

# NOTES ON A COLLECTION OF FISHES FROM THE ISLAND OF FORMOSA.

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The island of Formosa is now part of the Japanese Empire. Beyond the general fact that its fauna must be similar to that of the neighboring coasts of China and the Philippines, scarcely anything is known of its fishes. In the present paper is given the record of two collections made under Japanese auspices. The first was obtained by Mr. Tsunatsuke Tada, teacher in the Middle School at Osaka, for the Imperial University of Tokyo. The second was obtained by Japanese naval officers and others for a fisheries exhibit in Tokyo, and has been deposited in the Imperial Fisheries Institute or School of Fisheries of Tokyo. The latter collection was placed in our hands by Dr. Shimosuke Matsubara, director of the Fisheries Institute. These specimens are without other locality than "Taiwan," and are apparently a series of the common market fishes of the port of Keerun (Keelung), the chief port of Formosa. This collection contains but few duplicates. The collection of Mr. Tada was made in six localities: Keerun, Taihoku, Giran, Toii, Suwata (Suwo Bay), Kotosho, and Hokoto. Taihoku is the capital of Formosa on the Tan Sin (fresh water) river. Keerun (Keelung) is its seaport at the north end of the island. Giran is a neighboring seaport to the eastward of Keerun. Toii and Suwata are near Giran. Hokoto, or Pescadores, is a large group of islands to the westward of Formosa; Kotosho a smaller group to the southeastward. Giran is about 50 miles to the westward of Ishigaki, in the Riukiu group. This collection is made up chiefly of small fishes, but among them are numerous duplicates, of which specimens have been placed in the United States National Museum and in the Museum of Stanford University.

The authors are indebted to Mr. Edmund Heller for a preliminary identification of part of the collection, a piece of work which other duties have prevented him from completing. Important aid has also been given by Mr. Michitaro Sindo.

In the following list the specimens received from the Fisheries Institute without other locality than Taiwan (Formosa) and returned to that institution are marked F. I. The specimens have mostly Japanese collectors' numbers. 1 x, 2 x, etc.; those not so provided were given numbers by us. These numbers, remaining attached to the specimens for purposes of identification, may serve as a convenience to future students in Japan. The following genera and species seem to be new to science:

*Zacco*, new genus.

*Zacco erolans*, Taihoku.

*Acheilognathus mesenbrinum*, Kotosho.

*Anguilla remifera*, Formosa (Keerun?).

*Gymnothorax pescadoris*, Hokoto.

*Erenchelys* (new genus), Kotosho.

*Ophicephalus tadianus*, Formosa (Tan Sin R.?).

*Channa formosana*, Suwata.

*Bleekeria mitsukurii*, Giran.

*Pempheris nyctereutes*, Hokoto.

*Nemipterus matsubarae*, Giran.

*Plectrotychus ocyurus*, Formosa.

*Polydactylus rhadinus*, Formosa.

*Chacrops nyctemblema*, Formosa (Keerun?).

*Hemipteronotus verrens*, Keerun.

*Sillago wobus*, Keerun.

*Salarias numiyei*, Hokoto.

*Brotula formosa*, Formosa.

*Cymoglossus diplasios*, Formosa (Keerun?).

## Family HEMISCYLLIIDÆ.

### 1. CHILOSCYLLIUM INDICUM (Gmelin).

We refer our specimen to *Chiloscyllium indicum*, although the dorsal fins are somewhat farther apart than is shown in Dr. Day's figures of that species, separated by an interspace equal to the distance from the snout to base of pectorals. The snout is a little shorter than in *C. indicum*, 2.1 in head.

Description of specimen No. 1638, F. I., Formosa: Length, 685 mm.; head and body (snout to anus) 3 in length; head 2.5 in head and body; snout 5 in head and body; snout to mouth 4.5 in head and body; pectoral 3 in head and body; ventrals 4 in head and body; height first dorsal 1.4 times the base; interspace of dorsals 2.75 base of first dorsal.

Head flat above, the interorbital portion slightly concave; back with a low median ridge extending from above pectorals nearly to first dorsal, another between the dorsals, and one posterior to second dorsal.

Pectoral wide, rounded, beginning between second and third gill-slits; first dorsal slightly higher than second, truncated and beginning slightly posterior to posterior base of ventrals, separated from second dorsal by an interspace equal to length of pectoral; second dorsal similar in shape and size to first dorsal, situated considerably in advance of anal, from which it is separated by an interspace nearly equal to base of anal; anal low, rounded anteriorly and separated by a deep notch from the caudal; caudal long and low, length more than one-half head and body, truncated posteriorly and deeply notched below near the tip. Mouth wide, width equal distance of spiracle from first gill-slit; distance from tip of snout slightly less than one-half snout; inferior labial fold continuous; angle of mouth somewhat nearer eye

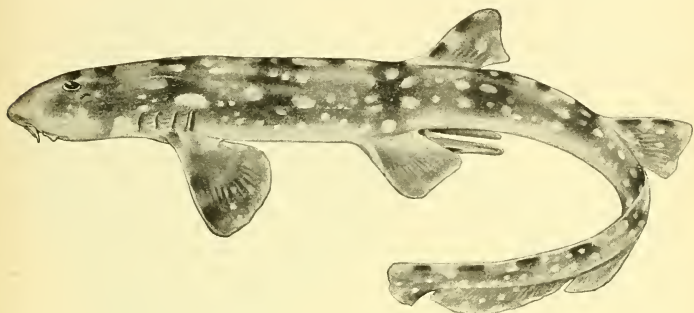


FIG. 1.—*CHILOSCYLLIUM INDICUM*.

than tip of snout; nasal tentacles slender, tapering, length equal to diameter of eye; teeth triangular, with a pair of small lateral cusps at the base of medium size.

Coloration, above grayish, marked with about 9 broad transverse bands of brownish inclosing light spots; pectorals, dorsals and caudal spotted like the back; below light grayish or yellowish-gray, unspotted.

Only one specimen in the collection which has been returned to the Fisheries Institute.

*Measurements.*

Length, 685 mm.	First dorsal, height, 27.
Snout to anus, 236 mm.	First dorsal, base, 20.
Head, 41 (hundredths of length to anus).	Second dorsal, height, 26.
Snout, 19.	Interspace of dorsals, 36.
Interorbital, 12.	Caudal, length, 55.
Snout to mouth, 9.	Base of anal, 25.
Pectoral, length, 35.	Second dorsal to anal, 23.
Ventral, length, 26.	

Dr. Günther records *Chiloscyllium indicum* from Formosa<sup>1</sup> and Nystrom records it from Nagasaki.

<sup>1</sup>Cat. Fish., VIII, p. 412.

## Family GALEORHINIDÆ.

## 2. TRIAKIS SCYLLIUM Müller and Henle.

Three small specimens in the collection, all unspotted: No. 6169, Formosa, F. I., 6173 (74x), Formosa, F. I., 6444 (72x), Formosa, F. I. A larger one, No. 12250, Formosa, F. I., is spotted and banded as in Japanese specimens.

## 3. GALEORHINUS JAPONICUS (Müller and Henle).

One rather small specimen, 570 mm. in length, No. 6168, Formosa, F. I.

## 4. SCOLIODON WALBEEHMI (Bleeker).

A single specimen, 525 mm. in length, differs from descriptions of this species only in the slightly shorter snout and interspace between anal and ventrals. No. 6166, Formosa, F. I.

## Family SPHYRNIDÆ.

## 5. SPHYRNA ZYGÆNA (Linnæus).

One small specimen in the collection. No. 73x=6165, Formosa, F. I.

## Family SQUALIDÆ.

## 6. SQUALUS, species.

Two fetuses. One of these has been compared with a fetus of *Squalus mitsukurii*, from Misaki. The Formosa specimen has the dorsal spines considerably lower and the snout shorter. It may belong to some different species. Dorsals and pectoral largely black, with white edgings in both. No. 6169, Formosa, F. I.

## Family RHINOBATIDÆ.

## 7. RHINOBATUS SCHLEGELI Müller and Henle.

Our specimen, which is 490 mm. in length, is without tubercles on the median line of back. No. 6170, Formosa, F. I. = 70xx.

## Family DASYATIDÆ.

## 8. DASYATIS AKAJEI (Schlegel).

Description of specimen No. 6445 = 77x, Formosa, F. I. Length of disc, 210 mm.; width  $1\frac{1}{2}$  length; snout 4 times in length of disc; interorbital width twice snout; tail 2 times length of disc; disc somewhat broader than long and rounded at the pectoral angles; snout slightly produced beyond the oblique anterior edges of the disc; interorbital space with a large triangular depressed area; snout with a

shallow median groove; eyes smaller than the large spiracles; ridge of back with a series of blunt spines, the interscapular one largest; a short series of three or four spines on the scapular region running parallel to the median series; dental laminae slightly undulated; floor of mouth with three tentacles.

Cutaneous fold along inferior surface of tail distinct, height about one-half pupil, beginning below caudal spine and extending to middle of tail; a much shorter and somewhat lower fold on superior surface of tail situated a considerable distance behind the spine; base of tail armed above with a median series of five stout spines situated some

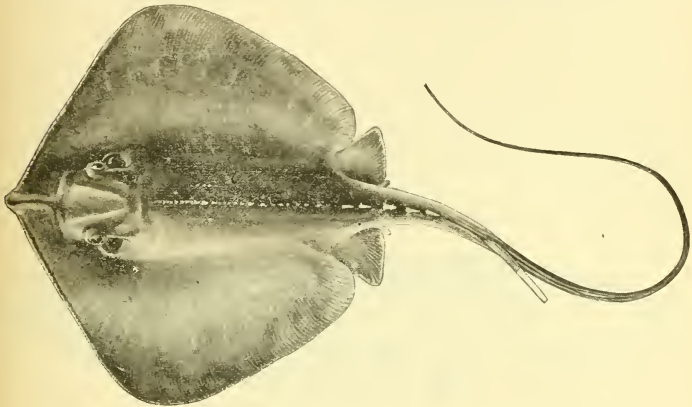


FIG. 2.—*DASYATIS AKAJEI*.

distance anterior to the caudal spine, which is placed about one-fourth distance from origin of tail; caudal spine of our specimen broken at tip, the basal portion without serrations.

Coloration above, purplish brown, becoming lighter toward edges of disc and posteriorly; tail like back; below uniform whitish.

This specimen differs a little from *Dasyatis akajei*, but is probably the young of that species.

*Measurements of specimen No. 77r.*

Length of disc, 210 mm.  
Width of disc, 235 mm.  
Tail, 420 mm.

Snout, 0.26.	
Interorbital width, 0.13.	
Ventrals, 0.20.	

The proportional measurements are based on length of disc as the unit of comparison.

## Family SILURIDÆ.

## 9. GLANIS ASOTUS (Linnæus).

Anal fin united to the caudal.

Head 5; depth 5.25; snout 3.3 in head; eye 3 in snout; interorbital 2.5 in head. D. 4; A. 81; P. I. 12; V. 11; C. 16. Body spindle-shaped, anteriorly depressed and posteriorly compressed; body deepest a little posterior to dorsal, from which point it slopes obliquely down to the broad depressed snout; mandible depressed like the snout, projecting; body posteriorly depressed and tapering gradually to the tail; interorbital space flat; a well-marked median dorsal groove from occiput to middle of anal.

Teeth in broad villiform bands in both jaws and in a broad continuous band on vomer; maxillary barbels long, reaching past end of ventral spine; mandibular tentacles short, equaling interorbital width; eye small, diameter 4 times in interorbital width; snout short, rounded, 3.3 in head; lateral line following outline of back, continuous from above opercle to base of caudal.

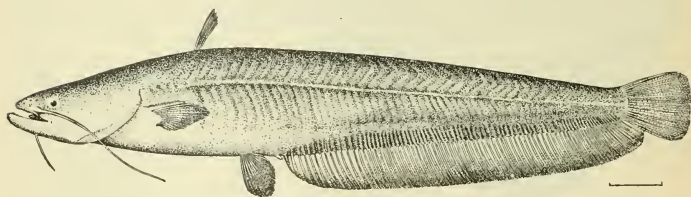


FIG. 3.—GLANIS ASOTUS.

Dorsal short, of 4 rays, placed about midway between insertion of pectorals and ventrals, height about 3 in head; pectoral inserted below angle of opercle, the longest rays reaching slightly past vertical from dorsal; pectoral spine strong, serrated on outer edge, length equal to height of dorsal; ventrals situated before anus, obtusely pointed, longest rays exceeding pectoral spine; anal long, beginning at anus and extending to the caudal to which it is united, height equal to that of dorsal; caudal 2 in head, truncate.

Coloration above, brownish-olive; fins, the same; below, yellowish-white, the mandible, sides below pectoral, and breast along gill-openings finely brown-spotted.

One specimen, 12 inches long, from Formosa, without indication of locality, but doubtless from the Tan Sin River at the capital, Taihoku. The generic name *Glanis* Agassiz is equivalent to *Parasilurus* Bleeker.

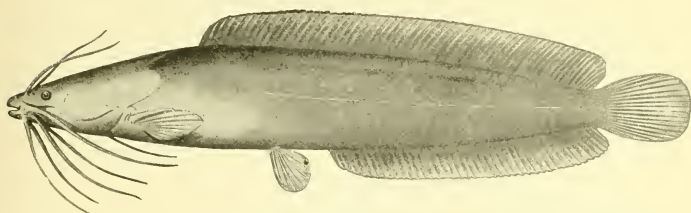
## 10. PLOTOSUS ANGUILLARIS (Bloch).

One specimen, No. 12071, from Giran.



11. *CHLARIAS FUSCUS* (Lacépède).

Two specimens, Nos. 6446, from Taihoku, and 5060 from Formosa, F. I. The first has P. 1., 9; A. 43.

FIG. 1.—*CHLARIAS FUSCUS*.12. *TACHYSURUS SINENSIS* Lacépède.

One specimen, No. 6171, F. I., with the dorsal and pectoral spines somewhat shorter and the palatine patches of teeth more rounded than in the published figures, otherwise agreeing. A young example, No. 12075, Suwata, is an immature representative probably of the same species.

13. *TACHYSURUS FALCARIUS* Richardson.

One specimen, No. 6171; Suwata.

## Family COBITIDÆ.

14. *MISGURNUS ANGUILLICAUDATUS* Cantor.

Two specimens, No. 5065, from Taihoku; one 57x, Formosa, F. I.

## Family CYPRINIDÆ.

15. *CYPRINUS CARPIO* Linnæus.

One specimen, No. 875=53x, Formosa, F. I.

16. *CARASSIUS AURATUS* (Linnæus).

Giran; Taihoku, No. 3830, Formosa, F. I.; No. 866=57x, Formosa F. I.

17. *ROHITA DECORA* (Peters).

One specimen, No. 3837=57x, Formosa, F. I., 162 mm. long.

D. 16, its first rays unbranched; A. 9, its first rays very small, the 7 posterior rays branched; P. 19; C. 20; scales 40; pharyngeal teeth 5-4, 2; head 5.5 in length; depth 3.2; eye 3.3 in head; no maxillary barbels.

The generic name *Rohita* should take the place of *Labeo* which is

preoccupied in *Sparidae* by *Labco* Bowdich, 1825 = *Boops* Cuvier, 1817. *Labco sparoides* Bowdich, Exe. Madeira, 1825, p. 122, fig. 59, is identical with *Boops boops* (Linnaeus).

18. CTENOPHARYNGODON IDELLUS (Cuvier and Valenciennes).

One large specimen, 355 mm. long, agreeing fairly with Günther's description. Head 4.3; depth 3.3; pharyngeal teeth 2, 5-4, 2; D. 10; A. 11; V. 10; P. 20; scale 6-41-4 (to ventrals); depth 3.8 in length; head 4.4.

No. 56x=5061, from Formosa, F. I., doubtless from Taihoku.

19. HEMIBARBUS BARBUS (Schlegel).

Head 3.5 in length; D. III, 7; A. 9; scales 47.

No. 57x=867, Formosa, F. I.

Also recorded from Formosa by Günther. It is similar to specimens from Osaka, except that the snout is a little longer and the dorsal spine stouter.

20. CULTER BREVICAUDA Günther.

Head 4.25; depth 3.25; D. II, 7; A. 28; scales 67; teeth 5, 4, 1-4, 4, 2.

No. 55x=865, F. I. The species was originally described from Formosa.

21. CIRRHINA, species.

Closely allied to *Cirrhina chinensis* Günther. D. 15; A. 7; scales 37; teeth 5, 4, 2.

No. 837, Formosa, F. I.

22. ZACCO PACHYCEPHALUS (Günther).

D. 9; A. 12; scales 53; Head 3.25; depth 3.5; pharyngeal teeth 5, 3, 1; four scales between lateral line and ventrals.

No. 12076, Suwata; 12232, Taihoku. The species was originally described from Formosa, collection of Consul Swinhoe.

The new generic name *Zacco* Jordan and Evermann (*Zakko*, a minnow, in Japanese) may be applied to the group of which *platypus* is the type. It differs from *Opsariichthys* in lacking the peculiar notched jaws of the type (*uncirostris*) of that genus. The anal fin in *Zacco* is much elevated in the males, which are also highly colored (blue and crimson) in the breeding season, the head covered with warts.

23. ZACCO EVOLANS Jordan and Evermann, new species.

Two specimens, No. 877, F. I., and 12231, Taihoku, agree fairly with ordinary Japanese specimens except in the much greater length of the pectorals. Scales 45; pectorals reaching ventrals; anal lobe past front of caudal. Body with about twelve dark cross-bars.



Head 4.25; depth 4.25; eye 3.2; snout 4; interorbital 3; D. 9; A. 11; scales 9-47-4. Body short and very greatly compressed; back somewhat arched; head moderate, mouth rather large, slightly oblique, the jaws subequal, the snout rather pointed; scales very thin, cycloid, lateral line running very low; jaws and cheek with a number of phosphorescent spots; origin of dorsal nearer tip of snout than base of caudal, the fin very high, its rays greater than length of head; caudal forked; anal fin very large, the rays nearly twice the length of head; ventrals short, reaching origin of anal; pectoral long and falcate, half longer than head, reaching middle of ventrals.

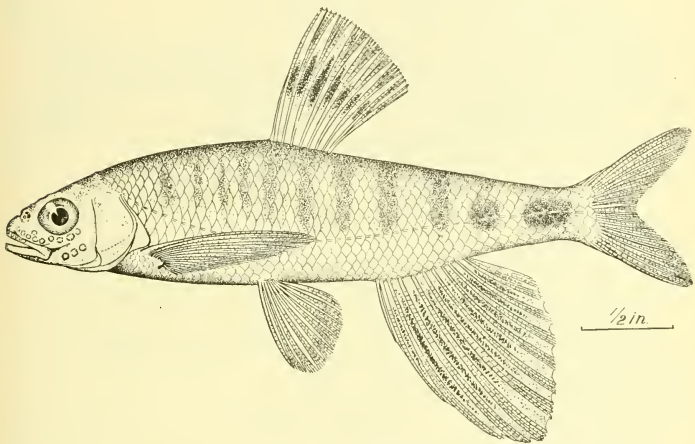


FIG. 5.—ZACCO EVOLANS.

Color in alcohol, silvery-olivaceous above, the side with about eleven broad, dark, plumbeous cross-bars, suggesting the parr marks in a young trout; membranes of dorsal fin dark brown or almost black near center of fin; membranes of anal fin dark; other fins pale.

*Type*.—No. 12230, a specimen 3.5 inches long, from Taihoku. This is numbered 7129 Stanford University Museum.

24. ACHEILOGNATHUS MESEMBRINUM Jordan and Evermann,  
new species.

Head 4; depth 2.8; eye 3.5; snout 4; maxillary 3; mandible 2.5; interorbital 2.5; D. 8; A. 15; scales 8-38-5.

Body short, deep, and very greatly compressed, bearing some resemblance to the American species called *Cyprinella*; head small and pointed; mouth moderate, somewhat oblique, the jaws subequal, maxillary reaching anterior edge of orbit; scales large and well imbricated; lateral line running low, gently decurved under front of dorsal, and

passing along lower third of caudal peduncle; origin of dorsal slightly nearer tip of snout than tip of caudal fin; the fin high, its anterior rays nearly equaling head in length; base of anal oblique, the free edge somewhat concave, the longest rays 1.3 in head; caudal fin lunate; ventrals and pectorals moderate, the latter falcate.

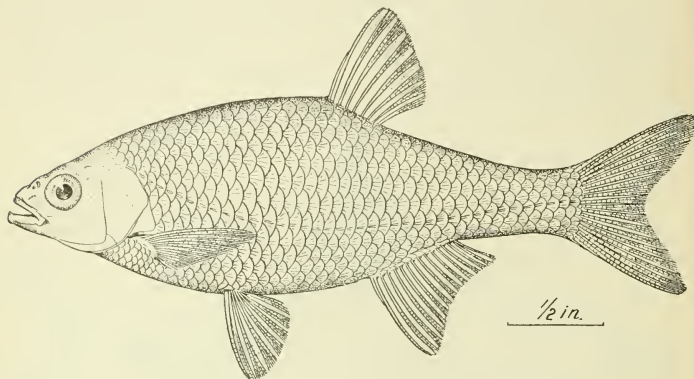


FIG. 6.—ACHEILOGNATHUS MESEBRINUM.

Color in alcohol, yellowish-silvery, without markings anywhere.

Two other specimens, Nos. 12072 and 12078, from Kotosho.

*Type*.—No. 12235, a specimen 3.5 inches long, from Kotosho, Formosa = 7130 Stanford University Museum.

#### 25. DILLONIA, species.

Allied to *Dillonia aculata* Cuvier and Valenciennes. Head shaped as in *Scaphiodon*. Mandible with barbels; D. 10; A. 11; scales 39.

The specimen of this species from Formosa has been mislaid, and nothing more can be said of it at present.

#### Family MONOPTERIDÆ.

#### 26. MONOPTERUS ALBUS (Zuiew).

Head 10.5; tail 3.5 in rest of body; No. 12066, F. I.

In another specimen, perhaps not the same species (No. 6448, Hokoto), the tail is a little longer, more than one-third rest of body, and the head 11.5 in length. Much more material is necessary to ascertain whether more than one valid species of *Monopterus* exists.

## Family ANGUILLIDÆ.

27. *ANGUILLA MANILENSIS* (Bleeker).

One specimen, No. 1590, from Kotosho. Maxillary teeth in two bands, separated by a longitudinal division, as in *A. bengalensis*; eye large, the cleft of the mouth extending to just below posterior edge of pupil; head somewhat less than distance between front of dorsal and anal; pectoral broad, dark; coloration mottled. This specimen agrees fairly with Bleeker's figure of *Muraena manilensis*.

28. *ANGUILLA MAURITIANA* Bennett.

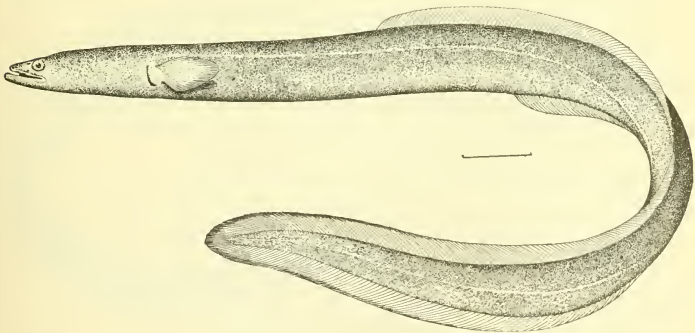
Distance from front of anal to front of dorsal much greater than head; pectoral 2.7 in head; head short, about equal to distance from gill-opening to dorsal fin; eye small, cleft of mouth extending to beyond it; lips very thick; anterior nasal tubes prominent; body much mottled with black. A large specimen, No. 12073, from Kotosho.

29. *ANGUILLA SINENSIS* McClelland.

A small specimen, No. 6447, from Taihoku. It agrees with Günther's account of *A. latirostris*, but that species was originally described from Nice. The long head, greater than the distance from front of dorsal to front of anal, is characteristic of this species.

30. *ANGUILLA REMIFERA* Jordan and Evermann, new species.

Near *Anguilla japonica* Schlegel, but the pectoral much longer, 2.17 in head and rather pointed. Distance from front of dorsal to front of anal slightly more than length of head.

FIG. 7.—*ANGUILLA REMIFERA*.

One specimen, No. 12064 (70), 18.5 inches long, from Hokoto, Formosa, returned to the Imperial University.

Head 9; depth 18; eye 10.5; snout 6. Distance from snout to origin of dorsal less than one-third total length; anal origin about two-fifths total length from tip of snout; dorsal and anal confluent around caudal; pectoral 2 in head; gill-opening small; lower jaw slightly projecting; teeth strong.

Body long and slender, little compressed, except posteriorly; head long, pointed. Color in alcohol, grayish-olive, paler below; caudal and posterior portions of dorsal and anal edged with black.

#### Family LEPTOCEPHALIDÆ.

##### 31. LEPTOCEPHALUS, species.

One ribbon-shaped larva of some eel or eel-like fish, probably a *Conger*, but not certainly identifiable.

#### Family OPHICHTHYIDÆ.

##### 32. PISOODONOPHIS BORO (Hamilton-Buchanan).

No. 1591, Toii, and No. 12065, Formosa, F. I.

##### 33. OPHICHTHUS CEPHALOZONA Bleeker.

A small specimen agreeing with *O. cephalozona* in most regards, but the dorsal is lower and the pectoral shorter, 4.7 in head. The coloration is obscure, the body being crossed by obscure paler bands; the markings on the head as figured in *O. cephalozona*. Apparently these variations are due to the immature condition of the specimen.

No. 6449, Hokoto.

#### Family MURÆNIDÆ.

##### 34. GYMNOTHORAX PESCADORIS Jordan and Evermann, new species.

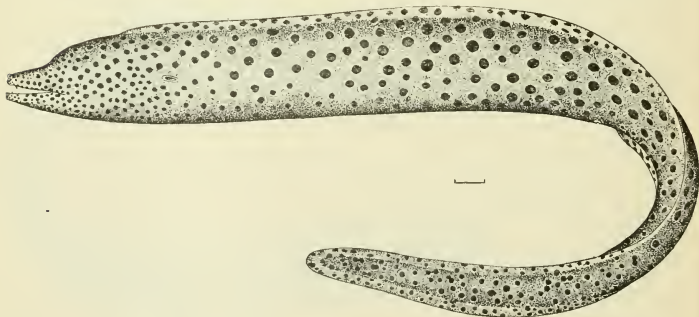


FIG. 8.—GYMNOTHORAX PESCADORIS

Teeth uniserial on side of each jaw; two large, sharp, movable teeth on median line of roof of mouth; eye 2.25 in snout, in anterior half of gape; tail slightly shorter than rest of body.

Color in alcohol, dark olive-brown, covered profusely everywhere with large, roundish, jet-black spots, these largest and most numerous on back and sides, more sparse on belly; spots of jaws and head less regular in shape and very numerous, the interspaces being more nearly white.

*Type*.—No. 6450, 40 inches long, from Hokoto or Pescadores Islands, No. 7131, Stanford University Museum.

35. *EVENCHELYS MACRURUS* (Bleeker).

Second series of mandibular teeth fewer than as described; posterior vomerine teeth fewer.

A fine specimen, 6.25 feet in length, No. 12063, from Kotosho.

The new genus *Evenchelys* Jordan and Evermann (type, *macrurus*) differs from *Gymnothorax* in the excessively long tail, which is nearly twice the length of the rest of the body.

Family CHANIDÆ.

36. *CHANOS CHANOS* (Forskål).

D. 14; A. 9; scales 92.

Several young examples, Nos. 12067 (Giran), 12238 (Taihoku), 11435, F. I., 12083, F. I., and 876 F. I.

One specimen from Toii.

Family ELOPIDÆ.

37. *ELOPS MACHNATA* Rüppell.

D. 20; A. 14; V. 14; Nos. 12236, Formosa, F. I., and 12237, from Suwata.

38. *MEGALOPS CYPRINOIDES* (Broussonet).

D. I, 8; A. 24; scales 39.

Head 4 in length; depth 3.5. Nos. 871 (Formosa), F. I., and 12069 (Giran).

Family CHIROCENTRIDÆ.

39. *CHIROCENTRUS DORAB* (Forskål).

Head 6.5 in length; depth 7; eye 4.5 in head; D. 17; A. 30. A large specimen, No. 87 x = 868 (Formosa), F. I.

Family DOROSOMIDÆ.

40. *CLUPANODON MACULATUS* (Richardson).

Head 3.7 in length; depth 2.75; D. 16; A. 25; scales 48. Dorsal not inserted much before ventrals; no black spot on shoulder. No. 12068 (Giran). Recorded by Günther from Formosa.

## 41. CLUPANODON NASUS (Bloch).

D. 17; A. 20; scales 49. Nos. 870, 878=77 x (Formosa), F. I., 12074 (Giran), and 12084 (Kotosho).

## Family CLUPEIDÆ.

## 42. SARDINELLA TOLI (Cuvier and Valenciennes).

D. 18; A. 20. Nos. 12077, and 12085 (Kotosho).

## 43. ILISHA ELONGATA (Bennett).

Head 3.7; depth 3.3; D. 16; A. 44; V. 5; scales 50,-13; 24 sentes before vent, 12 behind. No. 872 (Formosa), F. I., a very large example.

## 44. DUSSUMIERIA ELOPSOIDES Bleeker.

Head 4.3; depth 6; D. 19; A. 16; P. 15.  
No. 11343 (Kotosho), in bad condition.

## Family ENGRAULIDÆ.

## 45. ANCHOVIA INDICA (Van Hasselt).

(*Engraulis russelli* Bleeker.)

Head 4.5; depth 5.75; D. 16; A. 20; P. 13.  
Two specimens, Nos. 12233, F. I., and 12234 (Suwata).

## Family SALMONIDÆ.

## 46. PLECOGLOSSUS ALTIVELIS Schlegel.

Head 4.75; depth 4.75; D. 11; A. 17; V. 8; scales about 133.  
Nos. 3832, 3833, and 3834, Taihoku.

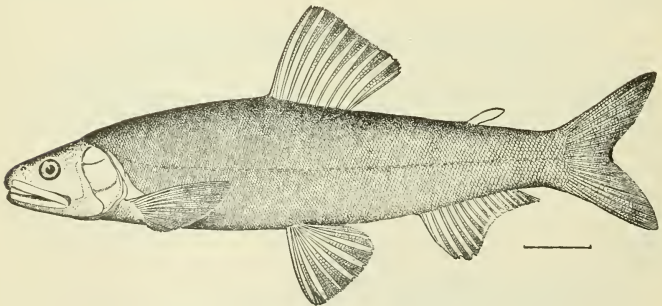


FIG. 9.—PLECOGLOSSUS ALTIVELIS.

These specimens agree with those of the common Ayu of Japan, except that the anal fin is slightly longer, its length being 1.17 in head, nearly twice its longest ray. This difference is doubtless due to their large size, and probably has no taxonomic value.



## Family SYNODONTIDÆ.

## 47. SAURIDA ARGYROPHANES (Richardson).

D. 12; A. 11; scales 52 to 54.

Nos. 11326 and 3836 (Formosa), F. I.

This species is quite different from the Japanese *Saurida japonica*, having the eyes scarcely veiled by the very narrow or adipose eyelid, and the pectoral fin much longer, 1.6 in head, reaching to or beyond front of pectoral. *Saurida japonica* (Wakanoura, Japan) has the pectoral 1.6 in head, not reaching ventrals and reaching about to the eighth scale of lateral line. Head 4.5 in length in *Saurida argyrophanes*; about 5 in *Saurida japonica*.

## 48. TRACHINOCEPHALUS TRACHINUS (Schlegel).

One specimen from Keerun.

## Family BELONIDÆ.

## 49. TYLOSURUS LEIURUS (Bleeker).

Head 3.25 in length; depth 17; D. 19; A. 24; eye 2.5 in postorbital part of head. Length of pectorals much greater than depth of body, equal to postorbital part of head; no gillrakers.

No. 5059=62x (Formosa), F. I.

## 50. TYLOSURUS MELANOSTIGMA (Cuvier and Valenciennes).

Head 3.75 in length; depth 14; D. 25; A. 27; eye 2.25 in postorbital part of head; no dark blotches on sides.

No. 3835 (Formosa), F. I.

## Family NEMIRAMPHIDÆ.

## 51. HEMIRAMPHUS FAR (Forskål).

(*Hemiramphus commersoni* Cuvier).

Head 4.5 in length; depth 5.75; D. 13; A. 11; side with a silvery band and 4 dark spots.

Nos. 11329, 11330, 11436 (Formosa), F. I.

## 52. HEMIRAMPHUS GEORGII Cuvier and Valenciennes

Head 4.5 in length; depth 7.5; eye 1.75 in postorbital region; D. 14; A. 13; scales 50.

Nos. 875 and 879=54x.

## 53. EULEPTORAMPHUS LONGIROSTRIS Cuvier.

One large specimen, No. 3835=17 x (Formosa), F. I.

## Family EXOCETIDÆ.

54. *CYPSILURUS SPILONOTOPTERUS* (Bleeker).

Head 4.75 in length; depth 5.5; D. 14; A. 10; scales 50. Pectorals black within; dorsal with a black blotch; second pectoral ray divided; ventrals white.

No. 3838 = 14x (Formosa), F. I.

## Family FISTULARIIDÆ.

55. *FISTULARIA PETIMBA* (Lacépède).

Head 2.75; snout 3.75; D. 16; A. 12.

One large example, No. 11437 (Formosa), F. I.

## Family OPHICEPHALIDÆ.

56. *OPHICEPHALUS MACULATUS* (Lacépède).

One specimen, No. 38x (Formosa), F. I.

A. 26; scales 53.

One specimen, No. 5096. from Giran.

57. *OPHICEPHALUS TADIANUS* Jordan and Evermann, new species.

Head 3; depth 4.75; eye 8.6; snout 6.2; maxillary 2.65; mandible 2.3; interorbital 5.3; D. 42; longest dorsal ray 3; A. 26; longest anal ray 2.7; ventrals 3.5; pectoral 2.3; scales 6-57-11. Body spindle-shaped, compressed posteriorly, caudal peduncle short, deep and greatly compressed; head long and snake-like, covered with plate-like scales; eye small, anterior; nostrils wide apart, the anterior in a small tube on upper edge of maxillary; mouth oblique, large, the maxillary reaching past orbit; a band of small teeth on outer edge of jaws, a band of large, wide-set, canine teeth on palatines and inner side of lower jaw; upper jaw protractile; dorsal long, of numerous spine-like rays, low anteriorly, gradually lengthening posteriorly; caudal rounded; anal similar to dorsal, but not so long; ventrals very small and short, not reaching vent; pectoral short and rounded; lateral line broken anteriorly, running along center of body from base of caudal to just over second anal ray, thence upward for 2 rows of scales, then forward for 15 rows of scales, thence downward for 1 row, then forward to upper edge of gill-opening, where it ends.

General color in alcohol, olivaceous-brown above, lighter below; belly white, with some yellowish markings; a row of 12 dark olivaceous blotches along base of dorsal, partly on fin and partly on body; below these but above lateral line another row of 8 or 9 similar but larger blotches, extending anteriorly to the middle of upward curve in lateral line; below this another line of about 13 lighter colored and

very irregular blotches, extending from base of pectoral posteriorly along lower edge of lateral line to base of caudal; below this another line of scattered and faint blotches from lower edge of pectoral to posterior end of anal; head color of upper part of body, but streaked with irregular lines of black above; a line of light dusky, as wide as pupil, but becoming nearly as broad as eye at edge of opercle, running from posterior edge of eye to base of pectoral, its lower edge just below upper base of pectoral; below this an irregular line of light brown-olivaceous slightly wider than pupil, running to middle of base of pectoral; head below this pale; dorsal with 2 broken stripes of brown-olivaceous about as wide as pupil; caudal membranes dark, rays pale brown-olivaceous, anal with indications of 4 or 5 dark

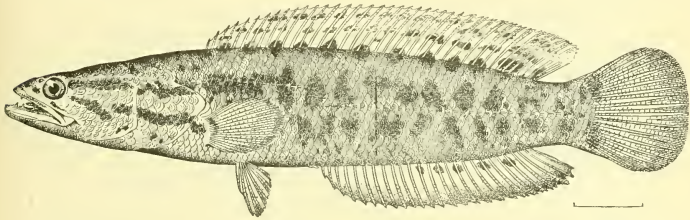


FIG. 10.—OPHIOCEPHALUS TADIUS.

blotches at the base of posterior half, rest of fin pale at base, becoming darker, almost brown-olivaceous toward tips; ventrals pale, dusky; pectoral slightly darker than ventrals.

*Type*.—No. 3xx, a specimen 9.5 inches long, from Formosa, returned to the Imperial Fisheries Institute.

58. *CHANNA FORMOSANA* Jordan and Evermann, new species.

Head 3.6; depth 5.75; eye 5.75; snout 5.25; maxillary 2.5; mandible 2.25; interorbital 3.5; D. 44; A. 28; scales 454-13. Body moderately long and slender, much compressed posteriorly; head large, broad, depressed and snake-like; mouth large, oblique, the lower jaw slightly projecting, the maxillary reaching posterior edge of orbit; teeth cardiform, in both jaws and on vomer; eye moderate; caudal peduncle short, very deep and very much compressed. Scales large, plate-like, each with strong concentric striae; lateral line very irregular, beginning above opercular opening, extending backward on 7 scales, then running for 8 scales on next row above, then dropping irregularly for 3 or 4 rows over origin of anal, thence continued along median line of side to base of caudal fin. Dorsal fin long, beginning over base of pectoral, the rays quite uniform in length, the last being somewhat longest, being about 2.5 in head; anal similar to dorsal, but shorter, beginning under about the twelfth dorsal ray and ceasing

under the last dorsal ray but two; rays of dorsal and anal all unbranched, but articulated; pectoral short and broad, its tip reaching vent; ventrals absent; caudal broad and rounded.

Color in alcohol, yellowish-brown, the side with about 8 V-shaped imbricated dark crossbars, the apex pointing forward; these crossbars plainest posteriorly, more or less broken and irregular in front; a large, round, black ocellus on caudal peduncle at base of caudal fin as large as eye, bordered by white; side of head with two broad, dark bars extending from eye to posterior edge of opercle; dorsal fin punctulate but with about 2 series of rather distinct white spots on the membrane, extending nearly full length of fin; anal fin plain, somewhat dusky at edge; caudal and pectoral pale, slightly punctulate.

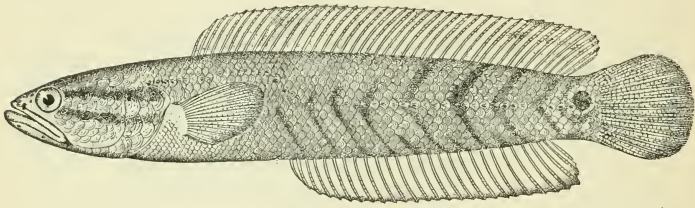


FIG. 11.—CHANNA FORMOSANA.

*Type*.—No. 5075, a specimen 5.25 inches long, from Sowo or Suwata, Formosa, now numbered 7132 Stanford University Museum; others, No. 269, are from Suwata.

#### Family MUGILIDÆ.

##### 59. MUGIL OEUR Forskål.

(*Mugil cephalotus* Cuvier and Valenciennes.)

Several specimens, Nos. 5061, 5062 from Giran, 1589 from Keerun, 5067 from Taihoku, 377, 1064 (F. I.) from Formosa.

D. IV-1, 8; A. III, 8; scales 40,-12.

Dark streaks along scales more or less distinct.

##### 60. LIZA TROSCHELI (Bleeker.)

Head 4.1; depth 3.8; eye 3.75; snout 4.5; interorbital 2; D. IV-1, 8; A. II, 10; scales 30,-10; body rather short and stout, the back gently and regularly arched from tip of snout to origin of spinous dorsal; head small, triangular, the interorbital broad and flat; eye rather large, snout short, the adipose eyelid small; teeth small but visible to the naked eye; sides of lower jaw meeting in a broad angle; lips thin; bare space between dentary bones club-shaped, broadest anteriorly, the subopercles overlapping below; pectoral broad and

short, 1.5 in head; ventrals shorter than the pectoral, their length 2.5 times in distance from their base to origin of anal; first dorsal spine 1.75 in head; soft dorsal low, its longest ray 2 in head; origin of spinous dorsal slightly nearer base of caudal than tip of snout, or over tips of ventrals; caudal moderately forked, the lobes equal, their length equal to that of head; anal origin in front of soft dorsal, its free edge concave, its longest rays 1.75 in head.

Color in alcohol, grayish-silvery on side, dark olive on back and top of head; lower parts silvery-whitish; fins dusky, tips of middle caudal rays blackish.

One specimen, No. 5068, 9 inches in total length, from Hokoto, Formosa.

This specimen agrees with *Mugil troscheli* from the East Indies except that the head is wider, the interorbital space twice the eye, and the body deeper 3.75 to 3.8 in length, equal to length of head. These discrepancies are probably due to individual variations or to the immaturity of the original type.

#### Family SPHYRÆNIDÆ.

##### 61. SPHYRÆNA JELLO Cuvier and Valenciennes.

D. V-I, 9; A. I, 10; scales 17-135-23.

This is doubtless identical with *Sphyræna jello*, but the scales seem smaller, more than 125 in lateral line.

No. 11328 (Formosa), F. I.

##### 62. SPHYRÆNA JAPONICA Schlegel.

D. V-I, 9; A. I, 9; scales 11-87-14.

Nos. 3831; 3839=33x (Formosa), F. I.

##### 63. SPHYRÆNA FORSTERI (Cuvier and Valenciennes).

Scales 110,-16.

Nos. 3831, 880 (34x), Formosa, F. I.

These specimens agree fairly with Günther's account of this species, but the species of this genus need comparative study.

#### Family AMMODYTIDÆ.

##### 64. BLEEKERIA MITSUKURII Jordan and Evermann, new species.

Two specimens, Nos. 11340 and 11342, from Giran.

Near to *Bleekeria kallolepis* and *B. gilli*, but with smaller scales than either. It is not easy to see why Dr. Day<sup>1</sup> should reject the genus *Bleekeria*, placing its species in *Ammodytes*. *Bleekeria* has well-formed and finely sculptured scales, as well as small teeth in the jaws.

<sup>1</sup> Fishes of India.

In *Ammodytes* there are no teeth and the scales are almost obsolete, the body being crossed by folds of skin. *Ammodytes* is subarctic in distribution, *Bleekeria* is tropical. *Ammodytes* has a much larger number of fin rays and doubtless of vertebrae also.

Head 4.6; depth 8.5; eye 5.2; snout 3.8; D. 42; A. 15. Body long, slender, and somewhat compressed; head very long; mouth rather large, the lower jaw much projecting, a prominent point below; maxillary thin, slipping under the preorbital, reaching orbit. Scales small and firm; lateral line running high, about two scales below dorsal, on caudal peduncle suddenly dropping to middle of caudal fin; dorsal fin long and low, depressible in a groove, its origin over base of pectoral; anal short, terminating under last dorsal ray; pectorals short

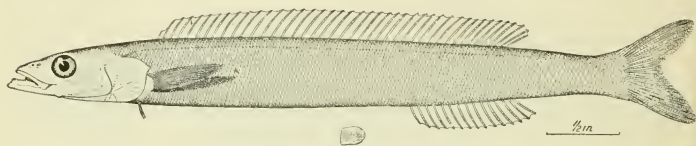


FIG. 12.—BLEEKERIA MITSUKURII.

and pointed; ventrals very minute, slightly in front of pectoral; opercular bones very thin and papery; teeth on front of jaws weak, apparently in villiform patches.

Color in alcohol, plain straw-yellow.

*Type*.—No. 11340, a specimen 4.25 inches long, from Giran, now No. 7133, Stanford University Museum.

#### Family HOLOCENTRIDÆ.

##### • 65. OSTICHTHYS JAPONICUS (Cuvier and Valenciennes).

A large specimen, 1 x, Formosa, F. I.

The genus *Ostichthys* differs from *Myripristis* in the very rough scales and from *Holotrachys* in their very large size, larger than in any species of *Myripristis*.

#### Family MULLIDÆ.

##### 66. UPENEUS INDICUS (Shaw).

One specimen, No. 1592, from Keerun. Two dark streaks on second dorsal; golden area under first dorsal and dark blotch on caudal peduncle distinct.

One specimen, No. 302, from Giran.



67. *UPENEUS CYCLOSTOMUS* (Lacépède).

(*Upeneus luteus* Curvier and Valenciennes; Day.)

One specimen, No. 273, from Keerun. It agrees fairly with Günther's account of *U. cyclostomus* and with Day's figure of *U. luteus*. In view of the doubt as to the synonymy of this species, we follow Günther in identifying it with Lacépède's *Mullus cyclostomus*.

68. *UPENEOIDES VITTATUS* (Forskål).

One specimen, No. 1756, from Keerun. Posterior black band on lower lobe of caudal very broad and black, the coloration unlike that of Hawaiian examples, supposed to be this species, the posterior band broader than in Day's figure.<sup>1</sup>

69. *UPENEOIDES BENSASI* (Schlegel).

One specimen, No. 275, from Keerun. Color, plain except for a dark tip to each dorsal, the color probably faded. Side with dark rivulate markings under each scale. Teeth all small, on jaws, vomer, and palatines. We identify this species with *Upeneoides bensasi* on the supposition that the color is faded. Such faded examples correspond to *Upeneus subvittatus* of Richardson.<sup>2</sup> Probably the original *subvittatus* of Schlegel also is the same species. The latter has a banded caudal, as in *Upeneoides bensasi*.

Two small specimens, No. 314, from Kotosho are colored as in Japanese specimens of *U. bensasi*. Caudal with four dark bands on the upper lobe, the lower dusky with a whitish edge; first dorsal with three dark cross-bands, the second dusky at tip.

70. *UPENEOIDES TRAGULA* (Richardson).

Two specimens, Nos. 1755 and 358, from Keerun, agreeing with Day's figure.<sup>3</sup>

Two specimens, Nos. 303 and 304, from Giran.

One specimen, No. 339, from Formosa, F. I.

One specimen, No. 281, from Hokoto.

Head 3.75; depth 4.2; eye 4; D. VIII-I, 8; A. I, 6; P. 13; scales 32.

## Family TRICHIURIDÆ.

71. *TRICHIURUS JAPONICUS* Schlegel.

One specimen, No. 5064, from Hokoto.

One large specimen, No. 17 x, from Formosa, F. I.

<sup>1</sup>Fishes of India, pl. xxx, fig. 2.

<sup>3</sup>Fishes of India, pl. xxx, fig. 4.

<sup>2</sup>Ieth. China, p. 219, from Canton.

## Family SCOMBRIDÆ.

## 72. SCOMBER JAPONICUS Houttuyn.

One small specimen, No. 27 x, from Formosa, F. I., of some mackerel, with low suborbital and rather elongate body. It may be *Scomber janesaba* Bleeker, but until these various Asiatic mackerel with air-bladders have been fully compared, we are not certain that any of them is separable from *Scomber japonicus*.

## 73. SCOMBER KANAGURTA Russell.

A small mackerel, No. 23 x, from Formosa, F. I., the body and especially the head deeper than in *S. japonicus*; the scales much more distinct, the color silvery, the dark markings less distinct. This corresponds fairly with Day's figure<sup>1</sup> of the species he calls *Scomber microlepidotus*. This seems to be different from *Scomber japonicus*.

## 74. GYMNOSARDA ALLETERATA (Rafinesque).

One specimen, No. 26 x, from Formosa, F. I., in bad condition, the spots behind pectoral obsolete. The identity of this with the Atlantic species is questionable.

## 75. SCOMBEROMORUS KUHLLI (Cuvier and Valenciennes).

One fine specimen, No. 21 x=357, from Formosa, F. I. Body without streaks or spots.

## Family CARANGIDÆ.

## 76. SCOMBEROIDES ORIENTALIS (Schlegel).

One specimen, No. 327, from Giran. This species seems to differ from *Scomberoides toloo* (= *S. sancti-petri*) in the elongate body, the depth being about  $\frac{1}{4}$  in length to base of caudal. The maxillary extends not quite to posterior margin of eye.

## 77. MEGALASPIS CORDYLA (Linnaeus).

(*Scomber rotleri* Bloch.)

A very large specimen, No. 18 x, from Formosa, F. I. Lateral plates extremely large, covering the posterior part of the body with a coat of mail, much larger than in any species of *Carangus*.

A fine large specimen, No. 370, from Formosa, F. I.

## 78. DECAPTERUS MUROADSI (Schlegel).

One specimen, No. 22 x, from Formosa, F. I.

<sup>1</sup>Fishes of India, pl. LIV, fig. 4.

## 79. DECAPTERUS MACROSOMUS (Bleeker).

One specimen, No. 337, from Formosa, F. I. This species is distinguished by the large number of dorsal and anal rays, and the great development of the lateral plates, 49 + 38, the latter number being that of the keeled plates on the straight part. There is a peculiar angulation of the lower part of the shoulder girdle approaching that in *Trachurops*.

A specimen of this species from Kagoshima, Japan, is in the Imperial Museum at Tokyo.

One specimen, No. 24 x, from Formosa, F. I.

## 80. TRACHUROPS TORVA (Jenyns).

One specimen, No. 352, from Formosa, F. I.; one specimen, No. 371 = 23 x, from Formosa, F. I.; one specimen, No. 325, from Giran; and one, No. 2070, from Giran.

## 81. CARANGUS LEPTOLEPIS (Cuvier and Valenciennes).

Two specimens, No. 297, from Keerun. Opercular spot very distinct, encroaching on the shoulder.

## 82. CARANGUS MALABARICUS (Schneider).

One specimen, No. 272, from Keerun. Dorsal lobe 1.4 in head; depth 2.12 in length (without caudal). Otherwise agreeing with Day's figure and Günther's description.

## 83. CARANGUS JARRA (Cuvier and Valenciennes).

One specimen, No. 274, from Keerun, referred with doubt to this species. The depth is 2.2 in length, the soft dorsal lobe 1.2 in head; D. VIII-1, 22. Lateral shields large, about 35 developed; breast naked; lateral line scarcely wavy.

## 84. CARANGUS SEXFASCIATUS (Quoy and Gaimard).

One young example from Keerun. It agrees in essential respects with *Carangus latus* of the Atlantic. D. VIII-1, 20; plates 28 to 30; breast scaly; no distinct opercular spots; body with six broad faint cross-bands; first dorsal and tip of second blackish; anal pale. It agrees in general with Günther's account of *Carangus hippos*, but the true *hippos* is an American species, quite distinct (*Carangus carangus* of Günther).

## 85. CARANGUS, species.

A small specimen from Kotosho resembling *Carangus jarra* (Cuvier and Valenciennes). D. VIII-1, 23; scales about 30; no spots.

86. *CARANGUS ARMATUS* (Forskål).

A large specimen, No. 17 x, from Formosa, F. I., with opercular spot and very high lobes to dorsal and anal fins.

One specimen, No. 21 x, from Formosa, F. I. Opercular spot present; lobes of dorsal and anal very low.

One specimen, No. 20 x, from Formosa, F. I. No opercular spot; produced anal ray as long as base of fin; ventrals pale.

This specimen corresponds to Cuvier and Valenciennes's figure of *Carangus cirrhosus*, but not to *Olistus malabaricus*, regarded by Günther as a synonym.

One large specimen, No. 349, from Formosa, F. I. Dorsal and anal lobes not extending much beyond middle of fin; opercular spot present.

87. *ALECTIS CILIARIS* (Bloch).

One specimen from Formosa, F. I., and two specimens from Keerun.

## Family LEIOGNATHIDÆ.

88. *LEIOGNATHUS EDENTULUM* (Bloch).

Head 3.3 in length; depth 1.7; second dorsal spine 1.3 in head.

Two specimens, Nos. 279 and 297, from Formosa, F. I.

89. *LEIOGNATHUS SPLENDENS* (Cuvier and Valenciennes).

One specimen from Keerun and one fine specimen, No. 329, from Hokoto.

90. *GAZZA EQUULÆFORMIS* (Rüppell).

One specimen, No. 317, from Kotosho. Depth 2.5 in length to base of caudal. Second dorsal spine about 2.7 in depth as in *G. equulæformis*. Axil black; spinous dorsal dusky anteriorly; some vague dark spots along lateral line.

One specimen, No. 328, from Hokoto.

## Family STROMATEIDÆ.

91. *APOLECTUS NIGER* (Bloch).

A large specimen, No. 27 x, from Formosa, F. I. No ventral fins; caudal fin with a strong keel, suggesting that of *Carangus*, the scales on the keel thickened but without spines; color, pale grayish; gill-openings very broad, the membranes not attached to the isthmus.

Head 3.8; depth 2.1; eye 5.6; snout 3.25; maxillary 3.4; mandible 3; interorbital 2.75; preorbital 10; D. 40; highest dorsal ray 1.1; A. 37; longest anal ray 1.3; scales about 27-97-50, rubbed off and difficult to count; pectoral very long and narrow, 1.3 times the head. Body oblong-rhombic, greatly compressed, dorsal and ventral outlines con-

siderably arched; dorsal profile from snout to origin of dorsal fin regularly curved; head moderate, the snout rather blunt; mouth moderate, somewhat oblique, the jaws subequal; maxillary broad, reaching front of orbit, slipping under preorbital for its entire length; teeth setiform, slender, and very weak in each jaw; top of head trenchant; nostrils oblong, very close together; eye moderate, partially covered by adipose membrane, slightly above level of upper lip; preorbital narrow. Cheek deep; edges of opercular bones membranaceous, the opercle very thin and flexible; caudal peduncle depressed, and strongly keeled. Scales small, cycloid, somewhat irregularly placed; cheeks and opercles with fine scales; a large naked area from snout between eyes to occiput; dorsal and anal densely covered with thin scales;

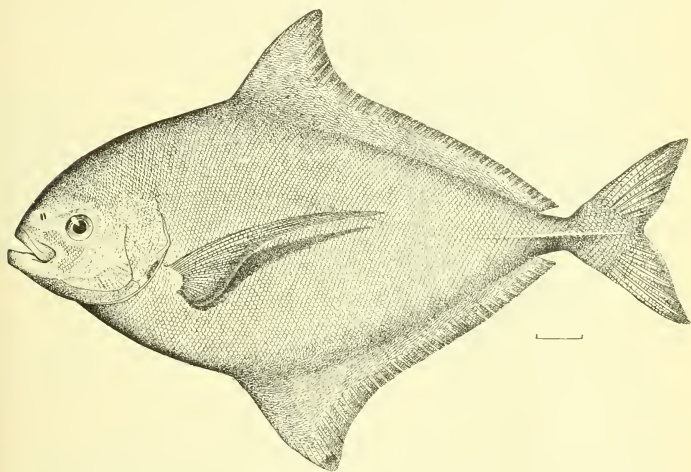


FIG. 13.—*APOLECTUS NIGER*.

caudal with less complete squamation; dorsal fin elevated in front, distance of its origin from snout 1.4 in its base; anal similar to dorsal, its origin more posterior; caudal widely forked.

Color in alcohol, dirty yellowish-white, without markings, except a narrow black blotch on edge of opercle.

#### Family PEMPHERIDÆ.

##### 92. *PEMPHERIS NYCTEREUTES* Jordan and Evermann, new species.

A single large specimen from Hokoto. It does not fit Dr. Döderlein's description of *Pempheris japonicus* very well, and the small size of the scales separates it still further from the others described.

Head 3.4; depth 2.4; eye 2.5; snout 5.5; maxillary 2; mandible 1.75; interorbital 4; D. V, 9; longest dorsal ray 1.5; A. III, 44; longest anal spine 3.6, ray 2.8; scales 80 in lateral line; those above and below are rubbed off and not to be counted accurately. Body oblong, compressed; long base of anal very oblique; lateral line concurrent with the dorsal outline and extending to tip of tail; head compressed; eye large; snout very short, blunt; mouth large, very oblique; villiform teeth on vomer, palatines, and jaws; maxillary extending to below middle of eye; dorsal short, slightly behind ventral; anal very long, low and densely scaled at base; ventral spine as long as rays; pectoral broad, falcate, 1.2 in head; scales deciduous, those of lateral line most persistent.

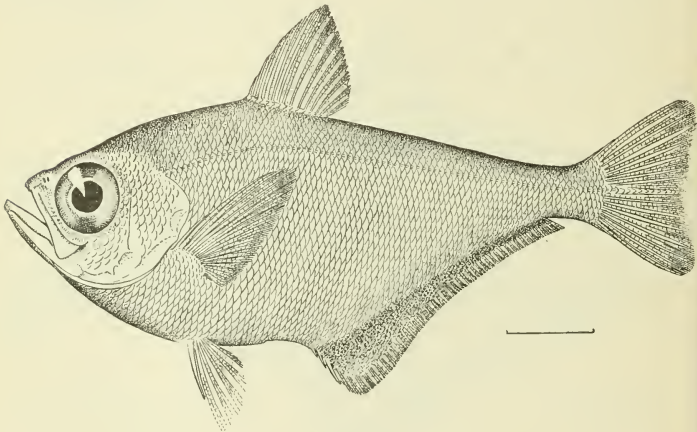


FIG. 11.—PEMPHERIS NYCTEREUTES.

General color in alcohol, olivaceous brown; pectoral and ventrals pale; base of anal dusky brown; throat and under parts of head rusty brown.

*Type*.—No. 286, a specimen 8 inches long from Hokoto, Formosa, returned to the Imperial University.

#### Family KUHLIIDÆ.

##### 93. KUHLIA MARGINATA (Cuvier and Valenciennes).

One specimen, No. 319, from Kotosho, agreeing fairly with Boulenger's description.

#### Family SERRANIDÆ.

##### 94. PSAMMOPERCA WAIGENSIS (Cuvier and Valenciennes).

One fine specimen, No. 340, from Formosa, F. I.



## 95. LATEOLABRAX JAPONICUS (Cuvier and Valenciennes).

One specimen, No. x z, from Formosa, F. I., and one specimen from Keerun.

## 96. EPINEPHELUS TAUVINA (Forskål).

(*Serranus salmoides* Day.)

Three specimens from Keerun, agreeing with Boulenger's description. Other specimens from Formosa are in the British Museum. One specimen, No. 376, with faint spots and with a broad black streak above maxillary.

## 97. EPINEPHELUS MERRA Bloch.

One specimen from Keerun. It belongs to the typical variety *merra* in Boulenger's Catalogue (I, p. 242).

## 98. EPINEPHELUS FUSCOGUTTATUS (Forskål).

One specimen, No. 3 x, from Formosa, F. I.

## 99. EPINEPHELUS EPISTICTUS (Schlegel).

One specimen, No. 280, from Giran, identical with one taken by us at Nagasaki. This species is near to *E. latifasciatus*, but is marked by spots only, not bands or stripes. A series of round blackish spots runs from the eye to the base of caudal. The spines on angle of preopercle are well developed.

One large specimen, No. x 7, from Formosa, F. I. Back sparsely covered with small round dark spots, no trace of dark lines; otherwise very near to *Epinephelus latifasciatus*, of which it may prove a color variation.

## 100. EPINEPHELUS CHLOROSTIGMA (Cuvier and Valenciennes).

One specimen, No. 345, from Formosa, F. I. The spots are less numerous than are shown in the figures of Day and Bleeker, but the general characters agree with Boulenger's description.

One large specimen, No. 363, Formosa, F. I., corresponding to Day's figure of *Serranus arcuatus*.

## 101. EPINEPHELUS DIACANTHUS (Cuvier and Valenciennes).

One small specimen, the dark cross-bands scarcely traceable; a dark streak above maxillary.

A fine specimen, No. 374, from Formosa, F. I. Angle of opercle with two rather strong spines.

One small specimen, No. 355, Formosa, F. I., referred with doubt to this species. There are no dark cross-bands; body with darker spots, which form reticulations, some of them more or less longitudinal; fins unspotted, darker near the edge; a dark streak above maxillary.

## 102. EPINEPHELUS HÆDTI (Bleeker).

One specimen, No. 4 x, from Formosa, F. I. Head and body closely dotted with darker; caudal and anal broadly edged with black; ventrals chiefly black; dorsal with a brownish edge; pectoral plain yellow.

It is possible that Boulenger is correct in referring this species to the synonymy of *Epinephelus flavoceruleus* (Lacépède), a species having the body plain blue or purple, the fins bright yellow.

## 103. PROMICROPS LANCEOLATA (Bloch).

(*Phrynotitan gigas* Günther.)

One young example, No. 5 x, from Formosa, F. I.

## Family LUTIANIDÆ.

## 104. GLAUCOSOMA BURGERI Richardson.

One large specimen, No. 364, 17 inches long, from Keerun, Formosa. Inside of mouth black; peritoneum black. This species seems

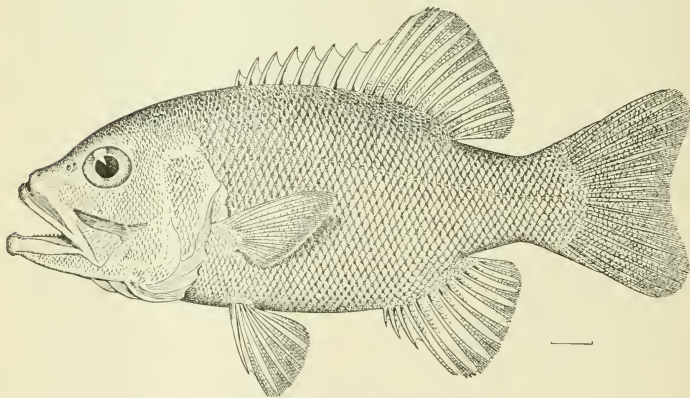


FIG. 15.—GLAUCOSOMA BURGERI.

distinct from *Glaucosoma hebraicum* Richardson. The genus belongs apparently to the *Lutianidæ*, although the extension of the lateral line on the caudal fin suggests relationship to *Lates* and *Psammoperca*. The caudal fin is very slightly lunulate.

Head 2.75; depth 2.4; eye 3.8; snout 3.8; maxillary 1.65; mandible 1.6; interorbital 5; preorbital 7.3; D. VIII, 12; longest dorsal spine 3.5, ray 1.9; A. III, 10; longest anal spine 4, ray 2; ventral 2; pecto-

ral 1.9; scales 12-52-20. Body rather short and deep, compressed; caudal peduncle compressed and deep, its least width 1.65 in eye, its least depth 2.5 in head; back gently and regularly arched from snout to caudal peduncle, somewhat depressed in front of eyes; head large and deep; mouth very large, somewhat oblique, jaws subequal; maxillary very broad at tip, scarcely slipping under preorbital; teeth in a strong villiform band on upper jaw composed of two rows, the outer in front canine-like; those of lower jaw in one series, except in front, where they are somewhat irregular; a large patch of villiform teeth on tongue and hyoid bone; a narrow V-shaped patch on vomer, apparently none on palatines; eye very large, rather high; nostrils close together, the posterior the larger. Scales moderate, weakly ctenoid, covering entire head, body and bases of dorsal, caudal and anal; maxillary densely scaled; base of pectoral scaled; preopercle at the angle with blunt coarse teeth. Fins moderate; dorsal spines rather short but strong, the soft part of dorsal somewhat elevated; anal similar to soft dorsal, the third spine considerably longest; caudal moderate, shallowly lunate, the lobes rounded; pectoral short and broad; ventrals scarcely reaching vent.

Color in alcohol, rusty silvery; head darker, somewhat purplish; edges of scales on side darkish, the bases brassy; dorsal, anal and caudal dusky; pectoral and ventral pale; a large brownish blotch on membrane below preorbital.

105. LUTIANUS FULVIFLAMMA Forskål.

(?*Lutianus hoteen* Richardson.)

A single specimen, badly faded, No. 332, from Keerun. It is identical with another received from Okinawa, and probably belongs to *Lutianus hoteen*, which Günther identifies with *L. fuscescens* from Celebes. In its dull olive coloration it approaches *L. hoteen* rather than *L. fulviflamma* Richardson, with which it agrees in the indistinctly notched preopercle.

It is not unlikely, however, that this is identical with the species figured by Dr. Day as the typical *Lutianus fulviflamma* as distinct from the golden-streaked *Lutianus russelli*.

Two specimens from Keerun. One large specimen, No. 344, from Formosa, F. I.

106. LUTIANUS ANNULARIS (Cuvier and Valenciennes).

One specimen, No. 291, from Formosa, F. I. Black blotch on caudal peduncle above very distinct, bordered before and behind by white; faint dark streaks along the rows of scales, those above oblique, those below horizontal, no trace of streak from first dorsal spine to eye. D. XI, 13; A. III, 8; scales 53.

107. *LUTIANUS ARGENTIMACULATUS* (Forskål).*(Mesoprion gembra* Günther.)

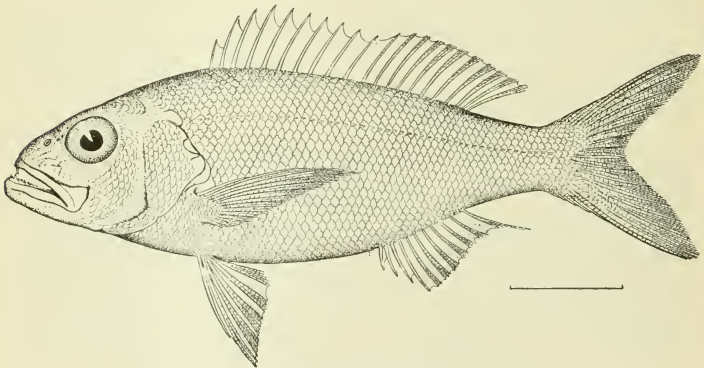
One specimen from Keerun. This species has much in common with *Lutianus argentiventris* and other American species. The parietal crest extends nearly to the point of junction of the supraoccipital crest and orbital rim, indicating that the genus *Neomivnis* will be found untenable.

108. *LUTIANUS VITTA* (Cuvier and Valenciennes).

One specimen from Keerun.

109. *PLATYINIUS SPARUS* (Schlegel).*(Mesoprion sparus* Schlegel.)

Head 3; depth 2.9; eye 3.2; snout 3.5; maxillary 2.25; mandible 1.9; interorbital 4; preorbital 6.25; D. X, 11; longest dorsal spine 2.75 in head; ray 2.75; A. III, 8; pectoral 1.25; ventral 1.7; scales

FIG. 16.—*PLATYINIUS SPARUS*.

10-50-15. Body rather short, deep and compressed; dorsal and ventral outlines gently arched, occipital region slightly depressed; head large; mouth large, somewhat oblique, the lower jaw slightly the longer; maxillary broad, slipping for its entire length under the broad preorbital; eye large; nostrils very small; preopercle strongly serrate at angle. Scales small, nearly cycloid; cheek and opercle scaled, caudal fin scaled at base. Fins moderate, last ray of anal considerably produced.

One specimen, No. 367, 6.25 inches long, from Formosa, F. I. No scales at base of dorsal or anal fins; band of scales at the temples separated from those behind it; scales above lateral line in series

parallel with lateral line; two strong canine teeth in front of each jaw, besides smaller lateral canines; teeth on vomer in a small V-shaped patch; no teeth on tongue; last ray of dorsal and anal produced; caudal deeply forked; gillrakers long, rather few in number, about 12 below angle; 6 rows of scales on cheek; preopercle scarcely notched, with fine long cirri; preorbital not so broad as eye.

Color, apparently bright red, now faded to silvery; cheeks bright silvery.

*Platyinius sparus* has the skull of *Etelis* and *Aprion*, the compressed form of *Platyinius*, and the strong canines of *Lutianus*. Its nearest ally is doubtless *Platyinius macrophthalmus*, but it should be placed in a genus distinct from *Aprion*, characterized by the robust anterior canines.

110. DENTEX HYPSELOSOMUS Bleeker.

Head 2.75; depth 2.2; eye 3.8; snout 2.4; maxillary 2.6; mandible 2.5; interorbital 3.75; preorbital 3.75; D. XII, 10; longest dorsal

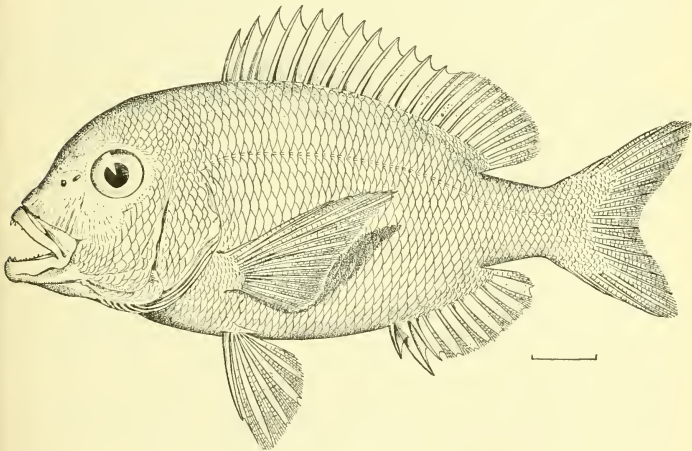


FIG. 17.—DENTEX HYPSELOSOMUS.

spine 2.5; ray 3.2; A. III, 8; longest anal spine 3; ray 3.2; ventrals 1.8; pectoral 1.2; scales 6–50–13. Body short, deep, and compressed, back considerably elevated and trenchant; the anterior profile concave in front of eyes and with a hump above; caudal peduncle moderately compressed, its least width 2 in eye, its least depth slightly greater than eye; head large and deep, mouth large, somewhat oblique, the jaws equal; maxillary heavy, slipping for most its length under the broad, thin preorbital; premaxillaries considerably protractile; teeth

in jaws in an irregular sparse row, broadened into a patch anteriorly; tip of each jaw with 4 large, stout, recurved canines, behind which are the smaller, blunter teeth; no teeth on vomer, palatines, or tongue; eye large, rather high, entirely above upper lip; nostrils remote, the anterior small and round, the posterior larger and ovoid; preorbital very deep; edge of preopercle crenulate; opercle ending in a broad, flat point. Scales large, cycloid, firm, the exposed part much deeper than long; forehead, snout, and preorbital naked; posterior part of cheek and opercles with large scales; nape with smaller scales; a few scales on base of pectoral, and many fine scales on caudal. Fins moderate, the dorsal and anal each folding down into a scaly sheath at base; dorsal spines rather long and slender; anal spines heteracanthous, the second much broader than the others; ventrals not reaching vent; pectoral longer, reaching origin of anal.

No. xx, a specimen 11 inches long, from Formosa, and No. 366 from Formosa.

Forward very gibbous, with a slight concavity above the projecting snout; canines very strong; lateral teeth small, two-rowed, slightly bluntish, not molar-like. Pectoral 3.3 in length; canines  $\frac{1}{4}$ . Silvery in spirits, doubtless crimson in life, the space between the eyes paler.

#### 111. NEMIPTERUS VIRGATUS (Houttuyn).

(*Synagris sinensis* (Lacépède) Günther; *Dentex setigerus* Cuvier and Valenciennes.)

One specimen, No. ix, from Formosa, F. I.

One specimen, No. 333, from Keerun. The depth of body is 3.5 in length (without caudal) in this common Japanese species, not 4, as stated by Günther.

#### 112. NEMIPTERUS MATSUBARÆ Jordan and Evermann, new species.

Head 3.5; depth 3.5; eye 4; snout 3; maxillary 2.5; mandible 2.2; interorbital 6; preorbital 4.2; D. X, 9; longest dorsal spine 2.5; ray 1.75; A. III, 8; longest anal spine 3, ray 1.9; ventral 1, reaching origin of anal; pectoral 1.2; scales 4-48-9; scales on cheek in 3 rows. Body oblong, compressed, deepest through base of ventral; caudal deeply forked; head subconic; preorbital almost as deep as eye; mouth low, anterior profile in a long, gentle curve; eye moderate; maxillary reaching anterior edge of pupil; mouth moderate, horizontal; no teeth on vomer, palatines, or tongue, a single row of small cardiform teeth on sides of each jaw, in lower jaw this row widens into a band of villiform teeth, anteriorly, those in front slightly larger; lower jaw without canines; front of upper jaw with about 8 large, curved canine teeth; dorsal outline a straight line to base of caudal; soft dorsal slightly higher than spinous portion; first anal spine shortest, fin gradually lengthening to last ray; ventral and pectoral long and narrow; no filaments on the fins.



*Type.*—No. 5071, specimen 10.6 inches long, from Giran, Formosa, returned to the Imperial University of Tokyo.

Head 2.5 (2.6 without flaps); depth 3.2; eye 5; snout 4.5; maxillary 2; mandible 1.7; interorbital 7.75; suborbital 12; D. XI, 13; A. III, 8; scales 22–110–40. Body short and compressed; head large, pointed; mouth very large, oblique, the lower jaw slightly projecting; maxillary long, reaching posterior edge of orbit; teeth strong, canine-like in jaws, the band broadening in front where the outer teeth are enlarged; patch of teeth on vomer and palatines, none on tongue; eye rather large; preopercle serrate, with 3 strong spines at the angle; opercle with 3 flat spines, the middle one strongest; nostrils small, in front of dorsal third of eye; interorbital narrow; caudal peduncle much compressed, its least depth 3.75 in head, with flap. Scales very small, covering body and entire head; lateral line slightly arched above

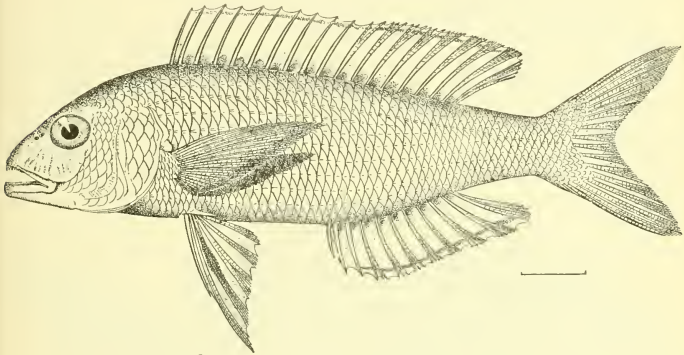


FIG. 18.—*NEMIPTEBUS MATSUBARE.*

the pectoral. Fins rather high; origin of dorsal over opercular spines; origin of anal under first dorsal ray; pectoral rather long and broad, reaching vent; ventrals scarcely reaching vent.

Color in alcohol, light brown; upper two-thirds of body, opercle, and nape with sparse, small roundish dark brown spots; dorsal, caudal, and anal with similar spots, fewest on anal.

One specimen 8 inches long, from Giran, Formosa.

General color in alcohol, pale dusky gray with silvery reflections, and some slight indications of dark in narrow lines on edge of scales along lateral line, and over body posterior to front of anal; dorsal and anal dark at base, this dark being in crescent spots as large as pupil on anterior base of membrane, rest of fin pale; caudal and pectoral pale; ventrals pale, except the third ray, which is yellow; this yellow extends on to the posterior base of the first and second rays; dorsal with a light yellow edge, anal with a yellow median stripe and a yellow edge.

## Family HLEMULIDÆ.

## 113. THERAPON THERAPS (Cuvier and Valenciennes).

One specimen from Keerun.

## 114. THERAPON CANCELLATUS (Cuvier and Valenciennes).

One specimen from Kotosbo, agreeing fairly with Bleeker's figure.

## 115. THERAPON QUADRILINEATUS (Bloch).

One specimen, No. 284, from Giran, agreeing with the account given by Dr. Günther. One specimen from Keerun.

## 116. THERAPON JARBUA (Forskål).

(*Therapon serrus* Cuvier and Valenciennes.)

One specimen, No. 7 x, from Formosa, F. I.

## 117. PLECTORHYNCHUS OCYURUS Jordan and Evermann, new species.

Head 3.75; depth 3; eye 3.5; snout 3.5; maxillary 3.2; mandible 3; interorbital 4; preorbital 9.5; D. XIV, 18; longest dorsal spine 2.3, ray 3; A. III, 8; longest anal spine 2.5, ray 2.5; ventral 1.5; pectoral

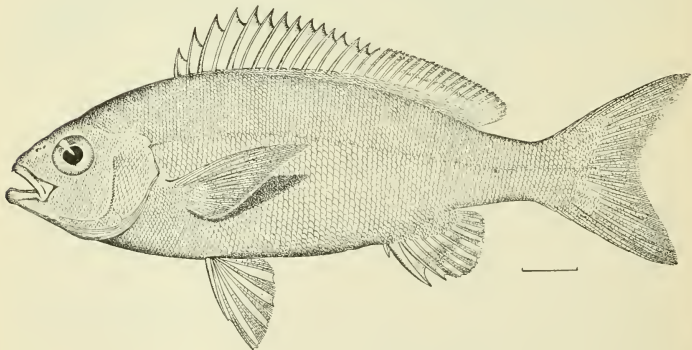


FIG. 19.—PLECTORHYNCHUS OCYURUS.

1.2; scales 19-115-21. Body rather long and compressed, the dorsal and ventral outlines about equally arched; nape rather trenchant; head moderate, pointed, jaws equal; maxillary broad at tip, slipping under preorbital for its entire length; teeth on jaws in a moderately broad band, the outer in front enlarged and canine-like, especially in upper jaw; no teeth on vomer, palatines, or tongue; eye very large, on level of upper lip; nostrils small, close together, oval, on level of upper edge of orbit; preopercle with numerous rather strong, slender

teeth. Scales small, ctenoid, densely covering entire head and body and extending considerably upon caudal fin; a scaly sheath at base of anal and dorsal; lateral line nearly straight, an occasional scale without a pore. Fins rather high; the dorsal spines long, sharp, and slender; second anal spine strong; caudal somewhat lunate; the pectoral long and somewhat falcate, reaching tips of ventrals.

Color in alcohol, yellowish-olive, somewhat rusty on head; membrane of spinous dorsal edged with black; a faint dark line through middle of soft dorsal; anal dusky, pale at tip.

*Type*.—No. 347, a specimen 12.5 inches long, from Formosa, returned to the Imperial Fisheries Institute.

118. *PLECTORHYNCHUS RADJABAN* (Lacépède).

(*Diagramma punctatum* Cuvier and Valenciennes.)

A large specimen, No. 372, from Formosa, F. I. Body unspotted; dorsal and caudal with black spots, thus corresponding to *Diagramma cinerascens* Cuvier and Valenciennes. D. X, 21.

One specimen, No. 346, from Formosa, F. I.

119. *PLECTORHYNCHUS PÆCILOPTERUS* (Cuvier and Valenciennes).

One specimen, No. 270, from Keerun. One specimen, No. 305, from Giran.

120. *POMADASIS HASTA* (Bloch).

Two specimens from Keerun. Spots on back obscure; on spinous dorsal very distinct.

One large specimen, No. 353, from Formosa, F. I.

121. *POMADASIS MACULATUS* (Bloch).

One specimen from Keerun. The snout a little more blunt than in Day's figure.

122. *SCOLOPSIS VOSMERI* (Bloch).

(*Scolopsis japonicus* Bloch; *Scolopsis torquatus* Cuvier and Valenciennes.)

One specimen, No. 331, from Keerun. White nuchal band very conspicuous; each scale with a dark blotch surrounded by pearly blue. The name *vosmeri* (1790) has priority over that of *auratus* (1797). According to Dr. Day, *Scolopsis torquatus*, which our specimen represents, is the young of *S. vosmeri*.

123. *SCOLOPSIS MONOGRAMMA* (Kuhl and Van Hasselt).

One specimen from Giran, No. 287, agreeing with the account given by Cuvier and Valenciennes. A rather broad dark band extends below the lateral line from the head to base of caudal, broader mesially and bordered above and below by pale.

One specimen, No. 306, from Keerun.

124. *CÆSIO CHRYSOZONA* (Kuhl and Van Hasselt).

One specimen from Keerun.

125. *CÆSIO TILE* Cuvier and Valenciennes.

A small specimen in poor condition from Keerun, the dusky lateral band almost obliterated, probably belongs to this species. Axillary spot distinct; each caudal lobe with a broad dusky lengthwise band; side of body apparently with a broad dark longitudinal band. D. X, 16.

## Family SPARIDÆ.

126. *LETHRINUS LEUTJANUS* (Bloch).

One large specimen, No. 334, from Formosa, F. I.

One specimen, No. 310, from Giran. The pearl-colored spots on the scales are still very distinct.

127. *LETHRINUS RICHARDSONI* Günther.

One specimen corresponding very closely to Richardson's figure.<sup>1</sup>

128. *PAGRUS MAJOR* (Schlegel).

One large specimen, No. XII, from Formosa, F. I.

A large specimen, No. 373, from Formosa, F. I.

129. *PAGRUS CARDINALIS* (Schlegel).

One specimen, No. 13 x, from Formosa, F. I.

130. *ARGYROPS LONGIFILIS* (Cuvier and Valenciennes).

One specimen, No. 318, from Kotosho. This species seems to be distinct from *Argyrops spiniferus*; the body is a little deeper depth 1.9), and the third, fourth, fifth, and sixth spines have fleshy-like filaments reaching almost to end of caudal. The genus *Argyrops* of Swainson differs from *Pagrus* in its filamentous dorsal, a character of doubtful value.

131. *SPARUS BERDA* Forskål.

One specimen, No. 10 x, from Formosa, F. I. It agrees with *Chrysophrys dainia* of Day in the anal spines and with *C. berda* in the width of the preorbital. It is not unlikely that Günther and Steindachner are right in referring all of these to one species.

132. *SPARUS LATUS* Houttuyn.

(*Chrysophrys avies* Schlegel.)

One specimen, No. 5072, from Giran.

<sup>1</sup>Voy. Sulphur, pl. LXIV, fig. 1.

## Family SCLENIDÆ.

133. *CORVULA ARGENTATA* Houttuyn.

One specimen, No. x 71, from Formosa, F. I. It seems to agree with *Corvula argentata* (= *Sciæna schlegelii* Bleeker) from Japan, but the soft dorsal rays are fewer (I, 23), the teeth are rather stronger than usual, and the black markings on first dorsal more distinct.

## Family PENTACEROTIDÆ.

134. *ANOPLUS BANJOS* Bleeker.

One specimen, No. 285, from Formosa, F. I., similar to Japanese examples.

## Family POLYNEMIDÆ.

135. *POLYDACTYLUS PLEBEIUS* (Broussonnet).

A small specimen, No. 324, from Kotosho. Scales about 50; pectoral filaments 5, the longest reaching beyond ventrals. The specimen is in bad order and the identification not quite certain.

136. *POLYDACTYLUS RHADINUS* Jordan and Evermann, new species.

Head 3.6; depth 4.6; eye 4.5; snout 9; maxillary 1.7; interorbital 5; D. VII-I, 15; A. III, 16; scales 10-89-12; pectoral 1.4; ventrals 2.5. Body long and slender, compressed, the back not much elevated; head

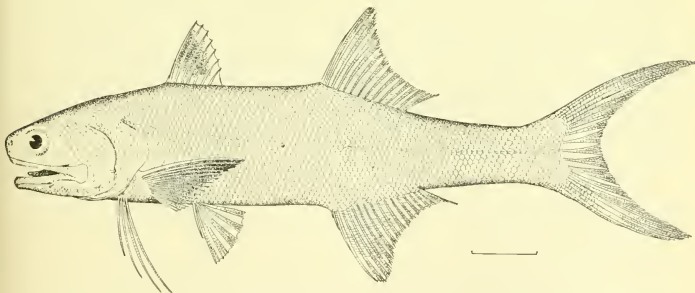


FIG. 20.—*POLYDACTYLUS RHADINUS*.

long, pointed, the snout blunt; mouth very large, nearly horizontal, the lower jaw much the shorter, the snout greatly projecting; maxillary very long and slender, projecting far behind the eye; teeth in jaws in broad setiform bands, covering the jaws not only on top but extending far down both sides; preorbital very narrow; eye covered largely by adipose membrane; caudal peduncle long and slender. Dorsal fins two; remote, the anterior of slender spines only, inserted

in front of ventrals; second dorsal high, the free margin concave, anal similar to soft dorsal, the last ray more produced; caudal ray deeply lunate, the lobes much produced and falcate; pectoral moderate, somewhat falcate, four filamentous rays widely detached and nearly equal to head in length; ventrals short. Scales rather small, smooth, thin, and deciduous; lateral line extending upon lower lobe of caudal which is scaled at base.

Color in alcohol, silvery, the spinous dorsal and pectoral fins dark, anterior edge of second dorsal also dark; detached pectoral rays white.

*Type*.—No. 17 x, a specimen 10.75 inches long, from Formosa, F. I., returned to the Imperial Fisheries Institute.

#### Family GERRIDÆ.

##### 137. *XYSTÆMA FILAMENTOSUM* (Cuvier and Valenciennes).

One specimen, No. 323, from Kotosho.

Dorsal filament broken. Faint, roundish, brownish spots present as shown in Bleeker's figure, these arranged in vertical cross rows; obsolete dark spots at base of dorsal rays. Depth 2.4 in length; scales 46.

One fine specimen, No. 40 x, from Formosa, F. I.

#### Family POMACENTRIDÆ.

##### 138. *GLYPHISODON SAXATILIS* (Linnæus).

Head 2.5 in length; depth 2; D. XIII, 13; A. II, 12; scales 5-30-12.

Dark bands 5, about as broad as the interspaces, the first from the nape to the axil forming a black spot on the pectoral; two below the spinous dorsal, the fourth under front of soft dorsal, the last under caudal peduncle; spinous dorsal dusky; soft dorsal and anal dusky at base and tip; caudal plain, without dark margin above or below.

This is *Glyphisodon celestinus* (the variety with plain caudal) of Günther and Bleeker, and corresponds fairly to Bleeker's fig. 5 in Pl. IX, in Bleeker's Atlas of the Pomacentridæ. But the true *Glyphisodon celestinus* has the caudal edged above and below with blackish. Whether this character is of distinctive value we have not the material to decide.

The names *Chaetodon saxatilis* and *Chaetodon rotundus* of Linnæus seem to belong to the present species. The American species, heretofore called *Glyphisodon saxatilis*, is a different species, having six black bands, the body deeper and the bands narrower. This may stand as *Glyphisodon marginatus* (Bloch). The Hawaiian species *Glyphisodon abdominalis* (Cuvier and Valenciennes), with deeper body and very narrow crossbands, is also different, although more like *G. marginatus*. It is not certain whether this species or *G. celestinus* is the original of *Chaetodon saxatilis*, or indeed that the two forms are really distinct,



but the name may be applied provisionally to the present form. We have numerous young examples of *Glyphisodon saratilis* from Misaki.

*Sparus fasciatus* Gronow and *Labrus scrofasciatus* Lacépède are probably referable to this species or to *G. celestinus*. *Chaetodon tyrwhitti* seems to be *G. celestinus*. *Glyphisodon rahti* Cuvier and Valenciennes, from the Red Sea and elsewhere, is said to have the fourth band under the second half of the spinous dorsal. It is, however, doubtless identical with *G. saratilis*. No. 294. Formosa, F. I.

139. GLYPHISODON SORDIDUS (Forskål).

One specimen from Kotosho similar to others from Hawaii and Misaki.

Family LABRIDÆ.

140. CHÆROPS AZURIO Jordan and Snyder.

(*Chærops japonicus* (Cuvier and Valenciennes); not *Labrus japonicus* Houttuyn.)

One specimen from Keerun.

141. CHÆROPS NYCTEMBLEMA<sup>1</sup> Jordan and Evermann, new species.

A large specimen, 18 inches long, No. 356, Formosa, F. I., returned to the Imperial Fisheries Institute.

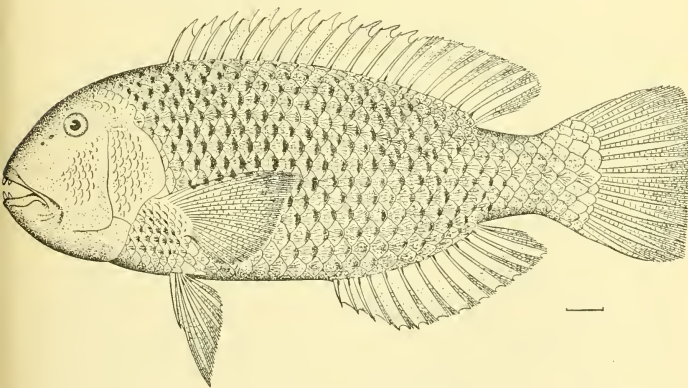


FIG. 21.—CHÆROPS NYCTEMBLEMA.

In the mouth is a card with these notes in Japanese: "Body with rows of purplish spots. Iris and chin blue."

Head 3.5; depth 2.7; eye 6.8; snout 2.2; interorbital 3.8; preorbital 2.7; D. XIII, 7; longest dorsal spine 3.5, ray 2.1; A. III, 10; longest anal spine 4, ray 2; ventral 1.5; pectoral 1.2; scales 5-30-9.

<sup>1</sup>The name νύξ, night, ἐμβλήμα, banner, refers to the black flag, the emblem of Formosa.

Body short, stout and compressed; anterior profile very steep, in a strong curve from tip of snout to origin of dorsal fin; head large; mouth large, the gape reaching middle of eye; jaws armed each with about four large, strong canines in front, with short, blunt, coalesced teeth on sides; three somewhat stronger close-set canines at base of upper jaw; eye moderate, high up; caudal peduncle deep and much compressed. Scales very large, thin, and adherent, those on cheek much reduced. Dorsal fin long, moderately high, and beginning over base of pectoral; anal beginning under twelfth dorsal spine, the last rays somewhat produced; caudal squarely truncate; pectoral broad, fan-shaped, the upper rays the longer; ventrals long and pointed, reaching vent, coterminous with the pectoral.

Color in alcohol, dirty olive-brown, scales of side and breast broadly edged with black or dark brown, irregular hair-like lines of dark over rest of scale; lateral line dark; base of pectoral dark, with a broad blue line through it; upper edge of pectoral with dark blotches; caudal peduncle with about 6 longitudinal series of oblong bright blue spots; fins all dusky and yellowish.

142. *DUYMÆRIA FLAGELLIFERA* (Cuvier and Valenciennes).

(*Ctenolabrus aurigaria* and *C. rubellio* Richardson).

One specimen, from Keerun.

This species is probably identical with the Japanese species, *Duymeria flagellifera* Cuvier and Valenciennes, of which *Duymeria japonica* Bleeker is a synonym. The equally common Japanese form, *Duymeria spilogaster* Bleeker, is the female of *D. flagellifera*.

143. *ANAMPSES CÆRULEOPUNCTATUS* (Rüppell).

One fine specimen, No. 343, from Formosa, F. I.

144. *HEMIPTERONOTUS VERRENS* Jordan and Evermann, new species.

One specimen from Keerun, distinguished by the very long ventrals.

Head 3.5; depth 2.9; eye 4.3; snout 2.4; interorbital 2 in snout; D. II-VIII, 12; A. III, 12; scales 3-29-7. Body short, deep, and very greatly compressed; head very short, the anterior profile nearly vertical; body highest at base of pectoral, thence tapering evenly on dorsal and ventral profiles to caudal; nape trenchant; eye high up; mouth small and low; teeth on jaws in a single close-set row, two outwardly directed strong canines in front in each jaw. Scales very thin; cheek with smaller scales; rest of head naked; lateral line running high, until near end of soft dorsal, where it drops 3 scales. Dorsal fin beginning on nape above posterior edge of orbit, the first 2 spines

detached and somewhat longer; anal beginning under first soft dorsal ray; caudal somewhat pointed or rounded; pectoral long and slightly falcate; ventral with the outer ray produced, reaching past front of anal.

Color in alcohol, pale yellowish, somewhat rosy on opercle; posterior part of side with indications of indistinct longitudinal lines; doubtless red in life.

*Type*.—A specimen 4.5 inches long, No. 7134, Stanford University Museum.

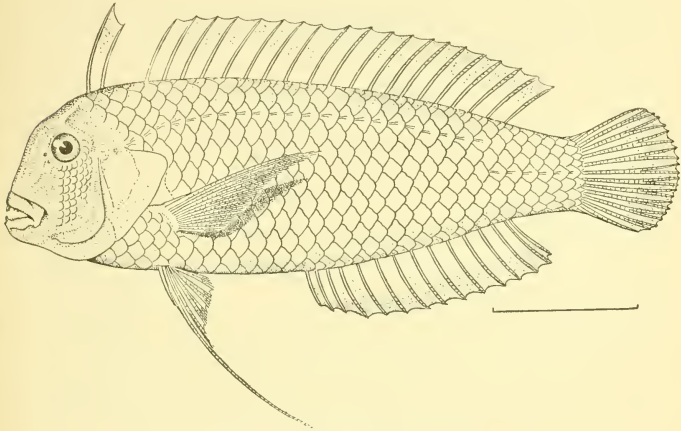


FIG. 22.—HEMIPTERONOTUS VERRENS.

145. *GUNTHERIA CENTIQUADRA* (Lacépède).

(*Julis hortulanus* Cuvier and Valenciennes.)

Coloration as described by Dr. Günther, except that no dark spots appear at base of caudal above; caudal and anal nearly plain. Canines  $\frac{2}{3}$ , the pair of small teeth next them somewhat enlarged; posterior canine inconspicuous, much smaller than figured in *G. centiquadra*. It is probably, however, not a distinct species. One specimen from Kotosho.

The genus *Guntheria* (including *Hemitautoga*) may be retained for those species of *Halichares* which have the upper part of the cheek covered with small scales, the cheek in *Halichares* being naked.

146. *CHEILO INERMIS* (Forskål).

One specimen, No. 11434, from Formosa, F. I.

## Family SCARIDÆ.

## 147. SCARUS LACERTA (Cuvier and Valenciennes).

(*Scarus æruginosus* Bleeker, Günther, Day; probably not of Cuvier and Valenciennes.)

A fine specimen, No. 37 x, Formosa, F. I.

No posterior canine; upper lip covering more than half of upper jaw; two rows of scales on cheek, with one or two below on opercular limb; caudal short, lunate; three pale streaks on side of belly; dorsal edged with dusky; caudal rather dark, the color otherwise lost.

The species called *Scarus æruginosus* from the Red Sea, uniform green, with green jaws, is apparently some other fish. In any case the name *Scarus lacerta* has priority.

## Family ILARCHIDÆ.

## 148. ILARCHES ORBIS (Bloch).

One specimen, No. 351, Formosa, F. I.

## Family EPHIPPIDÆ.

149. EPHIPPUS ARGUS<sup>1</sup> (Gmelin).

One specimen, No. 5073, from Suwata.

One specimen, No. 309, from Giran.

## Family PLATACIDÆ.

## 150. PLATAX TEIRA (Forskål).

One specimen, No. 298, from Hokoto, agreeing with a Japanese specimen from the coast of Rikuzen.

D. V, 33; scales 60.

One specimen, No. 341, Formosa, F. I.

## Family CHÆTODONTIDÆ.

## 151. CHÆTODON PRÆTEXTATUS Cantor.

(? *Chatodon reticulatus* Cuvier and Valenciennes.)

(*Chatodon collaris* Bleeker; not of Bloch.)

Two specimens, Nos. 12 x and 296, Formosa, F. I.

A specimen, No. 365, from Formosa, F. I.

These differ from a Japanese specimen (from Satsuma) of *Chætodon collaris* Bloch (= *Chætodon aureus* Schlegel = *Chætodon auripes* Jordan and Snyder), in not having any of the dark streaks branched or forked

<sup>1</sup>This species is the original type of Cuvier's genus *Ephippus*. *Ephippus* should replace *Scutophagus* and *Cacodoxus*.

behind, as is the case in the Japanese specimen and as figured by Schlegel (*Chaetodon aureus*). In the Japanese species the white band before the eye ceases at the level of the eyes, while in the Formosa species it extends above it. The Formosan specimens belong to *Chaetodon collaris* Bleeker, not Bloch, but we are not quite sure of their identity with *C. reticulatus*.

152. CHÆTODON FASCIATUS Forskål.

(*Chaetodon lunula* Lacépède.)

One specimen from Kotosho identical with others from Honolulu.

153. CHÆTODON LINEOLATUS Cuvier and Valenciennes.

Nos. 299 and 301, from Hokoto (Pescadores Islands).

*Chaetodon semilarvatus*, described as having 12 vertical cross-streaks of orange, can not be this species, as this one has about 16 cross-streaks.

154. CHÆTODON CITRINELLUS Cuvier and Valenciennes.

D. XIV, 21; A. III, 16; scales 36.

Dark spots along the rows of scales very distinct, as is also the yellow stripe above the broad black edge of the anal; dorsal with a very narrow dark edge. This species is wrongly identified by Bleeker with *Chaetodon miliaris*.

One specimen from Kotosho.

155. MICROCANTHUS STRIGATUS (Cuvier and Valenciennes).

One specimen, No. 311, of this common Japanese species.

Family ACANTHURIDÆ.

156. TEUTHIS TRIOSTEGUS (Linnæus).

One specimen, No. 326, from Kotosho.

Belly abruptly white, below a wavy bounding line; two black spots at base of caudal, one at upper, the other at lower edge; a black bar below eye; four black bars below dorsal fin; four black spots about base of pectoral; lips black.

This species, which is probably the original *triostragus*, differs from the species called by that name in Hawaii and on the off-shore islands of Mexico. The latter is *Teuthis sandwichensis* (Streets), its earlier synonymy, if any exists, being confused with that of *T. triostragus*.

157. TEUTHIS DUSSUMIERI (Cuvier and Valenciennes).

A large specimen, No. 335, Formosa, F. I.

D. IX, 26. Dark spots on caudal very distinct; traces of narrow wavy blue stripes on head, and faint traces of the same on body; a pale area about eyes; fins obscurely marked.

One specimen, No. 300, from Hokoto.

Allied to *Teuthis argenteus* (= *matoides*) and related species, but distinguished by the spotted caudal fin.

158. *TEUTHIS BIPUNCTATUS* (Günther).

(*Acanthurus nigros* Günther; not *A. nigroris* Cuvier and Valenciennes.)

Two specimens, No. 322, from Kotosho.

The synonymy of this species is rather uncertain. Our specimens are characterized by the plain dark-brown coloration, with ink-like spots in axil of dorsal and anal; lips black. Caudal deeply lunate, the upper lobe the longer. D. IX, 25; depth 2.17 in length.

159. *TEUTHIS OLIVACEUS* Solander.

A fine specimen, 13 inches long, No. 362, from Formosa, F. I.

This species is apparently the original *Teuthis olivaceus*, although different from the Polynesian species called by that name. D. IX, 24. Caudal lobes greatly produced. Orange band on shoulder extending to end of pectoral.

Head 4; depth 2.2; eye 4.75; snout 1.3; interorbital 2.75; D. IX, 24; longest dorsal spine 2.5, ray 1.6; A. probably about III, 27, the fin broken and hard to count accurately; ventrals 1.3; pectoral 1.2:

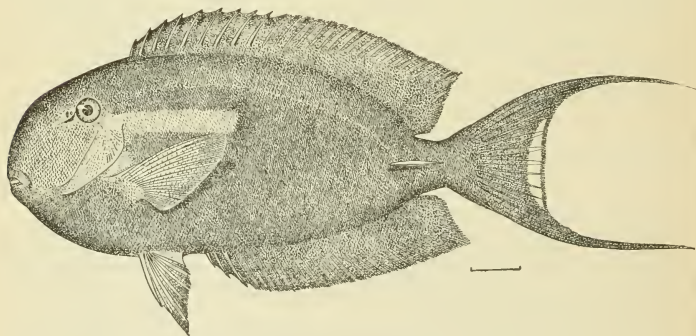


FIG. 23.—*TEUTHIS OLIVACEUS*.

scales about 140. Body oblong, compressed; dorsal and ventral outlines similarly arched; profile of head strongly arched, the outline almost vertical anteriorly; head rather short, the snout blunt; mouth very small, jaws equal; teeth broad, flat incisors, the tips and sides strongly denticulate; preopercular margin very oblique; branchiostegal membranes forming a fold across chin; eye small; nostrils close together in front of eye, the anterior somewhat the larger; caudal spine strong, somewhat keeled. Scales very small, strongly ctenoid,



densely covering entire body and head; a few scales on soft dorsal and anal; caudal fin densely scaled; dorsal fin beginning on nape just back of eye, the spines somewhat depressible in a groove, the last soft rays produced; anal similar to soft dorsal but the base longer; caudal lunate, the upper and lower lobes greatly produced; ventrals rather short, reaching origin of anal; pectoral short and broad, somewhat falcate.

Color in alcohol, dark brown, almost black; a long creamy white blotch on side from upper end of opercle to vertical at tip of pectoral, this bounded by jet black; fins all blue-black, except caudal which has a broad, subterminal, white bar on the middle rays, a narrow black border on tips of rays; pectoral black, the outer fifth yellowish white.

### Family SIGANIDÆ.

#### 160. SIGANUS VERMICULATUS (Kuhl and Van Hasselt).

One specimen, No. 5074, from Suwata.

Similar to *Siganus vermiculatus*, but with the body much more elongate; depth 2.5 in length, without caudal. This difference is perhaps due to the immaturity of the specimen.

#### 161. SIGANUS FUSCESCENS (Houttuyn).

(*Siganus albopunctatus* (Schlegel).)

One specimen, No. 290, from Formosa, F. I. It is covered with small rounded bluish white spots, as usual in Japanese examples.

Two large specimens from Keerun; one specimen, No. 14x, from Formosa, F. I.

### Family MONACANTHIDÆ.

#### 162. STEPHANOLEPIS SULCATUS (Hollard).

One small specimen, No. 276, from Keerun.

Depth about half length; dorsal spine 1.7 in head; anal rays 32. Body covered with fine longitudinal striæ, the raised keels of the rows of scales.

### Family TETRAODONTIDÆ.

#### 163. SPHEROIDES OCELLATUS (Osbeck).

One specimen, No. 330, from Hokoto.

Dark blotches behind pectorals forming a bar across the back.

#### 164. SPHEROIDES SCELERATUS (Forster).

One specimen, No. 283, from Hokoto, agreeing with the description given by Günther (VIII, 276). The back is dark brown, covered with darker spots of various sizes; the sides very abruptly silvery.

## Family DIODONTIDÆ.

165. *DIODON HOLACANTHUS* Linnæus.

One specimen from Hokoto, No. 277, similar to Japanese examples.

## Family SILLAGINIDÆ.

166. *SILLAGO SIHAMA* (Forskål).

One specimen. No. 292, from Formosa, F. I.

167. *SILLAGO ÆOLUS* Jordan and Evermann, new species.

Head 3.4; depth 5.6; eye 3.6; snout 2.5; interorbital 5.5; D. XI-I, 19; A. II, 17; scales 5-76-8. Body long, slender, and compressed; anterior profile gently arched from tip of snout to origin of spinous dorsal; ventral outline nearly straight; head long, the snout pointed; mouth small, low, somewhat oblique, the lower jaw included; teeth in

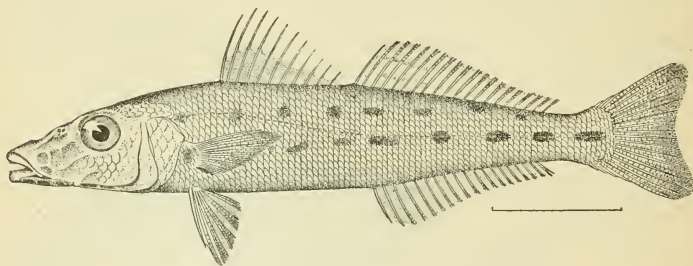


FIG. 24.—*SILLAGO ÆOLUS*.

broad villiform bands on each jaw and on vomer; head very rugose, the muciferous structure strongly marked; eye large, lateral; snout long and pointed; caudal peduncle moderate, compressed, its least depth a little more than one-half snout. Scales rather thin, somewhat irregular, weakly ctenoid; lateral line complete, slightly arched above the pectoral; nape scaled, head naked, except on cheek, where there are about two rows of large scales. Dorsal fins two, the first of long, slender spines, its origin above middle of pectoral; interspace between fins short; anal similar to soft dorsal, its origin somewhat more posterior; pectoral and ventrals moderate; caudal slightly forked.

Color in alcohol, pale straw-color; middle of side with two series of large, oblong, blackish blotches, about six or seven in each series; a plumbeous silvery band along middle of side below lateral line, most distinct posteriorly; fins all somewhat punctulate.

*Type*.—A specimen 5.25 inches long from Keerun, Formosa, No. 7135, Stanford University Museum.

## Family LATILIDÆ.

168. *LATILUS JAPONICUS* (Houttuyn).

(*Latilus sinensis* (Lacépède); *Latilus argentatus* Cuvier and Valenciennes.)

One specimen, No. 30x, from Formosa, F. I.; one specimen, No. 368, from Formosa, F. I.; one specimen, No. 5070, from Giran.

## Family PLATYCEPHALIDÆ.

169. *PLATYCEPHALUS INERMIS* (Houttuyn).

(*Platycephalus crocodilus* Tilesius; *Platycephalus guttatus* Schlegel.)

One specimen from Keerun, apparently identical with others from Hiroshima.

170. *PLATYCEPHALUS INDICUS* (Linnæus).

(*Platycephalus insidiator* Forskål.)

One large specimen, No. 342, from Formosa, F. I. One large specimen, No. 31 x=361, from Formosa, F. I.

## Family TRIGLIDÆ.

171. *LEPIDOTRIGLA ALATA* (Houttuyn).

(*Lepidotrigla bürgeri* Schlegel.)

One fine specimen, No. 288, from Hokoto (Pescadore Islands).

## Family CEPHALACANTHIDÆ.

172. *CEPHALACANTHUS JAPONICUS* (Bleeker).

One small example, No. 289, from Giran, apparently similar to the Japanese species, the proper name of which is still uncertain.

## Family GOBIIDÆ.

173. *ELEOTRIS FUSCA* (Schneider).

One specimen, No. 5076, from Suwata. Scales about 55. Otherwise essentially like Hawaiian specimens. A comparison of many specimens will be necessary to show the value of this character.

174. *GLOSSOGOBIUS BRUNNEUS* (Schlegel).

One specimen from Kotosho, apparently exactly like others from Nagasaki; the characteristic cross-lines of dark spots at the nape present.

One very large specimen from Keerun.

The types of *Glossogobius* Gill, from Hongkong, referred to *Gobius platycephalus*, must have belonged to this species, having the peculiar notched tongue.

## 175. CTENOGOBIOUS PLATYCEPHALUS (Richardson).

Five specimens from Kotosho; one from Taihoku; one larger one, No. 348, from Formosa, F. I.

This species much resembles *Ctenogobius giuris*, but the scales before the dorsal are much larger. It is allied to *Glossogobius brunneus*, but differs in the characters called generic in *Glossogobius*, having the tongue not emarginate, and the isthmus broad. The name *Glossogobius* refers to the emarginate tongue.

We identify our specimens with Richardson's description of *Gobius platycephalus* with some doubt, as the original account is very incomplete. So far as it goes, however, it agrees with our specimens. Richardson's type came from Macao

## Family BLENNIIDÆ.

176. SALARIAS NAMIYEI<sup>1</sup> Jordan and Evermann, new species.

Head 4.5; depth 4.5; eye 2.75; D. XXXII; A. XXIII; P. 13; V. 2. Body short and compressed; head short and very blunt, the profile from upper lip to top of eye vertical; mouth rather large, low,

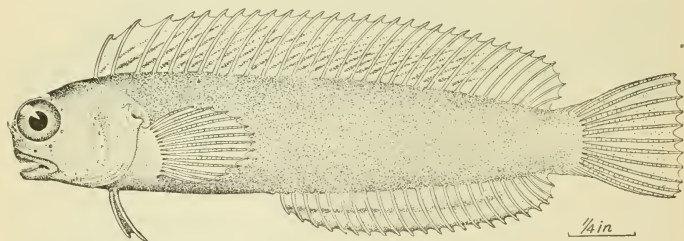


FIG. 25.—SALARIAS NAMIYEI.

nearly horizontal, the lower jaw somewhat the shorter; teeth in a very fine comb-like band on each jaw; eye large, high up, entering the profile; caudal peduncle deep and very thin. Body entirely naked. Dorsal fin very long, beginning on nape, composed entirely of soft flexible spines; anal similar, but beginning under about the thirteenth dorsal spine, the two fins coterminous; caudal truncate; pectoral broad and rounded; ventral of two slender rays and a concealed spine; a pair of short tentacles in front of eye.

<sup>1</sup> Named for Motokiche Namiye, curator in the Museum of the University of Tokyo, author of the earliest systematic account by a native author of the vertebrate animals of Japan. It is entitled Classified Catalogue of the Specimens of Vertebrates in the Collections of the Kyoiku Hakubutsu Kwan (Educational Museum), Tokyo, 1881.

Color in alcohol, purplish red, paler posteriorly; dorsal fin with narrow oblique darker markings; anal darker along the margin, and with a similar median band.

No canines; no tentacles; dorsal not notched, not connected with the caudal; no sharp color markings.

*Type*.—No. 278, specimen 2.5 inches long from Hokoto, or Pescadores Islands; returned to the Imperial University of Tokyo.

#### Family CEPOLIDÆ.

##### 177. ACANTHOCEPOLA MESOPRION Bleeker.

No. 5063, a specimen 13 inches long from Giran.

Head 12; depth 13; eye 2.75; snout 5.5; interorbital 4.5; maxillary 2; mandible 1.8; D. 104; A. 105; pectoral 1.75; ventral 2; scales about 300.

Body very long, slender, very greatly compressed, tapering gradually from the head, where it is deepest, to the very slender tail, the

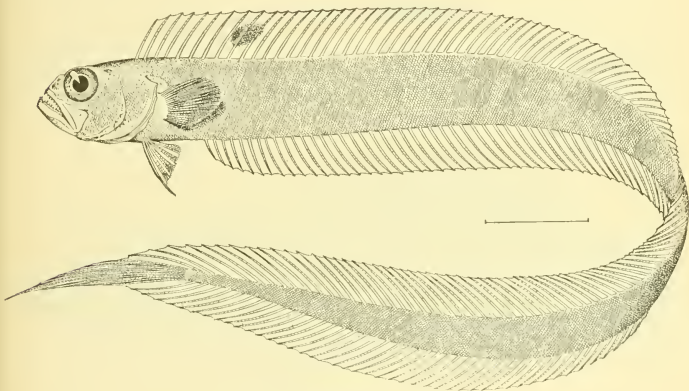


FIG. 26.—ACANTHOCEPOLA MESOPRION.

shape resembling that of the scabbard-fish (*Trichiurus lepturus*); eye very large, high up, entering the dorsal profile; snout very short; mouth very large, nearly vertical; maxillary broad at tip, reaching past pupil; teeth in a single wide-set row in each jaw, long, recurved, and canine-like; opercle and preopercle very deep, the latter with about 6 short sharp teeth at the angle; scales very small and smooth, covering sides of head and entire body; top of head, maxillary, and lower jaw naked; no lateral line. Dorsal and anal fins very long, each of about 105 soft rays; the dorsal beginning at nape, the third ray over opercular opening, the rays all of about equal length, about 1.75 in head; anal beginning under last third of pectoral, continuous with the caudal, as is the dorsal, the rays quite uniform in length, the longest

about 1.75 in head; caudal with about 9 rays, the middle ones very long, nearly twice length of head; pectoral short and broad, ventral I, 4, short, the spine long and slender, 3 in head; vent under nearly middle of pectoral.

Color in alcohol, dirty silvery, the head and body without markings; fins all plain except a large black blotch on membrane between the eighth and eleventh dorsal rays; other fins unmarked.

Dorsal with a large black spot in front; anal with a brown margin; scales extremely small; proopercle with 7 or 8 spinous teeth.

This species is certainly different from the Japanese *Acanthocephala krusensterni*, having minute scales, doubtless over 300 in the lateral line, and a more elongate body. It may be identical with the scantily described *Cepola limbata* or *Cepola marginata* of Cuvier and Valenciennes.

#### Family BROTULIDÆ.

##### 178. BROTULA FORMOSÆ Jordan and Evermann, new species.

Head 5; depth 4.5; D. 115; caudal 8; A. 83; P. 24; V. 2; about 158 scales in a lateral series between gill-opening and base of caudal; width of head 2 in its length; snout 4.5 in head; eye 4.7; interorbital space 6; maxillary 2 in head; pectoral a little over 2 in head; ventrals about equal to pectoral.

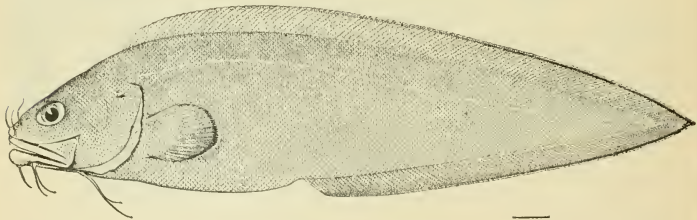


FIG. 27.—BROTULA FORMOSÆ.

Body elongate, compressed, and the tail tapering to a point; head oblong, compressed; snout blunt, rounded, and rather short; eye rather small, anterior and superior; mouth large, the maxillary reaching far behind the eye, and the distal expanded extremity of maxillary about equal to the diameter of the eye; 6 superior barbels, as 2 nasals and 4 labials, and 6 inferior barbels, 3 on each ramus; lips thick and tough; teeth in jaws, on vomer and palatines, in broad, villose bands; nostrils in 2 small tubes, separated by a little space, and upon the sides of the snout; 2 very short rudimentary barbels between each pair of upper labial barbels; interorbital space about  $\frac{3}{4}$  the eye, and convex; maxillary fitting under suborbital flap for nearly its whole distance; opercles with a spine above; tongue pointed, smooth, and free in front;



gill-opening large, the branchiostegal membrane narrowly free over the isthmus; gillrakers  $4 + 18$ , 3 of which are developed on the upper part of the ceratobranchial, all the others very short, rounded, and finely villous; pseudobranchiæ well developed; branchiostegals rather large, 8 in number; intestine short, of several turns; pyloric cæca 3, short; peritoneum pale or silvery. Scales small, thin, elongate and cycloid, very small upon the vertical fins, and upon the pectoral, the latter completely covered. Origin of the dorsal before that of the pectoral, the fin of uniform height and confluent with the caudal, which is pointed; origin of the anal much nearer the tip of the snout than base of caudal and similar to dorsal; pectorals broad, rounded, and a little less than halfway to origin of anal; ventrals of two filaments, one much longer than the other and ensheathed in a membrane for half the length of the longer; ventrals inserted slightly nearer posterior margin of eye than edge of opercle; lateral line superior and not particularly distinct.

Color in alcohol, more or less uniform brown, the edges of the vertical fins and pectorals blackish. Length 19 inches.

This description from a female from Formosa, No. 359, F. I., returned to the Imperial Fisheries Institute.

#### Family PLEURONECTIDÆ.

##### 179. PSEUDORHOMBUS OLIGODON (Bleeker).

This species differs from *Paralichthys arsius* (= *P. russelli*) in having the scales on the blind side ctenoid, like those on the left side.

The genus *Pseudorhombus* (*malayanus*; *russelli*) may be recognized as distinct from *Paralichthys*, being characterized by the presence of an accessory branch to the lateral line running from the upper edge of the gill-opening to the nape. The American species and the Japanese species *olivaceus* belong to *Paralichthys*. The East Indian species all seem to belong to *Pseudorhombus*.

The species of this type, described by Richardson<sup>1</sup> from drawings made at Canton, are probably unrecognizable from the descriptions.

One specimen, No. 350, Formosa, F. I.

One specimen, No. 42 x, Formosa, F. I. Gillrakers short,  $x + 11$ , about one-third diameter of eye. A. 57; scales 78. A dark blotch at angle of lateral line, and another behind; body and fins with dark blotches.

##### 180. PLATOPHRYS MYRIASTER (Schlegel).

One specimen from Keerun. A. 69; scales about 115. Surface covered with small blue spots; two dark spots on lateral line.

Two specimens, Nos. 41 x and 47 x, from Formosa, F. I.

<sup>1</sup> Ichth. China, p. 278.

## Family SOLEIDÆ.

## 181. LIACHIRUS NITIDUS Günther.

A fine specimen, 4 inches long (No. 287), from Giran, agreeing with Günther's description.

Head 4.5; depth 2.5; snout 3.2; D. 63; A. 48; V. 5; scales about 25-92-35, small and hard to count. Body dextral, the color and eyes being on the right side; body oblong elliptical; snout bluntly rounded; mouth rather large, the gape reaching eyes; eyes close together, small; scales very small, smooth, and rather loosely attached; lateral line extending from near upper eye nearly straight to middle of caudal; dorsal and anal fins rather high, about 1.8 in head.

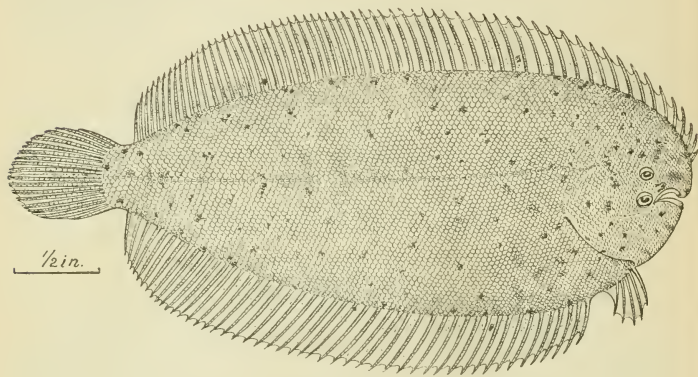


FIG. 28.—LIACHIRUS NITIDUS.

Color in alcohol, yellowish-gray, the body and head sparsely covered with small, roundish, black spots, a few of these upon dorsal and anal fins; dorsal and anal rays dark edged; caudal with a few dark specks.

## 182. SYNAPTURA ORIENTALIS (Schneider).

(*Synaptura foliacea* Richardson.)

One specimen, No. 369, from Formosa, F. I.

The nostrils in this species are similar to those of *Synaptura pan.* The genus *Euryglossa*, based on their supposed peculiarities, is without foundation.

## 183. USINOSITA JAPONICA (Schlegel).

One small example from Keerun, similar to examples from Kobe.

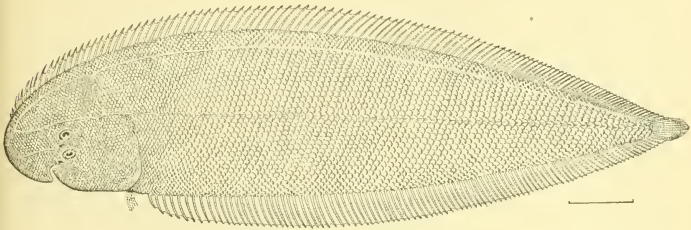
## 184. PARAPLAGUSIA BILINEATA (Bloch).

One specimen, No. 45x, from Formosa, F. I.; one specimen from Keerun.

185. *CYNOGLOSSUS DIPLASIOS* Jordan and Evermann, new species.

One large specimen (No. 43) 10.5 inches long, from Formosa, F. I., returned to the Imperial Fisheries Institute. This species is well distinguished by the presence of two complete and well developed lateral lines on either side.

Head 5 in total length; depth 4; eye 10; snout 2.6; D. 112; A. 95; scales about 100,—40; scales on upper part of head and along base of dorsal fin very strongly ctenoid, elsewhere scarcely or not at all ctenoid; scales on head very much reduced in size; mouth large, fully protected by the upper lip. Body sinistral, that is, the eyes and color

FIG. 29.—*CYNOGLOSSUS DIPLASIOS*.

on the left side; scales of blind side more smooth than elsewhere; nostril small, tubular, close to eyes; upper eye slightly in advance of lower, equal in size; dorsal beginning on snout in front of eyes; pectorals obsolete.

Color in alcohol, pale dirty-yellowish, the head somewhat darker; no distinct markings anywhere.

186. *ZEBRIAS ZEBRA* (Bloch).

One specimen, No. 44x, from Formosa, F. I., corresponding to Günther's description. D. 80. The figure given by Day<sup>1</sup> seems to represent some other fish, with the cross-bands not in pairs, and with fewer fin rays.

## GENERALIZATIONS.

It is evident that these collections comprise but a small part of the fish fauna of Formosa, being in fact chiefly made up of the common market fishes. The gobies and blennies, especially abundant in this region, are almost unrepresented, while the equally abundant *Callionymidae* are wanting altogether. The scant representation of *Labridae*, *Holocentridae* and *Scorpenidae* shows that no effort was made to secure the fishes of the coral reefs, and doubtless many of the commonest species were overlooked or rejected by the collectors. Yet with all

<sup>1</sup>Fishes of India, pl. xciv, fig. 3.

this, the collections give a fair understanding of the fishes of Formosa. It is evident in the first place that the marine species are essentially those of that part of the coast of China having similar physical conditions. The freshwater fishes are derived from China, but are largely distinct as to species.

Compared with Japan and India, the following statistics may be interesting:

	Species.
Common to Formosa and Kiusiu .....	30
Common to Formosa and Hindostan.....	77
Common to Formosa, Kiusiu, and Hindostan .....	37

It is evident that the faunal relations of Formosa are closer with those of Hindostan than with even the southernmost of the Japanese islands, Kiusiu. As for the main island of Japan (Hondo), few of its characteristic species extend their range south of the Tropic of Cancer; and few of them reach even to the Riukiu Archipelago.