IX. FIG. 1.)

Johnius regalis, SCHN.

Labrus squeteague, *Weak-fish*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 396, pl. 2, fig. 6.

L'Otolithe royal (*Otolithus regalis*, CUV., *Johnius regalis*, SCHN., *Labrus squeteague*, MITCH.), CUV. et VAL., v. p. 67.

Sciæna (*Otolithus*) *regalis*, *Squeteague*, RICH., Faun. Boreal. Americ., III. p. 68.

Otolithus regalis, *Weak-fish*, STORER, Report, p. 33.

" " " AYRES, Bost. Journ. Nat. Hist., IV. p. 259.

" " " DEKAY, Report, p. 71, pl. 8, fig. 24.

" " " LINSLEY, Cat. of Fishes of Conn.

" " " STORER, Mem. Amer. Acad., New Series, II. p. 318.

" " " STORER, Synopsis, p. 66.

Color. The upper part of the body is of a bluish color, with irregularly distributed brownish spots. Sides silvery. Abdomen white. Pupils black; irides yellow. Dorsals, pectorals, and caudal fin brownish. Ventrals and anal orange.

Description. Body elongated, compressed. The length of the head is equal to one fourth the whole length of the fish; it is flattened between the eyes, and slightly convex back of them. The eyes are large and horizontally oblong, and about one seventh the length of the head. The nostrils are situated directly in front of the superior anterior angle of the eye; — the posterior the larger, a vertical slit; the anterior circular. Mouth large. The lower jaw the longer, with a single row of separated, sharp teeth upon its sides, and several rows of smaller teeth at its centre. The sides of the upper jaw are armed with very minute teeth; somewhat larger teeth are observed at its centre, in

the midst of which are situated two strong, incurved fangs. Minute teeth in the pharynx.

The lateral line arches backwards until opposite the posterior termination of the second dorsal fin, whence it pursues a straight course to the extremities of the caudal rays.

The triangular first dorsal fin commences just back of the origin of the pectorals; its third and fourth rays are longest.

The second dorsal is elongated, and diminishes in height posteriorly; it terminates on a line with the anal fin.

The pectoral fins arise just beneath the posterior angle of the operculum, and extend beyond the middle of the first dorsal.

The ventral fins commence posterior to the base of the pectorals, and terminate on a line with the tips of those fins.

The anal fin is short and quadrangular.

The caudal fin is somewhat emarginated.

The fin rays are as follows: — D. 8-1-28. P. 15. V. 6. A. 13. C. 17. Length one to two feet.

Remarks. Many years since, this species was found in abundance about Nantucket and Martha's Vineyard, but of late it has disappeared. Dr. Yale wrote me, in October, 1837, "The *squeteague* has deserted these waters; there has not been one taken for three or four years about here; they left about the time that the *blue-fish* came." Hon. Hezekiah Barnard, of Nantucket, in a letter to me, dated July, 1838, remarked, "The *squeteague* or *weak-fish* have disappeared since the return of the *blue-fish*, who are their avowed enemy. I have conversed with our fishermen; they say they have scarce seen one for six years."

On the 23d of June, 1847, a *squeteague* was taken at Provincetown, the first known to have been taken there for twenty years.

Bay of Chaleur, Lieut.-Col. HAMILTON SMITH. Massachusetts, STORER. New York, MITCHILL, DEKAY. Caribbean Sea, CUVIER.

GENUS II. UMBRINA, Cuv.

Distinguished from the Scienoids by a cirrus under the symphysis of the lower jaw.

UMBRINA NEBULOSA, Storer.

The King-fish.

(PLATE IX. FIG. 4.)

- Sciæna nebulosa*, *King-fish*, MITCHILL, Trans. Lit. and Phil. Soc. of N.Y., I. p. 408, pl. 3, fig. 5.
L'Ombrine des Etats Unis (*Umbrina alburnus*, CUV., *Sciæna nebulosa*, MITCH., *Perca alburnus*, LIN., *Centropomus alburnus*, LACEP.), CUV. et VAL., Hist. Nat. des Poiss., v. p. 180.
Umbrina nebulosa, *King-fish*, STORER, Report, p. 35.
 " " " AYRES, Bost. Journ. Nat. Hist., IV. p. 259.
 " " " LINSLEY, Cat. of Fishes of Conn.
Umbrina alburnus, *King-fish*, DEKAY, Report, p. 78, pl. 7, fig. 20.
 " " " STORER, Mem. Amer. Acad., New Series, II. p. 323.
 " " " STORER, Synopsis, p. 71.

Color. Of a dull gray color, with silvery reflections upon sides, ornamented with irregularly disposed dark bars; some passing obliquely forwards from the dorsal fin; others passing obliquely backwards from nape of neck; and one broader one pursues a straight course backwards through the middle of the body, from extremity of pectorals to the tail. Body beneath, yellowish. Extremities of first dorsal, pectorals, and tips of ventrals, white; rays black; second dorsal and base of pectorals and ventrals color of abdomen.

Description. Body elongated, slightly arched over pectorals, gradually tapering towards tail. Length of head, which is the same as the greatest depth of the body, equal to one fifth the entire length of the fish. Scales upon the head smaller than those upon the body; head slightly flattened between eyes; rounded upon occiput; somewhat depressed back of snout. Snout blunted, projecting slightly beyond upper jaw. Eyes of moderate size; the greatest diameter equal to half the distance between eyes. Nostrils directly in front of eyes; the posterior larger, situated obliquely beneath and in front of the anterior inferior angle of eye; at the anterior inferior angle of this orifice is situated the anterior nostril, which is very small and circular. Mouth of moderate size, projectile; lips fleshy; jaws filled with numerous very small card-like teeth, the front row in the upper jaw the longest; upper jaw the longer; a small fleshy cirrus is suspended from the chin. Preoperculum serrated at its posterior margin; more sparsely so beneath. A small, concealed, delicate spinous point is observed at posterior portion of operculum. Lateral line very distinct, curving with the body.

The triangular dorsal fin arises just back of the pectorals; its first ray is a minute spine; the third ray is much the longest of all; this ray is nearly twice as high as the length of the fin, and nearly three tenths the length of the fish. The extremities of the rays are free, like those of the other fins.

The height of the second dorsal, which is equal throughout, is one sixth of its length.

The length of the pectorals is less than one third their height.

The ventrals arise in front of the posterior half of the pectorals; extremities multifid; first ray stoutest.

The caudal is deeply emarginated; the upper lobe pointed, the lower broad and rounded at extremities; about as high as long.

The fin rays are D. 10-26. P. 21. V. 5. A. 10. C. 18.

or D. 9-26. P. 19. V. 5. A. 10. C. 17.

Length sixteen and a half inches.

Remarks. In my "Report on the Fishes of Massachusetts," published in 1839, I admitted this species under the name of *Umbrina nebulosa*. As Dekay, in his "Report on the Fishes of New York," published in 1842, accepted the opinion of Cuvier, that it was identical with the *Perca alburnus* of Linnæus, I felt in a measure compelled to coincide; and consequently in my "Synopsis of the Fishes of North America" I introduced it as the *Umbrina alburnus*. Convinced that our species is distinct from the Southern fish, I have resumed my former opinion.

This species must be very rare in our waters. The specimen belonging to the Natural History Society of this city was captured in a lobster-pot at the Boston light-house, previous to the year 1833. In 1840, a specimen was taken at Lynn, and was referred to by me in the Journal of the Natural History Society. In July, 1846, Captain Atwood caught one at Provincetown; and in November, 1847, a second specimen at the same place. Both of these latter specimens were taken in nets, while fishing for mackerel. These are all of which I have any knowledge.

Massachusetts, STORER. Connecticut, AYRES, LINSLEY. New York, MITCHILL, DEKAY.

FAMILY IV. SPARIDÆ.

This family is characterized by the opercular pieces being unarmed; the palate toothless; the jaws not protractile; scales large. Branchial rays not exceeding six.

GENUS I. SARGUS, Cuv.

Trenchant incisors in front of the jaws, almost similar to those of man; molars rounded.

SARGUS OVIS, *Cuv.**The Sheep's-head.*

(PLATE X. FIG. 1.)

Sparus ovis, *Sheep's-head*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 392, pl. 2, fig. 5.*Le Sargue tête-de-mouton* (*Sargus ovis*, CUV., *Sparus ovis*, MITCH.), CUV. et VAL., Hist. Nat. des Poiss., VI. p. 53.*Sargus ovis*, *Sheep's-head*, STORER, Report, p. 36.

" " " DEKAY, Report, p. 89, pl. 8, fig. 23.

" " " AYRES, Bost. Journ. Nat. Hist., IV. p. 260.

" " " STORER, Mem. Amer. Acad., New Series, II. p. 332.

" " " STORER, Synopsis, p. 80.

Color. Light gray, with six quite distinct, dark-brown, transverse bands, broad and nearly equidistant from each other; another band across neck, over shoulders. Head above darker; orbits greenish; gill-covers with silvery and golden reflections. Throat somewhat reddish. Pupils black, irides golden. Scales throughout body margined with darker than their centre. Fin membranes dark brown or black, save that of pectorals, which is nearly colorless.

Description. Body short, stout. Back rounded, slightly elliptical. Head hardly projecting, about one fourth the length of fish; its depth about five sevenths its greatest depth; its width between eyes about two fifths its length. Posterior and upper part of head scaled, the rest naked. Lips large and fleshy; jaws equal, armed in front with large, stout, quadrangular teeth, the outer of which are somewhat curved inward; these teeth in the upper jaw slightly overlap those of the lower; within and behind these are several rows of teeth, rounded or obtusely conical. Eyes large, their diameter nearly equal to half the distance between them; just above and in front of them the orbital ridge is quite prominent. Nostrils high up in head, anterior to eye, double, the posterior an elongated slit opening backwards. Head anteriorly abounding in mucous pores. Posterior opercular margin sinuous. Scales upon body generally very large, although in some places their size is greatly diminished, as upon top of head, the throat, and the bases of all the fins save the anterior three quarters of the dorsal. Lateral line commences high over pectorals, and, curving upwards at first rather more than the line of body, gradually becomes parallel to it until it reaches a line with termination of dorsal and anal, whence it runs straight to middle of caudal; its scales present dark ramifications, which appearance is also found upon the scales bordering a triangular space on top of head.

The first twelve rays of dorsal fin are strongly spinous; of these the alternate rays are much larger than their neighbors. The first five of these rays gradually increase in length; the remaining seven are about equal. The rest of the fin increases in height, giving its termination a peculiar truncated appearance. Behind and beneath the base of the fin, as well as at termination of anal, is a deep emargination.

Pectorals very much elongated; the rays of first half are simple, the others branched.

Ventrals stout, subtriangular; at their base a strong spinous process, covered with scales, connected along its edge by several membranous attachments. The first ray is spinous.

The anal shuts anteriorly into a deep groove, as does also the dorsal. Its first three rays are spinous; the second is much the largest.

Caudal slightly truncated; the interspaces between its rays are well scaled at first.

D. 12-12. P. 16. V. 1-6. A. 3-2. C. 22. Length twenty inches.

Remarks. This delicious fish, which has been so minutely described and so highly eulogized by Mitchill, in his "History of the Fishes of New York," is occasionally taken in the waters of Massachusetts south of Cape Cod. Thomas A. Greene, Esq. of New Bedford, informs me it is sometimes sold in that market from the above-noticed locality. Dr. Mitchill speaks of it "as the most esteemed of the New York fishes, and fetching a higher price than any, excepting, perhaps, fresh salmon and trout"; and Dekay remarks, "The sheep's-head holds the same rank with American gastronomes that the turbot holds in Europe. I have frequently eaten of both, under equally favorable conditions, that is to say, within an hour after having been taken from the water, and can assert that the sheep's-head is the more delicate and savory fish."

Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY. Lake Pontchartrain, Louisiana, LESUEUR.

GENUS II. PAGRUS, Cuv.

But two rows of small, rounded molar teeth in each jaw.

PAGRUS ARGYROPS, Cuv.

The Scapaug.

(PLATE X. FIG. 4.)

Sparus argyrops, LIN., Syst. Nat., GMEL., p. 1277.

" " *Silver-eyed Sparus*, SHAW, Gen. Zool., IV. p. 426.

Labrus versicolor, *Big Porgie of New York*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 404, pl. 3, fig. 7.

Le Pagre ail-d'argent, *Pagrus argyrops*, CUV. et VAL., VI. p. 164.

" " *Big Porgie, Scapaug, Scup*, STORER, Report, p. 38.

" " " DEKAY, Report, p. 95, pl. 9, fig. 25.

" " LINSLEY, Cat. of Fishes of Conn.

" " *Porgie*, AYRES, Bost. Journ. Nat. Hist., IV. p. 260.

" " STORER, Mem. Amer. Acad., New Series, II. p. 334.

" " STORER, Synopsis, p. 82.

Color. When just caught, this fish is of a beautiful pinkish tinge or flesh-color upon the upper portion of the sides; abdomen silvery. The naked portion of the head, be-

tween, anterior, and posterior to the eyes, reddish. At the base of the dorsal fin on each side is a narrow green ridge; also a similar ridge just back of the eyes. Pupils black; irides silvery, with the exception of the upper middle portion, which is brown or cupreous. The dorsal fin is reddish, with the bodies of the anterior rays silvery white. Pectorals with a slight tinge of red, greenish at their base beneath. Ventrals of a greenish tinge. Anal brownish, margined with blue. Caudal reddish.

Description. The length of this species is from eight to twelve inches; the length of the head is about one fourth the length of the entire fish; the depth of the body across from the base of the pectorals is equal to rather more than one third its length; the width of the body at the base of the tail is equal to one tenth its length. Body very much compressed towards the back; back gibbous, gradually curving towards the tail. The eyes are large and circular. The jaws when closed are equal. In the back of the jaws are two rows of blunt teeth; those in front of the jaws are sharp and prominent. The lips are large and loose. The nostrils are double; the anterior is smaller and circular, the posterior larger and vertical. The head is destitute of scales. The preoperculum and operculum are covered with scales. A large semicircular scale is observed at the commencement of the lateral line; between this scale and the outer angle of the naked space at the posterior angle of the eye, a band of smaller scales than those of the body passes obliquely upwards to the anterior portion of the dorsal ridge. The lateral line, commencing back of the upper angle of the operculum, and passing obliquely up to a point on a line with the fifth or sixth spine of the dorsal fin, curves with the body to the base of the tail.

The dorsal fin is received into a deep groove at its base; when this fin is not erect, the spines are scarcely visible, so completely do they shut into this groove. The third spine is the longest; from the extremities of the first three spines are suspended delicate filaments. Just anterior to the dorsal fin is situated a strong horizontal spine, almost entirely enveloped by the skin, which projects forwards.

The pectoral fins commence on a line beneath the origin of the dorsal fin; they are one fourth the length of the body.

The ventrals are just back of the pectorals; their second and third rays are the longest. A large subsidiary scale exists at the anterior edge.

The anal fin is shorter than the dorsal, and terminates on the same plane with that fin, and like the dorsal is received into a groove at its base.

The caudal fin is quite deeply forked.

The fin rays are as follows: — D. 12–12. P. 15. V. 6. A. 3–11. C. 16 $\frac{3}{5}$.

Length about a foot.

Remarks. This pretty species, which is known as the Scup, Porgee, and Scapaug, is taken in large quantities in Buzzard's Bay and the Vineyard Sound; and at New Bedford, Holmes's Hole, and Gay Head it is one of the most common fishes, and in a fresh state is used more than any other. At Holmes's Hole it is taken from the first of June until the middle of October with the hook; after that date, in the ponds, with spears and nets. Within a few years, small numbers have appeared north of Cape Cod, and are now yearly captured at Wellfleet and Sandwich.

In the year 1834 or 1835, Captain William C. Downes, of Holmes's Hole, carried a smack-load of this species from the Vineyard Sound, and threw them overboard in Plymouth Harbor.

Mr. James Newcomb, fishmonger in the Boston Market, informs me that in the year 1831 or 1832 a smack-load of scapaugs arrived in Boston Harbor. A portion of them were purchased by subscription among the fishermen in the market, and thrown into the harbor. The next season two specimens were caught from our wharves; in the summer of 1835, one individual was taken at Nahant, and was considered a very strange fish, no specimen having been known to have been seen there before; in 1836, still another was captured at Nahant. As no specimen had ever been taken so far north before, and as the few taken would lead to the inference that those which had been transplanted from Buzzard's Bay had not bred in the cold waters of this portion of Massachusetts Bay, we are led to believe the individuals taken immediately around Boston were of the number of those originally brought from the South.

Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, CUVIER, DEKAY. South Carolina, LINNÆUS.

FAMILY V. SCOMBRIDÆ.

The fishes of this family have small scales, so that the greater part of the skin appears as if entirely smooth. The ventral fins are destitute of scales; the opercula are without spines or denticulations; in most of them the caudal fin is large and powerful, and generally they are furnished with numerous cœca.

GENUS I. SCOMBER, Cuv.

Body fusiform, covered by scales which are uniformly small; sides of the tail not carinated, but merely raised into two small cutaneous crests; dorsal fins widely separated; some of the posterior rays of the second dorsal and anal free, forming finlets; one row of small conical teeth in each jaw.

SCOMBER DEKAYI, *Storer.**The Spanish Mackerel.*

(PLATE XI. FIG. 1.)

Scomber colias, *The Spanish Mackerel*, STORER, Report, p. 45.

" " " " DEKAY, Report, p. 104, pl. 11, fig. 23.

" " " " STORER, Mem. Amer. Acad., New Series, II. p. 341.

" " " " STORER, Synopsis, p. 89.

Color. The upper part of the body is of a light-green color, with numerous contiguous beautifully undulating lines of a darker green passing down the sides and just crossing the lateral line. Beneath the lateral line is an interrupted dull-brown band, arising beneath the pectorals and continued in a straight course to the tail; below this band the sides are silvery, with numerous irregularly marked blotches, circular, oval, and oblong. The abdominal ridge is immaculate; the entire sides exhibit cupreous reflections. The upper portion of the operculum is greenish, with cupreous reflections; the inferior portion, as well as the preoperculum and jaws, is silvery. The first dorsal fin is transparent, slightly dusky; the pectorals have a small black blotch at their base, within, which is scarcely perceptible unless the fins are raised; their outer base is silvery. The ventrals are of a reddish white. The caudal fin is of a yellowish green. The pupils are black; the irides silvery. The mouth is fuliginous; the tongue is greenish, with a metallic tint.

Description. The body is cylindrical, very plump, tapering towards the tail, at the origin of which it is very small. The greatest depth of the body is equal to rather more than one sixth its length. The length of the head is less than one fourth the length of the body; it is flattened upon its top, compressed upon its sides; the snout is rather pointed. The eyes are large and circular; the diameter of the eyes is less than the distance between them. The nostrils are double; the anterior is circular, in front of posterior a distance equal to that between the posterior and the eye; the posterior is vertical, just in front of the eyes. The jaws are equal, crowded by a single row of very minute teeth.

The first dorsal fin arises opposite the middle of the pectoral fins; its first ray upon its outer edge is margined, as well as the spaces between the tips of the rays, with black; the second ray is the longest; the most posterior ray is exceedingly minute. The tips of all the rays project slightly beyond the membrane.

The second dorsal fin commences back of the first, at a greater distance than the length of the first dorsal. This fin is shorter than the preceding; its rays are short, and enveloped in a thick membrane emarginated above; the extremities of the rays project

slightly beyond the membrane. There are five finlets back of the second dorsal fin ; the fifth is deeply divided, making it appear like two finlets.

The pectorals are just beneath the origin of the lateral line ; they are triangular, and their length is equal to the height of the first dorsal ray.

The ventrals are fan-shaped ; they are situated just in front of the first dorsal fin : their rays are multifold.

The anal fin arises back of the second dorsal fin, and like it is emarginated above, and has five finlets posterior to it. A small spine, projecting backwards, is situated at the origin of the anal fin.

The caudal fin is deeply forked, and has at its base two lateral carinæ.

The fin rays are as follows : — D. 9 – 11 or 12. P. 19. V. 5. A. 12 or 13. C. 18 $\frac{1}{2}$. Length, one to two feet.

Remarks. The many points of resemblance to the *Scomber colias*, Gmel. presented by this fish, caused me to consider it as identical with that species, and thus I described it in my "Report on the Fishes of Massachusetts." With this opinion Dekay coincided in his "Report on the Fishes of New York" ; although we might infer that he was not perfectly convinced of our species being the foreign fish, from the following sentence at the conclusion of his description : "If this species is identical with the *S. colias* of Europe, it has a wide geographical range," &c. Subsequent investigation has convinced me that the species under consideration is indigenous to the American coast. It differs from the *S. colias* in its more robust figure, its markings, and the number of rays in the first dorsal fin. I know of no other species for which it can be mistaken. With a melancholy pleasure I would dedicate it to the memory of the lamented naturalist who has accomplished so much for the science of our country.

This fish is of late years found more rarely along our coast than formerly. Captain Blanchard, of Lynn, informs me, that during some seasons but two or three individuals are taken by the fishermen. Captain Atwood has seen but a single specimen during the last four or five years ; many years since, it was abundant at Provincetown, and would run up the small creeks, and be left by the tide. This fish usually weighs about three quarters of a pound ; generally speaking, it is as fat as the *Scomber vernalis*, but it is not considered so good to eat ; by epicures, however, it is thought to be excellent, even preferable to the common mackerel. Dekay states that he has seen specimens nearly two feet in length in the New York market.

Massachusetts, STORER. Connecticut, LINSLEY. New York to Carolina, DEKAY.

The second dorsal, situated upon the posterior half of the head, is of a fuliginous color, margined with white ; it is nearly three times as long as high ; back of this second dorsal, occupying the space between it and the tail, are five finlets, the fifth of which is usually the largest.

The pectoral fins, of a dark color, having at their base beneath, a black blotch, arise back of the upper third of the operculum. Their length is equal to about one third their height.

The ventrals arise back of the pectorals, and likewise have beneath them a black spot at their base ; save the tinge given them by this spot, they are of a flesh color in the fresh fish, but soon become the color of the abdomen after death. The first ray is very strong. All the rays are subdivided at their middle, and again divided into smaller portions at their extremities.

The anal fin arises directly back of the anus, which is situated opposite the origin of the second dorsal. At the commencement of this fin is a short spine ; this fin is slightly shorter than the second dorsal, and is of the same color as the abdomen. Back of this fin are six finlets ; that next the anal fin appearing at first sight to be a portion of the fin.

At the base of the caudal fin are situated two longitudinal carinæ, extending the whole length of the fleshy portion of the tail ; the outer rays of the caudal fin are much the larger ; their articulations are very direct ; the fin is deeply forked ; its extremities are margined with white ; the distance between the extremities of the caudal rays, when expanded, is equal to the length of the head.

The fin rays are as follows : — D. 10 – 12. P. 17. V. 5. A. 12. C. 20.

Remarks. Mitchill described the mackerel which visit our shores in the spring, and those which are taken in the autumn, as distinct species. Dekay coincides with him in his opinion. In my "Report" I considered them as one species, agreeing with Richardson, who observes : "The only differences between *S. grex* and *vernalis* seem to be in their size and color, and they are very probably different ages of the same species." In my "Synopsis" I reluctantly yielded my opinion to that of Dekay, and described the two species. Satisfied that my early impressions were correct, I again unite them, remarking, as in my "Report," that "I have examined with much care the mackerel which are brought to our market, and the differences are too slight between them to constitute distinct species."

This beautiful species is one of the most valuable fishes which frequents our waters. From the 10th of May to the 15th of June, they appear at the entrance of Massachusetts Bay, having been a few days previous at Nantucket and Vineyard Sound. Nine tenths of those which are first seen are *males*, and they are all large, but poor, weighing from

one pound to a pound and a half each. After they have been cured, and made ready for inspection, and are packed for the third quality, one hundred and fifty-four, fifty-five, or fifty-six constitute a barrel. At their first appearance they will not take the hook, and are therefore captured in nets. The fishermen of Provincetown are the only persons in the State who thus take them. Their nets are about eighty yards long and eighteen feet deep, with the meshes three and a quarter inches long, of a size intermediate between a herring net and a menhaden net, the one being too large and the other too small. These nets are suspended vertically in the water, so that when the mackerel, as they swim along, endeavor to pass through, they are caught by the gills; or should they be smaller than usual, they pass their heads through, and are caught by the body.

Most of the fishermen engaged in this method of catching mackerel reside at that portion of Provincetown called Long Point, north of the town; and it is exceedingly interesting to watch them in their laborious and successful avocation. The following notes I took upon the spot, June 26, 1847: — "Now all the male inhabitants of the Point are engaged in the mackerel fishery; from twenty to thirty boats, each of about three or four tons burden, sail at four or five o'clock in the afternoon, having all their nets, varying from ten to fifteen in number, carefully dried and rolled up for their night's fishing. Each boat has two persons on board, one to manage the boat while the other takes charge of the nets. As the boats sail from the harbor, the scene is very exciting, all leaving at about the same time, and doubling the point upon which the light-house is situated nearly together. (Occasionally a boat arrives late in the morning from its night's fishing, or is detained until an unusually late hour in the afternoon, by its nets being injured, or by the unusually large quantity of fish taken the previous night, and then it does not leave the harbor, but anchors within the Point; this, however, is seldom done, as but few mackerel, comparatively, are taken here, except when the fish first arrive upon the coast.) When the extremity of the Point is cleared, the boats separate from each other, and each skipper fixes upon his own locality. Some of the boats sail but a few miles, perhaps to the extremity of Race Point, which is distant four or five miles; while others go nearly to Plymouth, and others scatter all over the bay. The farther the boat sails, the later will the nets be thrown overboard; because, should the boats go, as they frequently do, nearly a fourth the distance to Boston, the crew will not be able to get them overboard until late in the evening, or even until midnight; and then, wishing to return as early in the morning as the other boats, they will necessarily keep them out but a few hours. Having thrown over their nets, the fishermen lie down in their little cabins, and get what sleep they can, having first fixed to one of the masts of their boat a light, to prevent their being run down by any vessel which may be passing; and some of the fishermen,

in stormy nights, hang up a bell in their rigging, which is kept ringing by the motion of the boat. About daylight in the morning the fishermen draw their nets, and one man continues to free them of the fishes they contain, during the whole time the boat is sailing homeward, while the other manages the boat. Frequently but small numbers of other species are taken besides the mackerel, while at other times the nets will contain three or four times as many whiting as mackerel, and, as the former are worthless, the duty of the fisherman is very laborious and irksome. The boats arrive early in the morning at the Point, and all is life and excitement. 'How many fish have you caught?' is the universal salutation; and, before they sail again in the afternoon, every boat's crew knows exactly how many have been taken by each boat during the previous night. As soon as the boats arrive, the fishermen at once draw their nets upon the shore, free them of the fish caught, unless it has already been done, and, spreading them upon the sand, or winding them upon a reel, leave them until the latter part of the afternoon to dry, when they again roll them up carefully and put them on board of their boats. Such quantities of whiting are sometimes contained in the nets that they cannot be freed for hours, not even until the middle of the day. Should only a few mackerel be taken during a night, they are sent at once to Boston in some one of the fishing-smacks which are in waiting to take them, and the carriers receive a part of the proceeds of the sale; or they are sold outright, for from three fourths of a cent to a cent and a half apiece, to the smacks. If many are caught, only a few are sent, and the rest are split and salted, and sold afterwards, to be sent in various directions. On the 26th, from twenty to twenty-three boats returned, while I was on the Point, from the previous night's fishing, and averaged about one thousand mackerel apiece; such a quantity could not be disposed of, fresh. Captain Atwood sold only one hundred of the largest, for two cents apiece, and was obliged to salt the remainder. It is very exciting to be on the shore and watch the fishermen as they empty their nets, — throwing out whiting, menhaden, sheep's-head, grunTERS, kiuks, blue-backs, goose-fish, and dog-fish."

To give an idea of this seining of mackerel, which continues only from a month to six weeks, I subjoin the following tables, furnished me by Captain Nathaniel E. Atwood, of his two years' fishing, including the seasons of 1846 and 1847, assisted by one person, in his beautiful little boat, the "*Scomber vernalis*."

Number of Mackerel caught in 1846.

Date.	Whole Number.	Sold Large.	Sold Small.	Stock.	Number Salted.
May 20,	39	34	5	\$ 3.18	
" 21,					
" 22,	68	68		4.11	
" 23,	69	69		4.30	
Sunday.					
" 25,	85	63	22	2.27	
" 26,	355				355
" 27,	352				352
" 28,	315	260		14.30	55
" 29,	200	170	30	9.00	
" 30,					
Sunday.					
June 1,	179	113	66	6.57	
" 2,	453	275	178	15.47	
" 3,	352	291	61	11.78	
" 4,	1,117	100		3.12	1,017
" 5,					
" 6,	426				426
Sunday.					
" 8,	463	322	141	16.66	
" 9,	223	178		8.01	45
" 10,	282	208	74	11.02	
" 11,	206	156	50	7.25	
" 12,	296	188	108	9.85	
" 13,					
Sunday.					
" 15,	273	150	123	9.51	
" 16,	340	222	118	11.94	
" 17,					
" 18,	110	15	95	1.84	
" 19,					
" 20,					
Sunday.					
" 22,	70	18	52	2.02	
" 23,					
" 24,	242	172	70	10.39	
" 25,	142	87	55	4.16	
" 26,	123	87	36	4.72	
" 27,					
Sunday.					
" 29,	242	131	111	10.39	
" 30,	98	55	43	3.54	
July 1,	20	10	10	.76	
	7,140	3,442	1,448	\$ 187.16	2,250 = 13 bbls. packed.

Number of Mackerel caught in 1847.

Date.	Whole Number.	Sold Fresh.		Stock.	Number Salted.
		Large.	Small.		
June 1,	442	245	197	\$ 13.39	
" 2,	189	66	123	4.95	
" 3,	268	111	157	7.12	
" 4,	262	180	82	8.84	
" 5,					
Sunday.					
" 7,	368	176	192	10.55	
" 8,	326	163	163	8.80	
" 9,	261	90	171	7.09	
" 10,					
" 11,	18	9	9	.94	
" 12,					
Sunday.					
" 14,	654	263	391	20.17	
" 15,	410				410
" 16,	1,172	384	788	27.60	
" 17,	271	70	201	3.08	
" 18,	346	75	271	4.10	
" 19,	460				460
Sunday.					
" 21,	426	92	334	10.64	
" 22,					
" 23,	262	53	209	6.30	
" 24,					
" 25,	888	100		2.10	788
" 26,	242				242
Sunday.					
" 28,	14			Price not named.	
" 29,	102	18	84	"	

By small mackerel in the table is meant those about half the size of the largest; they are culled out by the fishermen, and sold for about half the price of the largest. The salted mackerel are generally contracted for by some purchaser for a certain price (in Captain Atwood's case, for \$5 per barrel), to be delivered at his wharf within a month or two from the time they are taken.

This species revisits our shores again in the autumn, but is not taken in such quantities as in the spring of the year. Thus in the months of October and November, 1847, there were taken, by thirty-five fishermen who followed this business, 1,076 barrels full, which were packed; and \$783.73 worth, which were sold fresh.

These mackerel are inspected at the wharf, before they are barrelled, and are of four distinct qualities.

The first must be 13 inches long, from the tip of the snout to the notch of the caudal fin. The second is under 13 inches in length, but fat. The third comprises those which

are 13 inches long, but are poor. And the fourth contains those which are under 13 inches and poor.

After the 1st of July, the fishermen at Provincetown cease to catch this species in nets; it now readily takes the hook, and is captured along our coast in immense quantities. Captain Atwood informs me, that in 1845 the mackerel-fishery yielded the fishermen at Long Point two thousand dollars.

It is calculated that from six to eight thousand barrels of mackerel are annually sold fresh in Boston market alone. But their great value arises from the employment afforded by them to such a number of persons, in the process of salting and packing, requiring mechanics of various descriptions, and seamen to manage the vessels which transport them from place to place.

The number of barrels of mackerel *inspected* in Massachusetts from the years 1831 to 1847 was as follows:—

1831, . . .	383,559	1839, . . .	73,018
1832, . . .	224,000	1840, . . .	50,992
1833, . . .	225,000	1841, . . .	55,537
1834, . . .	253,000	1842, . . .	75,543
1835, . . .	197,000	1843, . . .	64,451
1836, . . .	180,616	1844, . . .	86,181
1837, . . .	138,157	1845, . . .	202,303
1838, . . .	108,358	1846, . . .	174,064

Those packed in 1836 were furnished by the following towns:—

	Barrels.		Barrels.
Boston,	40,559	Scituate,	3,782
Gloucester and Manchester, . .	43,937	Yarmouth,	2,446
Newburyport and Newbury, . .	21,463	Salem and Beverly,	2,394
Wellfleet,	17,500	Plymouth,	1,477
Provincetown,	14,139	Lynn,	1,400
Hingham,	13,882	Duxbury,	1,000
Cohasset,	11,700	Charlestown,	822
Barnstable,	4,115		

At the prices these fish were worth in November, 1836, the value of the year's fishing amounted to \$ 1,264,012 dollars.

Mr. Solomon Lincoln, of Hingham, wrote me that the number of barrels of mackerel taken at that place in 1837 was 17,134½; and that he estimated the gross proceeds of the mackerel fishery of that place for that year at \$ 115,000.

By the "Statistical Tables" drawn up by the Secretary of State, from the reports upon the various branches of industry, by the assessors of the different towns, it appears that the number of barrels of mackerel taken in the year 1837, with their prices, were as follows: — Whole number of barrels, 234,059; value, \$ 1,639,042. Taken by the following counties: Barnstable Co., 76,036; valued at \$ 490,638. Essex Co., 69,599 = \$ 518,663. Suffolk Co., 43,266 = \$ 320,165. Plymouth Co., 25,258 = \$ 179,748. Norfolk Co., 18,450 = \$ 120,528. Middlesex Co., 1,000 = \$ 6,000. Bristol Co., 450 = \$ 3,300.

From the same source, for the year ending April 1st, 1845, we collect the following facts: — Whole number of barrels of mackerel taken, 86,628; value, \$ 637,052. Taken by the following counties: Essex Co., 30,247; valued at \$ 234,385. Barnstable Co., 29,407 = \$ 207,145. Plymouth Co., 10,388 = \$ 74,191. Norfolk Co., 8,859 = \$ 56,583. Suffolk Co., 7,455 = \$ 63,118. Dukes Co., 217 = \$ 1,300. Middlesex Co., 55 = \$ 330.

I have not been able to ascertain with accuracy the number of vessels engaged exclusively in this fishery. In many towns, the same vessels are used, at different seasons of the year, for the cod as well as the mackerel fishery. I have ascertained, however, that there were two hundred and two vessels employed in this fishery in 1836 in the county of Barnstable, and that of this number ninety-eight belonged to Provincetown, which were valued at \$ 147,000.

It might be inferred, from an examination of the above table of the numbers of mackerel inspected in different years, that in some seasons fewer vessels were engaged in the business, or that it was considered at such periods of less importance than at others; this, however, is not a correct conclusion. In some seasons immense shoals of these fish are readily met with, and the vessels return in a few weeks with full cargoes; while the same localities may be visited at other seasons and the efforts of the fisherman prove fruitless, and his fare meagre.

So peculiar are the habits of this species, that oftentimes weeks may pass, the fishing-smacks be surrounded by millions sporting upon the surface of the ocean, and scarce one allow itself to be taken; while, again, the success of a few days will nearly retrieve the disappointments of a season.

Thus a fisherman informed me that, in the year 1837, having been to the Bay of Chaleur, and taken but few fish, the vessel to which he belonged was returning home, when, off Cape Cod, the fish were so numerous and voracious, that the crew, consisting of ten men, captured in two hours nearly thirty barrels of them. At this time about two hundred smacks were together, and they were all equally successful, some of them taking even forty barrels of fish in the same period.

Occasionally this fish visits the very harbors along both shores of Massachusetts Bay, and is taken in great numbers. When they first enter the Bay, immense quantities are captured in the harbor of Provincetown. By the following extract from the Boston Atlas of July 12, 1845, copied from the Gloucester Telegraph, it appears that that place had received a visit from this species: — “For a few days past our harbor has been filled with mackerel; and on Monday about four hundred barrels, it is estimated, were taken in seines, vessels, boats, and from the wharves. Upwards of a hundred barrels were taken in a seine at one haul.” The following, which I extract from a “Statement presented to the Members of the House of Representatives, by Mr. Caleb Cushing,” in reference to a “Bill in Addition to an Act to authorize the Licensing of Vessels to be employed in the Mackerel Fishery,” exhibits the peculiarities of this fish in an interesting manner: — “Their movements and haunts are very precarious, and their habits are more versatile than those of almost any other fish of commercial importance. So true is this, that fishermen who have pursued the business for a long period have but little advantage over those recently engaged in it, in judging, with any degree of certainty, which may be the best spot of fishing-ground at any particular season of the year. It is oftentimes the case, that vessels in extreme parts of the Bay, and in nearly all intermediate stations, will have good fishing for a few days, and for many succeeding days no mackerel will be visible; after which they will appear to rise simultaneously in nearly all parts of the Bay; and in moderate weather large tracts of the surface of the sea will seem to be covered with shoals of the fish, swimming with one side of the gill out of water. At times, the fishermen can take only a few from a shoal, as it passes directly in contact with their vessel, without being induced to stop by bait, or altering its course in the least degree. It occasionally happens, that late in the year the fishermen will reap a rich harvest, when the whole previous season had been comparatively unproductive. Thus it was in the autumn of 1831. In October of that year the mackerel struck in very near to Cape Ann. Large fleets of vessels collected in such close order as to be continually coming in contact. The sea being smooth, and great quantities of bait thrown out, the fish collected in such quantities that some vessels took nearly one hundred barrels in a single day. At the same time they were very abundant off Cape Cod and on Jeffries’ Ledge; and it was computed that more than 70,000 barrels were taken in a single week.”

Several of our most intelligent fishermen inform me that the difficulty of taking mackerel is yearly increasing, from the barbarous custom prevailing of “gaffing” them; that is, of collecting them around vessels by throwing out bait, and then suddenly drawing up an instrument armed with numerous sharp iron points, by which many are captured, and greater numbers are cruelly maimed without being taken.

After being carefully inspected, a ready market is found for these fish, as is shown by the following notice, copied from Mr. Cushing's "Statement," above referred to:—
 "A small portion of the mackerel, consisting chiefly of the poorest quality, No. 3, is exported to foreign countries. It is not easy to ascertain the precise quantity exported, as the Annual Statement printed by order of Congress embraces all kinds of pickled fish under one head; probably the amount does not exceed 40,000 barrels. They are sent to the West Indies, to South America, to some ports of the Mediterranean, and to the East Indies. But the principal market for this fish is in the United States. Philadelphia, New York, Baltimore, and New Orleans have taken the largest quantities hitherto; but more or less is shipped to most of the chief ports along the seaboard from New York to New Orleans. Thus far Philadelphia, by its rapid and steady increase of demand, has held the lead of other ports. From 1820 to 1825 that city required from 30,000 to 40,000 barrels, as its yearly supply for its own consumption, its interior trade, and its foreign or domestic export. It now receives three times that quantity, and about one third part of the whole product of the fishery. In the Southern States, also, the demand increases with the increased facilities of interior transportation, and must continue to be enlarged, as the interior of the country goes on acquiring access to markets and added population and prosperity. It is understood, also, that this fish, owing to its good qualities as an article of food, and its convenient form for subdivision and distribution among the slaves, is gaining favor in the estimation of the planters of the South. As evidence of which fact, it may be stated, by way of example, that, with a colored population of 210,000 persons, the State of Georgia consumed, the last year (1835), 37,000 barrels, of all qualities, valued there at \$286,750. Doubtless the consumption is proportionably great in all the other planting States."

Labrador, H. R. STORER. The whole of the Atlantic Coast, RICHARDSON. Maine, Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, MITCHILL, DEKAY.

GENUS II. PELAMYS, Cuv.

The teeth strong, separate, and pointed.

PELAMYS SARDA, Cuvier.

The Striped Bonito.

(PLATE XI. FIG. 5.)

Scomber sarda, BLOCH, Systema, p. 22, pl. 334.

" " *Bonetta*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 428.

La Pélamide commune, ou Bonite à dos rayé (*Pelamys sarda*, CUV., *Scomber sarda*, BL.), CUV. et VAL, VIII. p. 149, pl. 217.

Pelamys sarda, *Skip-Jack*, STORER, Report, p. 49.

" " *Striped Bonito*, DEKAY, Report, p. 106, pl. 9, fig. 27.

" " STORER, Mem. Amer. Acad., New Series, II. p. 323.

" " STORER, Synopsis, p. 91.

Color. The head and the upper part of the body are of a greenish-brown color; the sides are lighter, the abdomen of a silvery white. From ten to twenty dark-bluish bands pass obliquely downwards and forwards from the dorsum towards the abdomen; the first of these bands commences at the posterior extremity of the first dorsal fin; the last arises at the commencement of the caudal fin; several of these bands pass very low down upon the sides, almost reaching the abdomen. Besides these, several indistinct lighter-colored bands cross the body transversely. The gill-covers are silvery, marked with fuliginous. The pupils are black; the irides silvery. The first dorsal fin is of a light color, with dull patches. The pectorals are of a dark color above, and lighter beneath. The anal fin is white, with fuliginous. The caudal fin is of a dirty bluish color.

Description. The body is oblong, compressed, perfectly smooth. The scales are exceedingly minute, with the exception of a large triangular patch of larger scales, situated back of the opercles, in the middle of which are the pectoral fins. Several series of longitudinally arranged scales are situated on each side of the dorsum, running the whole length of the first dorsal fin.

The lateral line arises high up on the back, and pursues an undulatory course till it reaches a line opposite the anterior third of the anal fin, whence it is continued in a straight line to the tail.

The length of the head, which is destitute of scales, is less than one fifth the whole length of the fish. The jaws are equal. The jaws and palatine bones have each a single row of sharp, recurved, prominent teeth; upon the middle of the lower jaw are four teeth, the anterior two quite small, the posterior two the largest in the jaws; the palatine bones are very small. The gape of the mouth is large. Eyes circular. Diameter of eye about a sixth the length of the head.

The first dorsal fin commences on a line over the origin of the pectorals; its second and third rays are longest; the posterior rays are very short; the whole fin, when unexpanded, is concealed in a groove at its base. It is continued almost to the origin of the second dorsal.

The second dorsal is nearly triangular, emarginated posteriorly; its posterior portion is slightly tufted like the commencement of finlets; back of this fin are eight finlets, the posterior of which are the smallest.

The pectoral fins arise just back of the operculum. The fan-shaped ventrals are just back of the origin of the pectorals; when unexpanded, these fins shut into a depression on the abdomen.

The anal fin arises on a line with the posterior extremity of the second dorsal, and is shaped like that fin. Seven finlets are situated back of the anal fin.

The anus is small, and situated directly in front of the anal fin. A stout fleshy carina is situated on each side of the fleshy portion of the tail; on each side of the posterior part of this carina two quite small obtuse carinæ run directly backward across the middle of the caudal fin, causing quite a depression between them.

The caudal fin is lunated. Length of the exterior rays, compared with distance between the extremities when expanded, as 3 to $5\frac{1}{2}$.

About twenty inches in length.

The fin rays are as follows: — D. 20 - 14 + VIII. P. 24 or 26. V. 6. A. 14 + VII. C. 24 or 26 $\frac{3}{4}$.

Remarks. This species, called by the fishermen in Boston Market the *Skip-Jack*, and by those at the extremity of Cape Cod the *Bonito*, is very rarely met with in Massachusetts Bay; it is occasionally taken at Provincetown, and even at Lynn. South of the Cape, at some seasons, it is frequently caught at Martha's Vineyard, with trailing bait. Dekay remarks that it is but an "occasional visitor" to the coast of New York.

Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

GENUS III. THYNNUS, Cuv.

Form of the body like that of Scomber, but less compressed. A kind of corselet round the thorax, formed by scales larger and coarser than those of the rest of the body; a long, elevated crest on each side of the tail. The anterior dorsal reaching almost to the posterior one. Numerous finlets behind the dorsal and anal fins. A single row of small, pointed, crowded teeth in each jaw.

THYNNUS SECUNDO-DORSALIS, Storer.

The American Tunny.

(PLATE XII. FIG. 4.)

Thynnus vulgaris, Cuv., *Common Tunny*, STORER, Report, p. 47.

" " DEKAY, Report, p. 105, pl. 110, fig. 28.

" " STORER, Mem. Amer. Acad., New Series, II. p. 343.

" " STORER, Synopsis, p. 91.

Color. Nearly black above. Silvery upon sides; beneath white. Gill-covers a silvery gray. Pupils black; irides golden, with greenish reflections. Rays of first dorsal fuliginous; connecting membrane nearly black. Second dorsal of a reddish-brown color. Pectorals silvery gray. Ventrals black above; beneath white. Anal finlets, like those on the dorsum, of a bright yellow color; dark at base and upon anterior edge.

Description. Form elongated, gradually sloping from commencement of dorsal to extremity of snout, and tapering from dorsal to tail. Length of head about one fourth length of fish. Depth across base of pectorals, two ninths of entire length ; across base of anal, about one seventh ; at base of caudal, one twenty-eighth, and in another specimen, one thirty-fourth. Eyes circular ; distance between them less than half the length of head. Opercula very large, perfectly smooth. Jaws equal when closed. Tongue large. Inside of mouth blackish. Gape of mouth very large. Entire body covered by large scales, which are almost hidden by superjacent smaller ones, and a thickened membrane. Patches of still larger scales, or bony plates, in front of first dorsal, around pectoral, between it and lateral line.

First dorsal commences just over pectorals. Its rays are very strong, gradually decreasing in length until hardly perceptible ; the first the longer. The fin, when unexpanded, shuts out of sight into a deep groove, deepest of course at its origin.

The height of the second dorsal is much greater than that of the first, and more than twice its own length. Followed by ten finlets.

Pectorals falciform. About one seventh of length of fish.

Ventrals, just beneath pectorals ; stout, and shutting, like dorsal, into a groove.

Anal commences some distance back of a line from termination of second dorsal. Behind it nine finlets, the middle ones the longer, as is also the case with those of the dorsal.

Caudal lunated. Measured across the extremities of its lobes, it is equal to one third the entire fish. At its base a stout lateral carina of considerable length. Above and below its posterior third are two smaller carinæ.

Owing to the denseness of the membrane which connects them, it is with great difficulty that the fin rays can be counted. As accurately as they could be ascertained, they are as follows : — D. 14-1-13 + X. P. 34. V. 1-5. A. 2-12 + IX. C. 19.

Length of two specimens which I have examined, 8 feet 6 inches and 9 feet 3 inches. Weight, over 1,000 lbs.

Remarks. In the year 1838 I had an opportunity to examine a specimen of this fish, which was taken near Cape Ann, and concluded that it must be the *vulgaris* of Cuvier. Dr. Dekay, in his Report, not having seen an entire specimen, adopted my description and conclusion. During the last spring, a second specimen was examined at Provincetown, and carefully figured by Mr. Sonrel ; and I have satisfied myself that it differs from all the species of the genus contained in the *Histoire Naturelle des Poissons*. The following are the differential marks from the *vulgaris*, which it most nearly resembles : —

1st. In the *vulgaris* the height of the second dorsal is about that of the first. In our fish it is much greater, and also as compared with its own length.

2d. In the *vulgaris*, the anal arises on a line with the termination of the second dorsal. In ours, it is several inches behind it.

3d. In the *vulgaris*, the length of the tail, from the point of one lobe to that of the other, is shorter than the length of the head. In ours, it is much longer.

4th. In the *vulgaris*, the length of the pectorals is about one fifth the entire length. In both the specimens here examined, their length was one seventh the entire fish. It, however, differs in all other important respects from the *brachypterus* of the Mediterranean, which, indeed, seems identical with the *brevipinnis* of the same waters; and in this respect, as also in the greater height of its second dorsal, from the *Coretta* of the West Indies.

This species, which is known along our coast as the *Horse-Mackerel* and *Albicore*, comes into Massachusetts Bay about the middle of June, and remains until early in October. At the entrance of the Bay, they are met with in greater quantities than in any other part of it; thus, while a few stragglers are occasionally seen by the fishermen who supply the Boston market daily with cod and haddock, it is not an uncommon circumstance to observe fifty or more in a day at Provincetown. When this fish first appears, it is exceedingly poor, and is perfectly useless. By the first of September it becomes quite fat, and is frequently taken at Provincetown for its oil. This is not extracted from the liver, as in many other fishes, but is obtained from the head and belly by boiling. Sometimes twenty gallons of oil are procured from a single specimen. It is rarely caught with the hook, but is generally taken with the harpoon, in the same manner that whales are captured. Within a few years past, this species seems to have become more shy and distant. I learn from fishermen of veracity, that instances have occurred in which food has been taken by them from the hand when held to them from the boat. It feeds upon menhaden and other small species, which it drives near, and frequently upon, the shore. The fishermen are oftentimes much annoyed by having their nets injured by them. Its flesh is occasionally used for mackerel-bait, but not with us as an article of food, although Dekay states that it is met with in the New York market every season.

GENUS IV. CYBIUM, Cuv.

An elongated body without a corselet; and large, compressed, sharp teeth. The palatines have only short and even teeth.

CYBIUM MACULATUM, *Cuv.**The Spotted Mackerel.*

(PLATE XIII. FIG. 1.)

Scomber maculatus, *Spanish mackerel*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 426, pl. 6, fig. 8.*Le Taassard tacheté* (*Cybiium maculatum*, CUV., *Scomber maculatus*, MITCH.), CUV. et VAL., VIII. p. 181.*Cybiium maculatum*, *Spotted Mackerel*, STORER, Bost. Journ. Nat. Hist., IV. p. 179.

" " AYRES, Bost. Journ. Nat. Hist., IV. p. 261.

" " *Spotted Cybium*, DEKAY, Report, p. 108, pl. 73, fig. 232.

" " STORER, Mem. Amer. Acad., New Series, II. 344.

" " STORER, Synopsis, p. 92.

Color. The top of the head and the upper part of the sides of the body are of a dark leaden color; the sides are lighter; the jaws, opercula, and abdomen are of a beautiful clear white, presenting a satin-like appearance; the dorsal ridge throughout its whole extent is of a beautiful dark-green color; twenty or more circular or oblong spots, situated above and beneath the lateral line, ornament its sides; the most anterior of these spots is beneath the pectoral fins; the largest number of the spots is anterior to the dorsal fin. The membrane connecting the first eight rays of the dorsal fin is black; the second dorsal fin is of a lead-color; the pectorals are black beneath, light above; the ventrals are white.

Description. In its figure it resembles the *S. colias*. Its greatest depth, measured from the origin of the first dorsal fin, is equal to nearly one fourth its entire length.

The length of the head is equal to about one seventh the entire fish, and terminates anteriorly in a sharp point. The eyes are circular. The anterior nostril is the smaller, and is semicircular; the posterior nostril, which is situated directly in front of the centre of the eye, is a transverse slit. The upper jaw terminates in a point; the prominent tip of the lower jaw projects slightly beyond the upper: both of the jaws are furnished with a single row of prominent, sharp, somewhat conical teeth; those situated towards the angle of the jaws are the largest.

The lateral line, which is raised above the general surface of the fish, arises half an inch above the origin of the pectoral fins, and, in the language of Mitchell, "does not travel straight, but crooks and meanders along prettily towards the tail."

The first dorsal fin, when unexpanded, shuts almost completely into a groove at its base; its anterior portion is much higher than the posterior; the second and third rays are the highest; all the rays project beyond their connecting membrane, and are furnished with delicate filaments.

The second dorsal fin is triangular, emarginated posteriorly; its first two rays are simple; posterior to this fin are eight or nine finlets, of the same color as the fin.

The pectoral fins are falciform, and arise directly back of the angle of the operculum.

The ventral fins are quite small.

The anal fin arises opposite the middle of the second dorsal, and is of the same length as that fin ; eight or nine finlets are posterior to it, similar in their appearance to those back of the second dorsal fin.

The caudal fin is large and lunated. At its base is a lateral carina, upon which the lateral line terminates ; and on each side of this are two smaller carinæ running the entire length of the fleshy portion of the tail.

Length, about twenty inches.

The fin rays are as follows : — D. 18–17 + VIII. P. 20. V. 4. A. 18 + VIII. C. 26.

Remarks. This species, which is found on the coast of South America, and which Dekay speaks of as occurring sparingly in the waters of New York, must be exceedingly rare on the shores of Massachusetts. I have known but five specimens to be taken here ; one of these was captured at Lynn, July 24th, 1841, in a seine, in company with several *blue-fish*, and the others were taken at Provincetown, August, 1847. The former measured twenty-one inches in length, the latter but fifteen inches. It roams even farther north than Massachusetts, Captain Atwood having captured a specimen at Mohegan, on the coast of Maine.

Maine, Captain ATWOOD. Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, MITCHILL, DEKAY. South America, CUVIER.

GENUS V. TRICHIURUS, LIN.

Head pointed ; body without scales, elongated, compressed, thin, ribbon-shaped. No ventral fins, nor scales instead ; no anal fin ; a single continuous dorsal fin ; tail without rays, ending in a single elongated hair-like filament, from which the generic name is derived. A single row of compressed, cutting, and pointed teeth. Branchiostegous rays, seven.

TRICHIURUS LEPTURUS, *Lin.*

The Silvery Hair-tail.

(PLATE XII. FIG. 1.)

Trichiurus lepturus, LIN., Syst. Nat., p. 409.

Gymnogaster argenteus compressus, cauda attenuata impinna, BROWNE, Jamaica, p. 444, pl. 45, fig. 4.

Trichiurus lepturus, BLOCH, Ichth., v. p. 55, pl. 158.

Trichiurus argenteus, Silver Trichiure, SHAW, Gen. Zoöl., iv. p. 1, pt. 90, fig. 12.

Trichiurus lepturus, STRACK's Plates, xx. fig. 1.

Trichiurus argenteus, Silvery Hair-tail, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 364.

Le Trichiure de l'Atlantique (Trichiurus lepturus, LIN.), CUV. et VAL., VIII. p. 237.

- Trichiurus lepturus*, YARRELL, Brit. Fishes (2d edit.), I. p. 204.
 " " STORER, Bost. Journ. Nat. Hist., IV. p. 181.
 " " DEKAY, Report, p. 109, pl. 12, fig. 35.
 " " STORER, Mem. Amer. Acad., New Series, p. 346.
 " " " Synopsis, p. 94.

Color. Of a uniform silver color throughout. Pupils black; irides golden. Lateral line of a greenish-yellow color. The dorsal fin is greenish-yellow at its base; fuliginous above. The pectorals are yellowish at their base, and more or less fuliginous above.

Description. Body without scales; long, very much compressed, tapering to a point. The abdomen is full, rounded, and smooth on its edge; the inferior portion of the body back of the anus forms an acute edge, which is marked throughout with sharp serrations. The length of my specimen is thirty-nine and a half inches; the length of the head is six inches, or nearly one seventh of its whole length. The head is compressed upon its sides, flattened between the eyes; a protuberance exists upon the top of the occiput, and two similar projections directly back of the eyes. The operculum is large, margined with a very delicate membrane, and presenting numerous very delicate striæ upon its surface; similar striæ are noticeable upon the posterior portion of the superior maxillary bone. The eyes are large and circular; their diameter nearly equal to an eighth the length of the head; the nostrils are large, vertically oval, situated in front of the anterior superior angle of the eye. The gape of the mouth is large. The lower jaw is the longer, with a prominent chin; both jaws have numerous acute, lancet-shaped teeth. At the extremity of the upper jaw are two large, much-incurved, barbed teeth; and back of these, two other similarly formed, rather larger teeth, separated from the former by one or two very minute ones; posterior to these are about a dozen acute unarmed teeth, the posterior ones the largest. At the tip of the lower jaw, on each side, is a large tooth similar to those above them in the upper jaw; when the jaws are closed, these project beyond the upper jaw; and the two anterior teeth of the upper jaw shut into a cavity of the lower, just back of the chin; back of these prominent teeth, in the lower jaw, are from fifteen to seventeen other smaller ones; of these, three, which are the larger, on each side, in about the middle of the jaw, are barbed. The palatine bones are armed with very minute teeth. The tongue is of moderate size, and smooth. A portion of the roof of the mouth is covered by a loose membrane.

The lateral line arises upon the shoulder, at the superior angle of the operculum, curves backwards and downwards to the inferior third of the body, until opposite the fourteenth or fifteenth dorsal ray, when it pursues a straight course to the tip of the tail.

The dorsal fin, which is composed of flexible rays, commences upon a ridge just back of the occipital protuberance, and gradually increases in height towards its middle, then diminishes, and is lost in the naked tail.

The fan-shaped pectoral fins arise from under the posterior inferior angle of the operculum, being partly crossed by that angle; the first rays, which are highest, are nearly equal to one third the length of the head.

The fin rays are as follows: — D. 133–135. P. 12. Length, from two to three feet.

Remarks. This beautiful fish is a Southern species, and is very rarely found in our waters. During twenty years' attention to the fishes of Massachusetts, I have known but two individuals to be taken. One of these was cast ashore, during the summer of 1840, upon the beach at Buttermilk Bay, in the northern corner of Buzzard's Bay; the other was captured at Wellfleet in the summer of 1845. From this latter specimen, received in a perfectly fresh condition, my figure and description have been prepared.

Dekay states that it is known by the fishermen of New York by the name of *Ribbon-fish*. According to Browne, it is called *Sword-fish* at Jamaica.

Massachusetts, STORER. New York, MITCHILL, DEKAY. Gulf of Mexico, Caribbean Sea, South America, CUVIER.

GENUS VI. XIPHIAS, LIN.

Body fusiform, covered with minute scales; a single elongated dorsal fin; ventral fins wanting; tail strongly carinated; upper jaw elongated, forming a sword. Mouth without teeth. Branchiostegous rays, seven.

XIPHIAS GLADIUS, Lin.

The Sword-fish.

(PLATE XIII. FIG. 2.)

Xiphias gladius, LIN., Syst. Nat., p. 432.

" " *Common Sword-fish*, SHAW, Gen. Zoöl., IV. p. 99, fig. 14.

" " " " STRACK'S Plates, XXI. fig. 1.

" " " " PENNANT, Arc. Zoöl., II. p. 113.

" " " " GRIFFITH'S Cuv., x. p. 187, pl. 27, fig. 1, and Supplement to the Acanthopterygii, p. 349.

L'Espadon épée (*Xiphias gladius*, LIN.), CUV. et VAL., VIII. p. 255, pl. 225 and 226.

Xiphias gladius, WILSON, Encyclopædia Brit., Art. Ichth., p. 184, pl. 202.

" " JENYNS, Brit. Vert., p. 364.

" " YARRELL, Brit. Fishes (2d edit.), I. p. 164, fig.

" " STORER, Report, p. 51.

" " DEKAY, Report, p. 111, pl. 26, fig. 79.

" " STORER, Mem. Amer. Acad., New Series, II. p. 347.

" " " Synopsis, p. 95.

Color. In the fresh fish, the back and upper parts of the sides are almost black; this color changes to a bluish after death. The abdomen is of a dirty-white color, which afterwards is changed into a silvery gray. The gill-covers are silvery brown, and present on their surface an arborescent appearance.

Description. The surface of the body is smooth. The length of the head from the posterior edge of the operculum to the angle of the jaws equal to one twelfth the entire length of the fish. The length of the lower jaw, from the angle to the chin, equal to one ninth the length of the fish. The length of the sword, from the anterior angle of the eye to its extremity, equal to one third the length of the fish. Upper part of the sword dark brown, almost black, with a groove extending throughout its whole extent. Under portion of the sword lighter colored, and having a velvety feel. The edges of the sword have a bony, shining, perfectly smooth edge. The widest portion of the upper jaw equal to about one twelfth the length of the sword. This upper jaw gradually terminates to a point. Jaws, without teeth; a velvety feel, to the finger, upon the lower jaw. Eyes large and very movable in their orbits; the orbit horizontally oval, the eye itself circular. Branchiæ composed of four pairs of large parallel laminæ, and one smaller one. Branchial membrane composed of eight rays.

The dorsal fin commences nearly on a line above the posterior edge of the operculum. It is strongly falciform, four times as high as the upper jaw is wide; its length is equal to three fourths its height. In the specimen described in my Report, eighteen rays were obvious in the anterior portion of the dorsal; in the specimen from which my present description is written, twenty-one rays may be counted, although the former specimen measured twelve feet five inches, while the present one measures only seven feet three inches. In this specimen, as well as that, the whole dorsal ridge between these rays, and within a few inches of the base of the tail, has no vestige of a ray above the surface, but in their place is a shallow groove throughout the whole extent, supporting a slight membrane; the bases of a few rays are seen, however, upon dissection, beneath the skin. A few inches in front of the base of the tail is situated the extremity of the dorsal fin, composed of three rays in both of the specimens I have seen, slightly emarginated above and terminating posteriorly in a point, and looking like the adipose fin of the *Salmonides*, or the finlets of many of the *Scomberoides*.

The pectoral fins are also falciform, less high than the dorsal; their length a little more than one fourth the height.

The anal fin is formed like the dorsal, and is three fifths its height. The extremity of this fin terminates on the same plane with the dorsal, and is formed much like that. This portion in the former specimen contained three rays, in the present two. This small posterior portion is one eighth the height of the longest rays. At the base of the tail is situated a transverse furrow. On each side of the base of the tail is situated a carina about the height of the posterior extremity of the dorsal fin, and about as long again as high, extending on to the caudal fin.

The caudal fin is very deeply forked.

The fin rays are as follows: — D. 18–3. P. 15. A. 11–2–3. C. 17.

Remarks. This species is seldom seen in Massachusetts Bay, but is a common fish at some seasons of the year from Nantucket to Block Island, and has become quite an article of commerce. It is generally discovered by the fishermen by the projection of its dorsal fin above the surface of the water, as it is pursuing shoals of mackerel and menhaden, upon which it feeds. It is occasionally taken with a hook baited with one of these fishes, but almost always it is captured with an instrument called a “lily-iron,” from the form of its shafts or wings, which resemble the leaves of a lily. This instrument is thrown, like a harpoon, with great force, into the fish, the attempt always being made to wound the animal in front of the origin of the dorsal fin. When wounded, it sometimes frees itself from the iron by its struggles; and has been known to dive with so much force towards the bottom of the sea, as to bury the sword its whole extent into the sand or mud, which was proved by its appearance when taken. When unmolested, it is observed, not unfrequently, to spring several times its length forwards, some feet above the surface of the water. It appears at Gay Head about the first of June, and remains there until into September. Fifteen to twenty boats are employed from Martha’s Vineyard and Noman’s Land in this fishery. At Noman’s Land, two men in a boat not unfrequently take eight in a day. When caught, their heads and fins are cut off, and they are carried fresh to New Bedford market, where they are sold like the halibut, cut into slices, or cut into slices and pickled or salted, and kept for sale in that state throughout the year. In the first part of the season they sell fresh for four cents per pound, but late in the season they do not bring more than two cents per pound. When salted, the flesh is worth \$6 per barrel. About one third of the quantity taken is sold fresh. About two hundred barrels of this species are yearly captured at Martha’s Vineyard. Very rarely is the flesh of this species offered for sale in Boston market, although when salted it is preferred by many to that of several other species.

The largest individuals weigh about three hundred and fifty pounds.

Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

GENUS VII. PALINURUS, DEKAY.

Preopercle serrated, with spines on its margin. Opercle with one or more flat spines, more or less distinctly serrated beneath. Anal with one or more spines in front. Teeth small, pointed, subequal. Body compressed, oblong. The anterior portion of the single dorsal spinous.

PALINURUS PERCIFORMIS, *Dekay*.*The Black Pilot.*

(PLATE XIII. FIG. 3.)

Rudder-fish, or Perch Coryphæna, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., i. pl. 6, fig. 7. No description." " " *Coryphæna perciformis*, MITCHILL, Amer. Month. Mag., ii. p. 244.*Trachinotus argenteus*, STORER, Report, p. 53.*Palinurus perciformis, Black Pilot*, DEKAY, Report, p. 118, pl. 24, fig. 25.

" " STORER, Mem. Amer. Acad., New Series, ii. p. 351.

" " " Synopsis, p. 99.

Color. Of a bluish-white color upon the sides, covered with minute black punctures, the lower portion of the sides and abdomen of a lighter color; the top of the head and back mottled with black blotches. In the immature fish the color is a dark brown, variegated with yellow patches.

Description. The body of this fish is oblong. The head in length is equal to one fourth that of the body; a bony ridge is observed over the eyes; the diameter of the eyes is rather more than one fourth the length of the head. The operculum is large, naked, of a horny texture, margined by a membrane. The preoperculum is strongly serrated throughout, more conspicuously posteriorly. A depression exists upon the top of the head between the eyes. The distance between the eyes is equal to twice the diameter of the eyes. The nostrils are situated directly in front of the anterior superior angle of the eyes; the posterior is much the larger. The jaws are of equal length, with small, sharp teeth; the upper jaw descends abruptly.

The lateral line commences high above the operculum, and, curving over the pectorals to their extremities, pursues a straight course to the tail.

The dorsal fin, whose fleshy portion is preceded by eight spinous rays, commences back of a line opposite the posterior angle of the operculum, and is continued to the fleshy portion of the tail.

The pectorals are just beneath the posterior angle of the operculum; they are as long again as high.

The ventrals are more than half the length of the pectorals; their outer ray is spinous.

The anal fin arises just in the middle of the body, and is as long again as high; this fin is preceded by three spinous rays.

The caudal fin is quite deeply lunated.

Length, about twelve inches.

The fin rays are as follows: — D. 8–22. P. 19 to 21. V. 1–5. A. 3–17. C. 16½.

Remarks. This species, which, while preparing my Report, I considered to be the *Trachinotus argenteus* of Cuvier, is occasionally found in New York, according to Dekay, and is not unfrequently met with at Holmes's Hole. Dr. Yale writes me, from the latter place: "It follows vessels, or keeps near old casks or planks that are floating, and sometimes is found about the wharf-logs in our harbor." The only specimen I have known to be captured north of Cape Cod was taken at one of the wharves in this city, September 12, 1846.

It is known by the fishermen at Martha's Vineyard as the *Rudder-fish*.

Massachusetts, STORER. New York, MITCHILL, DEKAY.

GENUS VIII. CARANX, Cuv.

Body covered with small scales, with the exception of the lateral line, which is armed with a series of broad scales, those on the posterior half of the body having an elevated horizontal keel in the centre, forming a continuous ridge, each scale ending in a point directed backwards. Two distinct dorsal fins; free spines before the anal fin; teeth exceedingly minute; branchiostegous rays, seven.

CARANX CHRYSOS, Cuv.

The Yellow Mackerel.

(PLATE XIV. FIG. 1.)

Scomber chrysos, *Yellow Mackerel*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 424.

Le Carangue jaune (*Scomber chrysos*, MITCH. ; *Scomber hippos*, LIN.), CUV. et VAL., IX. p. 98.

Caranx chrysos, *Yellow Caranx*, DEKAY, Report, p. 121, pl. 27, fig. 85.

" " " " STORER, Proceedings of Bost. Soc. Nat. Hist., I. p. 148.

" " " " " Mem. Amer. Acad., New Series, II. p. 353.

" " " " " Synopsis, p. 301.

Color. Of a greenish-blue color upon the back and upper portions of its sides; the greater portion of the sides of a bright yellow. An obscure dark-brown blotch is observed at the posterior superior angle of the operculum. The abdomen is yellowish-white. The pupils are black; the irides golden. The dorsal and pectoral fins are yellowish-brown. The caudal fin is yellowish throughout its greatest extent. The ventrals and the anal are of the color of the sides.

Description. The length of the head is less than one fourth the length of the entire fish. The top of the head and the gill-covers are smooth, and destitute of scales; the top of the head is arched; upon its top is a distinct ridge, which passes from above and

between the nostrils to the spine before the first dorsal fin. The eyes are large and circular; the portion at the superior anterior angle of the eyes is translucent; at the anterior extremity of this space the nostrils are situated, and are obliquely oval, the posterior being the larger. The jaws are about equal in length, armed with numerous very minute teeth, which are also observed on the vomer and palatine bones. The tongue is rounded and single.

The lateral line commences just back of the blotch upon the opercula, and passes (slightly obliquely) upwards opposite the posterior half of the pectorals, then courses downwards to near the extremities of the pectorals, whence it proceeds in a straight line to the extremity of the fleshy portion of the tail. The lateral line is smooth until it assumes a straight course; thence it is armed with horny plates, about forty-eight in number; these plates at first are scarcely observable; they become gradually larger, and are most prominent upon the fleshy portion of the tail; they are most crowded at its termination. These plates terminate posteriorly in an acute angle, rendering the line a sharp ridge.

Just in front of the first dorsal fin is a naked recumbent spine, which projects forwards.

The rays of the first dorsal fin are so broken in my specimen that I am obliged to use the words of Dekay respecting it, and also to copy this portion of his figure: — "The first dorsal fin is triangular. This fin is composed of eight spinous rays; the first short, slender, and closely attached to the second, which is shorter than the third; the fourth longest, and all received into a deep groove."

The second dorsal arises on a line just before the termination of the pectoral fins; its rays are connected by a dense membrane; the first ray is shorter than the second; the first half-dozen rays much the highest; the posterior rays are very short. This fin shuts into a fleshy groove when unexpanded; the fin is continued to the fleshy portion of the tail.

The pectoral fins commence just beneath the posterior angle of the operculum; they are long, falciform, articulated.

The ventral fins are situated just back of the pectorals; when closed, they are received into a concavity of the abdomen, to which they are attached by a membrane connected to their inferior rays.

The anal fin is of a similar form with the second dorsal, and, like that fin, shuts into a groove at its base. Two strong spines are situated before this fin.

The caudal fin is deeply forked; two carinæ are seen on each side of its base.

Length, seven and a half inches.

The fin rays are as follows : — D. 8-24. P. 21. V. 1-4. A. 2-1-20. C. 19 $\frac{1}{4}$.

Remarks. I have seen a single specimen only of this species, which was taken from one of the bridges connecting Charlestown with this city. According to DEKAY, it is found in great abundance at New York in the autumn.

Massachusetts, STORER. New York, MITCHILL, CUVIER, DEKAY.

GENUS IX. ARGYREIOSUS, LACEP.

Body much compressed. Spines between the dorsal fins. Dorsal, ventral, and anal rays filamentous.

ARGYREIOSUS CAPILLARIS, *Dekay*.

The Hair-finned Dory.

(PLATE XIV. FIG. 3.)

Zeus capillaris, *Hair-finned Dory*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 383, pl. 2, fig. 2.

Argyreiosus capillaris, *Hair-finned Argyreiose*, DEKAY, Report, p. 125, pl. 27, fig. 82.

" " STORER, Mem. Amer. Acad., New Series, II. p. 356.

" " " Synopsis, p. 104.

Color. Of a beautiful silvery color, with several dark, almost black, transverse bands crossing the upper part of the sides ; these bands disappear in the dead fish. The dorsal and ventral filaments are black.

Description. The body, which is perfectly smooth, is of an irregular rhomboidal form, exceedingly compressed laterally. The forehead is high, and gradually slopes to the snout, which is very prominent.

The length of my specimen is two inches and five eighths ; its depth from the base of the first dorsal across to the pectorals is about two inches ; its greatest thickness is less than one quarter of an inch. The length of the head is seven eighths of an inch. The jaws are equal when closed. The eyes are circular, and are a little more than an eighth of an inch in diameter. The nasal orifices are directly in front of the eyes. The branchial rays are exposed. A slightly raised line passes upward from the upper portion of the operculum, curving backward before reaching the base of the first dorsal. Just back of this commences the lateral line, which at its origin rises immediately, makes a semicircle of an inch in height, and is then continued in a straight line to the tail. Three slight protuberances are situated anterior to the first dorsal fin.

The first dorsal fin is composed of eight rays, the first of which is a minute spine ; the second is a membranous ray prolonged into a filament, measuring in its whole extent

four and a half inches ; the third ray is about half an inch long ; the remaining five rays are small, naked spines.

The second dorsal fin, which appears to be almost a continuation of the first dorsal fin, is continued nearly to the tail. The first ray is spinous ; the second ray is nearly an inch long ; the fifteen posterior rays are of equal height.

The pectoral fins are situated directly on a line with the base of the first dorsal.

The ventral fins are an inch and five eighths in length. Anterior to the anal fin are two small spines. The first ray of the anal fin is spinous ; the first four membranous rays are longer than the remainder ; the first membranous ray is half an inch long ; the posterior rays are as high as the corresponding ones of the second dorsal fin. This fin terminates opposite the termination of the second dorsal.

The caudal fin is deeply forked ; the depth of its fleshy portion is less than the eighth of an inch ; the length of its rays is half an inch.

The fin rays are as follows : — D. 8 - 1 - 22. P. 17. V. 1 - 5. A. 2 - 1 - 18. C. 17. Length, five and a half inches.

Remarks. The only individual of this species I have known to be taken on our coast, was captured in a seine at New Bedford, in August, 1842, and sent to me by Mr. William H. Taylor of that place. I received it in fine condition, and from it the accompanying figure was made. Dekay observes that this fish is taken in the month of August "in very inconsiderable numbers" in gill-nets.

Massachusetts, STORER. New York, MITCHILL, DEKAY.

ARGYREIOSUS UNIMACULATUS, *Batchelder.*

The One-spotted Dory.

(PLATE XIV. FIG. 2.)

Argyreiosus unimaculatus, BATCHELDER, Proceed. Bost. Soc. Nat. Hist., II. p. 78.

" " STORER, Mem. Amer. Acad., New Series, II. p. 523.

" " " Synopsis, p. 271.

Color. Above, light bluish-slate ; on sides and belly, silvery ; an ill-defined fuliginous band passing upwards, slightly backward, from superior angle of eye. On sides, over vertebral column, but not reached by pectorals, a single darkish oblong spot, of moderate size.

Description. Outline of body semicircular beneath, semioval above ; truncated and inclined in front ; its depth five eighths its length, of which its greatest thickness is about one eleventh, it being very much compressed. Head large, gibbous above, thence

inclined forwards. Mouth and throat greatly projecting. Length of head about one third the length of body; its depth through eyes about three fifths the greatest depth. Eyes rather large, situated about midway between top of head and throat; their diameter about three fifths of the distance above them. Nostrils double, in front of eye; the anterior nearly beneath the posterior. Jaws about equal. Scales wanting. Lateral line with an abrupt curve over pectorals to lateral spot; thence straight to tail.

First dorsal commences slightly in front of pectorals. Second ray strongly filamentous; others somewhat so. Between this and the second dorsal four short but well-defined spines.

The first ray of the second dorsal is short and spinous; the next four much longer than the rest, which are of nearly equal length.

Pectorals quite large, of an elongated oval shape.

Ventrals somewhat filamentous, with an almost concealed spine at base.

Anal preceded at some distance by two spines, of which the anterior is the smaller; another spine at origin of the fin. Along its base, as at that of the dorsal, are spines corresponding in number to the rays, their points directed backward.

Caudal fan-shaped and deeply emarginate.

Length, two inches.

The fin rays are as follows: — D. 8-1-22. P. 9. V. 4. A. 2-1-17. C. 20.

Remarks. Although in many respects this fish resembles the *A. capillaris*, I think it must be distinct, and if so, the *unimaculatus* of Batchelder. His specimen was taken at Saco, Maine. The only specimen I have seen was caught in a scoop-net at one of the bridges leading to South Boston, in October, 1847, and sent to Dr. Gould, who kindly transmitted it to me.

Maine, BATCHELDER. Massachusetts, STORER.

GENUS X. SERIOLA, Cuv.

Lateral line with scales not larger than those on the rest of the body. First dorsal fin with a continuous membrane. No finlets.

SERIOLA ZONATA, Cuvier.

The Banded Mackerel.

(PLATE XV. FIG. 5.)

Scomber zonatus, *Banded Mackerel*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., 1. p. 427, pl. 4, fig. 3.
La Seriole à ceintures, *Seriola zonata*, CUV. et VAL., IX. p. 213.

Seriola zonata, DEKAY, Report, p. 128, pl. 9, fig. 26.

" " STORER, Mem. Amer. Acad., New Series, II. p. 357.

" " " Synopsis, p. 105.

Color. Of a silvery-brown color ; lighter upon the sides, with a yellowish tint, which is also observable upon the opercula and along the lower jaw. Five well-marked dark-brown transverse bands, upon the sides, passing from the dorsum to the abdomen, are continued upon the dorsal fin.

The first dorsal fin is black. The second dorsal fin has a yellowish tinge ; its first rays are tipped with white. The ventrals are fuliginous beneath, with their extremities yellowish-white. The centre of the anal fin is of a greenish brown ; its base and tips are white. The caudal fin is yellowish-green, with a dusky tinge at its base and posterior portion ; its extremity is white.

Description. Body elongated, compressed, with very minute scales. Its greatest depth is more than the length of its head. The length of the head is less than one third the length of the body ; the top of the head and the opercula are destitute of scales. The eyes are circular, and of moderate size. The nostrils are double, oval, just anterior to the edge of the superior orbital bone. The gape of the mouth is large ; the jaws are armed with several rows of minute card-like teeth. The tongue, pharynx, palatine, and vomer roughened by slight asperities.

The lateral line, which is a mere thread, commences at the superior angle of the operculum, and slants downwards in an undulatory manner to about opposite the middle of the second dorsal fin, whence it pursues a straight course to the tail, being elevated into a ridge upon its fleshy portion, forming a well-marked carina.

Just in front of the dorsal fin is a small distinct truncated spine, pointing forwards.

The first dorsal fin, which is composed of seven spinous rays, is quite small and triangular ; it arises just back of the pectorals, and is united by a prolongation of its connecting membrane to the base of the first ray of the second dorsal fin ; its third and fourth rays are highest ; the first ray and last two rays are very short.

The second dorsal fin arises opposite the extremity of the ventrals, and is continued until within a short distance of the tail ; it is high at its origin, diminishes in height until about the fourteenth or fifteenth ray, and the remainder of the rays are about the same height ; the rays are bifid at their extremities, all of which slightly project above the connecting membrane.

The pectoral fins are subtriangular, and are situated directly beneath the posterior angle of the operculum.

The ventral fins are just beneath the origin of the pectorals, and are composed of five strong multifid rays.

Just anterior to the origin of the anal fin are two very minute naked spines, the anterior of which is the smaller.

The anal fin is similar in form to the second dorsal, and terminates on a plane with it.

The caudal fin is very deeply forked; its rays are articulated, and its two extremities terminate in sharp points.

Length, about ten inches.

The fin rays are as follows: — D. 1–7–38. P. 20. V. 6. A. 2–20. C. $15\frac{5}{8}$.

Remarks. I have seen but two specimens of this fish. Both of these were caught in the harbor of Wellfleet, one in August, 1844, and the other in November, 1849. DEKAY speaks of it as not being uncommon in Long Island Sound.

Massachusetts, STORER. New York, MITCHILL, DEKAY.

GENUS XI. TEMNODON, Cuv.

The tail unarmed; the little fins or the detached spines before the anal, as in *Seriola*. The first dorsal fragile and low, the second and the anal covered with small scales; but the principal character consists in a row of separated, pointed, and cutting teeth in each jaw; behind the upper ones is a row of smaller teeth, and there are some fine as velvet on the vomer, palate, and tongue. The operculum terminates in two points, and there are seven branchiostegous rays.

TEMNODON SALTATOR, Cuv.

The Blue-fish.

(PLATE XV. FIG. 1.)

Saltatrix, *Skipjack*, *Green-fish*, LIN., CATESBY'S *Carolina*, II. pl. 14.

Gasterosteus saltatrix, LIN., 12 edit., p. 491.

" " *Skippling Stickleback*, SHAW, *Gen. Zoöl.*, IV. p. 609.

Pomatome Skip, LACEPEDE, IV. p. 436.

Scomber plumbeus, *Horse-Mackerel*, MITCHILL, *Trans. Lit. and Phil. Soc. of N. Y.*, I. p. 424, pl. 4, fig. 1.

Le Temnodon sauteur (*Temnodon saltator*, CUV.; *Perca saltatrix*, LIN.; *Cheilodiptere poptucanthe*, LACEP.), CUV. et VAL., IX. p. 225, pl. 260.

Temnodon saltator, *Blue-fish*, STORER, *Report*, p. 57.

" " " AYRES, *Bost. Journ. Nat. Hist.*, IV. p. 261.

" " " DEKAY, *Report*, p. 130, pl. 26, fig. 81.

" " " STORER, *Mem. Amer. Acad.*, New Series, II. p. 360.

" " " " *Synopsis*, p. 108.

Color. The upper part of the body is bluish; a greenish tinge upon the sides and abdomen. The irides are yellow. The pectorals are of a greenish-brown color, with a deep black blotch at their base beneath. The second dorsal and caudal fin are likewise of a greenish-brown color. The ventral and anal fins are of a bluish-white color.

Description. Body oblong, compressed, becoming suddenly narrower at the base of the tail. Length of the head not quite equal to one fourth the length of the fish; head above naked. Preoperculum naked beneath, finely denticulated upon its inferior edge, and terminated inferiorly and posteriorly in an obtuse angle. Eyes circular, and moderate in their size. Operculum terminating in two membranous points superiorly and posteriorly, which do not amount to spines. Nostrils double, terminating in the same cavity; the anterior orifice is perpendicularly ovate, and situated directly in front of the posterior, which is larger and crescent-shaped. Gape of the mouth large. Jaws armed with prominent, sharp, lanced teeth; the lower jaw has but one row of these, ten or twelve in number; the upper, besides a similar row to that in the under, has a row of very small teeth back of these. A row of very minute teeth at the base of the tongue; also small teeth upon the vomer. The lateral line commences just above the posterior angle of the operculum, and, curving slightly at its commencement, pursues nearly a straight course to the caudal rays.

The first dorsal fin, commencing on a line with the anterior half of the pectorals, is composed of seven spinous rays, the second, third, and fourth of which are longest; the rays of this fin are connected by a membrane, which proceeds obliquely backwards from the posterior tip of one to the anterior centre of the succeeding ray. This fin, when not expanded, is received into a groove at its base.

Just back of the first dorsal commences the second, which is nearly as long as the head; it is composed of a very dense membrane, which envelops all the rays, the second, third, fourth, fifth, and sixth of which are longest; this fin is slightly emarginated above, and its posterior termination resembles a finlet.

The pectorals are triangular.

The ventrals are beneath the pectorals, and are fan-shaped.

The anal fin, similar in its structure and form to the second dorsal, arises just back of the origin of that fin, and terminates nearly on a line with the termination of it.

The caudal fin is large, and deeply forked.

Length, about eighteen inches.

The fin rays are as follows: — D. 7 – 26. P. 17. V. 6. A. 23. C. 20.

Remarks. On some parts of our coast this is a common species. Many years since, it was held in high estimation by the aborigines of our country. For a long series of years it disappeared from our waters, as may be learned from a journal of the first settlement of the island of Nantucket, written by Zaccheus Macey, in 1792, and contained in the third volume of the *Massachusetts Historical Collections*. In this account, notice is taken of a great pestilence which attacked the

Indians of that island in 1763 and 1764, with such mortality that, of 358, the whole number, 222 died. He adds: "Before this period, and from the first coming of the English to Nantucket, a large fat fish, called a *blue-fish*, twenty of which would fill a barrel, was caught in great plenty all round the island, from the 1st of the 6th till the middle of the 9th month. But it is remarkable that in the year 1764, the very year in which the sickness ended, they all disappeared, and that none have been taken since." Occasionally, for the last thirty years, a few straggling specimens, very small, have been taken, but they were rarely seen until within the last fifteen years. During this latter period, they have gradually increased in numbers, and, generally speaking, have been of much larger size than when they were first observed. Now they visit the coast south of the Cape, at Buzzard's Bay, the Vineyard Sound, and Nantucket, in large numbers; and also Massachusetts Bay as far as Boston, from the wharves of which city I have observed specimens to be taken yearly since September, 1844. This species occasionally weighs fourteen pounds. In its flavor it resembles the mackerel, and is highly esteemed by many as an article of food; but it is excessively fat, and cannot always be borne by the stomach. In the early part of summer it is very lean; towards the latter part of summer and the commencement of autumn, it is in a state of perfection for the epicure. Its food is herring and mackerel, and when it appears these fisheries are destroyed. Thus, in March, 1846, the *herring fishery* on the south side of Falmouth was spoiled by the ravages of this species. On the night of the 27th of June, 1847, Captain Atwood caught in his mackerel-nets two large blue-fish. He fished but two nights more that season;—the blue-fish had driven the mackerel entirely from the coast. From that time until now, 1853, the mackerel fishery at Provincetown has been ruined. It is usually caught from the shore at Nantucket by throwing a drail,—a hook fixed into a piece of bone or ivory, and sometimes pewter, somewhat in the form of a fish, with brass wire around the line near it, to prevent its being bitten off by the strong jaws of the fish. It is also caught from a boat under sail with a good breeze, the line dragging behind; and they have been taken with a seine. In a number of the Nantucket Enquirer, July 8th, 1837, I find the following: "A few days since, there were caught at one haul, 241 blue-fish, 108 scuppaugs or poggies, 28 bass, and 19 shad, in all 396 fish, weighing about half a ton."

Maine, H. R. STORER. Massachusetts, STORER. Connecticut, AYRES, LINSLEY. New York, MITCHILL, DEKAY. South Carolina, LIN., CUV.

GENUS XII. RHOMBUS, LACEP.

Head and body compressed. Body covered with minute scales. Extremity of the

VOL. V. NEW SERIES.

pelvis forming, anterior to the anus, a small, pointed, and cutting blade, which resembles a vestige of the ventral fins. A horizontal, partially concealed spine before the dorsal and anal fins.

RHOMBUS TRIACANTHUS, Dekay.

The Skipjack.

(PLATE XV. FIG. 4.)

Stromateus triacanthus, PECK, Mem. Amer. Acad., II. p. 48, pl. 2, fig. 2.

Stromateus cryptosus, *Cryptous Broad-Shiner*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 365, pl. 1, fig. 3.

Peprilus cryptosus, CUV., Griffith's Transl., x. p. 203.

Le Rhombe à fossettes (*Rhombus cryptosus*, NOB., *Stromateus cryptosus*, MITCH.), CUV. et VAL., IX. p. 408.

Peprilus triacanthus, *Three-spined Peprilus*, STORER, Report, p. 60.

Rhombus triacanthus, *Short-finned Harvest-fish*, DEKAY, Report, p. 137, pl. 75, fig. 80.

" " STORER, Mem. Amer. Acad., New Series, II. p. 362.

" " " Synopsis, p. 110.

Color. Of a leaden color upon the back; lighter upon the sides; silvery beneath. The cheeks, intermaxillaries, chin, base of pectorals, and base of caudal fin, together with more or less of the abdomen, sprinkled with very minute black dots. The opercles are cupreous.

Description. The body is ovate, very much compressed laterally, particularly at the abdomen. The arch of the back is continued to the spine at the origin of the dorsal fin. The length of the head is rather more than one fifth the length of the body, and is gradually arched from the snout. The eyes are circular; their diameter is equal to one fourth the length of the head. The nostrils are small; the anterior is circular, the posterior a vertical fissure. The mouth is of moderate size. The jaws are of equal length, and present at their edges a large number of very minute, equal, compact teeth.

The lateral line, which is very well marked, commences just back of the posterior angle of the operculum, and, arching backwards, curves with the back to the base of the caudal fin. A slightly depressed straight line, destitute of scales, is seen passing from beneath the origin of the lateral line to the middle of the fleshy portion of the tail; and another line, similar in appearance to the last, though not so obvious, passes from the inferior base of the pectorals, curving with the abdomen, to the lower part of the fleshy portion of the tail, corresponding in its course to that of the lateral line. These lines gradually disappear after death. On each side of the dorsal fin, commencing at its origin and terminating towards its posterior half, are situated between twenty and thirty small circular black punctures, the orifices of mucous ducts.

At the origin of the dorsal fin is a small, naked, horizontal spine, pointing forwards. The dorsal fin commences opposite the anterior half of the pectorals, and is continued to the fleshy portion of the tail. The fifth, sixth, and seventh rays are the highest. The

most posterior rays are not quite equal to one fourth the height of the highest rays. The height of the pectorals is one fifth greater than the height of the head.

Just back of the anus is a minute naked spine, pointing forwards like that before the dorsal fin.

The anal fin terminates opposite the extremity of the dorsal fin. The membrane uniting the rays of this fin, as well as that of the dorsal fin, is very fine, appearing to be a continuation of the cuticle of the fish; it is not continued to the extremities of the rays, which are naked and bifid. Some distance anterior to the anus is a very minute spine, which is naked and directed backwards.

The caudal fin is deeply forked; its longest rays are higher than the length of the head. Length about ten inches.

The fin rays are as follows: — D. 45. P. 21. A. 43. C. 20.

Remarks. — This species was first described by Professor Peck in 1794, and his communication was published in the Memoirs of the American Academy for 1804. His description, which was a very accurate one, was accompanied by a respectable figure. His specimens were taken on the coast of New Hampshire. This fish, which is known upon some portions of Cape Cod as the *Sheep's-head*, and at Provincetown by the name of *Skipjack*, is not uncommon in the waters of our State. It is taken along the Cape, in considerable quantities, in nets with bass and mackerel. I have known a single specimen to be taken from one of the wharves in this city. A peculiarly unpleasant odor is emitted by this fish when caught, resembling somewhat that of sulphuretted hydrogen, which sometimes produces a faintness accompanied with headache in the captor. It is used as bait for the *Striped Bass* by our fishermen. By some it is considered an excellent pan-fish. Being very oily, it is principally used for manure upon several portions of Cape Cod.

New Hampshire, PECK. Massachusetts, STORER. Connecticut, AYRES, LINSLEY. New York, MITCHILL, DEKAY.

GENUS XIII. SPHYRÆNA, Cuv.

Body elongated, with two distinct dorsals. Lower jaw longest; both with long teeth. Ventrals back of the pectorals.

SPHYRÆNA BOREALIS, *Dekay*.

The Northern Barracuda.

(PLATE XII. FIG. 3.)

Sphyræna borealis, *Northern Barracuda*, DEKAY, Report, p. 39, pl. 60, fig. 196.

" " " " STORER, Proc. of Bost. Nat. Hist. Soc., I. p. 148.

" " STORER, Mem. Amer. Acad., New Series, II. p. 300.

" " " Synopsis, p. 48.

Color. Of a greenish brown above, silvery beneath; this silvery appearance is more striking upon the inferior portions of the head and throat. The lateral line and caudal fin are yellow.

Description. Body very much elongated and slightly compressed. Length of head equal to about one fourth the length of the body; it is flattened above and ridged; this upper portion of the head, as well as its sides in front of the eyes, and the intermaxillaries, is destitute of scales; gill-covers with minute scales. The operculum terminates posteriorly in an acute angle; preoperculum rounded posteriorly. Eyes large, circular; distance between eyes equal to diameter of eye. Nostrils situated directly in front of eye; the anterior circular and the smaller. Snout obtuse; lower jaw projecting beyond the upper. Gape of mouth large. Fleshy protuberance at chin. Posterior teeth in lower jaw largest of all, with the exception of the two anterior. Two prominent sharp teeth on each side of tip of upper jaw. A large number of very minute teeth are seen upon the intermaxillaries; numerous teeth also upon the palatines on each side, the three anterior of which are much the largest. Tongue rough. The lateral line commences at the posterior superior angle of the operculum, and, curving slightly downwards to a line above the posterior half of the pectoral fin, pursues a straight course thence to the tail. The scales along the lateral line slightly resemble those in the same situation of the genus *Caranx*.

The first dorsal fin commences nearly opposite the origin of the ventral fin. It is of a triangular form; its membrane is exceedingly delicate; the second ray is the highest; the first and third are equal; the length and greatest height of the fin are equal. The tips of all the rays project considerably beyond the connecting membrane.

The second dorsal fin commences anterior to the anal, and is subquadrangular. The membrane connecting the rays is much firmer than that of the first dorsal. The first ray is simple, the others bifurcated.

The pectorals commence just beneath the posterior angle of the operculum. The first ray is simple; its height is about equal to that of the first dorsal.

The ventrals are situated beneath the first dorsal; they are a little shorter than the pectorals.

The anal is situated beneath the second dorsal, and its height is about equal to the height of that fin.

The caudal is deeply forked.

Length about nine inches.

The fin rays are as follows:—D. 5–10. P. 14. V. 6. A. 10. C. 20.

Remarks. Several specimens of this fish were sent me in September, 1843, by Dr. Yale, from Holmes's Hole.

Massachusetts, STORER. New York, DEKAY.

FAMILY VI. ATHERINIDÆ.

Mouth protractile; no notch on the upper jaw, nor tubercle on the lower. Suborbital not dentated. A broad silvery band on the side. Very small crowded teeth on the pharyngeals. The first branchial arch with long pectinations. Two dorsal fins, most commonly distant. Ventrals behind the pectorals.

GENUS I. ATHERINA, LIN.

Body elongated. Two dorsals widely separated; ventrals further back than the pectorals; mouth highly protractile, and furnished with very minute teeth. A broad silvery band along each flank on all the known species.

ATHERINA NOTATA, Mitch.

The Dotted Silver-side.

(PLATE XVI. FIG. 1.)

Atherina notata, *Small Silver-side*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 446, pl. 4, fig. 6.

L'Athérine de Bosc (*Atherina Boscii*, CUV., *Atherina notata*, MITCH.), CUV. et VAL., X. p. 465.

Atherina Boscii, *Small Silver-side*, STORER, Report, p. 62.

" " " " AYRES, Bost. Journ. Nat. Hist., IV. p. 262.

Atherina notata, *Dotted Silver-side*, DEKAY, Report, p. 141, pl. 28, fig. 88.

" " STORER, Mem. Amer. Acad., New Series, II. p. 366.

" " " Synopsis, p. 114.

Color. Alive, the entire fish is translucent, with the exception of the abdomen, which is rendered opaque by the contained viscera. The body is greenish above, with minute black dots distributed along the edges of the scales upon the upper portion of the sides, and over the entire scales upon the dorsum, making it to appear quite dark-colored. Upon the sides a beautiful broad silvery band runs from the upper base of the pectorals to the tail; along its upper edge runs the black lateral line; the portion of the body beneath this band is of a lighter color than that above it, and of a silvery appearance. Minute black dots exist between the rays of the anal fin at its base. The fins are all translucent, colorless, and articulated. The top of the head is covered with minute black dots, similar to those on the scales. The space between the eyes is nearly black, owing to the black pupils beneath. The pupils are deep black, the irides a beautiful silvery color. A golden reflection is seen upon the operculum, which in some specimens is continued along the abdomen to the vent.

Description. The body is elongated, somewhat compressed, flattened upon the top of

the head. The scales are rounded, smooth at their edge with concentric striæ. Its greatest depth is equal to about one seventh its whole length. The length of the head is rather more than one fifth the whole length of the body. The eyes are horizontally oval; their greatest diameter is equal to one fourth the length of the head; the distance between the eyes is equal to their greatest diameter. The upper jaw is slightly the longer when the mouth is closed; the lower jaw, when closed, is situated obliquely with regard to the upper; both jaws are armed with minute teeth. The mouth is very protractile.

The first dorsal fin arises at a distance back of the posterior extremity of the pectorals about equal to half the length of the head. It is subtriangular when expanded, with a very delicate connecting membrane. Its first ray is shorter than the three next posterior; the last ray is connected to the dorsum by a prolongation of the connecting membrane.

The second dorsal fin is situated back of the first, at a distance equal to that at which the first dorsal is back of the extremities of the pectorals. This fin is quadrate, slightly emarginated above; its posterior ray projects slightly beyond the preceding rays.

The pectoral fins commence directly back of the upper part of the operculum; their highest rays are equal to three quarters the length of the head; the length of the fin is equal to one third of its height. The upper rays are as high again as the lower rays, when unexpanded. These fins cover a portion of the silvery lateral band.

The ventral fins are fan-shaped, and arise on a line opposite the posterior rays of the pectorals; their rays are multifid; they are connected at the inner edge of their base by a delicate membrane.

The anal fin is situated just back of the commencement of the first dorsal fin; it is much elongated, and terminates just posterior to the second dorsal. Its first eight or ten rays are much the highest.

The caudal fin is deeply emarginated. The height of its outer rays is equal to the height of the pectorals.

The fin rays are as follows: — D. 5–9. P. 12. V. 5. A. 25. C. 18.

Remarks. This species, specimens of which I have received from Holmes's Hole and Provincetown, in the spring and autumn accompanies the smelt in large numbers into the mouth of Charles River at Boston, and is taken by the boys, by whom it is invariably called the *Capelin*; which is the common name of the *Mallotus villosus*. In the third volume of the *Massachusetts Historical Collections*, for 1794, this fish is called the *Atherina (menidia)*, Lin., and is spoken of as being "found in great abundance in the River Piscataqua, in the months of August and September." The author's name is not mentioned, but we suppose it to be Professor Peck, who then resided at Kittery, N. H.

New Hampshire, PECK. Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, MITCHILL, CUVIER, DEKAY. South Carolina, CUVIER.

FAMILY VII. MUGILIDÆ.

Body almost cylindrical, covered with large scales, and furnished with two distinct dorsal fins, the first of which has only four spinous rays. Head rather depressed, also covered with large scales or polygonal plates. Muzzle very short. Teeth very fine, sometimes scarcely perceptible. The ventrals are attached somewhat behind the pectorals. Branchiostegous rays, six.

GENUS I. MUGIL, LIN.

Ventrals placed a short distance behind the pectorals. The first dorsal with four spinous rays. The middle of the under jaw tuberculated within, and a corresponding cavity in the upper jaw. Teeth very small.

MUGIL LINEATUS, *Mitch.**The Striped Mullet.*

(PLATE XVI. FIG. 4.)

Mugil lineatus, MITCH., MS. communicated to Cuvier.

Le Muge rayé (*Mugil lineatus*, MITCH.), CUV. et VAL., Hist. Nat. des Poiss., II. p. 96.

Mugil lineatus, DEKAY, Report, p. 144, pl. 15, fig. 42.

" " AYRES, Bost. Journ. Nat. Hist., v. p. 265, pl. 12.

" " STORER, Mem. Amer. Acad., New Series, II. 367.

" " " Synopsis, p. 115.

Color. Dusky grayish-blue above, thence to steel and to dirty silvery, with metallic reflections upon lower sides and abdomen. Sides throughout their whole depth from back to centre of belly marked with continuous longitudinal and parallel lines, equidistant, of little over a hair's breadth, and passing through the centre of each scale; the two upper reach over the top of the head to the snout; their number is from ten to fourteen. Snout and upper operculum clouded with greenish fuliginous; lower operculum a clear silver. Pupils black, irides yellowish. All the fins save the ventrals clouded with dusky, even the membrane of first dorsal. Second dorsal and caudal the darkest, the terminal margin of the latter edged with very dark brown. A deep purplish spot at upper base of pectorals.

Description. Body nearly cylindrical; dorsal outline somewhat convex, especially gibbous in region of second dorsal. Depth of body equal to length of head; depth near tail about one half of greatest depth.

Head moderate; its length about one fifth that of the entire fish; somewhat flattened

above, cheeks slightly protuberant. Opercles entire, though their suture is plainly visible. Space between edges of interopercula of moderate size. Jaws nearly equal, the lip of the upper, which is protractile, a little projecting; the tip of lower jaw with a pointed knob, which fits into a corresponding cavity above. Gape of mouth moderate and triangular; outer edge of upper jaw with a single row of very minute teeth, those on lower jaw scarcely perceptible, even if present. Nostrils double; the posterior near upper anterior angle of eye; the anterior smallest and rounded. Eyes large, their diameter equal to about two thirds the distance between them; with a thick gelatinous membrane, which more than covers them, and extends to some distance around.

Scales throughout body, large, rounded, engraved; present also upon throat and top of head; in which latter locality some of them are strangely channelled and grooved, as if by worms.

First dorsal commences just behind a line midway between pectorals and second dorsal. Moderate, rounded triangular; its rays spinous, the second the longest, the last the smallest and least stout. When shut, concealed nearly from view. Rays so arranged as to fall alternately upon opposite sides of the median line when fin is closed.

Second dorsal quadrangular, emarginated posteriorly, or rather superiorly; fleshy.

Pectorals subtriangular, slightly falciform; with a large, delicate, and movable axillary scale.

Ventrals with a movable pelvic plate, their first ray spinous and welded to the next, the rest branched; in advance of the pectorals.

Anal commences slightly in front of second dorsal, and terminates about on a line with it; the first three rays progressively increase in length, the first of them being very short, and are spinous.

Caudal deeply emarginated.

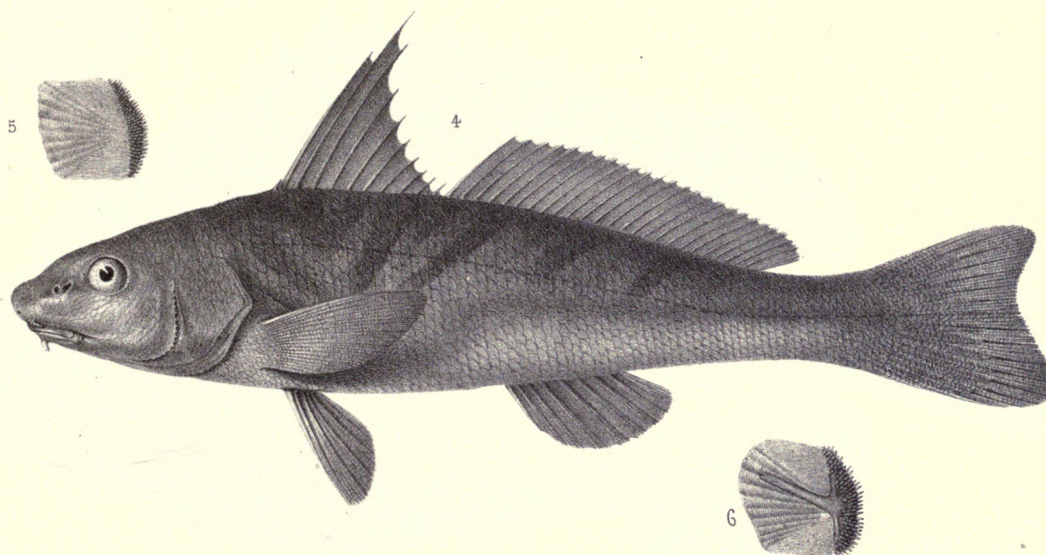
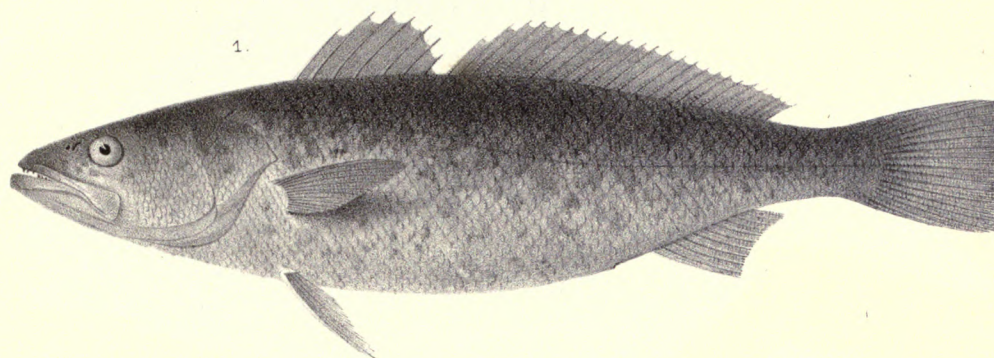
The fin rays are as follows: — D. 4-9. P. 16. V. 1-5. A. 3-10. C. 14.

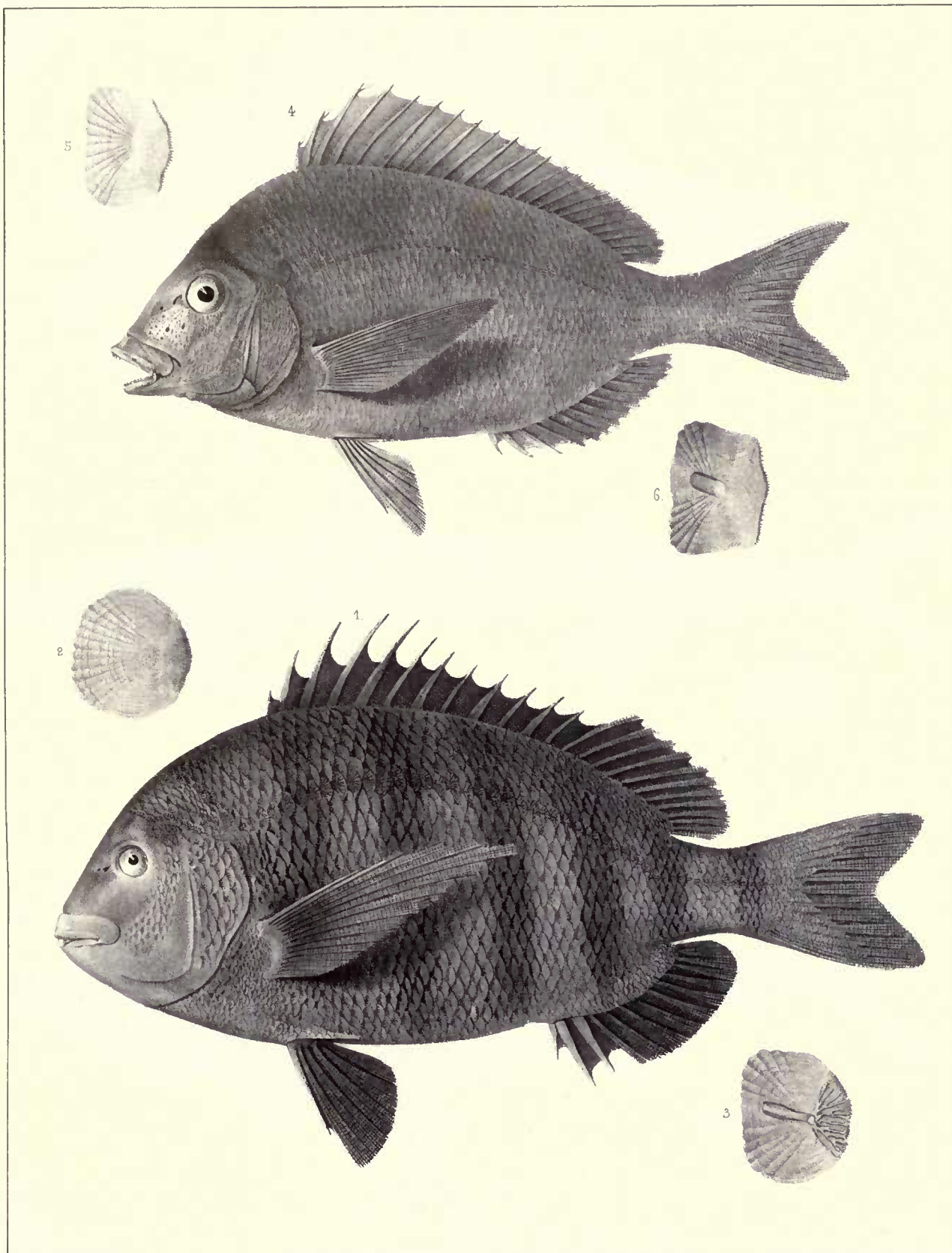
Length ten inches.

Remarks. Dekay says this species "was first detected on our coast by Dr. Mitchill, who sent a specimen, with the name and a description, many years ago." Cuvier, in his *Histoire Naturelle des Poissons*, accepts the specific name of Mitchill.

The only individual of this species I have known to be taken in our waters was found by Captain Atwood on the northern side of Long Point, Provincetown, November 7th, 1851, where it had run ashore.

Massachusetts, STORER. Connecticut, AYRES, LINSLEY. New York, MITCHILL, CUVIER, DEKAY.

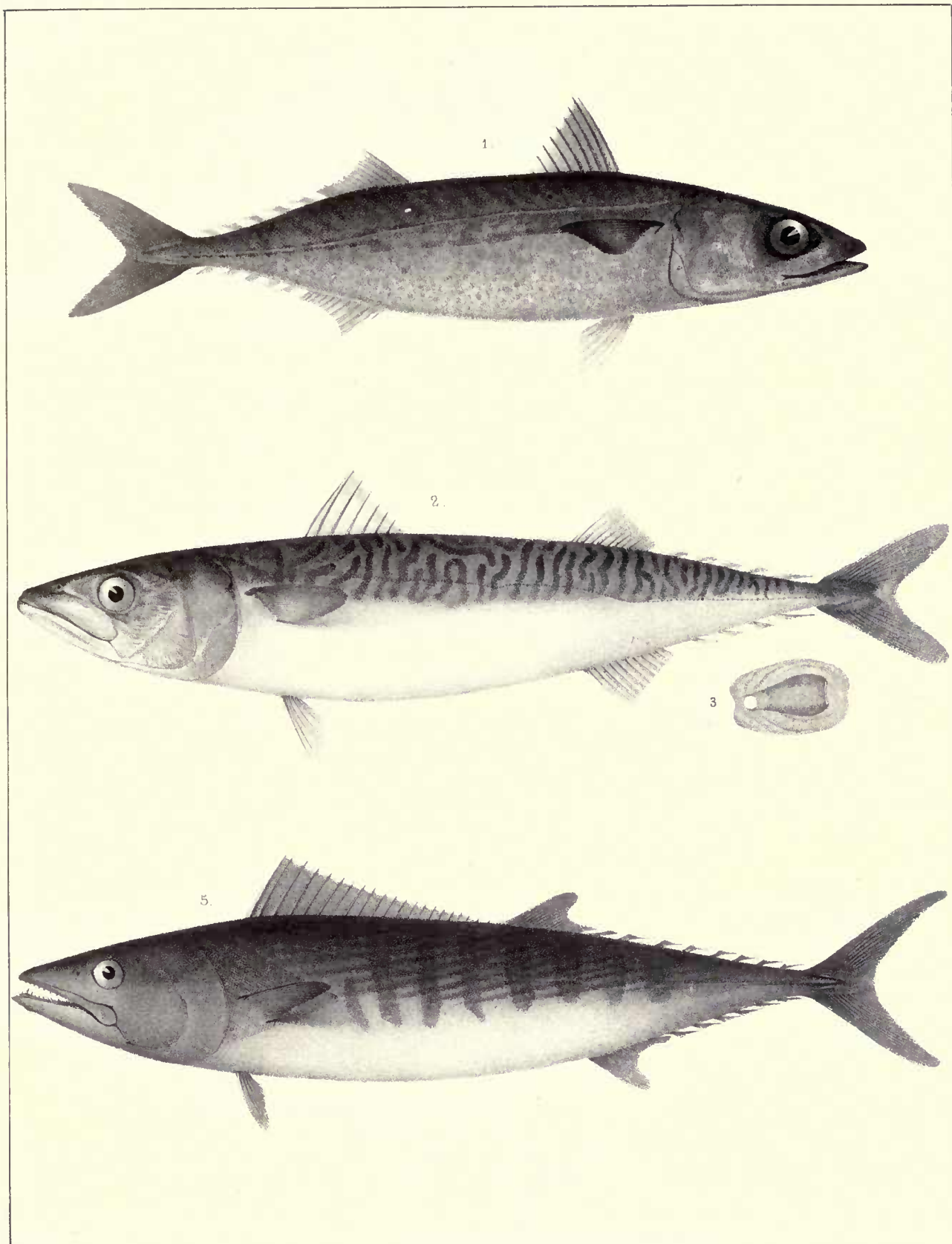




A Sonnet on stone from nat

Printed by Tappan & Bradford.

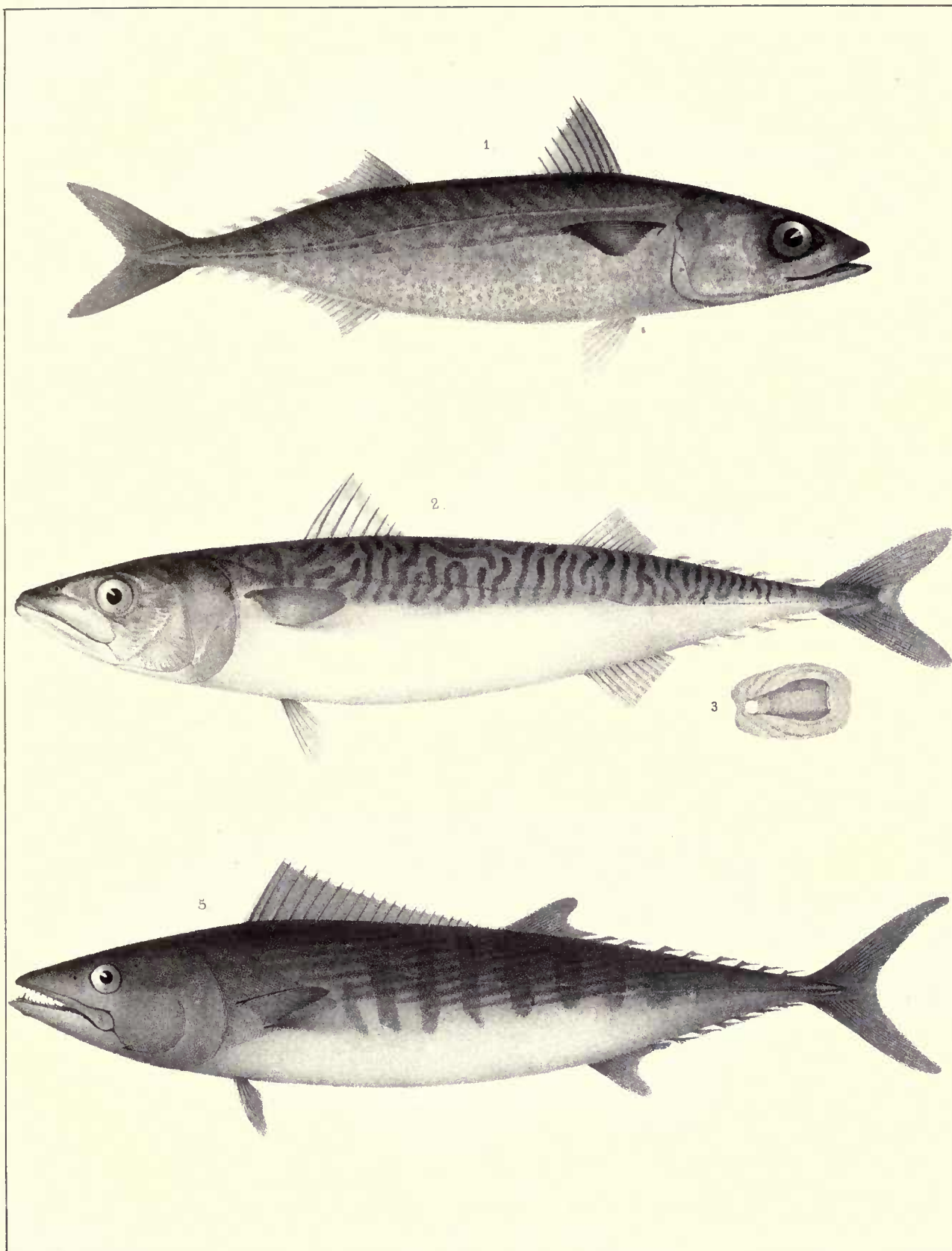
1-3. SARGUS OVIS Mitch. - 4-6. PAGRUS ARGYROPS, Lin.



Tappan & Sourel from nat.

Printed by Tappan & Bradford

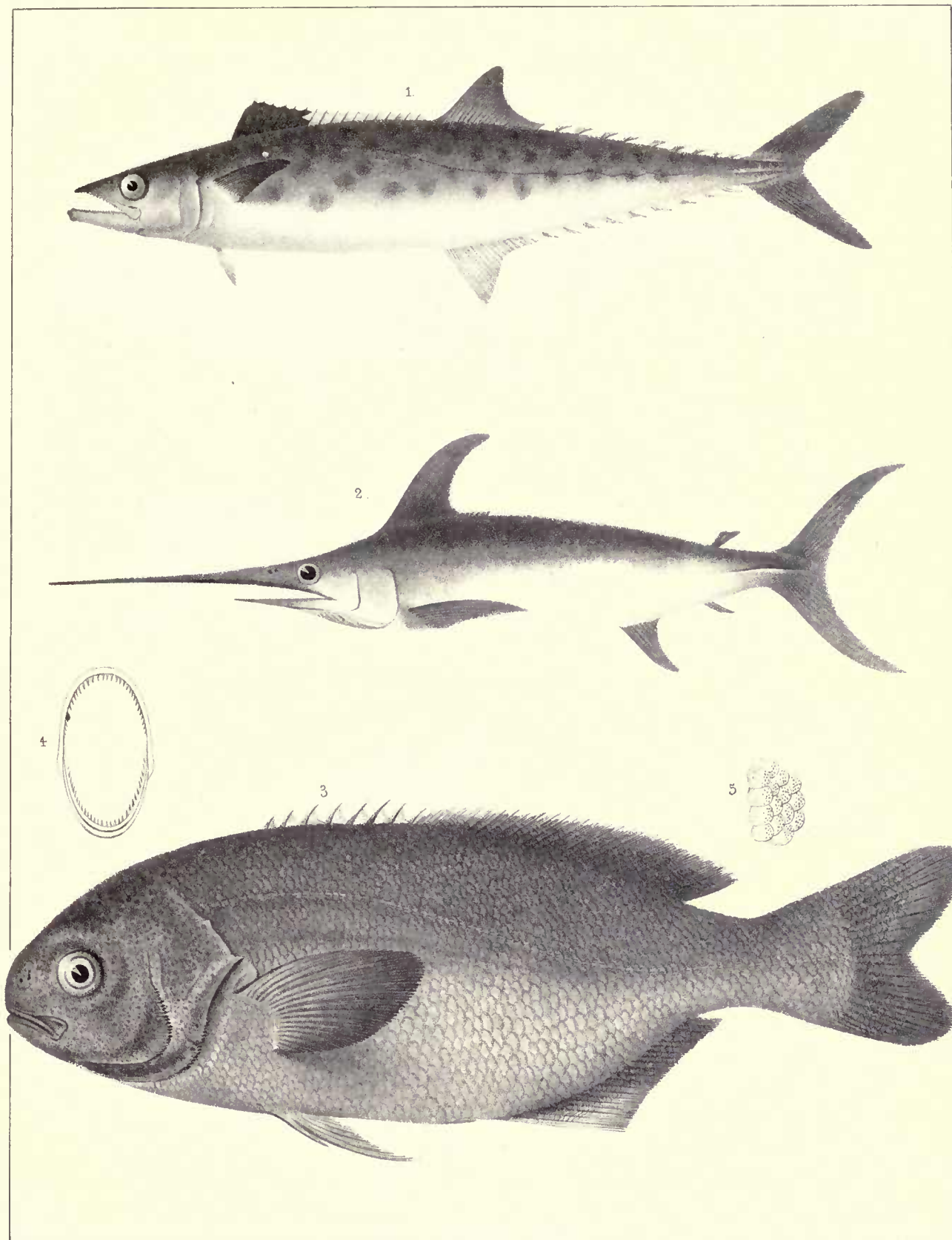
1, SCOMBER DEKAYI, Storer. — 2, 4. SCOMBER VERNALIS, Mitch.
5. PELAMYS SARDA, Cuv.



Tappan & Sonnet from nat.

Printed by Tappan & Bradford

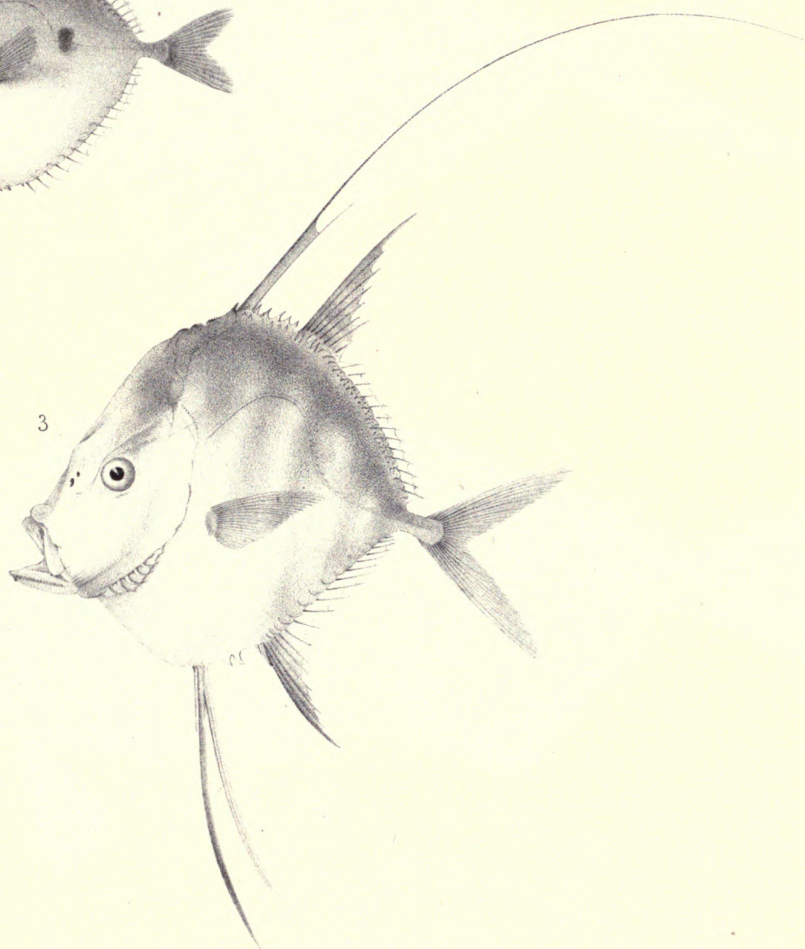
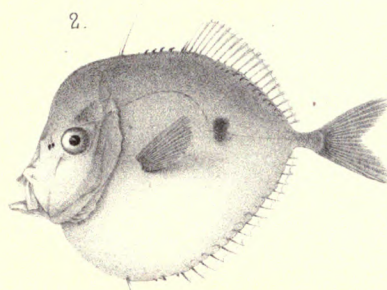
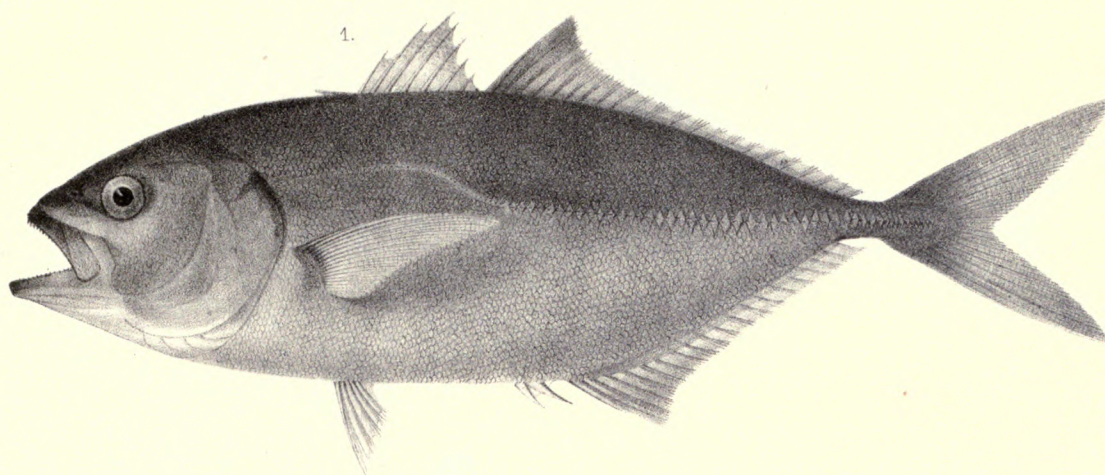
1, SCOMBER DEKAYI, Storer. — 2, 4. SCOMBER VERNALIS, Mitch.
5. PELAMYS SARDA, Cuv.



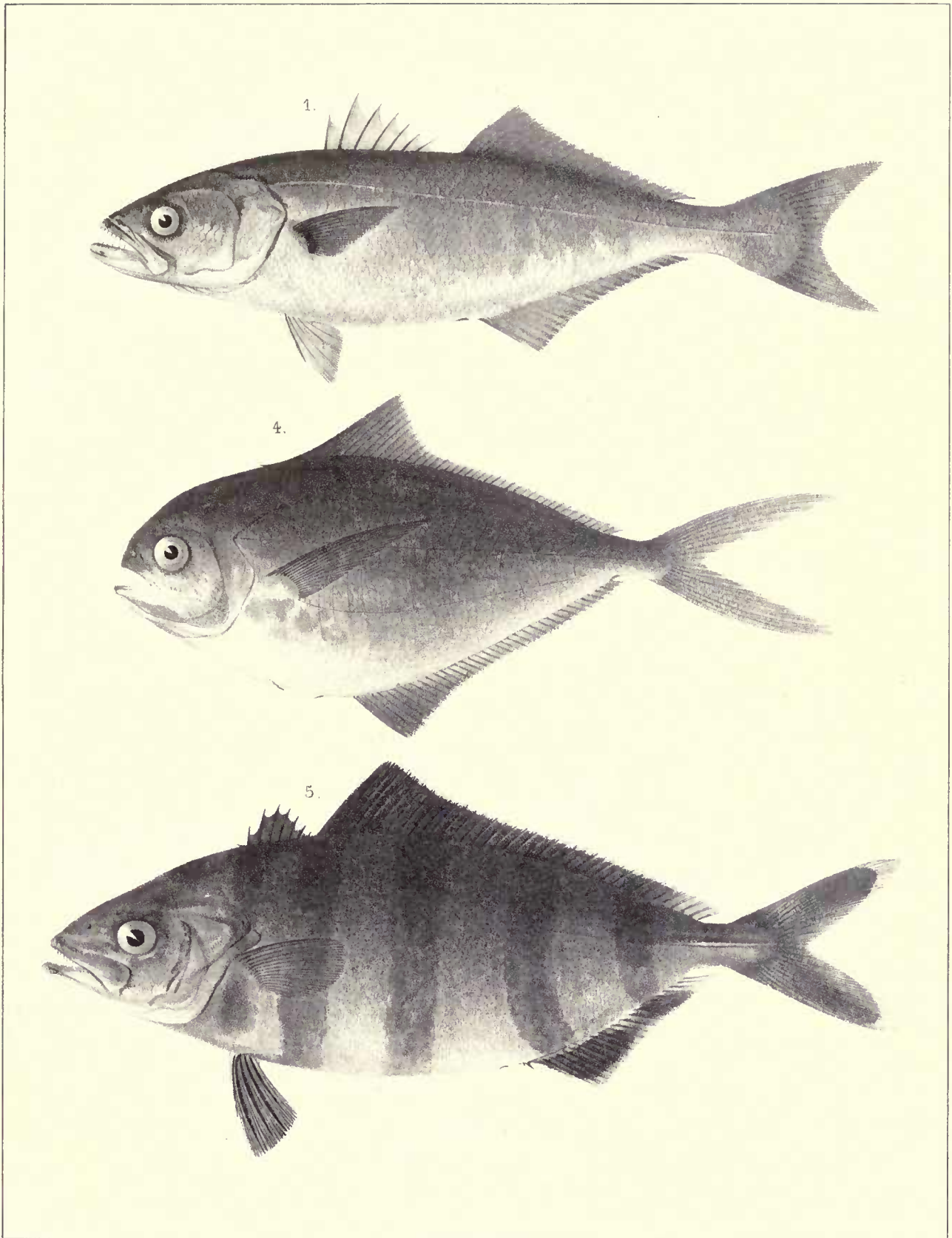
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1. CYBIUM MACULATUM, Cuv. — 2. XIPHIAS GLADIUS, Lin.
3 5. PALINURUS PERCIFORMIS, Dekay.



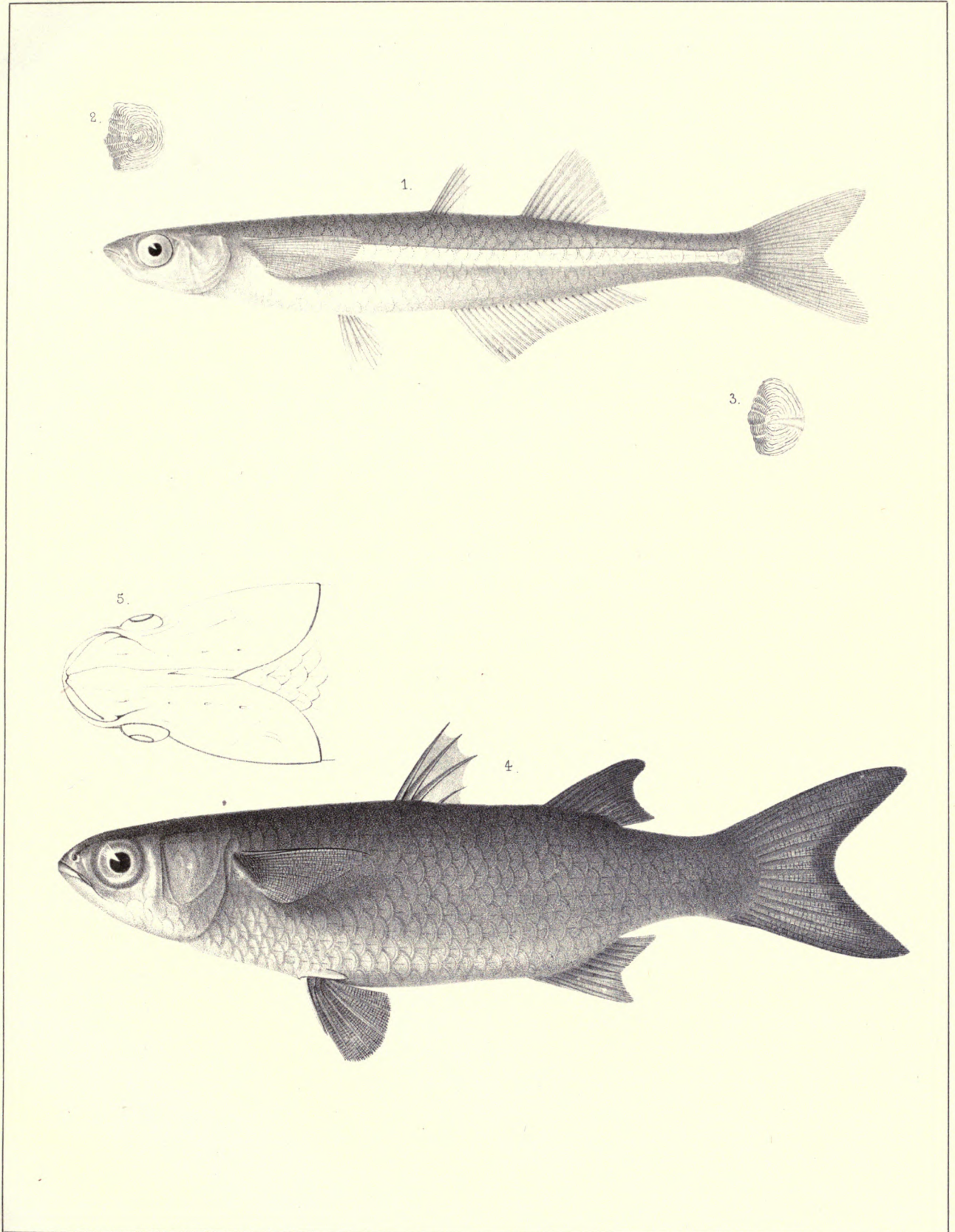
1. *CARANX CRYSOS*, Cuv. — 2. *ARGYREIOSUS UNIMACULATUS*, Batch.
3. *ARGYREIOSUS CAPILLARIS*, Dekay.



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1. TEMNODON SALTATOR Cuv — 4. RHOMBUS TRIACANTHUS, Dekay
5. SERIOLA ZONATA, Cuv.



A. Sonrel

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1-3. *ATHERINA NOTATA* Mitch., ~ 4, 5. *MUGIL LINEATUS*, Mitch.

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