

# A REVIEW OF THE GOBIOID FISHES OF JAPAN, WITH DESCRIPTIONS OF TWENTY-ONE NEW SPECIES.

BY DAVID STARR JORDAN and JOHN OTTERBEIN SNYDER,  
*Of the Leland Stanford Junior University.*

In the present paper is given a descriptive catalogue of the species of gobies found in the waters of Japan. It is based primarily on the large collection made by the authors in Japan in the summer of 1900, under the auspices of the Hopkins Biological Laboratory of Stanford University. Numerous additional specimens have been presented by the Imperial University of Tokyo through Dr. Kakichi Mitsukuri, and by the Imperial Museum of Japan through Dr. Chiyomatsu Ishikawa. The gobies collected by the U. S. Fish Commission steamer *Albatross* in 1900, the collections in the United States National Museum, and the collections of Professor Keinosuke Otaki in 1895 and 1896 have also been considered, as well as the collections made by Mr. Pierre Louis Jony in 1885.

A series of typical specimens are in the U. S. National Museum and in the Imperial University of Tokyo. Duplicates have been presented to several other institutions.

The accompanying drawings are the work of Mrs. Chloe Lesley Starks, artist of the Hopkins laboratory, and of Mr. A. H. Baldwin.

## MEASUREMENTS.

The measurements given in the tables were made by means of dividers and a proportional scale. In some cases they will be of great value as an aid in discriminating between closely related species. It is believed also that they will show, in an approximately definite way, some of the variations of certain characters useful in the determination of relationships.

They are expressed in hundredths of the length of the body, which is measured from the tip of the snout to the end of the last vertebra. The depth of the body is measured at its deepest part; depth of caudal peduncle at its narrowest place; length of caudal peduncle from base of last anal ray to end of last vertebra; length of head from tip of snout to posterior edge of opercle; length of snout from its tip to anterior margin of orbit; width of interorbital space measured on

the skull, the dividers compressed tightly between the eyes; diameter of orbit, longitudinally; length of caudal fin from end of last vertebra to tip of longest rays. Only fully developed fin rays are counted: the rudimentary rays of dorsal and anal when closely adnate to the first branched ray, are counted with it as one ray; when the soft dorsal contains a spine, it is enumerated as a ray. When last ray of dorsal or anal is double it is counted as one. Scales in the lateral series are counted to base of caudal fin; transverse series from insertion of ventrals or anal, whichever is nearer middle of body, upward and forward; above or below lateral line as indicated in the description.

### Family GOBIIDÆ.

#### THE GOBIES.

Body oblong or elongate, naked or covered with ctenoid or cycloid scales. Dentition various, the teeth generally small but sometimes developed into great canines; premaxillaries protractile; suborbital without bony stay. Skin of head continuous with covering of eyes. Eyes usually moderate, sometimes concealed. Opercle unarmed; preopercle unarmed, or with a short spine; pseudobranchiæ present or absent. Gills 4, a slit behind the fourth; gill membranes more or less united to the isthmus, the gill openings thus restricted to the sides. No lateral line. Dorsal fins separate or connected, the spinous dorsal short, of 2 to 8 flexible spines, or sometimes wanting; anal usually with a single weak spine, the fin similar to soft dorsal; ventral fins close together, separate or united, each composed of a short spine and 3 or 4 soft rays, the inner rays usually longest; the ventral fins when united form a sucking disk, a cross fold of skin at their base completing the cup; caudal fin convex; anal papilla prominent. No pyloric cæca; usually no air bladder. Carnivorous fishes, mostly of small size, living on the bottoms near the shores in warm regions. Some inhabit fresh waters and others live indiscriminately in either fresh or salt water; many of them bury in the mud of estuaries. Few of them are large enough to be of much value as food. The species are for the most part easily recognized, but their arrangement in genera is a matter of extreme difficulty. Until the multitude of Asiatic forms are critically studied, any definition of the Japanese genera must be tentative only.

#### ANALYSIS OF GENERA OF JAPANESE GOBIIDÆ.

- I. Soft dorsal and anal free from the caudal; body oblong or moderately elongate; eyes distinct; no deep pit above the opercle.
  - a. Spinous dorsal well developed, of 6 or more rays; ventral fins well developed; body well scaled in all Japanese species.
  - b. *Ocyropsis*. Ventral rays 1, 4, the two fins wholly separate; tongue pointed; mouth oblique.
  - c. Body elongate, compressed; scales small, cycloid; chin with a thick barbel followed by 3 smaller ones. Dorsal rays about VI-25; isthmus narrow; caudal with filaments. . . . . *Vireosa*. 1

bb. Ventral rays 1, 5.

d. *Eleotrinæ*. Ventral fins entirely separate; pectorals normal; eyes not erectile; body scaly more or less.

e. Vomer toothless.

f. Preopercle without spine.

g. Scales very large, 25 to 30; fins high; body short, compressed.

*Asterropteryx*. 2

gg. Scales moderate or small, 40 to 100; body not much compressed.

h. Head not depressed above; scales very small, ctenoid; dorsal spines filamentous; isthmus broad..... *Valenciennæ*. 3

hh. Head depressed behind eyes; scales moderate, ctenoid; dorsal spines not elevated; isthmus very narrow..... *Odontobutis*. 4

ff. Preopercle with a concealed, hook-like spine; scales moderate, ctenoid; isthmus broad; dorsal spines low..... *Eleotris*. 5

dd. Ventral fins joined at least at base.

f. *Periophthalmicæ*. Pectoral fin with a scaly muscular base; eyes erectile; ventral fins joined at base or to the tip; no barbels; scales very small, cycloid; isthmus broad; tongue short, rounded, scarcely free at tip.

h. Dorsal rays about V-25; head with fine roughnesses; ventral fins united; upper jaw with large exerted teeth; lower teeth horizontal..... *Bolophtalmus*. 6

hh. Dorsal rays about X to XV-12; head with small scales; ventral fins deeply notched; teeth not horizontal and not exerted.

*Periophthalmus*. 7

ff. *Gobiinæ*. Pectoral fins without scaly muscular base; ventral fins large, completely united and not adnate to the belly; eyes not erectile; dorsal spines 6 or more; body well covered with scales.

i. Teeth all simple, none of them trifid.

j. Chin and lower side of head without barbels.

k. Soft dorsal and anal short, each of 9 to 12 (rarely 13 or 14) soft rays.

l. Cheeks and opercles with large scales; scales on body large, ctenoid; dorsal spines 6..... *Hazeus*. 8

ll. Cheeks naked; opercles chiefly or entirely naked.

m. Tongue truncate or rounded or pointed at tip; gill openings chiefly confined to the sides, separated by a rather broad isthmus.

o. Scales ctenoid, rather large, mouth moderate; head not much depressed anteriorly or between the eyes, chin not prominent; isthmus broad.

pu. Pectoral with silk-like free rays above; dorsal spines 6..... *Gobius*. 9

pp. Pectoral without silk-like free rays above.

q. Dorsal spine 6..... *Ctenogobius*. 10

qq. Dorsal spines 7 to 9..... *Aboma*. 11

oo. Scales minute, cycloid; dorsal spines 6; head compressed, convex above, mouth large, oblique, but not opening widely; no silk-like rays on pectorals; some of the dorsal spines often elongate; isthmus narrow.

*Cryptocentrus*. 12

mm. Tongue emarginate at tip; mouth very large, isthmus narrow, the gill openings extending forward below, head low, depressed, flat between the eyes.

- r. Pectoral without silk-like rays above; chin prominent.
- s. Scales rather large, about 40; dorsal spines 6.  
*Glossogobius*. 13
- ss. Scales minute, 80 to 100.
- t. Dorsal spines 6 ..... *Chenogobius*. 14
- tt. Dorsal spines 7 or 8 ..... *Chloca*. 15
- rr. Pectoral with silk-like rays above; chin not prominent, head very broad, depressed; scales minute, cycloid.  
*Chasmius*. 16
- kk. Soft dorsal and anal long, the former of 14 to 30 rays; dorsal spines 7 to 10.
- u. Scales very small, often cycloid; tongue rounded; head compressed, narrow above, isthmus rather narrow, mouth moderate, oblique; pectoral with free silk-like rays above; soft dorsal and anal rays numerous, slender; color bright.  
*Pterogobius*. 17
- uu. Scales moderate, ctenoid; mouth moderate; isthmus broad.
- v. Soft dorsal moderate, of 14 to 20 rays.
- w. Cheeks naked; snout short, very bluntly decurved; mouth large, very oblique; pectorals without silk-like rays.  
*Suruga*. 18
- ww. Cheeks scaly, at least above; snout long, moderately decurved.
- x. Pectorals without free silk-like rays above.  
*Acanthogobius*. 19
- xx. Pectorals with free silk-like rays above . . . *Sugamia*. 20
- vv. Soft dorsal very long, of 20 or more rays; body elongate; caudal pointed; cheeks naked.  
*Synechogobius*. 21
- jj. Chin and edge of lower jaw with barbels.
- x. Dorsal short, about 6 to 11; scales ctenoid, moderate; barbels many on each side; isthmus broad; (a black ocellus on base of caudal above).  
*Parachaturichthys*. 22
- xx. Dorsals long, the rays VIII-14 to 25.

y. Barbels about 3 on each side; cheeks scaly; scales cycloid, deciduous, of moderate size; caudal fin pointed; isthmus narrow.

*Chaturichthys*. 23

yy. Barbels about 10 on each side; isthmus narrow; scales moderate, rather firm; caudal fin truncate; dorsal rays short VIII-15.

*Ainosus*. 24

ii. Teeth trifid in the outer series, the inner series simple; body robust, covered with rather large etenoid scales; head very broad; cheeks tumid, scaleless; tongue rounded; gill openings separated by a broad isthmus; pectoral without silky rays; ventrals as in *Gobius*, not adnate to the belly; dorsal spines 6; soft dorsal and anal short.

z. Edge of preopercle, pre-orbital, and rami of lower jaw with fringes of barbels; a large pore behind eye.

*Triaxnopogon*. 25

zz. Edge of preopercle, pre-orbital, and lower jaw without barbels.

*Tridentiger*. 26

uu. *Luciogobiinae*. Spinous dorsal wanting or reduced to a rudiment of less than 6 rays; ventrals small, united in a short, rounded flap; body naked or with small embedded scales; head broad, depressed above, with tumid cheeks; teeth simple; soft dorsal and anal of moderate length.

a'. Spinous dorsal present, of three small spines; isthmus broad.

b'. Body short and deep; the skin largely scaly ..... *Astracis*. 27

bb'. Body elongate.

c'. Mouth large, oblique, the chin projecting; body chiefly naked; insertion of dorsal opposite that of anal; suborbital with barbels ..... *Clariger*. 28

cc'. Mouth small, the chin included; body largely scaly; insertion of dorsal far in front of that of anal; suborbital without barbels.

*Etmichthys*. 29

aa'. Spinous dorsal wanting.

d'. Isthmus broad; anal fin moderate, its insertion almost directly below that of dorsal; mouth large, oblique; coloration dark.

*Luciogobius*. 30

dd'. Isthmus very narrow, the gill openings continued forward below; anal long, its insertion considerably before that of dorsal; mouth moderate; color translucent ..... *Leucopsarion*. 31

II. Soft dorsal and anal very long, joined to the caudal; body eel-shaped, elongate and compressed, naked, or covered with very small scales.

e'. *Trypaucheninae*. Temporal region with a deep pit; eyes distinct, small; teeth small; ventral fins small.

f'. Ventral fins divided, but united at base ..... *Trypauchen*. 32

ee'. *Gobioïdinae*. Temporal region without fossa; eyes scarcely visible; teeth very long; curved, fang-like.

g'. Soft dorsal and anal very long, of 35 to 50 rays each.

*Tenioides*. 33

## 1. VIREOSA Jordan and Snyder, new genus.

*Vireosa* JORDAN and SNYDER, new genus (*hanæ*).

Body greatly elongate, compressed, covered with minute, cycloid, separated, partly embedded scales; head naked, comparatively short, the forehead blunt, rounded; eyes large; chin with a long, flat barbel, followed by three smaller ones. Mouth large, subvertical; some of the teeth long; small canines present. Ventral fins entirely separate, the rays 1, 4. Caudal fin with the upper and lower rays ending in long filaments. Dorsal spines not produced, the rays about VI-25; anal fin long. Gill openings wide, the isthmus narrow; gill-rakers long and slender, pseudo-branchiæ present.

A single species known, from the coast of Japan. The genus is not close to any other, being nearest *Ptereleotris* and *Oryzias*. (*Vireo*, to grow green, the name of a genus of birds.)

## 1. VIREOSA HANÆ Jordan and Snyder, new species.

Head  $5\frac{1}{2}$  in length; depth,  $6\frac{1}{2}$ ; depth of caudal peduncle,  $9\frac{1}{2}$ ; eye,  $3\frac{2}{3}$  in head; snout,  $4\frac{1}{2}$ ; maxillary,  $2\frac{2}{3}$ ; D. VI-25; A. 25; P. 21.

Body very long; slender; compressed; caudal peduncle deep. Head short; its depth contained  $1\frac{1}{2}$  times in its length. Interorbital space slightly convex; the distance between the eyes about equal to their

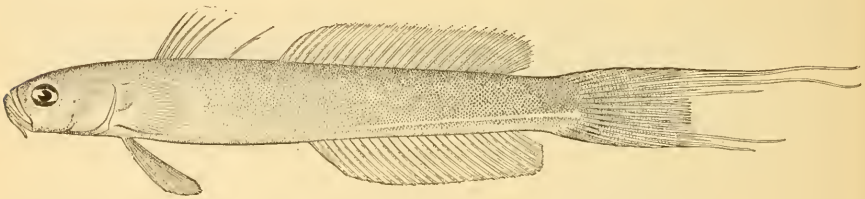


FIG. 1.—VIREOSA HANÆ.

longitudinal diameter. Eye large; directed laterally. Snout shorter than diameter of eye; blunt. Lower jaw projecting beyond the upper. Cleft of mouth large; almost vertical. Maxillary extending to a perpendicular passing midway between pupil and anterior edge of orbit; entirely concealed. Teeth in upper jaw in 2 series; the outer consisting of a few large, curved, fang-like canines; the inner of minute, simple teeth, growing close up to and between the canines; side of lower jaw with canines, 2 of which are notably large; minute teeth growing between the larger ones; posteriorly the jaw curves upward; its surface having a row of minute teeth. Tongue slender; compressed laterally; the tip free. Gill openings wide; extending forward below; the width of isthmus separating them about equal to half the diameter of eye. Inner edge of shoulder girdle without protuberances. Pseudo-branchiæ present. Gill-rakers on first arch long; slender; close set.

Chin with a large, median, flat barbel, about as long as the diameter of eye, followed by 3 minute ones which are concealed when the large one is depressed. Nostrils without tubes.

Head naked. Body with minute, cycloid, partly embedded scales; smaller and farther apart anteriorly; larger and more close together posteriorly. The scales appear to the unaided eye like shallow depressions in the skin.

Dorsals separate: the spines slender and flexible; the first 5 close together and evenly spaced; the sixth far removed; the distance between its base and that of the sixth about equal to the space occupied by the first 5; the last spine when depressed reaching insertion of soft dorsal. Anal inserted below the fourth or fifth ray of dorsal; the rays when depressed extending a little farther posteriorly than those of dorsal; neither reaching base of caudal. Caudal long; the upper and lower rays with long, ribbon-like filaments. Ventrals long; divided to the base; rays I, 4; the spine slender.

Color in spirits, whitish; growing brownish above; a narrow light band on posterior part of body, running from a point a little above insertion of dorsal, backward and upward to near middle of base of caudal; body below the band yellowish white; eye with a slightly oblique silvery band about as wide as the orbit. Dorsal fins somewhat dusky; center of caudal dusky; upper and lower parts lighter; upper filaments pearly white; the lower ones dusky; anal light, with a narrow, pearly band at base; pectoral with an indistinct, crescent-shaped light mark near its base.

In life the upper parts are bluish, becoming green on upper part of head with a shade of violet below the green; a reddish blotch at base of pectoral; lateral band above anal, brick red; the band extending on the caudal, where the reddish color becomes diffused over the fin above and below. Spinous dorsal light blue, with a tinge of pink; violet at base, becoming greenish above; 2 indistinct, narrow, blue lines running horizontally near upper edge of fin; caudal bluish, tinged with red; the filaments greenish; pectorals and ventrals with bluish and greenish tints.

The upper edge of the dorsal fins is damaged, so that the height of the rays can not be determined. The tips of the pectoral rays are broken off. The upper edge of the fins shows no trace of filaments.

*Measurements.*—Length of body, expressed in millimeters, 94; depth, expressed in hundredths of length, 15; depth of caudal peduncle, 10; length of head, 18; length of snout,  $4\frac{1}{2}$ ; width of interorbital space, 4; diameter of orbit,  $5\frac{1}{2}$ ; distance from snout to spinous dorsal, 25; from snout to soft dorsal, 48; distance from snout to anal,  $52\frac{1}{2}$ ; height of longest anal rays, 13; length of caudal peduncle, 10; length of caudal fin, without filaments, 22; with filaments, 52; length of ventral fins, 17.

*Type.*—No. 6444, Leland Stanford Junior University Museum.

Kuro Shiwo of Japan, one specimen known; taken off Misaki in a net used to sweep for *Mysis*, by Professor Mitsukuri. Its colors in life are singularly delicate.

(*Hana*, a flower, the name of Professor Mitsukuri's daughter.)

## 2. ASTERROPTERYX Rüppell.

*Asterropteryx* RÜPPELL, Atlas, Reise in Nord Afrika, 1828, p. 138 (*semipunctatus*).

*Priolepis* EHRENBERG fide Bleeker.

*Hypselotris* GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 270 (*cyprinoides*).

Body short, deep, compressed, covered with large, nearly smooth scales; eyes moderate; mouth moderate, the teeth medium, uniserial; chin prominent; no teeth on vomer; no spines on preopercle; dorsals separate, the first of six spines, the second like the anal short and high. Ventrals separate, close together, each 1, 5. Gill openings moderate.

Species rather numerous in the East Indian region, one of them ranging north to Japan.

(ἄστῆρ, star; πτέρυξ, fin.)

### 2. ASTERROPTERYX ABAX Jordan and Snyder, new species.

Head 4 in length; depth  $4\frac{3}{4}$ ; depth of caudal peduncle  $6\frac{1}{6}$ ; eye  $3\frac{2}{3}$  in head; snout  $4\frac{1}{6}$ ; D. VI-11; A. 9; P. 16; scales in lateral series 23; in transverse series 8.

Body rather short, greatly compressed; caudal peduncle very deep. Head large; snout short; bluntly rounded. Mouth oblique. Maxillary reaching a perpendicular through posterior edge of orbit. Lips

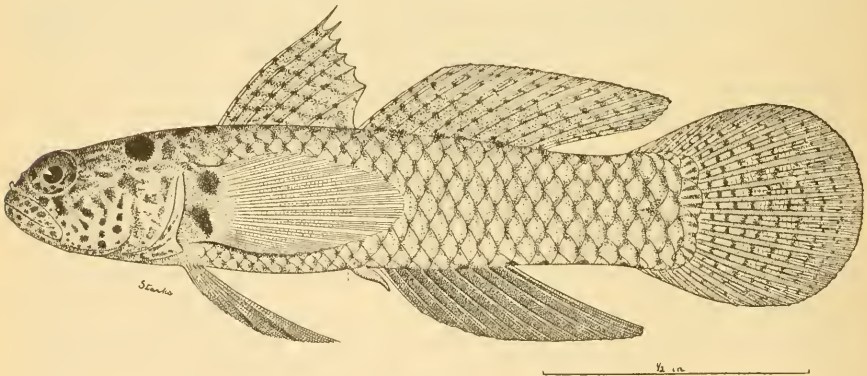


FIG. 2.—ASTERROPTERYX ABAX.

thick. Anterior nostril with a high tube. Jaws without barbels. Eyes high in head, directed almost laterally; interorbital space very narrow. Checks fleshy, though not much puffed out. Mouth well furnished with strong teeth; upper jaw with 2 series; an outer row of small canines, widely spaced; an inner, narrow band of minute, simple teeth; lower jaw with 3 series; the outer and inner of large canines;



slightly curved; widely spaced; a narrow band of villiform teeth between the canines. No teeth on vomer. Gill opening not extending far forward; the isthmus broad. No papillæ on inner edge of shoulder girdle. Gill-rakers much reduced in size.

Head naked; large pores on interorbital space and behind eyes; a space anterior to dorsal and extending backward a short distance along its base, and the region anterior to pectoral and ventral fins naked; other parts of the body with large, smooth scales. Anal papillæ conspicuous; its distal end fringed.

Fins markedly prominent; dorsals close together; the first spine elongate; when depressed reaching a little beyond insertion of soft dorsal; the latter, when depressed, reaching past base of caudal. Anal inserted below base of second or third dorsal ray; when depressed not reaching so far posteriorly as does the dorsal. Caudal large, rounded. Pectoral pointed; its upper edge without filamentous rays. Ventrals separated at base by a space about equal to half the diameter of eye; sharply pointed; the inner ray much longer than the others.

Color in spirits, light olive; each scale with a dark border; head with black spots, a large prominent one on each side of nape; a median one posterior to these; 2 distinct spots immediately anterior to base of pectoral; rays of dorsals and caudal with small black spots; a vertical row of elongate spots on base of caudal; anal, pectorals, and ventrals with considerable dusky color.

Other specimens were lighter in color, the distinctive markings being more or less plainly represented.

*Type*.—No. 6445, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

( $\check{\alpha}\beta\alpha\check{\epsilon}$ , a checker-board.)

*Measurements of Asteropteryx abax.*

Length in millimeters.....	33	32	30
Depth expressed in hundredths of length.....	21½	23½	22
Depth of caudal peduncle.....	16	16	16
Length of head.....	25	26	27
Length of snout.....	6	6	6
Length of maxillary.....	11½	11	11½
Width of interorbital space.....	2	2½	2
Diameter of orbit.....	8	6	6
Distance from snout to spinous dorsal.....	34	36	36
Distance from snout to soft dorsal.....	52	54	52
Height of longest dorsal spines.....	26	28	30
Height of longest dorsal rays.....	21	21	20
Distance from snout to anal fin.....	55	57	60
Height of longest anal rays.....	22	21	20
Length of caudal peduncle.....	25	27	26
Length of caudal fin.....	28	28	25
Length of pectoral fin.....	27	28	27
Length of ventral fin.....	22	24	24
Number of dorsal spines.....	6	6	6
Number of dorsal rays.....	11	11	11
Number of anal rays.....	9	9	9
Number of pectoral rays.....	16	16	16
Number of scales in lateral series.....	23	23	23
Number of scales in transverse series.....	8	8	8

## 3. VALENCIENNEA Bleeker.

*Valenciennea* BLEEKER, Boeroe, 1856, p. 412 (*strigata*).

*Callectotris* GILL, Proc. Acad. Nat. Sci. Phila., 1863, p. 270 (*strigata*).

*Valenciennesia* BLEEKER, Archives Nederl., 1874, p. 307 (*strigata*).

*Gobiomorus* GILL, Proc. U. S. Nat. Mus., 1888, p. 69 (*taibou* = *strigata*; not of Lacépède, 1801; type *gronovii* = *Nomeus*, Cuvier).

This genus is allied to *Eleotris*, having the same general form. Body rather elongate; head not much depressed, with no spine or bony crests. Mouth moderate, the jaws subequal, the teeth uniserial or nearly so, unequal; no vomerine teeth; pharyngeal teeth sharp; no preopercular spine; head naked, body covered with small, ctenoid scales; isthmus very broad; dorsal spines 6, elevated; soft dorsal and anal short; caudal convex; ventrals separate, the rays I, 5.

East Indies; species not very numerous, one of them extending northward to the Riu Kiu Islands.

(Named for Achille Valenciennes, the distinguished associate of Cuvier.)

## 3. VALENCIENNEA MURALIS (Quoy and Gaimard).

*Eleotris muralis* QUOY and GAIMARD, manuscript, Cuvier and Valenciennes, XII, 1837, p. 253, pl. CCCLVII, Tukopia.—BLEEKER, Amboyna and Ceram, p. 276, Amboyna, Ceram.—GÜNTHER, Cat. Fish., III, 1861, p. 130, Philippines.—ISHIKAWA, Cat. Fish., 1897, p. 38, Miyakoshima Is., Riukiu.

*Valenciennea muralis* BLEEKER, Boeroe, 1856, p. 412, Boeroe.

*Eleotriodes muralis* BLEEKER, Goram, p. 212, Goram.

*Eleotris longipinnis* LAY and BENNETT, Beechey's Voyage of the Blossom, 1839, p. 64, pl. xx, fig. 3, Riukiu, Coll. Lay and Collie.

Head  $3\frac{2}{3}$ ; depth 5 to 6; D. VI-1, 12; A. I, 12. Scales 80. Interorbital space half diameter of eye; second, third, and fourth dorsal spines filamentous. Color clear green, brownish in spirits; head and body with red longitudinal bands; back with some irregular dark cross bars; fins yellow; first dorsal with a black spot behind the top of the third spine; dorsal and anal fins with red longitudinal bands; caudal with red and brown spots. (Günther.)

East Indies; not rare. Two Japanese records, the one that of Lay and Collie, from Riukiu, with a poor sketch, which does not agree with the description, the dorsal filaments being broken; the other that of a specimen from Miyakoshima in the Riu Kiu Islands, noted by Dr. Ishikawa.

(*Muralis*, pertaining to a wall, the color markings resembling the lines in a stone wall: "forment un dessin semblable à des assises de pierre de taille.")

## 4. ODONTOBUTIS Bleeker.

*Odontobutis* BLEEKER, Archives Néerlandaises, IX, 1874, p. 305 (*obscurus*).

Body stout, not compressed, covered with rather large, ctenoid scales. Head large, scaly on top and sides, depressed at the crown; no bony crests above; mouth rather large, oblique, the chin projecting; teeth

short, in broad bands; no teeth on vomer; tongue broad, rounded; no preopercular spine; isthmus very narrow, the gill membranes almost separate, and not united with the isthmus; branchiostegals unarmcd. Dorsal fins short and low, the first of seven spines; ventrals moderate, separate, each 1, 5.

Japan and China, entering rivers; resembling in form and habit the American genus *Dormitator*.

(ὀδονίς, tooth; *Butis* a related genus, the name of Indian vernacular origin.)

#### 4. ODONTOBUTIS OBSCURUS (Schlegel).

##### KAWASUSUKI.

*Electris obscura* SCHLEGEL, Fauna Japonica, Poissons, 1847, p. 149, pl. LXXVII, figs. 1-3; streams tributary to the bay of Nagasaki.—GÜNTHER, Cat. Fishes, III, 1861, p. 115, Japan, Chikiang.—ISHIKAWA, Prel. Cat. Fishes Imp. Mus., 1897, p. 37, Lake Biwa, Maibara, Matsubara, Hikone, Yamashiro, Yamato, Tsuyama.

*Odontobutis obscura* JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 370, Yokohama.

Head  $2\frac{2}{3}$  in length; depth 4; depth of caudal peduncle  $2\frac{2}{3}$  in head; eye  $6\frac{2}{3}$ ; snout  $3\frac{1}{2}$ ; maxillary  $2\frac{1}{3}$ ; D. VII-9; A. 8; P. 15; scales in lateral series 36, in transverse series 16.

Form robust; the body thick-set; caudal peduncle deep; not much compressed. Head somewhat broader than the body, but less deep; snout long; pointed; the lower jaw projecting beyond the upper. Eye small; directed almost laterally; interorbital space concave; distance between eyes equal to about half their diameter. Mouth oblique; lips broad; maxillary concealed by lip and preorbital; extending to a vertical through posterior edge of pupil. Tongue very broad; rounded anteriorly. Teeth simple; in narrow bands on jaws; the outer ones not enlarged. Gill opening extending far forward; the isthmus narrow. Inner edge of shoulder girdle without papillæ. Gill-rakers on first arch 1 + 17; far apart; very stubby. Anterior nostril with a low tube. No barbels on chin.

Occiput and cheeks with small scales; snout, preorbital area, chin and throat naked; body with rather large, finely ctenoid scales.

Dorsal fins separate; spinous dorsal when depressed just reaching insertion of soft dorsal. Anal inserted below base of second or third dorsal ray; the posterior rays longest; reaching slightly farther posteriorly when depressed than does the dorsal; both falling far short of base of caudal. Caudal rounded. Pectorals acutely rounded; upper edge without filaments. Ventrals separate; the distance between their bases about equal to two-thirds the diameter of eye.

Body with much brownish or bluish black, in blotches of irregular shape and distribution; sides with 7 or 8 indistinct, narrow, light, lateral bands, which are more evident posteriorly; under part of head with large, light spots.

Soft dorsal and anal with dusky spots arranged in longitudinal rows; caudal with indistinct dark vertical bands; 2 or 3 on the basal half of fin broadest; pectoral with indistinct, dark, vertical bands.

Individuals from the same locality show considerable variation in color. Some are lighter, others darker than the one described. The light spots on the chin and throat are often represented by reticulations, while in some cases the white predominates, there being scarcely any dark color. Very young specimens have 3 dark bands passing over the back, and a broad band of dark color along the sides.

Described from specimens from the Chikugo River, Kurume. This species reaches a length of nearly a foot. It is rather common in estuaries and river mouths from Tokyo southward. Our specimens are from Tokyo Bay, Lake Biwa (Funaki), Chikugo River, at Kurume, and Kawatana, on the Bay of Omura. It is recorded by Günther from Chikiang in China.

(*obscurus*, dusky.)

Measurements of *Odontobutis obscurus*.

	Chikugo River, Kurume; Chikugo, Japan.			Tokyo, Japan.	
Length expressed in millimeters.....	114	102	82	133	123
Depth expressed in hundredths of length.....	26	24	28	26	27
Depth of caudal peduncle.....	11	14	14	12½	13
Length of head.....	36	35	35	35	35
Length of snout.....	11	10	10	11½	12½
Length of maxillary.....	15	15	16	16	15
Width of interorbital space.....	8	9	8	8	9½
Diameter of orbit.....	6	5½	7	5	5½
Distance from snout to spinous dorsal.....	46½	45	46	46	46
Distance from snout to soft dorsal.....	62½	62½	64	64	64
Height of longest dorsal spines.....	11½	12	11½	14	13
Height of longest dorsal rays.....	15	14	15½	15	14
Distance from snout to anal fin.....	69½	67	67	71½	70
Height of longest anal rays.....	15½	14½	15½	14½	15
Length of caudal peduncle.....	23½	23	23	22	22
Length of caudal fin.....	26	25	26	22½	23
Length of pectoral fin.....	24	25	24½	21½	23
Length of ventral fin.....	17	18½	19	16½	15½
Number of dorsal spines.....	7	7	7	8	7
Number of dorsal rays.....	10	9	9	10	9
Number of anal rays.....	8	9	8	8	8
Number of scales in lateral series.....	35	36	34	31	32
Number of scales in transverse series.....	17	16	17	14	15

5. ELEOTRIS (Gronow) Schneider.

*Eleotris* GRONOW, Zooph., 1763, p. 83 (nonbinomial).

*Eleotris* SCHNEIDER, Syst. Ichth., 1801, p. 65 (*pisonis*).

*Culius* BLEEKER, Archiv. Néerl., IX, 1874, p. 303 (*fuscus*).

Body long and low, compressed behind. Head long, low, flattened above, without spines or crests, almost everywhere scaly. Mouth large, oblique, lower jaw projecting. Lower pharyngeals rather broad, the teeth small, bluntnish. Preopercle with a small concealed spine below, its tip hooked forward. Branchiostegals unarmed. Eyes small, high, anterior; isthmus broad. Tongue broad, rounded. Post-temporal bones very strongly divergent, their insertions close together;

top of skull somewhat elevated and declivous; interorbital area slightly convex transversely; dorsal fins well apart, the first of 5 or 6 low, flexible spines; ventrals separate. Scales moderate, ctenoid, 45 to 70 in a longitudinal series; vertebrae (*pisonis*) 11+15. Tropical seas, entering fresh waters.

(ἠλεότρις, name of some small fish in the Nile, possibly from ἠλεός, bewildered, or ἔλεος, a pitiable thing.)

- a.* Scales small, about 70. Scales of sides with dark centers, forming longitudinal streaks; usually a dusky lateral band; dorsal and caudal with distinct series of brown dots, anal and pectoral faintly barred. . . . . *fusca*. 5  
*aa.* Scales larger, about 50. Sides with pale streaks along the series of scales and with dark dots; head below with round, pale spots; fins with serrated brown bands. . . . . *oxycephala*. 6

### 5. ELEOTRIS FUSCA (Schneider).

*Pacilia fusca* SCHNEIDER, Bloch, Syst., 1801, p. 453. (After *Cobitis pacifica* Forster MS. Insule oviadae.)

*Eleotris fusca* GÜNTHER, Cat. Fishes, III, 1861, p. 125, Ganges, Calcutta, Bengal, Amboyna, Aneitum, Oualan, Wanderer Bay, Ceylon, Canton.—ISHIKAWA, Prel. Cat. Fishes, 1897, p. 31, Rinkiu Islands.

*Cheilodipterus culius* BUCHANAN and HAMILTON, Fish. Ganges, p. 55, pl. v, fig. 16, Ganges.

*Eleotris nigra* QUOY and GAIMARD, Zool. Voy. Freycinet, Zool., p. 259, pl. LX, fig. 2, Guam, Waigiou.—CUVIER and VALENCIENNES, XII, 1837, p. 235; Isle de France, Ganges, Malabar, Bombay, Java, Otaiti, Borabora, Society Islands, Madagascar.

*Culius niger* BLEEKER, Boeroc, p. 411, Boeroc.

*Eleotris mauritianus* BENNETT, Proc. Conn. Zool. Soc., 1, 1831, p. 166, Mauritius.

Head  $3\frac{1}{2}$  in length; depth 4; depth of caudal peduncle 2 in head; eye 6; snout  $3\frac{1}{2}$ ; maxillary  $2\frac{1}{2}$ ; D. VI-9; A. 9; P. 18; scales in lateral series 73; in transverse series 23.

Body low, deep; compressed posteriorly; the caudal peduncle deeper and more compressed than that of *E. oxycephala*. Eyes small; directed almost laterally; interorbital space flat; distance between eyes slightly greater than length of snout. Snout sharp; lower jaw projecting. Mouth oblique; lips rather narrow; maxillary almost entirely concealed, extending to a vertical passing between pupil and posterior edge of orbit. Tongue rounded anteriorly. Teeth simple; in bands on both jaws; the outer and inner ones slightly enlarged; a narrow naked space on lower jaw at the symphysis. Gill openings not extending far forward below; width of isthmus about equal to length of maxillary. Gill-rakers on first arch 2+10; reduced to mere elevations. Inner edge of shoulder girdle without papillae. Nostrils small; the anterior with a tube. No barbels on jaw. Edge of preopercle with a strong, sharp spine, which projects downward and forward.

Head almost completely scaled; a small, naked area in front of the eye and on anterior part of chin; minute scales on upper part of head, running forward on snout; on cheeks, rami of lower jaw, and on

branchiostegal region. Body covered everywhere with small scales; those on nape, breast, and belly cycloid; on sides weakly ctenoid.

Dorsal spines slender; flexible; the tips with short, projecting filaments; the spines when depressed reaching slightly beyond insertion of soft dorsal. Caudal rounded. Anal rays longest posteriorly; when depressed they reach as far backward as do those of the dorsal, both falling far short of reaching the base of caudal. Pectorals pointed; the upper rays without free filaments. Ventrals separate; pointed.

Color in spirits, brownish; with indistinct, narrow, longitudinal, dark bands on body; 3 narrow, brownish bands radiating from posterior edge of eye.

This description is of specimens about 130 millimeters long, collected by Dr. O. P. Jenkins in Honolulu, Hawaiian Islands.

Islands and shores of the Western Pacific Ocean, especially in the mouths of streams; recorded from many localities. The only Japanese record is that of a specimen in the Imperial Museum, recorded by Ishikawa, from the Riukiu Islands.

(*fusca* dusky.)

#### 6. ELEOTRIS OXYCEPHALA (Schlegel).

*Eleotris oxycephala* SCHLEGEL, Fauna Japonica, 1845 or 1846, p. 150, pl. LXXVII, figs. 4, 5, Nagasaki.—GÜNTHER, Cat. Fish, III, 1861, p. 116, China.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 371, Lake Biwa.

*Eleotris cantherius* RICHARDSON, Ich. China, 1846, p. 209, Macao.

Head  $3\frac{1}{2}$  in length; depth 4; depth of caudal peduncle  $2\frac{1}{8}$  in head; eye  $8\frac{1}{2}$ ; snout  $3\frac{2}{3}$ ; maxillary; D. V-9; A. 9; P. 18; scales in lateral series 50; in transverse series, 15.

Body deep; compressed; caudal peduncle greatly compressed. Head long; pointed. Snout rather sharp; the lower jaw projecting. Eyes very small; directed laterally; interorbital area flat; the distance between eyes  $3\frac{1}{2}$  times their longitudinal diameter. Mouth very oblique. Maxillary except its distal part concealed; reaching a vertical between pupil and posterior edge of orbit. Tongue broad; the anterior edge concave. Teeth simple; in rather broad bands on jaws; the anterior and posterior ones enlarged. Gill openings not extending very far forward; the width of isthmus equal to length of snout. Inner edge of shoulder girdle without elevations. Gill-rakers on first arch 3 + 10; stubby; covered with setae. Posterior border of preopercle with a blunt spine which projects downward. Anterior nostril with a low tube. No barbels on lower jaw.

Head with scales, except on snout, throat, and chin; occiput and cheeks with small cycloid scales. Body with large ctenoid scales; those on nape, breast, and belly smaller; cycloid.

Dorsals separate; the spines when depressed just reaching insertion of soft dorsal; posterior rays of soft dorsal longest; when depressed they reach base of caudal. Caudal rounded. Anal inserted below

bases of second or third dorsal rays; when depressed the rays do not quite reach base of caudal. Pectoral acutely rounded; the upper rays without filamentous tips. Ventrals separate; pointed.

Scales with subdued, dark, lateral bands; a narrow brownish band running obliquely downward from eye to edge of preopercle; a similar but shorter band above the latter extending directly backward. Spinous dorsal with two brownish lines running horizontally; soft dorsal with brownish, inverted V-shaped marks on the membranes. Caudal and pectorals with small brownish spots arranged in vertical rows. Anal with indistinct dark markings.

Described from a specimen about 230 millimeters long from near Yokohama. A smaller specimen has 6 dorsal spines.

Coasts of China and southern Japan, rather rare, entering fresh waters; our specimens from Haneda, near Yokohama, from Wakanoura, and from Lake Biwa.

(ὄξυς, sharp; κεφαλή, head.)

#### 6. BOLEOPHTHALMUS Cuvier and Valenciennes.

*Boleophthalmus* CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 198 (*boldarti*).

*Scartelaos* SWAINSON, Classn. Fishes, 11, 1839, p. 279 (*viridis*).

*Boleops* GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 271 (*ocupatorius*).

Body elongate, compressed behind; covered with very small or rudimentary scales. Head not depressed nor compressed, the mouth moderate, little oblique, the lower jaw included. Eyes placed high, close together, prominent, the lower eyelid well developed. Teeth in one row above, two below; some of the upper prominent, canine-like, projecting; outer row of lower teeth nearly horizontal (dilated at tip in typical species). Tongue broad, rounded, and scarcely free at tip. Dorsal fins separate, the first high, of about 5 slender spines, filamentous at tip; second dorsal and anal long; caudal rounded; basal portion of the pectoral fin muscular and covered with small scales; ventral fins completely united; caudal oblong, the lower part obliquely truncate; isthmus broad.

Fishes of the estuaries of the East Indies, one species extending northward to Japan. Like the species of *Periophthalmus*, they are able to skip about on the mud by the use of the muscular pectorals.

(βολή, throwing; ὀφθαλμός, eye.)

#### 7. BOLEOPHTHALMUS CHINENSIS (Osbeck).

*Apocryptes chinensis* OSBECK, Aman. Acad., 1754, p. 29, fig. 23, Coll. Lagerstrom, Canton; Reise nach China, 1757, p. 170, Canton, pre-Linnaean; Voyage to China, English edition, 1771, p. 200, Canton.

*Gobius pectinirostris* GMELIN, Syst. Nat., I, 1788, p. 1200, China, after Lagerstrom and Osbeck, and of the copyists Bonnaterre, Schneider, Lacépède, Shaw, etc.

*Apocryptes pectinirostris* CUVIER and VALENCIENNES, XII, 1837, p. 150 (after Osbeck).

- Boleophthalmus pectinirostris* RICHARDSON, Ichth. China, 1846, p. 208, Canton.—  
GÜNTHER, Cat. Fish., III, 1861, p. 102, Penang, Molucca, Ningpo, Amoy.—  
ISHIKAWA, Cat. Fish., 1897, p. 38, Hizen (Nagasaki), China.  
*Boleophthalmus boddarti* SCHLEGEL, Fauna Japonica, 1847, p. 148, pl. LXXVI, fig. 3,  
Nagasaki (not *Gobius boddarti* Pallas, of the East Indies).

Head  $4\frac{1}{5}$  in length; depth  $6\frac{1}{4}$ ; depth of caudal peduncle  $2\frac{3}{4}$  in head; eye 6; snout  $3\frac{2}{3}$ ; maxillary  $2\frac{1}{8}$ ; D. V-25; A. 25; P. 19.

Body notably elongate; caudal peduncle deep; compressed. Head of moderate size, a little broader than body. Snout rather short, blunt. Eyes small, the lower lid enlarged so that it easily covers the eye; upper part of eye with skin similar to that of head. Interorbital space narrow; a slight ridge along its middle. Mouth oblique; upper lip thick; maxillary concealed throughout, extending to a vertical through a point a little posterior to eye. Tongue not free at tip. Teeth of upper jaw in a single row; 3 or 4 enlarged canines on each side anteriorly; the teeth posterior to the canines abruptly smaller; sharp; those of lower jaw in 2 rows; the inner row represented by a strong canine on each side of symphysis; those of the outer row placed horizontally; projecting outward beyond edge of jaw; anteriorly, simple and with rounded points; posteriorly, their cutting edges are broadened and notched. Gill openings small, restricted to the sides. No elevations on inner edge of shoulder girdle. Gill-rakers 6+6; short; pointed. No barbels on chin.

Head and anterior parts of body covered with conspicuous, conical, tubular papillæ. (On some specimens the skin is covered with mucus, the large openings of the tubes looking like white spots.) Body with cycloid scales; rather large posteriorly, becoming smaller and disappearing anteriorly.

Dorsals separate; the spines long, slender, and filamentous; the third projecting about half its length beyond the membrane; soft dorsal with a very long base; the rays of about the same height throughout. Anal inserted below base of fourth dorsal ray; similar in shape to dorsal, except that the rays are much shorter; when depressed, reaching base of caudal, but not extending so far posteriorly as do those of the dorsal. Caudal and pectorals rather acutely rounded; no filaments on upper edge of the latter. Ventrals short; free posteriorly.

Color of body plain brownish. Spinous dorsal bluish, with round or slightly oblong white spots with darker borders. Soft dorsal of same color, with elongate white spots arranged in 7 longitudinal rows; the spots more nearly round near base of fin, becoming elongate and linear near the top. Caudal with round or elongate white spots in vertical rows. Other fins light in color and without spots.

Coast of China and Japan, generally common in muddy bays southward. Our description based on specimens from the Bay of Tokyo. We also have representatives from Nagasaki.



Measurements of *Bolcophthalmus chinensis*.

	Bay of Tokyo.		Urinke, near Nagasaki.
Length expressed in millimeters.....	141	120	146
Depth expressed in hundredths of length.....	17	15	16½
Depth of caudal peduncle.....	9	10½	9½
Length of head.....	24½	26	24
Length of snout.....	7	6½	6½
Length of maxillary.....	12	12	11
Width of interorbital space.....	1	1	1
Diameter of orbit.....	4	4½	4
Distance from snout to spinous dorsal.....	33	34	33
Distance from snout to soft dorsal.....	51	52	51½
Height of longest dorsal spines.....	34	36	35½
Height of longest dorsal rays.....	14	14	16½
Distance from snout to anal fin.....	56	57	56½
Height of longest anal rays.....	9	8	9½
Length of caudal peduncle.....	9	8	7½
Length of caudal fin.....	23	25	27
Length of pectoral fin.....	15	14	16
Length of ventral fin.....	16	12	16
Number of dorsal spines.....	5	5	5
Number of dorsal rays.....	25	25	25
Number of anal rays.....	25	25	25

## 7. PERIOPHTHALMUS Schneider.

*Periophthalmus* SCHNEIDER, Syst. Ichth., Bloch, 1801, p. 63 (*papilio*).

*Euchoristopus* GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 271 (*kalreuteri*).

?*Periophthalmodon* BLEEKER, Archiv. Néerl., IX, 1874, p. 326 (*schlosseri*). (Ventral fins more nearly united; dorsal spines in smaller number; scales large.)

Body oblong, subcylindrical, covered with very small cycloid scales. Head large, the sides with minute scales; mouth rather small, horizontal, the chin included; teeth moderate, conical, vertical in both jaws; eyes high, very close together, erectile, the outer eyelid well developed; tongue broad, rounded, little free at tip. Dorsal fins 2, the first long of 10 to 15 spines; second dorsal and anal short; pectoral fin with a scaly muscular base; ventral fins broad each 1, 5, more or less completely separated; caudal obliquely truncate below. Isthmus broad. Vertebrae 11 + 15 = 26. No air bladder.

Small fishes of the estuaries and mud flats of the East Indian region, one species ranging northward to Japan. They are said to range about on land in muddy places, in pursuit of insects, etc., on which they feed.

(περί, around; ὀφθαλμός, eye.)

## 8. PERIOPHTHALMUS CANTONENSIS (Osbeck).

*Apocryptes cantonensis* OSBECK, Reise nach China, 1757, p. 171, Canton, pre-Linnæan; Voyage to China, English edition, 1771, p. 201, Canton.

*Periophthalmus modestus* CANTOR, Ann. Mag. Nat. Hist., IX, 1842, p. 29, Chusan.—RICHARDSON, Ich. China, 1846, pp. 208, 319 (after Cantor and Schlegel).

*Periophthalmus modestus* SCHLEGEL, Fauna Japonica, 1847, p. 147, pl. LXXVI, fig. 2, Nagasaki.

*Periophthalmus kalreuteri*, var. *modestus* GÜNTHER, Cat. Fish., III, 1861, p. 98, Ningpo, Hongkong, Chusan.—ISHIKAWA, Cat. Fish., 1897, p. 38, Gyotaku, Shimosa, Kishiw, Hizen.

*Gobius tannoto* RICHARDSON, Ichth. China, 1846, p. 206 (after Osbeck).

Head 4 in length; depth 5½; depth of caudal peduncle 2½ in head;

eye  $4\frac{2}{3}$ ; snout  $3\frac{1}{2}$ ; maxillary  $2\frac{2}{3}$ ; D. XIV-12; A. 12; P. 14; scales in lateral series 75; in transverse series 27.

Body elongate; compressed. Head large; the snout notably short and blunt anteriorly. Eyes small; high in head; their upper edges projecting above the dorsal contour; interorbital space very narrow; with a median linear depression. Cleft of mouth horizontal. Lips thin; pendulous; suborbital part of head with a pendulous flap. Maxillary completely concealed; extending to a vertical through pupil. Teeth in a single row in each jaw; simple, strong, and sharp; no enlarged canines. Gill opening small. Gill-rakers on first arch minute; stubby; no barbels on chin. Lower eyelid well developed; capable of extending over the whole eye.

Head naked except on upper edge of opercle and on occiput. Body with very small cycloid scales.

Spinous dorsal long and high, the spines varying in number from 12 to 16; higher anteriorly, growing gradually shorter posteriorly; when depressed not reaching insertion of soft dorsal. Rays of soft dorsal of about the same length throughout. Anal inserted on a vertical passing a little anterior to insertion of soft dorsal, its rays when depressed not reaching so far posteriorly as do those of dorsal, both falling far short of base of caudal. Pectorals and caudal rounded. Ventrals short; partially united by a very thin membrane.

Color in spirits brownish; darker above than below; small dark specks scattered over sides and upper parts. Color of spinous dorsal growing a little darker toward border of fin. Soft dorsal with a row of brown spots, one on each ray, along its base; a broad brownish band a little above middle of fin; outer parts of fin transparent. Caudal and pectorals dusky; the latter with brown specks. Anal and ventrals light.

Coasts of China, Korea, and southern Japan; rather common in muddy bays. Here described from specimens collected at Yotoku, Bay of Tokyo, presented by the Imperial Museum.

*Measurements of Periophthalmus cantonensis.*

Length expressed in millimeters.....	68	69	73	66	66
Depth expressed in hundredths of length.....	20	19	19	18	18
Depth of caudal peduncle.....	11	9 $\frac{1}{2}$	11	10	11
Length of head.....	25	24	24 $\frac{1}{2}$	24	25
Length of snout.....	6	6	6	6	7
Length of maxillary.....	8 $\frac{1}{2}$	8	8	8	8
Width of interorbital space.....	1	1	1	1	1
Diameter of orbit.....	5 $\frac{1}{2}$	5	5 $\frac{1}{2}$	5 $\frac{1}{2}$	5
Distance from snout to spinous dorsal.....	35	35	35	34	36
Distance from snout to soft dorsal.....	61	59	59	59	61
Height of longest dorsal spines.....	18	15 $\frac{1}{2}$	18	19	15
Height of longest dorsal rays.....	13	12	13	13	13
Distance from snout to anal fin.....	64	60	61	65	61
Height of longest anal rays.....	8	7	8 $\frac{1}{2}$	8	7
Length of caudal peduncle.....	20	20	21	21	20
Length of caudal fin.....	22	22 $\frac{1}{2}$	23	23	23
Length of pectoral fin.....	22	20	19	21	17
Length of ventral fin.....	12 $\frac{1}{2}$	11	12	12	12
Number of dorsal spines.....	13	13	13	13	16
Number of dorsal rays.....	12	12	12	12	12
Number of anal rays.....	12	12	12	12	12
Number of scales in lateral series.....	76	74	78	75	73
Number of scales in transverse series.....	28	27	26	26	26

## 8. HAZEUS Jordan and Snyder.

*Hazeus* JORDAN and SNYDER, new genus (*otakii*).

This genus agrees with *Ctenogobius* in all respects, except that the cheeks are covered with large scales, as in *Bollmannia*, from which the presence of but six dorsal spines especially separates it. Two species known. (*Haze*, the Japanese name for all small gobies.)

## 9. HAZEUS OTAKII Jordan and Snyder, new species

Head  $3\frac{1}{2}$  in length; depth  $5\frac{1}{3}$ ; depth of caudal peduncle  $2\frac{2}{3}$  in head; eye 3; snout 4; maxillary  $2\frac{3}{4}$ ; D. VI-9; A. 10; P. 17; scales in lateral series 24, in transverse series 7.

Body thickset; the contours sloping slowly and gradually from head to caudal peduncle, which is about half as deep as body. Head large; as broad as deep. Snout short; rather pointed. Eyes large, directed obliquely upward; interorbital space very narrow. Mouth oblique; the jaws equal; maxillary extending about to edge of pupil, concealed beneath the suborbital and the thick lip. Teeth simple; in bands on

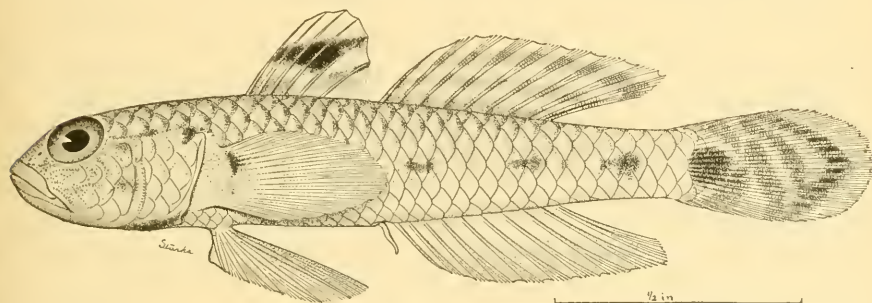


FIG. 3.—HAZEUS OTAKII.

both jaws; outer ones considerably enlarged; the most posterior large tooth on each side of lower jaw a little stronger than the others and curved backward. Gill openings not extending far forward; the isthmus narrow. No papillae on inner edge of shoulder girdle. Gill-rakers rather long; not very slender. No barbels on jaw. Anterior nostril with a tube.

Head with large cycloid scales on nape and cheeks; snout, chin, and throat naked. Body with large ctenoid scales, which are easily displaced. Scales on occiput and nape large, there being 7 in a row between interorbital space and base of first dorsal spine. Anal papilla notably long and slender.

Dorsals separate; highest spines about equal in length to depth of body; rays a little higher; when depressed, the fin does not reach base of caudal. Anal inserted below base of second or third dorsal ray; tip of depressed fin reaching slightly farther backward than does

the dorsal. Pectoral pointed; upper edge of fin without filaments. Ventrals free posteriorly, extending to vent.

Body with 6 small, dark spots along the sides; the anterior one at upper edge of gill opening; the posterior on base of caudal fin; branchiostegal membranes edged with dusky; each scale on head and body with a dusky margin. Dorsals and caudal with small black blotches arranged in wavy lines; anal broadly bordered with dusky; pectorals and ventrals with but little dusky color.

The species is represented by a single specimen, 44 millimeters long, from Nagasaki. It is recorded as type No. 6446, Leland Stanford Junior University Museum.

(Named for Keinosuke Otaki, professor in the Imperial Military Academy of Tokyo, a former student of Stanford University, who accompanied us in our travels through northern Japan, and to whom we are indebted for many favors.)

### 9. GOBIUS (Artedi) Linnæus.

*Gobius* ARTEDI, Genera, 1738, p. 28 (*niger*).

*Gobius* LINNÆUS, Syst. Nat., 10th ed., 1758, p. 262 (*niger*).

Body oblong, compressed behind. Head oblong, moderately depressed; the snout rounded. Eyes large, anterior, close together; opercles unarmed. Mouth moderate, not greatly oblique, the chin not prominent. Teeth conical, in few series, none of them canine. Tongue not notched; isthmus broad. Skull depressed, abruptly widened behind the eyes and without distinct median keel. Scales moderate, ctenoid, cheeks naked, no barbels; no fleshy flaps on shoulder girdle. Dorsal with 6 slender spines and about 10 soft rays. Anal short; ventrals fully united, not adnate to the belly; pectorals with free, or silk-like rays above; caudal fin obtuse.

Species few, but widely diffused; found in all warm seas.

(*Gobius*, the gudgeon, or other small fish.)

### 10. GOBIUS PÆCILICHTHYS Jordan and Snyder, new species.

Head  $3\frac{1}{2}$  in length; depth 5; depth of caudal peduncle  $2\frac{1}{8}$  in head; eye  $3\frac{3}{4}$ ; snout  $2\frac{3}{4}$ ; maxillary  $2\frac{2}{3}$ ; D. VI-10; A. 9; P. 18; scales in lateral series 37, in transverse series 13.

Body rather thickset; cylindrical anteriorly; the caudal peduncle compressed. Head as broad as body. Eyes large; directed laterally; the upper edges projecting slightly, making the interorbital space concave. Snout blunt, rather acutely rounded. Jaws equal; lips wide, the lower forming a broad fold over the upper at their union; maxillary entirely concealed, extending to a vertical passing between pupil and anterior margin of orbit. Teeth simple, in rather broad bands on jaws, the outer ones somewhat enlarged. Tongue broad anteriorly,

only the edge of tip free. Gill openings restricted laterally; isthmus very broad; its width almost equal to depth of caudal peduncle; edge of shoulder girdle without papillæ. Gill-rakers slender.

Head naked; no barbels on chin; anterior nostrils with tubes. Body with large, finely ctenoid scales; those on nape and breast minute.

Dorsals separate, though close together; spines slender, the anterior ones highest; rays somewhat higher than spines, growing gradually shorter from before backward. Anal inserted below third or fourth dorsal ray, extending posteriorly as far as dorsal, both falling far short of base of caudal. Caudal large, broadly rounded. Pectoral rounded posteriorly, its upper edge with conspicuous, free filaments. Ventrals nearly reaching vent; free posteriorly.

Head and body clouded with brownish black. Spinous dorsal with a broad, blackish blotch; fin with a wide, white margin; the first spine with 4 small, black spots. Soft dorsal with narrow, zigzag, dusky bands; the spine with 3 small, elongate, black spots. Upper two-thirds of caudal with oblong, dusky spots; lower third without marks.

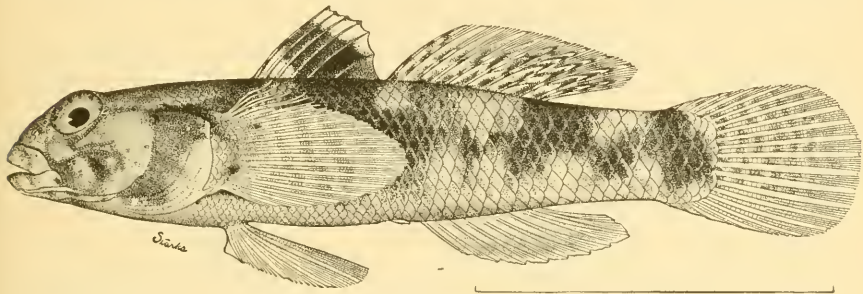


FIG. 4.—GOBIUS PECILICHTHYS.

Pectoral with indistinct, dusky spots arranged in vertical rows. Ventrals and anal with a little dusky color; the latter with a white margin.

The species is represented by 2 specimens, the type No. 6448, Leland Stanford Junior University Museum, and another very small one from Misaki, Sagami.

*Measurements.*—Length expressed in millimeters, 48; depth expressed in hundredths of length, 21; depth of caudal peduncle, 13; length of head, 29; length of snout, 10; length of maxillary, 11; width of interorbital space, 1; diameter of orbit,  $7\frac{1}{2}$ ; distance from snout to spinous dorsal, 37; to soft dorsal, 55; height of longest dorsal spines, 14; rays,  $17\frac{1}{2}$ ; distance from snout to anal, 51; height of longest anal rays, 15; length of caudal peduncle, 24; length of caudal fin, 25; length of pectoral, 25; of ventral, 23.

*Pecilichthys*, *ποικίλος* variegated; *ἰχθύς* fish, name of a genus of American Percidae, which this fish much resembles.

## 10. CTENOGOBIUS Gill.

*Ctenogobius* GILL, Fish. Trinidad, 1858, p. 374 (*fasciatus*).

*Euctenogobius* GILL, Ann. Lye. Nat. Hist., N. Y., 1859, p. 45 (*badius*).

*Rhinogobius* GILL, Proc. Ac. Nat. Sci., Phila., 1859 (*similis*).

*Coryphopterus* GILL, Proc. Ac. Nat. Sci., Phila., 1863, p. 263 (*glaucofrænum*).

*Acentrogobius* BLEEKER, Archiv. Néerl., IX, 1874, p. 321 (*chlorostigma*).

*Zonogobius* BLEEKER, Archiv. Néerl., IX., 1874, p. 323 (*semifasciatus*).

Body oblong, compressed behind. Head oblong, not much depressed. Eyes high, anterior, close together; opercles unarmed. Mouth moderate, the lower jaw usually shortest. Teeth on jaws only, conical, in few or several series, those in the outer row enlarged; no large canines; tongue usually truncate. Isthmus broad. Shoulder girdle without fleshy flaps or papillæ. Skull depressed, abruptly widened behind the eyes and without distinct median keel. Scales moderate or large, ctenoid, permanently covering the body; cheeks naked; opercles naked, or scaled above only; belly generally scaly. Dorsal with 6 rather weak spines; pectorals well developed, the upper rays without free or silk-like tips; ventrals completely united, not adnate to the belly; caudal fin usually obtuse.

Species numerous in Asia and America. The genus *Ctenogobius*, as here understood, comprises a large number of species more or less closely related to the European genus *Gobius*, in which genus the species have been usually placed. The species of *Gobius* are larger in size, with a different physiognomy and with silk-like free tips to the upper rays of the pectorals.

(κτείς, comb; *Gobius*.)

- I. Opercles scaly on the upper half; scales about 36; body with dark bands and streaks; first dorsal filamentous, with a black blotch on last rays; caudal streaked ..... *abei*. 11
- II. Opercles entirely naked.
- a. Nape with a naked area; head rather large; dorsal spines in adult filamentous.
- b. Scales 31; body rather robust; dorsal elevated in the adult and margined with white; caudal unspotted; body olivaceous, with faint lateral blotches. *similis*. 12
- bb. Scales 26; body more elongate; dorsals edged with black, finely spotted; caudal spotted above, the lower part abruptly without spots, body with small spots ..... *gymnauchen*. 13
- aa. Nape closely scaled; scales of body 26 to 28.
- c. Head large,  $3\frac{1}{2}$  in length; fins large; sides with 6 conspicuous black spots; dorsals spotted; caudal with faint wavy bands ..... *hadropterus*. 14
- cc. Head moderate, about 4 in length.
- d. Body sparsely covered with round dark spots, and with faint longitudinal stripes; dorsal spotted; caudal vaguely banded ..... *campbelli*. 15
- dd. Body without well-defined round black spots; a black blotch at base of caudal.
- e. Sides with 5 distinct narrow streaks along the rows of scales; eye small, nearly 4 in head; no long dark blotch on chin and throat. *virgatulus*. 16
- ee. Sides without well defined stripes; eye large,  $3\frac{1}{2}$  in head; branchiostegal region blackish ..... *pflaumi*. 17

## 11. CTENOGOBIUS ABEI Jordan and Snyder, new species.

Head  $3\frac{2}{3}$  in length; depth  $5\frac{1}{4}$ ; depth of caudal peduncle 2 in head; eye  $3\frac{2}{3}$ ; snout 4; maxillary  $2\frac{2}{3}$ ; D. VI-9; A. 9; P. 16; scales in lateral series 36, in transverse series 13.

Body short, thick, cylindrical anteriorly; caudal peduncle compressed. Head large; snout bluntly rounded. Eyes of moderate size directed laterally; interorbital space somewhat convex; distance between eyes equal to  $1\frac{1}{2}$  times their diameter. Mouth oblique; jaws equal; maxillary concealed, extending to a vertical through posterior part of pupil. Teeth in narrow bands on both jaws; the outer ones enlarged. Tongue concave anteriorly. Gill openings restricted to the sides; isthmus broad; its width contained about 3 times in head. No papille on inner edge of shoulder girdle. Gill-rakers very short and blunt. Anterior nostril with a tube. No barbels on head.

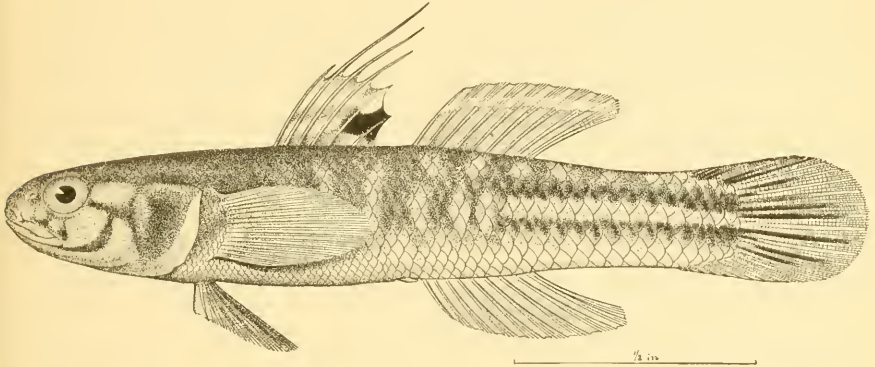


FIG. 5.—CTENOGOBIUS ABEI.

Occiput and upper part of opercles with scales, head otherwise naked; body covered everywhere with finely etenoid scales, small anteriorly, growing gradually larger posteriorly.

Dorsals separate; the spines with long, projecting filaments; when depressed they reach beyond insertion of soft dorsal; rays a little longer posteriorly; when depressed not reaching base of caudal. Anal inserted below base of second dorsal ray; when depressed, reaching as far posteriorly as does the dorsal. Caudal rounded. Pectorals pointed; the upper rays without free filaments. Ventrals free posteriorly from belly.

Color in spirits, light olive, mottled and banded with brownish black. Anterior half of body with 5 broad, vertical dark bands; posterior half with 2 longitudinal dark bands extending on base of caudal fin; the upper band connected with its fellow on the opposite side of body by indistinct dark bands which nearly coalesce into a dark mass of color. Head with dark reticulations. Spinous dorsal with a black

spot on its posterior part; soft dorsal, anal, pectorals and ventrals dusky; caudal dusky, with dark lines running in the direction of the rays.

*Type*.—No. 6447, Leland Stanford Junior University Museum, collected at Wakanoura, Kii.

Another specimen has 41 scales in the lateral series and 15 in the transverse series.

The species is easily distinguished from *H. otukii* by its much smaller scales and peculiar dark color markings.

(Named for Mr. Kakichi Abe, of Tokyo, a former student of Stanford University, who accompanied us in our travels throughout southern Japan, to the great advantage of our work.)

*Measurements of Ctenogobius abei.*

Length in millimeters.....	36	35
Depth expressed in hundredths of length.....	20	19
Depth of caudal peduncle.....	14	13
Length of head.....	27	29
Length of snout.....	6	7
Width of interorbital space.....	6	7
Diameter of orbit.....	6	5
Distance from snout to spinous dorsal.....	38	38
Distance from snout to soft dorsal.....	58	60
Height of longest dorsal spines.....	24	31
Height of longest dorsal rays.....	13	19
Distance from snout to anal fin.....	60	57
Height of longest anal rays.....	13	16
Length of caudal peduncle.....	24	24
Length of caudal fin.....	23	25
Length of pectoral fin.....	22	22
Length of ventral fin.....	16	16
Number of dorsal spines.....	6	6
Number of dorsal rays.....	9	9
Number of anal rays.....	9	9
Number of scales in lateral series.....	41	36
Number of scales in transverse series.....	15	13

12. CTENOGOBIUS SIMILIS (Gill).

*Rhinogobius similis* GILL, Proc. Ac. Nat. Sci., Phila., 1859, p. 145, near Shimoda. Coll. J. Morrow, Comm. Perry Exp.

*Gobius similis* JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Ishikawa Province, Japan; Proc. U. S. Nat. Mus., XXIII, 1901, p. 759, Yokohama, Tsushima, Coll. P. L. Jouy.

*Gobius yokohamæ* GÜNTHER, Ann. Mag. Nat. Hist., 1877, p. 437, Yokohama.

Head  $3\frac{1}{3}$  in length; depth 5; depth of caudal peduncle  $2\frac{1}{3}$  in head; eye  $5\frac{1}{2}$ ; snout  $2\frac{1}{4}$ ; maxillary 2; D. VI-9; A. 9; P. 19; scales in longitudinal series 31, in transverse series 11.

Head and body of nearly the same depth throughout, the caudal peduncle slightly constricted. Head very broad; its width contained  $1\frac{2}{5}$  in its length; the muscles of the cheeks greatly developed, and bulged out far beyond the contour of the body. Eyes small, directed obliquely upward, projecting above the dorsal outline of head, making the interorbital space convex. Snout long, rather blunt. Jaws about equal, the upper slightly projecting. Maxillary entirely concealed by the fleshy lip and overhanging preorbital, extending to a vertical



passing between anterior edge of orbit and pupil. Teeth in narrow bands on both jaws; those in outer row of upper jaw considerably enlarged; the outer ones of lower jaw enlarged, though somewhat smaller than the corresponding ones above. The area bearing teeth extends farther back on the lower than on the upper jaw. Gill opening not extending far forward, the width of the isthmus contained about 3 times in length of head. Inner edge of shoulder girdle with a narrow ridge, but without papillae. Gill-rakers on first arch 2 + 8; short; pointed; far apart. Anterior nostril with a short tube; the posterior with a narrow rim. Lower jaw without barbels.

Head naked; the skin loose and somewhat wrinkled, with a number of elevated mucous pores nearly as large as the nostrils; 1 on each side, above and before the eyes; 1 on the posterior part of interorbital space; 2 behind each eye, and a row of 4, the uppermost of which is largest, along the posterior edge of preopercle.

Scales large above, very small on belly; ctenoid growing smooth on anterior and on ventral parts. Nape with a naked space, the scales extending forward in 3 pointed areas, the median of which is short and narrow; the lateral areas wider, extending farther forward and bordering upper edge of opercle.

Dorsal fins separate, their bases short. Spinous dorsal greatly elevated; the spines slender and filamentous at tips; the second longest, its height  $3\frac{1}{2}$  in length; the third a little longer than the first; the last about a third as long as the second. Soft dorsal high, the posterior rays longest; when depressed, the tip of fin just reaches bases of first caudal rays. Anal not so high as dorsal; the last ray inserted directly below that of dorsal; the fin, when depressed, falling far short of base of caudal. Caudal rounded posteriorly. Pectorals almost reaching a vertical through vent. Ventrals short, free from body posteriorly.

Color in alcohol, light brown; the tint not being uniform, but darker near the center of each scale; sides with four or five very indistinct large dark blotches. Fins a little darker than body, upper anterior edge of soft dorsal white; soft dorsal, anal, and caudal bordered with white, especially in the adult.

This description is of a male specimen collected at Tsushima by P. L. Jouy. Many other male specimens are like the one described. Others are somewhat lighter in color. There is some variation in the length of the fin rays.

Females have a shorter snout and smaller mouth; much lower and shorter fins, with the white borders narrow and indistinct. The females have 2 or 3 rows of small dark brown spots, 1 spot on each scale of upper part of body, and a very narrow lateral band of the same color, more distinct posteriorly, extending along the sides.

Specimens collected in Ishikawa Province by Prof. K. Kishinouye are very light in color, with darker spots on the sides; the spots absent

in some individuals. The fins are dark, having small brown spots arranged in lines. The occiput has a few small brown spots.

Several hundred specimens collected by us in Lake Biwa, at Matsubara, are light colored, with five or six large, dark, lateral spots. The dorsal, anal, and caudal fins have light borders. The white edgings of the dorsal are especially conspicuous in the larger specimens.

Fresh waters of Japan, from above Tokyo southward, everywhere very common; excessively abundant in Lake Biwa. It is one of the smallest gobies, being mature at 2 to 4 inches. Our specimens are from Ishikawa-ken, Lake Biwa. Tsushima, Nagasaki, Kurume, Kaga, Kama R., Kawatana, and Iyo.

(*Similis*, similar to *Ctenogobius pflaumi*.)

Measurements of *Ctenogobius similis*.

Length in millimeters	75	73	69	70	69	66	60	60	54	60
Depth expressed in hundredths of length	18	17	21	20	19	20	20	18	18	19
Depth of caudal peduncle	14	13	14	14	14	14	13	13	13	13
Length of head	33	31	34	32½	31	32	28	28	28	29
Length of snout	15	13	16	14	13	14	12	10	11	11
Width of interorbital space	2½	2½	2½	2	2	2½	2	2	2	2½
Diameter of orbit	5½	6	6	5	6	6	7	6	6½	6
Distance from snout to spinous dorsal	42	41	44	43	43	42½	40	39	40	42
Distance from snout to soft dorsal	61	61	62	62	61½	63	62	61	61	62½
Height of longest dorsal spines	23	29	27	30	24	28	15	14	16	18
Height of longest dorsal rays	25	20	25	24	21	20	15	16	15	17½
Distance from snout to anal fin	65	64	66	66	65	66	66	66	65	65
Height of longest anal rays	17	15	16	17	15	15	15	16	11	15
Length of caudal peduncle	24	24½	24	23	24	24½	25	23	24	24
Length of caudal fin	26	26	26	26	25	26	24	25	24	26
Length of pectoral fin	25	23	24	24	23	23	26	25	24	26
Length of ventral fin	12	11	13	13	12	12	12	12	12	12
Number of dorsal spines	6	6	6	6	6	6	6	6	6	6
Number of dorsal rays	9	10	9	9	9	9	9	9	9	9
Number of anal rays	9	10	9	9	9	9	9	9	9	9
Number of pectoral rays	19	19	19	19	19	19	20	19	19	20
Number of scales in lateral series	31	31	30	31	29	29	28	32	31	33
Number of scales in transverse series	11	11	11	11	10	11	10	11	10	10
Locality, Tsushima.										

13. CTENOGOBIUS GYMNAUCHEN (Bleeker).

*Gobius gymnauchen* BLEEKER, Act. Soc. Sci. Indo-Nederl., Japan, VI, p. 84, pl. 1, fig. 2, Tokyo.—GÜNTHER, Cat. Fish., III, 1861, p. 43 (after Bleeker).

*Acentrogobius gymnauchen* JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Tokyo.

Head  $3\frac{2}{3}$  in length; depth 6; depth of caudal peduncle  $2\frac{1}{2}$  in head; eye  $4\frac{1}{3}$ ; snout  $4\frac{1}{3}$ ; maxillary  $3\frac{1}{2}$ ; D. VI-10; A. 10; P. 16; scales in lateral series 26, in transverse series 7.

Body elongate; head about as deep as body, somewhat broader; eyes rather large, high up, directed laterally or somewhat obliquely; interorbital space narrow, slightly convex. Snout rather sharp, its upper outline more oblique than that of *C. pflaumi*. Lower jaw slightly projecting. Mouth oblique. Maxillary concealed throughout, extending to a vertical through anterior edge of pupil. Teeth simple, in narrow bands on both jaws, outer row enlarged, the most posterior large tooth on each side of lower jaw strongly curved backward. Gill opening not extending far forward; isthmus broad, its width about

equal to length of snout. No papillæ on inner edge of shoulder girdle. Pseudobranchiæ large. Gill-rakers on first arch 3 + 9; slender.

Head naked; no barbels; a triangular naked space extending backward from occiput to insertion of dorsal; body elsewhere covered with large, finely ctenoid scales.

Dorsals separate; spines with filaments, the first and second very long and slender. Anal fin inserted below second dorsal ray, reaching posteriorly as far as the dorsal, both touching base of caudal. Pectorals and caudal rather pointed. Ventrals large, free posteriorly.

Color in spirits, light olive; throat with a narrow, longitudinal dark spot; sides of head and upper parts of body with dark spots, those near middle of sides arranged in an indefinite undulating line. Spinous dorsal with a wide, black edge; below this a broad band of pearly

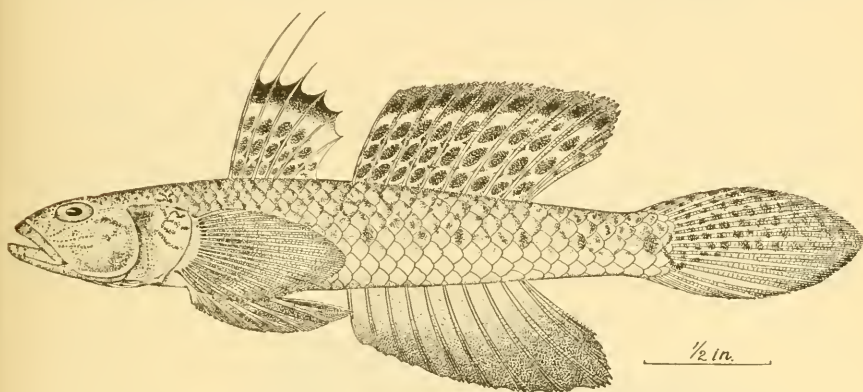


FIG. 6.—CTENOGOBIOUS GYMNAUCHEN.

white; basal half of fin with 3 rows of oval, dusky, or black spots; soft dorsal similarly colored. Caudal with small, dusky, oval spots on interradiæ membranes, except on lower parts of fin. Anal broadly edged with dusky. Pectorals dusky at base, the dark color fading out toward the edge. Ventrals streaked longitudinally with black. Described from a specimen from Enoshima.

Some individuals are much lighter in color. They have a more or less conspicuous dark blotch at base of caudal, and occasionally a row of 4 or 5 poorly defined small spots along the sides.

This small prettily colored goby is rather common in Japan, living chiefly in the estuaries about and under muddy rocks. Our numerous specimens are from Misaki, Wakanoura, Nagasaki, Tokyo Bay, Tsuruga, and Enoshima.

(*γυμνός*, naked; *αὐχίη*, nape.)

Measurements of *Ctenogobius gymnauchen*.

Length in millimeters.....	57	50	46	52	43
Depth expressed in hundredths of length.....	14	13½	17	16	16
Depth of caudal peduncle.....	9	8	8	8	8½
Length of head.....	26	26½	26½	27	28
Length of mouth.....	7	6½	6½	7	7½
Length of maxillary.....	9½	9½	9	9½	9
Width of interorbital space.....	6½	6	½	½	½
Diameter of orbit.....	6½	6	6	7	7
Distance from snout to spinous dorsal.....	34	33	36	34	36
Distance from snout to soft dorsal.....	53	54	54	51	56
Height of longest dorsal spines <i>a</i> .....	37	21	23	33	14
Height of longest dorsal rays.....	27	27	21	25	15
Distance from snout to anal fin.....	55	56½	54	55	57
Height of longest anal rays.....	25	22	17	23	14
Length of caudal peduncle.....	19	21	22	22	20
Length of caudal fin.....	28	31	28	27	26
Length of pectoral fin.....	26	25	22	24	23
Length of ventral fin.....	25	25	24	25	25
Number of dorsal spines.....	6	6	6	6	6
Number of dorsal rays.....	10	10	10	10	10
Number of anal rays.....	10	10	10	10	10
Number of pectoral rays.....	16	16	16	17	16
Number of scales in lateral series.....	23	24	26	25	27
Number of scales in transverse series.....	6	6	6	6	7
Locality, Tokyo.					

*a* Including filaments.

## 14. CTENOGOBIUS HADROPTERUS Jordan and Snyder, new species.

Head  $3\frac{1}{3}$  in length; depth  $4\frac{1}{2}$ ; depth of caudal peduncle  $2\frac{1}{2}$  in head; eye 4; snout  $2\frac{2}{3}$ ; maxillary  $2\frac{1}{4}$ ; D. VI-9; A. 9; P. 19; scales in lateral series 28; in transverse series 9.

Body robust, a little deeper than wide. Snout long and sharp. Eye high in head, the upper margin projecting above contour of head,

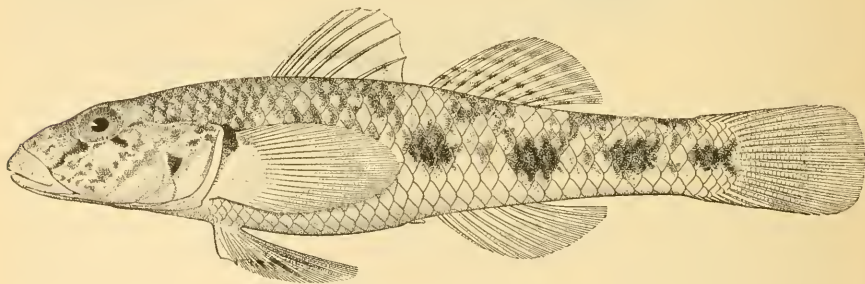


FIG. 7.—CTENOGOBIUS HADROPTERUS.

directed obliquely, situated at a point halfway between tip of snout and posterior edge of opercle. Interorbital space narrow, concave. Nostrils minute, the anterior with a distinct tube. Mouth moderate, somewhat oblique. Jaws subequal, the lower slightly shorter; upper lip very wide; maxillary entirely concealed, not quite reaching a vertical through anterior edge of orbit. Tongue broad, the tip truncate. Teeth of jaws in 2 series, outer ones in a single row, small, canine-like, not firmly attached; second series in upper jaw very minute, in lower jaw a little smaller than the anterior ones; no large canines. Gill opening extending upward to edge of base of pectoral; width of isthmus about equal to length of snout. No papillae on inner edge of shoulder girdle. Gill-rakers small, 2 + 8 on first arch. No barbels on lower jaw.



## 15. CTENOGOBIOUS CAMPBELLI Jordan and Snyder, new species.

Head 4 in length; depth  $5\frac{1}{2}$ ; depth of caudal peduncle  $2\frac{1}{3}$  in head; eye  $3\frac{2}{3}$ ; snout  $3\frac{1}{2}$ ; maxillary  $2\frac{2}{3}$ ; D. VI-11; A. 10; P. 18; scales in lateral series 26, in transverse series 9.

Body thickset; cylindrical anteriorly; the caudal peduncle deep. Snout short; blunt. Eye very large; the upper margin projecting slightly above dorsal contour of head; directed obliquely upward. Interorbital space narrow; concave. Mouth somewhat oblique. Maxillary entirely concealed; extending to a vertical through pupil. Lips narrow. Teeth simple; in narrow bands on both jaws; outer ones somewhat enlarged; no canines. Tongue narrow; truncate anteriorly. Gill openings not extending far forward; isthmus broad; its width equal to distance between tip of snout and middle of pupil. Inner edge of shoulder girdle with a sharp ridge but no papillae. Gill-rakers long and rather slender. Anterior nostril with a conspicuous tube. No barbels on lower jaw.

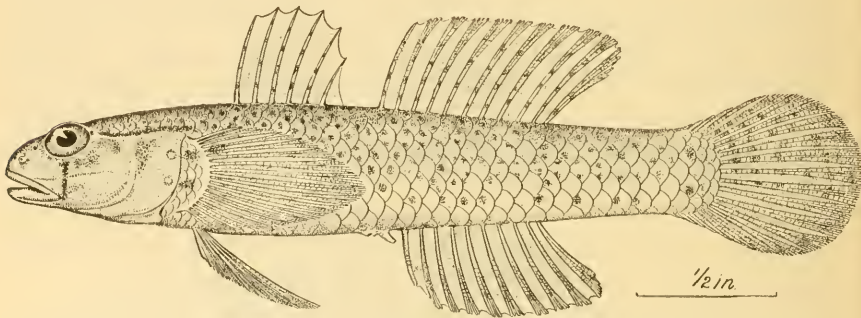


FIG. 8.—CTENOGOBIOUS CAMPBELLI.

Head naked, except on occiput. Body with large etenoid scales; those on nape and occiput cycloid; smaller than those of body; those on breast anterior to ventrals and on region before pectorals cycloid.

Dorsals separate; spines when depressed not reaching insertion of soft dorsal. Anal inserted below base of second or third dorsal ray; reaching as far posteriorly when depressed as the dorsal; neither touching base of caudal. Caudal rounded. Pectoral pointed; its upper edge without free filaments. Ventrals free posteriorly, their tips reaching anal opening.

Body with small, round, dark spots; 5 or 6 very indefinite, narrow, dark, longitudinal bands. Head with small dark spots; those on nape arranged in longitudinal rows; a sharply defined, narrow, dark band running backward from eye; opercle with 2 small brown rings. Dorsal spines and rays with small, oblong, dark spots; caudal with small, dark spots on upper two-thirds; not evident on the lower part. Anal narrowly edged with white; suffused with dusky below the white,

growing lighter toward the base. Pectorals and ventrals suffused with dusky; a spot about as large as pupil on upper part of base of the former.

This species is probably closely related to *C. virgatulus* or to *C. pflaumi*. It more closely resembles the former, but may be easily distinguished from it by its much less oblique mouth and by having larger scales on the nape. In *C. virgatulus* the scales of the nape are minute when compared with those of the body, while on the species in hand they are at least one-half as wide as those of the body.

The species is at present known from a single specimen 81 millimeters long, from Wakanoura, Kii, Japan. Type No. 6450, Leland Stanford Junior University Museum.

*Measurements*.—Length, tip of snout to base of caudal, 65 millimeters; depth, expressed in hundredths of length, 18; depth of caudal peduncle,  $11\frac{1}{2}$ ; length of head,  $25\frac{1}{2}$ ; length of snout,  $6\frac{1}{2}$ ; width of interorbital space, 1; diameter of orbit, 7; distance from snout to spinous dorsal, 33; distance from snout to soft dorsal, 54; height of longest dorsal spines  $15\frac{1}{2}$ , of longest dorsal rays  $15\frac{1}{2}$ ; distance from snout to anal fin, 56; height of longest anal rays, 15; length of caudal peduncle 25, of caudal fin 25, of pectoral fin 26, of ventral fins 22.

This species is named for Dr. Douglas Houghton Campbell, professor of botany in Leland Stanford Junior University, in recognition of his interest in the flora of Japan and in all things Japanese.

16. CTENOGOBIUS VIRGATULUS Jordan and Snyder, new species.

Head 4 in length; depth  $5\frac{3}{8}$ ; depth of caudal peduncle 10; eye  $3\frac{1}{8}$  in head; snout  $3\frac{1}{2}$ ; maxillary 3; D. VI-11; A. 11; P. 16; scales in lateral series 26, in transverse series 9.

Body elongate, the dorsal and ventral contours sloping gradually from occiput posteriorly; caudal peduncle compressed, narrowest near the middle, widening somewhat toward base of caudal; head large, deeper and broader than body. Snout blunt. Eyes prominent, though smaller than those of *C. pflaumi*; directed obliquely, the upper edges projecting above dorsal contour of head; interorbital area very narrow. Mouth oblique, lower jaw slightly projecting. Maxillary entirely concealed, extending posteriorly to anterior edge of orbit. Tongue broad at tip, with a shallow notch. Teeth of jaws in narrow bands, simple, the outer ones enlarged; those near middle on upper jaw largest; a pair of short, strong canines on each side of lower jaw, the posterior one being larger, strongly curved backward. Gill openings not extending far forward; the isthmus broad; inner edge of shoulder girdle without papillæ. Pseudobranchiæ consisting of 6 large projecting tufts. Gill-rakers on first arch about  $3 + 8$ ; those of upper limb represented by minute elevations; those of the lower limb rather long and slender. No barbels on chin.

Head, except a small occipital area, naked; a large pore above and between the nostrils; 2 similar pores on interorbital area; a row of 3 running backward from the eye; sides of head with rows of minute pores. Body covered with large, weakly ctenoid scales, the rough edges of which are hidden by epidermis; scales on nape and occipital area very small.

Dorsal fins separate; spines slender, the first 5 evenly spaced; the interval between fifth and sixth twice that between two of the others; spinous dorsal, when depressed, reaching past insertion of soft dorsal. Anal inserted below second or third dorsal ray, the fin extending slightly farther posteriorly than the dorsal, neither reaching base of caudal. Caudal acutely rounded. Pectoral without filaments on upper edge. Ventrals free posteriorly, extending as far backward as do the pectorals.

Color in spirits much darker above than below, the sides with 5 narrow, dark, longitudinal streaks; a median row of indistinct, large, dark spots, the one at base of caudal being most prominent; cheeks

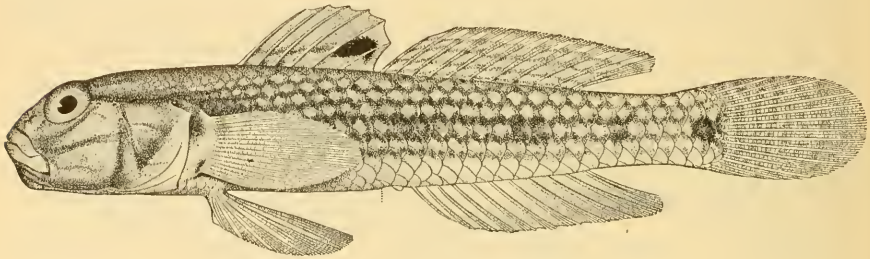


FIG. 9.—CTENOGOBIOUS VIRGATUS.

with 1 or 2 dark lines; opercle with a large dark blotch; scales of breast each with a subdued dusky spot. Spinous dorsal dusky, with a narrow longitudinal band, the posterior part widened, forming a distinct oval spot; soft dorsal dusky, each ray with 3 indistinct spots; caudal rays with small, dusky spots arranged in vertical rows; spots on lower fourth of fin very indistinct or absent; ventrals and anal dusky; pectoral dusky, with an elongate dark spot at upper part of base and a narrow dark dash on the lower edge.

*Type*.—No. 6451, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

Many specimens from Misaki are lighter in color than the type, a highly colored male; on the lighter one the bands and spots are much more distinct.

Individuals from Nagasaki have the color pattern in every detail, as described above, although it is much lighter and less distinct.

The species is closely related to *C. pflaumi*. It may be distinguished by its smaller eyes and by the absence of a long, dark blotch on chin and throat.



This species is found with *Ctenogobius pflaumi*, and equally common, in the bays and inlets of southern Japan. We have specimens from Misaki, Wakanoura, Nagasaki, Tokyo Bay, Matsushima, Onomichi, and from Semida R., near Tokyo.

(*Virgatulus*, finely streaked.)

*Measurements of Ctenogobius virgatulus.*

	Misaki, Sagami.			Nagasaki, Hizen.		
Length in millimeters.....	65	65	60	52½	58	50   50
Depth expressed in hundredths of length.....	17	17	18	17	18	20   18
Depth of caudal peduncle.....	10	10	10	10	12	11   10
Length of head.....	25	25½	26½	27	25	25   24
Length of snout.....	7½	7	7	7	6	6   6
Length of maxillary.....	9	10	9	9	9½	10   9
Width of interorbital space.....	¾	¾	¾	¾	¾	¾   ¾
Diameter of orbit.....	7	6½	6½	7	6½	7   6½
Distance from snout to spinous dorsal.....	35	35	33	35	33	35   35
Distance from snout to soft dorsal.....	54	53	52	54	.....	.....
Height of longest dorsal spines.....	15	13	8	14	.....	.....
Height of longest dorsal rays.....	13	15	7	14	.....	.....
Distance from snout to anal fin.....	59	59	55	57	55	57   58
Height of longest anal rays.....	14	20	17	13	.....	.....
Length of caudal peduncle.....	20	20	19	21	.....	.....
Length of caudal fin.....	22	23	25	22	28	26   24
Length of pectoral fin.....	22	22	21	21	24	25   24
Length of ventral fin.....	22	21	22	21	22½	22   21½
Number of dorsal spines.....	6	6	6	6	6	6   6
Number of dorsal rays <i>a</i> .....	11	11	11	11	11	11   11
Number of anal rays.....	11	11	11	11	11	11   11
Number of pectoral rays.....	16	17	16	16	.....	.....
Number of scales in lateral series.....	26	26	27	26	26	26   27
Number of scales in transverse series.....	9	9	9	9	8	9   8

*a* The last dorsal and anal rays are cleft to the base.

17. CTENOGOBIUS PFLAUMI (Bleeker).

*Gobius pflaumi* BLEEKER, Verh. Bat. Gen., XXV, Japan, p. 42, figs. 3, 18, Nagasaki.

*Accentrogobius pflaumi* JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, near Tokyo. Coll. Kishinouye.

Head 4 in length; depth 4½; depth of caudal peduncle 11; eye 3½ in head; length of snout 3½; maxillary 2⅔; D. VI-11; A. 11; P. 17; scales in lateral series 26, in transverse series 9.

Body elongate, the dorsal and ventral contours sloping gradually from occiput to caudal peduncle; caudal peduncle narrowest near the middle, widening somewhat toward base of caudal. Head about as deep and broad as body. Snout rather blunt, the lower jaw slightly projecting. Eyes very large, directed obliquely upward, the upper edges of orbit projecting slightly above contour of head; interorbital space narrow; concave. Mouth oblique. Maxillary entirely concealed, extending posteriorly to a vertical through anterior edge of orbit. Tongue broad at tip; truncate. Teeth of jaws in narrow bands; simple; the outer ones enlarged; a pair of short, strong canines on each side of lower jaw, the posterior one being larger and curved backward. Gill openings not extending far forward; the isthmus broad. Gill-rakers 2 + 8; those of the upper arch much reduced; the lower ones slender. Inner edge of shoulder girdle without papillæ. No barbels on chin.

Head, except occipital area, naked. A large pore above and between the nostrils; 2 similar pores on interorbital area; a row of 3 running backward from the eye; sides of head with rows of minute pores. Body covered with large weakly ctenoid scales; those of nape and occipital area very small.

Dorsal fins separate; spines slender, the first 5 evenly spaced; the interval between fifth and sixth about double that between 2 of the others; spines when depressed reaching beyond insertion of soft dorsal. Anal inserted below second or third dorsal ray, the fin, when depressed, extending slightly further posteriorly than the dorsal, both falling short of base of caudal. Caudal acutely rounded. Upper edge of pectoral without free filaments. Ventrals free posteriorly, extending about as far backward as the pectorals.

Body olivaceous, with dark markings; head blue in life.

Scales on upper parts, with dusky margins; sides with 2 or 3 faintly outlined dark stripes; a median row of 4 or 5 indistinct dusky spots; a distinct, round, black spot about as large as eye at base of caudal; a small dark spot on lower part of opercle; branchiostegal region of throat dusky. Fins dusky, but without conspicuous markings.

Southern Japan, generally common in the bays and inlets, in salt water; here described from specimens collected at Tsuruga, Echizen. Others are in the collection from Yokohama, Wakanoura, Aomori, Matsushima, Onomichi, Kobe, Owari Bay, and from Kawatana.

This species very closely resembles *Ctenogobius virgatus*. It differs in having much larger eyes, an oblong black blotch on branchiostegal region, and in having the general color of body much lighter.

*Measurements of Ctenogobius pflaumi.*

	Tsuruga, Echizen.				Nagasaki, Hizen.		
	56	54	57	56	55	47	55
Length in millimeters.....	56	54	57	56	55	47	55
Depth expressed in hundredths of length.....	19	19	17	21	17	19	18
Depth of caudal peduncle.....	9	10	10	10	10	11	9
Length of head.....	26	25½	25	26	27	26	25
Length of snout.....	7	6	6	7	7	6	6½
Length of maxillary.....	10	11	10	10	10	9½	10
Width of interorbital space.....	½	½	½	½	½	½	½
Diameter of orbit.....	8	7½	8	8½	8	8	7½
Distance from snout to spinous dorsal.....	35	34	35	34	33	33	34
Distance from snout to soft dorsal.....	55	52	53	51	51	52	53
Height of longest dorsal spines.....	16	14	15	16	14	14	14
Height of longest dorsal rays.....	14	19	17½	17	18	16	14
Distance from snout to anal fin.....	60	56	56½	58	57	55	56
Height of longest anal rays.....	14½	18½	18	17	18	19	16
Length of caudal peduncle.....	20	19	19	20	22	20	21
Length of caudal fin.....	26	27	29	30	22	32	29
Length of pectoral fin.....	25	24	26	24	24	25	25
Length of ventral fin.....	20	19	22	22	19	22	22
Number of dorsal spines.....	6	6	6	6	6	6	6
Number of dorsal rays <i>a</i> .....	11	11	11	11	11	11	11
Number of anal rays <i>a</i> .....	10	11	11	11	11	11	11
Number of pectoral rays.....	16	17	16	17	17	17	17
Number of scales in lateral series.....	25	25	25	26	25	25	26
Number of scales in transverse series.....	8	9	9	8	8	8	9

*a* The last dorsal and anal rays are cleft to the base.

## 11. ABOMA Jordan and Starks.

*Aboma* JORDAN and STARKS, Proc. Cal. Ac. Sci., 1895, p. 497 (*ethrostoma*).

This genus is very closely allied to *Ctenogobius*, differing chiefly in the presence of 7 or 8 dorsal spines; head naked, rounded in profile, narrow and not depressed between eyes; mouth moderate, not very oblique, the chin usually not prominent; outer teeth somewhat enlarged; tongue not notched. Scales usually large, ctenoid, sometimes rather small. Dorsals and anal short; no flaps on shoulder girdle; no silk-like rays on pectoral.

Species numerous, small in size and mottled in coloration, mostly Japanese, three of them from the west coast of Mexico.

(*Aboma*, Spanish name of the small gobies in Mexico.)

- a. Scales large, 30 to 45 in longitudinal, 9 to 12 in transverse series; breast naked.
- b. Ventral fins dusky, with a bright yellow, broad median stripe; depth  $4\frac{2}{3}$  in length; scales 36-10; coloration rather bright; caudal with zigzag bands above, plain below..... *lactipes*. 18
- bb. Ventral fins plain; coloration rather obscure; caudal spotted above, plain below.
- c. Scales large, 9 in transverse series; depth  $5\frac{2}{3}$  in length; a faint caudal spot. *tsushima*. 19
- cc. Scales smaller, 12 in transverse series; no caudal spot; first dorsal with a black spot with white before it..... *heptacantha*. 20
- aa. Scales small, 15 to 20 in transverse series (probably 60 to 70 in longitudinal series).
- d. Scales in cross series 15; anal rays 10 or 11; caudal translucent, with fine dots..... *bremigi*. 21
- dd. Scales in cross series 20; anal rays 12 or 13; caudal with a median cross band always present..... *urotonia*. 22

## 18. ABOMA LACTIPES (Hilgendorf).

*Gobius lactipes* HILGENDORF, Sitzber. Naturf. Freunde, 1878, p. 109, Tokyo; No. 10650, Mus. Berlin.

*Aboma lactipes* JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Tokyo, Tonegawa.

Head  $3\frac{3}{4}$  in length; depth  $4\frac{2}{3}$ ; depth of caudal peduncle 10; eye  $5\frac{1}{2}$  in head; snout  $2\frac{3}{4}$ ; maxillary  $2\frac{1}{3}$ ; D. VIII-11; A. 11; P. 18; scales in lateral series 36, in transverse series 10.

Body cylindrical anteriorly, sloping gradually to the rather deep caudal peduncle. Head large; snout long; blunt. Eyes small; situated high up; nearer to tip of snout than to posterior edge of opercle a distance equal to one-half the diameter; directed almost laterally. Mouth almost horizontal; jaws equal; upper lip wide; maxillary concealed except at distal end; reaching a vertical passing midway between anterior edge of orbit and pupil. Teeth simple; in a narrow band on each jaw; outer ones but little enlarged. Tongue rather broad; its anterior edge truncate or slightly rounded. Gill openings restricted to the sides; width of isthmus a little less than length of snout. Inner

edge of shoulder girdle with a low, narrow, sharp ridge, but no papillae. Gill-rakers 1 + 7; short; flat. Anterior nostrils with low tubes. No barbels on lower jaw.

Head naked. Body with large, finely ctenoid scales; those on sides of nape small; middle of nape, breast anterior to ventrals and region before pectorals naked.

Dorsals separate; spines and rays of about equal height; the spinous dorsal when depressed reaching insertion of soft dorsal. Anal inserted below base of second dorsal ray; the rays a little shorter than those of dorsal; when depressed, reaching almost as far posteriorly as do those of dorsal; neither reaching bases of caudal rays. Caudal rounded. Pectorals rather pointed; the upper border without free filaments. Ventrals very large, extending to anal opening; free posteriorly.

In spirits the upper part of the body suffused with dusky; sides with 9 rather definite, dark vertical bands, extending from a little

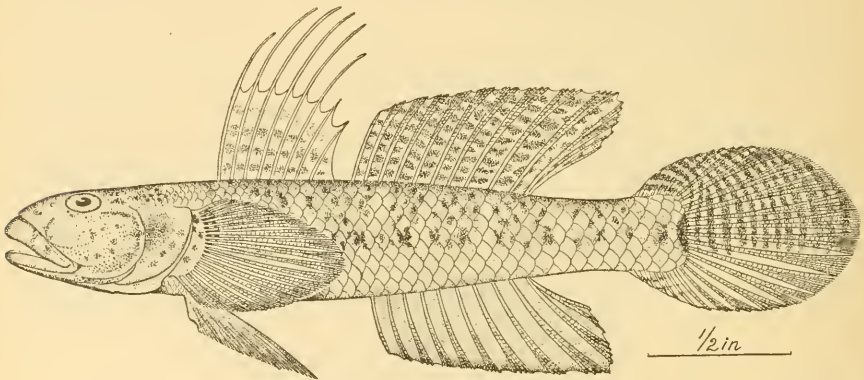


FIG. 10.—*ABOMA LACTIPES*.

below the middle of body upward; darker near their lower edges. Head dark; a narrow blackish line running from eye to tip of maxillary; under parts without dusky, except on throat and chin. Spinous dorsal edged with white; interradiar membranes dusky; jet black on upper posterior part of fin; soft dorsal with small, oblong, dark spots arranged in rows. Upper two-thirds of caudal with vertical, zigzag bands; the lower third dusky; without bands. Anal dark; narrowly bordered with white; pectoral dusky. Ventral with a white, median area broadly bordered with black.

Color in life, lemon yellow; middle area of ventrals bright yellow, slightly tinged with orange; spinous dorsal edged with orange; anal with a narrow marginal band of dead white.

The above description is of a specimen from the bay at Tsuruga. Other individuals from the same locality are like it except in color. In some the lateral bands are very indistinct, the sides being covered with small dusky spots. Others are much lighter, the general color-

pattern being preserved however. A large male specimen has a series of narrow, bright, transverse lateral bands on the sides. The soft dorsal is distinctly edged with white. Occasionally in males the anterior spines of the first dorsal have very long filaments extending above the margin of the fin.

The species is generally common in the bays of Hondo. Our many specimens are from Matsushima, Aomori, Tokyo, Tsuruga, Enoshima, and the Tone River, near Tokyo.

(*Lac. lactis*, milk; *pus*, foot.)

*Measurements of Aboma lactipes.*

Length in millimeters .....	72	72	66	56	48
Depth expressed in hundredths of length .....	22	22	22	21	21
Depth of caudal peduncle .....	10 $\frac{1}{2}$	10	9 $\frac{1}{2}$	10	10
Length of head .....	27	27	26	27 $\frac{1}{2}$	28
Length of snout .....	10	10	10	11	11
Width of interorbital space .....	2	2 $\frac{1}{2}$	2	2	2
Diameter of orbit .....	5 $\frac{1}{2}$	5 $\frac{1}{2}$	5	6	6
Distance from snout to spinous dorsal .....	34	34	34	35	36
Distance from snout to soft dorsal .....	56	55	55	55	57
Height of longest dorsal spine .....	16	15	15	15	15
Height of longest dorsal rays .....	17	15 $\frac{1}{2}$	16	15 $\frac{1}{2}$	16
Distance from snout to anal fin .....	56	57	60	58	59
Height of longest anal rays .....	15	14	13	14	16
Length of caudal peduncle .....	22	23	22	22	23
Length of caudal fin .....	24	24	25	26	25
Length of pectoral fin .....	22	23	23	24	25
Length of ventral fin .....	24	25	22	27	25
Number of dorsal spines .....	8	8	8	8	8
Number of dorsal rays .....	11	12	11	12	11
Number of anal rays .....	11	11	10	11	11
Number of pectoral rays .....	18	18	18	18	18
Number of scales in lateral series .....	36	37	35	35	35
Number of scales in transverse series .....	10	10	9	9	9
Locality, Tsuruga.					

19. ABOMA TSUSHIMÆ Jordan and Snyder.

*Aboma tsushima* JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 759, Sasuna, Tsushima, Japan.

Head  $3\frac{1}{2}$  in length; depth  $5\frac{3}{5}$ ; depth of caudal peduncle  $2\frac{3}{4}$  in head; eye 4; snout  $3\frac{2}{3}$ ; maxillary  $2\frac{3}{5}$ ; D. VIII-12; A. 11; P. 17; scales in lateral series 33, in transverse series 9.

Body not notably elongate; gradually diminishing in size from the region of pectoral fins backward. Head as wide as body, but less deep. Snout very blunt; rounded when viewed from above; truncate when seen from the side.

Eyes high in head; directed obliquely upward; interorbital space very narrow. Jaws subequal, the lower slightly included. Mouth rather small; the cleft somewhat oblique. Lips large. Maxillary, except the tip of the distal end, concealed; extending to a vertical through anterior edge of orbit. Space between orbit and maxillary about equal to longitudinal diameter of eye. Tongue broad; rounded anteriorly; its free edge narrow. Teeth simple; in narrow bands on jaws; outer ones largest, slender, sharp, slightly curved; the ones on sides of lower jaw enlarged, though not notably so, there being no strong canines. Gill opening not extending far forward; the width of

isthmus about equal to length of maxillary. Inner edge of shoulder girdle projecting as a sharp ridge, without papillæ or other dermal modifications. Gill-rakers on first arch, 2 + 7 or 8; short and pointed. Anterior nostril with a high rim. No barbels on jaw.

Head naked. Body with large, finely ctenoid scales; the region immediately anterior to pectorals, the breast in front of ventrals, and a narrow space extending backward nearly to vent naked.

Dorsal fins separate from each other and from the caudal; second spine highest; the others successively shorter; when depressed, just reached origin of soft dorsal. Dorsal rays, when depressed, falling far short of base of caudal. Anal inserted directly below base of third dorsal ray; the rays somewhat longer posteriorly, when depressed extending as far back as the dorsal. Pectorals pointed; their tips reaching a vertical through insertion of soft dorsal; the upper rays not peculiar. Ventrals long; not extending so far posteriorly as pectorals; free from body except at base.

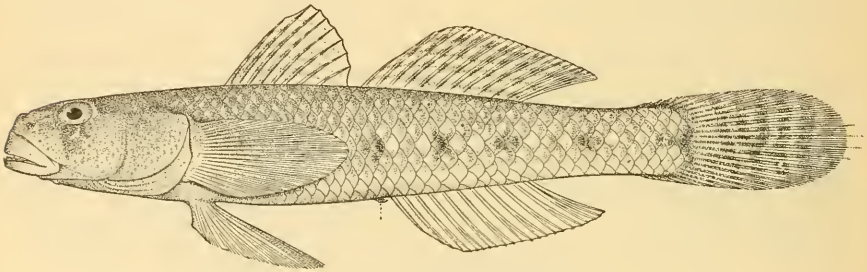


FIG. 11.—*ABOMA TSUSHIME*.

Color in alcohol light-brownish, everywhere with small, indistinct darker spots and reticulations; sides with 6 or 7 poorly defined lateral spots, the last and most conspicuous one at base of caudal fin. Dorsals with markings of light brown, arranged in longitudinal rows on the membranes; similar marks assembled in wavy lines on the rays of upper three-fourths of caudal; the lower part of fin without spots. Other fins somewhat dusky.

Specimens smaller than the type have the dark marking a little more distinct.

Known only from specimens collected at Sasuna, on the island of Tsushima, Japan, by P. L. Jouy.

20. *ABOMA HEPTACANTHA* (Hilgendorf).

*Gobius heptacanthus* HILGENDORF, Sitzber. Natur. Freunde, 1878, p. 110, Tokyo; No. 10656, Mus. Berlin.

Head  $4\frac{1}{2}$  (with caudal); depth  $6\frac{1}{2}$ ; D. VII-12; A. 12; scales in 12 rows between dorsal and anal. Eye equal to snout and to interorbital width, 4 in head. Profile of head nearly straight; lower jaw projecting; mouth large, the maxillary reaching posterior border of eye;

teeth in several rows, the outer larger; scales of body ctenoid, each with about 10 little teeth; a pair of large pores in posterior part of interorbital space; pectoral without silky rays.

Color clear violet brown with darker net-like marbling; throat dark brown; first dorsal with a black spot with white below it, and a brown band forward and downward; second dorsal with about 5 oblique bands; anal with dark margin especially behind; pectoral colorless; ventral and caudal dusky with fine points; no spot on base of caudal.

Bay of Tokyo. (Hilgendorf.) Not seen by us.

(ἑπτὰ, seven; ἄκανθα, spine.)

#### 21. ABOMA BREUNIGI (Steindachner).

*Gobius breunigi* STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 22, Hakodate.

Head 4; depth  $5\frac{2}{3}$  (with caudal); eye  $4\frac{2}{3}$  in head; snout  $4\frac{1}{3}$ ; D. VII–I, 11; A. 10 or 11; P. 20 or 21; scales 60 to 62–15; snout  $4\frac{1}{3}$  in head.

Body slender, compressed; scales ctenoid; head naked; jaws subequal; maxillary reaching to opposite front of eye; teeth small, those of the outer row longest. Dorsal spines low, slender, the fourth about 2 in head, not so high as body, a little lower than soft dorsal. Caudal a little shorter than head. Pectorals shorter than head, without silky rays; as long as ventrals. Reddish brown above, pale below, a dark stripe from eye to side of snout; dark brown close set spots forming narrow zigzag streaks on upper part of head and body; often a small dark spot at base of pectoral above; behind this dark cross streaks; both dorsals and caudal translucent with dark spots and fine dots.

Length 60 mm. Hakodate; not found by us. (Steindachner.)

Named for Dr. Ferdinand Breunig, professor of natural history in the Imperial Gymnasium at Schotten.

#### 22. ABOMA UROTÆNIA (Hilgendorf).

*Gobius urotænia* HILGENDORF, Sitzber. Nat. Freunde, Berlin, 1878, p. 108, Tokyo; No. 10644, Mus. Berlin.

Head  $3\frac{2}{3}$ ; depth  $5\frac{1}{2}$ ; D. VI or VII–12 or 13; A. 12 or 13; scales 20 in cross series. Eye  $4\frac{1}{2}$  in head, scarcely less than snout; depth of head 2 in head, breadth  $2\frac{2}{3}$ ; interorbital width equal to vertical diameter of eye; lower jaw projecting; teeth in several rows, the outer larger; rays of dorsal not produced; profile of head very weakly convex; head scaleless; scales of body ctenoid, each with 7 to 9 teeth on the edge.

Color clear brown, with irregular darker spots, those along lateral line mostly rhombic, a distinct spot at base of caudal; a horizontal streak before eye; a dark streak along caudal peduncle above and below; caudal with a well-marked median cross band constantly present; a fainter band near the edge. Spinous dorsal with one, anal with two, distinct bands.

Bay of Tokyo; known from small examples about 37 mm. in length. (Hilgendorf.) Not seen by us.

(οὐρά, tail; ταινία, ribbon.)

## 12. CRYPTOCENTRUS Ehrenberg.

*Cryptocentrus* (Ehrenberg Ms.) BLEEKER, Arch. Néerl., IX, 1874, p. 322 (*cryptocentrus*).

*Paragobius* BLEEKER, fide BLEEKER, Arch. Néerl., IX, 1874, p. 322.

Body moderately elongate, covered with minute cycloid scales. Head compressed, narrow above and convex in profile, the eyes close together. Mouth large, oblique, the thick chin prominent; tongue narrow, not notched; teeth rather strong; no barbels; lower jaw not moving readily, so that the mouth is not easily opened wide; head naked. Dorsals short, the first of six spines, which are sometimes produced in filaments in the male; caudal pointed; ventrals rather long; pectorals without silky rays; no filaments on the shoulder girdle; isthmus very narrow; the gill membranes somewhat continued forward below.

Species brightly colored; rather numerous in the seas of the East Indies. The Japanese species differs from the type in the elevation of the dorsal spines.

(κρυπτός, hidden; κέντρον, spine, from a concealed projection on the opercle in *C. cryptocentrus*.)

## 23. CRYPTOCENTRUS FILIFER (Cuvier and Valenciennes).

*Gobius filifer* CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 106. ("Mer des Indes.")

*Gobius knutteli* BLEEKER, Act. Soc. Sci. Indo-Nederl., III, Japan, p. 16, pl. 1, fig. 2, Nagasaki.—GÜNTHER, Cat. Fish., III, p. 73, Hongkong.

Head  $3\frac{3}{5}$  in length; depth  $5\frac{1}{2}$ ; depth of caudal peduncle  $2\frac{1}{3}$  in head; eye 5; snout  $4\frac{1}{2}$ ; maxillary  $1\frac{5}{6}$ ; D. VI-11; A. 10; P. 18; scales in lateral series about 95, in transverse series about 35.

Body deepest at insertion of spinous dorsal, from where it grows gradually smaller to the caudal peduncle. Head large; snout about equal to diameter of eye; blunt, rounded. Eyes small; not directed upward; interorbital space narrow; convex. Mouth large, oblique; jaws equal; lips thick; no barbels; maxillary entirely concealed; extending posteriorly far beyond eye to a point midway between tip of snout and posterior border of opercle. Teeth of jaws in broad bands; the outer row much enlarged and canine-like; curved backward; a large canine on each side of lower jaw; pharyngeal teeth bristle-like. Gill opening extending far forward below; the isthmus narrow, extending upward slightly above base of pectoral. Gill-rakers short, slender; 11 on lower limb of first arch; represented on upper limb of arch by 3 small papillae. Inner edge of shoulder girdle without papillae. Head naked; skin on interorbital area, snout, and suborbital loose, wrinkled and folded; body behind nape with minute cycloid scales, deeply embedded anteriorly, where their position is



indicated by shallow pits; larger and more evident posteriorly. Lateral line represented by a series of 15 or more vertical rows of minute pores, the rows separated by a space about equal to the diameter of eye.

Dorsals well separated; the spines, except the last, long and filamentous; when depressed reaching almost to base of last ray; soft dorsal low; posterior rays longest, their height about equal to depth of body. Anal inserted below third or fourth dorsal spine, the rays a little higher than those of dorsal; when depressed, extending as far posteriorly as do the dorsal, both fins reaching base of caudal. Caudal and pectorals sharply rounded posteriorly, the latter extending to a vertical through last dorsal spine; without filaments on its upper edge; ventrals reaching a vertical through insertion of second dorsal; free posteriorly.

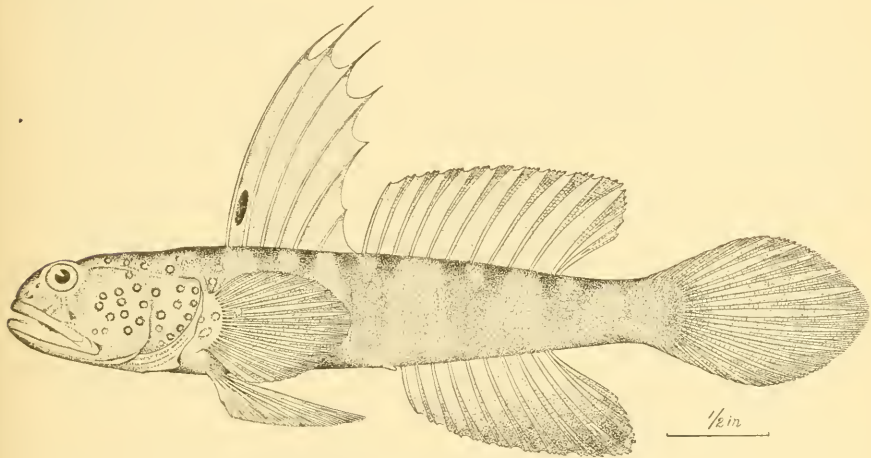


FIG. 12.—CRYPTOCENTRUS FILIFER.

In spirits the color is brown, a little darker above than below; sides with 5 broad, vertical brown bands, having narrow, indistinct ones between them, the second of the wide bands located below the space between dorsals, the last at base of caudal; head, except lower jaw, dark; cheeks and opercle with small, pearly white spots (bright blue in life), surrounded by narrow, brownish rings. Fins dusky; the first dorsal with an elongate black spot on lower part of membrane between first and second spines, the spot preceded and followed by a narrow strip of white; membranes of anal bluish white; interradial membranes of caudal bluish white, the upper half with elongate white (blue) spots; pectorals lighter than the other fins; two inner rays of ventrals darker than the outer ones.

Coasts of southern Japan and China; living near the surface in open water or about rocks; generally common. Here described from a specimen 95 millimeters long from Nagasaki. Our numerous speci-

mens are from Tokyo, Tsuruga, Wakanoura, Kobe, Onomichi, and Nagasaki.

(*Filum*, thread; *fero*, bear).

### 13. GLOSSOGOBIUS Gill.

*Glossogobius* GILL, Ann. N. Y. Lyc. N. H., VII, 1859, p. 46 (*Platz cephalus*).

From *Chenogobius*, with which genus the affinities are most close, *Glossogobius* differs mainly in the large size of the scales, which number about 31 in the lateral series.

This genus is less closely allied to *Utenogobius*, from which it differs in the larger mouth, the strongly projecting chin, the deeply emarginate tongue, and in the narrow isthmus, the gill openings being extended considerably farther forward than in *Utenogobius*. Head naked; depressed anteriorly. Teeth moderate, in broad bands; the inner teeth depressible; pseudobranchiæ well developed; no fleshy flaps on shoulder girdle; scales rather large, weakly etenoid; dorsal fins both short, the first of six slender spines.

Species few, one of them a large goby common in the streams of Japan.

( $\gamma\lambda\omega\delta\sigma\sigma\alpha$ , tongue; (*Gobius*.)

### 24. GLOSSOGOBIUS BRUNNEUS (Schlegel).

*Gobius brunneus* SCHLEGEL, Fauna Japonica, p. 142, 1847, pl. LXXIV, fig. 2, Nagasaki.—GÜNTHER, Cat. Fish., III, p. 65; after Schlegel.—ISHIKAWA, Cat. Fish., 1897, p. 39, Tokyo, Boshu.

*Gobius olivaceus* SCHLEGEL, Fauna Japonica, p. 143, 1847, pl. LXXIV, fig. 3, Nagasaki, on a drawing by Bürger.—BLEEKER, Verh. en Meded. cft. Natuurk., 1867, p. 245, Jedo.

Head  $3\frac{1}{5}$  in length; depth  $4\frac{1}{2}$ ; depth of caudal peduncle 3 in head; eye  $5\frac{1}{8}$ ; snout 3; maxillary  $2\frac{1}{8}$ ; D. VI-10; A. 9; P. 20; scales in lateral series 30, in transverse series 10.

Body thickest; cylindrical; caudal peduncle deep; somewhat compressed; dorsal contour considerably arched; its highest point near insertion of spinous dorsal. Head very large; broader than body but less deep; snout rather pointed; broadly rounded when viewed from above. Eye small; directed laterally; interorbital space flat; distance between eyes equal to their vertical diameter. Mouth oblique; maxillary concealed; extending to a vertical through middle of orbit; lips broad; lower jaw projecting beyond the upper. Teeth simple; in 2 series; the outer ones somewhat enlarged; in a single row near edge of jaw, the inner ones depressible; in a narrow band. Tongue broad; deeply notched. Gill openings running far forward below; width of isthmus about equal to space between eyes. Inner edge of shoulder girdle without papillæ. Gill rakers on first arch 3 + 10; very short and flat; reduced to mere elevations near ends of arch. Anterior nostril with a tube. Chin without barbels.

Head naked except on occiput. Body with large, finely ctenoid scales; those on nape and breast minute.

Dorsal fins separate; anterior spines highest; the second with a short, filamentous tip; the fin when depressed just reaching insertion of soft dorsal; dorsal rays a little shorter than the spines. Caudal rounded. Anal inserted below base of second or third dorsal rays; its posterior rays longest; reaching almost as far backward as do those of dorsal; both falling short of base of caudal. Pectoral rounded; the upper edge without free filaments. Ventrals free posteriorly, the disk very broad.

Upper parts dark; sides with 4 or 5 large dark spots. Dorsal fins with small dusky spots in more or less definite longitudinal rows, the spots on anterior part of spinous dorsal large and black. Pectorals and caudal with small dark spots arranged in vertical rows. Ventrals and anal edged with white.

Described from an individual from Wakanoura. Specimens from Onomichi are a little lighter in color. On the nape and along the back are scattered small spots of a deep brownish black. This large goby is common in the streams and estuaries of southern Japan. Our numerous specimens are from Hakodate, Onomichi, Kurume, Nagasaki, and Wakanoura. This species is closely related to the Chinese goby *Glossogobius giurii*.

(*Brunneus*, brown.)

Measurements of *Glossogobius brunneus*.

	Nagasaki, Hizen.		Wakanoura, Kii.	
Length expressed in millimeters	141	119	106	112
Depth expressed in hundredths of length	20	22	20	21
Depth of caudal peduncle	12	11 $\frac{1}{2}$	10 $\frac{1}{2}$	11
Length of head	29	30	30	32
Length of snout	10	10	9 $\frac{1}{2}$	10 $\frac{1}{2}$
Length of maxillary	13 $\frac{1}{2}$	13	13	14
Width of interorbital space	3 $\frac{1}{2}$	3 $\frac{1}{2}$	3	3 $\frac{1}{2}$
Diameter of orbit	5	5 $\frac{1}{2}$	5 $\frac{1}{2}$	6
Distance from snout to spinous dorsal	36	39	37 $\frac{1}{2}$	35
Distance from snout to soft dorsal	56 $\frac{1}{2}$	58	58	58 $\frac{1}{2}$
Height of longest dorsal spines	15 $\frac{1}{2}$	14	15	19
Height of longest dorsal rays	18 $\frac{1}{2}$	12 $\frac{1}{2}$	15	15
Distance from snout to anal fin	59 $\frac{1}{2}$	62 $\frac{1}{2}$	61	61 $\frac{1}{2}$
Height of longest anal rays	17	12	15	15 $\frac{1}{2}$
Length of caudal peduncle	24	23 $\frac{1}{2}$	25	23 $\frac{1}{2}$
Length of caudal fin	26	22 $\frac{1}{2}$	24 $\frac{1}{2}$	26
Length of pectoral fin	24	23	23	25
Length of ventral fin	20	19	20	20
Number of dorsal spines	6	6	6	6
Number of dorsal rays	10	10	10	10
Number of anal rays	9	9	9	9
Number of scales in lateral series	32	31	31	30
Number of scales in transverse series	10	10	11	10

14. CHÆNOGOBIUS Gill.

*Chaenogobius* GILL, Ann. Lyc. Nat. Hist. N. Y., 1859, p. 12 (*annularis*).

*Gymnogobius* GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 269 (*macrognathus*, based on specimens wrongly described as scaleless).

Body rather elongate; the head broad and depressed anteriorly; mouth large, oblique, the lower jaw projecting; teeth moderate, in

bands; tongue emarginate; sides of head naked; no barbels; eyes well separated; isthmus very narrow, the gill opening continued forward below. Scales very small, cycloid or weakly ctenoid; dorsal fins short, the first of 6 slender spines; ventrals moderate, not adnate; caudal short.

Gobies of moderate size abounding in the rivers of Japan. This genus differs from *Ctenogobius* in the large mouth, notched tongue, wide gill openings, and very small scales.

Not having seen the type of *Chænogobius*, we are not quite sure of its identity with *Gymnogobius*.

(χαίρω, yawn; *Gobius*.)

a. Dorsal rays VI-9; anal 9; scales small; ocellate spots about the vent.

*annularis*, 25.

ad. Dorsal rays VI-12; anal 12; scales 70; body and fins finely dotted, the caudal with zigzag vertical bands.....*macrognathos*, 26.

#### 25. CHÆNOGOBIUS ANNULARIS Gill.

*Chænogobius annularis* GILL, Ann. Lye. Nat. Hist. N. Y., 1859, p. 12, Hakodate.  
*Gobius annularis* GÜNTHER, Cat. Fish., III, p. 65; after Gill.

Head 4 in length; eye 4 in head; D. VI-9; A. 8.

Body cylindrical anteriorly; compressed posteriorly. Head broader than deep. Eye located anteriorly; 4 in head; directed obliquely. Interorbital space three-fifths diameter of eye. Mouth somewhat oblique; jaws equal. Scales small cycloid. Color brownish; dotted above with blackish; several ocellate spots about the vent; second dorsal with 3 bands. (Gill.)

Hakodate, island of Hokkaido. Not seen by us.

(*Annularis*, having rings.)

#### 26. CHÆNOGOBIUS MACROGNATHOS (Bleeker).

*Gobius macrognathos* BLEEKER, Act. Soc. Sci. Indo-Nederl., VI, Japan, p. 83, pl. I, fig. 1, Rivers of Jeddo near Tokyo.

*Gobiosoma macrognathos* GÜNTHER, Cat. Fish., III, 1861, p. 86, after Bleeker.

*Chænogobius macrognathos* JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Tokyo, Lake Biwa.

Head  $3\frac{2}{5}$  in length; depth  $4\frac{3}{5}$ ; depth of caudal peduncle  $2\frac{3}{5}$  in head; eye 6; snout 3; maxillary  $1\frac{1}{2}$ ; D. VI-12; A. 11; P. 20; scales in lateral series 70, in transverse series 20.

Body thickset, rather cylindrical anteriorly; caudal peduncle deep, compressed. Head broad, its dorsal contour concave in region of eyes; snout long, pointed. Eyes small, directed obliquely upward; space between eyes equal to  $1\frac{1}{2}$  times their diameter. Mouth very large, oblique; lips rather broad; lower jaw projecting beyond the upper. Maxillary exposed posteriorly, extending to a vertical through posterior edge of pupil, varying in length in different individuals.

Tongue broad, notched anteriorly. Teeth minute, simple, in narrow bands on both jaws; the outer ones but little enlarged. Gill openings large but not extending extremely far forward; the width of isthmus about equal to space between eyes. No papillæ on shoulder girdle. Gill-rakers on first arch 2+8; short; rather slender. Anterior nostril with a short tube. No barbels on lower jaw.

Head naked. Body with small cycloid or finely ctenoid scales, both kinds often occurring on the sides of the same individual; scales on nape and breast minute; those on belly small and easily displaced.

Dorsals separate; the spines lower than the rays; when depressed the first dorsal does not reach insertion of second. Anal inserted below base of third or fourth dorsal ray, extending when depressed a little farther posteriorly than does the dorsal, both falling considerably short of reaching base of caudal. Pectoral rather pointed, its upper edge without free filaments. Caudal rounded. Ventrals free posteriorly.

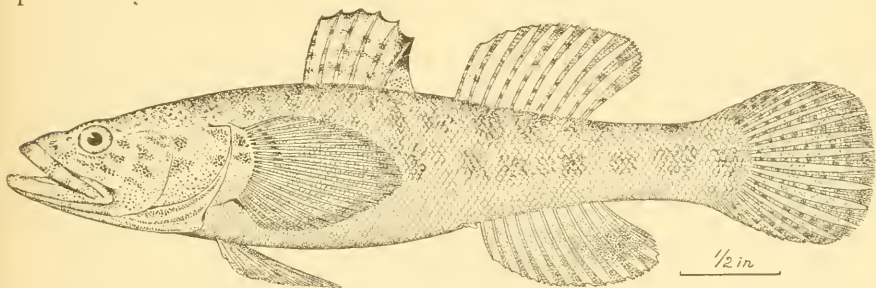


FIG. 13.—CTENOGOBIOUS MACROGNATHOS.

Sides mottled with brownish or dusky; a lateral row of about 9 indistinct large blotches present, the most posterior at base of caudal fin; head with mottlings and reticulations of dark color. Spinous dorsal with a dark blotch on its posterior upper part; fin with a very narrow dark edge, below which is a light band anteriorly; other parts of fin dusky; soft dorsal dusky, with small white spots; caudal with dark broad zigzag vertical bands; anal dusky; the soft dorsal, caudal, and anal conspicuously bordered with white; pectorals light; ventrals dusky.

Here described from a specimen collected near Tokyo by Professor Otaki.

The species is of wide distribution, living in rivers, and is but little less abundant than *Ctenogobius similis*. It is subject to considerable variation in shape of body, length of maxillary, and in color. Some specimens from Lake Biwa have the caudal peduncle narrower than have those from other localities. The length of the maxillary varies considerably with the sex, in the females being much shorter than in the males. Some are very light in color, but the pattern as described is

usually preserved. The darker ones may have either light or dark ventrals and anal, these fins in some cases being almost black.

Our specimens are from Fujiaki, Omi; Kurume; Aomori; Tokyo; Tsuruga; Chitose; Matsubara; Same; Gifu, Mino; Nagoya; Owari; Kawatama.

(μακρός, long; γνάθος, jaw.)

*Measurements of Chanogobius macrognathos.*

	Matsubara, Lake Biwa.		Fukabe River, Gifu, Mino.		Bay of Tokyo.	
Length in millimeters .....	87	77	72	65	89	82
Depth expressed in hundreds of length .....	24	21½	20	18	21½	21
Depth of caudal peduncle .....	11	11	12	12	10	12
Length of head .....	31	30	30	31½	30	30
Length of snout .....	10	9	9	9	10	10
Length of maxillary .....	13½	12½	13½	15½	15	15½
Width of interorbital space .....	5	5	5	5	5½	5
Diameter of orbit .....	5½	6½	6	6	5	5
Distance from snout to spinous dorsal .....	42½	41½	42	42	41	42½
Distance from snout to soft dorsal .....	63	62	62	62	62	62
Height of longest dorsal spines .....	13½	14	14	13	13	11½
Height of longest anal rays .....	14½	16	15½	15	15	14
Distance from snout to anal fin .....	67½	65	66	65	65	67
Height of longest anal rays .....	13	13	13½	14	13	12½
Length of caudal peduncle .....	20	22	19	20	21	21
Length of caudal fin .....	21½	21½	22	25	21	22
Length of pectoral fin .....	24	22	23	24	22	23
Length of ventral fin .....	18	17	18	19	17	18
Number of dorsal spines .....	6	6	6	6	6	6
Number of dorsal rays .....	11	11	12	11	11	12
Number of anal rays .....	11	11	11	12	11	11
Number of pectoral rays .....	18	18	18	18	18	19
Number of scales in lateral series .....	65	68	67	74	68	68
Number of scales in transverse series .....	22	22	21	21	22	22

	Fukabi, Gifu.				Matsubara, Lake Biwa.			
Length of body in millimeters .....	71½	73	71½	64	70	48	42½	42
Depth of caudal peduncle expressed in hundredths of length .....	12	11	12	12	11	11	11	11
Length of snout .....	10	9½	9½	10	10	8	10	9
Length of maxillary <i>a</i> .....	20	16	18	17½	17½	13	12	11
	Male.	Female.	Male.	Male.	Male.	?	Female.	Female.

*a* Measured from tip of snout to posterior end of maxillary.

	Lake Biwa.				Nagoya.			
Length of body .....	49	51	54	50	73	75	60	.....
Depth of caudal peduncle .....	8	8½	8	8½	10	12	10	.....
Length of snout .....	9½	9½	10	9	9½	8	10	.....
Length of maxillary .....	20	20	19	17	15½	14	18	.....
	Male.	Male.	Male.	Male.	Female.	Female.	Male.	.....

15. CHLOEA Jordan and Snyder.

*Chloea* JORDAN and SNYDER, new genus (*castanea*).

This genus is very close to *Chanogobius*, differing chiefly in the presence of 7 or 8 dorsal spines instead of 6. The isthmus is a little wider than in *Chanogobius*, and the head a little less depressed above. Salient characters of the two genera are the large oblique mouth,

prominent chin, notched tongue, moderate or short soft dorsal and anal, naked head, and the very small scales. No silky rays to the pectorals.

The species are small and speckled in coloration, abounding on the sandy shores of Japan, especially to the northward.

Named for Mrs. Chloe Lesley Starks, artist and naturalist.

- a.* Head large,  $2\frac{2}{3}$  in length, rather pointed and not 4-angled in section; depth  $4\frac{1}{4}$  in length; scales 67-19; dorsal rays VII-11; body and fins finely mottled or dotted ..... *castanea*. 27
- aa.* Head shorter,  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in length, somewhat 4-angled in section; depth about 6 in length.
- b.* Dorsal rays VII-11; scales 72-20 ..... *laris*. 28
- bb.* Dorsal rays VII-13.
- c.* Scales 90-26 ..... *mororana*. 29
- cc.* Scales 70-20 ..... *stretchymis*. 30

### 27. CHLOEA CASTANEA (O'Shaughnessy).

*Gobio castaneus* O'SHAUGHNESSY, Ann. Mag. Nat. Hist., XV, 1875, p. 145, Nagasaki.

Head  $2\frac{2}{3}$  in length; depth  $4\frac{1}{4}$ ; depth of caudal peduncle  $2\frac{1}{5}$  in head; diameter of eye 4; length of maxillary  $2\frac{1}{5}$ ; D. VII-11; A. 11; P. 18; scales in lateral series 67, in transverse series 19.

Body robust, almost cylindrical; caudal peduncle narrow, somewhat compressed. Head rather pointed, deeper than wide. Eye of medium size, directed almost laterally, the upper edge projecting slightly above the dorsal outline of head; width of space between eyes equal to about half their diameter. Mouth oblique, lower jaw projecting somewhat beyond the upper. Maxillary exposed at its posterior end only, reaching a vertical between anterior edge of orbit and pupil. Teeth villiform, in narrow bands on both jaws, the outer ones of lower jaw slightly enlarged. Tongue notched anteriorly. Gill opening not extending far forward; the isthmus wide. Gill-rakers on first arch 2 + 11; rather thick set. Pseudobranchiae large. No papillae on shoulder girdle.

Head naked except on occiput, where there are minute scales. Body covered with small, finely ctenoid scales, except on breast, which is naked; scales on median line of belly easily displaced.

Dorsal fins separate, the spines almost as high as the rays. Anal inserted below base of second or third dorsal rays; the rays equal in height to the dorsal spines, the depressed fin reaching a little farther posteriorly than does the dorsal, both falling considerably short of base of caudal. Caudal round; pectoral without filaments on upper edge; round posteriorly. Ventrals rather short and broad.

Color in spirits yellowish, tinged with olive; upper parts having narrow dusky bands with a reticulate arrangement. Dorsal fins with small dusky spots on spines and rays in diagonal rows. Caudal with faint dusky spots. Other fins with a little dusky.

Described from a specimen taken at Tsuruga, Echizen. Other specimens are from Nagasaki, Misaki, Matsushima, Aomori, Tsuruga, Niigata. The species is common in sandy bays.

(*Castaneus*, chestnut).

Measurements of *Chloea castanea*.

	Tsuruga, Echizen.					Nagasaki, Hizen.			
	56	56	55	51	56	46	44	40	40
Length in millimeters.....	56	56	55	51	56	46	44	40	40
Depth expressed in hundredths of length.....	22	20	21	21	19	19	19	17	21
Depth of caudal peduncle.....	10	8½	9	9½	9	10	10	9	10
Length of head.....	27	26½	27	28	25	27	29	28	29
Length of snout.....	7	7	8	8	8	7½	8	7½	8
Length of maxillary.....	11½	10	11	12	10	10	12	10	10½
Width of interorbital space.....	2	2½	3	3	3	3½	3½	3	3
Diameter of orbit.....	7	6	6	7	6	6	8	7	7
Distance from snout to spinous dorsal.....	38	37	37	38	36	38	37½	38	38
Distance from snout to soft dorsal.....	58	58	57	56	56	57	58	57	56
Height of longest dorsal spines.....	13	13	14	14	10	12	13	13	15
Height of longest dorsal rays.....	14	15	15	15	13	14	12½	16	15
Distance from snout to anal fin.....	63	61	64	61	63	61	62	60	59
Height of longest anal rays.....	13	13	14	13	12	11½	12	13	13
Length of caudal peduncle.....	22	24	24	23	23	24	23½	23	25
Length of caudal fin.....	21	22	22	23	20	19	18	20	21½
Length of pectoral fin.....	21	20	19	23	20	18	21	20	19
Length of ventral fin.....	20	20	22	23	20	19	20	22	19
Number of dorsal spines.....	7	7	7	7	7	7	7	7	6
Number of dorsal rays.....	11	11	11	11	11	11	11	11	11
Number of anal rays.....	11	11	10	11	11	11	11	10	10
Number of pectoral rays.....	18	17	17	18	18	18	19	18	19
Number of scales in lateral series.....	67	70	68	65	69	63	63	64	65
Number of scales in transverse series..	19	20	19	20	19	18	18	18	18

28. *CHLOEA LÆVIS* Steindachner.

*Gobius laevis* STEINDACHNER, Ichth. Beitr. VIII, 1879, p. 20, Hakodate.

Head  $3\frac{1}{3}$ ; depth 6; D. VII-1. 11; A. I, 11; P. 21. Eye 6 in head; snout  $3\frac{3}{5}$ ; scales 70 to 75-20.

Body compressed. Head four-angled in section, flat above; a streak of scales on middle of nape; sides of head naked. Mouth large, rising vertically; end of maxillary a little behind middle of eye. Teeth numerous, small; no canines; tongue emarginate. Scales cycloid; small. First dorsal weakly convex, the fifth spine longest; second dorsal scarcely higher; pectoral long, about as long as caudal without silky rays. Clear brown, with many dark specks. A dusky spot at base of caudal; fins all translucent, with thick-sown points, especially the ventrals which are dusky in the males. Second dorsal and caudal with regular cross-bands; tip of first dorsal dusky. Length 80 mm. (Steindachner.)

Hakodate, not seen by us.

(*Lævis*, smooth.)

29. *CHLOEA MORORANA* Jordan and Snyder, new species.

Head  $3\frac{3}{4}$  in length; depth  $6\frac{1}{4}$ ; depth of caudal peduncle  $3\frac{1}{2}$  in head; eye  $5\frac{1}{8}$ ; snout  $3\frac{1}{3}$ ; maxillary  $1\frac{2}{3}$ ; D. VII-13; A. 12; P. 20; scales in lateral series 90, in transverse series 26.



Body moderately compressed, sloping considerably from the deepest part to caudal peduncle. Head as wide as body but much less deep, rather long, pointed. Eyes placed high, the upper margin projecting slightly above head, directed laterally; interorbital area flat; distance between eyes about equal to their diameter. Mouth extremely large; oblique, the cleft curving upward in front. Maxillary notably long extending beyond eye a distance equal to the eye's diameter. Lower jaw projecting beyond the upper. Teeth villiform, in narrow bands on both jaws, the outer ones slightly enlarged; no canines. Tongue deeply notched. Gill opening extending forward a short distance; width of isthmus equal to diameter of eye. Inner edge of shoulder girdle without papillæ. Gill-rakers very long and slender, 5 + 19 on first arch. Anterior nostril with a tube. No barbels on head.

Head naked; body with very small cycloid scales; nape with a naked space running from insertion of dorsal to occiput, the scales extending forward along the sides; breast and median part of belly naked.

Dorsals separate, the spines slender, when depressed not reaching insertion of soft dorsal; soft dorsal somewhat higher anteriorly, when

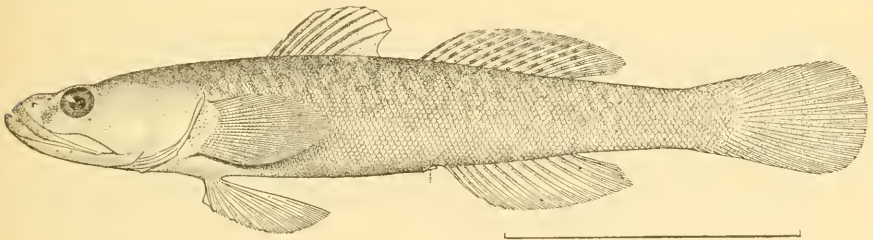


FIG. 14.—*CHLOEA MORORANA*.

depressed, the rays fall far short of reaching the caudal. Anal inserted below base of third or fourth dorsal ray, extending a little farther posteriorly than does the dorsal. Caudal bluntly rounded. Pectoral acutely rounded; the upper edge without free filaments. Ventrals large, almost as long or longer than pectorals, free posteriorly.

Color in spirits light yellowish olive, finely dotted with black; the dots gathered in clouds and reticulations on the upper parts; snout and lower jaw rather darker than other parts of head. Spinous dorsal dusky at base, growing lighter toward the margin; soft dorsal with dusky spots arranged in oblique rows; caudal dusky, with very indistinct spots in transverse rows. Pectorals and anal with a little dusky.

The species is represented by several specimens from Mororan, Hokkaido. The type is No. 6452, Leland Stanford Junior University Museum. Locality, Mororan, Hokkaido. We also have two examples from Tokyo which are slightly darker in color; the spinous dorsal has a blackish blotch on its posterior part. The species is not rare

about rocks and in rock pools to the northward. Our specimens are from Mororan, Tokyo, and Matsushima Bay.

(*Mororan*, iris-huts; a town on Volcano Bay where the species was first taken.)

*Measurements of Chloea mororana.*

Length in millimeters.....	70	62	59
Depth expressed in hundredths of length.....	19	16	18
Depth of caudal peduncle.....	8	8	9
Length of head.....	26½	27	27
Length of snout.....	8	8	8
Width of interorbital space.....	3½	3	3
Diameter of orbit.....	5	5½	5
Distance from snout to spinous dorsal.....	36	36½	37
Distance from snout to soft dorsal.....	55	57	57
Height of longest dorsal spines.....	12½	11	11
Height of longest dorsal rays.....	12	12	11
Distance from snout to anal fin.....	61	59	61
Height of longest anal rays.....	11½	11	12
Length of caudal peduncle.....	21	21	20
Length of caudal fin.....	20	20	20
Length of pectoral fin.....	18	18	18
Length of ventral fin.....	19	17	16
Number of dorsal spines.....	9	7	7
Number of dorsal rays.....	14	13	11
Number of anal rays.....	11	13	11
Number of scales in lateral series.....	90	91	95
Number of scales in transverse series.....	26	27	26
Locality, Mororan.			

Number of dorsal spines.....	7	7	8	7	8	8	8
Number of dorsal rays.....	14	14	14	13	13	13	14
Number of anal rays.....	14	14	14	12	13	13	14

30. *CHLOEA SARCHYNNIS* Jordan and Snyder, new species.

Head  $3\frac{2}{3}$  in length; depth  $5\frac{1}{2}$ ; depth of caudal peduncle 3 in head; eye 4; snout  $3\frac{1}{3}$ ; maxillary  $1\frac{1}{2}$ ; D. VII-13; A. 13; P. 20; scales in lateral series 70, in transverse series 20.

Body rather elongate, somewhat compressed. Head long, sharp. Eyes directed laterally, the space between them about equal to their diameter. Snout a little longer than eye. Mouth large, oblique; lower jaw projecting beyond the upper. Maxillary very long, extending beyond posterior border of eye and considerably farther than cleft of mouth, its posterior third being free. Teeth simple, very small, slender; in narrow bands on both jaws. Tongue very deeply cleft. Vomer with 2 conspicuous pads projecting downward, each apposed to a lobe of the tongue. Gill openings extending moderately far forward; the width of isthmus about equal to length of snout. No papille on inner edge of shoulder girdle. Gill-rakers on first arch 6 + 14, long and very slender. Head without barbels.

Head naked; body covered with small, finely ctenoid scales, except on breast and nape; the naked space on nape not quite reaching insertion of spinous dorsal.

Dorsals widely separated, the spines short and slender, the rays a little longer than spines; when depressed the fin falls far short of reaching caudal. Anal inserted below base of second dorsal ray; when

depressed it extends slightly farther backward than does the dorsal. Caudal obtusely rounded or truncate behind. Pectorals pointed; the upper edge without filamentous appendages. Ventrals free posteriorly.

Sides with a row of 15 or more small dusky spots, some of which are joined together; upper parts with dusky reticulations; a band extending forward from eye; snout dusky. Spinous dorsal with a small dark spot on its posterior part; soft dorsal with small dusky spots arranged in 2 horizontal rows; anal with just a trace of dark color; lower half of caudal dusky; pectorals and ventrals without dark color.

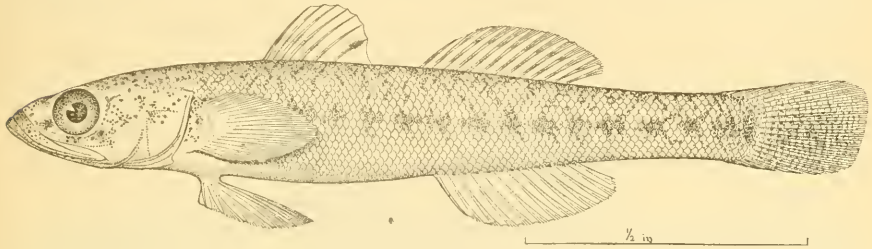


FIG. 15.—*CHLOEA SARCHYNNIS*.

Type No. 6463, Leland Stanford Junior University Museum. Locality, Wakanoura. We have 7 small specimens only, all from the type locality.

The species closely resembles *Chloea mororana*. It has larger scales and is differently colored. The latter species has not the vomerine pads described above, although some specimens show elevations on each side of the vomer.

(σάρξ, flesh; ὄνυξ, vomer.)

Measurements of *Chloea sarchynnus*.

Length expressed in millimeters .....	33	32	31
Depth expressed in hundredths of length .....	17	17	16
Depth of caudal peduncle .....	9	9	8
Length of head .....	28	26	25
Length of snout .....	8	7	7
Length of maxillary .....	15	15	16
Width of interorbital space .....	1	4	1
Diameter of orbit .....	6	7	7
Distance from snout to spinous dorsal .....	35	35	35
Distance from snout to soft dorsal .....	57	56	56
Height of longest dorsal spines .....	12	10	12
Height of longest dorsal rays .....	12	12	14
Distance from snout to anal fin .....	57	55	57
Height of longest anal rays .....	12	7	12
Length of caudal peduncle .....	21	22	23
Length of caudal fin .....	19	18	20
Length of pectoral fin .....	19	18	16
Length of ventral fin .....	16	15	15
Number of dorsal spines .....	7	7	7
Number of dorsal rays .....	13	13	13
Number of anal rays .....	13	13	13
Number of scales in lateral series .....	70	64	70
Number of scales in transverse series .....	20	20	20

## 16. CHASMIAS Jordan and Snyder.

*Chasmias* JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 761  
(*misakius*).

Body moderately elongate, covered with very small, cycloid scales; head broad, flattish above, wide between the eyes, the cheeks without scales; mouth very large, horizontal, the lower jaw included; teeth in moderate bands; maxillary much produced backward; tongue broad, rounded; isthmus very broad, the gill openings restricted to the sides. Shoulder girdle without fleshy flaps; no barbels. Dorsal fins short, the first of 6 low, flexible spines; caudal rounded; pectorals with free silky tips above; no filamentous rays on dorsal; ventrals short and broad.

This genus is near to *Platygobius* Bleeker (*macrorhynchus*), differing at least in the small, smooth scales and in the narrow gill openings.

(*χασμάω*, to yawn, from the large mouth.)

- a.* Vertical fins distinctly spotted or checkered with black; scales moderate, about 60-20; depth 6 in length; a black caudal spot ..... *dolichognathus*. 31.  
*aa.* Vertical fins dusky, nearly plain or dotted with white, and with a broad whitish margin; scales minute, about 90-30; depth  $4\frac{3}{4}$  in length; a black caudal spot ..... *misakius*. 32.

## 31. CHASMIAS DOLICHOGNATHUS (Hilgendorf).

*Gobius dolichognathus* HILGENDORF, Sitzber. Naturf. Freunde, 1878, p. 108, Tokyo; Mus. Berl., Nos. 1065, 10654.

Head  $3\frac{2}{3}$  in length; depth 6; depth of caudal peduncle  $2\frac{2}{3}$  in head; eye  $5\frac{1}{2}$ ; snout 3; maxillary  $1\frac{3}{4}$ ; D. VI-11; A. 10; P. 20; scales in lateral series 58, in transverse series 19.

Body about like that of *C. misakius*; the head somewhat smaller, the space between the eyes narrower, and the snout shorter and more rounded. Eyes small; not directed upward; interorbital space wide, the distance between the eyes a little less than length of snout. Mouth nearly horizontal, very large; the maxillary extending to a vertical through a point posterior to the hinder margin of the eye, a distance equal to one-half the diameter of eye. Lower jaw included by the upper. Lips rather thick and pendulous. A fleshy flap before and below the eye hanging down over the lip. Teeth in narrow bands near middle of jaws, the posterior half of each side of jaw being naked; teeth villiform; those of upper jaw with a somewhat enlarged outer series; pharyngeal teeth above and below stiff, bristle-like. Gill openings extending but little forward of the base of pectorals, the isthmus wide. Gill-rakers on first arch 3 + 8, minute, slender. No papillæ on inner edge of shoulder girdle.

Head naked; skin but little wrinkled or folded; pores on head similar to those of *C. misakius*. Anterior nostrils with tubes. Scales

on body small and weak, cycloid. A suggestion of a lateral line similar to that of *C. misakius* is present.

Fins like those of *C. misakius*; the upper edge of pectoral with thread-like appendages.

Sides with distinct, elongate, light color patches which extend upward and downward from a horizontal somewhat above the median part of body; of those below, the first spot is immediately behind the base of pectoral; above this a very indistinct light band passes over the body behind the occiput; the second has a fellow above, which unites with one on the opposite side at insertion of spinous dorsal; the third has 2 bands above it, the posterior of which passes over the body at insertion of soft dorsal; others with corresponding spots above, the last 2 uniting to form 1 band. Sides also with scattered small

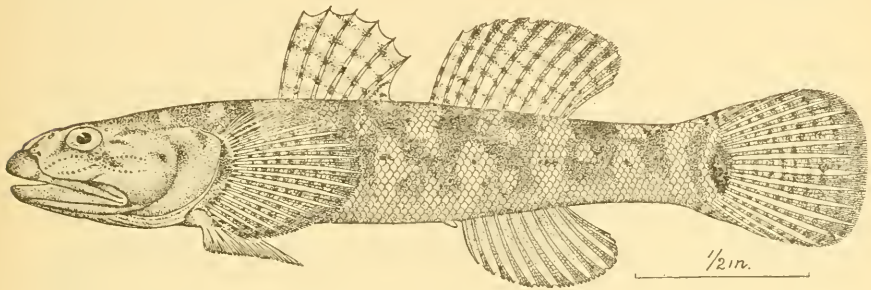


FIG. 16.—CHASMIAS DOLICHOGNATHUS.

light spots, and with black dots, some of which are on the light areas. A large black spot at base of caudal. Head above with indistinct dark dots and bars, the latter extending backward from the eye; ventral parts of head with minute spots of dead white. Pectorals, dorsal and caudal fins with small dark spots arranged in lines, transversely on pectoral and caudal, longitudinally on spinous dorsal, and obliquely on soft dorsal. Anal dusky. Ventrals without dark color.

Described from a specimen collected at Misaki. The species is very abundant along the beaches and among the rocks between tide marks from Hakodate to Nagasaki, being in many places the most abundant species. It was taken by us at Misaki, Wakanoura, Nagasaki, Tsuruga, Matsushima, Enoshima, Hakodate, and Same.

(*δολιχός*, long; *γνάθος*, jaw.)

Measurements of *Chasmias dolichognathus*.

Length in millimeters .....	53	46	51	58	46	48	43	36	36	36
Depth expressed in hundredths of length.	16	17½	18	19	22	19	17	19	18	18
Depth of caudal peduncle .....	10	11	11½	11	11	12	10	13	11½	12
Length of head .....	29	31	30	29	30	30	31	32	31	31
Length of snout .....	9½	10	10	10	11½	9	10	10	10	10
Width of interorbital space .....	3	4	4	3½	3½	4	4	3½	4	4
Diameter of orbit .....	5	6	5	5	6	6	6	7	9	7
Distance from snout to spinous dorsal .....	40	41	41	41	43	42	42	42	42½	41
Distance from snout to soft dorsal .....	60	59*	60	60	60	60	60	60	60	61
Height of longest dorsal spines .....	13½	13½	11	12	14	14	14	13	13	14
Height of longest dorsal rays .....	14	15	13	14	17	11	15½	16	14	15
Distance from snout to anal fin .....	63	62	64	64	62	65	63	62	60	59
Height of longest anal rays .....	11½	13	13	12	14	13	14	15	14½	14
Length of caudal peduncle .....	22	22	21	24	24	21	24	25	24½	25
Length of caudal fin .....	22	23	22	21	24	22	25	24	22	23
Length of pectoral fin .....	19	22	21	20	22	22	23	22	21	22
Length of ventral fin .....	12½	12	12½	11	12	10	12	14	13	14
Number of dorsal spines .....	6	6	6	6	6	6	7	6	6	6
Number of dorsal rays .....	11	11	11	11	11	11	10	11	11	11
Number of anal rays .....	10	10	10	10	9	10	10	10	10	10
Number of pectoral rays .....	20	20	20	19	20	20	20	19	20	21
Number of scales in lateral series .....	58	68	56	59	62	59	65	60	56	56
Number of scales in transverse series .....	19	19	18	17	18	18	17	19	17	17

## 32. CHASMIAS MISAKIUS Jordan and Snyder.

*Chasmias misakius* JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 761, pl. xxxvi, Misaki, Tsushima, Nagasaki.

Head  $3\frac{1}{2}$  in body; depth  $4\frac{2}{3}$ ; depth of caudal peduncle  $2\frac{1}{3}$  in head; length of snout  $2\frac{2}{3}$ ; maxillary  $1\frac{2}{3}$ ; D. VI-11; A. 10; P. 21; scales in lateral series 89, in transverse series 28.

Body thickset, the caudal peduncle deep; head very broad, depressed, wider posteriorly than the body; snout, viewed from above, broadly rounded. Eyes small, directed obliquely; interorbital space markedly wide, the distance between the eyes equal to the length of the snout. Mouth extremely large, horizontal; lower jaw included by the upper, the wide upper lips hanging down over the lower; upper lip with a fringed interior border next the teeth. Maxillary extending posteriorly to a vertical through a point midway between eye and edge of opercular flap; covered for the greater part of the length. Tongue very broad, slightly notched. Teeth villiform, none of them enlarged, in bands which extend backward a little less than half the length of mouth; pharyngeal teeth bristle-like. Gill opening not large; the lower edge an eye's diameter below base of pectoral; the width of isthmus slightly greater than depth of caudal peduncle. Gill-rakers on first arch  $3 + 10$ , short and slender, the length of longest less than diameter of pupil. No protuberances on inner edge of shoulder girdle. Lower jaw without barbels. Anterior nostril with a conspicuous short tube, widened at its opening.

Head naked; the skin thick, not much wrinkled nor folded; preorbital with a fleshy flap which extends forward and downward below nostrils. A conspicuous line of pores extends from a point above and posterior to the nostrils forward and then downward along upper edge of preorbital flap, where it divides, one branch running backward below the eye and curving upward behind it, the other backward toward the

middle of cheek. A similar line of pores lies on either side of lower jaw, between the folds of skin. A large pore on interorbital space between posterior parts of eyes. Body with small, thin, cycloid scales, which are more or less deeply embedded in the skin. Anteriorly the scales are closely crowded and somewhat irregularly placed; on the breast and belly they are minute and almost hidden beneath the skin.

Dorsal fins well separated; height of longest spines about equal to length of snout; posterior spine connected with the back by a large triangular membrane; rays somewhat higher than the spines, the longest about equal to depth of caudal peduncle; no membrane connecting posterior ray with the back. Anal equal in height to spinous dorsal; when depressed the anal and dorsal extend an equal distance posteriorly, both falling short of bases of first caudal rays a distance equal to one-half the depth of caudal peduncle. Caudal rounded. Pectoral rounded; its upper edge with a fringe of 14 or 15 thread-like filaments, of which each ray except the uppermost contributes 2. Ventrals short, free from body posteriorly; the membrane connecting the spines fleshy, elevated; its height equal to diameter of eye, its edge concave.

Color in spirits dark above, the throat and belly light; head with indistinct dots above, and scarcely discernible bars on cheeks; sides of body with irregularly shaped small white spots, in which a transverse arrangement is suggested. Dorsal, anal, and caudal fins edged with white, the white of caudal forming a distinct band; membranes of fins with indefinite light spots; first dorsal with a large, round, white spot just behind last spine, where the membrane is black; caudal with a large black blotch at its base, followed by a transverse row of small white spots, 1 on each ray. Pectorals and ventrals without spots except at the base of the former.

Length of the type 100 mm.

Smaller specimens have the spots on top of head and the bars or spots on cheeks distinct; anterior parts of body with small dark spots; sides with 8 or 9 transverse, light-colored bands with small light blotches between them, in some cases the bands being broken up into elongate blotches. The dark caudal spot and the white terminal band are very distinct.

On the smaller specimens a lateral line is suggested by a row of 29 groups of minute papillæ extending along the middle of the sides. Each group has 5 or 6 papillæ in 1, or occasionally 2, vertical rows, which are a little less than the width of a scale in length. A mere trace of the lateral line is seen on large specimens.

A specimen from Tsushima appears to have no light spots on the sides. The dark spot at base of caudal is scarcely perceptible.

Type No. 6484, Leland Stanford Junior University Museum.

This species very closely resembles *P. dolichocephalus*. It differs from it in coloration, not having very distinct, narrow, wavy, dark

bands on pectorals, dorsals, and caudal; in having a terminal band of white on the caudal, a sharper snout, and much smaller scales.

It is very abundant about the rocky headlands of Japan, especially about Misaki. Our specimens are from Misaki, Nagasaki, Enoshima, Tsushima, and Hakodate.

(*Mi*, red; *saki*, point; name of a very fine collecting ground on which the investigation station of the Imperial University of Tokyo is situated.)

### 17. PTEROGOBIOUS Gill.

*Pterogobius* GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 266 (*virgo*).

Body moderately elongate, somewhat compressed, covered with very small cycloid or finely ctenoid scales; head not depressed, rounded in profile, broad between the eyes, the cheeks with a patch of small scales above or wholly naked; mouth moderate, terminal, oblique, the lower jaw more or less prominent; tongue rounded, scarcely or not at all notched at tip; teeth moderate, the outer enlarged; gill openings moderate, separated by a rather broad isthmus. No barbels. First dorsal of about 8 slender spines, sometimes produced in the male; soft dorsal and anal very long, of 20 to 30 very slender, close-set rays; caudal fin moderate; pectoral fin of slender rays, the upper silk-like, with free tips. Ventrals well developed, not adnate to the belly.

Gobies of rather large size and striking coloration, the most brilliant members of the family, found about the rocks in clear water on the shores of Japan and Korea.

(πτερόν, fin; *Gobius*, from the long fins.)

- a. Body without vertical bands; its color stripes of orange and dark blue running horizontally; fins washed with orange and dark blue; D. VIII-28; A. 27; scales 133.....*virgo*. 33
- aa. Body with vertical bands, light or dark, and no horizontal stripes.
- b. Body with black cross-bands on a background of clear brown.
- c. Eye with a dark cross-band; bands on body sharply defined and edged with paler. Dorsal rays VIII-22; scales 78.
- d. Caudal fin with a black cross-band at its base; dark rings on body bordered with yellow.....*clapoides*. 34.
- dd. Caudal fin without dark cross-band at base; dark rings on body edged with pale.....*daimio*. 35.
- cc. Eye without dark cross-band; bands on body broad, diffuse, not edged with pale. Dorsal VIII-26; scales 96.....*zacalles*. 36.
- bb. Body with very faint, pale cross-bands on a ground color of light olive. Dorsal VIII-20; scales 66.....*zonoleucus*. 37.

### 33. PTEROGOBIOUS VIRGO (Schlegel).

*Gobius virgo* SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 143, pl. LXXIV, fig. 4, Nagasaki.—GÜNTHER, Cat. Fish., III, 1861, p. 79; after Schlegel.

Head 4 in length; depth  $6\frac{1}{2}$ ; depth of caudal peduncle 10; eye 6 in head; snout  $2\frac{5}{6}$ ; maxillary  $2\frac{5}{6}$ ; D. VIII-28; A. 27; P. 22; scales in lateral series 133, in transverse series 41.



Shape of head and body similar to that of *P. daimio*. Eyes of moderate size, directed laterally; interorbital space concave, the distance between the eyes equal to  $1\frac{1}{2}$  times their longitudinal diameter. Maxillary concealed, extending to a vertical between anterior edge of orbit and pupil; mouth oblique. Teeth simple, slightly curved, in 2 or 3 rows on each jaw, the outer row slightly enlarged; no canines. Tongue broad, its edge slightly concave. Gill-rakers on first arch  $4+10$ , slender, about equal in length to diameter of pupil. No papillae on inner edge of shoulder girdle. No barbels on chin. Nostrils without tubes or evident rims.

Head with minute scales on occiput and on upper part of opercle and preopercle, those on occiput not extending forward to edge of orbit. Other parts of head naked. Body covered with small, finely ctenoid scales; those on under parts and on upper posterior region cycloid.

Dorsals separate. Spinous dorsal, when depressed, reaching a short distance beyond insertion of soft dorsal. Anal inserted below third or fourth dorsal ray, extending posteriorly an equal distance with the dorsal, both fins reaching base of caudal. Caudal rounded. Pectoral with a few short filaments on upper border. Ventrals rather long, free posteriorly.

Color in alcohol light olive; 2 narrow, parallel, dark, lateral bars, the lower of which is on median part of body, extending from tip of snout to caudal; a third line on cheeks parallel to the others. Fins dusky, the dorsals bordered with white, below which is a dark band; margins of anal and caudal broadly suffused with black; pectorals and ventrals dusky.

Color in life light grayish olive, somewhat greenish on the back; a lateral band of bright orange bordered above and below by sky blue, the lower border tinged with violet ventrally; sides of head orange, the blue bands of body extending in wavy or broken lines, growing brighter in color, to end of snout; a violet-blue band on cheeks extending backward from mouth; a blue spot above each eye; forehead and lips dusky; under part of head tinged with violet. Dorsal fins olive, bordered below with orange, above with a narrow band of sky blue; the dorsal edges of fins orange; a blackish blotch on anterior part of spinous dorsal; caudal olive, broadly margined with violet, the edges black; bands of body extending on basal third of fin; anal with a broad violet band and a dark margin. Pectoral and ventral olive gray, slightly shaded with dusky.

The specimens of which this description was written were collected in the inland sea of Japan, at Miyajima, in the province of Aki. Other specimens were taken at Uraga. The species reaches the length of 150 to 200 millimeters. It is taken rather rarely in clear water about rocks in the sea, and is one of the most brilliantly colored of Japanese fishes. It is known as *Beruhazi* or Labroid goby.

It may be known from the other species of the genus by the absence of vertical color bands on the body, its bright stripes running horizontally.

(*Virgo*, a virgin, in allusion to the gay coloration.)

*Measurements of Pterogobius virgo.*

Length in millimeters .....	166	158	141
Depth expressed in hundredths of length .....	16	15½	17
Depth of caudal peduncle .....	10	10	10
Length of head .....	25	24	24
Length of snout .....	9	8½	9½
Width of interorbital space .....	5	5	5
Diameter of orbit .....	4½	4½	5
Distance from snout to spinous dorsal .....	31	30	30
Distance from snout to soft dorsal .....	51	51	52
Height of longest dorsal spines .....	11	11	11
Height of longest dorsal rays .....	9½	10	10
Distance from snout to anal fin .....	56	56	55
Height of longest anal rays .....	9½	10	10
Length of caudal peduncle .....	11½	11½	11
Length of caudal fin .....	20	21	21
Length of pectoral fin .....	20	20	21
Length of ventral fin .....	15	14	14
Number of dorsal spines .....	8	8	8
Number of dorsal rays .....	28	26	27
Number of anal rays .....	27	27	27
Number of pectoral rays .....	22	22	23
Number of scales in lateral series .....	133	130	136
Number of scales in transverse series .....	41	40	39

34. PTEROGOBIUS ELAPOIDES (Günther).

*Gobius elapoides* GÜNTHER, Proc. Zool. Soc. London, 1871, p. 665, pl. LXIII, fig.

D. Locality unknown, supposed to be from Japan. Coll. A. Adams.

*Pterogobius elapoides* is very closely related to *P. daimio*. We have been able to find no striking difference between the two except in color. The former is lighter, the ground shades pinkish-brown and the dark cross-bands dark brown instead of deep brownish black, as in the latter. The bands are narrower in *P. elapoides*, and there is, in addition to those on the body, alike in the two species, a distinct vertical band on base of caudal. This band on the caudal serves to distinguish the species at a glance.

In life the dark rings of the body are bordered by narrow bands of bright lemon yellow. The dorsal and caudal fins are dull, brick red.

The range of the species is evidently farther to the northward than that of *Pterogobius daimio*, both species living in clear water about rocks in the open sea.

In the original description by Dr. Günther the habitat of this species was doubtfully assigned to the seas of Japan. We obtained many specimens at Aomori, at Hakodate, from Matsushima Bay, and from Utatsu in Noto. P. L. Jouy collected numerous individuals at Fusan, Korea.

(*Elaps*, the coral snake;  $\epsilon\lambda\delta\omicron\varsigma$ , likeness, from the resemblance of the cross-bands.)

*Measurements of Pterogobius daimioides.*

	Hakodate, Hokkaido.		Fusan, Korea.		
Length in millimeters.....	78	62	73	62	68
Depth expressed in hundredths of length.....	22	22	21	20	22
Depth of caudal peduncle.....	12	11	12	12	12
Length of head.....	26	26	27	26	27
Length of snout.....	9	9	9	8	8
Width of interorbital space.....	5	5	5½	6	6
Diameter of orbit.....	5½	6	5	6	6
Distance from snout to spinous dorsal.....	35	36	31	35	31
Distance from snout to soft dorsal.....	52	52	52	53	53
Height of longest dorsal spines.....	21	18	19	23	21
Height of longest dorsal rays.....	13	11	14	14	13
Distance from snout to anal fin.....	58	58	57	58	57
Height of longest anal rays.....	12	12	12½	15	13
Length of caudal peduncle.....	17	18	15	17	17
Length of caudal fin.....	21	21	23	23	22
Length of pectoral fin.....	19	22	21	21	22
Length of ventral fin.....	12½	12	12½	11	14
Number of dorsal spines.....	8	8	8	8	8
Number of dorsal rays.....	21	21	21	21	20
Number of anal rays.....	20	20	21	19	20
Number of pectoral rays.....	21	20	19	19	20
Number of scales in lateral series.....	83	88	90	91	83
Number of scales in transverse series.....	27	27	31	31	32

## 35. PTEROGOBIUS DAIMIO Jordan and Snyder, new species.

Head  $3\frac{5}{8}$  in length; depth  $4\frac{5}{8}$ ; depth of caudal puncle  $2\frac{1}{8}$  in head; eye  $1\frac{1}{2}$ ; snout 3; maxillary  $2\frac{2}{5}$ ; D. VIII-22; A. 22; P. 23; scales in lateral series 78, in transverse series 27.

Body cylindrical, compressed posteriorly, the dorsal and ventral contours sloping but little to caudal peduncle; depth and width of head equal. Snout bluntly rounded. Eyes rather large, directed laterally; the dorsal rim projecting slightly, making the interorbital space somewhat concave. Mouth oblique; jaws equal, maxillary extending to a perpendicular through anterior edge of pupil; lips thin. Teeth in 2 series, slender and sharp, the inner ones minute, in a narrow band; outer ones much stronger, those of upper row growing successively smaller from before backward, the lower ones becoming larger laterally to the fang-like ones on sides of jaw, then abruptly smaller. Gill opening not extending far forward below, the width of isthmus equal to distance between eyes. No elevations on inner edge of shoulder girdle. Gill-rakers on first arch long, very slender, and stiff. No barbels on lower jaw.

Head with a few rather deeply embedded scales on upper edge of opercle and preopercle; occiput with small scales; other parts of head naked. Body with small cycloid scales; a few etenoid scales below tip of depressed pectoral; scales on breast immediately behind isthmus minute, similar to those on occiput.

Dorsals separate, though close together, the 4 spines after the first greatly lengthened; when depressed their tips reach nearly to the middle of base of dorsal; the last 2 much shorter, just reaching insertion of soft dorsal when depressed; rays growing successively longer posteriorly, the last or next to last being longest. Anal similar to dorsal

in shape, inserted below base of third or fourth dorsal ray. Pectoral rounded; each of the 6 upper rays with 2 long silky filaments. Ventrals short, free posteriorly.

Color in spirits dusky above, lighter underneath, the body conspicuously marked with broad, light-edged, brownish-black lateral rings; the first passing through bases of first, second, and third dorsal spines; the second passing on either side of base of last spine; the third, fourth, and fifth crossing the base of anal; the sixth on caudal peduncle some distance anterior to base of fin; a dark band extending across the interorbital space encroaching a little on the upper surface of the eye; below the eye it is continued downward to the lower edge of cheek, growing narrower and lighter toward the lower end; upper part of head with a U-shaped mark, the open part of which is forward, the ends touching the middle of posterior edges of the eyes. Bases of dorsal and anal fins with large black spots, connected with the body rings; spinous dorsal narrowly edged anteriorly with black; pectoral, ventral, and caudal fins without distinct markings.

Living individuals have the dark rings bordered by bright yellow, the dorsal and caudal fins reddish.

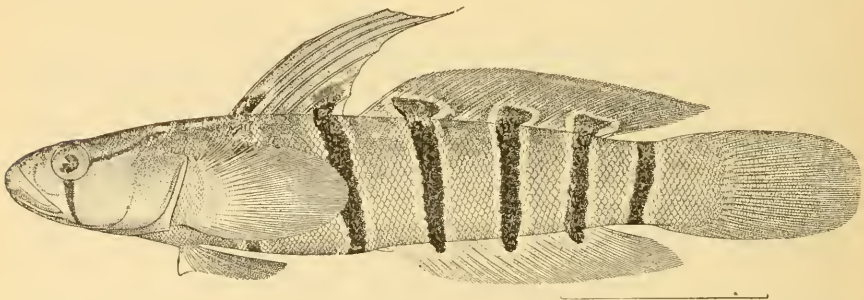


FIG. 17.—PTEROGOBIOUS DAIMIO.

This species is closely related to *P. dapooides* (Günther). We have been able to find no great differences between the two forms, except in color. *P. daimio* is darker; the dark bands on body are wider than those of *P. dapooides*, and there is no vertical band on caudal. These differences, though slight, are definite and constant in a large number of individuals examined by us.

Our collecting in Japan seems to indicate that *P. daimio* is a southern form, the Bay of Tokyo being somewhere near its northern limit. *P. dapooides* is found farther to the north, or if extending south is not found on the shores washed by the warm southerly currents. Our specimens are from Misaki, and from Wakanoura.

Type No. 6455, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

Described from a male specimen 105 mm. in length.

(*Daimio*, a feudal lord in Japan).

Measurements of *Pterogobius daimio*.

Length in millimeters.....	81	81	81	88	81
Depth expressed in hundredths of length.....	20	25	20	20	20
Depth of caudal peduncle.....	12½	13	14	12½	12½
Length of head.....	26	28	28	28	26½
Length of snout.....	9	10	10	10	9
Width of interorbital space.....	6½	6½	7	6½	6
Diameter of orbit.....	6	6	6	6	6
Distance from snout to spinous dorsal.....	34	35	37	34	34
Distance from snout to soft dorsal.....	52	55	51	55	53
Height of longest dorsal spines.....	39	30	32	23	32½
Height of longest dorsal rays.....	21	11	20	13	17
Distance from snout to anal fin.....	59	58	59	62	58
Height of longest anal rays.....	15	12	16½	13	15
Length of caudal peduncle.....	14½	15	16	16	15
Length of caudal fin.....	25	22½	27	22	25
Length of pectoral fin.....	21	21	23	21	21
Length of ventral fin.....	15	13	15	13	13
Number of dorsal spines.....	8	8	8	8	8
Number of dorsal rays.....	22	23	20	22	22
Number of dorsal rays.....	22	20	19	21	21
Number of dorsal rays.....	21	22	21	22	22
Number of scales in lateral series.....	77	89	78	79	80
Number of scales in transverse series.....	28	27	26	26	27

## 36. PTEROGOBIUS ZACALLES Jordan and Snyder, new species.

Head  $4\frac{1}{2}$  in length; depth  $5\frac{2}{5}$ ; depth of caudal peduncle 10; eye  $3\frac{1}{2}$  in head; snout  $3\frac{1}{2}$ ; maxillary  $2\frac{1}{2}$ ; D. VIII-26; A. 26; P. 22; scales in lateral series 96, in transverse series 33.

Body somewhat cylindrical, becoming more compressed near caudal fin; contours of body sloping slowly to caudal peduncle, which is little more than one-half the depth of body. Head large; not so deep or broad as body. Snout short and blunt, its length equal to diameter of eye. Interorbital space broad, concave. Eyes large; directed almost laterally. Mouth oblique; maxillary concealed by the fleshy lip; extending to a vertical passing between pupil and anterior edge of orbit. Teeth simple, in 2 series; an outer row of enlarged ones; an inner, narrow band of minute teeth; lower jaw with a small, curved canine on each side. Width of isthmus equal to length of snout. No papille on inner edge of shoulder girdle. Gill-rakers slender. Anterior nostril with an elevated rim or tube. Chin without barbels.

Head with minute scales on nape, upper edge of opercle, and on preopercle; those on preopercle extending downward considerably below the level of eye; other parts of head naked. Body closely covered with small, cycloid scales; a small patch of ctenoid scales in region of pectoral.

Dorsals separate, though the membrane posterior to last spine extends to insertion of soft dorsal. Fifth or sixth dorsal spine longest; the fin when depressed reaching a little beyond insertion of soft dorsal. Second dorsal very long; its base contained about  $2\frac{1}{2}$  times in length. Anal inserted below base of third or fourth dorsal ray; when depressed it extends slightly beyond dorsal posteriorly, both reaching the first basal rays of caudal. Caudal acutely rounded; small upper and lower basal rays extending a short distance forward on caudal peduncle. Pectorals sharply rounded; 3 or 4 upper rays with small filaments. Ventrals free posteriorly.

Body with 5 dark, broad, vertical bands; the last on base of caudal; the first at intersection of spinous dorsal; a suggestion of a dark band on nape; color bands of body saddle-like; extending over the back, but not uniting below. Each scale with a conspicuous, narrow, dusky edging. Fins more or less dusky throughout.

This species may be distinguished at once from *P. dajoides* and *P. daimio* by its not having a dark band passing through the eye and over the head. The bands of the body are less sharply defined and not edged with paler. It differs in color from *P. virgo* in having vertical bands on the body.

Represented by a single specimen, Type No. 6453, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

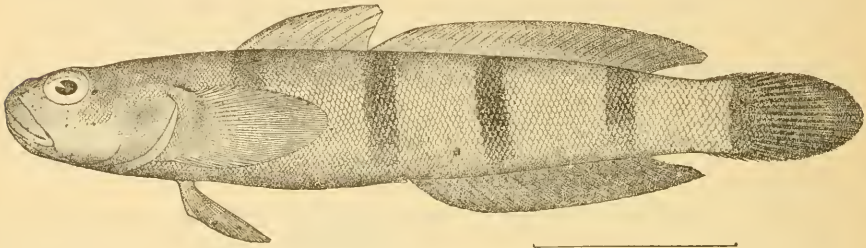


FIG. 18.—PTEROGOBIOUS ZACALLES.

*Measurements.*—Length in millimeters 91; depth, expressed in hundredths of length, 18; depth of caudal peduncle  $9\frac{1}{2}$ ; length of snout  $7\frac{1}{2}$ ; width of interorbital space  $3\frac{1}{2}$ ; diameter of orbit  $6\frac{1}{2}$ ; distance from snout to spinous dorsal 32; snout to soft dorsal 59; height of longest dorsal spines 13; rays 12; distance from snout to anal fin 58; height of longest anal rays 9; length of caudal peduncle  $11\frac{1}{2}$ ; of caudal fin 19; of pectoral fin 20; of ventral fin 16.

A single specimen is known, 95 millimeters long, taken at Misaki, Sagami, in a rock pool on the island of Yogashima.

(ζακαλλijs, very beautiful.)

37. PTEROGOBIOUS ZONOLEUCUS Jordan and Snyder, new species.

Head  $4\frac{1}{5}$  in length; depth  $4\frac{5}{6}$ ; depth of caudal peduncle  $2\frac{1}{3}$  in head; eye  $3\frac{1}{5}$ ; snout  $3\frac{2}{5}$ ; maxillary  $2\frac{2}{5}$ ; D. VIII-20; A. 19; P. 21; scales in lateral series 66, in transverse series 21.

Body large; deep; compressed, the caudal peduncle notably so. Head small, pointed, deeper than broad. Eye very large; directed laterally; interorbital space flat; its width equal to diameter of eye; preorbital area narrow. Mouth oblique; jaws subequal. Maxillary concealed, extending to a vertical between pupil and anterior edge of orbit. Tongue of medium width, its anterior edge concave. Teeth simple; in narrow bands on both jaws; outer ones much enlarged; those of upper jaw, rather larger before, growing gradually smaller

posteriorly; lower jaw with 2 or 3 much enlarged teeth near the symphysis, these followed on each side by a few smaller ones; then 2 larger curved canines, after which the teeth are abruptly smaller. Gill opening not extending very far forward; the width of isthmus about equal to diameter of eye. No papillæ on inner edge of shoulder girdle. Gill-rakers slender.

Head naked except on occiput; body everywhere covered with small, finely ctenoid scales.

Dorsals separate; spines slender; the first short; the second, third, fourth, and fifth notably elongated; the others much shorter though having free tips; rays somewhat longer anteriorly than posteriorly. Anal inserted below base of fourth or fifth dorsal rays; when depressed, reaching as far posteriorly as does the dorsal; both falling far short of

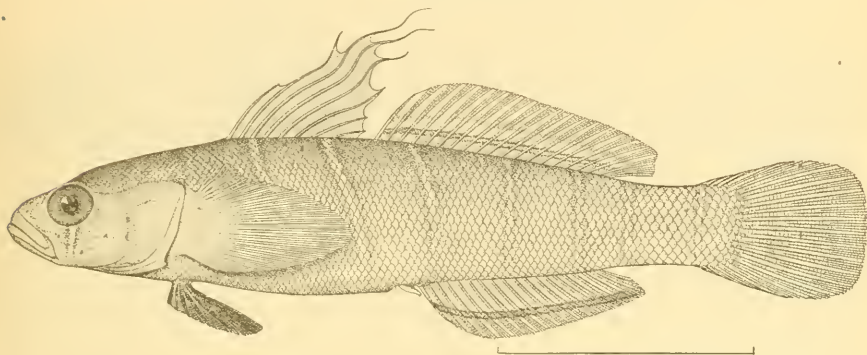


FIG. 19.—PTEROGOBIOUS ZONOLEUCUS.

base of caudal. Caudal truncate or very obtusely rounded. Pectorals with free filaments on upper edge; 2 filaments to each ray bearing them. Ventrals short; free posteriorly.

Color rather dark above, with 8 narrow, indistinct, light, vertical bands; fins dusky; the soft dorsal with 2 dark longitudinal bands; the upper being lighter and less distinct than the lower; anal with a dark longitudinal band; ventrals almost black.

Type No. 6454, Leland Stanford Junior University Museum, from Misaki, Japan.

A smaller specimen from the same locality has larger eyes; is much lighter in color, showing just a trace of the vertical bands. No bands can be distinguished on the fins.

Three specimens were obtained about the rocks of Yoga Island at Misaki.

(ζώνη, zone; λευκός, white.)

Measurements of *Pterogobius zonoleucus*.

Length in millimeters.....	71	42	44
Depth expressed in hundredths of length.....	22	22½	20
Depth of caudal peduncle.....	12	12½	12
Length of head.....	21	27	26
Length of snout.....	6	7	6½
Length of maxillary.....	9	9	9
Width of interorbital space.....	5	7	6
Diameter of orbit.....	6	8	7½
Distance from snout to spinous dorsal.....	35	35	31
Distance from snout to soft dorsal.....	56	53	53
Height of longest dorsal spines.....	31	18	20
Height of longest dorsal rays.....	13	15	13
Distance from snout to anal fin.....	62	58	60
Height of longest anal rays.....	12	13	13
Length of caudal peduncle.....	17	18	16
Length of caudal fin.....	23	23	21
Length of pectoral fin.....	22	26	23
Length of ventral fin.....	14	16	15
Number of dorsal spines.....	8	8	8
Number of dorsal rays.....	20	20	22
Number of anal rays.....	19	20	20
Number of scales in lateral series.....	66	63	65
Number of scales in transverse series.....	21	19	22

## 18. SURUGA Jordan and Snyder.

*Suruga* JORDAN and SNYDER, new genus (*fundicola*).

Body moderately elongate, covered with rather large, finely ctenoid deciduous scales; head large, not depressed; the interorbital space very narrow; eyes very large, longer than the short, blunt snout; cheeks scaleless; mouth rather large, very oblique; the chin prominent; teeth rather strong; tongue not notched; isthmus broad, the gill openings not continued forward below; fins all low; dorsal of eight spines and 17 to 20 rays; pectorals modearte, without silk-like rays; ventrals well developed.

Small plainly colored gobies inhabiting considerable depths in the sandy bays; allied to *Abomus*, but with the long soft dorsal and anal of *Acanthogobius*, and having the eyes larger than in any of the shore species.

(*Suruga*, name of the bay where especially abundant; Japanese, *suru*, stork; *ga*, good; the bay of the good stork.)

## 38. SURUGA FUNDICOLA Jordan and Snyder, new species.

Head  $3\frac{3}{4}$  in length; depth  $5\frac{1}{2}$ ; depth of caudal peduncle  $3\frac{2}{5}$  in head; eye  $2\frac{4}{5}$ ; snout 4; maxillary  $2\frac{1}{4}$ ; D. VIII-18; A. 16; P. 21; scales in lateral series about 41, in transverse series about 12.

Head deeper and broader than body. Eye notably large; directed obliquely upward; interorbital space very narrow, the eyes nearly meeting above. Snout short; its length about equal to distance from anterior edge of orbit to posterior edge of pupil. Mouth large; oblique. Maxillary concealed except at its posterior end, extending to a vertical through pupil. Jaws equal. Teeth in narrow bands on both jaws, not close-set, simple; those of outer series of upper jaw much enlarged; the corresponding ones of lower jaw slightly enlarged. Tongue thick, rather broad, round anteriorly. Gill openings broad



but not extending far forward. No papille on inner edge of shoulder girdle. Gill-rakers long and very slender, 3 + 8 on first arch. No barbels on jaw.

Head naked; body, except part of nape, region anterior to pectorals, and breast covered with finely ctenoid scales, the rough edge of which is easily effaced; a triangular patch of small round scales extending forward on nape. The scales are easily displaced, nearly all of our specimens having them entirely removed.

Spines of dorsal long; slender, filamentous at tips, when depressed reaching insertion of soft dorsal; rays somewhat shorter than the

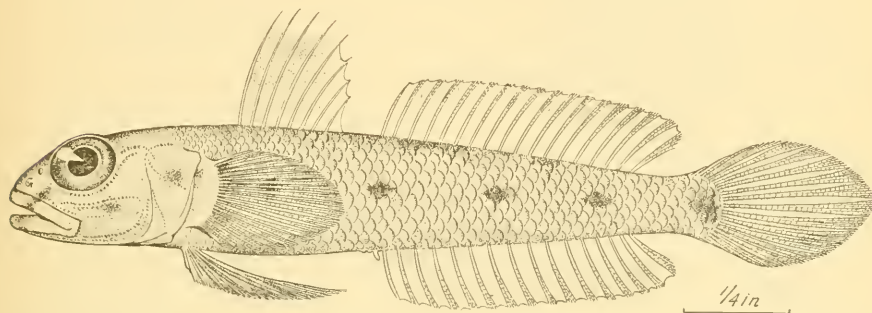


FIG. 20.—SURUGA FUNDICOLA.

spines. Anal inserted below third or fourth dorsal ray; extending posteriorly as far as the dorsal, both reaching base of caudal. Pectorals rounded; the upper edge without filaments. Caudal pointed. Ventrals long, free posteriorly.

Color dusky above; darker on snout; 6 or 7 indefinite dusky spots on sides; fins dusky.

Type No. 49744, U. S. N. M. Co-type No. 6456, Leland Stanford Junior University Museum, dredged at a depth of 65 fathoms, station 3745, off Sagami, by the United States Fish Commission steamer *Albatross*.

We have examined very many specimens from Suruga Bay, Matsushima, Owari Bay, and from the coast of Sagami. All are from sandy bottom at a depth of 40 to 80 fathoms.

(*Fundus*, bottom; *colo*, inhabit.)

Measurements of *Suruga fundicola*.

Length in millimeters	63	54	54	50
Depth expressed in hundredths of length	18	36	17	16
Depth of caudal peduncle	7	7	7	7½
Length of head	27	26	26	26
Length of snout	7	5	6	6
Length of maxillary	10	10	10	11
Width of interorbital space	1	1	1	1
Diameter of orbit	9½	9½	10½	11
Distance from snout to spinous dorsal	33	32	36	33
Distance from snout to soft dorsal	52	52	54	52
Height of longest dorsal spines	17	16	16	16
Height of longest dorsal rays		13	15	13
Distance from snout to anal fin	58	58	58	56
Height of longest anal rays	13	8	13	13
Length of caudal peduncle	10	10	13	11
Length of caudal fin	25	24	26	25
Length of pectoral fin		22		22
Length of ventral fin	22	20	21	20
Number of dorsal spines	8	8	8	8
Number of dorsal rays	19	18	17	17
Number of anal rays	18	17	16	17
Number of scales in lateral series <i>a</i>	40	44	38	40
Number of scales in transverse series <i>a</i>	12	10	10	
Locality, Suruga Bay.				

*a* Careful estimates only, as the scales had all been displaced, and even the scale pouches had in some specimens been rubbed off.

## 19. ACANTHOGOBIUS Gill.

*Acanthogobius* GILL, Proc. Ac. Nat. Sci. Phil., 1859, p. 145 (*flavimanus*).

Body oblong, little compressed, covered with medium-sized roughish scales; cheeks with small scales; snout rather long, the head rounded in profile; mouth moderate, oblique, the jaws about equal, the teeth moderate; tongue truncate or very slightly notched; isthmus rather broad, the gill openings slightly continued forward below; no flaps on shoulder girdle. Dorsal fins rather long, the first of 7 to 9 slender spines, the second of 14 or 15 soft rays; anal of 12 to 13.

Species of large size inhabiting the rivers and shores of Japan. The genus is near *Aboma*, differing in the scaly cheeks and longer second dorsal.

(ἄκανθα, spine; *Gobius*.)

## 39. ACANTHOGOBIUS FLAVIMANUS (Schlegel).

*Gobius flavimanus* SCHLEGEL, Fauna Japonica, 1847, p. 141, pl. LXXIV, fig. 1, Nagasaki.—BLEEKER, Ver. Bat. Genootsch., Japan, p. 42.—GÜNTHER, Cat. Fish., III, 1861, p. 77, after Schlegel.—ISHIKAWA, Cat. Fish., 1898, p. 38, Rikuzen, Yechizo, Hokkaido, Tokyo.

*Acanthogobius flavimanus* GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 145, Shimoda.

Head 3⅔ in length; depth 5¾; depth of caudal peduncle 3⅓ in head; eye 6; snout 2⅔; maxillary 2¼; D. VIII-14; A. 12; P. 19; scales in lateral series 48, in transverse series 17.

Body elongate, somewhat cylindrical anteriorly; the caudal peduncle compressed. Head large; snout rather blunt. Eyes small, high up, directed obliquely; interorbital space concave; distance between eyes less than their diameter. Mouth very large, oblique; jaws equal; lips broad; maxillary concealed, extending to a vertical through anterior

part of pupil. Tongue broad, truncate, with but a narrow free margin. Teeth simple, small, in narrow bands on both jaws. Anterior nostrils with low rims. No barbels. Gill openings not extending far forward; the isthmus broad, its width about equal to  $1\frac{1}{2}$  times diameter of eye. Inner edge of shoulder girdle with a narrow ridge, but no papillae. Gill-rakers on first arch 3 + 9, short, rather thick.

Head with scales on upper parts of opercles and cheeks, and on occiput; those on cheeks small, round, difficult to detect. Body completely covered with large ctenoid scales, except on nape and breast, where they are small and cycloid; those of breast minute.

Dorsals separate, the spines slender, when depressed reaching insertion of second dorsal. Anal inserted below base of third or fourth dorsal rays, when depressed reaching posteriorly about as far as the dorsal, both touching base of caudal. Pectorals and caudal pointed or acutely rounded; upper edge of the former without filaments. Ventrals large; free posteriorly.

Color light yellowish olive; dusky above; sides with 5 very indistinct spots; snout rather darker than body. Dorsals with dusky spots arranged in oblique rows; upper two-thirds of caudal with zigzag dusky bands; the lower third of fin plain dusky; pectorals with a little dark color at base; ventrals and anal with some dark color. In some specimens the ventrals and anal have scarcely a trace of dark color, while in others they are dusky, often approaching black. The latter condition is found to obtain usually in the males, although males with light fins and females with dark ones have been observed.

Described from specimens collected at Wakanoura, Kii.

One of the most abundant fishes of Japan, reaching a length of 200 to 250 millimeters, and abounding in all sluggish rivers and estuaries. We have numerous representatives from Hakodate, Onomichi, Kurume, Nagasaki, Wakanoura, Misaki, Matsushima, Aomori, Tokyo, Tsuruga, Enoshima, Niigata, and the Yodo River, near Osaka.

(*Flacens*, yellow; *manus*, hand.)

Measurements of *Acanthogobius flavimanus*.

	Tokyo Bay.			Nagasaki, Hizen.		
Length in millimeters .....	137	143	132	123	118	121
Depth expressed in hundredths of length .....	18	11	16	17	20	18
Depth of caudal peduncle .....	10	9	10	9 $\frac{1}{2}$	10	9 $\frac{1}{2}$
Length of head .....	28	28	28	26	28	28
Length of snout .....	10	10	10	10	10 $\frac{1}{2}$	11
Length of maxillary .....	10 $\frac{1}{2}$	10	10 $\frac{1}{2}$	10	10	10
Width of interorbital space .....	2	2	2	2	2	2
Diameter of orbit .....	5	5	5 $\frac{1}{2}$	6	5 $\frac{1}{2}$	6
Distance from snout to spinous dorsal .....	35	34	34 $\frac{1}{2}$	33	36	36
Distance from snout to soft dorsal .....	55	54	53 $\frac{1}{2}$	55	56	56
Height of longest dorsal spines .....	14	13 $\frac{1}{2}$	13	11	13	15
Height of longest dorsal rays .....	13	14	13	12	12 $\frac{1}{2}$	12
Distance from snout to anal fin .....	60	58	60	58 $\frac{1}{2}$	62	59
Height of longest anal rays .....	12	11	11	9 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$
Length of caudal peduncle .....	21	21	20	22	21	22 $\frac{1}{2}$
Length of caudal fin .....	26	24	27	21	22	23
Length of pectoral fin .....	20	19	20	16	18	18
Length of ventral fin .....	19	18	17	14	15	18
Number of dorsal spines .....	8	8	8	8	8	8
Number of dorsal rays .....	14	14	14	14	14	14
Number of anal rays .....	11	12	12	12	12	12
Number of scales in lateral series .....	11	48	47	48	50	50
Number of scales in transverse series .....	17	18	17	16	17	18

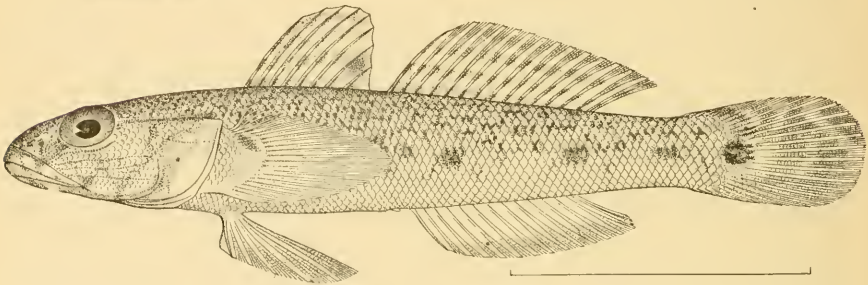


FIG. 21.—SAGAMIA RUSSULA.

## 20. SAGAMIA Jordan and Snyder, new genus.

*Sagamia* JORDAN and SNYDER, new genus (*russulus*.)

This genus agrees with *Acanthogobius* in nearly all respects, differing in the presence of free silky rays on the pectorals, as in *Gobius*, *Pterogobius*, and *Chasmias*. Japanese.

(Name from Sagami Bay.)

## 40. SAGAMIA RUSSULA Jordan and Snyder, new species.

Head  $3\frac{1}{3}$  in length; depth  $5\frac{2}{3}$ ; depth of caudal peduncle 3 in head; eye  $3\frac{1}{2}$ ; snout  $3\frac{1}{2}$ ; maxillary  $2\frac{2}{3}$ ; D. VIII-15; A. 14; P. 21; scales in lateral series 54, in transverse series 16.

Body rather long, somewhat cylindrical, a little less wide than deep, caudal peduncle deep. Eyes very large, rather oblong, directed upward, nearer tip of snout than posterior edge of opercle a distance equal to one-half their diameter; interorbital space very narrow, slightly concave. Snout blunt; nostrils with slight rims, the anterior of which is the higher; width of preorbital area equal to diameter of pupil. Jaws subequal, the lower just included; maxillary extending to a vertical midway between pupil and anterior edge of eye; concealed beneath preorbital except at its distal end. No barbels. Tongue very

broad, the anterior edge concave. Teeth on jaws in 2 rows; the outer ones enlarged; the inner ones minute; a strong canine on each side of lower jaw curving backward. Gill opening extending above to upper edge of base of pectoral; the width of isthmus equal to diameter of eye. No projection on inner edge of shoulder girdle. Gill-rakers on first arch 2 + 11; slender; the length of the longest about equal to diameter of pupil. Cheeks with 4 rows of elevated mucous pores; the first just below the eye; the third, branched posteriorly, joining the fourth and curving upward around the anterior edges of the first and second; a double row along the lower and posterior edges of preopercle, extending forward on lower jaw; 2 rows on opercle; one extending downward, and the other backward from its upper anterior angle; a row running backward from eye, above opercle to upper edge of gill opening; a conspicuous pore above and between the nostrils; rows of minute pores on upper part of snout.

Head, except snout, lower jaw, throat, and opercle, except its upper part, with cycloid scales. Body with rather small, finely ctenoid scales.

Dorsal fins separate; the spines not elongate; the longest contained twice in head; rays a little shorter than spines. Anal inserted below third or fourth dorsal ray; the depressed fin extending as far posteriorly as does the dorsal, both falling far short of base of caudal. Caudal acutely rounded. Pectorals pointed; reaching a vertical through insertion of soft dorsal; the upper edge with 4 or 5 slender filaments. Ventrals free posteriorly; extending to a point as far before vent as the insertion of anal is behind.

Color in spirits soiled white; upper parts with dark spots and reticulations; sides with 7 or 8 dark spots, indistinct anteriorly, better defined posteriorly; the last of the series at base of caudal fin, very prominent; a small spot on upper part of base of pectoral; 3 poorly defined, oblique lines on sides of head, the posterior one on opercle; the anterior one running forward and downward from eye. Spinous dorsal with a dark spot near ends of last two spines; with 3 longitudinal rows of dark spots; soft dorsal with 4 longitudinal rows of dark spots; anal edged with dusky; upper part of caudal with vertical, wavy, dark bands; pectorals and ventrals suffused with dusky. In life bluish olive; the lateral spots rather bright brick red with darker centers.

Described from Type No. 6457, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

Specimens from Nagasaki are much lighter in color, though preserving in an indefinite way the general markings of the type. The spinous dorsals have 2 dark spots, one situated anteriorly, the other posteriorly.

We have many specimens from Misaki, Wakanoura, and Nagasaki. It is one of the commonest species found in the clear waters of the bays; never in the rivers.

(*Russulus*, reddish.)

Measurements of *Sagamia russala*.

	Misaki, Sagami.				Nagasaki, Hizen.						
	61	53	63	63	64	62	58	57	47	41	
Length in millimeters.....	61	53	63	63	64	62	58	57	47	41	
Depth expressed in hundredths of length.....	16	16	18	16	15	16	17	16	16	18	
Depth of caudal peduncle.....	9	9	10	10	10	9	10	10	9	9	
Length of head.....	30	31	30	29	27	30	30	28	29	30	
Length of snout.....	10	9	9	8	8	9	8	9	8	9	
Width of interorbital space.....	14	2	2	2	2	2	2	2	2	2	
Diameter of orbit.....	8	9	8	8	8	9	8	9	8	9	
Distance from snout to spinous dorsal.....	34	37	36	33	33	36	35	34	35	36	
Distance from snout to soft dorsal.....	55	55	56	54	53	55	56	54	52	56	
Height of longest dorsal spines.....	15	14	15	14	16	15	18	16	17	17	
Height of longest dorsal rays.....	13	14	16	16	13	14	15	16	15	16	
Distance from snout to anal fin.....	58	56	57	57	56	58	59	59	58	58	
Height of longest anal rays.....	10	10	10	10	11	12	12	12	13	11	
Length of caudal peduncle.....	18	20	21	21	21	20	22	21	21	20	
Length of caudal fin.....	21	23	22	20	21	22	22	22	22	21	
Length of pectoral fin.....	22	25	24	24	23	25	22	23	24	25	
Length of ventral fin.....	19	20	22	20	19	23	19	21	20	23	
Number of dorsal spines.....	8	8	8	8	8	8	8	8	8	8	
Number of dorsal rays.....	15	15	14	15	15	15	15	15	15	15	
Number of anal rays.....	14	14	13	14	13	14	13	13	14	14	
Number of pectoral rays.....	21	20	21	22	22	20	20	21	20	20	
Number of scales in lateral series.....	51	49	53	54	55	51	55	55	57	52	
Number of scales in transverse series.....	16	16	16	16	17	17	17	16	17	16	

## 21. SYNECHOGOBIUS Gill.

*Synechogobius* GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 266 (*hasta*).

This genus seems to be closely allied to *Acanthogobius*, differing in the more elongate body and fins and in the naked head. From *Gobionellus*, an American genus of similar form, it differs in the presence of 8 or 9 dorsal spines. The single known species is Japanese.

(συνέχω, repeat; *Gobius*, the form repeating the elongate body and lanceolate caudal of *Gobionellus*.)

## 41. SYNECHOGOBIUS HASTA (Schlegel).

*Gobius hasta* SCHLEGEL, Fauna Japonica, Fishes, p. 144, pl. LXXV, fig. 1, Nagasaki.—GÜNTHER, Cat. Fishes, III, 1861, p. 78, Japan.

Head  $5\frac{1}{2}$  in length; depth 10; D. VIII-20; A. 17; P. 22.

Body elongate; caudal peduncle long and slender. Eyes small; high up; interorbital width equal to vertical diameter of eye. Snout rather long; pointed; jaws equal; mouth oblique. Maxillary extending to a vertical through anterior edge of orbit. Teeth in bands, the outer ones slightly enlarged. Head naked; no barbels. Body with rather large scales.

Dorsals separate; the spines slender, their tips filamentous; when depressed not reaching insertion of soft dorsal. Anal inserted below base of fourth dorsal ray; when depressed, reaching about as far posteriorly as does the dorsal, neither fin touching base of caudal. Caudal pointed. Pectoral pointed; its upper edge without filaments. Ventrals free posteriorly.

Color brownish green; pectoral, anal, and lower part of caudal suffused with brownish red; soft dorsal with elongate dusky spots in longitudinal rows. (Schlegel.)

Nagasaki, not seen by us.

(*Illustra*, a dart).

## 22. PARACHÆTURICHTHYS Bleeker.

*Parachaturichthys* BLEEKER, Archives Néerl., 1874, p. 325 (*polynemus*).

Body moderately elongate, covered with rather large, ctenoid scales; head rounded in profile, not depressed above, the eyes close together; cheeks scaly; mouth moderate, oblique, the chin not very prominent; teeth moderate, simple; chin with many small barbels on each side along the ramus of the lower jaw; dorsal fins short, the rays about VI-11. Caudal pointed with a black ocellus at base above; pectorals pointed, without silk-like rays; ventrals united, not adnate to the belly. Isthmus broad, the gill openings not continued forward below.

One species, in the Japanese and Indian seas.

(παρά, near; *Chaturichthys*.)

## 42. PARACHÆTURICHTHYS POLYNEMUS Bleeker.

*Chaturichthys polynema* BLEEKER, Verh. Batav. Genoots., XXV, Japan, p. 44, fig. 4, Nagasaki.

*Gobius polynema* GÜNTHER, Cat. Fish., III, 1861, p. 46, China, Madras.

Head  $4\frac{1}{2}$  in length; depth  $5\frac{1}{4}$ ; depth of caudal peduncle  $2\frac{1}{8}$  in head; eye  $3\frac{1}{2}$ ; snout  $3\frac{5}{8}$ ; maxillary  $2\frac{2}{3}$ ; D. VI-11; A. 10; P. 22; scales in lateral series 28, in transverse series 9.

Body elongate, somewhat compressed; caudal peduncle deep, much compressed. Head broader than body, but a little less deep. Snout blunt. Eye large, the upper edge projecting slightly above dorsal contour of head; interorbital area concave; the space between the eyes equal to their vertical diameter. Mouth oblique; jaws equal. Maxillary entirely concealed, extending posteriorly to a vertical through center of pupil. Tongue rather narrow, rounded anteriorly. Teeth simple, in narrow bands on both jaws, the outer ones slightly enlarged; no canines. Gill opening not extending far forward; width of isthmus equal to diameter of eye. Inner edge of shoulder girdle without papillæ. Gill-rakers 3 + 10, rather short and blunt. Anterior nostril with a low tube. Lower jaw with a row of slender barbels along under sides of rami; branchiostegal region with barbels.

Cheeks, occiput, interorbital space, and posterior part of snout with cycloid scales. Body everywhere covered with large scales, those on nape and anterior under parts cycloid, the others finely ctenoid.

Dorsal fins separate; the spinous dorsal when depressed not reaching insertion of soft dorsal; the rays longer posteriorly. Anal inserted below base of second or third dorsal ray; its rays when depressed reaching as far posteriorly as do those of the dorsal, both touching bases of caudal rays. Caudal pointed. Pectoral pointed, its upper edge without filaments. Ventrals rather short; free posteriorly.

Body with considerable dusky color, a little lighter below than

above. Fins dusky, growing darker toward the edges; caudal with a conspicuous, black, oval spot about as large as eye on upper half; the spot surrounded by a lighter border.

Described from a specimen from Wakanoura. Representatives from other localities show no important differences.

The species may be recognized at once among Japanese gobies by the large, oval, black spot on the upper half of the caudal fin.

Our collections include individuals from Tsuruga, Kobe, Nagasaki, Wakanoura, Hiroshima, and Onomichi. The species is generally common in Southern Japan and grows to a length of 150 millimeters.

(*πολύς*, many; *νήμα*, thread.)

*Measurements of Parachaturichthys polygenus.*

	Nagasaki, Hizen.		Wakanoura, Kii.		
Length expressed in millimeters.....	100	90	85	95	78
Depth expressed in hundredths of length .....	20	18	19	19	21
Depth of caudal peduncle.....	13	12	12	11	11
Length of head.....	25	25	24	24	25
Length of snout.....	6 $\frac{1}{2}$	6	5 $\frac{1}{2}$	6	5
Length of maxillary.....	10	10	10	10	9 $\frac{1}{2}$
Width of interorbital space.....	3 $\frac{1}{2}$	2	3	3	2 $\frac{1}{2}$
Diameter of orbit.....	7 $\frac{1}{2}$	7 $\frac{1}{2}$	7	7	7
Distance from snout to spinous dorsal.....	35	35	35	33	35
Distance from snout to soft dorsal.....	53	54	52	52	53
Height of longest dorsal spines.....	13	12	13	12	13
Height of longest dorsal rays.....	18	19	19	19	18
Distance from snout to anal fin.....	59	59	57	56	58
Height of longest anal rays.....	16 $\frac{1}{2}$	19	19	18	18
Length of caudal peduncle.....	23	23	22	23	24
Length of caudal fin.....	36 $\frac{1}{2}$	41	44	43	38
Length of pectoral fin.....	27	29	31	30	27
Length of ventral fin.....	18	17	18	17	17
Number of dorsal spines.....	6	6	6	6	6
Number of dorsal rays.....	11	11	11	11	11
Number of anal rays.....	10	10	10	10	10
Number of scales in lateral series.....	28	28	28	28	27
Number of scales in transverse series.....	9	9	9	9	9

23. CHÆTURICHTHYS Richardson.

*Chaturichthys* RICHARDSON, Voyage Sulphur, 1844, p. 55 (*stigmatias*).

*Amblychaturichthys* BLEEKER, Archives Néerl., 1874, p. 324 (*hexanemus*).

Body moderately elongate, covered with moderate-sized cycloid scales, which fall readily; head broad, rounded in profile, the eyes close together, the cheeks scaly; mouth moderate, oblique; the teeth pointed, medium; tongue truncate; isthmus narrow, the gill openings continued well forward below; lower jaw with 3 small barbels on either side. Dorsal fins long of 8 slender spines and 14 to 25 rays. Caudal more or less pointed, with shorter rays at base above and below; pectorals pointed, without silky rays.

Species few, mostly Japanese. Large gobies of dull coloration, chiefly of the seas of Japan and China.

(*χαίτη*, bristle; *ὄψά*, tail; *ἰχθύς*, fish, from the short marginal rays of the caudal.)

*a. Chaturichthys.* Dorsal rays VIII-22; anal 19; scales 57-14; caudal long and pointed; spinous dorsal with a large black spot.....*stigmatias*. 43

*aa. Amblychaturichthys.* Dorsal rays VIII-15 to 17; anal 13 or 14; scales 35 to 40; caudal shorter.



- b.* Dorsal rays VIII-17; scales 39-45; color soiled olive without distinct markings; first dorsal without distinct black spot. . . . . *hucanensis.* 44  
*bb.* Dorsal rays VIII-15; scales 35-40; color olivaceous; a large black ocellus on spinous dorsal. . . . . *sciistius.* 45

43. CHÆTURICHTHYS STIGMATIAS Richardson.

*Chaeturichthys stigmatias* RICHARDSON, Voy. Sulphur, 1844, p. 55, locality uncertain—  
 JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 764, Tsushima.  
*Gobius stigmatias* GÜNTHER, Cat. Fish., III, 1861, p. 78, from Richardson's type.

Head  $3\frac{2}{3}$  in length; depth 7; depth of caudal peduncle  $4\frac{2}{3}$  in head; eye  $4\frac{2}{3}$ ; snout  $3\frac{1}{2}$ ; maxillary 2; D. VIII-22; A. 19; P. 24; scales in lateral series about 57, in transverse series about 14.

Body elongate posteriorly, the dorsal and ventral contours sloping gradually to the caudal peduncle, which is narrow and compressed. Head large; wider than body; the width equal to distance from tip of snout to posterior border of eye.

Eyes high in head; oblong; directed obliquely upward, more of the eye being visible when viewed from above than when seen from the side. Interorbital space slightly concave. Mouth large; oblique; lower jaw projecting somewhat beyond the upper; lips thin; maxillary extending to a perpendicular through middle of pupil; entirely concealed beneath a pendulous dermal fold of the suborbital. Tongue broad; concave anteriorly. Teeth in 2 rows on each jaw; slender, pointed and curved; those in outer row stronger and fang-like. Gill opening extending far forward, the isthmus narrow. Three large papillæ on inner edge of shoulder girdle. Gill rakers on first arch 3 + 11; long and slender. Lower jaw with 3 barbels on each side, the distance between them equal to the diameter of the orbit; anterior barbel shorter and thicker than the others.

Occiput, opercles, and preopercles with small, round, smooth scales, scarcely or not at all imbricated. Body with cycloid scales, small near the head, growing larger posteriorly.

Dorsal fins separate; the first 6 spines evenly spaced, the others further apart. When depressed the fin does not extend to insertion of soft dorsal. Dorsal rays growing higher from before backward; when depressed, reaching base of upper caudal rays. Anal inserted below base of third dorsal ray; the rays not reaching so far posteriorly when depressed as do those of the dorsal. Caudal long, pointed, with short accessory rays above and below (hence the name "*Chaeturichthys*"); short dorsal and ventral rays of the fin growing far forward on the caudal peduncle. Pectorals pointed, extending to vent. Ventrals free from body posteriorly, extending to a point below base of seventh dorsal spine.

Body without distinctive color markings. Spinous dorsal with a large black spot on its posterior border. Soft dorsal, caudal, and pectorals

with indistinct dark wavy markings. Ventrals and anal without dark markings except a little dusky on posterior border of the latter.

This species, the habitat of which was heretofore unknown, is represented in our collection by 2 poorly preserved specimens obtained by P. L. Jouy at Sasuma, island of Tsushima, Japan. Richardson's specimens collected by the *Sulphur* were in a bottle labeled "Southern Pacific," but Richardson observes, "As the bottle held several species from the China Sea, there appears some doubt as to the native place of the fish." It probably came from China.

(*στυγματίας*, branded.)

*Measurements of Chæturichthys stigmatias.*

Length in millimeters .....	79	92
Depth, expressed in hundredths of length .....	15	15
Depth of caudal peduncle .....	6	5
Length of head .....	29	27
Length of snout .....	9	8
Width of interorbital space .....	4 $\frac{1}{2}$	4 $\frac{1}{2}$
Diameter of orbit .....	6	6
Distance from snout to spinous dorsal .....	34	33
Distance from snout to soft dorsal .....	52	51
Height of longest dorsal spines .....	13	12
Height of longest dorsal rays .....	14	12
Distance from snout to anal fin .....	56	57
Height of longest anal rays .....	13	11
Length of caudal peduncle .....	16	16
Length of caudal fin .....	32	23
Length of pectoral fin .....	24	23
Length of ventral fin .....	20	18
Number of dorsal spines .....	8	8
Number of dorsal rays .....	22	21
Number of anal rays .....	19	20
Number of pectoral rays .....	24	25
Number of scales in lateral series .....	a57	a50
Number of scales in transverse series .....	a14	a14

*a*The above counts are only approximately correct, the specimens being so poorly preserved that but few of the scales remain in place.

44. CHÆTURICHTHYS HEXANEMUS (Bleeker).

*Chæturichthys hexanema* BLEEKER, Verh. Batav. Genootsch., XXV, Japan, p. 435, Nagasaki—GILL, Ann. Lyc. Nat. Hist. N. Y., 1859, p. 16, Shimoda—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Lake Biwa.

*Gobius hexanema* GÜNTHER, Cat. Fish., III, 1861, p. 77; after Bleeker.

Head  $3\frac{2}{3}$  in length; depth  $5\frac{1}{3}$ ; depth of caudal peduncle  $2\frac{3}{4}$  in head; eye  $4\frac{1}{4}$ ; snout  $3\frac{3}{8}$ , maxillary  $2\frac{2}{3}$ ; D. VIII-17; A. 14; P. 23; scales in lateral series 39, in transverse series 15.

Body thick-set. Snout blunt. Eyes high in head, directed obliquely upward, nearer tip of snout than to posterior end of opercular flap a distance equal to their diameter; width of interorbital space equal to diameter of pupil. Anterior nostril with a slight rim. Mouth large, oblique; lower jaw slightly projecting. Maxillary entirely concealed beneath preorbital; extending posteriorly to a vertical through a point midway between pupil and anterior edge of orbit. Lower jaw with 3 pairs of slender barbels; each of the anterior pair inserted on either side of a large pore at angle of lower jaw; others just posterior, at intervals equal to diameter of orbit. Teeth on jaws in bands, bristle-like; outer ones slightly enlarged; no canines. Gill openings extend-

ing far forward below; the isthmus narrow. No protuberances on inner edge of shoulder girdle. Gill-rakers on first arch 14, slender.

Head, except anterior part of snout, lower jaw, and throat, with ctenoid scales; body with large ctenoid scales.

Dorsals separate; the height of longest spines contained about 3 times in length of head, rays somewhat longer; spinous dorsal when depressed just reaching insertion of soft dorsal; the latter touching bases of upper caudal rays. Anal inserted below base of fifth dorsal ray; posterior rays longest, not extending so far posteriorly when depressed as do those of dorsal. Caudal and pectorals pointed; the latter without filaments on upper edge. Ventrals free posteriorly.

Color dusky olive; sides with a row of 5 dark spots; the posterior ones, especially that at base of caudal most conspicuous. Fins dusky; the ventrals with a wide, light, posterior border.

Here described from a specimen 130 millimeters long from Nagasaki.

We have specimens from Tsuruga, Owari Bay, Aomori, Tokyo, Matsushima, Mororan, Hakodate, and Nagasaki. The species is extremely common throughout Japan, in all bays and estuaries. It reaches a length of 150 to 200 millimeters. It is called *Akaihaze* or red Goby.

( $\xi\xi$ , six;  $\nu\eta\mu\alpha$ , thread.)

*Measurements of Chaturichthys hexanemus.*

Length in millimeters.....	134	127	115	95	90
Depth expressed in hundredths of length.....	20	19	18	19	20
Depth of caudal peduncle.....	10	10	9 $\frac{1}{2}$	10	10
Length of head.....	26	25 $\frac{1}{2}$	26	26 $\frac{1}{2}$	27
Length of snout.....	7	7 $\frac{1}{2}$	7 $\frac{1}{2}$	7	7 $\frac{1}{2}$
Length of maxillary.....	10	10 $\frac{1}{2}$	11	10 $\frac{1}{2}$	10
Width of interorbital space.....	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2
Diameter of orbit.....	7	6 $\frac{1}{2}$	7	7 $\frac{1}{2}$	8
Distance from snout to spinous dorsal.....	34	33 $\frac{1}{2}$	33 $\frac{1}{2}$	32	35
Distance from snout to soft dorsal.....	52	52 $\frac{1}{2}$	54	52 $\frac{1}{2}$	53
Height of longest dorsal spines.....	13 $\frac{1}{2}$	13	13 $\frac{1}{2}$	14	13
Height of longest dorsal rays.....	16 $\frac{1}{2}$	16 $\frac{1}{2}$	15	14	15
Distance from snout to anal fin.....	59	59	59	59 $\frac{1}{2}$	60
Height of longest anal rays.....	18	16 $\frac{1}{2}$	16	15	16
Length of caudal peduncle.....	25 $\frac{1}{2}$	22 $\frac{1}{2}$	22	22	22
Length of caudal fin.....	34	32 $\frac{1}{2}$	33	30	26
Length of pectoral fin.....	19	18 $\frac{1}{2}$	18	19	20
Length of ventral fin.....	17	16	16	16 $\frac{1}{2}$	16 $\frac{1}{2}$
Number of dorsal spines.....	8	8	8	8	8
Number of dorsal rays.....	17	17	17	17	17
Number of anal rays.....	13	14	14	13	11
Number of scales in lateral series.....	42	46	42	40	43
Number of scales in transverse series.....	16	16	15	14	.....
Locality, Nagasaki.					

45. CHÆTURICHTHYS SCIISTIUS Jordan and Snyder, new species.

Head 3 $\frac{2}{3}$  in length; depth 5 $\frac{1}{4}$ ; depth of caudal peduncle 2 $\frac{3}{4}$  in head; eye 3; snout 4; maxillary 2 $\frac{1}{3}$ ; D. VIII-15; A. 12; P. 20; scales in lateral series 32, in transverse series 10.

Shape like that of *C. hexanemus*. Eye very large, the diameter greater than length of snout; directed obliquely upward; interorbital space narrow. Mouth oblique. Maxillary entirely concealed; extending to a perpendicular through posterior part of pupil. Lips thin. Tongue truncate anteriorly. Teeth simple, in 2 rows on each jaw,

those of the outer row slightly enlarged, extending farther back on jaw than do those of inner row; no canines. Gill opening extending far forward; the isthmus narrow. No protuberances on inner edge of shoulder girdle. Gill-rakers on first arch 4 + 13, very long and slender. Anterior nostril with a low rim. Lower jaw with 3 slender barbels on each side of inner edge.

Head with scales on opercles, preopercles, and on nape; other parts naked. Body with large cycloid scales.

Dorsal fins separate; spines slender; the filamentous tips projecting slightly beyond the membrane; the fin when folded just touching insertion of second dorsal; posterior rays of anal longest; reaching, when depressed, a little beyond bases of first upper caudal rays. Anal inserted below base of third or fourth dorsal ray; posterior rays much longer than the anterior ones; reaching almost as far backward when depressed as do those of the dorsal. Caudal pointed. Pectoral without free filaments on its upper edge; pointed posteriorly. Ventrals long; free posteriorly.

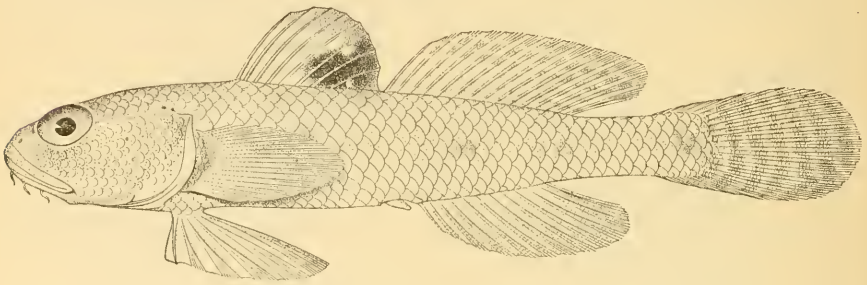


FIG. 22.—*OLETURICHTHYS SCHISTUS*.

Color in spirits yellowish white; sides with 5 or 6 very indistinct dusky spots, the most posterior of which is near base of anal; dorsal surface of body and upper part of head with a little dusky color. Spinous dorsal with a broad black blotch on posterior part; the dark area preceded by 2 or 3 rows of white spots; anterior part of fin dusky; soft dorsal dusky; with 2 narrow longitudinal light bands. Anal with 5 or 6 vertical zigzag dusky bands about equal in width to their light interspaces. Anal dusky. Pectorals and ventrals without light color.

Type No. 6458, Leland Stanford Junior University Museum. Locality, Hakodate, Hokkaido.

This species differs from *C. heranemus* in having fewer dorsal and anal rays and larger scales. It is lighter in color, has a conspicuous black spot on spinous dorsal, and is smaller in size. Some of our specimens were obtained offshore at a depth of 14 to 18 fathoms.

We have the species from Tsuruga, Owari Bay, Aomori, Tokyo,

Matsushima, Mororan, and Hakodate. It is found on sandy bottoms in rather deep water, and apparently rather to the northward.

(σκιά, shadow; ἰστίον, sail, fin.)

Measurements of *Chaturichthys scintilus*.

	Owari Bay.					Hakodate, Hokkaido.		
Length in millimeters	47	47	17	46	45	67	71	70
Depth expressed in hundredths of length	18	20	20	19	20	20	18	19
Depth of caudal peduncle	9	9	9	8	8	8	9	8
Length of head	27	28	28	26	28	28	27	26
Length of snout	7	6½	6	6½	7	7	7	7
Length of maxillary	12	12½	12	12	12	12	11	12
Width of interorbital space	2	2	2	2	2	1½	1½	2
Diameter of orbit	9	9	9	9	10	8	8	8
Distance from snout to spinous dorsal	36	34	36	31	36	36	35	35½
Distance from snout to soft dorsal	56	51	56	55	57	57	55	56
Height of longest dorsal spines	14	16	15	14	16	16	15½	15
Height of longest dorsal rays	19	16	19	19	16½	17	16	16½
Distance from snout to anal fin	59	60	61	58	62	62	62½	59
Height of longest anal rays	18	22	15	15	20	18	16	16
Length of caudal peduncle	23	22	22	22	20	21	20	22
Length of caudal fin	28	30	28	31	27	32	30	28
Length of pectoral fin	22	22	20	21	23	23	22	22
Length of ventral fin	22	22	21	22	22	22	21½	21
Number of dorsal spines	8	8	8	8	8	8	8	8
Number of dorsal rays	15	15	15	14	15	15	14	15
Number of anal rays	12	13	13	13	13	12	13	12
Number of scales in lateral series	32	33	33	32	31	35	31	36
Number of scales in transverse series	12	11	11	10	12	10	11	10

24. AINOSUS Jordan and Snyder, new genus.

*Ainosus* JORDAN and SNYDER, new genus (*genicionemus*).

This genus is allied to *Chaturichthys*, differing in the presence of about 10 barbels on either side, in the smaller, firmer, and rougher scales, the shorter soft dorsal, the free filaments on upper edge of pectoral, and in the truncate caudal fin. The isthmus is somewhat narrow, as in *Chaturichthys*, and the tongue is truncate.

The known species is small and spotted, resembling *Tenogobius*, but with more dorsal spines and rays and with the numerous white barbels along the lower jaw.

(*Aino*, the name of the bearded aborigines of Japan, a lost offshoot from the Indo-European race of men.)

46. AINOSUS GENEIONEMUS (Hilgendorf).

*Gobius genicionema* HILGENDORF, Sitzgeber. Naturf. Freunde, 1879, p. 108, Bay of Tokyo, No. 10653, Mus. of Berlin.

Head  $3\frac{1}{2}$  in length; depth 4; depth of caudal peduncle 3 in head; eye  $3\frac{2}{5}$ ; snout  $3\frac{1}{5}$ ; maxillary 3; D. VIII-16; A. 14; P. 20; scales in lateral series 62.

Body elongate; cylindrical anteriorly. Head large; the snout rather sharp. Eyes large; the diameter about equal to length of snout; directed obliquely upward. Mouth oblique; jaws equal; maxillary entirely concealed; extending to a perpendicular through anterior edge of orbit. Teeth simple; in 2 well-separated rows on each jaw; the outer row enlarged; notably so in lower jaw where posteriorly they assume the shape of canines. Gill openings extending some dis-

tance forward; the width of isthmus slightly greater than diameter of pupil. Gill-rakers on first arch 2 + 9; long and very slender. No papillæ on inner edge of shoulder girdle. Lower jaw and anterior part of throat with about 24 slender barbels; the longest somewhat shorter than diameter of pupil. Nostrils with rims, the anterior one the higher. Cheeks below eye with 4 rows of minute pores.

Head naked, except occiput and upper edge of opercle, which have small scales. Body completely covered with small ctenoid scales.

Fins large. Dorsals separate; the spines and rays of about the same height; much higher anteriorly than posteriorly; spines, when depressed, just reaching insertion of soft dorsal. Anal inserted below base of third dorsal ray; the tips of the rays not extending quite so far posteriorly as do those of the dorsal, both falling far short of base of caudal. Caudal truncate posteriorly; the upper rays slightly longer than the lower. Pectoral pointed; the upper edge with filamentous rays. Ventrals free posteriorly; extending a little beyond vent.

Color in spirits light; 6 or 7 large, dusky spots along middle of sides; a row of similar spots below these; upper parts of head and body with small, elongate spots, indistinct in outline; suborbital and cheeks with 4 oblique, parallel, dusky lines, the anterior extending from eye forward and downward. Spinous dorsal with 3 or 4 narrow, longitudinal, dusky bands; a large black blotch on the posterior membranes; soft dorsal with 3 bands similar to those of spinous dorsal. Caudal with oblong, dusky spots arranged in 3 or 4 zigzag vertical rows. Anal with a white margin, suffused with dusky between margin and base. Pectoral somewhat dusky. Ventral without dark color.

Here described from a small specimen collected at Misaki.

The species is as yet known only from about Tokyo, in clear water. It reaches a small size. Our specimens are from Misaki.

(γένειον, chin; ρήμα, thread.)

*Measurements of Ainosus genivomeris.*

Length expressed in millimeters .....	54	50	37	37
Depth expressed in hundredths of length ...	16	17	18	17
Depth of caudal peduncle .....	9	10	9	9
Length of head .....	27½	30	30	31
Length of snout .....	8	10	8	8
Length of maxillary .....	9	9½	10	11
Width of interorbital space .....	2	2	2	2
Diameter of orbit .....	8	8	9	10
Distance from snout to spinous dorsal .....	34	34	36	37
Distance from snout to soft dorsal .....	53	53	55	55
Height of longest dorsal spines .....	16½	16	17	17
Height of longest dorsal rays .....	17½	16	18	20
Distance from snout to anal fin .....	56	58	58	57
Height of longest anal rays .....	12	12	16	12
Length of caudal peduncle .....	22	22	23	23
Length of caudal fin .....	20	20	23	25
Length of pectoral fin .....	22	23	25	24
Length of ventral fin .....	20	20	22	22
Number of dorsal spines .....	8	8	8	8
Number of dorsal rays .....	16	16	15	15
Number of anal rays .....	14	14	14	14
Number of scales in lateral series .....	61	62	59	62
Number of scales in transverse series .....	18	16	18	17

## 25. TRIÆNOPOGON Bleeker.

*Triænopogon* BLEEKER, Archives Néerl., 1874, p. 24 (*barbatus*).

This genus is close to *Tridentiger*, from which it differs in the presence of a conspicuous fringe of barbels, the one series along the sub-orbital and preorbital region, another along the edge of the preopercle and the rami of the lower jaw to the chin. Body very robust.

A single known species, from Japan, distinguished from all other gobies by the combination of barbels and trifid teeth.

(*τρίαινα*, three fork; *πώγων*, beard.)

## 47. TRIÆNOPOGON BARBATUS Günther.

*Triænochorichthys barbatus* GÜNTHER, Cat. Fish., VII, 1861, locality unknown, "probably from China;" Hasler collection.

*Tridentiger barbatus* STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 33, "Celebes or the Philippines."

Head 3 in length; depth  $3\frac{1}{4}$ ; depth of caudal peduncle  $2\frac{2}{5}$  in head; eye  $6\frac{3}{8}$ ; snout  $3\frac{1}{2}$ ; maxillary 2; D. VI-11; A. 10; scales in lateral series 36, in transverse series 14.

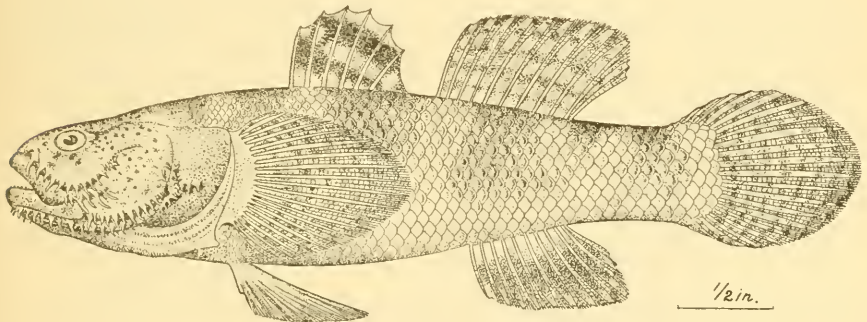


FIG. 23.—TRIÆNOPOGON BARBATUS.

Body stout; caudal peduncle deep, compressed. Head large, much broader than the body; cheek muscles bulging out conspicuously. Snout short, blunt. Mouth broad, somewhat oblique; jaws equal; distal part of maxillary exposed, extending much farther posteriorly than cleft of mouth, reaching a vertical passing a little beyond posterior edge of orbit. Tongue broad, rounded anteriorly.

Teeth of jaws in 2 series, the outer ones of upper jaw placed alternately in 2 rows; trilobed; the middle lobe much the highest, the inner ones in a single row, simple, small; the teeth of lower jaw in 2 rows; the outer trilobed; the inner simple, small; no canines.

Gill openings confined to the sides; the width of isthmus about equal to depth of caudal peduncle. No papillæ on inner edge of shoulder girdle. Gill-rakers on first arch 2 + 5 short, rather slender. Edge of suborbital with a double fringe of barbels which extends on cheek a

short distance beyond eye; lower jaw with 2 rows of barbels, which extend upward along edge of preopercle; opercle with a few scattered barbels. A conspicuous flap covering a pore near posterior edge of eye. Anterior nostrils with tubes.

Head naked. Body with rather large etenoid scales; breast anterior to ventrals naked.

Dorsals separate; the spines when depressed not reaching insertion of soft dorsal; rays higher than the spines, not touching base of caudal when depressed. Anal inserted below base of third or fourth dorsal ray; the depressed rays reaching as far posteriorly as do those of the dorsal. Caudal acutely rounded. Pectoral pointed; the upper edge with 1 or 2 filamentous rays. Ventrals free from body posteriorly.

Color in spirits light olive, with 4 or 5 broad, indistinctly outlined, vertical, dusky bars on body; a transverse bar on nape; anterior part of head dusky. Spinous dorsal with 2 broad, blackish, oblique bands; soft dorsal dusky, with longitudinal rows of indistinct dusky spots; caudal very dark, with light spots in vertical rows; pectorals somewhat lighter, though similarly marked; anal dusky; ventrals white.

Here described from 3 specimens from the bay of Tokyo, the only definite locality yet known for the species, the earlier specimens being from uncertain collections. Günther states that it is "probably from China," while Steindachner assigns it to "Celebes or the Philippines." (*Barbatus*, bearded.)

*Measurements of Tricunopogon barbatus.*

Length in millimeters.....	89	98	65
Depth expressed in hundredths of length.....	27	25	22
Depth of caudal peduncle.....	11	11	11
Length of head.....	33	36	22
Length of snout.....	9½	10½	9
Width of interorbital space.....	6	7	7
Diameter of orbit.....	5	5	5
Distance from snout to spinous dorsal.....	42	42	41
Distance from snout to soft dorsal.....	62	61	61
Height of longest dorsal spines.....	13½	14	11
Height of longest dorsal rays.....	16	15½	17
Distance from snout to anal fin.....	67	66	63
Height of longest anal rays.....	15½	15½	15½
Length of caudal peduncle.....	21½	22	23
Length of caudal fin.....	21½	23	24
Length of pectoral fin.....	26½	25	25
Length of ventral fin.....	21½	21	20
Number of dorsal spines.....	6	6	6
Number of dorsal rays.....	11	11	12
Number of anal rays.....	10	10	11
Number of scales in lateral series.....	36	33	33
Number of scales in transverse series.....	14	15	15

26. TRIDENTIGER GILL.

*Tridentiger* GILL, Ann. Lyc. Nat. Hist. N. Y., 1858, Dec. (*obscurus*).

*Tricunopogon* GILL, Ann. Lyc. Nat. Hist. N. Y., 1859, p. 17 (*trigonocephalus*; name preoccupied by *Tricunopogon* Rudolphi, a genus of worms).

*Tricunopogonichthys* GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 195 (*trigonocephalus*).

*Trifissus* JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372 (*ioturus*).

Body robust, little compressed, covered with moderate or rather large etenoid scales; head broad, little depressed above, the eyes well



separate, the cheeks tumid, scaleless; mouth moderate, oblique, the lower jaw rather prominent; teeth rather large, fixed, in about 2 rows, those in the outer row trifold, the middle cusp the longer; inner series of smaller, pointed teeth; tongue rounded at tip; no barbels; gill openings restricted to the side, the gill openings very broad. Dorsals short, the first of 6 slender spines, the second of 10 to 12 rays; caudal rounded; pectoral rounded, some of the upper rays short, none of them silky. Ventrals rather long, formed as in *Gobius*, not adnate to the belly.

Rivers of China and Japan. Robust species, allied to *Ctenogobius*, but with the teeth trifold. We follow Steindachner in identifying *Trianophorichthys* with *Tridentiger*. *Trifissus* is also unworthy of separation. This genus has no especial affinity to *Sicydium*.

(*Tres*, three; *dens*, tooth; *gero*, bear.)

*Tridentiger*.

*a*. Body olive green, with faint cross bands but no lengthwise stripes; scales less than 50.

*b*. Scales 34-16; D. VI-12; head  $3\frac{1}{2}$  in length; depth  $4\frac{1}{2}$ ; cheeks moderately tumid; head with pale spots; pectoral with a dark spot and pale bar at base ..... *obscurus*. 48.

*bb*. Scales 48-15; D. VI-13; head  $3\frac{1}{2}$  in length; depth  $6\frac{1}{2}$ ; cheeks excessively swollen; head with pale spots; a pale band on pectoral at base. .... *bucco*. 49.

*Trifissus*.

*aa*. Body olive green, with 2 black lengthwise bands; D. VI-13; scales 54-16; head  $3\frac{2}{3}$  in length; body  $4\frac{1}{3}$ ; cheeks little tumid ..... *bifasciatus*. 50.

#### 48. TRIDENTIGER OBSCURUS (Schlegel).

*Sicydium obscurum* SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 145, pl. LXXVI, fig. 1, Nagasaki.

*Tridentiger obscurus* GILL, Ann. Lyc. Nat. Hist. N. Y., 1858, Shimoda.—GÜNTHER, Cat. Fish., III, 1861, p. 566; after Schlegel.—STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 29.

*Trianophorichthys squamistrigatus* HILGENDORF, Sitzber. Naturf. Freunde, 1879, III, Tokyo; No. 10647, Mus. Berl.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Yokohama; Coll. Otaki.

*Tridentiger squamistrigatus* STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 31, Japan.

Head  $3\frac{1}{2}$  in length; depth  $4\frac{1}{2}$ ; depth of caudal peduncle  $2\frac{1}{3}$  in head; eye  $5\frac{1}{2}$ ; snout  $3\frac{1}{3}$ ; D. VI-12; A. 11; P. 20; scales in lateral series 34, in transverse series 16.

Head large and broad, the cheek muscles not so greatly developed as in *T. bucco*. Snout blunt; the jaws equal; mouth oblique. Maxillary reaching a vertical passing between pupil and anterior edge of orbit. Teeth in 2 series, those of the outer series in 2 closely apposed rows, the teeth alternating in position, flat, trilobed, except 2 or 3 posterior ones on each side of jaw; teeth of inner row small, simple, curved backward. Tongue broad, rounded anteriorly. Gill opening not extending far forward; the isthmus broad, its width equal to distance from pupil to tip of snout. Inner edge of shoulder girdle with

a narrow, elevated ridge; but no papillae. Gill-rakers 3 + 12, rather short and blunt.

Head naked, without barbels; anterior nostril with a high tube. Body with large, ctenoid scales; those anterior to dorsal and pectorals and on belly small and smooth; those on breast anterior to ventrals minute, embedded in the skin.

Dorsals separate; the spines long and filamentous, those of the females much shorter. Anal inserted below third or fourth dorsal ray, when depressed extending as far posteriorly as the dorsal, neither quite reaching the caudal. Caudal fin rounded. Pectoral without filaments on its upper border. Ventrals of moderate size; free posteriorly.

Color dark; head with a few small, faint light spots; body with narrow, light, lateral bands, which are more distinct posteriorly; dorsals dusky; with subdued darker markings; the first spine or ray of each fin with 4 sharply outlined black dots; soft dorsal and anal narrowly edged with white; interradial membranes of caudal dark; pectoral with a vertical white band near its base, and a dark spot at upper edge of base. The band of pectoral is bright orange in life.

In some specimens the snout is broader, the cheek muscles more puffed out, the eye a little smaller, and the maxillary slightly shorter than in others. Those from some localities are a little lighter in color than the one described. They have definite, small, round, white spots on the lower parts of the cheeks; the longitudinal bars on the body are more distinct and the spot at upper part of base of pectoral is more conspicuous.

*Trienophorichthys squamistrigatus* of Hilgendorf is believed to be identical with *Sicydium obscurum* of Schlegel. The series of specimens examined by us agree with the descriptions of both species referred to above, except in the covering of the breast. Hilgendorf's statement that the breast is naked is probably due to an oversight, as the region anterior to the ventrals is covered with small, deeply embedded scales. The species is represented in our collection by specimens from Nagasaki on the south to Tokyo on the north.

The present description is taken from an individual from Enoshima. Our specimens are from Tsuruga, Aomori, Matsushima, Kawatana, Kobe, Kurume, Nagasaki, Misaki, Wakanoura, Same, Enoshima, Niigata, Tone River, Ise, and from Ishikawa-ken.

The species is very abundant in the river mouths and estuaries throughout the southern islands of Japan. It is called *Torahaze* or Tiger goby.

(*Obscurus*, dusky.)

*Measurements of Tridentiger obscurus.*

	Ishika-		Naga-
	waken.		saki, Hi- zen.
Length in millimeters.....	80	66	55
Depth expressed in hundredths of length.....	26	21	24
Depth of caudal peduncle.....	13	13	12½
Length of head.....	30	30	31
Length of snout.....	10	9	11
Width of interorbital space.....	4½	4½	4½
Diameter of orbit.....	4	5½	5
Distance from snout to spinous dorsal.....	41	42	40
Distance from snout to soft dorsal.....	61	60	60
Height of longest dorsal spines.....	23	18½	28
Height of longest dorsal rays.....	16½	14	16
Distance from snout to anal fin.....	65	66	65
Height of longest anal rays.....	15	14	14
Length of caudal peduncle.....	22	24	22
Length of caudal fin.....	21½	22	22
Length of pectoral fin.....	23½	25	24
Length of ventral fin.....	16	16	18
Number of dorsal spines.....	6	6	6
Number of dorsal rays.....	11	12	12
Number of anal rays.....	11	11	11
Number of pectoral rays.....	20	21	20
Number of scales in lateral series.....	34	37	33
Number of scales in transverse series.....	15	16	17

## 49. TRIDENTIGER BUCCO Jordan and Snyder, new species.

Head  $3\frac{1}{4}$  in length; depth  $5\frac{1}{5}$ ; depth of caudal peduncle 7; eye 7 in head; snout  $4\frac{1}{3}$ ; maxillary  $2\frac{1}{4}$ ; D. VI-13; A. 11; P. 20; scales in lateral series 48, in transverse series 15.

Body rather robust, not tapering much toward the tail; caudal peduncle almost as deep as body, compressed. Head broad and depressed; its depth contained  $1\frac{2}{3}$  times in its width; cheek muscles enormously developed, puffed out on either side beyond contour of body; top of head flat; interorbital space broad, the distance between eyes  $2\frac{1}{2}$  times their diameter. Snout rounded. Eyes very small, directed laterally; anterior in position. Mouth oblique; jaws equal; maxillary reaching a vertical, passing a little beyond eye; entirely concealed by the lip and suborbital. Tongue broad, round anteriorly. Teeth in 2 series on the anterior part of jaws; the outer ones in a single row, trilobed, except 2 or 3 posterior ones, which are simple; the middle lobe high and rounded, the lateral lobes short and sharp; inner series of lower jaw in 3 rows; simple, slender, sharp, and curved backward; inner series of upper jaw in a single row, similar to those in the corresponding position below; no canines. Gill opening extending a little below base of pectoral; width of isthmus equal to space between eyes. Shoulder girdle with a narrow ridge on inner edge; no papillae. Gill-rakers on first arch 3 + 8; short and pointed.

Head naked; no barbels or conspicuous rows of mucous pores. Anterior nostril with a thin-walled tube. Body covered with large, weakly ctenoid scales, except a small naked space beneath ventrals.

Dorsals separate, the membrane of the spinous dorsal attached to the base of the first ray; spines slender and flexible; the third longest;

the 5 anterior ones evenly spaced; the distance between the last 2 about twice that of the others; rays of soft dorsal growing successively longer toward posterior end of fin; the last rays when depressed just reaching bases of upper caudal rays. Anal inserted below base of third dorsal ray; the first ray short; the others successively longer to the fourth, which is about twice as long as the first; the fin when depressed not reaching so far posteriorly as does the dorsal. Caudal rounded. Pectoral round, extending almost to a vertical through posterior end of base of spinous dorsal; the upper edge without filamentous rays. Ventrals free from body posteriorly; their tips reaching a point halfway between base of fin and insertion of anal.

Color in alcohol pale olive gray; sides of body with 6 or 7 narrow, dark, lateral cross-bands, the upper and lower of which are indistinct; on the anterior half of body all but 2 of the bands fade out and disappear; head dark, covered with small, closely crowded, light spots.

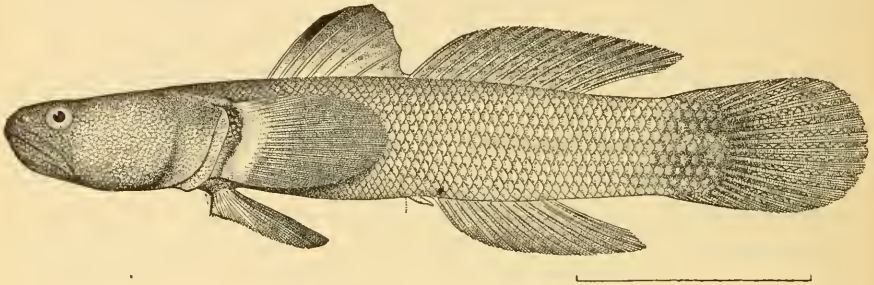


FIG. 24.—TRIDENTIGER BUCCO.

Dorsals and anal edged with black; the color more intense in the region of the first and second dorsal spines; soft dorsal with an indistinct, narrow, dusky horizontal band near the middle. Caudal dusky; black spots on interradiial membranes. Pectorals and ventrals dusky; the former with a light, vertical band at base.

Description of type No. 6459, Leland Stanford Junior University Museum. Locality, Misaki, Japan. We also have specimens from Tokyo.

Some other specimens from the type locality are a little lighter or darker in color; some have the small caudal spots arranged in more or less distinct wavy, vertical lines; others have the soft dorsal and anal narrowly edged with lighter color.

*T. bucco* is closely related to *T. obscurus*. It is easily distinguished by its larger mouth, broader head, smaller eye, and smaller scales; the latter species has about 36 scales in a lateral series.

(*Bucco*, thick-cheeked.)

Measurements of *Tridentiger bucco*.

Length in millimeters.....	78	74	75	69	67	67	72	70	70
Depth expressed in hundredths of length <i>a</i> .....	18	18	17	19	20	20	20	19	19
Depth of caudal peduncle.....	14	14	14	14	14	15	14	14	14
Length of head.....	29	29	29	30	29	30	30	30	30
Length of snout.....	8	8	7 $\frac{1}{2}$	8	8	7 $\frac{1}{2}$	8 $\frac{1}{2}$	8	8
Width of interorbital space.....	6 $\frac{1}{2}$	7	6 $\frac{1}{2}$	6	7	6 $\frac{1}{2}$	7	7	7
Diameter of orbit.....	4 $\frac{1}{2}$	4	4	4	4	4 $\frac{1}{2}$	4 $\frac{1}{2}$	4	4
Distance from snout to spinous dorsal.....	37	37	36 $\frac{1}{2}$	39	40	39	39	38	38
Distance from snout to soft dorsal.....	57	57	56 $\frac{1}{2}$	58	57	59	59	57	58
Height of longest dorsal spines.....	15	15	14	16	16	18	16	11	11 $\frac{1}{2}$
Height of longest dorsal rays.....	17	15	14 $\frac{1}{2}$	16	15	15	17	14	14 $\frac{1}{2}$
Distance from snout to anal fin.....	63	60	61	62	63	63	62 $\frac{1}{2}$	65	62
Height of longest anal rays.....	15	14	15	15	13	15 $\frac{1}{2}$	15	13	14
Length of caudal peduncle.....	25	23	22	21 $\frac{1}{2}$	22 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	23	23
Length of caudal fin.....	22	22	22	24	21	22	22	22	22
Length of pectoral fin.....	22	26	24	24	23	25	24	24	24
Length of ventral fin.....	16	17	16 $\frac{1}{2}$	16 $\frac{1}{2}$	17	17	18	17	16 $\frac{1}{2}$
Number of dorsal spines.....	6	6	6	6	6	6	6	6	6
Number of dorsal rays.....	13	13	13	13	13	13	13	13	13
Number of anal rays.....	11	11	11	11	11	11	11	11	11
Number of pectoral rays.....	19	19	19	19	19	19	20	19	20
Number of scales in lateral series.....	48	53	48	48	49	48	50	49	52
Number of scales in transverse series.....	15	15	15	15	16	16	17	17	17

*a* The measurements of the depth in this case are only approximate, the abdomen having shrunken in preservation.

## 50. TRIDENTIGER BIFASCIATUS Steindachner.

## SHIMAHAZE (STRIPED GOBY).

*Tridentiger bifasciatus* STEINDACHNER, Ichth. Beitr., X, p. 12 (190), Bay of Strielok, Japan Sea, near Vladivostock. Coll. Professor Dybowski, based on adult specimens without black caudal spot.

*Trifissus ioturus*<sup>1</sup> JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 373, Bay of Tokyo. Coll. K. Kishinouye; type No. 49403 U. S. Nat. Mus.; co-type No. 6270, L. S. Jr. Mus.; based on young specimens.

Head 3 $\frac{1}{2}$ ; depth 5; D. VI-13; A. 11; P. 19; scales 54-16. Eye 7 $\frac{1}{2}$  in head (less in young specimens); interorbital space 3 $\frac{1}{2}$  (the bony

<sup>1</sup>The following is the description of Japanese specimens (*T. ioturus*), which we are unable to separate from *T. bifasciatus*, except by characters subject to change with age:

## TRIFISSUS IOTURUS Jordan and Snyder.

*Description*—Head 3 $\frac{2}{3}$  in length; depth 4 $\frac{1}{3}$ ; depth of caudal peduncle 6 $\frac{1}{3}$ ; eye 4 in head; snout 4 $\frac{2}{3}$ ; interorbital space, bony ridge, 7 to 8 (fleshy part 3 $\frac{1}{4}$  to 4); height of longest dorsal spine, 7 in length, ray 7; longest anal ray 7 $\frac{1}{2}$ ; length of pectorals 3 $\frac{2}{3}$ ; ventrals 4 $\frac{2}{3}$ ; caudal 4 $\frac{1}{2}$ ; dorsal VI-13; anal 12; scales in lateral series 54, in transverse series 16, between origin of soft dorsal and anal.

Head wide and flat, its width contained 1 $\frac{1}{2}$  times in its length; interorbital space convex. Snout blunt. Mouth slightly oblique; jaws equal; premaxillary extending to a vertical through anterior edge of pupil; lips thick. Upper jaw with a row of 18 long, flat, trilobed, movable teeth, behind which is a row of small, sharp, simple teeth; lower jaw with 20 trilobed teeth, followed by a narrow band of simple, sharp, curved ones; each side of lower jaw with a small, curved canine scarcely larger than the other teeth. Gill-rakers short, pointed. Body covered with small, etenoid scales, large posteriorly, smaller anteriorly, extending forward on nape and top of head to within a short distance—about the diameter of pupil—of the edge of orbits; other parts of head naked; without barbels. Dorsal fins not connected; third spine longest; others gradually shorter; rays, except first and last, of about the same length. First ray of anal short, simple; others gradually longer. Soft dorsal and anal projecting an equal distance posteriorly. Caudal rounded.

ridge 7 to 8); snout  $4\frac{1}{3}$ ; breadth of head  $1\frac{1}{3}$ ; height 2. Body moderately compressed. Head very broad, *Cottus*-like, flattish above; eyes small; interorbital broad; pectorals without silky rays. Snout decurved. Teeth in the outer row trifold, well separated from the inner row of smaller pointed teeth, hindmost tooth sometimes a little larger. Cleft of mouth broader than long, its breadth half length of head; maxillary reaching to posterior margin of eye. Head naked; nape with small scales. Scales on body moderate, ctenoid.

Color olivaceous, a broad black band on each side beginning at the forehead and extending along below the dorsals to the caudal; a second band much narrower along middle of side from base of pectoral to

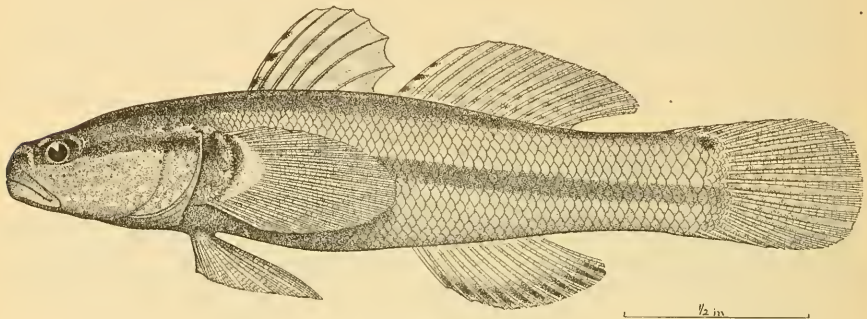


FIG. 25.—TRIDENTIGER BIFASCIATUS.

caudal; a blackish cross streak on bases of upper pectoral rays. Black streaks along near upper edge of first dorsal and front of second dorsal and along anterior rays of anal; caudal with numerous streaks of blue-gray specks; scales with dark points. Length 110 mm.

Steindachner's description, above condensed, was taken from specimens from the Bay of Strielok, near Vladivostock.

Pectoral somewhat pointed, extending posteriorly as far as tip of depressed dorsal. Ventrals not adherent to belly; their length equal to distance from center of pupil to edge of opercle. A dark color band, equal in width to vertical diameter of pupil, extending from upper edge of eye, along base of dorsal fins to the caudal, where it ends in a distinct, dark spot; a similar band running from tip of snout, through eye, upper edge of base of pectoral and along side of body to a little below middle of base of caudal; an indistinct dark spot on lower part of base of caudal; sides of head with small, light spots; first spine and first ray of dorsal fins with three distinct dark dots; the color extending posteriorly to the membrane; similar spots faintly outlined on the other spines and rays; the membranes with minute, dark dots; edges of fins a little dusky. Anal, with a dark band along the edge. Caudal, with indistinct cross-bars of bluish spots. Base of pectoral with a white band with a dusky spot before it.

*Type*.—No. 49403. U.S.N.M.

*Locality*.—Bay of Tokyo, Japan. Collector, K. Kishinouye. Japanese name, *Shimahaze* (striped goby).

Besides the type, one other specimen (cotype, No. 6270, Leland Stanford Junior University Museum) was collected. It is a little smaller and has somewhat brighter colors than the type, but differs from it in no other important way.

(*ἰῶτα*, jot; *ὄψα*, tail)

We have specimens from Tokyo Bay and from Nagasaki, the first named young, types of *T. ioturus*.

(*Bi.* two; *fasciatus*, banded.)

27. *ASTRABE* Jordan and Snyder, new genus.

*Astrabe*, new genus (*lactisella*).

Body thick-set; caudal peduncle deep. Teeth in both jaws simple; no canines; no teeth on vomer. Gill openings not extending far forward; the isthmus broad; 2 low, papillæ-like elevations on inner edge of shoulder girdle. Head naked; the skin conspicuously wrinkled and folded; body with small embedded scales on posterior parts, extending on sides almost to base of pectoral; other parts naked. Dorsals separate; 3 spines, 11 rays. Anal with 10 rays. Spines and rays of the 3 fins enveloped in thick skin. Upper rays of pectoral simple, free at tips. Ventral rays I, 5; the fins united; free from the body posteriorly. Color black, conspicuously marked with white. A single species from the rock pools of Japan. Its relations are evidently with *Luciogobius*, *Clariger* being intermediate.

(ἀστράβη, a saddle.)

51. *ASTRABE LACTISELLA* Jordan and Snyder, new species.

Head 3 in length; depth  $4\frac{1}{3}$ ; D. III-11; A. 10; P. 24.

Body short, robust; depth of caudal peduncle  $2\frac{1}{3}$  in head. Head depressed, broad posteriorly, its width equal to depth of body. Snout  $\frac{1}{2}$  in head, broadly rounded when viewed from above. Nostrils with high rims. Eyes small, perfect; interorbital space 3 in head. Jaws subequal, the lower slightly projecting; maxillary not greatly prolonged, extending to a vertical through posterior edge of orbit. Lips pendulous. Teeth on both jaws simple; no canines; no teeth on vomer. Gill opening extending upward as far as does the base of the pectoral, not running far forward below; the isthmus wide. Inner edge of shoulder girdle with 2 small elevations.

Skin thick, considerably wrinkled and folded on head, a V-shaped ridge extending from the interorbital space toward the upper edge of gill openings; a low crest above the eye; a preorbital fold running downward parallel with the maxillary, a branch passing backward below the eye well on to the cheek; snout and interorbital area conspicuously wrinkled; lower jaw with a low median fold, a larger one on either side, the anterior part of which is cut off, forming a small pendant flap; a third fold, the edge of which has bead-like elevations lying between the latter and the lower lip; branchiostegal area with small folds.

Dorsal fins separate; the longest spine contained about 3 times in head; soft dorsal free from caudal; when depressed not quite reaching base of latter; the rays slightly longer than the spines of first

dorsal. Anal inserted below base of second dorsal ray; when depressed it extends a little farther posteriorly than does the dorsal. Dorsals and anal covered with thick skin, making the determination of the number of rays difficult. Caudal rounded. Pectoral similar in shape, extending to a vertical midway between tip of ventrals and the anal opening; of 24 or 25 rays, the upper 6 of which are detached and simple. Ventrals rays I, 5; the fins united; the disk elevated anteriorly; free from body posteriorly.

Head and anterior parts of body naked; small, thin, embedded scales on posterior parts, the scales growing forward on a V-shaped area almost to base of pectoral. Lateral line indicated anteriorly by a series of 9 or 10 groups of little pores, 3 or 4 pores arranged vertically in each group.

Color blue black; a broad, white band passing over back part of head and anterior region of body, including basal third of pectoral fin; another narrower and shorter band between the dorsals, encroaching

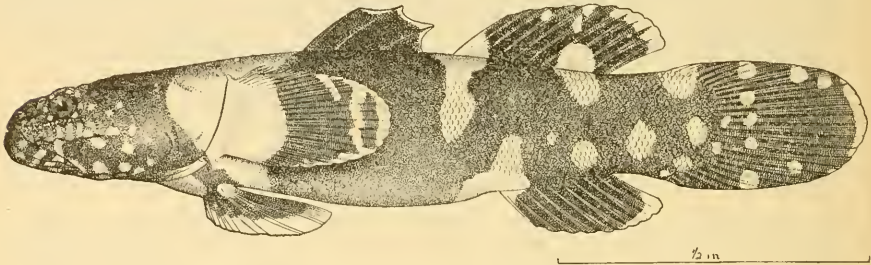


FIG. 26.—*ASTRABE LACTISELLA*.

on base of soft dorsal; a third passing over the ventral surface at insertion of anal, its ends in the central region of the body being near those of the dorsal band just mentioned; several large and small white spots on body and on the unpaired fins posterior to the bands; throat white; cheeks and chin with white specks; pectorals spotted with white near the tips; ventral disk bordered with white.

The general form of the body and the peculiarly wrinkled and folded skin of the head reminds one of the blind goby of Point Loma, *Typhlogobius californiensis*.

Type No. 6460, Leland Stanford Junior University Museum.

The single known specimen was taken in August, 1900, at the rock pools near Misaki, in Sagami.

(*Lac, lactis*, milk; *sella*, saddle.)

## 28. *CLARIGER* Jordan and Snyder, new genus.

*Clariger* JORDAN and SNYDER, new genus (*cosmurus*).

This genus has the form and general appearance of *Luciogobius*, differing in the presence of a short spinous dorsal of three slender



spines. The body is elongate, the head broad and flattened, and the skin with a few cycloid scales on the tail. Below the eye are a few short filaments or barbels.

Japan.

(*Clarus*, clear; *gero*, to bear, from the white back.)

52. CLARIGER COSMURUS Jordan and Snyder, new species.

Head  $3\frac{3}{4}$  in length; depth  $7\frac{3}{4}$ ; depth of caudal peduncle 10; eye  $7\frac{3}{4}$  in head; snout 5; D. III-12; A. 12; P. 18.

Body not sloping much from its deepest part toward caudal peduncle; cylindrical anteriorly; caudal peduncle greatly compressed. Head elongate; broad; flat on top. Snout long; pointed; lower jaw projecting. Maxillary extending beyond eye. Mouth almost horizontal. Tongue broad, notched anteriorly. Teeth simple, in narrow bands on both jaws; lower jaw with a small canine on each side. Eyes directed obliquely upward; the space between them about equal to their diameter. Gill openings not extending far forward. No papillae

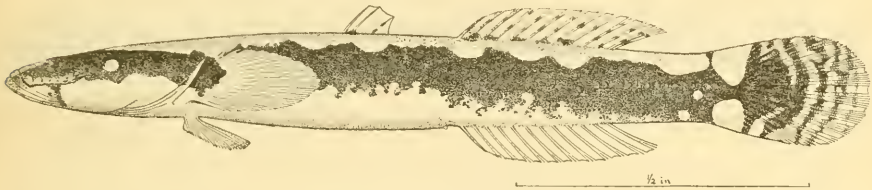


FIG. 27.—CLARIGER COSMURUS.

on inner edge of shoulder girdle. No barbels on jaw. A row of slender barbels extending along suborbital area from snout to a point a little beyond eye.

Head naked; a row of rather large, round, cycloid scales on median part of caudal peduncle. Dorsals separate, the first of 3 slender spines; soft dorsal with fleshy membrane. Anal inserted below first dorsal ray. Caudal round. Pectorals acutely rounded. Ventrals free posteriorly from body.

Color white; a broad, chocolate-colored lateral band, with irregular borders, extending from tip of snout to base of caudal fin; the band narrow on snout, gradually widening to the posterior end; at base of caudal the white encroaches on the band from above and below, nearly dividing it, and causing it to spread out in a fan-shaped figure almost entirely covering the fin, the solid color broken up into dots and vertical bands on posterior part of fin.

The species is known from a single specimen, 37 millimeters long, secured at Misaki, Sagami. Type 6461, Leland Stanford Junior University Museum.

(*κοσμέω*, to adorn; *οὐρά*, tail.)

## 29. EUTÆNIICHTHYS Jordan and Snyder, new genus.

*Eutæniichthys* new genus (*gilli*).

Body elongate, compressed, with rudimentary, embedded, rather small, cycloid scales. Head short; mouth small, oblique, the chin not prominent; teeth simple; isthmus broad; no barbels; dorsal rays III, 17; anal 12, the soft dorsal much larger than the anal, and beginning far in front of it. Ventrals well developed. Caudal pointed.

Japan.

(*Eutænia*, a garter snake; *εὖ*, well; *ταβία*, ribbon; *ἰχθύς*, fish.)

## 53. EUTÆNIICHTHYS GILLI Jordan and Snyder, new species.

Head  $6\frac{1}{2}$  in length; depth 11; depth of caudal peduncle 3 in head; eye  $4\frac{1}{2}$ ; D. III-18; A. 11.

Body very long and slender. Snout blunt, about equal in length to diameter of eye; jaws equal. Eyes directed obliquely upward; interorbital space narrow. Mouth oblique, cleft reaching a vertical

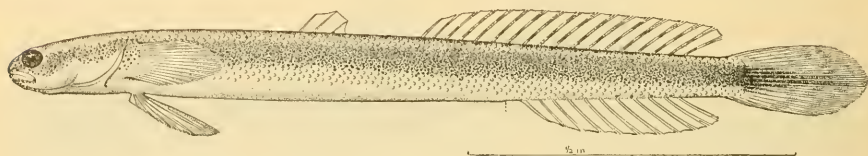


FIG. 28.—EUTÆNIICHTHYS GILLI.

through anterior edge of pupil. Teeth simple, curved, in 2 or 3 rows on each jaw; no canines. Gill openings not extending far forward below; the isthmus broad. No papillæ on inner edge of shoulder girdle. No barbels on head.

Head naked; body with rather small, round, cycloid, scattered scales.

Dorsals separate, the spinous dorsal far in advance of soft dorsal; spines short, slender; soft dorsal, when depressed, not quite reaching caudal. Anal inserted below anterior third of dorsal, extending as far posteriorly as does the dorsal. Caudal acutely rounded. Pectoral pointed, the upper edge without free filaments. Ventrals long, free posteriorly.

Color in spirits yellowish white; a broad band of brownish and blackish dots extending along sides throughout the entire length, the color on caudal fin darker than that of body; median dorsal region with brown dots grouped together, forming spots of irregular outline.

The species is easily recognized by its short spinous dorsal and very slender body. Known only from four specimens about 35 mm. long, collected by Dr. K. Kishinouye in the Tone River, near Tokyo. Type No. 6462, Leland Stanford Junior University Museum.

(Named for Dr. Theodore Gill, in recognition of his studies of Japanese gobies.)

## 30. LUCIOGOBIUS Gill.

*Luciogobius* GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 146 (*guttatus*).

Body elongate, moderately compressed, the skin naked. Head long and low, depressed above, with tumid cheeks; mouth rather large, terminal, oblique, the chin prominent; teeth pointed; no barbels; tongue notched; gill openings narrow, not extending forward below, separated by a broad isthmus. Spinous dorsal wanting. Soft dorsal rather short, opposite the short anal; caudal short, rounded, remote from dorsal and anal; pectorals rather large, without silk-like rays; ventrals very short, the rays indistinct, the two fins united in a rounded disk. Color dusky.

One species known, a small goby of the muddy shores of Japan, resembling *Zoarcids* in appearance, but evidently belonging to the same family with the other gobies.

(*Lucius*, pike; *Gobius*, goby.)

## 54. LUCIOGOBIUS GUTTATUS Gill.

*Luciogobius guttatus* GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 146 (Shimoda; Coll. J. Morrow).—GÜNTHER, Cat. Fish., III, 1861, p. 152; after Gill.

*Luciogobius guttatus* STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 26, Yokohama.

Head  $4\frac{1}{2}$  in length; depth  $6\frac{1}{2}$ ; depth of caudal peduncle  $9\frac{1}{2}$ ; eye  $8\frac{1}{2}$  in head; snout  $4\frac{1}{2}$ ; D. 13; A. 12; P. 17.

Body cylindrical anteriorly; caudal peduncle not much compressed. Head broad and depressed; the cheek muscles greatly developed, bulging outward and upward, making a deep concavity on top of head. Eyes small, directed obliquely upward; interorbital space concave, the eyes projecting somewhat above its floor. Snout rather pointed, its length contained about 3 times in postorbital part of head; lower jaw projecting. Mouth almost horizontal; the cleft wide, extending to a vertical passing just behind orbit. Teeth minute, in narrow bands on both jaws; no canines. Tongue broad, forked at tip. Gill openings narrow, extending upward but little above middle of base of pectoral; the isthmus very broad, its width about equal to depth of caudal peduncle. Inner edge of shoulder girdle without protuberances. Gill-rakers on first arch represented by slight elevations only.

Head and body naked; skin of snout wrinkled; lips pendulous; anterior nostril with a short tube. No barbels.

Spinous dorsal absent. The skin in the region which is occupied by the fin in other gobies has a peculiar folded structure, shaped somewhat like a feather, a median elevated ridge, with smaller radiating ridges on either side; the latter extending posteriorly along the base of soft dorsal. Soft dorsal inserted directly above first ray of anal; the distance between tip of snout and insertion of dorsal about equal to 3 times length of head; depressed fin falling far short of base of

caudal; anal lower than dorsal; the height of rays about 2 times the diameter of eye; membranes of both dorsal and anal fleshy. Caudal rounded posteriorly. Pectoral rounded, the upper edge without filamentous rays. Ventral disk small, broad, free posteriorly.

Color in spirits light yellowish olive; upper parts darkened by a close stippling of blue-black, the points growing larger and farther apart on the ventral surface; dorsal parts and sides of head and body with small, round spots of the light body color. Dorsal fin with about

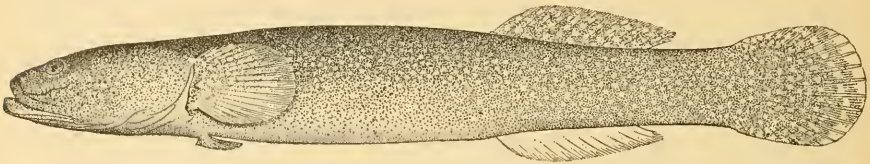


FIG. 29.—LUCIOGOBIUS GUTTATUS.

4 longitudinal rows of indistinct, small dark spots on the rays. Caudal with vertical, wavy, dark bands, broader than the light interspaces. Anal white, except a very narrow dusky area at base. Pectoral dusky. Ventrals without dark color.

A small species found living in little sandy pools under rocks at low

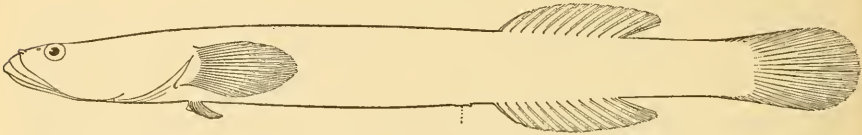


FIG. 30.—LUCIOGOBIUS GUTTATUS (elongate example).

tide: the specimens here described found among stones on one of the old artificial islands in the bay of Tokyo. We also have very numerous specimens from Hakodate, Wakanoura, Same, and a very small one from Nagasaki. In the rock pools of Hakodate Head they are especially abundant. The species varies widely in depth of body and in breadth of the head. We are unable, however, to recognize more than one species in the genus.

(*Guttatus*, spotted.)

Measurements of *Luciogobius gultatus*.

Length in millimeters. ....	47	51	46	51
Depth expressed in hundredths of length ...	15	14½	14½	15½
Depth of caudal peduncle .....	9½	9	10	9½
Length of head .....	24	22	25	24
Length of snout .....	6	5	6	6
Width of interorbital space <i>a</i> .....	6	6	7	7
Diameter of orbit .....	3	3½	3½	3½
Distance from snout to dorsal .....	65	65	66	66
Height of longest dorsal rays .....	5	5	5½	8½
Distance from snout to anal .....	65	65	66½	65
Height of longest anal rays .....	5	4½	5½	6½
Length of caudal peduncle .....	18	19	18	17½
Length of caudal fin .....	14½	14	14	15
Length of pectoral fin .....	15½	14	14½	14
Length of ventral fin .....	5	5	6	5
Number of dorsal rays .....	12	12	12	12
Number of anal rays .....	12	12	12	12
Number of pectoral rays .....	17	16	17	16

*a* Distance between eyes.

## 31. LEUCOPSARION Hilgendorf.

*Leucopsarion* HILGENDORF, Berliner Monatsber., 1880, p. 339 (*petersi*).

Body elongate, compressed, scaleless, the substance translucent; head short, depressed above; the cheeks little tumid; the eyes prominent; mouth rather large, terminal, oblique; teeth simple, no barbels; tongue notched; isthmus narrow, the gill openings continued forward below. Spinous dorsal wanting; soft dorsal moderate, well separated from the short caudal; anal longer than the soft dorsal and inserted well in advance of the latter; pectorals rather long; ventrals very small, fully united, forming a rounded scale-shaped disk, the rays obscure; the structure seems exactly as in *Gobius*, but the fin much less developed.

Small translucent fishes of the estuaries of Japan, evidently closely allied to *Luciogobius* and related to the true gobies. One species known.

(λευκός, white; ὀψάριον, a little fish.)

## 55. LEUCOPSARION PETERSI Hilgendorf.

SHIRO-UWO (WHITE FISH): HIO.

*Leucopsarion petersi* HILGENDORF, Berliner Monatsber., 1880, p. 340, April 5, Southern Japan.

Head 5½ in length; depth 7½; depth of caudal peduncle 12⅔; eye 4 in head; snout 3½; maxillary 2½; D. 13; A. 17; P. 15.

Body long, slender, considerably compressed; caudal peduncle notably long. Head long, not so deep or broad as body; snout rather blunt, the lower jaw projecting. Eyes small, directed laterally; interorbital space convex, the distance between eyes equal to length of snout. Mouth oblique; maxillary extending to a point below middle of pupil. Teeth simple, long, slightly curved backward, in a single row on each jaw; no canines. Gill opening broad, extending very far forward; the isthmus narrow. No papillæ on inner edge of shoulder girdle. Gill-rakers long and slender. No barbels on head.

Head and body naked. Skin along median part of back anterior to dorsal, with a peculiar feather-shaped structure; a median elevation with short, oblique, lateral branches.

Dorsal extending a little farther posteriorly than the anal. Caudal slightly notched, the lobes rounded. Anal inserted much in advance of dorsal. Pectoral rounded, without detached rays on upper edge. Ventrals short, free from body posteriorly.

Color in life translucent, in spirits yellowish white; lips with minute brownish dots; occiput with a few small spots of same color; median

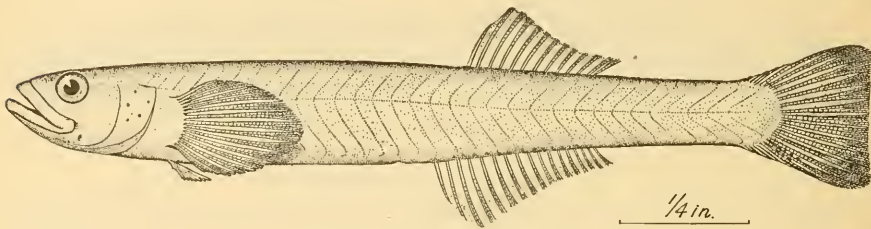


FIG. 31.—LEUCOPSARION PETERSI,

dorsal area with small dots; a brownish black line on throat and anterior half of belly. Some specimens have the color less intense than have others, the small spots on occiput often being absent.

Described from numerous specimens collected at Niigata, in Echigo, presented by Dr. C. Ishihawa. We also have representatives from Hiroshima. It was not seen elsewhere by us. (Named for Dr. W. Peters, of the University of Berlin.)

*Measurements of Leucopsarion petersi.*

Length in millimeters.....	39	36	36
Depth expressed in hundredths of length....	13	13	14
Depth of caudal peduncle.....	8	7½	8½
Length of head.....	21	20	21
Length of snout.....	6	5½	5½
Width of interorbital space.....	4	5	5
Diameter of orbit.....	4	5	5
Distance from snout to soft dorsal.....	51	61	60
Height of longest dorsal rays.....	10	11	6
Distance from snout to anal fin.....	55	55	54
Height of longest anal rays.....	12	11	7
Length of caudal peduncle.....	21	21	21
Length of caudal fin.....	14	15	15
Length of pectoral fin.....	14	17	14
Length of ventral fin.....	7	6	17
Number of dorsal rays.....	13	13	13
Number of anal rays.....	17	17	17

32. TRYPAUCHEN Cuvier and Valenciennes.

*Trypauchen* CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, p. 152 (*ragina*).

Body elongate, compressed, covered with minute cycloid scales; head short, compressed, bluntly rounded in profile; mouth rather small, terminal, oblique, the thick lower jaw very prominent; teeth moderate, in bands; tongue inconspicuous, not notched; no barbels; gill openings confined to the side, the isthmus very broad; eyes very

small, but distinct, the interorbital space elevated; a pit above the opercle, opening into a cavity which is separate from the gill cavity. Dorsal fin continuous, very long and low, of 6 short spines and 40 to 50 soft rays; soft dorsal and anal continuous with the pointed caudal; pectoral fins small; ventral fins very small, I, 4, more or less fully united, but usually notched at tip. Vertebrae  $10 + 24 = 34$ .

East Indies, north to Japan. Slender, eel-shaped gobies, remarkable for the cavity above the opercle.

(*τρύπη*, hole; *ἀρχήν*, nape.)

56. TRYPAUCHEN WAKÆ Jordan and Snyder, new species.

*Trypauchen vagina* STEINDACHNER, Reise Schiff Aurora, 1898, p. 220, Kobe (not of Schneider).

Head  $6\frac{2}{5}$  in length; depth  $8\frac{3}{4}$ ; eye  $11\frac{1}{2}$  in head; interorbital space  $6\frac{3}{4}$ ; snout 4; maxillary 3; D. VI, 52; A. 46; scales in lateral series 55, in transverse series about 12.

Body very long; greatly compressed. Head short, as wide and deep as body; its dorsal part, posterior to eyes, with a sharp, bony crest. Eyes very small, directed obliquely forward; interorbital area convex;

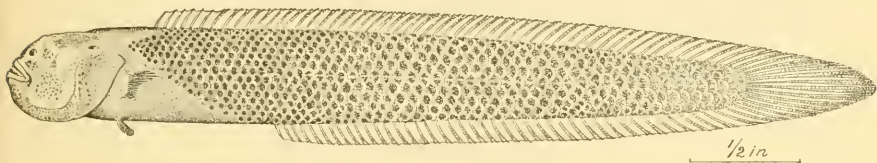


FIG. 32.—TRYPAUCHEN WAKÆ.

space between the eyes about equal to twice their diameter. Snout short, blunt; lower jaw projecting beyond the upper. Mouth oblique. Maxillary concealed, extending to a vertical through anterior edge of orbit. Teeth in 2 rows, simple, the outer ones enlarged; no canines. Gill opening not extending far forward; the isthmus broad, its width contained about 3 times in head. No papillæ on inner edge of shoulder girdle. Gill-rakers reduced to mere elevations on the arch. Anterior nostrils with distinct tubes. Deep pit at upper edge of opercle, about as long as eye. No barbels.

Head naked; the skin with many mucous pores. Body with small, thin, round, cycloid scales; nape to front of dorsal and breast to beyond tip of pectoral and ventral naked; belly nearly back to vent naked, or with a few scattered scales.

Dorsals connected; the spines short and strong; the rays slightly longer than the spines; anal rays as high as those of dorsal; both dorsal and anal connected with caudal. Caudal pointed. Pectoral acutely rounded above; the lower rays shortened, its upper edge without free filaments; its length  $3\frac{1}{2}$  in head. Ventrals very small, 5 in head, free posteriorly; the tip of the united fin notched.

Color in spirits bluish brown.

Type No. 6515, Leland Stanford Junior University Museum.

Wakanoura, Kii.

The species is close to *Trypauchen vagina* of India, but the pectorals and ventrals are much shorter than in the latter species. According to Cuvier's description and Day's figure, the naked area on front of trunk is much smaller, and the figure shows a more elongate mouth and head.

Inland sea of Japan in sandy bays. We have specimens from Wakanoura, Owari Bay, and Kobe.

(*Waka-no-ura*, bay of Waka, or romantic song.)

### 33. TÆNIOIDES Lacépède.

*Tænioides* LACÉPÈDE, Hist. Nat. Poiss., II, 1798, p. 580 (*herrmannianus*).

*Amblyopus* CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 157 (*herrmannianus*).

*Odontamblyopus* BLEEKER, Archives Néerl., IX, 1874, p. 330 (*rubicundus*).

Body elongate, compressed, eel-shaped, naked or with very rudimentary scales. Head oblong quadrilateral, flattish above. Mouth almost vertical, the lower jaw prominent, thick, its cleft directed upward; maxillary not produced backward; tongue not notched. Teeth slender, in a band, the outer ones, especially below, very long and curved. Eyes minute, hidden. Gill openings confined to the sides; the isthmus broad. Dorsal fin very long, the anterior part of 5 or 6 slender, wide-set spines, more or less distinct; the soft dorsal of 30 to 50 rays; soft dorsal and anal continuous with the slender, pointed caudal; pectoral fins short; ventral fins long, I, 5, completely united, not adnate to the belly; no pseudobranchiæ. Vertebrae 11 + 17 = 28.

Estuaries of Japan, China, and southward; several species known. Distinguished from the American genus *Gobioïdes* by the much larger number of dorsal and anal rays. (D. VI, 16 in *Gobioïdes*.)

(*ταινία*, ribbon; *εἶδος*, resemblance.)

### 57. TÆNIOIDES LACEPEDEI (Schlegel).

*Amblyopus lacepedei* SCHLEGEL, Fauna Japonica, Poiss., 1848, p. 146, pl. LXXV, fig. 2.

Bay of Omura, near Nagasaki.

Head  $7\frac{1}{2}$  in length; depth 17; depth of caudal peduncle 4 in head; maxillary 3; D. VI, 46; A. 44.

Body extremely elongate, compressed. Head long, rounded anteriorly. Mouth almost vertical, the lower jaw projecting beyond the upper. Maxillary concealed, not extending far back. Eyes small; covered by the skin. Teeth in 2 series; an inner narrow band of villiform teeth, and an outer row of large, loosely attached, fang-like teeth. Tongue rounded anteriorly. Gill opening restricted to the sides; the isthmus broad. No papillæ on inner edge of shoulder girdle. Gill-



rakers very short and blunt. No pseudobranchia. Anterior nostrils with small tubes. Symphysis of lower jaw with a pair of short, slender barbels. Skin much wrinkled on snout and lower jaw.

Head and body naked. Lateral line represented by a series of about 27 groups of minute pores, each group arranged in vertical lines.

Dorsal continuous; 6 slender spines; 46 rays; anal of about 44 rays; dorsal and anal continuous with the caudal; the membranes tumid. Caudal pointed. Pectoral very small, contained about 3 times in

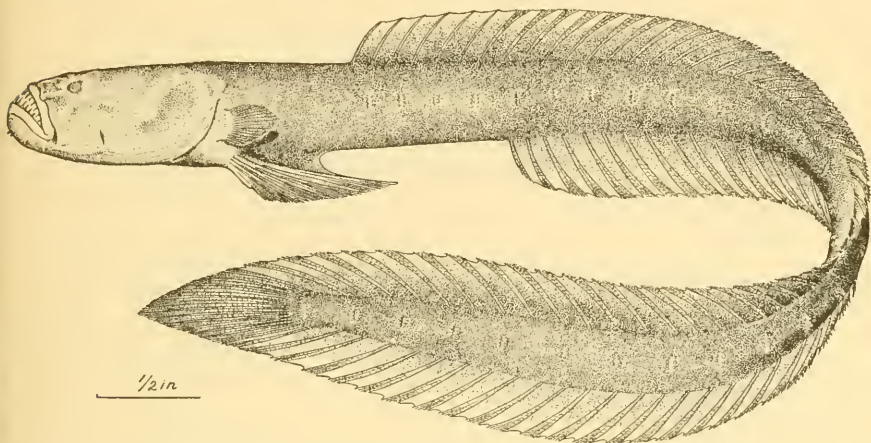


FIG. 33.—TENIOIDES LACEPEDEI.

head; acutely rounded; the upper edge without free filaments. Ventrals large; about equal to length of head; free posteriorly; the anterior half connected to the body by a flexible fold of skin.

Color in spirits bluish brown.

Its slender body, long dorsal and anal, concealed eyes, and other peculiar characters make it easy to recognize among Japanese gobies.

Southern Japan, in sandy bays; apparently not common. Our specimens were obtained at Wakanoura. It is called *Warasubo*, or straw-eel. (Named for Bernard Germain Étienne de la Ville-sur-Ilon, Comte de La Cépède.)

RECAPITULATION.

List of the species of Gobiidae known to be found in Japan, with localities from which we have specimens. Species marked \* are here described for the first time.

1. *Vircosa* Jordan and Snyder.

1. \* *hauw* Jordan and Snyder.  
Misaki, Sagami.

2. *Asterropteryx* Rüppell.

2. \* *abaix* Jordan and Snyder.  
Misaki.

3. *Valenciennesa* Bleeker.

3. *muralis* (Quoy and Gaimard).

4. *Odontobutis* Bleeker.  
4. *obscurus* (Schlegel).  
Tokyo; Kurume, Chikugo; Lake Biwa (Funaki); Kawatana.
5. *Eleotris* Schneider.  
5. *fusca* (Schneider).  
6. *oxycephala* (Schlegel).  
Yokohama; Wakanoura, Kii; Lake Biwa.
6. *Boleophthalmus* Cuvier and Valenciennes.  
7. *chinensis* (Osbeck).  
Nagasaki; Tokyo.
7. *Periophthalmus* Schneider.  
8. *cantonensis* (Osbeck).  
Tokyo.
8. *Hazeus* Jordan and Snyder.  
9. \* *otakii* Jordan and Snyder.  
Nagasaki.
9. *Goous* Linnaeus.  
10. \* *pacilichthys* Jordan and Snyder.  
Misaki.
10. *Ctenogobius* Gill.  
11. \* *abei* Jordan and Snyder.  
Wakanoura.
12. *similis* (Gill).  
Nagasaki; Kurume; L. Biwa, Matsubara; Kaga; Kana R., Yamashiro; Tsuchishima; Ishikawa-ken; Kawatana, Hizen; Iyo, Shikoku.
13. *gymnauchen* (Bleeker).  
Misaki; Wakanoura; Nagasaki; Tokyo Bay; Tsuruga; Enoshima, Sagami.
14. \* *hadropterus* Jordan and Snyder.  
Nagasaki; Kurume; Tsuruga; Kawatana.
15. \* *campbelli* Jordan and Snyder.  
Wakanoura.
16. \* *virgatulus* Jordan and Snyder.  
Misaki; Wakanoura; Nagasaki; Tokyo Bay; Matsushima; Onomichi; Semida R., near Tokyo.
17. *pylaumi* (Bleeker).  
Yokohama; Wakanoura; Tsuruga, Echizen; Aomori, Rikuoku; Matsushima; Rikuzen; Onomichi, Bingo; Kobe, Settsu; Owari Bay; Kawatana.
11. *Aboma* Jordan and Starks.  
18. *lactipes* (Hilgendorf).  
Matsushima; Aomori; Tokyo; Tsuruga; Enoshima; Tone R., near Tokyo.
19. *tsushima* Jordan and Snyder.  
Tsushima.
20. *heptacantha* (Hilgendorf).  
21. *breunigi* (Steindachner).  
22. *urotonia* (Hilgendorf).
12. *Cryptocentrus* Ehrenberg.  
23. *filifer* (Cuvier and Valenciennes).  
Onomichi; Nagasaki; Wakanoura; Tokyo; Kobe; Tsuruga.

13. *Glossogobius* Gill.

24. *brunneus* (Schlegel).  
Hakodate; Onomichi; Kurume; Nagasaki; Wakanoura.

14. *Chenogobius* Gill.

25. *annularis* Gill.  
26. *macrognathos* (Bleeker).  
Funaki, Omi; Kurume; Aomori; Tokyo; Tsuruga; Chitose; Matsubara; Same;  
Gifu, Mino; Nagoya, Owari; Kawatana.

15. *Chloea* Jordan and Snyder.

27. *castanea* (O'Shaughnessy).  
Nagasaki; Misaki; Matsushima; Aomori; Tsuruga; Niigata, Echigo.  
28. *lavis* Steindachner.  
29. \* *mororana* Jordan and Snyder.  
Mororan, Hokkaido; Tokyo, Matsushima.  
30. \* *sarchymnis* Jordan and Snyder.  
Wakanoura.

16. *Chasmius* Jordan and Snyder.

31. *dolichognathus* (Hilgendorf).  
Misaki; Wakanoura; Nagasaki; Tsuruga; Matsushima; Enoshima; Hakodate,  
Hokkaido; Same, Rikuoku.  
32. *misakius* Jordan and Snyder.  
Misaki; Nagasaki; Enoshima; Hakodate; Tsushima.

17. *Pterogobius* Gill.

33. *virgo* (Schlegel)  
Miyajima; Uruga, Sagami.  
34. *clapoides* (Günther).  
Hakodate; Matsushima; Aomori; Utatsu, Noto.  
35. \* *daimio* Jordan and Snyder.  
Misaki; Wakanoura.  
36. \* *zacalles* Jordan and Snyder.  
Misaki.  
37. \* *zonoleucus* Jordan and Snyder.  
Misaki.

18. *Suruga* Jordan and Snyder.

38. \* *fundicola* Jordan and Snyder.  
Suruga Bay; Matsushima; Sagami; Owari Bay.

19. *Acanthogobius* Gill.

39. *flavimanus* (Schlegel).  
Hakodate; Onomichi; Kurume; Nagasaki; Wakanoura; Misaki; Matsushima,  
Aomori; Tokyo; Tsuruga; Enoshima; Niigata; Yodo R., Osaka.

20. *Sagamia* Jordan and Snyder.

40. \* *russula* Jordan and Snyder.  
Nagasaki; Misaki; Wakanoura.

21. *Synechogobius* Gill.

41. *husta* (Schlegel).

22. *Parachaturichthys* Bleeker.

42. *polymenus* Bleeker.  
Tsuruga; Kobe; Nagasaki; Wakanoura; Hiroshima; Onomichi.

23. *Chaturichthys* Richardson.
43. *stigmatias* Richardson.  
Sasuna, Tsushima.
44. *hexanemus* (Bleeker).  
Nagasaki; Tsuruga; Owari Bay; Aomori; Tokyo; Matsushima; Mororan,  
Hakodate.
45. \**sciistius* Jordan and Snyder.  
Tsuruga; Owari Bay; Aomori; Tokyo; Matsushima; Mororan; Hakodate.
24. *Ainosus* Jordan and Snyder.
46. *genicnemus* (Hilgendorf).  
Misaki.
25. *Tricenopogon* Bleeker.
47. *barbatus* Günther.  
Tokyo.
26. *Tridentiger* Gill.
48. *obscurus* (Schlegel).  
Tsuruga; Aomori; Matsushima; Kawatana; Kobe; Kurume; Nagasaki; Misaki;  
Wakanoura; Same; Enoshima; Niigata; Tone R.; Ise; Ishikawa-ken.
49. \**bucco* Jordan and Snyder.  
Misaki; Tokyo.
50. *bifasciatus* Steindachner.  
Tokyo; Nagasaki.
27. *Astrabe* Jordan and Snyder.
51. \**lactisella* Jordan and Snyder.  
Misaki.
28. *Clariger* Jordan and Snyder.
52. \**cosmurus* Jordan and Snyder.  
Misaki.
29. *Eutrechthys* Jordan and Snyder.
53. \**gilli* Jordan and Snyder.  
Tone R., near Tokyo.
30. *Luciogobius* Gill.
54. *guttatus* Gill.  
Tokyo; Hakodate; Nagasaki; Wakanoura; Same, in Rikuoku.
31. *Leucopsarion* Hilgendorf.
55. *petersi* Hilgendorf.  
Niigata; Hiroshima.
32. *Trypauchen* Cuvier and Valenciennes.
56. \**wakae* Jordan and Snyder.  
Owari Bay; Kobe; Wakanoura.
33. *Tenioides* Lacépède.
57. *lucpedei* (Schlegel).  
Wakanoura.