

ON THE RELATIONSHIPS OF THE LUTIANOID FISH,  
APHAREUS FURCATUS.

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A single specimen of the rare Lutianoid fish, *Aphareus furcatus*, 23 inches in length, was obtained by Dr. Kakichi Mitsukuri at Odawara, on Sagami Bay, in Japan. It was presented to the Museum of Stanford University by the Imperial University, with the label "Unknown fish from Odawara."

The specimen differs from the published descriptions in having the jaws absolutely toothless, but the specimens from which the descriptions were taken were small, and the teeth are doubtless deciduous.

APHAREUS FURCATUS.

(Plate XXVIII.)

Head  $3\frac{2}{5}$  in length; depth  $3\frac{2}{5}$ . Dorsal X, 11; Anal III, 8. Scales 9, 72, 15. Eye  $5\frac{1}{2}$  in head; snout  $2\frac{2}{7}$ ; maxillary  $1\frac{3}{8}$ .

Body moderately elongate and compressed, tapering to a rather long caudal peduncle. Head large, slightly concave above eye; snout pointed. Lower jaw produced, its end squarish with the lower angle anterior to upper. Mouth large, somewhat oblique. Edges of jaws very slightly roughened anteriorly, but no teeth are present. Vomer and palatines toothless. Maxillaries scarcely protractile; upper edge covered by preorbital nearly to posterior end. Nostrils close together, placed about half an eye's diameter anterior to eye. Longest gill-rakers about equal to diameter of eye. Their number is  $17+34$ .

Top of head, suborbital ring, preorbital maxillaries, lower jaw naked. Preopercle, upper part of clavicle, exposed portion of supraclavicle, and a Y-shaped tract at temporal region following supratemporal sensory canals naked. Scales all cycloid. Opercles and subopercles entirely scaled and cheeks with about seven rows of scales; a patch of scales at temporal region; scales of back extending forward to occiput. Lateral line concurrent with dorsal outline. No scales on fins, except a few on base of pectoral and much crowded rows covering

base of caudal rays and extending between rays from where they branch nearly to their tips.

Dorsal fin without notch between spinous and soft parts. First dorsal spine about a third the height of the second. Third, fourth, and fifth about equal, the spines thence growing slightly shorter, the tenth about equaling the second. First dorsal ray articulated but not branched. Its height slightly less than that of last spine. The rays thence growing slightly shorter to before the last, which is at least (its tip is broken) twice as long as preceding one. First anal spine less than a fourth the height of the second and third, which are subequal. The rays about equal in height to the dorsal rays; the last ray about two and a half times the preceding one. Pectoral long and falcate. Its tip reaching to below base of first dorsal rays. Its lower rays produced, making its posterior outline very concave, more acutely curved below. Distance from tips of ventrals to front of anal half eye's diameter less than their length. Caudal widely forked.

Color of old alcoholic specimen somewhat silvery, darker on back, slightly iridescent toward head. Naked areas of head seal brown. Upper edge of mandible, a space back of maxillary, and border of pre-orbital darker. Dorsal dusky anteriorly, light posteriorly. Other fins colorless.

*Measurements of Aphareus furcatus.*

Length without caudal expressed in millimeters .....	480
Head expressed in hundredths of length .....	31
Depth .....	28
Eye .....	5½
Maxillary .....	16½
Height of fourth dorsal spine .....	11
Height of second anal spine .....	5
Length of pectoral .....	28½
Length of ventrals .....	16½
Length of caudal fin, about (broken) .....	24
Length of caudal peduncle .....	22½
Distance from tip of snout to first dorsal spine .....	36
Number of dorsal rays .....	X, 12
Number of anal rays .....	11, 8
Scales .....	9, 72, 15

We have skeletonized one side of our specimen and find that its osteology seconds the external characters in showing its position to be in the family Lutianidae. It has the characters indicated by Dr. Theodore Gill for that family. "The absence of distinct tubercles from the cranium for the articulation of the epipharyngeal bones, the development of enlarged apophyses for articulation with the palatine and preorbital bones, and the atrophy of parapophyses of the anterior vertebrae. The parapophyses may be said to be absolutely wanting on the anterior four vertebrae, and but faintly developed on the fifth and sixth, or even seventh."

The supraoccipital and lateral crests not extending over the inter-orbital region places *Aphareus* with that section of the family to which *Aprion* and *Etelis* belong. It shows its affinity to *Aprion* in having a

continuous dorsal with the last rays of the dorsal and anal filamentous, and in having the alisphenoids attached medially restricting anterior opening to the brain case to a narrow space above them between two descending wings from the frontals, and a foramen behind them in front of the basisphenoid. *Aphareus* more closely resembles *Etelis* in the character of the periotic region, it being "little convex, and with the bones thick and unpolished."

THE SKELETAL CHARACTERS OF *APHAREUS FURCATUS* IN DETAIL.

Vomer toothless; at the anterior end somewhat trilobate; the middle portion rounding upward while the lateral parts recurve backward and downward.

Ethmoid wider than deep with the usual median ridge little developed.

Prefrontals heavy, swollen, with the articular facets for the palatine and preorbital well developed, and with the usual foramen for the passage of the olfactory nerve. They scarcely touch each other posteriorly, there being much cartilage interposed between them and above and below.

Frontals thick and sculptured with fine tracing much as in *Lutjanus ayu*.

Behind projection on sphenotic to which suborbitals attach is an unusually deep socket into which the rounded anterior part of hyomandibular head fits.

Parietals widely separated by supraoccipital, and with a well-developed crest.

Epiotic developed into an acute point, but not extending backwards as a shelf. Over it lies the upper limb of post temporal.

Supraoccipital crest rising well upwards. Anteriorly not extending beyond supraoccipital. Posteriorly extending well back and merging imperceptibly into ligamentous tissue.

Basioccipital, prootic, pterotic, and opisthotic typical. To the last, lower limb of posttemporal attaches by ligament.

Parasphenoid wide under myodome. Laterally sending processes about half way up prootics. Posteriorly ending in two points and inclosing three sides of the rectangular opening into myodome.

Basisphenoid developed downward and backward as a spine. A thin lamella of bone developed from its anterior edge reaching to the parasphenoid.

Exoccipitals meeting above and below foramen magnum entirely surrounding it.

Alisphenoids particularly large, attaching suturally to each other, and restricting the anterior opening to the brain case to a narrow slit above them between two descending wings from the frontals, and to a very small semicircular opening below them, which latter is not nearly so large as foramen magnum.

Myodome wide anteriorly and little longer than wide. Opening to exterior posteriorly.

Hyomandibular sending a very long process downward to symplectic, which latter bone is almost hidden by the quadrate. The typical foramen between the upper edge of the metapterygoid and hyomandibular and guarded by a wing from the former bone is here almost absent. Otherwise the shape, size, and arrangement of the elements which make up the suspensorium is typical.

Opercular apparatus showing no departure from the usual percoid arrangement.

Nasal a very large thin wide bone, which attaching to frontal behind, to epiotic along inner edge, and its outer edge curving downward roofs over a large chamber in which the olfactory organs lie.

Supratemporal a widely forked thin tunnel of bone. Its inner branch arching over the skull to frontal, its outer continuous with sensory canal along edge of pterotic.

Preorbital large, extending over maxillaries. Suborbitals with a well developed inner shelf.

Shoulder girdle showing no peculiarities. Post-temporal widely forked; attached to skull by ligaments; hypercoracoid with a foramen through its center; actinosts four, graduated; postclavicle with both elements very wide and thin.

Four branchiostegals on the ceratohyal; three on the epihyal.

Interhyal short and with a rounded head which curves in between hyomandibular and symplectic.

Basibranchials two in number. Hypobranchial of fourth arch lacking as usual. Inferior pharyngeals long and slender, separate, and covered with small, curved, cordiform teeth. Four superior pharyngeals present on each side. The first or suspensory pharyngeal is styliiform and toothless as usual; second, bearing an irregular row or recurved cordiform teeth; third and fourth large, united at bases, though not ankylosed, and bearing large, roundish, and separated patches of similar teeth.

Angular present, small.

Maxillaries without supplementary bones, processes from upper part of premaxillaries very short.

Dental surface of jaws slightly roughened anteriorly, but no teeth present.

Pelvic girdle typical; firmly attached between clavicles.

Vertebrae  $10 + 13 + \text{hypural} = 24$ . Parapophyses not developed on four anterior vertebrae; a rudimentary one on fifth, thence growing longer posteriorly. Inferior and superior zygapophyses well developed.

Epiplurals present, none on centre of vertebrae.

Interspinous bones typical; each with a transverse longitudinal lamella of bone, best developed anteriorly. Three supplementary interneurals present anteriorly. The first interhemal not differentiated or much enlarged.

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EXPLANATION OF PLATES.

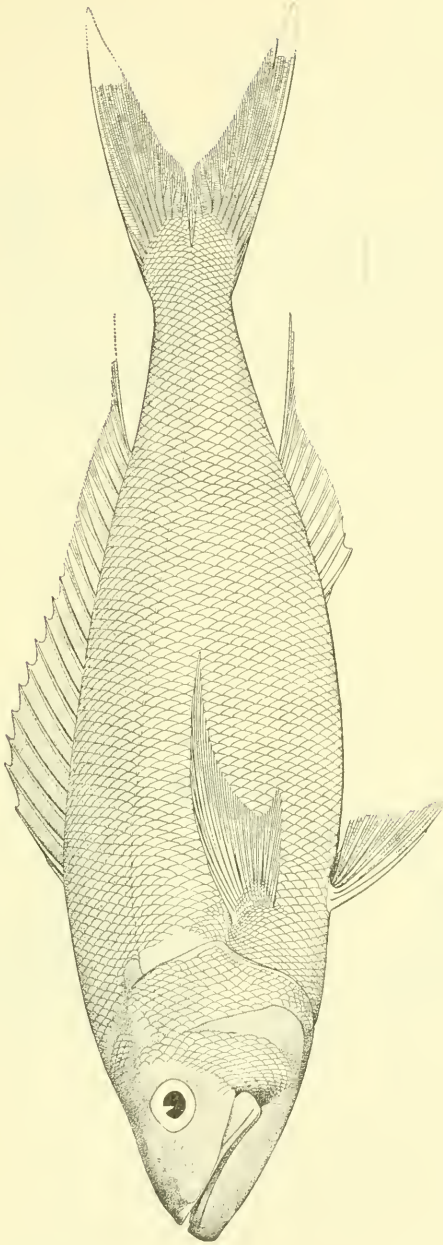
SIGNIFICANCE OF REFERENCE LETTERS USED ON PLATES.<sup>1</sup>

<i>als.</i> Alisphenoid.	<i>p.</i> Parietal.
<i>bas.</i> Basisphenoid.	<i>pas.</i> Parasphenoid.
<i>bo.</i> Basisoccipital.	<i>pf.</i> Prefrontal.
<i>e.</i> Ethmoid.	<i>pro.</i> Prootic.
<i>eo.</i> Exoccipital.	<i>pto.</i> Pterotic.
<i>epo.</i> Epiotic.	<i>so.</i> Supraoccipital.
<i>fr.</i> Frontal.	<i>spo.</i> Sphenotic.
<i>opo.</i> Opisthotic.	<i>v.</i> Vomer.

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<sup>1</sup>The plates are from drawings made by Chloe Lesley Starks, Artist of the Hopkins Seaside Laboratory.



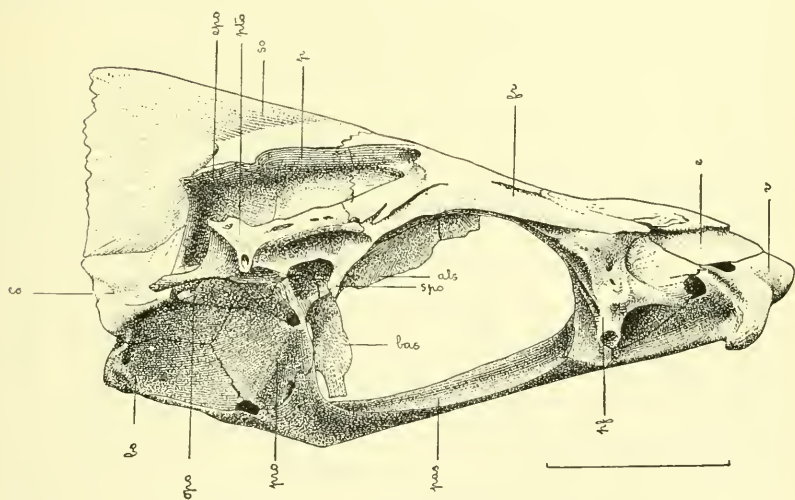
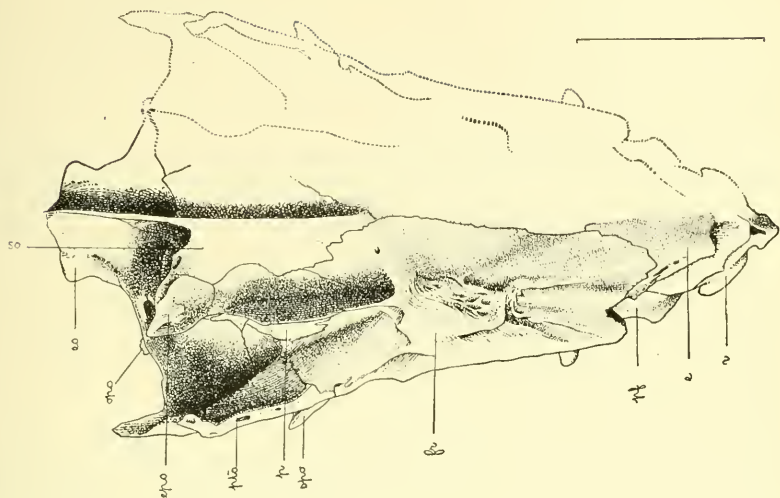


ALPHAREUS FURCATUS.

FOR EXPLANATION OF PLATE SEE PAGE 719.







CRANIA OF ALPHAREUS FURCATUS.

FOR EXPLANATION OF PLATE SEE PAGE 723.