

Actual measurements of the parts are not given, as the proportions vary but little.

Several examples were collected November 26, 1879, at a depth of ten fathoms, in Drake's Bay, 35 miles north of San Francisco, by Mr. Voy, who has presented them to the State University, Berkeley, Cal.

One of the types is in the United States National Museum, numbered —.

This species is referred to the genus *Brachyopsis*, proposed by Dr. Gill for the reception of *Agonus rostratus*.

This genus is distinguished from *Agonus* by the projecting lower jaw and consequent comparatively large terminal mouth, and by the absence of an isthmus.

**DESCRIPTION OF A NEW GENUS AND SOME NEW SPECIES OF CALIFORNIA FISHES (ICOSTEUS ÆNIGMATICUS AND OSMERUS ATTENUATUS).**

**By W. N. LOCKINGTON.**

Fam. BLENNIDÆ (?).

**ICOSTEUS.**

Body much compressed. Teeth in a single row in both jaws, close-set, sharp. No teeth on vomer, palatines, or pharyngeals. Gill-openings continuous under the throat, composed of flexible rays, the anterior simple.

A single long dorsal fin; anal similar. Base of pectorals fleshy. Ventrals thoracic in position. Lateral line with groups of spines. Pseudo branchiæ.

Body scaleless throughout; fins beset with spinules along the rays.

Etymology: *εἰζω*, to yield; *οστρεον*, bone.

**Icosteus ænigmaticus.**

Body much compressed throughout; head thicker than any portion of the body. Dorsal outline rising rapidly to the origin of the dorsal; thence more slowly in a regular curve to about the center of the length of the body; thence curving gradually downward to the caudal peduncle. Abdominal outline regularly curved.

Upper and lower outlines of caudal peduncle concave, the peduncle widening posteriorly to support the fin-shaped caudal.

Greatest depth about  $3\frac{1}{2}$  times in total length; length of head about 5 times in total length; eye 6; snout more than 3; interorbital width about  $2\frac{1}{2}$  times in the length of the head; caudal peduncle about  $5\frac{1}{2}$  times in the greatest depth.

Nostrils simple, elongate-elliptical; eyes lateral; their diameter less than the length of the snout; mouth-opening rather large, horizontal, or nearly so; tip of the intermaxillary below the lower margin of the eye; margin of upper jaw formed of the intermaxillaries only; maxilla-

ries narrow throughout, not hidden beneath the preorbital; posterior extremity of the maxillary extending to a little beyond a vertical from the center of the eye.

Teeth in jaws in a single row, numerous, fine, sharp-pointed, closely and regularly set, those in the upper jaw smaller than those in the lower. No teeth on vomer or palatines. No pharyngeal teeth present.

Gill-rakers flexible, few, about half as long as the diameter of the eye on the first branchial arch, diminishing on each successive arch.

Gill-openings continuous under the throat; branchiostegals six.

Dorsal commencing at a vertical above the pectoral axil, and consisting of 52-55 rays, all soft and flexible, but some of the anterior ones unbranched. Anterior portion of dorsal low, the rays gradually increasing in height posteriorly, the base of the fin terminating opposite to that of the anal, at about  $1\frac{1}{2}$  times the least width of the caudal peduncle from the origin of the caudal fin; but the longest rays (last but two or three) extending backwards almost to the origin of the central caudal rays. None of the dorsal rays bifurcate more than once.

Anal commencing opposite the 24th-27th dorsal ray; similar to and about equal in depth to the height of the posterior portion of the dorsal, consisting of 37-40 rays, most of them once bifurcate; its base terminating opposite to that of the dorsal, and its longest posterior rays extending backwards even with those of the latter; three last anal rays diminishing rapidly in length.

Some of the anterior anal rays appear to be unbranched.

Caudal elongate, fan-shaped, the central rays longest, and the posterior margin greatly rounded. Posterior part of caudal peduncle expanded, and forming the larger half of an ellipse, around which the rays are set; the central ones straight, the outer ones curving outward and backward. Accessory rays numerous; principal rays twice bifurcate.

Pectorals with a fleshy base, having a curved posterior border from which the rays radiate, forming a fan-shaped fin; the central rays longest, the others diminishing regularly on both sides. All the rays straight; the seven or eight central ones twice, the others once, bifurcate.

Ventrals inserted a little behind the base of the pectorals, narrow, consisting of a short (spinous?) and four long rays.

Lateral line conspicuous, curving downwards above the pectoral until, a little posterior to the origin of the anal, it reaches the median line of the trunk, along which it continues till it dies out upon the fleshy base of the caudal.

Groups of small spines along the entire length of the lateral line, the number of spines in each group variable. About 120 groups of spines in the smaller example. No scales upon any portion of the body or fins, but the latter rendered rough by asperities or small spinules; a single series along the base of each ray, and a series along each of its branches.

*Color*.—Purple spots and blotches of irregular shape upon a yellowish-brown ground; the spots largest upon the dorsal region, and becoming

smaller and more numerous near the lateral line. The region above and behind the pectorals beset with numerous purple spots, smaller than those above the lateral line. Beneath the lateral line, on the posterior part of the body, there are no spots, except along the line of the anal; but probably this is the result of exposure to alcohol, which has caused the disappearance of most of the spots from the smaller specimen, the color of which, when fresher, was like that of the larger.

Throat and greater portion of gill-membranes without blotches, but sown with dark points, which occur also over the whole of the body and the interior of the mouth. Fleshy bases of caudal and pectorals with several purple blotches. Fins darker than the body, and showing traces of blotches of a deeper tint, especially upon the caudal.

Vertebrae numerous; vertebral column highly flexible and soft.

Cranial bones tolerably firm, those of the face and opercles, &c., highly flexible.

Entire body characterized by a lack of firmness, as it can be doubled up as readily as a piece of soft, thick rag. Swim-bladder large.

I append measurements of the two specimens, but many of these must be regarded as approximate only, in consequence of the distortion arising from the softness of texture of the fish, together with that consequent upon cutting them open shortly after they were first procured.

In the larger specimen the ventrals are partly destroyed, and the tips of many of the dorsal and anal rays are wanting.

The shape of the head in the two examples is very different, doubtless owing to the flexibility of the bones. In the larger the snout is bluff, almost perpendicular, the dorsal outline rises rapidly to the origin of the dorsal, and the tip of the premaxillaries is far below the eye; while in the smaller the dorsal outline slopes regularly from the tip of the snout, which is almost level with the lower margin of the eye, to the origin of the dorsal.

*Dimensions.*

	No. 1.	No. 2.
Total length, to tip of caudal.....	10 1/2	11 1/2
Greatest depth (approximate).....	2 1/2	3 1/2
Depth of peduncle of tail where narrowest.....	1 1/2	2 1/2
Length of head.....	2 1/2	2 1/2
Diameter of eye.....	1/2	1/2
Interorbital width.....	1 1/2	1 1/2
Length of upper jaw.....	5 1/2	5 1/2
Length of snout.....	5 1/2	5 1/2
Tip of snout to origin of dorsal.....	5 1/2	3 1/2
Length of base of snout.....	5 1/2	6 1/2
Length of longest posterior dorsal rays.....	1 1/2	1 1/2
Interval between dorsal and caudal.....	5 1/2	5 1/2
Tip of mandible to anal fin.....	5 1/2	5 1/2
Length of anal base.....	3 1/2	3 1/2
Origin of dorsal to upper axil of pectoral.....	1 1/2	2 1/2
Upper axil of pectoral to tip of snout.....	1 1/2	2 1/2
Length of pectorals.....	1 1/2	1 1/2
Length of ventrals.....	1 1/2	1 1/2
Number of dorsal rays.....	55	52 or 53
Number of anal rays.....	40	37
Number of groups of spines in lateral line.....	Circa 110	Circa 120

These two individuals, together with a third of smaller size, and certainly of another species, were procured in the market of San Francisco by W. G. W. Harford, in 1876. The fishmonger called them "deep-sea fish," and said that he had never seen the kind before. No others have appeared in the market since. A smaller example is in the museum of the State University, Berkeley, and was procured in Washington Territory.

The relations of this fish are probably with the Blennioid fishes. It can, however, hardly be referred to any of the current families, and should perhaps form the type of a separate one.

*Osmerus attenuatus.*

*Osmerus elongatus* Lockington, Rep. Commissioners Fisheries State of Cal., 1879, p. 43; not *Osmerus elongatus* Ayers, Proc. Cal. Acad., Vol. I, p. 17.

D. 1-10. A. 17. P. 14. V. 1-8.

Form elongate, fusiform, dorsal outline rising gently to a point just behind the origin of the pectoral, thence almost straight to dorsal, thence tapering regularly to the caudal peduncle. Abdominal outline straight from the posterior extremity of the maxillary to the ventrals, thence inclining upwards slowly to the caudal peduncle.

Greatest depth  $7\frac{2}{3}$ - $8\frac{3}{4}$  times; head  $4\frac{1}{3}$  to nearly 5 times in the total length; eye about 4 times in the length of the head; snout about the same length as the eye; caudal peduncle  $2\frac{2}{5}$ - $2\frac{3}{4}$  times in the greatest depth.

Viewed from above, the forehead and snout diminish in width anteriorly.

Nostrils conspicuous, divided by a thin partition, simple, situated on a line from the top of the pupil to the tip of the snout, and about half-way between the latter and the anterior margin of the orbit.

Eyes large, subcircular, entirely in the anterior half of the head; upper orbital margins raised, but the interorbital space between these margins flat transversely.

Mouth large, the commissure straight and ascending anteriorly at an angle of about  $30^\circ$ , the tip of the upper jaw horizontal with the center of the pupil, and the posterior extremity of the maxillary on a vertical line from the posterior margin of the pupil; mandible straight on its lower border, its tip projecting beyond that of the upper jaw.

Dentition tolerably strong, on jaws and palatines. Teeth of upper jaw in a single row, numerous, small, slender, those in front inclined forward, a large tooth at the symphysis.

Lower jaw with a double row of slightly recurved teeth in front, the outer extending only about one-fifth of the length of the sides of the mandible, the inner row extending along the sides, and consisting of larger teeth than the outer or than those of the upper jaw; the largest situated along the sides, and much wider apart than those of the upper jaw.

Inner palatine row of numerous small teeth; outer palatine series

very variable in its development, but usually consisting of few rather large teeth, increasing in size forwards, the anterior tooth sometimes quite a large canine. Teeth in front part of tongue in a single series on each side, with a single terminal tooth; all the teeth large and curved, the terminal tooth largest. A large patch of several rows of villiform teeth on the base of the tongue, marked off by a constriction from the terminal patch.

Gill-rakers long and slender, those of first pair of branchial arches half as long as the eye, the others diminishing gradually. Branchiostegals seven.

Angle of preoperculum a little more than a right angle, both the posterior and the inferior margins nearly straight. Posterior margin of gill-cover forming a bold and almost regular curve, its most posteriorly produced portion occupied by the suboperculum.

Pectoral of fourteen rays, the third or fourth longest, narrow, the rays bifurcate. Tips of the pectorals distant from the ventrals more than the length of the ventrals.

Ventrals not greatly shorter than the pectorals; the rays bifurcate, their tips not reaching to the anus; insertion of ventrals about one scale in advance of that of dorsal.

Dorsal of one spine and ten bifurcate rays, highest in front, the height about twice the length of the base; the second ray slightly longer than the first, the last longer than the spine. Anal commencing at about the posterior third of the total length, and consisting of seventeen branched rays, the first very short, the second nearly equal to the third and longest, the fourth nearly equal to the third, thence descending gradually.

Caudal deeply emarginate, almost forked; rays 11-10-9- $\frac{8}{10}$ , principal rays several lines branched.

Lateral line not very distinct, running along the center of the silvery band of each side. Scales rather large, their exposed portion forming a diamond-shaped pattern, each diamond about twice as deep as long. Head scaleless.

No scales upon the fins.

Adipose fin falcate, rather large.

*Color of the fresh fish.*—Light greenish gray on the back, the pattern of the scales marked by a series of black dots around the edge of each; these die out upon the silvery lateral line. A very bright silvery line along the side, reaching one scale above lateral line; the upper boundary of this band distinct, the lower fading into the silvery-white of the belly. Operculum and suboperculum bright like the lateral band, except above, where they become greenish gray like the back; snout and cheeks darker greenish gray than the back. Lower jaw with black points below and on the sides, closer together toward the tip. Fins spotted with dark points. Forehead between eyes almost black; eyes silvery; pupil black.

Locality, San Francisco.

The whole fish is highly transparent when fresh, the outline of the brain being clearly visible through the occiput.

From *Osmerus thaleichthys*, which at first sight nearly resembles it, this species may be distinguished by the following characters: The slightly greater length and more tapering form of the snout, when viewed from above; the straight lower jaw, which in *O. thaleichthys* is considerably curved upwards toward the tip; the gradual declivity of the upper outline of the head, which in the latter species is straight with the line of the back; the larger eyes; the different arrangement of the teeth; the more elongated body, much less curvate along the abdominal outline; and the much greater distance between the tips of the pectorals and the base of the ventrals.

*Dimensions.*

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
Total length .....	4.12	4.50	5.25	5.72	5.06	6.00
Greatest depth of body .....	.55	.58	.60	.72	.62	.75
Length of head, to tip of lower jaw .....	.96	1.00	1.13	1.25	1.12	1.22
Longitudinal diameter of eye .....	.23	.23	.30	.29	.25	.30
Interorbital width .....	.19	.20	.23	.31	.26	.35
Length of snout, to tip of upper jaw .....	.23	.25	.28	.30	.28	.31
Length without caudal .....	3.47	3.84	4.42	4.87	4.30	5.09
Tip of lower jaw, to adipose fin .....	2.97	3.00	3.62	4.14	3.60	4.31
Tip of lower jaw, to ventrals .....	1.97	2.10	2.56	2.68	2.35	2.78
Length of pectoral .....	.50	.58	.63	.72	.65	.81
Height of dorsal .....	.56	.56	.64	.75	.62	.69
Length of ventral .....	.45	.45	.56	.64	.53	.69
Tip of lower jaw to origin of dorsal .....	2.00	2.15	2.56	2.75	2.40	2.94
Length of lower jaw .....	.56	.60	.68	.70	.60	.....
Width of caudal peduncle .....	.20	.20	.24	.30	.26	.31

Nos. 1, 2, and 3 are alcoholic specimens; the others were measured while fresh.

The comparatively elongate form of this fish induced me to believe that this species must be *O. elongatus* Ayres (Proc. Cal. Acad. Sci., I, 17, 1854), but as the latter ichthyologist transmitted examples of his species to Washington, and these examples were examined by Girard, and found by him to be identical with his *Osmerus pretiosus* (= *Argentina pretiosa* Grd. = *Hypomesus olictus* (Pallas) Gill), there is no doubt that the foregoing is an undescribed species.

There are thus four species of *Microstomatidae* on the Pacific coast, United States, viz, *Thaleichthys pacificus*, *Hypomesus olictus*, *Osmerus thaleichthys*, and *O. attenuatus*. The first of these does not occur in the markets of San Francisco, but is sent down packed in salt from the Columbia River, also to some extent in oil, under the name of "Columbia River sardines." The other three are brought into the markets in a fresh state. *Hypomesus olictus* grows to the largest size, and is most highly esteemed of the three. *Osmerus attenuatus* is tolerably abundant in the markets during the spring and summer months.