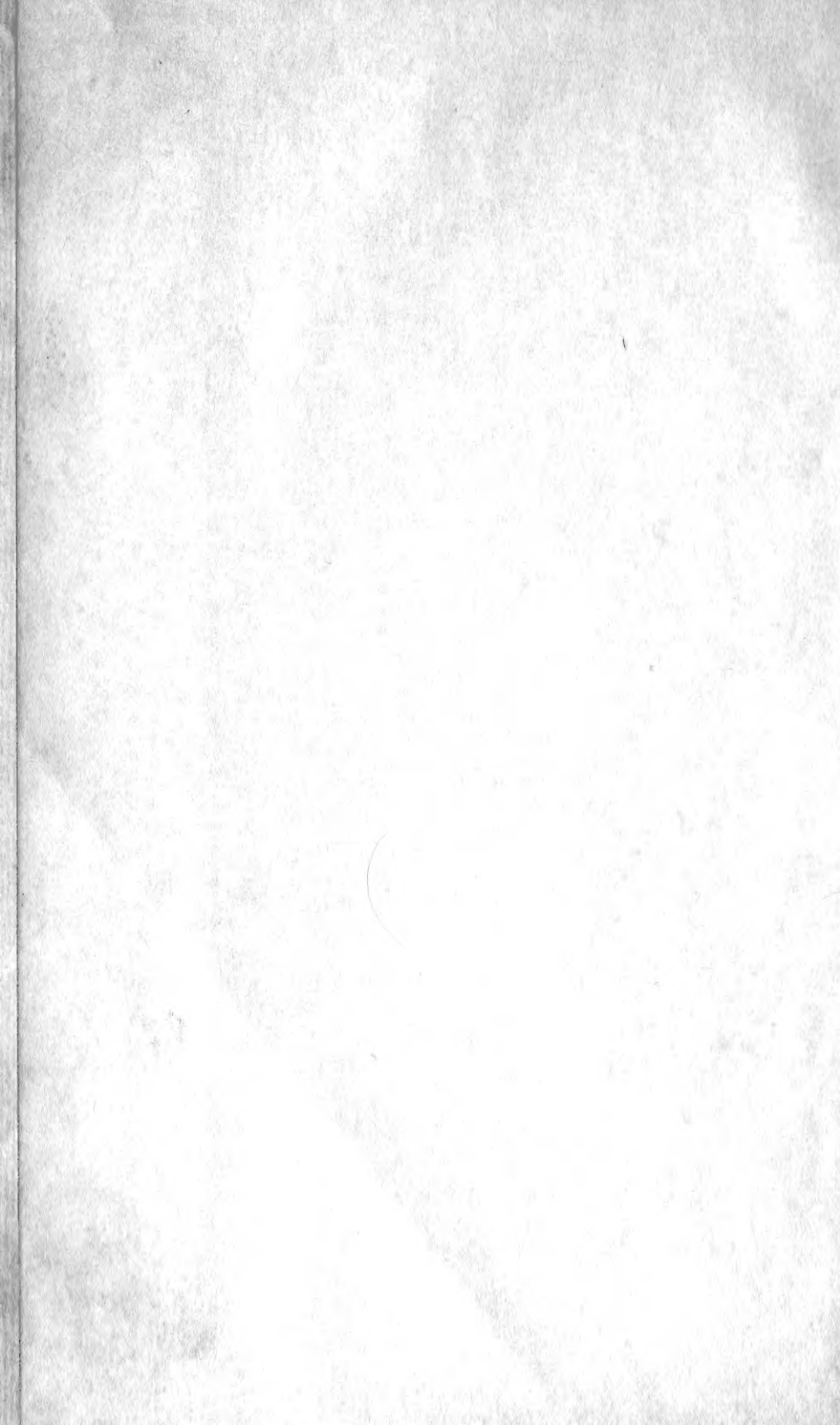


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ALLAN HANCOCK FOUNDATION  
PUBLICATIONS

OF

THE UNIVERSITY OF SOUTHERN CALIFORNIA

FIRST SERIES

ALLAN HANCOCK PACIFIC  
EXPEDITIONS

VOLUME 9

1940-1946

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REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
AND GALAPAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935,  
IN 1936, IN 1937, IN 1938, AND IN 1939.

REPORT ON FISHES FROM ALLAN HANCOCK  
EXPEDITIONS IN THE CALIFORNIA  
ACADEMY OF SCIENCES

*By* ALVIN SEALE

THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS  
ALLAN HANCOCK PACIFIC EXPEDITIONS  
VOLUME 9, NUMBER 1  
ISSUED APRIL 29, 1940

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THE UNIVERSITY OF SOUTHERN CALIFORNIA PRESS  
LOS ANGELES, CALIFORNIA

REPORT ON FISHES FROM ALLAN HANCOCK  
EXPEDITIONS IN THE CALIFORNIA  
ACADEMY OF SCIENCES

(PLATES 1-5)

ALVIN SEALE

*Superintendent of Steinhart Aquarium*

Most of this collection of fishes was obtained by the Allan Hancock Pacific Expeditions of the *Velero III* off the coast of Mexico, Central America, and the Galapagos Islands in 1931-32. Additional specimens were sent to the author from the 1934 expedition.

These collections were made by members of the scientific staff and crew of the *Velero III*. Numbers of young fishes and larval crustaceans were obtained by the use of the submerged electric light. Traps, nets, and derris powders were also used with success.

The following species are described as new in this paper:

|  |         |
|--|---------|
| <i>Uropterygius galapagensis</i> , family Muraenidae . . .   | Page 7  |
| <i>Aseraggodes herrei</i> , family Soleidae . . . . .        | Page 13 |
| <i>Callionymus garthi</i> , family Callionymidae . . . . .   | Page 37 |
| <i>Ophioblennius lanieri</i> , family Blenniidae . . . . .   | Page 41 |
| <i>Stathmonotus culebrai</i> , family Chaenopsidae . . . . . | Page 43 |

**Eptatretidae** Hagfish

\**Polistotrema stoutii* (Lockington)

One from Prisoners Harbor, Santa Cruz Island, California, April 24, 1934. Length 490 mm. Caught on a fishhook.

**Carchariidae** Gray Sharks

*Scoliodon longurio* (Jordan and Gilbert)

One from Tangola-Tangola, Mexico, December 15, 1931. Length 490 mm. This species has a sharp-pointed snout. Lips with a distinct groove. Many flat serrated teeth placed obliquely in the jaws.

*Galeorhinus zyopterus* Jordan and Gilbert

\* For the most part the author has followed Jordan, Evermann and Clark's *Check List of Fishes and Fishlike Vertebrates of North and Middle America*, Doc. 1055, Rept. Comm. Fish., 1928.

Numerous large specimens of this species were examined at a shark fishery on Cerros Island, where they were secured for their oil and fins. They are known locally as the "Soup-fin Shark."

### **Sphyrnidae** Hammer-headed Sharks

#### *Sphyrna zygaena* (Linnaeus)

Perhaps the most abundant species of shark in the Galapagos Islands. Specimens were taken measuring up to 12 feet in length.

### **Rhinobatidae** Guitarfishes

#### *Rhinobatos leucorhynchus* (Günther)

One from Tenacatita, Mexico, December 10, 1931. Length 140 mm. A row of distinct spines down the back, a pair of spines on each shoulder, and spines on the orbital ridge. Color in alcohol grayish without distinct markings.

### **Torpedinidae** Torpedoes

#### *Discopyge ommata* Jordan and Gilbert

One from Port Culebra, Costa Rica, February 25, 1932. Length 165 mm. Back mottled with ocellated spots and with a black ring in the center of the disk.

One from Port Culebra, Costa Rica, February 25, 1934. Length 65 mm. This specimen is mottled and marbled with brown over the back with a distinct round white spot surrounded by rings of black and white on the center of the back.

### **Elopidae** Tenpounders

#### *Elops affinis* Regan

One from Tenacatita, Mexico, December 10, 1931. Length 305 mm. Silvery with the dorsal, anal, and caudal washed with yellowish color.

### **Albulidae** Ladyfishes

#### *Albula vulpes* (Linnaeus)

One from Acapulco, Mexico, December 15, 1931. Length 64 mm. Grayish, with about 12 dark bands over the back.

**Clupeidae** Herrings and Sardines*Clupea pallasii* Cuvier and Valenciennes

Two from Tenacatita, Mexico, March 4, 1934. Length 80-90 mm. Dorsal with 20 rays, anal with 17, scutes 35, depth 3.5, head 3.5 in standard length, eye 3 in head, being slightly more than length of snout, ventrals inserted under 7th dorsal ray. Color blue above, silvery below.

*Sardinia caerulea* (Girard)

Two from Tagus Cove, Albemarle Island, Galapagos, January 12, 1934. Length 75-76 mm. Grooves on opercles distinct.

*Lile stolifera* (Jordan and Gilbert)

Three from Corinto, Nicaragua, February 8, 1932. Length 65-100 mm. Fifteen from Tenacatita, Mexico, December 10, 1931. Length 65-75 mm. Two from Port Utria, Colombia, February 14, 1934. Length 39-42 mm. Silvery on sides with a more or less distinct darker stripe from head to tail. Tip of fins uncolored.

*Harengula thrissina* (Jordan and Gilbert)

Four from Tangola-Tangola, Mexico, December 6, 1931. Length 52-104 mm. Three from Tenacatita, Mexico, December 10, 1931. Length 53-90 mm. Dorsal 16, anal 16, scales 37, scutes 16 x 14.

*Opisthonema libertate* (Günther)

Five from Post Office Bay, Charles Island, Galapagos, January 2, 1931. Length 180-250 mm. Great schools were seen at this place.

*Ilisha furthii* (Steindachner)

One from Guayas River, Guayaquil, Ecuador, February 6, 1939. Length 196 mm. Dorsal with 17 rays, anal with 45. Tips of all fins black, body uniform silvery.

*Opisthopecterus macrops* (Günther)

Three from Sihuatanejo, Mexico, December 11, 1931. Length 90-102 mm. No ventral fins, anal with about 60 rays. Color silvery on sides, darker on back.

*Pliosteostoma lutipinnis* (Jordan and Gilbert)

Four from Mazatlan, Mexico, December 8, 1931. Length 55-65 mm.

**Dussumieriidae** Round Herrings*Stolephorus delicatulus* (Bennett)

Two from Wreck Bay, Chatham Island, Galapagos, January 21, 1934. Length 83-90 mm. Belly rounded, no scutes, origin of ventrals

entirely posterior of dorsal, maxillary extending to anterior margin of orbit, dorsal 11, anal 10. Caudal forked. Origin of the dorsal nearer to tip of snout than to caudal.

### Engraulidae Anchovies

#### *Anchoviella miarchus* (Jordan and Gilbert)

Twenty-two from Corinto, Nicaragua, February, 1932. Length to 46 mm. Dorsal 14, anal 22 rays. Depth 5.6 in length from tip of snout to end of caudal vertebra. Head 3.5. Young, without stripe.

#### *Anchoviella exigua* (Jordan and Gilbert)

Four from Tangola-Tangola Bay, Mexico, December 16, 1931. Length 65-90 mm. A distinct silvery stripe from head to caudal. Maxillary not extending to margin of opercle. Two from La Plata Island, Ecuador, February 10, 1934. Length 82-88 mm.

#### *Anchoviella delicatissima* (Girard)

One from Corinto, Nicaragua, February 8, 1932. Length 80 mm. Dorsal 23, anal 13 rays, eye 3 in length of head, silvery stripe on side distinct.

#### *Anchoviella curta* (Jordan and Gilbert)

Twenty-four from Tenacatita, Mexico, December 10, 1931. Length 60-95 mm. Fourteen from Sihuatanejo Bay, Mexico, December 11, 1931. Length 54-85 mm. Six from Mazatlan, Mexico, December 8, 1931. Length 55-65 mm. One from La Plata Island, Ecuador, February 10, 1934. Length 110 mm.

#### *Cetengraulis mysticetus* (Günther)

Six from Panama Market, December 24, 1931. Length 150-180 mm. The head is 2.8 into the standard length, depth 3.2. Dorsal 14, anal 23 rays. Color blue above, silvery on sides and below.

### Muraenidae Morays

#### *Muraena lentiginosa* Jenyns

Three from South Seymour Island, Galapagos, January 17, 1932. Length 141-450 mm.

#### *Muraena pardalis* Schlegel

One from Espiritu Santo Island, Mexico, February 18, 1932. Length 227 mm. Ocellated white spots over the body, these crowded on the



throat. Gill openings and angle of mouth black. Inside of mouth spotted. Two series of teeth in upper jaw. This record seems to extend the range of this species east from Tahiti.

*Rabula panamensis* (Steindachner)

Two from Bahia Honda, Panama, February 21, 1934. Length 108-162 mm. One from Black Beach Anchorage, Charles Island, Galapagos, January 14, 1934. Length 85 mm. Uniform brown in color with the pores on lower jaw white. Origin of dorsal above gill openings. Teeth strong and sharp.

*Gymnothorax funebris* Ranzani

One from Isabel Island, Mexico, February 13, 1932. Length 164 mm. One from Espiritu Santo Island, San Gabriel Bay, Mexico, February 18, 1932. Length 240 mm. Color uniform dark brown.

*Gymnothorax dovii* (Günther)

One from Balboa, Panama, December 24, 1931. Length 584 mm. Color dark brown spotted and mottled with yellow, throat and belly pale, a large black spot at gill opening.

**Uropterygius galapagensis**, new species

Plate 1, Fig. 1

*Holotype*.—Calif. Acad. Sci. No. 5744.*Type locality*.—From Post Office Bay, Charles Island, Galapagos, January 21, 1934. Length 75 mm.

No fins, the tail ending in a sharp point. No scales. Teeth pointed and directed backward in 2 rows of unequal length. Vomerine teeth quite small. Gape of mouth less than  $\frac{1}{2}$  length of head. Eye but slightly less than snout, and located over middle of gape. Anterior nostril in tube. Color in alcohol, brown on the back down on the sides to middle line, under parts yellow. About 50 narrow yellow lines over back down to middle of sides. A wide yellowish white band over the middle portion of head. This species is closely related to *U. necturus* of Jordan and Gilbert with which this specimen was compared.

**Ariidae** Sea Catfish*Bagre pinnimaculatus* (Steindachner)

One from Panama Market, December 24, 1931. Length 340 mm. Maxillary barbules extending to posterior of anal. Dorsal filament reaching to fork of caudal, the pectoral filament extending to middle of caudal peduncle.

**Synodontidae** Lizardfishes*Synodus jenkinsi* Jordan and Bollman

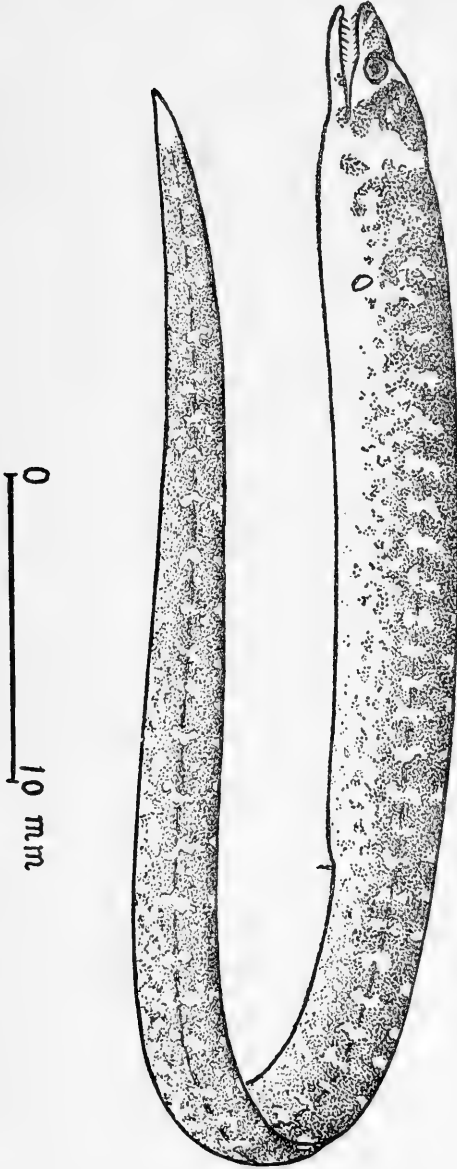
Two from Tenacatita, Mexico, December 9, 1931. Length 172-260 mm. Two from James Bay, James Island, Galapagos, January 23, 1934. Length 50-51 mm. Dorsal 11, anal 13, scales 62. The origin of the dorsal is midway between the origin of the adipose fin and the anterior margin of pupil.

*Synodus scituliceps* Jordan and Gilbert

Two from Port Culebra, Costa Rica, February 24, 1934. Length 55-165 mm. Grayish green above, white below. Anal of 13 rays.

*Synodus evermanni* Jordan and Bollman

One from Espiritu Santo Island, Mexico, February 18, 1932. Length 129 mm. Dorsal 13, anal 10. About 13 dark blotches along the sides.



UROPTERYGIUS GALAPAGENSIS

**Belonidae** Needlefishes*Tylosurus fodiator* Jordan and Gilbert

One from Bahia Honda, Panama, December 22, 1931. Length 344 mm. Two from Tangola-Tangola Bay, Mexico, December 16, 1931. Length 356-405 mm. Two from Corinto, Nicaragua, February 8, 1932. Length 505-545 mm. This species was found to be very common in the above localities.

*Ablennes pacificus* Walford

One from Charles Island, Galapagos, January 3, 1932. Length 670 mm.

**Hemiramphidae** Halfbeaks*Euleptorhamphus longirostris* (Cuvier)

Two from South Seymour Island, Galapagos, January 17, 1932. Length 468-475 mm. Length of head including lower jaw 2.6 into standard length. Origin of ventral fins midway between axil of pectorals and end of caudal vertebra.

*Hyporhamphus unifasciatus* (Ranzani)

Three from Gorgona Island, Colombia, February 12, 1934. Length 100-113 mm. Two from Port Utria, Colombia, February 15, 1934. Length 90-102 mm. Dorsal 16, anal 15 rays. Origin of anal on a line with the origin of the dorsal. Origin of ventrals midway between base of caudal and middle of eye. Length of lower jaw beyond upper  $\frac{1}{4}$  greater than head. Interorbital space less than eye.

*Hyporhamphus roberti* (Cuvier and Valenciennes)

One from Sihuatanejo, Mexico, December 12, 1931. Length 342 mm. Eighteen from Mazatlan, Mexico, December 8, 1931. Length 53-250 mm. Five from Post Office Bay, Charles Island, Galapagos, January 3, 1932. Length to 250 mm. Two from James Bay, James Island, Galapagos, January 10, 1931. Length 77-102 mm. Four from South Seymour Island, Galapagos, January 14, 1932. Length 100-115 mm. One from Corinto, Nicaragua, February 9, 1932. Length 190 mm. One from Tagus Cove, Albemarle Island, Galapagos, January 12, 1934. Length 62 mm. Dorsal 16, anal 16 rays. Origin of the ventrals midway between base of caudal and the posterior margin of eye. A blue silvery stripe from eye to caudal. Head with lower jaw 2.8 in length.

**Exocoetidae** Flyingfishes*Fodiator acutus* (Cuvier and Valenciennes)

Three from Sihuatanejo Bay, Mexico, December 11, 1931. Length 139-1533 mm. One from Acapulco, Mexico, December 15, 1931. Length 140 mm. Five from Mazatlan, December 7, 1931. Length 134-140 mm. Two from Panama Bay, December 23, 1931. Length 146-165 mm. Two from Bahia Honda, Panama, February 21, 1934. Length 53-64 mm. These have a long slender snout with an acute lower jaw. Dorsal fin of 9 very high rays; when prone these extend to the caudal. Origin of the anal below the 5th dorsal ray. Origin of the ventrals midway between base of caudal and posterior margin of eye. Color bluish above, silvery on sides and below. Dorsal purplish, the lower rays white. Caudal with lower lobe prolonged and marked by three purple bars.

*Exocoetus volitans* Linnaeus

Two from Panama Bay, December 23, 1931. Length 153-227 mm. Origin of ventrals midway between base of caudal and the posterior hard margin of the opercle. Pectorals blue with an oblique white band, the margin white. Axil and upper portion of ventral rays grayish.

*Cypselurus bahiensis* (Ranzani)

One from Chatham Island, Galapagos, December 31, 1931. Length 380 mm. Origin of ventrals midway between end of caudal vertebra and the middle of opercle. Dorsal with a large black spot on the posterior of the fin. Pectorals and ventrals uncolored.

*Cypselurus callopterus* (Günther)

One from Chatham Island, Galapagos, January 2, 1932. Length 315 mm. Two from Tagus Cove, Albemarle Island, Galapagos, January 5, 1932. Length 305-322 mm. Pectorals covered with round dark spots, ventrals with dark centers and with spots.

*Cypselurus katoptron* (Bleeker)

(*E. altipinnis* of author's is probably another species)

One from South Seymour Island, Galapagos, January 22, 1934. Length 30 mm. Dorsal 12, anal 10 rays. Origin of the anal on a line with base of 5th dorsal ray. Origin of ventrals midway between end of caudal vertebra and posterior margin of eye. Pectorals extending slightly past the origin of dorsal. Ventrals extending posterior to axil of anal. No barbules. Snout short, being equal to pupil of eye. Pectoral dark

blue with white area in center. Ventrals blue. Caudal whitish without markings. Body whitish with 4 more or less distinct wide blue bands (probably the immature markings).

### Bregmacerotidae

#### *Bregmaceros bathymaster* Jordan and Bollman

Twenty from White Friars Islands, Mexico, March 2, 1934. Length 38-58 mm. A single long dorsal spine on the head. Anterior portion of the dorsal and anal fin elevated. Ventral with 38 elongated rays, which extend to the middle of anal or beyond. Caudal forked. Teeth in jaws, vomer, and palatines. Color silvery with grayish wash on back. Taken by dredge in 90-140 fathoms.

### Bothidae Flounders, Flatfishes

#### *Platophrys constellatus* Jordan

Three from Tangola-Tangola Bay, Mexico, February 28, 1934. Length 40-48 mm. Eyes well separated; mouth small; color grayish with dark specks and dots over body.

#### *Platophrys leopardinus* (Günther)

Nine from Petatlan Bay, Mexico, December 13, 1931. Length 20-75 mm. One from La Libertad, Ecuador, February 9, 1934. Length 42 mm. Two from Tenacatita, Mexico, March 4, 1934. Length 29-40 mm. Interorbital space very wide. Lateral line with a short deep arch. Body with bluish spots and rings.

#### *Citharichthys sordidus* (Girard)

One from Tenacatita, Mexico, December 10, 1931. Length 203 mm. Five from Tagus Cove, Albemarle Island, Galapagos, January 13, 1934. Length 29-66 mm. Eyes close together with a sharp ridge between. Lateral line straight. Gillrakers sharp pointed, 18 on lower limb. Color grayish with dark spots.

#### *Citharichthys stigmaeus* Jordan and Gilbert

Eight from Charles Island, Galapagos, January 27, 1934. Length 30-70 mm. These were taken in the dredge at 355 meters. They are light in color with darker or bluish specks.

*Citharichthys gilberti* Jordan and Evermann

One from Mazatlan, Mexico, December 7, 1931. Length 139 mm. One from Jicarita Island, Panama, February 1, 1931. Length 85 mm. Lateral line straight. Interorbital narrow. Dorsal of 91 rays.

*Citharichthys xanthostigmus* Gilbert

Four from Tenacatita, Mexico, December 10, 1931. Length 87 mm. Color uniform light brownish.

*Etropus crossotus* Jordan and Gilbert

Three from Tenacatita, Mexico, December 9, 1931. Length 122-134 mm. Color brownish with darker spots and markings. Cleft of mouth less than diameter of the orbit.

*Azevia panamensis* (Steindachner)

One from Bahia Honda, Panama, December 21, 1931. Length 107 mm. One from Corinto, Nicaragua, February 9, 1932. Length 209 mm. Maxillary extending to below posterior margin of eye. Color dark gray with black spots on dorsal and anal. Ten young specimens, length 20-55 mm., were taken at Port Culebra, Costa Rica, February 24, 1934.

*Syacium ovale* (Günther)

Fifteen from Tangola-Tangola Bay, Mexico, February 28, 1934. Length 17-56 mm. Two from Tenacatita, Mexico, March 4, 1934. Length 36-43 mm. Lateral line straight. Gillrakers thick and blunt, 8-9 on lower limb. Color whitish powdered with darker specks.

**Paralichthyidae** Bastard Halibuts*Paralichthys woolmani* Jordan and Williams

One from Jicarita Island, Panama, February 20, 1934. Length 95 mm. Eyes separated by a narrow ridge. Color brownish with dark spots and blotches.

**Soleidae Soles**

Plate 2, Fig. 2

***Aseraggodes herrei*, new species***Holotype*.—Calif. Acad. Sci. No. 5747.*Type locality*.—One specimen from Post Office Bay, Charles Island, Galapagos, January 2, 1932.

Body oblong, dextral. Head 4.3, depth 2.4. Scales ctenoid. A straight lateral line on each side, this more distinct on colored side. Mouth contorted, with minute teeth on the rami of jaw only. No pectoral fin. Dorsal and anal separate from the caudal, the dorsal beginning on snout in front of upper eye. Ventrals symmetrical and free from the anal. Dorsal of 77 rays, anal of 53. Ventrals 5. Gill membranes united, free from isthmus. Eye 4.5 in head, the upper eye in advance of the lower by a distance equal to  $\frac{1}{2}$  its length; eyes are separated by a scaled interorbital space equal to the diameter of the orbit. Caudal peduncle short and deep, its depth equal to distance from posterior margin of lower eye to posterior margin of opercle. Caudal rounded, its longest median ray  $\frac{1}{4}$  longer than the head. Gape of mouth on right side extending to a line with the posterior margin of the upper eye. Ventrals, anal, and caudal of branched rays; the rays of the pectoral simple. Color in alcohol grayish green, everywhere, including fins, marked with specks and lines and blotches of black. There are about 3 large irregular blotches along the middle line of the colored side and in the center of these a black longitudinal line in each. There are also numerous small reticulations. The caudal is banded with black dots, the dorsal and anal have dark lines and dots. Named for Dr. Albert Herre, ichthyologist.

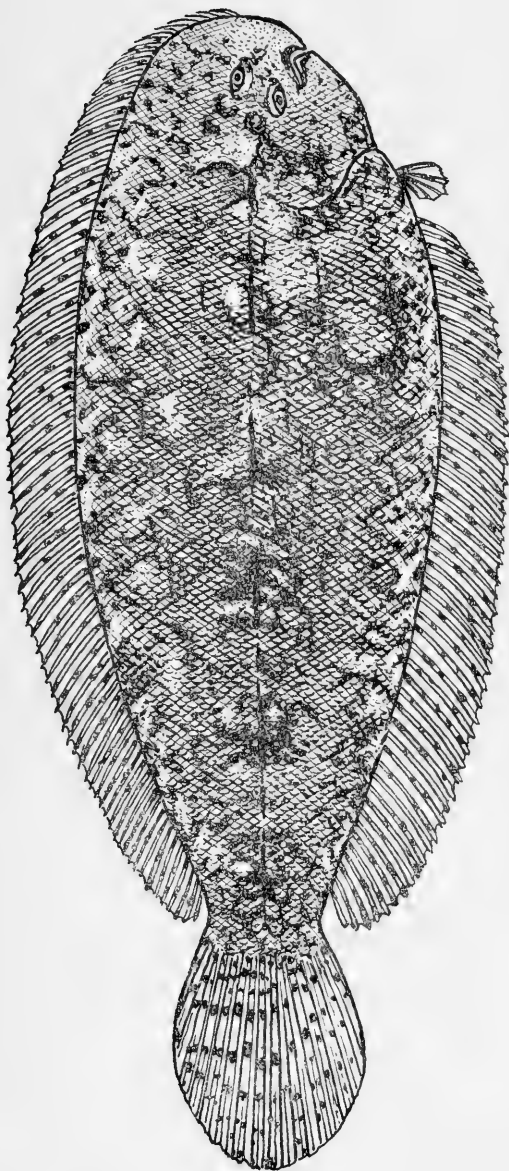
**Achiridae Broad Soles*****Achirus fonsecensis* (Günther)**

Two from Post Office Bay, Charles Island, Galapagos, January 4, 1932. Length 85-150 mm. No pectorals, ventrals symmetrical and distinct from anal. Dorsal 77, anal 53. One from Corinto, Nicaragua, February 8, 1932. Length 37 mm.

**Cynoglossidae Tonguefishes*****Symphurus atramentatus* Jordan and Bollman**

One from Jicarita Island, Panama, February 20, 1934. Length 65 mm. One from Bahia Honda, Panama, February 21, 1934. Length 74





0 10 20 mm

ASERAGGODES HERREI

mm. Three from Petatlan Bay, Mexico, March 3, 1934. Length 32-35 mm. Two from White Friars Islands, Mexico, March 2, 1934. Length 31-50 mm. Taken at a depth of 75 fathoms. One from Tenacatita, Mexico, March 4, 1934. Length 86 mm. Seven from Tagus Cove, Albemarle Island, Galapagos, January 13, 1934. Length 48-65 mm. Two from Wenman Island, Galapagos, January 11, 1934. Length 60-67 mm. One from Hood Island, Galapagos, January 21, 1939. Length 80 mm. From a depth of 35 fathoms. Color whitish with dark blotches and fine brownish specks on dorsal and anal fins.

*Symphurus elongatus* (Günther)

One from Port Utria, Colombia, February 15, 1934. Length 80 mm. One from Tenacatita, Mexico, March 4, 1934. Length 50 mm.

*Symphurus atricaudus* (Jordan and Gilbert)

One from Tenacatita, Mexico, December 10, 1931. Length 159 mm. One from Jicarita Island, Panama, January 29, 1932. Length 55 mm. Color grayish white with alternating black and white marks on posterior half on the dorsal and anal fins.

### Holocentridae Soldierfishes

*Adioryx suborbitalis* (Gill)

One from Panama Bay, December 24, 1931. Length 140 mm. Six from Mazatlan, Mexico, December 7, 1931. Length 34-38 mm. Five from Gorgona Island, Colombia, February 12, 1934. Length 42-59 mm. One from Cabita Bay, Colombia, February 13, 1934. Color in alcohol steel gray, the spinous dorsal with lighter spots between the spines at base, the young with dark margin to dorsal with darker area between the anterior spines at tip.

### Fistulariidae Cornetfishes

*Fistularia petimba* Lacépède

Four from Sihuatanejo, Mexico, December 11, 1931. Length 173-265 mm.

### Atherinidae Silversides

*Eurystole eriarcha* (Jordan and Gilbert)

Four from Black Beach Anchorage, Charles Island, Galapagos, January 17, 1934. Length 32-46 mm. Two from Port Utria, Colombia,

February 17, 1934. Length 45-46 mm. Color white with a distinct wide silvery strip on side. Dorsal IV-I, 13-15; anal 30-34. Jaws terminal.

### Mugilidae Mulletts

#### *Mugil cephalus* Linnaeus

One from Tower Island, Galapagos, January 22, 1932. Length 223 mm.

#### *Mugil thoburni* Jordan and Starks

Nine from Tenacatita Bay, Mexico, December 10, 1931. Length 129-233 mm. Twenty-seven from Sihuatanejo, Mexico, December 12, 1931. Length 65-133 mm. The young have only 2 anal spines. Two from Bahia Honda, Panama, December 21, 1931. Length 155-159 mm. Two from Post Office Bay, Charles Island, Galapagos, January 3, 1932. Length 128-298 mm. Three from Port Utria, Colombia, February 14, 1934. Length 55-59 mm. Four from Gorgona Island, Colombia, February 12, 1934. Length 50-55 mm. Two from South Seymour Island, January 22, 1934. Length 31-33 mm. Six from Charles Island, Galapagos, January 22, 1934. Length 20-35 mm.

Dorsal IV-I, 7; anal III, 9 (II, 9 in young). Scales 39-42. The adults have a well-developed adipose eyelid which is absent in the young.

#### *Mugil hospes* Jordan and Culver

Two from Colon, Panama, December 24, 1931. Length 201-209 mm. This species is easily distinguished by the long falcate pectorals, which are equal to or greater than length of head. Adipose eyelid present.

#### *Chaenomugil proboscideus* (Günther)

One from Sihuatanejo, Mexico, December 12, 1934. Length 138 mm. One from Port Utria, Colombia. Length 103 mm. No adipose eyelid. Length of the snout greater than width of orbit. A black spot at upper axil of pectoral. Scales 44.

#### *Agonostomus hancocki* Seale

Two specimens (Type No. 838 and cotype) from fresh-water stream on Chatham Island, Galapagos, January 1, 1932. Length 343 mm.

### Sphyraenidae Barracudas

#### *Sphyraena ensis* Jordan and Gilbert

One from Tenacatita Bay, Mexico, December 10, 1931. Length 74 mm. One from Tangola-Tangola Bay, Mexico, December 16, 1931.

Length 469 mm. One from Panama Market, Panama, December 24, 1931. Length 394 mm. Dorsal V-I, 8; anal I, 8. Scales 120. Body with 20 dark bands about equal in width to their interspaces.

*Sphyræna idiaestes* Snodgrass and Heller

One from Tagus Cove, Albemarle Island, Galapagos, January 13, 1934. Length 60 mm. This specimen has 8 dark bars over the back and a dark stripe down the side, also 3 dark spots posteriorly on the under side of the body. Maxillary not reaching eye. Origin of ventrals slightly in advance of origin of spinous dorsal, being midway between tip of upper jaw and middle of caudal peduncle.

**Polynemidae** Threadfins

*Polynemus approximans* Lay and Bennett

Fifteen from Mazatlan, Mexico, December 7, 1931. Length 49-225 mm. Five from Tenacatita, Mexico, December 10, 1931. Length 50-109 mm. Two from Sihuatanejo, Mexico, December 12, 1931. Length 166-223 mm. Two from Corinto, Nicaragua, February 8, 1932. Length 101-158 mm. Four from Port Utria, Colombia, February 14, 1934. Length 40-53 mm. Six pectoral filaments. Dorsal VIII-I, 12; anal III, 14. Scales 63.

*Polynemus opercularis* (Gill)

Three from Mazatlan, Mexico, December 7, 1931. Length 305-325 mm. One from Tenacatita, Mexico, December 10, 1931. Length 229 mm. One from Panama Market, Panama, December 10, 1931. Length 287 mm.

**Acanthocybiidae** Wahoos

*Acanthocybium solandri* (Cuvier and Valenciennes)

A number of these large game fishes were taken during the cruise. They were especially abundant at Cocos Island, February 2-3, 1932, and are an excellent food fish. Specimens exceeding 1½ meters in length were taken. They are known locally under the following names: Guahu, Guarapucu, Peto, Queenfish, Springer, Ono.

**Cybiidae** The Sierras

*Scomberomorus sierra* Jordan and Starks

A number of these fine food and game fishes were taken along the coast of Mexico and in the Galapagos Islands. They may be distinguished

by the bright yellow spots on the sides. Their usual length is about 760 mm. This species is known locally as Spanish Mackerel, Cero, Sierra, Spotted Mackerel.

### **Scombridae** Mackerels

#### *Pneumatophorus diego* (Ayres)

One from Tagus Cove, Albemarle Island, Galapagos, January 14, 1934. Length 152 mm. Several schools of the common mackerel were seen in the Galapagos. It is probable that the proper name for this fish is *Scomber scomber* Linnaeus, as we have examined specimens from many seas and found no specific differences.

### **Katsuwonidae** Skipjacks

#### *Katsuwonus pelamis* (Linnaeus)

Numerous specimens of this Ocean Skipjack were taken in the Galapagos Islands in January, 1932. The average length was about 650 mm. This species may be distinguished by the 5 distinct stripes on the lower sides, none on the back. In life there are purplish bars over the back, which disappear after death. This fish is also known as Ocean Bonita, Striped Tuna, and Skippy.

#### *Euthynnus lineatus* Kishinouye

One from Tower Island, Galapagos, January 22, 1932. Length 415 mm. This species is known as the Black Skipjack and may be distinguished by the dark stripes on the back and the 3 or 4 round dark spots below the pectoral fin. It may also have 3 or 4 stripes on the sides, but these fade soon after death.

### **Thunnidae** Tunnies and Bonitos

#### *Sarda lineolata* (Girard)

Specimens of this California Bonita were taken in the Galapagos and at Cocos Island. They may be distinguished by the 10 dark lines that extend upward and back on the sides of the body.

#### *Neothunnus macropterus* (Temminck and Schlegel)

The Yellowfin Tuna was common among the islands of the Galapagos, where it may be taken on the hand line. It reaches a weight of 450 pounds. When first taken from the water, it is one of the most gorgeous of fish, being deep blue above, silvery below, with a wonderful flush of

pinkish and golden iridescence over the body. There are no stripes on the body. The pectoral fin is equal to or slightly greater than the length of the head.

### Trichiuridae Cutlassfishes

#### *Trichiurus lepturus* Linnaeus

One from Balboa, Canal Zone, February 22, 1932. Length 422 mm. Gift from Captain Fred Whalen.

### Carangidae Cavallas and Pampanos

#### *Decapterus hypodus* Gill

One from Post Office Bay, Charles Island, Galapagos, January 2, 1932. Length 405 mm. These have a single detached finlet behind the dorsal and the anal fin, 30 scutes on the lateral line, and a distinct opercular spot. This species is known locally as Mackerel Scad.

#### *Trachurops crumenophthalma* (Bloch)

Twenty-seven from Post Office Bay, Charles Island, Galapagos, January 2, 1932. Length 150-189 mm. Five from Acapulco, Mexico, December 15, 1931. Length 175-208 mm. Three from La Plata Island, Ecuador, February 10, 1934. Length 85-105 mm. This Big-eyed Scad is easily identified by the deep cross furrow at the isthmus and by the fleshy projection into the gill cavity. They were so abundant at Charles Island, Galapagos, that half the catch had to be turned out of the net before it could be drawn out of the water.

#### *Hemicaranx atrimanus* (Jordan and Gilbert)

One from Panama Market, December 23, 1931. Length 178 mm.

#### *Paratractus caballus* (Günther)

One from Tenacatita, Mexico, December 10, 1931. Length 229 mm. Three from Acapulco, Mexico, December 15, 1931. Length 188-227 mm. One from Tower Island, Galapagos, January 20, 1932. Length 238 mm. One from Corinto, Nicaragua, February 9, 1932. Length 307 mm. This Common Green Jack has the breast fully scaled, pectoral fins much longer than the head, dorsal VIII-I, 24; anal II-I, 21; scutes 41-44.

#### *Xurel marginatus* (Gill)

Seven from Mazatlan, Mexico, December 7, 1931. Length 100-198 mm. One from Bahia Honda, Panama, December 21, 1931. Length 228 mm. One from Panama Market, December 24, 1931. Length 167 mm.

One from Corinto, Nicaragua, February 9, 1932. Length 94 mm. One from Acapulco, Mexico, February 12, 1932. Color silvery, darker above, no black spots except a minute black dot at the origin of the lateral line. Dorsal darker on its outer half. Lower fins yellowish. Young specimens are banded. Dorsal VIII-I, 19; anal II-I, 17. Maxillary ending on a line with middle of pupil. Breast fully scaled. Thirty-three scutes in lateral line. This fish is known locally as the Big-eyed Jack.

*Caranx hippos* (Linnaeus)

Twenty from Mazatlan, Mexico, December 7, 1931. Length 87-410 mm. Four from Panama Market, December 24, 1931. Length 85-142 mm. This Horse Crevalla has the dorsal VI, 20-21, anal II, 17. Breast naked except for a small patch of scales at base of ventrals. Thirty-eight armed scutes. Pectorals falcate, longer than head.

*Hynn timer hopkinsi* Jordan and Starks

One from White Friars Islands, Mexico, February 14, 1932. Length 658 mm. Color silvery with a bluish flush when first taken from the water. Jaws with fine granulate teeth. Maxillary extending to a line with the pupil. Eighteen soft rays in the dorsal and 16 in the anal. Very fine scales on each side of the breast.

*Argyreosus oerstedii* (Lütken)

One from Panama Market, December 24, 1931. Length 179 mm. Dorsal with 18 soft rays, anal with 15. Dorsal and anal rays extending to beyond caudal. Spinous dorsal and posterior half of ventrals black.

*Vomer declivifrons* Meek and Hildebrand

One from Panama Market, December 24, 1931. Length 234 mm. Head rounded above eyes. Dorsal with 24 rays. No scutes. Lateral line with deep curve.

*Selene brevoortii* (Gill)

Four from Mazatlan, Mexico, December 7, 1931. Length 47-192 mm. Two from Tenacatita, Mexico, December 10, 1931. Length 363 mm. Eight from Bahia Honda, Panama, December 21, 1931. Length 44-55 mm. One from Panama Market, December 24, 1931. Length 164 mm. Three from Corinto, Nicaragua, February 9, 1932. Length 46-187 mm. Dorsal VII, 20; anal II-I, 17. No scutes.

*Trachinotus rhodopus* (Gill)

Three from Panama Market, January 29, 1932. Length 133-185 mm. Color silvery, becoming darker on back. A dark opercular spot. Axil of pectorals dark.

*Trachinotus paloma* Jordan and Starks

Two from Mazatlan, Mexico, December 8, 1931. Length 40-45 mm.

*Oligoplites saurus* (Bloch and Schneider)

One from Sihuatanejo Bay, Mexico, December 11, 1931. Length 63 mm. This species is known locally as the Yellow-tailed Leather Jacket.

*Oligoplites mundus* Jordan and Starks

One from Panama Market, December 24, 1931. Length 360 mm. Color bluish above, golden below. Depth 2.8 in length. Maxillary extending far posterior of eye.

**Seriolidae** Amberjacks*Elagatis bipinnulatus* (Quoy and Gaimard)

A number of these "Rainbow Runners," as they are locally known, were taken at White Friars Islands, February 14, 1932. They may be distinguished by the single finlet behind the dorsal and the anal. Color bright blue above to near middle of side, where a wide stripe of yellow extends from head to tail; this is bordered below by a narrow blue line, all below being silvery white. Length 1 meter.

*Seriola dorsalis* (Gill)

Numerous specimens of the Yellow Tail or Amberjack, as they are locally known, were taken along the Mexican coast and in the Galapagos. They may be distinguished by the dark or brassy stripe from head to tail. Length up to 1 meter.

**Nematistiidae** Roosterfish*Nematistius pectoralis* Gill

This fine food and game fish was taken at many localities along the Mexican coast and in the Gulf of California. In life it has a black stripe on the side extending up and back. Specimens of more than 1 meter in length were taken.

**Kuhliidae** Island Perch*Kuhlia taeniura* (Cuvier and Valenciennes)

One from Gorgona Island, Colombia, February 12, 1934. Length 52 mm. This species has two oblique dark bars on the caudal lobes and a bar in the center of the fin.



**Centropomidae** Robalos*Centropomus viridis* Lockington

Six from Sihuatanejo, Mexico, December 12, 1931. Length 86-125 mm. Maxillary extending to below middle of eye. Scales 75-80. Tip of dorsal fin black.

*Centropomus pedimacula* Poey

One from Panama Market, December 24, 1931. Length 469 mm. This species has a very distinct silvery lateral line located in a dark stripe. Ventral fins tipped with dusky wash. First and third anal spines very long and strong.

*Centropomus armatus* Gill

Eight from Tenacatita, Mexico, December 10, 1939. Length 150-203 mm. One from Guayas River, Guayaquil, Ecuador, February 6, 1934. Length 185 mm. Lateral line not dark. Second anal spine equal to length of head. Large teeth at angle of preopercle. Scales 48 in lateral line. Dorsal VII-I, 10; anal III, 6. Color yellowish, darker above; dorsal fins with dusky wash.

**Epinephelidae** Groupers*Epinephelus analogus* Gill

Two from Tower Island, Galapagos, January 23, 1932. Length 205-211 mm. Color grayish green covered with fine dark dots or specks.

*Epinephelus merra* Bloch

One from Post Office Bay, Charles Island, Galapagos, January 2, 1932. Length 165 mm. Body brown covered with fine white lines marking small hexagonal spots. All the fins spotted.

*Epinephelus septemfasciatus* (Thunberg)

One from Sullivan Bay, James Island, Galapagos, January 23, 1934. Length 57 mm. Body with 8 distinct dark vertical bands about equal to interspaces, the bar on the caudal peduncle greater in width and jet black, a black line at maxillary groove.

*Epinephelus labriformis* (Jenyns)

One from Panama Market, December 24, 1931. Length 335 mm. One from Isabel Island, Mexico, February 16, 1932. Length 225 mm. One from Espiritu Santo Island, Mexico, February 18, 1932. Length 229 mm. Two from South Seymour Island, Galapagos, January 15, 1932. Length 135 mm. Color greenish gray with slight pinkish wash, numerous white spots over the body.

*Promicrops itaiara* (Lichtenstein)

Two large Jewfish with a weight of approximately 25 kilos each were captured at Espiritu Santo Island, February 18, 1932.

*Alphestes multiguttatus* (Günther)

One from Panama Market, December 24, 1931. Length 209 mm.

*Dermatolepis punctatus* Gill

One from Charles Island, Galapagos, January 3, 1932. Length 207 mm. One from Cocos Island, February 2, 1932. Length 279 mm. A few of this species were brought alive to Steinhart Aquarium, San Francisco, where they lived quite contentedly for seven years.

*Mycteroperca olfax* (Jenyns)

One from Tower Island, Galapagos, January 20, 1932. Length 340 mm. One from Panama, February 1, 1932. Length 335 mm. This species was very abundant in the Galapagos Islands and in the Gulf of California. Many specimens were taken and used as food. The Golden Grouper seems only a color variety of this species.

*Xystroperca pardalis* (Gilbert)

One from Ensenada de los Muertos, Mexico, February 20, 1932. Length 389 mm. Grayish with darker spots and mottlings, the fins covered with small dark spots.

**Serranidae** Sea Bass*Paralabrax humeralis* (Cuvier and Valenciennes)

One from Tagus Cove, Albemarle Island, Galapagos, January 6, 1932. Length 222 mm. One from Indefatigable Island, Galapagos, January 13, 1932. Length 121 mm. This is a common sea bass of the Galapagos Islands. They are easily distinguished by the row of large white blotches along the side with two larger white blotches above these.

*Cratinus agassizii* Steindachner

Two from Tagus Cove, Albemarle Island, Galapagos, January 5, 1932. Length 360-455 mm. Specimens of this bass with its peculiar elongated dorsal spines were taken alive. They seemed quite contented in the tanks at the aquarium and lived for seven years.

*Diplectrum pacificum* Meek and Hildebrand

One from Bahia Honda, Panama, February 12, 1934. Length 42 mm. Color gray with three dark longitudinal lines on upper half of body. A

large black caudal spot. Some indistinct crossbars are indicated. Dorsal X, 12; anal III, 7. Margin of preopercle distinctly toothed.

*Prionodes fasciatus* Jenyns

One from Tagus Cove, Albemarle Island, Galapagos. Length 135 mm. One from Sullivan Bay, James Island, Galapagos, January 23, 1934. Length 60 mm. Dorsal X, 12; anal III, 7. Body with 10 indistinct broken crossbands. Small round black dots on lower anterior portion of body. Fins spotted.

*Paranthias furcifer* (Cuvier and Valenciennes)

Post Office Bay, Charles Island, Galapagos, January 2, 1932. Length 165-170 mm. Four from Tagus Cove, Albemarle Island, Galapagos, January 5, 1932. Length 120-450 mm. Two from Tower Island, Galapagos, January 20, 1932. Length 95-260 mm. When first taken from the water, these fish have a beautiful pinkish flush over the body. There are 4 or 5 small white points on the sides. These fish take kindly to captivity, and specimens taken in 1932 are still (1940) alive in Steinhart Aquarium.

### **Pseudochromidae**

*Pseudochromis polyacanthus* Bleeker

One from Port Utria, Colombia, February 15, 1934. Length 45 mm. Distinguished from related forms by the distinct black spot on the opercle and the seven dorsal spines.

### **Lobotidae** Tripletails

*Verrugato pacificus* (Gilbert)

One specimen from Panama Market, December 24, 1931. Length 195 mm. Color uniform brown. The rather uniform size of the soft dorsal, anal, and caudal may well supply the local name "Tripletail" to this fish.

### **Lutianidae** Snappers

*Lutianus jordani* (Gilbert)

One from Cocos Island, February 3, 1932. Length 385 mm. Color reddish brown, fins darker.

*Lutianus kasmira* (Forsk.)

One from Post Office Bay, Charles Island, Galapagos, January 2, 1932. Length 243 mm. Color golden with four blue stripes which are

margined with deeper blue, fins yellowish. Lighter colored below. A number of this species were secured alive at James Bay, James Island, and at Cocos Island, and were brought to Steinhart Aquarium, where they may still be seen swimming about in the tanks. (*Lutianus viridis* is probably the same species.)

*Lutianus argentiventris* (Peters)

Four from Panama Market, December 24, 1931. Length 145-175 mm. Three from Corinto, Nicaragua, February 8, 1932. Length 50-100 mm.

*Lutianus guttatus* (Steindachner)

One from Acapulco, Mexico, December 15, 1931. Length 329 mm. One from Panama Market, December 24, 1931. Length 189 mm. One from La Libertad, Ecuador, February 9, 1934. Length 36 mm. Color grayish with a large round black spot just below the anterior portion of soft dorsal fin. Three or 4 stripes on lower half of body and numerous lines extending up and back on upper portion. These, however, are very indistinct in some specimens. The young have indications of dark bands.

*Lutianus novemfasciatus* (Gill)

Fourteen from Tenacatita, Mexico, December 10, 1931. Length 75-150 mm. One from Mazatlan, Mexico, December 7, 1931. Length 208 mm. This species, known locally as the "Dog Snapper" and "Red Snapper," is quite common along the coast of Mexico and specimens up to 30 kilos in weight were taken. The adults are uniform red in color. The young show indistinct crossbars.

*Raizero aratus* (Günther)

One from Tenacatita, Mexico, December 10, 1931. Length 152 mm. Dorsal XI, 12; anal III, 7. A dark area at axil of pectoral.

*Aphareus furcatus* (Lacépède)

One from Cocos Island, February 2, 1932. Length 385 mm. Color in life bluish gray with the dorsal and anal having a few dark dots. The posterior rays of the dorsal and anal are elongate.

### Haemulidae The Grunters

*Haemulon scudderi* Gill

One from Seymour Island, Galapagos, January 10, 1932. Length 274 mm. Center of scales dark, forming oblique lines above the lateral line.

*Orthostoechus maculicauda* Gill

One from Panama Market, December 24, 1931. Length 209 mm. Color silvery gray with pearly lines on the side. A large blackish blotch at base of caudal.

*Paraconodon pacifici* (Günther)

One from Guayas River at Guayaquil, Ecuador, February 6, 1934. Length 150 mm. Head 3.2 into standard length. Depth 2.1. Dorsal XI, 15; anal III, 9. Scales 48. No teeth on vomer or palatine; fine, sharp-pointed teeth in the jaws, those in front somewhat enlarged. Eye 3.1 in length of head, being equal to the interorbital space, which is fully scaled. Preopercle armed. Second anal spine very large and longer than the longest dorsal spine. Caudal lunate. Maxillary extending to below front margin of eye.

*Paraconodon dovii* (Günther)

One from Panama Market, December 24, 1931. Length 222 mm. Second anal spine very strong, its length 1.6 in head. Color grayish with 3 wide oblique bands on sides.

*Anisotremus interruptus* (Gill)

One from James Bay, James Island, Galapagos, January 10, 1932. Length 224 mm. One from Seymour Island, Galapagos, January 15, 1932. Length 335 mm. Three from Tower Island, Galapagos, January 15, 1932. Length 356 mm. A bright-colored fish, blue gray anteriorly, shading into orange on posterior portion.

*Anisotremus scapularis* (Tschudi)

One from Tagus Cove, Albemarle Island, Galapagos, January 5, 1932. Length 265 mm.

*Anisotremus taeniatus* Gill

One from Tenacatita, Mexico, December 10, 1931. Length 229 mm. This species very closely resembles the eastern Porkfish with its distinctive markings.

*Brachydeuterus leuciscus* (Günther)

One from Panama Market, December 24, 1931. Length 229 mm. Dark stripes on the middle of sides, axil of pectoral dark.

*Rhencus panamensis* (Steindachner)

One from Panama Market, December 24, 1931. Length 200 mm. Color silvery, a black spot on opercle, another under the middle of the spinous dorsal.

*Pomadasys macracanthus* (Günther)

One from Panama Market, December 24, 1931. Length 269 mm. Color silvery with 4-5 wide indistinct bands extending down to middle of sides. Second anal spine very strong, extending beyond soft rays.

*Orthopristis cantharinus* (Jenyns)

Five from Tagus Cove, Albemarle Island, Galapagos, January 13, 1934. Length 20-27 mm. One from Post Office Bay, Charles Island, Galapagos, January 2, 1932. Length 348 mm. Grayish in color with irregular crosslines. The young have 7-8 dark bands.

*Orthopristis lethopristis* Jordan and Fesler

One from Panama Market, December 24, 1931. Length 335 mm. A wide black area on opercular membrane. Axil of pectoral black.

*Orthopristis forbesi* Jordan and Starks

One from Seymour Island, Galapagos, January 15, 1932. Length 332 mm. One from Tagus Cove, Albemarle Island, Galapagos, January 5, 1932. Length 329 mm. Color reddish brown, somewhat lighter below. Gill membrane black. Dorsal XII, 14; anal III, 9.

**Sparidae** Porgies*Archosargus pourtalesii* (Steindachner)

One from Post Office Bay, Charles Island, Galapagos, January 3, 1932. Length 304 mm. Marked with yellow stripes from head to tail. A round black spot above pectoral fin.

**Kyphosidae** Pilotfishes*Kyphosus analogus* (Gill)

One from Sihuatanejo, Mexico, December 11, 1931. Length 254 mm.

**Gerridae** Mojarras*Eucinostomus californiensis* (Gill)

Nineteen from Mazatlan, Mexico, December 8, 1931. Length 74-175 mm. Three from Tenacatita, Mexico, December 10, 1931. Length 145-152 mm. Nine from Sihuatanejo, Mexico, December 11, 1931. Length 84-152 mm. Eight from Acapulco, Mexico, December 14, 1931. Length

63-109 mm. Nine from Bahia Honda, Panama, December 21, 1931. Length 25-84 mm. Two from Panama Market, December 24, 1931. Length 146-152 mm. Three from Post Office Bay, Charles Island, Galapagos, January 2, 1932. Length 62-100 mm. Five from South Seymour Island, Galapagos, January 15, 1932. Length 94-127 mm. Four from Corinto, Nicaragua, February 8, 1932. Length 82-109 mm. One from Guayas River at Guayaquil, Ecuador, February 6, 1934. Length 143 mm. This is one of the most abundant species of the regions visited, being found on all sandy beaches. Color is silvery with a jet-black tip to the dorsal fin, usually with a white area just below. Opercle smooth, preopercle entire.

*Gerres cinereus* (Walbaum)

Four from Tenacatita, Mexico, December 10, 1931. Length 115-229 mm. Two from Sihuatanejo, Mexico, December 12, 1931. Length 196-330 mm. One from Tower Island, Galapagos, January 20, 1932. Length 145 mm. Color silvery with 7-8 broken dark bars on the sides.

*Diapterus peruvianus* (Cuvier and Valenciennes)

Two from Panama Market, December 24, 1931. Length 145-252 mm. One from Corinto, Nicaragua, February 9, 1932. Length 82 mm. Color silvery with a slight dusky wash on ventral fins.

*Eugerres lineatus* (Humboldt)

One from Sihuatanejo, Mexico, December 11, 1931. Length 196 mm. Silvery with a dark line on each row of scales. The lateral line is located in a narrow dark line. All fins except pectorals are grayish.

### Mullidae Surmulletts

*Upeneus grandisquamis* Gill

One from Panama Market, December 24, 1931. Length 184 mm. Head 3.3 in standard length. Depth 3. Eye 4 in head. Scales 30 in lateral line, 3 rows on cheeks. Barbules fall slightly short of posterior edge of opercle. Color pinkish white, caudal yellow.

*Mulloides auriflamma* (Forsk.)

One from Cocos Island, February 2, 1932. Length 374 mm. Scales 38 in lateral line. Eye 4.5 in length of head. Color pinkish with a slight wash of yellow. A bright golden stripe from head to caudal. This extends the range of this species from Nukuhiva of the Marquesas Islands, where the author took 6 specimens in 1902.

## Sciaenidae Croakers

*Larimus acclivis* Jordan and Bristol

One from Panama Market, December 24, 1931. Length 223 mm. One from Guayas River at Guayaquil, Ecuador, July 6, 1934. Length 150 mm. Mouth but little oblique. Lower jaw projecting. Second anal spine strong and extending to tip of rays. Color silvery with narrow dark oblique lines on sides above middle of body.

*Bairdiella ensifera* (Jordan and Gilbert)

One from Guayas River at Guayaquil, Ecuador, February 6, 1934. Length 180 mm. Dorsal IX-I, 24; anal II, 8. Sixty-two scales in the lateral line. Strong teeth at angle of preopercle, the lower one directed down. Second anal spine strong, equal in length to distance from anterior margin of eye to posterior margin of opercle. Color silvery, a narrow dark line along each row of scales, spinous dorsal and outer half of anal dark.

*Nector chrysoleucus* (Günther)

One from Panama Market, December 24, 1931. Length 224 mm. One from Mazatlan, Mexico, December 8, 1931. Length 319 mm. One from Guayas River at Guayaquil, Ecuador, February 6, 1934. Length 175 mm. Color silvery with the center of the scales yellowish, forming indistinct lines. Dorsal, caudal, and anal dusky; in large specimens the fins are yellowish.

*Zestis oscitans* (Jordan and Gilbert)

One from Panama Market, December 24, 1931. Length 189 mm. Mouth quite oblique. Interorbital space broad and flat. Two spines at angle of preopercle. Pectorals longer than head. Caudal lanceolate.

*Ophioscion typicus* Gill

One from Tenacatita, Mexico, December 10, 1931. Length 157 mm. No barbules. Teeth setiform, with some enlarged teeth in upper jaw. Color silvery, lighter below. Fins grayish.

*Umbrina galapagorum* Steindachner

One from Post Office Bay, Charles Island, Galapagos, January 2, 1932. Length 170 mm.

*Umbrula elongata* (Günther)

Three from Mazatlan, Mexico, December 7, 1931. Length 122-252 mm. One from Acapulco, Mexico, December 15, 1931. Length 157 mm.



A long slim fish with a depth of 4.7 in standard length. A single fleshy barbule on chin. Color uniform silvery.

*Polyclemus dumerili* (Bocourt)

One from Panama Market, December 24, 1931. Length 252 mm. Six wide distinct black bands over the body extending more or less onto the dorsal fin. Pectorals, caudal, and anal yellowish.

*Zaclemus goodei* (Gilbert)

One from Panama Market, December 24, 1931. Length 202 mm. Four indistinct dark bands over back. Fins grayish.

### Otolithidae Weakfish

*Isopisthus remifer* Jordan and Gilbert

One from Panama Market, December 24, 1931. Length 253 mm. Color silvery with black in axil of the pectoral.

*Nebris occidentalis* Vaillant

One from Panama Market, December 24, 1931. Length 279 mm. No barbules. Two very weak anal spines. Head spongy and fully scaled. Eye small. Mouth oblique. Color silvery.

*Eriscion nebulosus* (Cuvier and Valenciennes)

One from Panama Market, December 24, 1931. Color silvery with grayish reticulations above the lateral line. Lower jaw not included. Teeth small canines. Caudal lanceolate.

### Cirrhitidae

*Cirrhitus rivulatus* (Valenciennes)

Two from Cocos Island, February 2, 1932. Length 304 mm. Three (young) from Mazatlan, Mexico, December 8, 1932. Length 33-61 mm. One from Bahia Honda, Panama, February 21, 1934. Length 30 mm. Four from Port Utria, Colombia, February 15, 1934. Length 40-58 mm. Two from Gorgona Island, Colombia, February 13, 1934. Length 34-35 mm. The adult of this species is a most peculiarly colored fish, being greenish with rivulated bands and spots of yellow edged with bright blue, more or less chainlike. The young (*C. betaurus* Gill) may prove to be a distinct species; all of our specimens are yellowish with 4-5 jet-black bands as wide as the interspaces.

**Ephippidae** Spadefish*Parapsettus panamensis* Steindachner

One from Sihuatanejo, Mexico, December 11, 1931. Length 159 mm. Dorsal IX, 28; anal III, 24. Snout somewhat overhanging the lower jaw. Lateral line curved.

**Chaetodontidae** Butterflyfishes*Chaetodon humeralis* Günther

One from Tagus Cove, Albemarle Island, Galapagos, January 12, 1934. Length 30 mm. Two from Black Beach Anchorage, Charles Island, Galapagos, January 14, 1934. Length 14-15 mm. One from South Seymour Island, Galapagos, January 22, 1934. Length 35 mm. Color in alcohol dull brownish yellow. A distinct ocular band almost equal to eye extends from origin of dorsal and unites with its fellow below. A second dark band, slightly greater in width, extends from the anterior portion of the spinous dorsal down the opercles, covering the base of the pectorals, and to the axil of the ventrals. A third wide dark band from posterior of spinous dorsal along base of soft dorsal and anal. Caudal peduncle black. Ventrals black. Soft dorsal, caudal, and anal uniform yellowish.

*Centropyge passer* (Valenciennes)

One from Panama Market, December 24, 1931. Length 209 mm. Blue black with a distinct white stripe extending down to the middle of side. Caudal, pectoral, and ventral yellow.

**Acanthuridae** Tangs*Acanthurus crestonis* (Jordan and Starks)

One from Panama Market, December 24, 1931. Length 209 mm. Color uniform bister brown, with a slightly darker area encircling the base of caudal. Teeth lobate. (Very near if not identical with *A. matoides* Cuvier and Valenciennes.)

**Scorpaenidae** Scorpionfishes*Sebastes kelloggi* Jenkins

One from Port Culebra, Costa Rica, February 25, 1934. Length 60 mm. Dorsal XII, 10; anal III, 5. No teeth on the palatine. Four spines

on posterior margin of opercle. Maxillary extending to posterior of pupil. Color grayish, mottled with darker gray. Three distinct dark bars on caudal.

*Scorpaenopsis gibbosus* (Schneider)

Five from Charles Island, Galapagos, January 27, 1934. Length 15-27 mm. One from Bahia Honda, Panama, February 21, 1934. Length 32 mm. Two from Hood Island, Galapagos, January 31, 1934. Length 22-44 mm. One from Port Utria, Colombia, February 14, 1934. Length 39 mm.

*Scorpaenodes xyris* (Jordan and Gilbert)

One from Espiritu Santo Island, Mexico, February 10, 1932. Length 555 mm. The 2nd anal spine is 4 times the length of the 1st spine. Teeth on the vomer, none on the palatines. Body mottled black and red, a large round black spot on head posterior of eye.

*Scorpaena mystes* Jordan and Starks

One from Port Utria, Colombia, February 15, 1934. Length 50 mm. Dorsal XII, 10; anal III, 5. Palatines with teeth. Three distinct cross-bars on caudal. Axil of pectoral jet black with white spots.

*Scorpaena isthmensis* Meek and Hildebrand

One from Port Utria, Colombia, February 14, 1934. Length 27 mm.

*Scorpaena guttata* Girard

One from Cedros Island, Mexico, February 25, 1934. Length 170 mm.

*Scorpaena histrio* Jenyns

Five from Post Office Bay, Charles Island, Galapagos, January 15, 1934. Length 19-30 mm. Two from Tagus Cove, Albemarle Island, January 12, 1934. Length 45-55 mm. One from La Libertad, Ecuador, February 9, 1934. Length 38 mm. Four from Bahia Honda, Panama, February 22, 1934. Length 40-50 mm. Eight from Port Culebra, Costa Rica, February 24, 1934. Length 20-45 mm. One from Port Utria, Colombia, February 15, 1934. Length 60 mm. One from Tenacatita Bay, Mexico, March 4, 1934. Length 70 mm. Color in alcohol grayish mottled with dusky on back and sides, belly white. Posterior half of ventral fins and a portion of the pectorals black. A wide black band through the middle of caudal.

*Sebastapistes bynoensis* (Richardson)

Three from White Friars Islands, Mexico, February 3, 1934. Length 20-55 mm.

*Pontinus sierra* (Gilbert)

One from Port Culebra, Costa Rica, February 2, 1934. Length 35 mm. Dorsal XII, 10; anal III, 5. All rays of pectoral simple. Palatine with teeth. A distinct filament above eye. Two diverging spines on pre-orbital. Color gray, with small dots of brown, and two or more indistinct dark bands on body.

*Pontinus strigatus* Snodgrass and Heller

One from Tagus Cove, Albemarle Island, Galapagos, January 5, 1934. Length 95 mm. Color reddish above, pale below, fins more or less barred with dusky.

**Triglidae** Sea Robins*Gurnardus xenisma* (Jordan and Bollman)

Three from Bahia Honda, Panama, February 21, 1934. Length 15-45 mm. Head with large spines, the snout ending in two flat spinelike projections. Spinous dorsal with distinct black ocellus between 4-5 spines.

*Prionotus miles* Jenyns

One from Tagus Cove, Albemarle Island, Galapagos, January 13, 1934. Length 34 mm. Dorsal X, 12; anal 10. Color brownish with indistinct bars. Ventral and anal fins white. Pectorals black. Caudal barred. Distal portion of spinous dorsal black.

**Pomacentridae** Demoiselle*Eupomacentrus leucorus* (Gilbert)

Fourteen from Post Office Bay, Charles Island, Galapagos, January 3, 1932. Length 65-112 mm. This species may be easily recognized by the uniform dark brown body and the narrow bright yellow or whitish tips on the pectorals.

*Eupomacentrus rectifraenum* (Gill)

Twenty from Mazatlan, Mexico, December 8, 1931. Length 61-65 mm. Seven from Port Utria, Colombia, February 15, 1934. Length 19-23 mm. Color purplish, with a pale blue line on each row of scales, 2 blue lines on snout to nape, a blue line from eye to tip of snout, another blue

line below eye, a blue-edged ocellus on the anterior portion of the soft dorsal fin, a black spot on top of caudal peduncle.

*Eupomacentrus arcifrons* (Snodgrass and Heller)

Nineteen from Seymour Island, Galapagos, January 14, 1931. Length 55-103 mm. One from Darwin Bay, Tower Island, Galapagos, January 22, 1931. Length 128 mm. One from Indefatigable Island, Galapagos, January 12, 1931. Length 112 mm. Five from Black Beach Anchorage, Charles Island, Galapagos, January 27, 1934. Length 19-20 mm. Color dark brown with caudal peduncle and caudal fin yellowish. The adults have a distinctively arched forehead.

*Stegastes dorsalis* (Gill)

One from Sihuatanejo, Mexico, December 11, 1931. Length 297 mm. Blue black in color. Dorsal, anal, and caudal with elongated tips.

*Abudefduf saxatilis* (Linnaeus)

One from Espiritu Santo Island, Mexico, February 18, 1932. Length 65 mm. One from Cabita Bay, Colombia, February 13, 1934. Length 42 mm. Nine from Gorgona Island, Colombia, February 12, 1934. Length 22-94 mm. Two from Jicarita Island, Panama, February 20, 1934. Length 24-26 mm. Distinguished by the 5 wide dark bands over the body, these being about equal to interspaces. No dark stripes on caudal lobes. A dark spot in upper axil of pectoral. No dark spot on soft dorsal or anal.

### Labridae Wrasse Fishes

*Bodianus diplotaenia* (Gill)

One from Indefatigable Island, Galapagos, January 12, 1932. Length 240 mm. Color pinkish with dark markings; caudal, soft dorsal, and anal yellowish.

*Pimelometopon pulcher* (Ayres)

One from Cedros Island, Mexico, February 25, 1932. Length 430 mm. This species was very common at Cedros Island.

*Iridio nicholsi* (Jordan and Gilbert)

One from James Bay, James Island, Galapagos, January 9, 1932. Length 272 mm. One from Tower Island, Galapagos, January 21, 1932. Length 65 mm. Color grayish green with a large dark area below the middle of spinous dorsal fin.

*Julidio notospilus* (Günther)

One from Mazatlan, Mexico, December 7, 1931. Length 57 mm. Color greenish, with a lighter stripe from head to caudal. A black blotch on the anterior portion of soft dorsal. No posterior canines. Scales 26.

*Thalassoma lutescens* (Lay and Bennett)

One from Tower Island, Galapagos, January 21, 1932. Length 84 mm. Head naked except for a small patch of scales three rows deep on upper portion of opercle. Scales 28.

**Eleotridae** Sleepers*Gymneleotris seminuda* (Günther)

One from Port Utria, Colombia, February 15, 1934. Length 35 mm. Ventrals well separated at base, caudal with numerous short rays at base. Posterior half of the fish scaled. Color red with numerous well-defined white narrow bands, 12 of which are posterior to pectoral axil.

**Gobiidae** Gobies*Bathygobius soporator* (Cuvier and Valenciennes)

Nine from Mazatlan, Mexico, December 7, 1931. Length 40-50 mm. Five from Isabel Island, Mexico, February 16, 1932. Length 25-95 mm. Fourteen from Espiritu Santo Island, Mexico, February 18, 1932. Length 37-85 mm. Two from Charles Island, Galapagos, January 3, 1932. Length 32-87 mm. One from Narborough Island, Galapagos, January 6, 1932. Length 82 mm. Seventy-seven from South Seymour Island, Galapagos, January 15, 1932. Length 23-98 mm. Eighteen from Black Beach Anchorage, Charles Island, Galapagos, January 13, 1934. Length 35-78 mm. One from Cabita Bay, Colombia, February 13, 1934. Length 37 mm. Distinguished by the free silky rays at the upper margin of the pectorals and the slight constriction of the tip of the tongue, making it somewhat bilobed. Color greenish with darker mottlings and spots. Specimens from Narborough Island are darker, which may be due to the dark lava pools in which they live.

*Odontogobius gilberti* (Heller and Snodgrass)

Two from Tagus Cove, Albemarle Island, Galapagos, January 12, 1934. Length 19-21 mm. One from Charles Island, Galapagos, January

26, 1934. Length 18 mm. Color yellowish white, with 12 narrow dark bands over the body. The anterior spines of the dorsal are very long and filamentous.

*Zonogobius rhizophora* (Heller and Snodgrass)

One from Black Beach Anchorage, Charles Island, Galapagos, January 13, 1934. Length 26 mm.

*Garmannia paradoxa* (Günther)

Two from Espiritu Santo Island, Mexico, February 19, 1932. Length 42-50 mm. Anterior rays of the dorsal elongated. Color grayish, with 12 white bands over the body.

*Cotylopus cocoensis* Heller and Snodgrass

Twenty-four from Wafer Creek on Cocos Island, February 3, 1932. Length 25-79 mm. Our specimens were secured in the fresh water about half a mile up the small stream that empties into Wafer Bay. All are dull brown, almost black in color with black spots on the side of the head and at the base of the pectorals. There is a lighter area through the soft dorsal. Ventrals very short and cuplike. In old males the dorsal rays extend slightly beyond the membrane of the fin. We counted 65 scales in the lateral line instead of 56, as given in the original description.

### Echeneidae Remoras

*Remora remora* (Linnaeus)

One from Balboa, Canal Zone, February 6, 1934. Length 175 mm. Lamella 18, the disk long. Ventrals adnate to body, pectorals rounded. Lower jaw scarcely projecting. Maxillary not extending to below eye. Color bluish, the fins darker.

*Remoropsis brachyptera* (Lowe)

One from Balboa, Canal Zone, July 9, 1934. Length 179 mm. Color uniform yellowish. Lower jaw projecting. Maxillary extending to a line with the eye. Ventrals not adnate to body.

**Callionymidae** Dragonets**Callionymus garthi**, new species

Plate 3, Fig. 3

*Holotype*.—Calif. Acad. Sci. No. 5746.*Type locality*.—One from Port Utria, Colombia, February 14, 1934. Length 30 mm.

Head, (measured from tip of snout to gill openings), 3.1 in length. Depth 2 in head. Eye 2.5 in head. The length of the snout is  $\frac{1}{2}$  the width of the eye, a very narrow ridge separating the large eyes. Snout triangular. Small teeth in narrow bands in jaws. A large bifurcated spine at angle of preopercle. Gill with small round opening on the dorsal surface. Body naked, without lateral line. Fins all well developed, especially the ventrals, but no elongate or filamentous rays or spines. The longest dorsal spine equal to the distance from tip of snout to posterior margin of orbit. Color yellowish white, the back entirely covered with fine brown specks. Dorsal fin dusky at base. Anal fin with two narrow indistinct dark stripes. Anal with some dark markings on its outer third. A dark area at base of caudal fin, all other fins uniform white. Named for John S. Garth, zoologist.

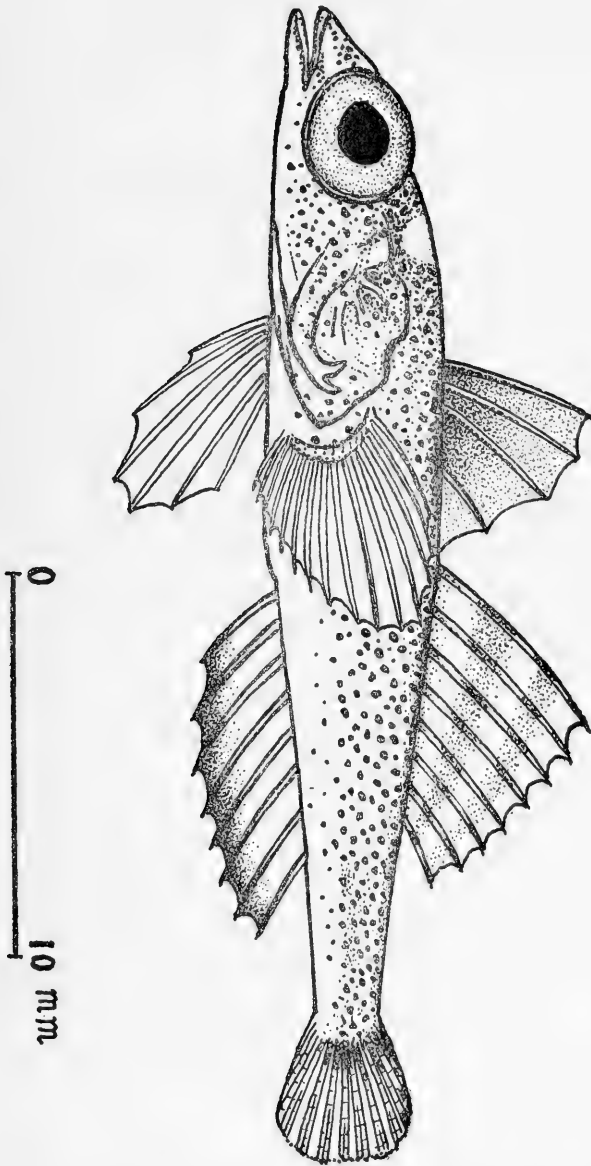
**Ammodytidae** Sand Lance*Bleekeria gilli* Bean

One from Charles Island, Galapagos, January 16, 1934. Length 70 mm. Head 4, depth 9.7. Eye equal to length of snout. Caudal forked. No ventrals. No teeth. Lateral line of 105 pores extending along side of back to caudal peduncle. Origin of dorsal above axil of pectorals. Origin of anal midway between end of caudal vertebra and opercle. This forms an addition to the recorded species from the Galapagos.

**Dactyloscopidae** Sand Stargazers*Dactyloscopus lunaticus* Gilbert

Two from Petatlan Bay, Mexico, March 3, 1934. Length 55-84 mm. Opercle with stiff fringe posteriorly. Lower jaw projecting. Eye small. Three brownish stripes on the body from head to tail.





CALLIONYMUS GARTHI

*Myxodagnus opercularis* Gill

One from Tangola-Tangola Bay, Mexico, December 16, 1934. Length 77 mm. Head 4.3, depth 8. Dorsal 39; anal II, 36. Lower jaw projecting beyond upper by a distance greater than eye. Snout about equal to eye. Curved movable teeth directed backward in lower jaw, a single row of fine pointed teeth in upper jaw. Opercles extending back and covering entire base of pectorals, 5 or 6 membranous fingers on upper posterior portion of opercle. Body with thin scales, the lateral line strongly curved anteriorly, becoming straight on a line with the tip of the pectorals and extending to caudal on the median line of the side. Forty-six pores in the lateral line. Color in alcohol uniform yellowish white.

*Gillellus semicinctus* Gilbert

One from Tangola-Tangola Bay, Mexico, February 28, 1939. Length 33 mm. Body white with 5 wide dark bands over back and down to middle of side, a black band around base of caudal.

**Clinidae** Kelpfish*Starksia cremnobates* (Gilbert)

Three from Tangola-Tangola Bay, Mexico, March 1, 1934. Length 27-30 mm. Indistinct bands extending up into the dorsal fin. A dark spot or bar behind eye. Distinct teeth on vomer and palatines.

*Auchenopterus monophthalmus* Günther

One from Espiritu Santo Island, Mexico, February 18, 1932. Length 37 mm. Dorsal III-XXVI; anal II, 19. Color greenish with 7 indistinct bands on body. A black ocellus on 18-21 rays of dorsal.

*Enneapterygius corallicola* Kendall and Radcliffe

One from Black Beach Anchorage, Charles Island, Galapagos, January 13, 1934. Length 62 mm. One from Port Utria, Colombia, February 14, 1934. Length 25 mm. Dorsal fin with 3 distinct divisions, III-13-12, or 3 spines and 25 rays. A small tentacle at nostril and another on orbit. Color greenish gray with 6 double bands over body. Cheeks with 3 dark bars.

*Malacoctenus delalandi* (Cuvier and Valenciennes)

One from Mazatlan, Mexico, December 7, 1931. Length 73 mm. Thirty-three from Espiritu Santo Island, Mexico, February 18, 1932. Length 37-89 mm. One from La Plata Island, Ecuador, February 10,

1934. Length 25 mm. One from Cabita Bay, Colombia, February 13, 1934. Length 46 mm. Five from Jicarita Island, Panama, February 20, 1934. Length 25-55 mm. Color greenish, banded and spotted with black. Tentacles on neck, over eye, and at nostril. Dorsal notched.

*Malacoctenus zonogaster* Heller and Snodgrass

One from Black Beach Anchorage, Charles Island, Galapagos, January 14, 1934. Length 75 mm. Anterior dorsal spine longest. Color greenish with 7 dark double bands over body. Head variegated.

**Blenniidae** Blenny

*Hypsoblennius striatus* (Steindachner)

Two from Tangola-Tangola Bay, Mexico, February 28, 1934. Length 30-32 mm. These proved to be a male and female.

*Rupiscirtes atlanticus* (Cuvier and Valenciennes)

Nine from Mazatlan, Mexico, December 7, 1931. Length 55-67 mm. Six from Sihuatanejo, Mexico, December 11, 1931. Length 55-60 mm. One from Port Utria, Colombia, February 15, 1934. Length 93 mm. Color uniform bluish, the fins darker, except caudal which is whitish on its outer margin. A round black spot just posterior of eye. Posterior canines large.

*Ophioblennius steindachneri* Jordan and Evermann

One from Sihuatanejo, Mexico, December 12, 1931. Length 93 mm. Golden brown in color with a dark ocellated spot behind eye. No black band on caudal base.

**Ophioblennius lanieri**, new species

Plate 4, Fig. 4

*Holotype*.—Calif. Acad. Sci. No. 5743.*Type locality*.—One specimen from Tagus Cove, Albemarle Island, Galapagos, January 13, 1934. Length 45 mm.

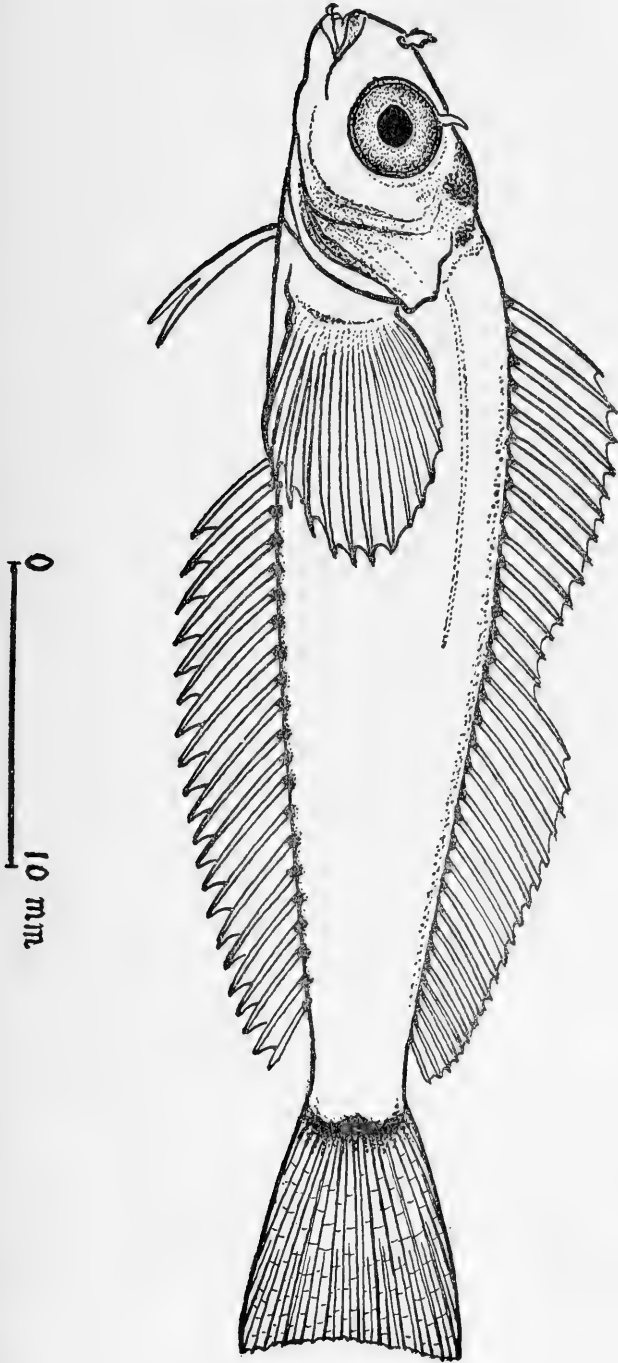
Body compressed, scaleless, a short lateral line over pectoral fin. Snout short, deep, and strongly curved. Mouth small, the lower jaw with 4 large recurved canines which project, the posterior ones almost at right angles to the jaw. Upper jaw with canines, which, however, do not project, small teeth posterior to these canines. Eye large, 3 in length of head, its diameter  $\frac{1}{3}$  greater than length of snout. Gill membranes united and free from the isthmus. Dorsal X, 24, the fin long, slightly lower near the center; anal 21. Caudal lunate, not united to dorsal or anal. Pectoral with strong muscular base, the fin equal in length to the distance from anterior nostril to posterior margin of opercle. Ventrals of 2 rays, equal in length to the distance from pupil to the posterior margin of the opercle. A flaplike tentacle at anterior nostril, a simple tentacle over the eye. Color in alcohol, yellowish white with a narrow distinct black band around base of caudal. No black ocellus back of eye. Named for Robert Lanier, aquarist.

*Spinoblennius spiniger* Herre

One from Tagus Cove, Albemarle Island, Galapagos, January 13, 1934. Length 20 mm. No scales. A boney plate covering the top of head. A prominent spine at angle of preopercle.

*Petrocirtes belanskei* Boranger

One from Tagus Cove, Albemarle Island, Galapagos, January 12, 1934. Length 44 mm. A wide black stripe on middle of body from snout to caudal, and alternating black and white bars on dorsal and anal.



*OPHIOBLENNIUS LANIERI*

**Chaenopsidae** Eel-like Blennies**Stathmonotus culebrai**, new species

Plate 5, Fig. 5

*Holotype*.—Calif. Acad. Sci. No. 5745.*Type locality*.—One specimen from Port Culebra, Costa Rica, February 24, 1934. Length 30 mm.

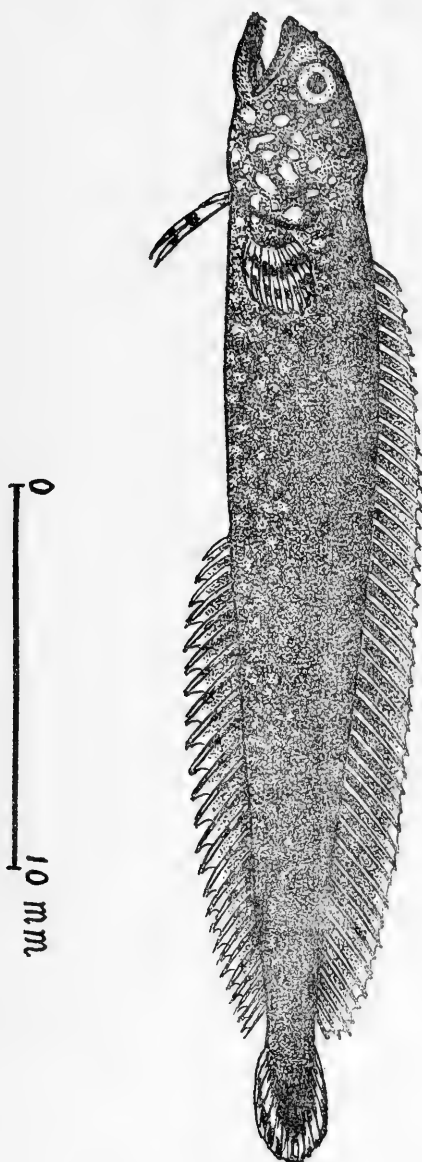
Head 5, depth 7 into standard length. Dorsal XLII; anal II, 24. No scales or filaments. No lateral line. Caudal distinct. Gill membranes broadly united and free of isthmus. Mouth oblique. Teeth short, stout, and sharp pointed, in 2 rows in upper jaw and on front of lower jaw. Eye large, about equal to snout. Ventrals jugular with 2 rays and a spine. Pectorals 2.5 in head. Origin of anal on a line with 16th dorsal spine. Origin of dorsal on a line with mid-length of pectorals. Color in alcohol dark brown, almost black, with white spots on head; these are round and about the size of the pupil. Pectorals and ventrals with 3 white bands. Dorsal and anal with a narrow margin of white.

**Cerdalidae** Elongate Blennies*Cerdale bilineatus* Clark

One from Seymour Island, Galapagos, January 15, 1939. Length 47 mm. An elongated eel-like blenny distinguished by the 3 black stripes of about equal width from the head to caudal; these are as follows: one from snout to base of caudal over the back, one on each side from tip of lower jaw to tip of caudal fin. The body color is usually a bluish white. This species is closely related to *Petrocirtes rhinorhynchus* Bleeker. Our specimen, however, has the head 9.30 and the depth 13 into standard length. There are no scales or filaments. The teeth are rounded and directed backwards.

**Brotulidae** Brotula*Ogilbia ventralis* (Gill)

One from Seymour Island, Galapagos, January 14, 1932. Length 50 mm. Uniform yellowish white. No barbules. Small teeth in bands. Eye small. Caudal entire.



STATHMONOTUS CULEBRAI

**Ophidiidae** Cusk Eels*Lepophidium prorates* (Jordan and Bollman)

Two from Port Utria, Colombia, February 15, 1934. Length 57-80 mm. These specimens have the dorsal and anal margined with black.

**Batrachoididae** Stargazers*Porichthys margaritatus* (Richardson)

One from White Friars Islands, Mexico, February 2, 1934. Length 63 mm. Two from La Libertad, Ecuador, February 9, 1934. Length 35-45 mm. Five from Cabita Bay, Colombia, February 13, 1934. Length 25-28 mm. Three from Port Utria, Colombia, February 15, 1934. Length 48-64 mm. Two from Port Culebra, Costa Rica, February 24, 1934. Length 24-29 mm. One from Tenacatita, Mexico, March 4, 1934. Length 43 mm. Color silvery with 8 dark bands over the back. Caudal not united with anal. The 3rd lateral line extends to or beyond the posterior of anal fin.

**Gobiesocidae** Clingfish*Gobiesox adustus* Jordan and Gilbert

Eight from Port Utria, Colombia, February 15, 1934. Length 30-40 mm. Dorsal 9; anal 7. Teeth round, pointed. Color brown, with indistinct darker markings. A light band on caudal peduncle.

*Gobiesox poecilophthalmus* Jenyns

Four from Black Beach Anchorage, Charles Island, Galapagos, January 14, 1934. Length 38-45 mm. Nine from Albemarle Island, Galapagos, January 13, 1934. Length 28-36 mm. Dorsal 7; anal 7. Incisor teeth with smooth edge. Body banded and with 2 or more black spots just back from the head.

*Gobiesox rhodospilus* Günther

Eight from Jicarita Island, Panama, February 20, 1934. Length 24-43 mm.

**Balistidae** Trigger Fish*Sufflamen verres* (Gilbert and Starks)

Four from Mazatlan, Mexico, December 7, 1931. Length 69-91 mm. One from Sihuatanejo, Mexico, December 11, 1931. Length 51 mm.



*Melichthys radula* (Solander)

One from Cocos Island, February 3, 1932. Length 215 mm. Color jet black with a narrow bluish white line at base of dorsal and anal.

**Tetraodontidae** Puffers*Sphoeroides angusticeps* (Jenyns)

One from Espiritu Santo Island, Mexico, February 18, 1932. Length 229 mm. Distinguished by the small white spots over the body.

*Sphoeroides lagocephalus* (Linnaeus)

One from Tagus Cove, Albemarle Island, Galapagos, January 5, 1932. Length 355 mm.

*Cheilichthys annulatus* (Jenyns)

One from Tenacatita, Mexico, December 10, 1931. Length 69 mm. Two from Bahia Honda, Panama, December 21, 1931. Length 189-223 mm. Three from Post Office Bay, Charles Island, Galapagos, January 3, 1932. Length 78-220 mm. One from Port Culebra, Costa Rica, February 24, 1934. Length 43 mm. One from Petatlan Bay, Mexico, March 4, 1934. Length 23 mm. Color greenish above, white below, the back marked by dark lines into large rings or spots.

**Canthigasteridae** Sharp-nosed Puffers*Canthigaster punctatissimus* (Günther)

One from Espiritu Santo Island, Mexico, February 23, 1932. Length 66 mm. One from Chatham Island, Galapagos, December 31, 1931. Length 64 mm. One from Tower Island, Galapagos, January 22, 1932. Length 52 mm. One from Petatlan Bay, Mexico, March 3, 1934. Length 21 mm. Back elevated, snout long and sharp. Color grayish with round whitish spots on the sides.

**Diodontidae** Porcupine Fish*Diodon hystrix* Linnaeus

One from Sihuatanejo, Mexico, December 11, 1931. Length 289 mm.

*Diodon holacanthus* Linnaeus

One from Espiritu Santo Island, Mexico, February 23, 1932. Length 139 mm. In this species the frontal spines are longer than the postpectoral

ones. A black blotch behind pectorals, the back marked with dark spots and blotches.

### Antennaridae Frogfishes

#### *Antennarius sanguineus* Gill

One from Port Culebra, Costa Rica, February 24, 1934. Length 15 mm. One from Lat.  $0^{\circ} 55' S.$ , Long.  $90^{\circ} 30' W.$ , at a depth of 50 fathoms, January 26, 1934. Bait less in length than the 2nd spine. A large black ocellus at the base of the longest dorsal ray. Color brownish, lighter below, some indistinct dark spots below the 3rd dorsal spine.

A NEW GENUS AND SPECIES OF PEARL FISH, FAMILY  
CARAPIDAE, FROM OFF GORGONA ISLAND,  
COLOMBIA\*

(PLATE 6)

EARL D. REID

*United States National Museum*

Further study of the fishes obtained by Dr. Waldo L. Schmitt, Curator of Marine Invertebrates, United States National Museum, during the 1935 Cruise of Captain Allan Hancock's *Velero III*, reveals a very interesting new genus, belonging to the family Carapidae.

**ENCHELIOPHIOPS**, new genus

*Genotype*.—*Encheliophiops hancocki*, new species.

This new genus is characterized by its elongate scaleless body tapering to a subconical point beyond the termination of the moderately developed dorsal and anal fins; pectoral and pelvic fins absent; premaxillaries atrophied, or rudimentary; teeth uniserial, conical, close set, present on the jaws, vomer, and palatines; opercular apparatus well developed; branchiostegal rays 6; vent far forward; origin of anal fin close behind vent; no bony structure at the nape; eyes well developed.

Other characters of this genus are those of the species.

***Encheliophiops hancocki***, new species

Plate 6

*Holotype*.—U.S.N.M. Cat. No. 101789, field No. 411, a specimen 74.8 mm. total length, taken January 22, 1935, off a coconut beach among the coral, *Pocillopora*, Gorgona Island, Colombia. Hancock Pacific Expedition, 1935.

This new genus and species of pearl fish differs from all other genera in the family, Carapidae, by lacking both pectoral and pelvic fins, except *Encheliophis*, which also lacks these fins as described by Müller<sup>1</sup> from a specimen taken in the Philippines.

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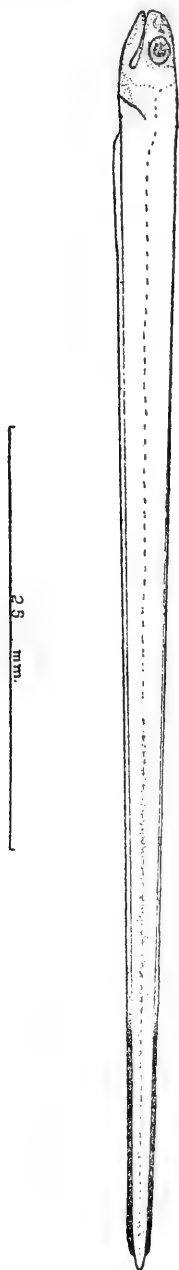
<sup>1</sup> Müller, H., 1845. Untersuchungen über die Eingeweide der Fische, Schlufs der vergleichenden Anatomie der Myxinoiden. Abhandlungen der Königlichen Academie der Wissenschaften zu Berlin. Aus dem Jahre 1843 s. 154, Tab. 5, fig. 4.

*Encheliophis vermicularis* Müller is obviously related to this new genus but differs from *Encheliophis hancocki*, new species in several respects as indicated in the comparative table below:

| <i>Character</i>                      | <i>Encheliophis</i> <sup>2</sup> | <i>Encheliophis</i>  |
|---------------------------------------|----------------------------------|--|
| Tail tapering to a:                   | Long band.                       | Point, dorsal and anal fins are not confluent around the tip of the caudal.                            |
| Vertical fins:                        | United around tail.              | Not united, dorsal and anal ending anterior to tip of tail.  |
| Color of body:                        | Uniform blackish brown.          | Pale, except posteriorly when a few brownish pigment cells are apparent.                               |
| Color of vertical fins:               | Pale.                            | The dorsal and anal fins near their bases posteriorly on the tail have a narrow black band of pigment. |
| The head is contained in the length:  | Eight times.                     | Eleven times.  |
| The depth is contained in the length: | Fifteen times.                   | Twenty-two or twenty-three times.  |

*Description* of the holotype only known specimen: Body scaleless, elongate, gradually tapering from the occiput to the extremity of the finless tail; origin of the dorsal fin 16.5 mm. from tip of snout, or  $2\frac{3}{7}$  head lengths behind the tip of the snout, its development so gradual that the first appearance of rays above the skin is difficult to make out, the rays gradually lengthening posteriorly, the fin terminating about one diameter of the pupil in front of the extremity of the tail; origin of the anal fin one diameter of the eye behind the upper angle of the gill opening; directly below the rear edge of gill opening is the center of the anus; anal fin more developed forward than the dorsal and ending exactly as the latter; pectoral and pelvic fins absent; upper edge of gill opening a trifle below a longitudinal line passing along the ventral margin of the eye; branchiostegal membranes join under isthmus, and probably form a free fold across it, although they are injured and this point cannot be definitely determined; branchiostegal rays 6; gills apparently 4, a pore behind the last; gill-rakers undeveloped; pseudobranchiae absent;

<sup>2</sup> Data for this table were taken from Müller (l.c.) and Günther, 1862, Cat. Fishes Brit. Mus., vol. 4, p. 384.



**ENCHELIOPHIOPS HANCOCKI**, new species  
Holotype U.S.N.M. Cat. No. 101789

posterior nostril close before center of eye with thin cutaneous flap on anterior border of the moderately raised rim; anterior nostril situated in a round spongy tissue area, slightly smaller than eye in the mid-length of the snout; teeth very small, sharp, in close-set single series in the jaws and on the vomer and palatines; tongue fully adnate to the floor of the mouth; mouth moderate, somewhat oblique, cleft to below posterior edge of the pupil; maxillary reaching to slightly past the rim of the orbit; jaws about equal; upper jaw nonprotractile; snout with a low median ridge of fleshy tissue about as wide as pupil beginning between eyes and continuing to upper lip, but at the interorbital region it expands laterally and blends with the tissue of the postorbital regions of the head; no filaments or barbels; lips moderately developed, without superior margin; head deeper than wide, without noticeable tumidity; profile of snout rather blunt, a pronounced angle formed at the extremity of the frontals.

The following figures represent proportional measurements; those in parentheses are lengths in millimeters: Total length (74.8). The head is contained 11 (6.8) times in the total length; depth 22.6 (3.3); tip of snout to origin of dorsal fin 4.5 (16.5); tip of snout to origin of anal fin 8.8 (8.5); tip of snout to center of anus 11.5 (6.5). The snout is contained 4.5 (1.5) in the length of the head, measured from tip of snout to upper end of gill opening; eye 4.5 (1.5); interorbital width 5.7 (1.2); greatest width of head 2.8 (2.4); length of maxillaries 2.2 (3.1).

The vertical fins fail to reach the extremity of the tail by a space equal to diameter of the pupil. There are about 118 pores in the course of the lateral line.

Color in alcohol light yellowish gray; tip of snout, lower lip, and spongy area on side of snout dusted with minute brown pigment cells; iris dull slate; pores of the lateral line slightly darker than the surrounding light color of the body, so that the pores are obvious; posteriorly along midlateral axis of body occur numerous brownish pigment cells similar in size and color to those of the snout; beginning 13 mm. from tip of tail these pigment spots occur all over the side of the body; the dorsal and anal fins are heavily pigmented posteriorly, and are almost jet black the last 13 mm. of their length. Tip of the tail beyond termination of the vertical fins is not pigmented.

I take great pleasure in naming this species for Captain Allan Hancock, leader of the expedition that obtained the specimen.

A KEY TO THE PIPEFISHES OF THE PACIFIC AMERICAN  
COASTS WITH DESCRIPTIONS OF NEW  
GENERA AND SPECIES

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This paper, the first of a series which will deal with the American pipefishes, was originally to be limited to descriptions of new genera and species, but, because of the confusion regarding the taxonomic status of the western American species of this group, it was thought advisable to include a key. It is hoped that, as soon as additional material becomes available, a complete monograph of the Pacific American pipefishes, now under preparation, may be published. One other paper, "A Systematic Analysis of Variation in the Western American Pipefish, *Syngnathus californiensis*," is now in press (Stanford Ichthyological Bulletin).

**PSEUDOPHALLUS**, new genus

*Type species.*—*Siphostoma starksi* Jordan and Culver

*Diagnosis.*—(1) On sexually mature females, the presence of a phallic-like anal papilla used in oviposition (structure measures 2, 2.4 mm. long, in two specimens 110, 160 mm., respectively); (2) median lateral trunk cristae continuous over anus and connecting with superior tail cristae; (3) superior trunk and tail cristae raised and very distinct; median and inferior trunk and tail cristae rounded and indistinct; (4) free end of each dermal flap of filled brood pouch extending midventrally to middorsally so that pouch is completely divided in center by double membranes; and (5) absence of anal fin.

*Discussion.*—*Pseudophallus starksi* is unique among pipefishes in the development by the female of a much elongated anal papilla. To the author's knowledge no other pipefish has this structure elongated to such an extent. Two other species of Pacific American pipefishes, *Syngnathus elcapitanensis* and *S. acus* (as represented by the paratypes of *S. carinatus* (Gilbert), SNHM 240), have the eggs in the brood pouch separated into two sections by a median double membranous partition formed of the free ends of the pouch flaps. An Atlantic pipefish, *S. mackayi*, has the same type of division of the filled pouch, but in this species the median

dividing membranes do not extend so far dorsally. *P. starksi* is similar to *S. elcapitanensis* in the confluence of the median lateral cristae over the anus, in the division of the brood pouch, and in the absence of the anal fin; but it differs in that the adult female of the latter does not have a conspicuous development of the anal papilla and in that the median and ventral cristae of the latter are very pronounced. The only mature female of 5 paratypes in the Stanford collection (No. 2686) has the phallic papilla retracted; this may explain the oversight of Jordan and Culver in failing to call attention to this obvious structure.

The material examined consisted of 10 specimens (2 males and 8 females).

### BRYX,\* new genus

*Type species.*—*Bryx veleronis*, new species

*Diagnosis.*—Genus of *Corythoichthys*-like pipefishes characterized by (1) smooth head as in *Syngnathus*; (2) short snout; (3) trunk and tail cristae with inter-ring indentations and with plates roughened, both as in *Corythoichthys*; (4) dermal covering of pouch of brooding male widely agape thus exposing eggs in ventral midline; (5) eggs arranged longitudinally in 2 regular rows; (6) all prominences very slightly if at all crenulated; and (7) anal fin absent.

*Discussion.*—Including *Bryx*, there have been described in the literature 3 genera of pipefishes very closely related to *Corythoichthys*; they are *Bhanotia*, *Bhanotichthys*, and *Bryx*.

Hora (1925, Rec. Indian Mus., 28(6):463) with material consisting of one male specimen of *Corythoichthys corrugatus* Weber described a new genus of pipefishes, *Bhanotia*; this genus was characterized by the following differences when compared with the more typical members of *Corythoichthys*: (1) a brood pouch in which the skin folds met in the midventral line; (2) eggs few, large, and arranged in 2 rows; (3) serration of all prominences on the head and body; and (4) a short snout provided with spines on the dorsal surface.

Parr (1930, Bull. Bingham Oceanogr. Coll., 28(6):27) correctly points out that (1) Hora has accepted Duncker's definition of the genus *Corythoichthys* as well as his selection of the genotype, *C. conspicillatus* Jenyns; and that (2) this selection constitutes a violation of the International Rules of Zoological Nomenclature, since the genotype had already

\* *Bryx*, a coined name, to be declined *Bryx*, *Brycis*.



been designated as *C. albirostris* Heckel by Jordan and Evermann (1896: 761); (3) that neither the eggs nor the brood pouch of *C. albirostris* has been described in the literature. Quoting Parr at this point:

There are thus two possibilities of classification to be further investigated. Firstly, that *C. albirostris* may prove perfectly concordant with the definition of the genus *Bhanotia*, in which case the latter designation becomes reduced to a synonym of *Corythoichthys*. Secondly, that *C. albirostris* may prove truly differentiable from *Bhanotia* on the basis of the size of its eggs and the dermal cover of its brood pouch, in which case *Bhanotia* and *Corythoichthys* may be maintained as truly distinct genera. It will, however, in either case be necessary to give a new generic definition for that group of species the distinction of which was first pointed out by Hora, i.e., for the forms with a relatively long slender and smooth snout, with smooth crests (at least on the head), with small, numerous eggs, and with the dermal folds of the brood pouch not meeting in the median. For the species thus defined (*Corythoichthys sensu stricto* Duncker, nec. (Kaup) Jordan), the author herewith introduces the new generic name of *Bhanotichthys*, in recognition of the true merits of Dr. Hora's differentiation of two taxonomically separate groups among the forms here considered, and in an endeavor to perpetuate in only a slightly altered form the nomenclatural dedication intended by him for one of these groups, since the author considers it most probable that *Bhanotia* will prove entirely synonymous with *Corythoichthys sensu stricto* (Kaup) Jordan, nec. Duncker. As the genotype of *Bhanotichthys* may be designated *Syngnathus fasciatus* Gray (*Corythoichthys fasciatus* Duncker; (?) Hora).

Careful study of this extract will show a contradiction. First it is stated that regardless of whether or not *Bhanotia* should prove to be a synonym of *Corythoichthys*, it would be necessary to erect a new genus for those species typified by *C. fasciatus*. Then later, the new genus *Bhanotichthys* is introduced and based entirely upon the supposition that *Bhanotia* would prove completely synonymous with *Corythoichthys*. However it is evident from the discussion that only 2 groups were meant to be dealt with, although the first statement as given in this paragraph would lead the reader to believe that there were 3 groups.

The question concerning the status of *Bhanotichthys* and *Bhanotia* must be settled by the results of a re-examination of the type species of *Corythoichthys*, *C. albirostris*. If the brooding males of this species have a complete dermal covering to the pouch and have the eggs arranged in 2 rows, then *Bhanotia* will become a synonym of *Corythoichthys* and *Bhanotichthys* will be valid, but, if the eggs are arranged in several rows and the brood pouch flaps do not meet in the midventral line, then *Bhanotichthys* will become a synonym of *Corythoichthys* and *Bhanotia* will be valid.

Of 5 sexually mature males of *albirostris* which I have examined, all had pouch flaps which did not meet in the midventral line, even though the pouch contained no eggs (in an empty-pouched male of 95 mm. the gape between the flaps was 1 mm. at its widest part and  $\frac{1}{2}$  mm. at its narrowest part). A few eggs present in the pouch of one male averaged  $1\frac{1}{2}$  mm. in diameter; they were distributed in a maximum of four rows across the pouch and a single row in depth. Lateral protecting plates of the pouch are very evident in the males of this species.

When *C. albirostris* is compared with *C. fasciatus* (type of *Bhanotichthys*), there are many similarities and also one marked difference. Of specimens examined of this latter species, the eggs averaged one millimeter in diameter, and were arranged 4 to 6 in a row along the width of the pouch and but a single egg in depth. The pouch flaps covered only the outermost row of eggs of the brood. This is a great deal less coverage than is found in *albirostris*. In fact, preserved males of *fasciatus* with eggs in the brood pouch must be handled with extreme care, for the clutch of eggs drops readily from the pouch. The reason for this is quickly apparent, for in this species the pouch has no lateral protecting plates, although they are well developed in *albirostris*. In cross section through the brood pouch of *fasciatus* the ventral tail surface is flat, whereas in *albirostris*, because of the lateral protecting plates, it is inwardly concave. Perhaps the most interesting fact about the developing embryos of *fasciatus* is the orientation which they show. With very few exceptions these oblong-shaped embryos have the eyespots turned toward the ventral tail surface so that they do not show externally. No embryos of *albirostris* were available for examination.

As previously stated, two other characters have been cited as diagnostic for *Bhanotichthys*: the smooth head and the long, slender snout. As to the first, Weber and de Beaufort (Indo-Australian Fishes, 1922, 4:71) were the first to point out that *fasciatus* has a well-defined trilobed occipital-nuchal crest. Even within the species, *albirostris*, the length of the snout is an extremely variable character, for large individuals have much elongated snouts. There then remains only one outstanding difference between *Bhanotichthys* and *Corythoichthys*, the absence or presence of lateral protecting plates for the brood pouch. I do not hold this single character to constitute a valid generic differentiation. Therefore, in my opinion, *Bhanotichthys* should be regarded as a synonym of *Corythoichthys*.

When *Bryx* is compared with *Bhanotia* and *Corythoichthys*, it is apparent that with respect to the brood pouch it holds a position intermediate between the two, with the eggs arranged in 2 rows as is found in *Bhanotia* and with the brood pouch flaps not meeting in the center as is found in *Corythoichthys*. With respect to the head *Bhanotia* has all prominences serrated; *Corythoichthys* has the prominences very well developed but with slight if any crenulation; and *Bryx* has a smooth head with very few prominences and very little crenulation. So far as is known all 3 genera agree in that the contents of the pouch are never more than one egg in depth. *Corythoichthys*, as represented by *albirostris* but not by *fasciatus*, and *Bryx* have the lateral protecting plates for the brood pouch; whether they are present in *Bhanotia* has not been recorded in the literature.

***Bryx veleronis*,\* new species**

*Holotype*.—Hancock Foundation collection (AHF no. 6), male, 45 mm. in length with filled brood pouch containing 46 eggs; taken by dredging in 15-20 fathoms, Cartago Bay, Albemarle Island, Galapagos; Velero Station 799-38, January 22, 1938.

*Paratypes*.—(29 specimens); Hancock collection: male, same data as holotype; 2 males, 1 female, Sullivan Bay, James Island, Galapagos, Velero Station 341-35, 20 fathoms, red algae, 1935; 5 males, 8 females, Clarion Island, Mexico, Velero Station 305-34, 15 fathoms, July 11, 1934.

Stanford collection: No. 34342, 1 male, 2 females, Clarion Island, same data as preceding specimens; No. 34341, 1 male, 1 female, same data as holotype.

U.S. National Museum collection: No. 101686, female, off Monkey Point, Gorgona Island, Colombia, 22 fathoms, January 22, 1935; No. 101689, male, Charles Island, Galapagos, 3 fathoms, January 17, 1934; No. 101691, female, Post Office Bay, Charles Island, Galapagos, 8-10 fathoms, January 27, 1934.

California Academy of Sciences collection: 2 females, Narborough Island, Galapagos, May 31, 1932; 2 females, Bat Island, Costa Rica, July 2, 1932.

*Description*.—Dorsal rays 21-28; pectoral 10-12; anal 0; caudal 10; trunk rings 14-15; tail rings 33-37; dorsal covering 0-1 trunk rings plus

\* This species is named in honor of the Hancock research ship, *Velero III*.

5-7 tail rings, usually  $\frac{1}{2}$  plus 6; brood pouch under tail and covering first 10-15 rings; head in standard length 9.0-10.5; dorsal in head .75-1.05; snout in head 2.5-3.6; longest specimen 60 mm.

End of snout turned sharply upward; crest on snout usually well defined with minute crenulations; ocular ridge extended caudally; occipital-nuchal crest interrupted at center, but readily apparent; in some specimens these crests with several papillar-like cirri; occasionally other cirri present supra and postorbitally as well as upon trunk and tail rings, but with no definite arrangement. Keel extending for length of opercle, but only well defined on anterior half. Cover plate of pectoral fin with two distinct longitudinal ridges, but may not be apparent unless dissecting needle is passed over plate. Body cristae (keels) sharply defined, often crenulated; plates roughened; young individuals with more pronounced indentation of cristae between rings than older individuals. Superior trunk cristae ending approximately at posterior end of dorsal fin; inferior trunk and tail cristae continuous; median trunk cristae ending at anus; median cristae of tail beginning slightly dorsocaudally of median trunk cristae and continuing caudally to become confluent with superior tail cristae just caudal of dorsal fin.

Smallest sexually mature male with eggs in pouch, 45 mm.; eggs  $\frac{1}{2}$  to  $\frac{3}{4}$  mm. in diameter, one row deep and 2 rows wide in pouch; additional eggs occasionally wedged in center; in filled pouch, dermal covering does not completely enclose eggs, exposed area remaining through center for length of pouch; maximum number eggs in 6 incubating males, 48.

*Color and Habitat.*—Holotype, brownish white with dull white bars around tail every 3 or 4 rings; base of each dorsal and pectoral fin ray with conspicuous black spot. Clarion Island specimens ringed with narrow brown stripes. James Island specimens light red with occasional dorsal silver crossbars; silvery spots present dorso- and ventrolaterally between rings. Holotype, 3 paratypes collected with 2 specimens of *S. coccineus* by dredging in red algae at Cartago Bay, Albemarle Island, Galapagos; all were said to be carmine red at time of preservation and to agree very closely with color of algae in which they were collected.

*Comparisons and Discussion.*—From the Pacific species of pipefishes which lack an anal fin, *Pseudophallus starksi* and *Syngnathus elcapitanensis*, *Bryx veleronis* may be differentiated by the fewer rays in the dorsal fin and the smaller size. From all other Pacific American species it may be segregated by the absence of the anal fin. To the unaided eye *B.*

*veleronis* appears very similar to *S. arctus*, with which it has often been confused; however, examination of the specimen under a low-power lens will quickly serve to make the differentiating characters more apparent. The relation of *B. veleronis* to other genera and species has been given under the generic discussion for *Bryx*. The following tabulation of dorsal fin rays and trunk and tail rings shows the range of variation and the differences between locality groups for these characters:

| Dorsal<br>Rays             | Clarion Island,<br>Mexico | Bat Island,<br>Costa Rica | Gorgona Island,<br>Colombia | Charles, Narborough,<br>James, and Albemarle<br>Islands,<br>Galapagos, Ecuador |
|----------------------------|---------------------------|---------------------------|-----------------------------|--|
|                            |                           |                           |                             |  |
| 21                         |                           |                           | 1                           | 1  |
| 22                         |                           | 1                         |                             | 3  |
| 23                         |                           |                           |                             | 5  |
| 24                         |                           | 1                         |                             | 1  |
| 25                         | 3                         |                           |                             |  |
| 26                         | 8                         |                           |                             |  |
| 27                         | 4                         |                           |                             |  |
| 28                         | 1                         |                           |                             |  |
| <i>Trunk<br/>Rings</i>     |                           |                           |                             |  |
| 14                         |                           |                           |                             | 1  |
| 15                         | 16                        | 2                         | 1                           | 10   |
| <i>Tail<br/>Rings</i>      |                           |                           |                             |  |
| 33                         |                           | 2                         |                             |  |
| 34                         |                           |                           | 1                           |  |
| 35                         | 2                         |                           |                             | 3  |
| 36                         | 9                         |                           |                             | 7  |
| 37                         | 5                         |                           |                             | 1  |
| <i>Total<br/>Specimens</i> | 16                        | 2                         | 1                           | 11   |

***Syngnathus coccineus*,\* new species**

*Holotype*.—U.S. National Museum collection, No. 101688, female, 89 mm., Charles Island, Galapagos, dredging, 3 fathoms to low tide, January 17, 1934.

*Paratypes*.—(4 specimens); U.S. National Museum collection: No. 92120, female, 50 mm., Puerto Jimenez, Costa Rica, October 2, 1930;

\* This species named *coccineus* because of the carmine red exhibited by specimens collected at Albemarle Island, Galapagos.

No. 101690, female, 57 mm., Puerto Culebra, Costa Rica, 3-10 fathoms, February 24, 1934.

Hancock Foundation collection: AHF no. 7, male, 78.5 mm., Cartago Bay, Albemarle Island, Galapagos, 15-20 fathoms, Station 799-38, January 22, 1938.

Stanford collection: No. 34340, female, 53.5 mm., same data as previous specimen. Also referred to this species, 2 specimens, 31, 33 mm. (California Academy of Sciences collection), from Tagus Cove, Albemarle Island, Galapagos; not made paratypes because of small size and poor condition.

*Description.*—Dorsal rays 19-21; pectoral 10-11; anal 2-3; caudal 10; trunk rings 15; tail rings 36-39; dorsal covering  $\frac{1}{4}$ -1 trunk rings plus 4-5 tail rings, usually  $\frac{1}{2}$  plus  $4\frac{1}{2}$ ; one incubating male, 78.5 mm., with pouch covering first 15 tail rings and containing approximately 79 embryos, 1 layer deep, 2-3 layers wide. Head-in-standard length 8.94-10.6; dorsal-in-head 1.24-1.51; snout-in-head 2.63-2.81; longest specimen 89 mm. (holotype).

Snout, occipital and nuchal plates carinate; opercle striate; specimens 50 mm. or shorter with horizontal keel extending over anterior  $\frac{1}{3}$  or  $\frac{1}{2}$  of opercle; larger specimens (holotype) entirely lacking keel. Cover plate of pectoral usually with one sharp, dorsally placed longitudinal ridge. Trunk and tail cristae slightly elevated. Cristae system very similar to that described for *Bryx veleronis*. Lateral and ventral intersegmental plates (scutella) large, distance between each being approximately  $1\frac{1}{4}$  size of scutellar plate. Brood pouch of only incubating male with dermal flaps completely covering eggs, and with free flap ends slightly overlapping each other in midventral line.

*Color and Habitat.*—Holotype dark brown mottled with white; brown dorsal transverse crossbars every 2 or 3 rings; paratypes dark brown or brownish white; one specimen with indication of narrow white ring every third or fourth trunk and tail ring. Two specimens collected with *Bryx veleronis* by dredging in red algae beds, Albemarle Island, Galapagos.

*Comparisons.*—*Syngnathus coccineus* is similar to *S. arctus*, from which it may be differentiated by a dorsal-in-head value of more than 1.25, whereas the latter has a value of 1.25 or less. This overlapping type of brood pouch covering which is present in *S. coccineus* is also found in *S. arctus* as well as in *S. dunckeri* from the Atlantic coast. *S. coccineus* may be segregated from *S. tweedliei* and *S. auliscus* by the differences in the number of rays in the dorsal fin.

## SPECIES LIST

1. *Bryx veleronis* Herald

Known from Clarion Island, Mexico; Bat Island, Costa Rica; Gorgona Island, Colombia; Charles, Narborough, James, and Albemarle islands, Galapagos, Ecuador; 30 specimens examined.

2. *Doryrhamphus melanopleura* (Bleeker)

*Syngnathus melanopleura* Bleeker, Nat. Tijdschr. Ned. Ind., vol. 15, 1858, p. 464.

\**Doryrhamphus californiensis* Gill, Proc. Acad. Nat. Sci. Phila., vol. 14, 1862, p. 284.

San Jose del Cabo, Lower California, south to Galapagos Islands, and westward to Japan; 7 specimens examined.

3. *Leptonotus blainvillianus* (Eydoux and Gervais)

*Syngnathus blainvillianus* Eydoux and Gervais, Mag. de Zoologie, 7 année Cl. 4, p. 3, pl. 17.

*Hemithylacus petersi* Duméril, Hist. Nat. des Poiss., vol. 2, 1870, p. 600.

*Acmonotus chilensis* Philippi, Ann. Univ. Santiago (Chile), vol. 93, 1896, p. 383.

West Coast of South America from Peru south to Orange Bay, South Patagonia; one record from Golfo Nuevo, Argentina; 1 specimen examined.

4. *Oostethus brachyurus* (Bleeker)

*Syngnathus brachyurus* Bleeker, Verh. Bat. Genootsch., vol. 25, 1853, p. 16.

*Dorichthys brachyurus* Regan, Biol. Centr. Amer., Pisces, pt. 2, 1907, p. 55.

An Indo-Pacific species, but recorded by Regan from Tehuantepec; record doubtful.

5. *Pseudophallus starksi* (Jordan and Culver)

*Siphostoma starksi* Jordan and Culver, Proc. Calif. Acad. Sci., 3d ser., vol. 5, 1895, p. 416, pl. 30.

San Jose del Cabo, Lower California, south to Santa Rosa, Ecuador; 10 specimens examined.

### 6. *Syngnathus acus* Linnaeus

*Syngnathus acus* Linnaeus, Syst. nat., ed. 10, 1758, p. 337.

\**Syngnathus acicularis* Jenyns, Zoology of the Voyage of H.M.S. Beagle, pt. 4, p. 147, pl. 27, fig. 3.

\**Siphostoma carinatum* Gilbert, Proc. U.S. Nat. Mus., vol. 14, 1891, p. 547.

Probably world wide in distribution; Pacific coast records based upon specimens from Gulf of California (*S. carinatum*) and from Chile (*S. acicularis*); 9 specimens examined.

### 7. *Syngnathus arctus* (Jenkins and Evermann)

*Siphostoma arctum* Jenkins and Evermann, Proc. U.S. Nat. Mus., vol. 11, 1888, p. 137.

Santa Catalina Island and San Pedro, California, south to Mazatlan, Mexico; 32 specimens examined.

### 8. *Syngnathus auliscus* (Swain)

*Siphostoma auliscus* Swain, Proc. U.S. Nat. Mus., vol. 5, 1882, p. 547.

\**Siphostoma sinaloae* Jordan and Starks, Proc. Calif. Acad. Sci., 2nd ser., vol. 6, 1896, p. 268.

Anaheim Bay, Orange County, California, south to Mazatlan, Mexico; 52 specimens examined.

### 9. *Syngnathus bairdianus* Duméril

*Syngnathus bairdianus* Duméril, Hist. Nat. des Poiss., vol. 2, 1870, p. 574.

"Coast of Mexico, near California"; status uncertain; only known specimens, 2 types, examined for author by Dr. Paul Chabanaud of Paris Museum.

### 10a. *Syngnathus californiensis californiensis* Storer

*Syngnathus californiensis* Storer, Proc. Bost. Soc. Nat. Hist., vol. 2, 1845, p. 73.

\**Dermatostethus punctipinnis* Gill, Proc. Acad. Nat. Sci., Phila., vol. 14, 1862, p. 283.



\**Siphostoma exilis* Osburn and Nichols, Bull. Amer. Mus. Nat. Hist., vol. 35, 1916, p. 153, fig. 7.

San Francisco and Monterey Bay regions, where the subspecies intergrades with the *griseo-lineatus-leptorhynchus* complex, south to Ballenas Bay, Lower California; in kelp beds, very rarely coming into bays; 128 specimens examined.

#### 10b. *Syngnathus californiensis griseo-lineatus* Ayres

*Syngnathus griseo-lineatus* Ayres, Proc. Calif. Acad. Nat. Sci., vol. 1, 1854, p. 14.

*Syngnathus abboti* Girard, Pac. R.R. Survey, vol. 10, 1858, p. 346.

\**Syngnathus arundinaceus* Girard, Ibid.

Elkhorn Slough, Monterey Bay, California, north to Sitka, Alaska; in eel-grass of bays and sloughs; 784 specimens examined.

#### 10c. *Syngnathus californiensis leptorhynchus* Girard

*Syngnathus brevirostris* Girard, Proc. Acad. Nat. Sci. Phila., vol. 7, 1854, p. 156; name preoccupied.

*Syngnathus leptorhynchus* Girard, Ibid.

*Syngnathus dimidiatus* Gill, Proc. Acad. Nat. Sci. Phila., vol. 14, 1862, p. 284.

*Siphostoma barbarae* Swain, Proc. U.S. Nat. Mus., vol. 7, 1884, p. 238.

Morro Bay, California, south to Punta Banda Estero near Ensenada, Lower California; in eel-grass beds of shallow bays and lagoons; 1003 specimens examined.

#### 11. *Syngnathus coccineus* Herald

Known from Puerto Jimenez and Puerto Culebra, Costa Rica; and Albemarle Island, Galapagos, Ecuador; 7 specimens examined.

#### 12. *Syngnathus elcapitanensis* Meek and Hildebrand

*Syngnathus elcapitanense* Meek and Hildebrand, Field Mus. Nat. Hist., Zool., vol. 10, 1914, p. 118.

*Siphostoma auliscus* (nec Swain) Gilbert and Starks, Mem. Calif. Acad. Sci., vol. 4, 1904, p. 57.

All valid records from Panama; mostly fresh water; 5 specimens examined.

### 13. *Syngnathus spicifer* Rüppell

*Syngnathus spicifer* Rüppell, Neue Wirbelthiere, Fische des Rothen Meeres, 1840, p. 143.

*Syngnathus spicifer* Regan, Biol. Centr. Amer., Pisces, pt. 2, 1907, p. 54.

An Indo-Pacific species, but recorded by Regan from Tehuantepec; record doubtful.

### 14. *Syngnathus tweedliei* Meek and Hildebrand

*Syngnathus tweedliei* Meek and Hildebrand, Field Mus. Nat. Hist., Zool., vol. 15, 1923, p. 259, pl. 18, fig. 1.

Known only from Chame Point, Panama; 4 specimens examined.

In the species list the number of specimens examined refers only to those individuals available from the Pacific coasts. An asterisk before a synonymized name indicates that the name has hitherto been unrecognized in the relationship as presented in this paper.

For the purposes of the key, the ring bearing the pectoral fins is counted as the first body ring and the ring bearing the anus as the last trunk ring. Since the anus is usually located on the posterior part of this last trunk ring, the anal fin, which immediately follows, generally marks the first tail ring. Occasionally it will be found that the anus is extremely posterior on the anal ring, or on the dividing line between the anal ring and the first tail ring or just over the line and very anterior on the following segment. In these three cases the anal ring is counted as the last ring over which the digestive tract completely extends. All rays of the dorsal fin are counted including the last one or two, which in small specimens are missed by most ichthyologists. The measurement of the head is taken from the most anterior point on the specimen, with the mouth firmly closed, to the most posterior edge on the opercle.

When more specimens are available, *S. tweedliei* may prove to be synonymous with *S. auliscus* and *S. bairdianus* with *S. acus*; *S. acicularis* may subsequently prove to be a valid species, but on the basis of the present material it cannot be separated from *acus*.

## KEY TO SPECIES

- a.* Anal fin absent:
- b.* Dorsal fin rays 29 or less . . . . . *Bryx veleronis*
- bb.* Dorsal fin rays 36 or more . . . . . *Pseudophallus starksi*
- bbb.* Dorsal fin rays 30 to 35 incl. . . . . *Syngnathus elcapitanensis*
- aa.* Anal fin present:
- c.* Body rings greater in number than tail rings; egg pouch on ventral trunk surface . . . . . *Doryrhamphus melanopleura*
- cc.* Body rings nearly equal to number of tail rings; egg pouch on ventral trunk surface . . . . . *Oostethus brachyurus*
- ccc.* Body rings at least one-third fewer in number than tail rings; egg pouch on ventral tail surface:
- d.* Body rings 15 or 16, occasionally 14:
- e.* Dorsal fin rays 19 to 24:
- f.* Dorsal-in-head value .90 to 1.25; dorsal covering 6 or more rings . . . . . *Syngnathus arctus*
- ff.* Dorsal-in-head value 1.26 to 1.55; dorsal never covering more than 5½ rings . . . . . *Syngnathus coccineus*
- ee.* Dorsal fin rays 25 to 34:
- g.* Dorsal fin beginning in front of, or over anus, never behind anus:
- h.* Dorsal-in-head value greater than 1.35 . . . . .  
. . . . . *Syngnathus tweedliei*
- hh.* Dorsal-in-head value less than 1.35 . . . . .  
. . . . . *Syngnathus auliscus*
- gg.* Dorsal fin beginning one or more rings behind anus . . . . .  
. . . . . *Syngnathus spicifer*
- dd.* Body rings 17 to 21:
- i.* Median lateral cristae (ridges) continuous over anus; dorsal profile of trunk of mature females rising rapidly just posterior of head . . . . . *Leptonotus blainvillianus*
- ii.* Median lateral cristae interrupted over anus; dorsal profile of trunk nearly straight just posterior of head:
- j.* Tail rings 34 or less . . . . . *Syngnathus bairdianus*
- jj.* Tail rings 35 or more:
- k.* All cristae of trunk and tail distinctly carinate . . . . .  
. . . . . *Syngnathus acus*

- kk.* All cristae of trunk and tail rounded—only slightly raised even under microscope . . . . .  
 . . . . . *Syngnathus californiensis*
- l.* Dorsal rays 28-37; (7 of 220 specimens with 37 rays—3.18 per cent; 26 of 220 with 36 rays—11.8 per cent); rings 17-19 plus 36-42 . . .  
 . . . *Syngnathus californiensis leptorhynchus*
- ll.* Dorsal rays 35-47; (23 of 466 specimens with 35 rays—4.92 per cent):
- m.* Tail rings 39-46; (9 of 338 specimens with 46 rings—2.66 per cent); body rings 18-20; dorsal rays 35-44 . . . . .  
 . . . *Syngnathus c. griseo-lineatus*
- mm.* Tail rings 45-50, mostly 46 and greater; body rings 18-21; dorsal rays 36-47 . . . . .  
 . . . *Syngnathus c. californiensis*

FOUR NEW GENERA AND TEN NEW SPECIES OF EELS  
FROM THE PACIFIC COAST OF TROPICAL AMERICA

(PLATES 7-16)

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After completing that portion of the manuscript on the marine fishes of the west coast of South America which deals with the Apodal fishes, it seems desirable at this time to describe the new forms. These were collected either by the senior author in tide pools or under an electric light swung at the ship's gangway at night while at anchor, or in dredge hauls from the ship or the small dredging launch, during the 1938 cruise of the *Velero III*, under the command of Captain Allan Hancock. The major part of the collecting was done at the Galapagos Islands and along the coasts of Colombia, Ecuador, and Peru; but a few species were obtained farther north along the Central American coast, especially at Cocos Island, Costa Rica. The authors are also including a new genus and two new species from the Hancock Pacific Expeditions' material in the United States National Museum, collected by Dr. Waldo L. Schmitt on the 1935 expedition.

In the list of specimens at the beginning of each description AHF refers to catalogue numbers in the ichthyological collections of the Allan Hancock Foundation. All holotypes save two are in the Allan Hancock Foundation. Where there is more than one paratype, one or more paratypes are to be deposited in the Natural History Museum of Stanford University, where the work upon these fishes was done.

## Congridae

### CHILOCONGER, new genus

*Genotype*.—*Chiloconger labiatus*, new species

Body elongate, head roughly cylindrical. Body and especially the tail compressed. Tail much longer than head and trunk. Dorsal fin inserted

behind gill openings, confluent with the anal around the tail. Pectoral fins well developed. Snout short and blunt, abruptly decurved, shorter than the eye. Flange of the upper lip developed into a short, broadly rounded flap, the highest part of which reaches the edge of the posterior nostril and covers a hollowed-out area. Another uncovered hollowed-out area below the eye. Posterior nostril with a well-developed rim, but no tube, directly in contact with the eye. A well-developed, tubed pore just above posterior nostril and in contact with both eye and nostril. Anterior nostrils tubular, on the upper lip and near tip of snout. Maxillary teeth triserial, not forming a cutting edge; vomerine teeth in a roughly oblong patch, narrower posteriorly; premaxillary teeth in a semicircular patch, separated from the vomerine teeth by a narrow groove. Tongue well developed, the edges free anteriorly and laterally. Gill openings far apart, vertical, and large. Eye large. Nine branchiostegal rays.

Close to *Ariosoma*, but differing in the extremely short, blunt head; the short snout, which is shorter than the eye; the excavated sides of the head below the eye and posterior nostril; and the wide flaplike flange of the upper lip.

### ***Chiloconger labiatus*, new species**

#### Plate 7

*Holotype*.—AHF no. 9.

*Type locality*.—Station 856-38, Port Utria, Colombia, dredged in 15-30 fms., mud and sand bottom, February 25, 1938.

*Measurements of holotype in mm.*—Length 83, depth 6, head and trunk 33, tail 50, head 14, snout 2.8, eye 3, gape of mouth 4, pectorals 5.

*Description*.—Head and trunk 1.5 in tail, 2.51 in total length. Tail 1.66 in total length. Head large, 2.36 in head and trunk, 5.93 in total length. Snout short, abruptly decurved and blunt, 5 in head, slightly shorter than the eye. Eye 4.66 in head. Gape of mouth 3.5 in head. Depth 13.8 in total length, 2.33 in head. Dorsal fin inserted behind gill openings, over tip of pectoral fins. Dorsal and anal fins continuous around tip of tail; anal not so high as dorsal. Pectoral fins well developed, 2.8 in head. Gill openings lateral, low on sides, the top of the opening at the upper end of the pectoral base. Isthmus equal to length of gill openings. Gular region ventrally with longitudinal folds.

Anterior nostrils tubular, inserted on the upper lip at the tip of the lower jaw. Posterior nostrils at level of lower edge of pupil, posterior

edge of nostril in contact with anterior border of eye, its edge slightly raised, but not tubular. Just above the nostril is a large, well-developed pore, with a diameter of slightly less than half that of the posterior nostril; the edge of the pore is in contact with the edge of the nostril. Upper jaw only slightly projecting beyond tip of lower jaw. Upper lip with a broad flange, developed into a high rounded flap, upturned against the side of the snout and in its highest part reaching the lower edge of the posterior nostril, and covering a hollowed-out area. The anterior end of the flange is joined to the snout well above the mouth, on the same plane as the upper edge of the anterior nostril. From this point the dorsal edge of the flange curves upward until it reaches the lower edge of the posterior nostril, then downward to the point at which the posterior end joins the upper lip at a vertical through the pupil of the eye. The hollowed-out area hidden by the flange flap is followed by a smaller, fully visible hollow directly below the eye; this second hollow is separated from the first by a slightly inclined, vertical partition. Lower lip with a broad flange, longer than the upper but not developed into an extensive flap.

Maxillary teeth in three irregular rows, closely united to the head of the shaft of the vomer. Vomerine teeth in a roughly oblong patch, narrower posteriorly. Premaxillary teeth in a semicircular patch anterior to the symphysis of the lower jaw, and separated from the vomerine teeth by a slight groove. Mandibular teeth in a narrow band. All teeth small, pointed, fairly close set and subequal; in appearance they are villiform. Tongue well developed, edges free anteriorly and laterally.

Color light yellowish brown; back and sides peppered with minute dark specks. Under sides of the head, except for tip of lower jaw, edge of the upper lip, and an area between the jaws under the center of the eye, without the dark specks. Distal half of lip flanges colorless. Dorsal fin with a dark distal border anteriorly, becoming only a faint dark line on the remainder of the fin. Anal and pectoral fins colorless.

### Genus *ARIOSOMA* Swainson

*Ariosoma* Swainson, 1838, Nat. Hist. Fishes, Amphibians and Reptiles, vol. 1, p. 220;—1839, *op. cit.*, vol. 2, p. 196 (no species mentioned; this genus is evidently the same one which Swainson calls *Ophisoma* in his second volume, and we therefore hold that its type was designated by Bleeker, 1864, Atlas Ichthyologique, vol. 4, p. 20, when he indicated that *Ariosoma*=*Ophisoma*=*Conger*-

*muraena*; and the type by subsequent designation of Bleeker is therefore *Ophisoma acuta* Swainson, 1839, vol. 2, p. 396, which equals *Muraena balearica* De la Roche).

*Ophisoma* Swainson, 1839, *op. cit.*, vol. 2, p. 334 (type *O. acuta* Swainson = *Muraena balearica* De la Roche, by subsequent designation of Bleeker, 1864; see explanation under *Ariosoma* above).

*Congermuraena* Kaup, 1856, Cat. Apodal Fishes, p. 71 (type *Muraena balearica* De la Roche, by subsequent designation of Bleeker, 1864).

*Congrellus* Ogilby, 1898, Proc. Linn. Soc. New South Wales, vol. 23, p. 288 (type by original designation *Muraena balearica* De la Roche).

Upper lip with a flange, which is rather narrow and not developed into a wide flap. No facial excavations above the upper lip. Bony facial canals not sending processes into the flange of the upper lip. Teeth pointed, not forming a cutting edge. Dorsal inserted over gill openings. Snout pointed, somewhat longer than eye. Posterior nostril in advance of eye, with which it is not in contact; a tubed pore above the posterior nostril but not in contact with it.

#### KEY TO EASTERN TROPICAL PACIFIC SPECIES

- 1a. Head and trunk 1.42 in tail; cleft of mouth 4 in head; maxillary teeth in a single irregular row; mandibular teeth in a single row posteriorly, medially in two rows and anteriorly in three rows; 6 to 8 teeth grouped at head of vomer and 2 or 3 small teeth on the shaft (Coast of Colombia). . . . *A. vomerina*, new species.
- 1b. Head and trunk 1.85 in tail; cleft of mouth 3.4 to 3.8 in head; teeth in jaws in villiform bands; vomerine teeth in an elongate triangular patch on head and shaft of the vomer (Cape San Lucas to northern Colombia). . . . *A. gilberti* (Ogilby).

#### *Ariosoma vomerina*, new species

Plate 8

*Holotype*.—AHF no. 10.

*Type locality*.—Station 856-38, Port Utria, Colombia, dredged in 15-30 fms., mud and sand bottom, February 25, 1938.



*Measurements of holotype in mm.*—Length 99, head and trunk 41, tail 58, head 14, snout 3, eye 2.5, cleft of mouth 3.5, depth 6, pectorals 5, gill openings 2.5, isthmus 2.

*Description.*—Body elongate, cylindrical except the last fourth of tail, which becomes somewhat compressed. Body heavier at middle than anteriorly. Head and trunk 1.42 in tail. Head 2.92 in head and trunk, 7.07 in total length; its greatest depth slightly less than greatest depth of body. Eye 1.2 in snout and 5.6 in head. Snout 4.66 in head. Cleft of mouth 4 in head, not quite reaching below center of eye. Body depth greatest at midpoint of total length, into which the depth goes 16.5 times. Isthmus slightly narrower than height of gill openings, which are equal to eye. Pectorals long and narrow, well developed, 2.8 in head. Dorsal fin inserted over gill openings, low anteriorly, becoming higher on tail. Anal fin about equal in height to dorsal. Both fins confluent around tip of tail. Gill openings low on sides, vertical, top of slit not reaching the upper edge of the narrow pectoral base.

Anterior nostrils tubular, just above edge of upper lip, near tip of snout. Posterior nostril just in front of eye, but not in contact with it, and at the level of the lower edge of the pupil; it is elongated and has a very slightly raised rim. Maxillary teeth in one irregular series, the teeth small, pointed, slender, depressible, and irregularly placed, slightly larger and more recurved anteriorly. Maxillary teeth continued around tip of jaw, and somewhat enlarged. Vomerine teeth in a small patch of 6 to 8 teeth at the head of the shaft; behind this there is a short irregular row of small teeth on the shaft. Mandibular teeth similar to maxillary teeth in size and shape, disposed in a narrow band, narrowing posteriorly to a single row, and widening anteriorly into three irregular rows.

Color very light cream, with no dark markings on the body, except minute black specks dorsally, which are visible only under the microscope.

From *Ariosoma gilberti*, the only other known species from eastern tropical Pacific, *vomerina* differs in having the maxillary teeth uniserial and not in a villiform band. In *vomerina* there are 6 to 8 teeth at the head of the shaft of the vomer, followed by 3 to 4 small teeth on the shaft, while in *gilberti* the vomerine teeth are arranged in an elongate triangular patch with a long posterior projection. In *vomerina* the tail is longer than the rest of the body by a length greater than the head, while in *gilberti* the tail is only the length of the snout longer than the rest of the body. *Vomerina* also differs from *gilberti* in having the isthmus narrower than the gill openings, instead of much wider.

## Echelidae

See Myers and Storey 1939, Stanford Ichth. Bull., vol. 1, no. 4, p. 156, for remarks on the classification of this family.

### Genus **GARMANICHTHYS** Seale

*Garmanichthys* Seale, 1917, Bull. Mus. Comp. Zool. Harvard, vol. 61, p. 80 (type by monotypy *G. dentatus* Seale).

*Arenichthys* Beebe and Tee-Van, 1938, Zoologica, Sci. Contrib. New York Zool. Soc., vol. 23, p. 301 (type by original designation *A. apterus* Beebe and Tee-Van).

This genus is composed of small eels differing from the Indo-Pacific *Muraenichthys* chiefly in the more anterior insertion of the dorsal fin, which begins above or slightly behind the gill openings instead of far behind. Pectoral fins absent. Vomerine teeth in two more or less parallel series, the series separated by an interspace anteriorly, running close together posteriorly, with one median, enlarged tooth at the beginning of the vomerine series. Snout pointed. Lower jaw shorter than the upper. Two of the three known species show one or two collarlike color bands at the nape. Seale's description of *G. dentatus* mentions "ten" vomerine series, which is evidently a misprint for "two."

This genus is entirely American in its known distribution. *G. dentatus* is described from Barbados in the Atlantic. The other two species are from the eastern Pacific.

### KEY TO THE KNOWN SPECIES

- 1a. Body yellowish, thickly banded with brown across the body and fins; a white band across the nape (Barbados). . . *G. dentatus* Seale.
- 1b. Body plain brown or longitudinally bicolor; no bands or only one or two on head.
  - 2a. Dorsal beginning a snout length behind the gill opening; body bicolor, brown above and whitish beneath, the line of demarcation sharply marked from eye to near end of tail; no band across nape; canthal line and upper lip white; lower jaw with a longitudinal brown line (Cape San Lucas and Gorgona Island). . . . .
  - . . . . . *G. apterus* (Beebe and Tee-Van).

- 2b. Dorsal beginning above the gill opening; body bicolor only to a point slightly behind the anal origin; no white canthal line; a white band across nuchal region and another band across the back at the origin of the dorsal fin; lower jaw unmarked (Galapagos).  
 . . . . . *G. bicollaris*, new species.

**Garmanichthys bicollaris**, new species

Plate 9

*Holotype*.—AHF no. 11.

*Type locality*.—Station 798-38, Cartago Bay, Albemarle Island, Galapagos, at surface under electric light, January 21, 1938.

*Paratypes*.—Three specimens, 170-195 mm., Station 73-33, North Beach, Albemarle Island, Galapagos, February 13, 1933.

*Measurements of holotype in mm.*—Total length 160, head and trunk 54, tail 106, depth of body 7, head 19, eye 2.8, snout 4.5, interorbital (not bony) 3, gape 6, length of gill opening 1.5, height of dorsal at a point 63 mm. from tip of tail 2.5, height of anal at same point 2.

*Description*.—Body rounded in cross section anteriorly, growing somewhat more compressed posteriorly. Depth 22.85 in total length, head 8.94, head and trunk 2.96. Tail 1.96 in head and trunk. Snout 4.22 in head, interorbital 6.33. Skin naked and smooth. Snout covered with fine, short, hairlike papillae, which are more scattered on lower jaw and other parts of head and gular region. Snout flattened dorsally and broadly rounded in dorsal aspect. Head only very faintly swollen in occipital region. Interorbital broad, two thirds the length of the snout. Gape barely reaching vertical from posterior margin of eye. Anterior nostrils tubular and directed downward, placed almost at tip of snout, the length of the tubes less than one-third diameter of eye. Posterior nostrils opening downward in the upper lip directly below anterior margin of eye; they have slightly raised edge, which is developed into a distinct flap on the outer side, this flap folding down and concealing the opening. A groove immediately follows the nostril and runs forward and toward the inside of the mouth between the nostril and a conspicuous pore just behind it. Gill openings small, oblique (at an angle of 40° from horizontal), placed laterally at the center of the body depth, more than half the diameter of the eye in length. Surface of gular-branchial region with a few longitudinal folds. Jugostegalia not evident but possibly present. Four pores anteriorly on top of the snout, two on each side just above and

behind the anterior nostrils, forming a quadrangle. Upper lip with five pores on each side under its edge, about equally spaced, one before anterior nostril, two between anterior and posterior nostrils, one just behind the posterior nostril and one at the angle of the jaws. Lower jaw with a series of four pores on each side, the last about below the end of the gape.

Maxillary teeth laterally in two rows (at one point two thirds of the way back on jaw, in three irregular rows), the outer row of very small teeth, the inner row of somewhat larger ones. Maxillary teeth separated anteriorly from the large, circular patch of premaxillary teeth, which are scarcely separated from those on the shaft of the vomer. The vomerine teeth begin with one median tooth and extend backward as two regular, rather widely separated series, which gradually run close together and finally coalesce into a single series posterior to a vertical from the end of the orbit. Mandibular teeth on each side anteriorly in a wide band of three or four rows, the bands of the two sides appressed anteriorly; posteriorly the band narrows to a single irregular series; anteriorly the inner teeth are largest. All teeth in mouth pointed, those of the premaxillary and vomer stouter and larger than the others.

Dorsal and anal fins high, confluent around end of tail. Origin of dorsal over gill openings. No pectoral fins.

Body longitudinally bicolor to a point about a head-length behind anus, the brownish dorsum sharply differentiated from the whitish underside. Posteriorly, on the tail, the light venter disappears and the color is a uniform brown, slightly lighter below. At the origin of the dorsal fin the light ventral color crosses the dorsum to form a collarlike band, and another such band crosses the head in the occipital region. On the sides of the snout, just behind the anterior nostril, a small patch of the brown color descends to the lower part of the snout. Tip of lower jaw with a dark patch at each side. Dorsal and anal fins light.

This species is allied to Beebe and Tee-Van's *apterus*, which was described from near Cape San Lucas, and of which we have an example from Gorgona Island, Colombia. In *bicollaris* the dorsal fin is inserted over gill openings instead of almost a snout length posteriorly to them as in *apterus*. The larger eye and the distinctively different color pattern also serve to distinguish this new form.

### LEPTENCHELYS, new genus

*Genotype*.— *Leptenchelys vermiformis*, new species

Body elongate, cylindrical, vermiform, becoming slightly compressed

toward tip of tail. Tail shorter than head and trunk. Branchial region greatly swollen, with jugostegalia very evident and reaching far up on the dorsum. Dorsal fin inserted anterior to gill openings, slightly closer to them than to eye, the fin very low and poorly developed anteriorly, becoming higher toward the end of the tail. Dorsal confluent with anal around tip of tail. Anal fin inserted just posterior to anal opening. No pectoral fins present.

Head pointed, snout projecting beyond mouth. Anterior nostrils tubular, directed downward, near tip of snout. Posterior nostrils under edge of upper lip below eye. All teeth uniserial; premaxillary teeth present, visible when the mouth is closed. Lateral line prominent, continued forward over the head to the tip of the snout, and sending off accessory branches dorsally and ventrally on the head. Pores around edges of upper and lower jaws large, with raised rims. Pores of lateral line extending to the surface through tubules, the outer end of these tubules slightly elevated above the surface of the body.

This genus is similar to *Muraenichthys* and *Garmanichthys* in the absence of pectoral fins. It differs from them in the following: (1) the very pointed head, (2) the insertion of the low anterior part of the dorsal fin on the head anterior to the gill openings (instead of near vent as in *Muraenichthys* and near the gill opening as in *Garmanichthys*), (3) the uniserial vomerine teeth, and (4) the short tail.

### ***Leptenchelys vermiformis*, new species**

Plate 10

*Holotype*.—U.S. National Museum, no. 101785.

*Type locality*.—Station 462-35, Playa Blanca, Costa Rica, dredged in 40 fms., mud and sand bottom, February 8, 1935.

*Measurements of holotype in mm.*—Total length 115, depth of body posterior to branchial region 2.6, head and trunk 67, tail 48, head 11, eye .5, snout 1.8, cleft of mouth 2.5.

*Description*.—Body elongate, cylindrical, wormlike; somewhat compressed toward end of tail. Tail contained 1.39 in head and trunk, 2.39 in total length. Head 10.45 in total length, 6.09 in head and trunk. Snout short, 6.1 in head. Eye very small, 22 in head, 5 in snout. Cleft of mouth 4.4 in head. Depth 44.23 in total length. Dorsal fin inserted on head before gill openings, slightly nearer to them than to eye. Dorsal fin low and poorly developed, except posteriorly on tail, where it becomes

higher and lies in a groove. It is confluent with anal fin around tip of tail. Anal fin inserted immediately behind anal opening; low and poorly developed its entire length. No pectoral fins.

Head pointed, the snout projecting well beyond mouth. Mouth inferior and upper jaw longer than lower. Anterior nostrils tubular, directed downward, and located on the snout just anterior to the symphysis of the lower jaw; tubes almost equal in length to eye. Posterior nostrils an elongate slit on the under side of upper lip just below anterior edge of eye, the slit covered by a pendulous flap of skin. Eye small, located slightly nearer to angle of jaws than to tip of snout. Top of head and snout covered with many bluntly tipped, small, villiform papillae, especially abundant on snout and interorbital space. Gill openings low on sides, almost vertical, and deeply curved. The membranes covering the gill chambers expanded, giving a pouchlike effect to this area of the head. Jugostegalia evident as numerous, fine, slightly curved lines running obliquely, crossed by other lines to form a typical crosshatched pattern.

Maxillary, mandibular, and vomerine teeth uniserial. The teeth small, conical, sharp, and slightly recurved. Anteriorly in the jaws they become slightly larger and more widely spaced. Three or four teeth on shaft of vomer. Premaxillary teeth only two in number, visible when the mouth is closed. They lie between the anterior nostrils and are caninelike, curved, depressible, and larger than the rest of the teeth. The lateral line is prominent. Each pore opens on the surface through a short tubule directed downward from the main lateral tube. The outer end of each tubule has its edge slightly raised above the surface of the body. The lateral line continues forward past the gill opening, abruptly arching above the gill chambers and continuing forward over the eye to the tip of the snout. Just anterior to the gill chambers, two branches are given off, one extending dorsally and meeting a like branch from the other side, the other extending ventrally and forward along the side of the lower jaw. Immediately behind the eye two more branches are given off, the dorsal joining a corresponding branch from the other side, on the midline of the back and the ventral branch passing under the eye and extending anteriorly along the edge of the upper jaw. Along the sides of the upper and lower jaws and anteriorly on the head are large, prominent pores lying over the various branches of the lateral line, and with well-developed rims which extend above the surface.

The color of the body is light yellowish, and there are no color markings.

## Ophichthyidae

### Genus CAECULA Vahl

*Caecula* Vahl, 1794, *Skriv. Naturh. Selsk., Kjöbenhavn*, vol. 3, p. 149  
(type by monotypy *C. apterygia* Vahl).

*Sphagebranchus* Bloch, 1795, *Naturgeschichte ausland. Fische*, vol. 9, p. 88  
(type by monotypy *S. rostratus* Bloch).

*Verma* Jordan and Evermann, 1896, *Bull. U.S. Nat. Mus.*, no. 47, pt. 1, p. 374  
(type by original designation *Sphagebranchus kendalli* Gilbert).

Vertical fins absent or feebly developed. No pectoral fins. Posterior nostrils in the upper lip and directed downward. Gill openings small, close together, longitudinal, oblique, or vertical. Gill membrane not apparently duplicating the gill opening anteriorly by a false fold. Snout projecting far beyond the lower jaw. Teeth small and mostly uniserial.

#### KEY TO EASTERN TROPICAL PACIFIC SPECIES

- 1a. Eye 5 in snout; snout 6.6 in head; cleft of mouth 3.8 in head; width of isthmus equal to eye; posterior nostrils under edge of upper lip, elongate and with a raised rim; dorsally and laterally snout is sharply pointed (Colombia, off Cocos Island, Costa Rica, and north to Cape San Lucas). . . . *C. selachops* (Jordan and Gilbert).
- 1b. Eye 3.4 in snout; snout 4.76 in head; cleft of mouth 4.26 in head; width of isthmus equals one half of eye; posterior nostrils a slightly rounded pore above edge of upper lip with no raised rim present; dorsally the snout is very blunt and rounded, not at all sharp (Galapagos Islands). . . . . *C. equatorialis*, new species.

#### *Caecula equatorialis*, new species

##### Plate 11

*Holotype*.—AHF no. 12.

*Type locality*.—Station 810-38, north of Barrington Island, Galapagos, 0° 43' S., 90° 01' W., dredged in 73 fms., on a sand bottom, January 26, 1938.

The type was cut in two by the dredge, and only the anterior part of the specimen is present, but this is in good condition and seems to represent a new form.

*Measurements of the holotype in mm.*—Head 16, head and trunk 93, eye 1, snout 3.4, cleft of mouth 3.75, interorbital 1.2.

*Description.*—Cleft of mouth 4.26 in head, snout 4.76. Eye 3.4 in snout, 16 in head. Body elongate and cylindrical, no evidence of any fins present. Gill openings inferior; they are curved (convex side anteriorly) in the form of a quarter-segment of a circle; the medial end of each slit is transverse, the posterior end horizontal. Isthmus very narrow, one-half diameter of eye. Dorsal outline of snout curved downward, ventral border of snout straight. Dorsally tip of snout broadly rounded. Eye nearer the angle of the jaws than tip of snout, just posterior to the symphysis of the lower jaw. A shallow groove above and paralleling the upper lip, from the posterior nostril backward, fading out before the end of the gape.

Anterior nostrils tubular, set in a pit; opening of the tube hourglass shaped, formed by two opposed papillae projecting into the opening. Posterior nostril a rounded pore without a raised rim, set above the edge of the lip on the outside of the mouth, at the anterior end of the groove which parallels the edge of the upper lip. Maxillary teeth uniserial, small, slender, close set, and recurved. Vomerine teeth uniserial, somewhat larger at the head of the shaft. Premaxillary teeth four, two on a side at the symphysis of the upper jaw. Mandibular teeth uniserial, similar to the maxillary teeth, except that anteriorly a few of the teeth are slightly enlarged. Gular region with faint longitudinal folds; jugostegalia evident. Lateral line curved upward anteriorly over the opercular apparatus.

Body color light cream with no dark markings of any kind. The snout and the anterior part of the head are somewhat lighter in color.

In comparison with a specimen of *C. selachops* of almost the same diameter and of what we judge to be almost the same size, we find that the snout of *equatorialis* is a great deal heavier, blunter, and more broadly rounded from the dorsal aspect. The eye is farther forward on the head, the head much shorter, and the lower jaw is broader and not so long and pointed. In *equatorialis* the mouth is smaller, and the position of the posterior nostrils is above the outside edge of the upper lip and not under it as in *selachops*. The anterior nostrils are set in a pit and not on the surface, and the tip of the snout is not black.



**PHAENOMONAS**, new genus

*Genotype*.—*Phaenomonas pinnata*, new species

Body elongate, cylindrical, very wormlike. Head and trunk very much longer than tail. A short, well-developed dorsal fin present, beginning on the head in advance of the gill openings, *its entire length shorter than the head*. No pectoral or anal fins present. Snout blunt, lower jaw included, eye small, closer to angle of jaws than to tip of snout. Anterior nostrils tubular, on underside of snout. Posterior nostrils on underside of upper lip, inside the mouth, the pore covered by a flap of membrane. Gill openings wide apart, vertical, and low on sides. All teeth uniserial, pointed and close set.

This remarkable little eel differs from all known Ophichthyid genera in the brief, anteriorly placed, well-defined dorsal fin and in the absence of all other fins.

**Phaenomonas pinnata**, new species

Plate 12

*Holotype*.—AHF no. 13.

*Type locality*.—Station 856-38, Port Utria, Colombia, dredged in 15-30 fms., mud and sand bottom, February 25, 1938.

*Paratype*.—One specimen, 233 mm., Station 870-38, Isabel Island, Nayarit, Mexico, dredged on coralline bottom, March 8, 1938.

*Measurements of the holotype in mm.*—Length 221, head and trunk 153, tail 68, snout 2.5, eye .5, cleft of mouth 2.5, depth 3.

*Description*.—Body very elongate, cylindrical, not compressed; tail ending in a blunt, conical point. Depth of body in total length 73.66. Head and trunk 1.44 to 1.47 in total length. Tail very short, 2.1 to 2.25 in head and trunk. Dorsal fin present, beginning half way between the gill openings and the angle of the jaws, ending slightly less than this distance behind the gill opening, its height about twice eye diameter. No anal or pectoral fins. Lateral line lying in a slight groove anteriorly and on a slightly raised ridge posteriorly, but this may be due to the preservation of the specimens.

Anterior nostrils tubular, on the under side of the snout, anterior and lateral to the tip of the lower jaw. Anteriorly each nostril is recessed into a pit; posteriorly the tube is on the edge of the upper lip. Lying between the anterior nostrils are two papillalike folds of skin, pointing backward

and attached by their inner surfaces to the underside of the snout. Posterior nostrils under the edge of the upper lip, lying entirely within the mouth and covered by a flap of skin, which must be lifted before the rounded pore is visible. Gill openings wide apart, vertical, and low on the side. Isthmus equal in width to the height of the gill opening. Just inside the edge of the gill opening there is a dermal fold of skin, forming what first appears to be another opening. Gular region not particularly swollen, ventrally with many longitudinal folds. Jugostegalia not evident externally.

Eye small, 5 to 6 in snout, 25 to 27 in head; much closer to angle of jaws than to tip of snout and only faintly visible under the skin. Snout projecting beyond end of lower jaw for a distance equal to width of the isthmus, its ventral surface swollen so that the mouth is included behind it. Snout 4.5 to 5 in head, cleft of mouth equal to snout. Head small, 17.26 to 17.68 in total length and 11.7 to 12.4 in head and trunk; its point blunt and rounded. All teeth uniserial. Maxillary teeth not following the curve of the jaws, but running in a straight line from their posterior insertion to where the anterior teeth meet at the head of the vomerine shaft. One slightly enlarged tooth at the symphysis of the two rows, all teeth pointed, small and close set. Vomerine teeth in a single row of about five teeth, the first largest, becoming smaller posteriorly. Posterior nostrils entirely outside the row of teeth. Premaxillary teeth not in a row around the tip of the snout; one large tooth lying under the median edge of each of the papillalike folds of skin between the anterior nostrils, a smaller tooth lying just posterior to each of the anterior teeth. Mandibular teeth in a single series, small and close set posteriorly, becoming larger, canineline, and more widely spaced anteriorly. The tips of the anterior two mandibular teeth of each side fit into small pores in the roof of the mouth.

Color whitish, no markings or pattern of any kind. Under the microscope, small pin points of dark dots are visible, most abundantly placed along the mid-line of the side.

### POGONOPHIS, new genus

*Genotype*.—*Pogonophis fossatus*, new species

Dorsal and anal fins rather well developed, the former inserted a short distance behind the gill openings, becoming more elevated posteriorly, both the dorsal and anal in a groove near the tip of tail, as is com-

monly the case in Ophichthyids. Gill openings rather wide, lateral, oblique, and curved; the isthmus wide with no grooves across it, a slight dermal fold behind the gill opening and another in front. Jugostegalia faintly evident externally. Vomer with a single series of depressible teeth, the anterior tooth longest. Pectoral fins reduced, small, less than the diameter of the eye in length. Teeth all pointed, none molariform. Maxillary teeth biserial, the rows separated by a narrow trough; outer row of smaller teeth, inner row larger. Mandibular teeth uniserial, a few anterior ones larger. Two enlarged canines at the front of the upper jaw immediately behind the anterior premaxillary teeth. Anterior nostrils tubular, the lower part of the margin of each elongated into a pendant, barbel-like flap. Posterior nostrils beneath the eye, slitlike, opening downward, their position marked externally by rather conspicuous narial barbels nearly half the eye diameter in length. Sides of snout constricted by a groove just behind the anterior nostrils and by another just behind the posterior nostrils. Snout from above not particularly pointed and more rounded than in typical Ophichthyids.

Distinguished from other genera of Ophichthyids by the narial barbels, the rounded snout, equal jaws, the grooves behind the anterior and posterior nostrils, and many other characters.

### ***Pogonophis fossatus*, new species**

Plate 13

*Holotype*.—AHF no. 14.

*Type locality*.—Station 780-38, 5° 33' 50" N., 86° 58' 46" W., dredged in 40-47 fms., January 14, 1938.

*Paratypes*.—2 anterior portions of much larger specimens, Station 780-38, 5° 33' 50" N., 86° 58' 46" W., dredged in 40-47 fms., January 14, 1938.

*Measurements of the holotype in mm*.—Length 108, head and trunk 52, tail 56, head 15, depth 6, cleft of mouth 6, snout 3, eye 1.8.

*Description*.—Body elongate, cylindrical, slightly compressed toward the tip of tail. The tail slightly longer than head and trunk. Depth 18 in total length; head 7.2 in total length, 3.46 in head and trunk. Cleft of mouth 2.5 in head, snout 5 in head, eye 1.66 in snout. Skin smooth and naked. Jaws equal in length, snout not projecting. Dorsal fin low, inserted 1.5 times length of snout behind gill opening; it becomes more

elevated posteriorly near the tip of tail and lies in a definite groove. Anal fin beginning immediately behind the anal opening and lower than dorsal; it also lies in a groove. Tip of tail projecting beyond ends of fins. Pectoral fins rudimentary, one-half to four-fifths diameter of eye, inserted at the upper edge of gill openings. Eye slightly nearer to angle of jaws than to tip of snout. Pupil elliptical. Gill openings vertical, deeply curved, low on sides, slightly greater in length than orbit. Isthmus broad, slightly wider than length of snout.

Anterior nostrils just above edge of upper lip, tubular, the tube as long as eye and closer to tip of snout than to eye. Lower side of tube with an elongate, triangular flap of membrane almost equal in height to the tube. Posterior nostrils under edge of upper lip, on a vertical from the anterior edge of the eye; their position marked externally by rather conspicuous labial barbels, which are almost one half the diameter of the eye in length. Maxillary teeth in two series laterally. The outer series extends as far forward as the posterior nostril with about eight to ten close-set, pointed, sharp, slightly recurved teeth, smaller than those of the inner series. Inner series with about ten more widely spaced and larger teeth. The inner series is continued forward to the midpoint between anterior and posterior nostrils, with a space before the premaxillary teeth begin. Premaxillary teeth in a single series, about five in number around the tip of the upper jaw. Two large canine teeth, close set, side by side, lie just behind the premaxillary row. Vomerine teeth in a single series, anterior tooth largest, becoming progressively smaller posteriorly; about ten teeth on shaft of vomer. Mandibular teeth in a single series, slender, pointed, and equal in size to the outer series of the maxillary but more closely set, about fifteen teeth on a side. The three anterior teeth of each side are somewhat larger and heavier than the more posterior, lateral ones. No teeth lying inside the tip of the lower jaw.

Body color a light yellowish tan. Dorsally along each side of the fin are large, paired, dark-brown spots, lying close to the fin but not crossing it. From the insertion of the dorsal anteriorly the spots are smaller and not paired. The dark spots on the dorsal side of the head are abruptly smaller than those of the body. Mid-line of the side reddish brown for the entire length of body, with darker spots included at intervals. From these dark spots, dark-brown bars extend down upon the light yellowish ventral surface; anteriorly these bars either meet faintly or are close together, becoming weaker and farther apart posteriorly. Lower jaw and sides of head with small, dark spots.

Genus **LETHARCHUS** Goode and Bean

*Letharchus* Goode and Bean, 1882, Proc. U.S. Nat. Mus., vol. 5, p. 436  
(type by monotypy *L. velifer* Goode and Bean).

Dorsal fin inserted slightly behind eye; the fin high until above the middle of tail, becoming obsolete toward end. Anal and pectoral fins entirely absent. Mouth and cranial parts of the head very small for an Ophichthyid, the mouth inferior. Gill openings curved, the posterior part of each nearly horizontal. A deep pocket, like a second (anterior) opening, in front of each gill opening. Directly below the gill openings a deep, transverse groove (indistinct in poorly preserved specimens) crosses the isthmus. From this groove, two folds of skin extend backward on each side of the under part of the body, fading out somewhere between the middle of the trunk and the anal opening; between the folds the belly is flat.

Gular region swollen, the exterior of the lower part thrown into several longitudinal folds in well-preserved specimens, these folds ending abruptly at the transverse groove across the isthmus. Jugostegalia well developed. Anterior nostrils with an incipient or well-developed tube; the end of tube with three papillae, one anterior and two lateral (the lateral larger), which project into the opening and tend to close the nostril. Posterior nostrils under lip and beneath eye, more or less slitlike and marked externally by a dermal flap beneath the eye. Lateral line conspicuous.

Three species known, one from the coast of the South Atlantic States and the Caribbean, another from Lower California, and the third, the new species described below. The above description was made from an examination of a specimen of *L. velifer* (Stanford 3932), from Charleston, South Carolina, and the types of *L. opercularis*.

## KEY TO THE KNOWN SPECIES

- 1a. Anterior nostrils scarcely tubular; lower jaw much longer than its width from rictus to rictus; pupil ovate, the iris dark except for a light inferior elliptical or top-shaped area (which includes the pupil); middle of pupil far anterior to the middle of the length of the lower jaw; body deep uniform brown; the dorsal fin white with a dark margin (Atlantic). . . . *L. velifer* Goode and Bean.

- 1b. Anterior nostrils in a well-developed tube; lower jaw only slightly longer than its width from rictus to rictus; pupil round, the iris light except for its outer rim; middle of the pupil directly above or very slightly anterior to the middle of the lower jaw; head and dorsal fin spotted or mottled (Eastern Pacific).
- 2a. Eye 14 to 16.8 in head; head in trunk 7 to 8.3; tail 1.41 to 1.5 in trunk; snout 7.4 to 8.6 in head; isthmus half again as wide as diameter of eye; a pendulous, operculumlike fold of skin hanging down over and screening gill openings (Galapagos). . . . .  
 . . . . . *L. opercularis*, new species
- 2b. Eye 12 in head; head 6.5 in trunk; tail 1.66 in trunk; snout 6 in head; isthmus equal to eye; no pendulous fold of skin hanging down over and covering the gill openings (Gulf of California).  
 . . . . . *L. pacificus* Osburn and Nichols.

### *Letharchus opercularis*, new species

Plate 14

*Letharchus pacificus* (nec Osburn and Nichols) Fowler, 1932, Proc. U.S. Nat. Mus., vol. 80, art. 6, p. 3 (Gardner Bay, Hood Island, Galapagos).—Fowler, 1938, Mon. Acad. Nat. Sci. Philadelphia, no. 2, p. 251 (name only).

*Holotype*.—AHF no. 15.

*Type locality*.—Station 813-38, Gardner Bay, Hood Island, Galapagos, collected at surface with electric light, January 27, 1938.

*Paratypes*.—Five specimens, 190-295 mm., Station 813-38, Gardner Bay, Hood Island, Galapagos, collected at surface with electric light, January 27, 1938.

*Measurements of holotype in mm.*—Length 381, head and trunk 232, tail 149, head 29, depth 9.6, snout 3.5, eye 1.5, cleft of mouth 4, isthmus 2.5.

*Description*.—Body elongate, somewhat compressed, dorsally rounded, ventrally somewhat flattened. Tail much shorter than head and trunk, 1.57 to 1.70 in them, ending in a sharp point. Head 12.9 to 14.1 in total length, 7 to 8.3 in trunk, 8 to 9.3 in head and trunk. Depth 29.1 to 39.6 in total length, 2.3 to 3.02 in head. Snout 7.4 to 8.6 in head; eye 14 to 16.8 in head, 2 to 2.3 in snout. Isthmus much wider than diameter of eye. Skin smooth and naked. Mouth inferior; lower jaw much shorter than

upper; snout sharply pointed, projecting beyond the mouth a distance equal to that from symphysis of upper jaw to center of eye. Lateral line distinct, lying in an uncolored space along the sides.

Dorsal fin beginning the length of the gape behind the posterior edge of the eye, high anteriorly, becoming lower on the anterior portion of tail, and finally becoming almost nonexistent on the posterior third of the tail. Dorsal fin not covered with heavy membrane, the rays visible. Pectoral and anal fins absent. Eye small, situated much nearer to angle of jaws than to tip of snout.

Anterior nostrils on underside of snout, tubular, the tube extremely thick and heavy, a little more than half the diameter of the eye in outside diameter and length. Each tube with 3 papillae on the rim of the orifice, one anterior and two lateral, the posterior part of the rim lacking one; these papillae project into the opening and tend to close the nostril. Between the nostrils a heavy rounded fold of skin runs posteriorly and bifurcates, forming two papillae just anterior to the tip of the closed lower jaw. Posterior nostrils within the mouth just under the eye. Without manipulation they appear to be wide, almost *transverse* slits protected by a delicate membrane on the anterior side. Upon manipulation, it becomes evident that the apparent flaps are only the higher anterior part of a circular, more or less tubular membrane surrounding the round nostril openings in the roof of the mouth, this membrane normally folding so as to almost completely hide the nostril. On the outside of the mouth the lip is interrupted immediately posterior to the lateral end of the folded membrane flap of the nostril by a transverse break. Posterior to this break the lip is again evident, but bordered above by a lateral groove extending deep into the face below the eye and fading out posteriorly before the end of the gape is reached. There is a similar deep groove below the posterior part of the lower lip.

Gill openings inferior and curved, posteriorly almost horizontal, anteriorly curving transversely to the median line. A deep pocket, like a second anterior opening, in front of each gill opening. The distal membrane of this pocket is developed into an operculumlike covering, somewhat pendulous, extending downward and covering the openings to the pocket and gills. Jugostegalia well developed. Isthmus crossed by a transverse groove. From the isthmus two folds of skin, one on each side, run backward delimiting the flattened area of the venter; these folds fade posteriorly on the body. Anteriorly several faintly marked, parallel folds lie medially to each main lateral fold. Maxillary teeth uniserial, well

inside the edge of the jaw; they are very small, sharp, pointed, and close set, extending anteriorly to the inside edge of the posterior nostril. Vomerine teeth somewhat larger, depressible, in a diamond-shaped patch; no teeth on shaft of vomer. No premaxillary teeth. Mandibular teeth uniserial and similar to the maxillary teeth.

Body color light yellowish, overlaid with dark brown. This dark-brown pattern varies from longitudinal rows of dark spots with the lighter body color prominent, to individuals with this body color almost entirely obscured by the brown. In those individuals in which the brown coloring is in the form of rows of spots, there are two rows above the lateral line, the one at the base of the dorsal fin the larger, and three more irregular and smaller rows below the lateral line. All the spots tend to become more or less crowded and somewhat fused toward the end of the tail. The dorsal fin is white, with a narrow, submarginal band composed of irregularly defined spots. The dark spotting on the head varies from light to very heavy; correlated with this are narrow black bands on the chin and throat, which vary from two faint to six distinct bands.

## Muraenidae

### Genus *UROPTERYGIUS* Rüppell

*Uropterygius* Rüppell, 1835, Neue Wirbelthiere zu der Fauna von Abyssinien gehörig, vol. 1, p. 83 (type *Nebius concolor* Rüppell).

All fins absent or only the rudiments of a dorsal and anal fin present around tip of tail. Anterior nostrils tubular, posterior nostrils developed variously. Cleft of mouth reaching to behind eye, the mouth capable of being closed completely or nearly so. Eye small, covered by skin. Gill openings small, porelike, in the center of body height or somewhat above or below.

#### KEY TO EASTERN TROPICAL PACIFIC SPECIES

- 1a. Tip of tail with a rudiment of a fin; with at least a few rays present; tip of tail not sharply pointed or hard.
  - 2a. Head and trunk longer than tail (Galapagos Islands). . . . .  
 . . . . . *U. polystictus*, new species.
  - 2b. Head and trunk shorter than tail (Indo-Pacific, Panama and Colombia). . . . . *U. marmoratus* (Lacépède).



- 1b. Tip of tail sharply pointed and hard, with no evidence of fin rays.
- 3a. About fifty narrow, yellow lines over back and down the sides; a yellowish band over mid-part of head (Galapagos, Cocos Island, Panama, Colombia). . . . *U. galapagensis* Seale.
- 3b. Dorsally plain brown; ventrally freckled with brown spots on a lighter background (Gulf of California). . . . .  
 . . . . . *U. necturus* (Jordan and Gilbert).

***Uropterygius polystictus*, new species**

Plate 15

*Holotype*.—AHF no. 16.

*Type locality*.—Station 793-38, South Seymour Island, Galapagos, collected in tidepool with derris root, January 20, 1938.

*Paratype*.—One specimen, 185 mm., Station 811-38, Barrington Island, Galapagos, taken from a coral head, January 26, 1938.

*Measurements of holotype in mm.*—Length 321, head and trunk 165, tail 156, head 36, snout 5.5, eye 3, cleft of mouth 11.5, body depth 23, greatest width of head 18.5, greatest depth of head 21.

*Description*.—Body rounded anteriorly, the tail becoming compressed posteriorly; skin much wrinkled. Head and trunk longer than tail, which is 1.06 in their length. Depth of body 13.3 in total length; head 9.11 in total length. Eye 12 in head, 1.83 in snout. Snout 6.54 in head. Cleft of mouth 3.05 in head. Width of head 1.94 in its length, 1.16 in depth of head. Head anteriorly broad and heavy, especially in cross section at angle of jaws. Eye nearer tip of snout than angle of jaws, less than two in snout. Anterior and posterior nostrils tubular, tubes of the posterior nostrils equal in length to the tubes of the anterior nostrils, both equal half eye diameter. They are above the eye, but in advance of its center. Gill openings porelike, directed upward and backward, slightly smaller than diameter of eye, inserted at mid-depth of sides.

Maxillary teeth in two series. Outer series of about twenty to twenty-one small, close-set, pointed, slightly recurved teeth on each side. Inner series of large depressible canines, about eight on a side. Both rows continued around the tip of the jaw. Premaxillary teeth arranged in two triangles, the anterior the smaller with its apex toward the symphysis of the jaw, the posterior with apex toward the vomer, and their bases lying almost together. An enlarged tooth at each of the corners of the two triangles. Vomerine teeth about five in number, in a single series, all of

them smaller canines than those of the premaxillaries. Mandibular teeth similar to those of the maxillaries, approximately twenty-five teeth on each side. The inner series comprises about nine teeth on each side, though these are not so large as the teeth of the inner series of the maxillaries. Dorsal and anal fins absent; a slight caudal fringe, with a few rays evident, at tip of tail, almost surrounding it and extending further upward and forward on the dorsal curve than on the ventral. Tip of tail narrower than the remainder of the caudal region, ending in a moderate curve, not sharply pointed.

Body color yellowish, marbled with reddish brown. Over this marbling there are numerous brownish black spots of irregular size and shape. The dark mottling is especially heavy above the midline and on top of the head, almost obscuring the reddish ground color. Ventrally the reddish brown marbling predominates, only a few dark spots being present, mainly around the anal opening and on the tail. Yellowish body color is more strongly evident ventrally, especially on belly and ventral side of head. Anterior and posterior nostrils white. Pores of the upper and lower jaw surrounded by white. Edge of membrane around tip of tail yellowish white.

This species seems to be allied to *U. macrocephalus* of the Indo-Pacific region, with which it agrees in having the trunk and head longer than the tail. It differs from that species in the much shorter head, the greater depth of the body, the much greater development of the posterior nostrils (in specimens of the same size), and the different color pattern.

### Genus GYMNOTHORAX Bloch

*Gymnothorax* Bloch, 1795, Naturgeschichte der ausländischen Fische, part 9, p. 83 (type *G. reticularis* Bloch, under suspension of the Rules by the International Commission on Zoological Nomenclature, Opinion 93, 1926, Smithsonian Misc. Coll., vol. 73, no. 4, p. 5).

*Lycodontis* M'Clelland, 1844, Calcutta Journ. Nat. Hist., vol. 5, no. 18, pp. 173, 185 (type *L. literata* M'Clelland by subsequent designation of Jordan and Evermann, 1896, Bull. U.S. Nat. Mus., no. 47, p. 392).

*Rabula* Jordan and Davis, 1892, Report U.S. Fish Comm. for 1888, vol. 16, p. 589 (type by original designation *Muraena aquae-dulcis* Cope).

Fowler (1936, Bull. Amer. Mus. Nat. Hist., vol. 70) has shown very definitely that Bleeker (1863, *Natuurkundige Verhandelingen van de Hollandsche Maatschappij der Wetenschappen te Haarlem*, ser. 2, vol. 18, p. 130) was the first to designate a type species for *Gymnothorax*, and that he designated *G. catenata* Bloch, which is a species of *Echidna* Forster, 1777. The name *Gymnothorax* thus disappears from the system. Fowler also shows good reasons, based on a proper appreciation of "first type designations," for applying the name *Muraena* Linnaeus, 1758, to the genus commonly known as *Anguilla*. Under Fowler's arrangement, *Anguilla* auctorum becomes *Muraena*, *Muraena* auctorum becomes *Murenophis*, and *Gymnothorax* auctorum becomes *Lycodontis*.

The utter confusion which these shifts would introduce into the nomenclature of several of the commonest genera and best-known families of eels is patent, and anything that can be done to save the old and universally accepted usage is to be commended. However, no especial action seems needed at the present time, owing to several things entirely overlooked by Mr. Fowler.

The International Commission on Zoological Nomenclature, in Opinion 93 (cited above in synonymy) has shown that *Gymnothorax* was originally merely a substitute name for *Muraena* Linnaeus, 1758, and therefore, under the Rules, automatically takes as type the same type as *Muraena*, namely, *M. helena* Linnaeus, 1758. However, since this would evidently cause confusion in established nomenclature, the Commission has, under suspension of the Rules, placed *Gymnothorax* in the International Official List of Generic Names, with *G. reticularis* Bloch, 1795, as its type.

Moreover, in Opinion 77 (1922, Smithsonian Misc. Coll., vol. 73, no. 1, p. 71), the Commission has placed *Muraena*, type *M. helena*, in the Official List. This timely action saves the well-known genus *Anguilla* in its universally accepted sense, and negates the confusion that Fowler would so rashly introduce into the literature.

#### KEY TO EASTERN TROPICAL PACIFIC SPECIES

- 1a. Body color brown, either plain or marked with darker, never with yellowish or whitish.
- 2a. Body color uniform brown.
- 3a. Outer series of teeth thickened, bent abruptly backward at tips, the posterior concave margin distinctly serrate; lower jaw bent

- upward; pores in jaws whitish; margin around eye blackish (Panama and Galapagos Islands). . . . .  
 . . . . . *G. panamensis* (Steindachner).
- 3b. Outer series of teeth not abruptly retrorse and not serrate; teeth in jaws very long and fanglike; both jaws bent toward each other at the tips; lips thin, not concealing teeth when gape is closed; no whitish pores, no blackish margin around eye (Colombia and Galapagos Islands). . . . . *G. octavianus*, new species.
- 2b. Body color brown with darker markings, marblings or reticulations.
- 4a. Tail considerably shorter than head and trunk.
- 5a. Maxillary teeth biserial, rest of teeth uniserial; coffee brown, irregularly marbled with darker (Chile). . . . .  
 . . . . . *G. chilensis* (Günther).
- 5b. All teeth uniserial; brown with irregular darkish venules (Chile). . . . . *G. modesta* (Kaup).
- 4b. Tail equal to or longer than head and trunk; eye in center of gape.
- 6a. Head 3.36 to 4.43 in trunk; eye small 15.3 to 15.8 in head; gill opening larger than diameter of eye; irregularly reticulated with dark over body (Peru). . . . .  
 . . . . . *G. wieneri* Sauvage.
- 6b. Head 2 to 2.66 in trunk; eye large, 8.6 to 9.6 in head; gill opening much smaller than eye diameter; dark color in faint, wavy, anastomosing, more or less complete crossbands (Indo-Pacific, Galapagos). . . . .  
 . . . . . *G. chilospilus* Bleeker.
- 1b. Body brownish, reticulated, speckled, or banded with *both* light and dark markings.
- 7a. Body pattern spotted or reticulated, but never banded.
- 8a. Dorsal inserted on head in advance of gill opening.
- 9a. Head 3.3 to 3.6 in trunk; eye 10.2 to 13.6 in head; body brown, spotted with pale yellow spots, which are sometimes reduced to mere specks (Mazatlan, Mexico, to Colombia and Galapagos Islands). . . . . *G. dovii* (Günther).

- 9b. Head 2 to 2.6 in trunk; eye 8.4 to 8.75 in head; body with yellowish-gray reticulations under brownish spots and markings (Indo-Pacific, Galapagos Islands). *G. undulatus* (Lacépède).
- 8b. Dorsal inserted over gill openings; ground color light brown, with numerous dark brown spots mixed with white (Juan Fernandez Island, Chile). . . . *G. porphyrea* (Guichenot).
- 7b. Body banded with narrow bands of yellowish brown, about 20 in number, each one third width of the blackish interspaces (Galapagos). . . . .  
. . . . . *G. chlevastes* (Jordan and Gilbert).

*Gymnothorax octavianus*, new species

Plate 16

*Holotype*.—U.S. National Museum no. 101801.

*Type locality*.—Station 435-35, Octavia Bay, Colombia, collected from coral head, January 28, 1935.

*Paratype*.—One specimen, 187 mm., Station 811-38, north of Barrington Island, Galapagos, collected from coral head, January 26, 1938.

*Measurement of holotype in mm.*—Length 294, head and trunk 133, tail 161, head 39, snout 8, eye 3.5, depth 6, cleft of mouth 17, interorbital 3.75.

*Description*.—Body elongate, somewhat subcylindrical, becoming slightly compressed posteriorly. Depth 19.5 to 20.8 in total length. Head and trunk shorter than tail by three fourths length of head, 1.21 to 1.25 in tail. Head long and slender, not greatly expanded at occiput, 7.5 to 8.5 in total length. Eye 8.8 to 11.4 in head, 1.8 in snout. Snout 4.8 to 4.86 in head. Cleft of mouth 2.3 in head. Interorbital 10.4 in head. Dorsal fin inserted over gill openings, high and well developed, especially posteriorly, confluent with anal around tip of tail. Anal fin well developed but not as high as dorsal. No paired fins present. Several longitudinal folds in membrane covering dorsal fin.

Dorsal outline of head only moderately swollen at occiput and slightly concave over eye. Upper and lower jaws curved toward each other at the tips; the mouth cannot be completely shut. Lips thin and not concealing teeth on upper and lower jaws when mouth is closed. Cleft of mouth wide; eye at mid-point between symphysis and angle of jaws. Anterior

nostril tubular, near tip of snout. Posterior nostrils above and in front of eye, with a slightly raised rim, but not tubular. Gill openings small, length equals diameter of eye; opening almost horizontal, below the mid-line of sides. Gular region with heavy longitudinal folds ventrally and laterally.

Maxillary teeth biserial with the exception of about three teeth lying between the two rows at the mid-point of the gape. Outer series of teeth small, compressed, sharp, close set, and irregular in size. Every fourth tooth is two or more times as long as the three intervening teeth. Inner series of large, widely spaced, fanglike, depressible canines, nine on a side. Three large, depressible canines on the median line of the premaxillary plate. Fourteen small, conical, uniserial teeth on the shaft of vomer. Mandibular teeth biserial. Outer series small, compressed, sharply pointed, and close-set teeth of irregular size. Inner series of 11 widely spaced, large, sharp, fanglike canines.

Color a uniform brown, except for the lower jaw, the chin, and the gular region, which are light tan faintly mottled with darker. Skin in the longitudinal folds of the gular region darker than the surface.

*G. octavianus* is distinguished from other species of this genus found in this area by its long and slender head, the presence of extremely long, fanglike teeth, the wide cleft of the mouth, which does not completely close, the thin lips, which do not entirely cover the teeth when the gape is closed, the uniform brown color, and the insertion of the dorsal fin.



All specimens illustrated are holotypes unless noted to the contrary.

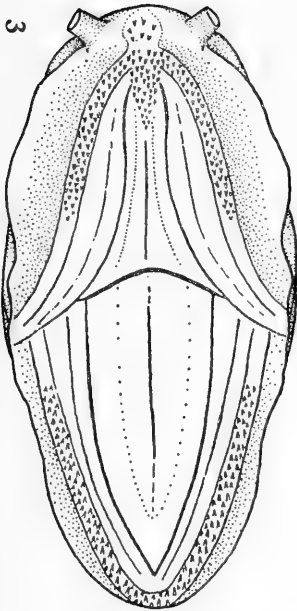
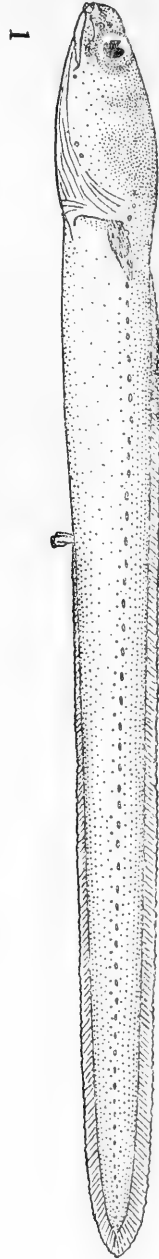
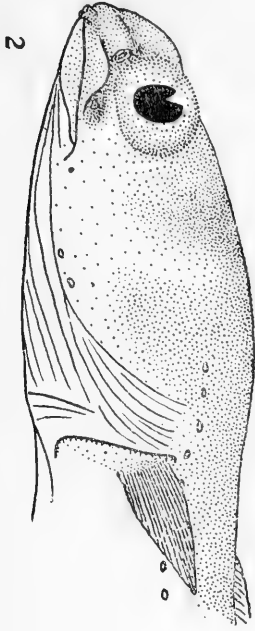
All illustrations were drawn by Pascual Ortiz.

PLATE 7

*Chiloconger labiatus*, n. gen., n. sp.

1. Side view of holotype.
2. Enlarged side view of head.
3. Dentition.

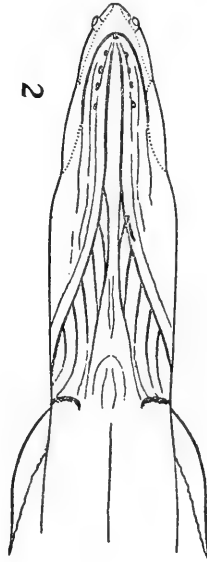
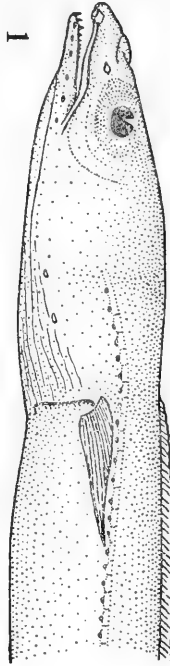
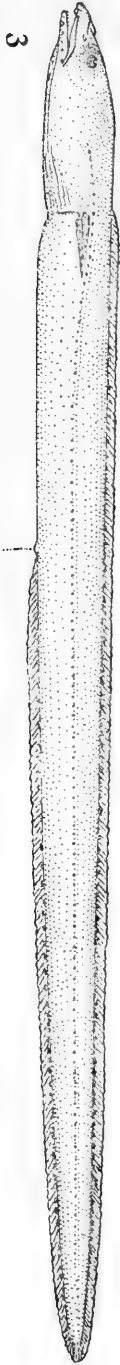




## PLATE 8

*Ariosoma vomerina*, n. sp.

1. Enlarged side view of head of holotype.
2. Under view of head.
3. Side view of entire fish.  
(Owing to the difficulty of examining the teeth of the unique specimen, no illustration of the dentition could be prepared.)

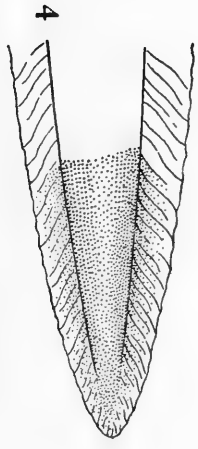
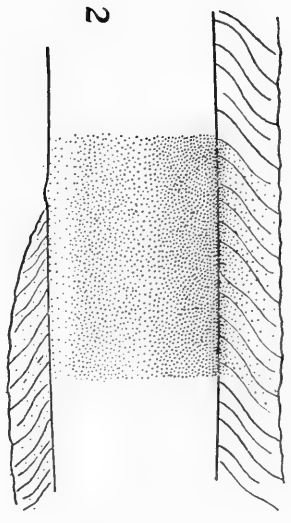
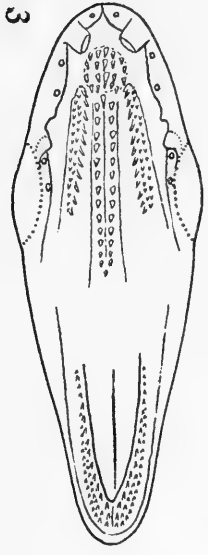
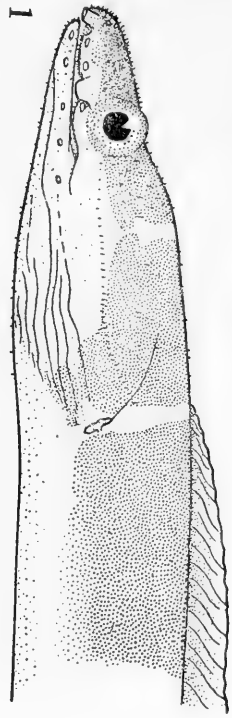


## PLATE 9

*Garmanichthys bicollaris*, n. sp.

1. Side view of head of holotype.
2. Anal region of body.
3. Dentition.
4. End of tail.

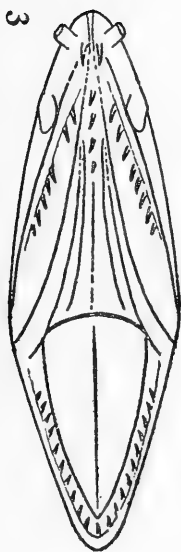
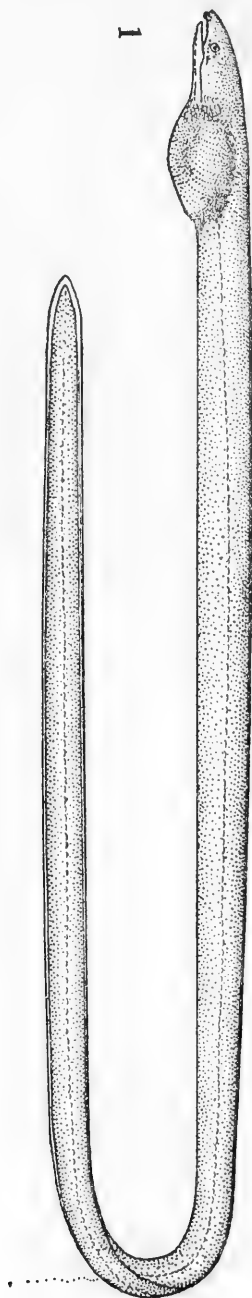
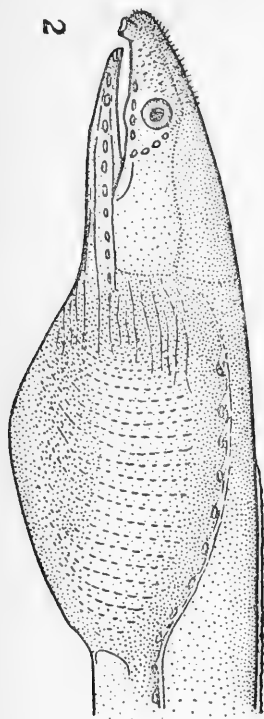
(What appear to be the teeth in the upper jaw in fig. 1 are the villi along the edge of the upper lip.)



## PLATE 10

*Leptenchelys vermiformis*, n. gen., n. sp.

1. Side view of holotype.
2. Enlarged side view of head.
3. Dentition.

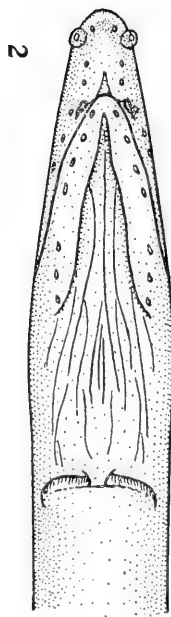
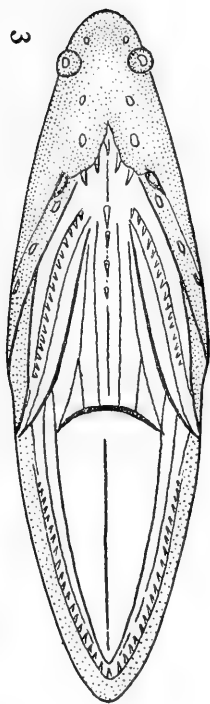
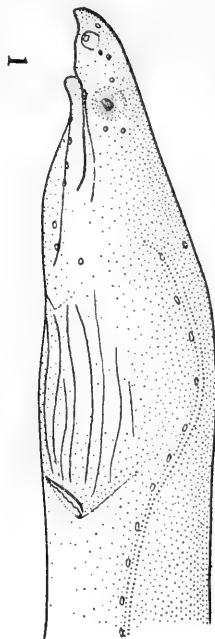


## PLATE 11

*Caecula equatorialis*, n. sp.

1. Side view of the holotype.
2. Under view of head.
3. Dentition.

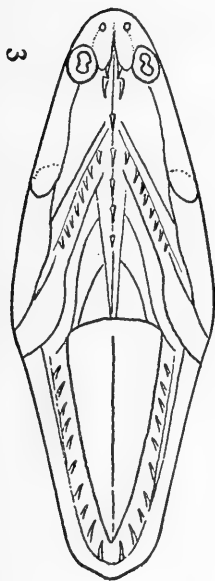
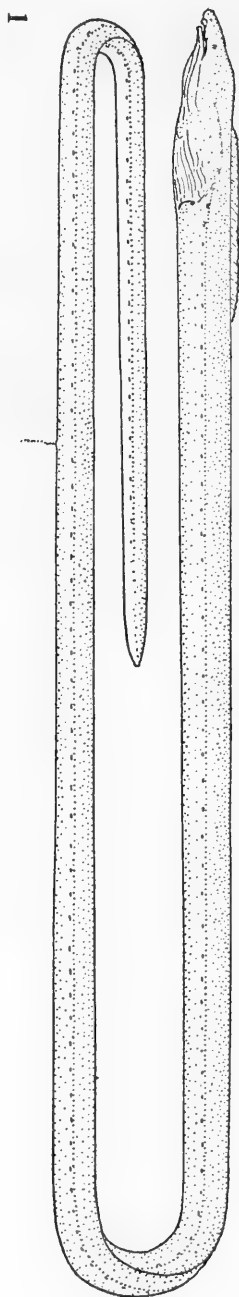
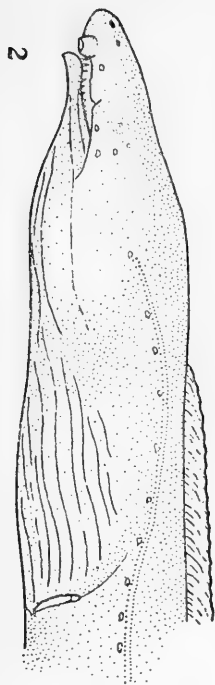




## PLATE 12

*Phaenomonas pinnata*, n. gen., n. sp.

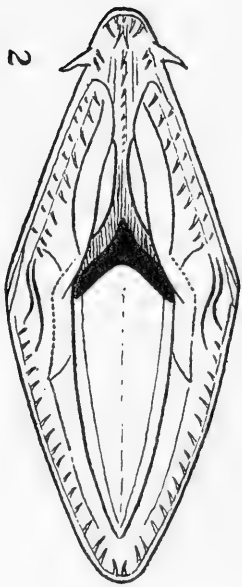
1. Holotype, entire specimen.
2. Enlarged side view of head.
3. Dentition.



## PLATE 13

*Pognophis fossatus*, n. gen., n. sp.

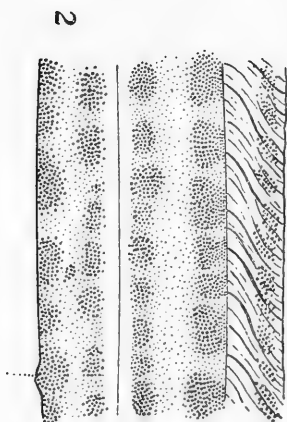
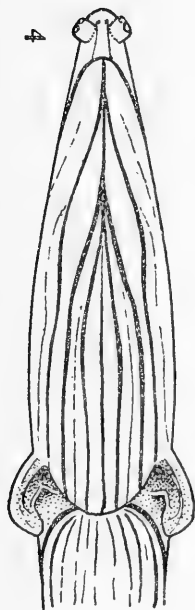
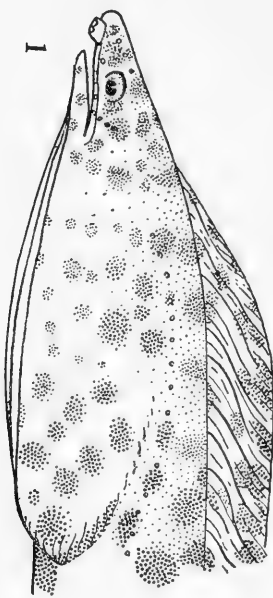
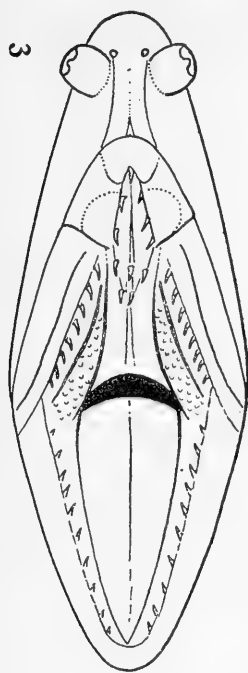
1. Side view of head of large paratype.
2. Dentition of large paratype.
3. Side view of holotype.



## PLATE 14

*Letharchus opercularis*, n. sp.

1. Side view of head of holotype.
2. Color pattern in anal region.
3. Dentition.
4. Under side of head showing pseudo-opercula.

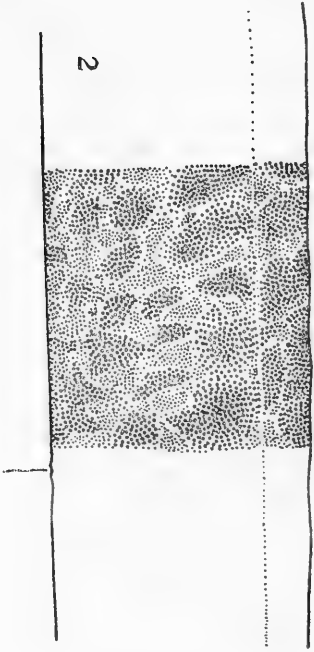
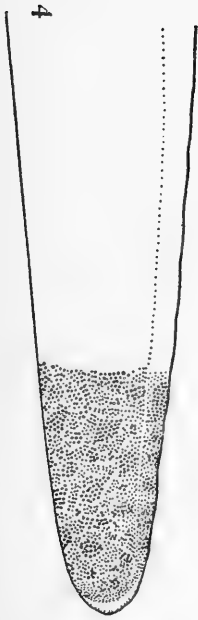
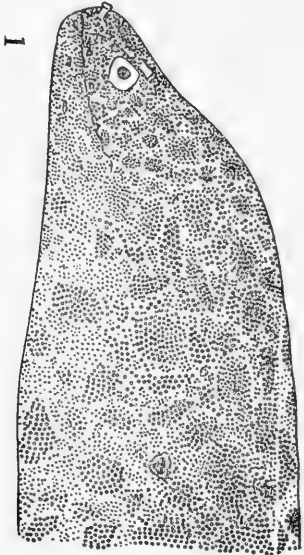
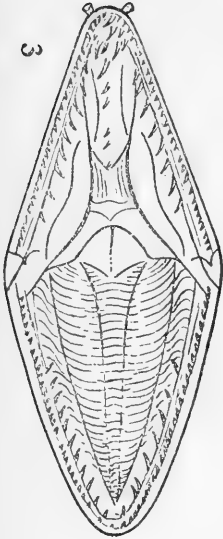


## PLATE 15

*Uropterygius polystictus*, n. sp.

1. Side view of head of holotype.
2. Color pattern in preanal region.
3. Dentition.
4. Tip of tail.

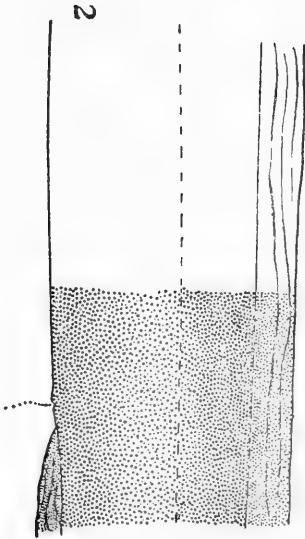
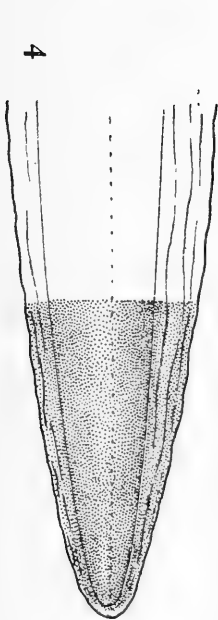
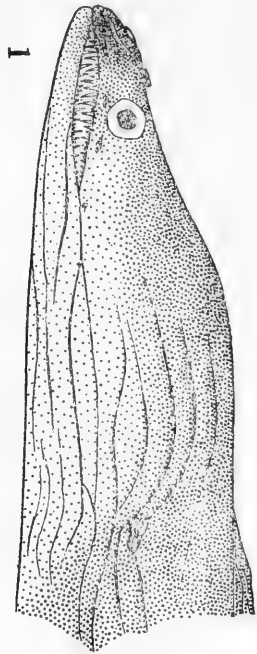
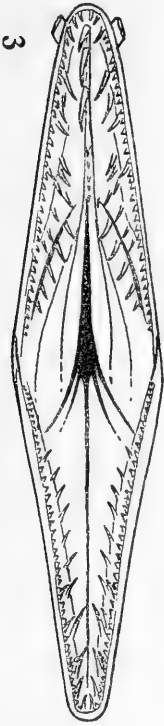




## PLATE 16

*Gymnothorax octavianus*, n. sp.

1. Side view of head of holotype.
2. Anal region.
3. Dentition.
4. Tip of tail.





THE PACIFIC AMERICAN ATHERINID FISHES OF THE  
GENERA *EURYSTOLE*, *NECTARGES*, *COLEOTROPIS*, AND  
*MELANORHINUS*

(PLATES 17-19)

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AND

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*Research Assistant*  
*Allan Hancock Foundation*  
*The University of Southern California*



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1. INTRODUCTION

While working over the Atherinidae for a projected synoptic check list of the marine fishes of the Pacific coast of South America, the authors found it necessary to determine some small Atherinids obtained by the senior author while night-fishing with a dip-net in the Galapagos during the 1938 cruise of the *Velero III*, Captain Allan Hancock commanding. These fishes appeared to belong to the genus *Eurystole*, long known from the single species *E. eriarcha*, described in 1881 by Jordan and Gilbert from a single specimen taken by Dr. C. H. Gilbert at Mazatlan, Sinaloa, Mexico. *Eurystole* has remained a rare genus in museum collections. The second specimen was reported from Mazatlan by Jordan in 1895, and of the genus only these two individuals and a few other examples from Lower California, the Galapagos, Colombia, and Peru have been recorded.

Our Galapagos specimens proved puzzling, and we were very much pleased when Dr. Rolf L. Bolin, of the Hopkins Marine Station of Stanford University, Pacific Grove, turned over to us the *Eurystole*-like Atherinids he had obtained during the 1939 cruise of the California State Division of Fish and Game Research Vessel *N. B. Scofield*. These specimens were most surprising. They represented two remarkably distinct species, one with large scales and one with small, both agreeing fairly well with current diagnoses of *Eurystole eriarcha*, but neither of them identical with our Galapagos species.

A key to the three species was prepared and forwarded to Dr. L. P. Schultz of the U.S. National Museum for comparison with the holotype of *Eurystole eriarcha*. Dr. Schultz has been so kind as to take measurements and counts of the holotype and to determine that this specimen definitely agrees with our key diagnosis of the large-scaled species. He also sent us for identification a series of specimens obtained by Dr. Waldo L. Schmitt in Ecuador and Peru, which turned out to be a third new form, and has loaned us a fine paratype of *Menidia starksi* Meek and Hildebrand, which, from the description and figure, we had suspected might be related to *Eurystole*. We are indebted also to Mr. H. Walton Clark of the California Academy of Sciences, who has allowed us to examine the extensive series of *Eurystole eriarcha* in the Academy's collections, mostly collected by Mr. Clark and others aboard Mr. Templeton Crocker's yacht *Zaca*.

*Menidia starksi* proves to be only very superficially similar to *Eurystole*, being related rather to the Atherinid group typified by *Melaniris* (= *Thyrina*, preoccupied), in which it forms a very distinct new genus. On the other hand, our four species of "*Eurystole*" seem to represent at least two genera, *Eurystole*, a large-scaled form with one species, and a new, small-scaled genus comprising three new species. That this distinctive genus and its three new species have remained totally unrecognized and unknown to the present day is most remarkable.

Both *Eurystole* and its relative, *Nectarges*, appear to be surface fishes of open water close to shore, or inhabitants of the surf on sandy beaches, and the species are undoubtedly abundant, judging from the rather large series of the two Central American species we have at hand. Nearly all of our specimens were collected at night by fishing with dip-nets under lights rigged over the sides of ships at anchor.

It may be mentioned that this method of nocturnal surface collecting, carried on inshore or adrift over deep water in calm weather, has pro-

duced an abundance of rich ichthyological material ever since it was first used aboard the U.S.S. *Albatross* fifty or more years ago. Atherinids, pipefishes, flying-fishes, anchovies, and even such surprising forms as intertidal blennies are frequently taken, and prolonged fishing often results in the capture of rare eels. The light should be slung over the rail soon after sundown, and a half hour or so given for invertebrates and fishes to gather. Fishing is then carried on from the lowered gangway or a scaffold rigged over the rail with a bar to lean against, its floor just above the reach of the waves or swell. A strong, deep, fine-meshed ( $\frac{1}{8}$ - $\frac{3}{16}$  inch bobbinet) dip-net, its ring with the diameter of 12-14 inches, is used. The handle should be of light wood or bamboo and not over 4 feet long. The long-handled dip-nets in vogue for collecting from the deck are too heavy and clumsy for the quick action needed. The senior writer much prefers an overwater to a submarine light in spite of the glare, especially for eels and most surface fishes. The light should, however, have a conical shade, and is suspended just out of reach of the swells or waves, and close to the fisherman. If fishing proves good within the first hour, it should be carried on until ten or eleven o'clock. This may be hard on the fisherman, who must preserve and label his catch before retiring, but it is well worth the trouble.

The present paper consists of a revision of the genera *Eurystole* and *Nectarges*, and their species, to which we have appended the description of the new genus *Coleotropis* (erected for *Menidia starksi*) and an account of the genus *Melanorhinus* and its Pacific coast member. In the lists of specimens, AHF = Allan Hancock Foundation, The University of Southern California; USNM = United States National Museum, Washington; CAS = California Academy of Sciences, San Francisco; and Stanford = Natural History Museum of Stanford University. The study was made and the paper was prepared in the laboratories of the last-named institution.

## 2. A SYSTEMATIC REVISION OF THE GENERA *EURYSTOLE* AND *NECTARGES*

### KEY TO THE GENERA *Eurystole* AND *Nectarges* AND THEIR SPECIES

- 1a. Anal fin lacking a scaly sheath on the rays except for a single row of 3-8 small modified scales anteriorly; silvery lateral band constricted to a thin line on caudal peduncle and broadening again into a triangle at caudal base; scales in a lateral series from upper end of

- gill-opening to hypural fan 38-41; predorsal scales 13-16; scales around caudal peduncle 12; maxillary reaching vertical of a point about midway between anterior border of orbit and anterior border of pupil when mouth is tightly closed. (Genus *Eurystole*.) . . . . . *Eurystole eriarcha*.
- 1b. Anal fin with a deep, scaly basal sheath composed of two rows of scales on the basal part of the rays of most or all of the fin; silvery lateral band scarcely or only very slightly constricted on caudal peduncle, never constricted to a thin line; scales in lateral series 58-65; predorsal scales 23-28; scales around caudal peduncle 16-18; maxillary not or barely reaching vertical of front edge of orbit when mouth is tightly closed. (Genus *Nectarges*.)
- 2a. Scaly sheath on basal part of anal rays composed of a distal row of scarcely or not at all modified scales, large and rounded in form, extending along the base of the entire fin, and a proximal row of highly modified, very oblique scales; lateral silvery band very wide, including three complete longitudinal rows of scales at a point below first dorsal fin; head 4.32-4.58 and depth 3.9-4.2 in standard length; gill-rakers on lower limb of first gill-arch 15-17. (Subgenus *Euryarges*.) . . . . . *Nectarges nesiotetes*.
- 2b. Scaly sheath on basal part of anal rays composed of a distal row of modified, more or less oblique quadrilateral scales with the apexes forming a rounded angle at the postero-inferior corner of each scale, and a proximal row of very oblique scales which are only partly on the rays, the sheath sometimes absent on the posterior third of the fin; lateral silvery band narrower, covering not more than two complete scale rows below the first dorsal; head 4.63-4.88 and depth 4.2-5.22 in standard length; gill-rakers on lower limb 17-20. (Subgenus *Nectarges*, *s. str.*)
- 3a. Lateral silvery band below first dorsal covering two complete scale rows and a half of another row both above and below; distance between caudal base and origin of second dorsal fin 2.6-3 in standard length; least depth caudal peduncle in its length (from base last anal ray to middle hypural fan) 2.31-2.74; snout 3.2-3.54 in head; scales 58-63 in lateral series from above gill-opening to end hypural fan; depth 4.22-5.22 in standard length . . . . . *Nectarges nepenthe*.
- 3b. Lateral silvery band below first dorsal covering one complete scale row, over half of another row above, and less than half of



another below; distance between caudal base and origin of second dorsal 3.22-3.25 in standard length; least depth caudal peduncle 1.76-2.18 in its length; snout 3.53-3.84 in head; scales 55-59; depth 4.2-4.5 in standard length . . . . .  
 . . . . . *Nectarges nocturnus*.

### Genus EURYSTOLE Jordan

*Eurystole* Jordan, 1895, p. 418 (type by original designation *Atherinella eriarcha* Jordan and Gilbert).

Anal fin elongate, with a single spine and 23-31 rays, its origin in advance of that of second dorsal. Dorsal fins widely separated, height of the first less than the distance between the origins of the two fins. First dorsal with III to V flexible spines, its origin slightly before to slightly behind anal origin. Caudal fin forked. Ventral fins abdominal, farther from upper angle of pectoral base than from anal origin.

Premaxillaries dilated posteriorly, the anterior part not separated by a notch from the posterior; protractile, the skin covering them separated by a deep fold from that of the head. Gape strongly curved, restricted at the corners of the mouth by a membrane between the jaws. Maxillary reaching past vertical of front margin of orbit; it extends to below a point about midway between front border of orbit and the pupil of the eye. Rami of mandibles scarcely elevated. Teeth well developed, a narrow band of small, pointed teeth in each jaw. Lower jaw very slightly shorter than upper with mouth tightly closed.

Sides of head and trunk scaled. Scales large, 37-41 in a lateral series from above gill-opening to caudal base. Predorsal scales along mid-line of back 13-16. Scales around caudal peduncle 12. Anal sheath reduced or obsolete, composed of 3-8 small, modified scales on the bases of the first few anterior anal rays.

Head rather abruptly truncated posteriorly, the curve of the gill-cover flat. Head and trunk moderately compressed for an Atherinid. Preopercular angle with a small, flat, weak, closely appressed "spine." Interorbital moderately convex.

Eye large, its diameter greater than the shortest distance from orbital rim to angle of preopercle. A distinct, thin, adipose eyelid visible in well-preserved specimens.

The wide, silvery, lateral band is abruptly constricted to a thin line on the caudal peduncle and immediately broadens again to form a triangle

with its base against the base of the caudal fin. This remarkable color character is the most easily seen characteristic of the genus and enables specimens of *Eurystole* to be sorted without fail from their very similar relatives.

The genus as now defined contains a single species occurring from Lower California and the Revillagigedo Islands south to Port Utria in the Province of Choco, Colombia.

The genus *Eurystole* is usually credited to Jordan and Evermann (1896). As we have noted above, Jordan diagnosed the genus and designated its type species a full year earlier. Jordan does refer to Jordan and Evermann as the authors of the genus; but, since there is no internal evidence to show that Evermann had anything to do with the preparation of the text on *Eurystole eriarcha* in Jordan's 1895 paper, the International Rules of Zoological Nomenclature require that Jordan be cited as sole author. The senior author has discussed such cases of authorship in Copeia, 1931, no. 3, p. 95.

*Note on the genotype.*—It will be noted in the discussions below that the supposed second specimen of *Eurystole eriarcha*, described and figured by Jordan in 1895, is actually not a *Eurystole* at all, but a specimen of what we call *Nectarges nepenthe*. Yet this same example is the one upon which the current accounts of *Eurystole eriarcha* are based, and was the only specimen in Jordan's hands when he founded the genus *Eurystole*. There is, therefore, some doubt as to whether the generic name *Eurystole* should be held to apply to the genus typified by the species *eriarcha* or to the genus we here call *Nectarges*.

This is one of those numerous instances in which a generic name was based upon a misidentified type species. Opinion 65 of the International Commission on Zoological Nomenclature discusses such cases. The Commission says, "If an author designates a certain species as genotype, it is to be assumed that his determination of the species is correct; if a case presents itself in which it appears that an author has based his genus upon certain definite specimens, rather than upon a species, it would be well to submit the case, with full details, to the Commission. At the present moment it is difficult to lay down a general rule." It is evident that the Commission has never definitely decided upon this question, which is not covered by the International Rules.

In the present instance it is clear that Jordan's 1895 description of *Eurystole* was based upon Stanford 2689, an example which is generically different from the type of *Eurystole eriarcha*, but it is equally clear that

Jordan believed he was proposing the new genus for his own 1881 *Atherinella eriarcha*. However, if we were to consider that Jordan's name *Eurystole* belongs with Stanford 2689, which we are now describing as a new species, the well-known combination *Eurystole eriarcha* would be broken up, *eriarcha* would receive a new generic name, and *Eurystole* would contain only species described 46 years after its first diagnosis. This appeals to us as preposterous, in the present instance at least, and we therefore follow the senior author's inclination—that a generic name should constantly be associated with the specific name of its designated type species, whatever concept the describer of the genus may have had of that type species. This is also in line with the general recommendation of the International Commission in Opinion 65—that “if an author designates a species as genotype it is to be assumed that his determination of the species is correct.”

### ***Eurystole eriarcha* (Jordan and Gilbert)**

Plate 17

*Atherinella eriarcha* Jordan and Gilbert, 1881, p. 348 (Mazatlan).

? *Eurystole eriarcha* Osburn and Nichols, 1916, p. 156 (Cape San Lucas, and Santa Catalina Island, Gulf of California).—Breder, 1936, p. 6 (San José del Cabo, Lower California).—Seale, 1940, p. 14 (Port Utria, Colombia; but not Galapagos specimens).

*Material examined*.—One hundred thirty-eight specimens, in the collections of Stanford University (54), the U.S. National Museum (3), and the California Academy of Sciences (81).

Stanford 37054: 3 specimens, 54-64 mm, Muertos Bay, Baja California, 23° 59' 15" N., 109° 49' 30" W., March 6, 1939, dip-net under electric light from *N. B. Scofield* at anchor in 4 fms, R. L. Bolin, collector;—37055: 26 specimens,<sup>1</sup> 47.2-64.5 mm, off Arroyo de San Luis, Baja California, 23° 10' 30" N., 109° 27' 45" W., March 7, 1939, dip-net under electric light from *N. B. Scofield* at anchor in 5 fms, R. L. Bolin, collector;—37056: 21 specimens, 39-67 mm, Santa Cruz Bay, Oaxaca, Mexico, 15° 45' N., 96° 07' 20" W., March 14, 1939, dip-net under electric light from *N. B. Scofield* at anchor in 8 fms, R. L. Bolin, collector;—37057: 3 specimens, 49.5-50 mm, Maria Magdalena Island, Tres Marias Islands, Mexico, February 9, 1940, Vernon Brock, collector.

<sup>1</sup> Specimens from this lot are being deposited in the Hancock Foundation and the U.S. National Museum.

USNM 101635: 2 specimens, 37.5-45.1 mm, Port Utria, Colombia, January 23, 1935, under electric light from *Velero III* at anchor, W. L. Schmitt, collector;—101636: 1 specimen, 52 mm, same data as 101635.

CAS 2549-2553, 3787, 5270-5273, 5319-5329: 21 specimens, Braithwaite Bay, Socorro Island, March 6, 1932, under electric light, *Zaca*;—5275-5279: 5 specimens, Braxilito Bay, Costa Rica, July 1, 1932, under electric light, *Zaca*;—2554-2560: 7 specimens, Cape San Lucas, Baja California, August 6, 1932, seine haul, *Zaca*;—1235-1236, 1339-1344, 1346-1359, 2005: 23 specimens, Clarion Island (no other data; 1932?);—1717-1721: 6 specimens and 1 without number, Socorro Island (no other data; 1932?);—(no numbers): 3 specimens, Socorro Island, March 17, 1932, under light at night;—(no numbers): 9 specimens, Braxilito Bay, Costa Rica, July 1, 1932, *Zaca*;—(no numbers): 4 specimens, off Bat Island, Costa Rica, July 2, 1932, under electric light;—(no numbers): 2 specimens, Maria Madre Island, Tres Marias Islands, Mexico, July 31, 1932, *Zaca*. A number of these specimens in the Academy are not in good condition.

*Range*.—From Lower California and the Revillagigedo Islands, Mexico, to Port Utria, Choco, Colombia.

*Description*.—Body elongate, compressed, depth 3.46-4.5 in standard length. Dorsal outline of body either moderately and evenly curved from tip of snout to caudal base or much flattened before the first dorsal. Ventral outline equally or only slightly more curved in specimens which have an evenly curved dorsal outline, and much more deeply curved in those specimens in which the predorsal outline is much flattened. Abdomen compressed, but not sharply so. Preventral edge thinly rounded, not keeled. Caudal peduncle length 4.7-6.3 in standard length; caudal peduncle depth 2.1-2.6 in its length.

Sides of head and body scaled; 38-41 scales in a lateral series from above gill-opening to caudal base. Predorsal scales along mid-line of back 13-16. Scales around caudal peduncle 12. Preventral scales 9-11. Base of caudal fin scaled. Anal sheath greatly reduced; a short, single row of 3-8 small, modified scales along the base of the anterior anal rays. Other fins naked. One complete row of scales included in the lateral line below the first dorsal and half a row both above and below. Lateral line of several irregular and incomplete series of pores along the sides.

Head short and deep, rather abruptly truncate posteriorly, its length 3.67-4.5 in standard length; head width 1.18-1.96 in its length. Snout short, bluntly rounded from both dorsal and lateral aspects, 3.04-3.86 in

head. Eye large, 2.2-2.66 in head, its diameter greater than the shortest distance from orbital rim to angle of preopercle. Upper edge of orbit reaching, but not rising above, the dorsal outline of the head. Adipose eyelid present, more strongly developed anteriorly. Interorbital slightly convex, 2.75-3.52 in head. Preopercle with a small, weak, flat, closely appressed "spine" at its angle. Branchiostegal rays 6.

Mouth terminal, strongly oblique, the gape curved; lower jaw slightly included at tip when mouth is tightly closed. Maxillary narrow, reaching or extending somewhat behind vertical of front of inner edge of the adipose eyelid when the mouth is tightly closed, 2.12-2.92 in head. Premaxillaries protractile, broadly dilated posteriorly. Gape restricted at corners of mouth by a membrane between the jaws. Teeth of upper jaw in a narrow band of small, pointed, slightly curved, depressible teeth, narrowing to a single row laterally. Mandibular teeth similar to those of upper jaw. No vomerine or palatine teeth present. Gill-membranes not united, free from isthmus. Gill-rakers 14-16 on lower limb of first arch. Pseudobranchiae present.

Dorsal III to V-I, 9-12. First dorsal short, spines flexible, origin slightly anterior to slightly posterior to a vertical through the anal origin, and from slightly nearer caudal base than tip of snout to slightly farther. Second dorsal origin over about twelfth anal ray, the base ending over about fourth from last anal ray. Anal fin I, 23-31, moderately falcate, the posterior rays about 2.5 in greatest height of fin. Caudal fin forked, lower lobe very slightly longer. Pectoral rays 13-15, the fin short and broad, its length equal to or slightly less than head length. Ventral fins I, 5, abdominal, closely approximated, short, not or barely reaching anal opening, their origins nearer anal origin than upper angle of pectoral base.

Body color in alcohol light yellowish. Lateral band silvery, dorsally edged by a narrow dark line. Band constricted on caudal peduncle into a fine line, expanded again on caudal base into an irregular triangle. Exposed margins of scales above lateral band outlined with small, blackish punctulations in most specimens. Caudal fin dusky marginally, pale proximally. Dorsal fin colorless or with a few scattered, minute punctulations along the rays. Anal, pectoral, and ventral fins colorless. The bases of many dorsal and anal rays have small, dark punctulations. Cheeks and opercles silvery; head dark dorsally; nape blackish, lighter anteriorly. Lips and tip of snout moderately to heavily marked with a smudge of small, dark spots.

*Notes on geographical variation.*—We have been considerably disturbed by the differences which exist between our Arroyo de San Luis, Lower California, material of *E. eriarcha* and the series from the coast of Oaxaca. Except for two rather peculiar examples, one from each place, and two or three small, less well-preserved individuals, the series from the two localities are separable upon very superficial examination. In the Lower California fish the predorsal profile of the back is flattened, the dorsal contour being broken at the origin of the second dorsal fin and thence sloping in a concave curve to the caudal fin. The head of the fish seems to be more definitely in line with the straight axis of the body (*i.e.*, the head axis in line with the body axis), and the eye to be placed in line with the body axis. In the Oaxaca specimens, on the contrary, the predorsal profile of the back is definitely arched, there is little or no break in the dorsal contour at the origin of the second dorsal fin, and the profile posterior to this point is straight or only slightly concave back to the narrowest part of the caudal peduncle. The head axis is definitely at an angle with the less-straight body axis, the head appearing to be pointed slightly downward, and the middle of the eye is definitely below the front part of the body axis. Moreover, the Oaxaca fish seem to have a somewhat more pointed and less pigmented snout when viewed from above, the top of the head is less flattened, the dark scale-edging of the back is usually weaker and sometimes absent, and the preentral profile is more oblique and less liable to be horizontal than in the Lower California individuals.

The differences in appearance caused by these features are striking in almost all the specimens of the two series, but are difficult to reduce to definitive descriptions. Perhaps the most easily expressed difference is the position of the eye in relation to straight lines projected forward along the lines of the anterior upper and lower borders of the lateral silvery band. In the Lower California series the projected line of the upper edge of the band subtends the upper part of the pupil, while in the Oaxaca specimens the same projected line passes entirely above the orbit or subtends only the uppermost part of the rim.

These characters are, however, all variable, and no one of them is entirely constant for the locality. Moreover, we have been unable to apply these character-criteria with any degree of precision to the available material from localities other than Lower California and Oaxaca, chiefly because all these other specimens are in much poorer condition than the magnificently preserved series obtained by Dr. Bolin. Finally, it seems extremely unlikely that the single original type of *eriarcha* from Mazat-

lan (USNM 29243) is in good enough condition to show these characters clearly; and, until a large, finely preserved sample of specimens from Mazatlan is available, it would be useless to speculate upon the systematic characters and possible racial relationships of the population at the type locality of *eriarcha*.

An effort was made to correlate these elusive characters of the Lower California and Oaxaca series with the more usual types of counts and measurements used in defining systematic units in fishes; but, although these do in part support the differences observable "by eye," the variations encountered are so great, so haphazard, and so unexpected that we have been forced to conclude that a racial analysis of the populations of *Eurystole eriarcha* must await the collection of large series well representing the range of the species—from the Gulf of California and the Revillagigedo Archipelago to the coast of Colombia. It must be remembered that the available material is almost all from at or near the northern and southern extremes of the supposed range of the species.

The counts and proportional measurements of the Oaxaca and Lower California (Arroyo de San Luis) series are presented in Table I.

The two rather peculiar specimens which were mentioned above (one from the Arroyo de San Luis and one from the Oaxaca series) differ rather strikingly from the others. The Lower California specimen, 54.5 mm in standard length, besides entirely lacking the dark scale-edgings of the dorsum and most of the supraocular and snout pigmentation, differs from its fellows in the greater depth. Moreover, the extended line of the upper edge of the lateral band subtends the upper edge of the orbital rim. The peculiar Oaxaca specimen (40.5 mm in standard length) resembles its fellows and the peculiar Lower California example in its lack of dark pigmentation, but, unlike the other Oaxaca specimens, the head axis is in line with the body axis. In both of these peculiar specimens, and in contradistinction to nearly all the others in both series, the anterior part of the lateral silvery band is curved noticeably upward. The shape of the head of the Lower California individual mentioned also appears peculiar, but this is due solely to the unnatural extension of the branchiostegal membranes. This same fortuitous peculiarity is shown also in Jordan's 1895 plate of *Nectarges nepenthe*.

Dr. L. P. Schultz has given us the following counts and measurements of the holotype of *E. eriarcha* (USNM 29243): standard length 35.5, head length 8.8, body depth 7.8, eye diameter 3.9, length caudal peduncle (base of last anal ray to end of hypural fan) 7.2, least depth

TABLE I  
 COUNTS AND PROPORTIONAL MEASUREMENTS OF *Eurystole eriarcha*  
 FROM SANTA CRUZ BAY, OAXACA, AND ARROYO DE SAN LUIS,  
 LOWER CALIFORNIA

| <i>Standard Length</i>                      | <i>Dorsal</i> | <i>Anal</i> | <i>Lateral Scales</i> | <i>Predorsal Scales</i> | <i>Head in Standard Length</i> | <i>Depth (at Anus) in Standard Length</i> |
|---|---------------|-------------|-----------------------|-------------------------|--------------------------------|---|
| Santa Cruz Bay, Oaxaca, Mexico (37056)      |               |             |                       |                         |                                |   |
| 66.5  | IV—I, 12      | I, 28       | 40                    | 16                      | 4.44                           | 3.91                                      |
| 63.7  | IV—I, 9       | I, 25       | 39                    | 15                      | 4.45                           | 3.98                                      |
| 59.5  | IV—I, 9       | I, 23       | 39                    | 16                      | 4.37                           | 4.18                                      |
| 59.4  | IV—I, 9       | I, 24       | 37                    | 15                      | 4.55                           | 4.08                                      |
| 55.5  | III—I, 11     | I, 26       | 36                    | 15                      | 4.44                           | 4.02                                      |
| 54.5  | IV—I, 10      | I, 25       | 38                    | 15                      | 4.70                           | 4.00                                      |
| 53.6  | III—I, 11     | I, 25       | 38                    | 15                      | 4.55                           | 4.22                                      |
| 50.6  | III—I, 11     | I, 25       | 37                    | 15                      | 4.60                           | 4.20                                      |
| 50.0  | III—I, 10     | I, 26       | 38                    | 15                      | 4.50                           | 4.15                                      |
| 47.5  | IV—I, 10      | I, 25       | 37                    | 15                      | 4.40                           | 4.50                                      |
| 45.8  | IV—I, 13      | I, 31       | 40                    | 15                      | 4.32                           | 4.36                                      |
| 43.3  | IV—I, 10      | I, 26       | 40                    | 14                      | 4.40                           | 4.33                                      |
| 43.0  | III—I, 11     | I, 26       | 38                    | 15                      | 4.53                           | 4.34                                      |
| +2.6  | III—I, 9      | I, 23       | 37                    | 15                      | 4.35                           | 4.36                                      |
| 41.5  | IV—I, 11      | I, 25       | 38                    | 15                      | 4.60                           | 4.35                                      |
| 38.6  | IV—I, 10      | I, 24       | 38                    | 15                      | 4.54                           | 4.54                                      |
| Arroyo de San Luis, Baja California (37055) |               |             |                       |                         |                                |   |
| 68.5  | IV—I, 11      | I, 25       | 40                    | 15                      | 4.61                           | 4.27                                      |
| 66.0  | III—I, 10     | I, 29       | 40                    | 15                      | 4.71                           | 4.71                                      |
| 63.7  | V—I, 11       | I, 25       | 39                    | 15                      | 4.70                           | 4.55                                      |
| 63.5  | IV—I, 11      | I, 24       | 39                    | 14                      | 4.38                           | 4.38                                      |
| 61.5  | III—I, 10     | I, 24       | 39                    | 15                      | 4.40                           | 4.40                                      |
| 61.5  | IV—I, 12      | I, 29       | 39                    | 14                      | 4.72                           | 4.72                                      |
| 62.5  | III—I, 11     | I, 27       | 42                    | 17                      | 4.80                           | 4.62                                      |
| 60.0  | III—I, 10     | I, 28       | 40                    | 14                      | 4.60                           | 4.45                                      |
| 59.0  | III—I, 11     | I, 28       | 41                    | 16                      | 4.54                           | 4.37                                      |
| 58.5  | IV—I, 11      | I, 27       | 39                    | 15                      | 4.50                           | 4.67                                      |
| 56.2  | IV—I, 12      | I, 27       | 39                    | 15                      | 4.52                           | 4.68                                      |
| 56.0  | IV—I, 10      | I, 26       | 40                    | 15                      | 4.50                           | 4.75                                      |
| 54.8  | III—I, 11     | I, 25       | 40                    | 15                      | 4.38                           | 4.65                                      |
| 53.0  | IV—I, 12      | I, 25       | 39                    | 13                      | 4.50                           | 4.60                                      |
| 50.4  | IV—I, 10      | I, 25       | 39                    | 15                      | 4.33                           | 4.30                                      |
| 49.3  | IV—I, 10      | I, 26       | 40                    | 15                      | 4.32                           | 4.25                                      |
| 49.0  | III—I, 11     | I, 26       | 40                    | 14                      | 4.90                           | 4.90                                      |
| 48.5  | III—I, 11     | I, 26       | 41                    | 14                      | 4.85                           | 4.85                                      |
| 48.0  | IV—I, 11      | I, 26       | 40                    | 14                      | 4.55                           | 4.74                                      |
| 37.9  | III—I, 10     | I, 25       | 40                    | 14                      | 4.30                           | 4.90                                      |
| 37.5  | IV—I, 12      | I, 26       | 39                    | 14                      | 4.42                           | 5.00                                      |



caudal peduncle 3.5, tip of snout to anal origin 17.8, anal origin to caudal base 19.2, pectoral length 6.1, tip of snout to posterior edge of orbit 6.2, gill-rakers on lower limb first arch 13, lateral scales 39 or 40, predorsal scales 14, scales around caudal peduncle 12.

*History of the species.*—Jordan and Gilbert described this species from a single specimen taken by Gilbert at Mazatlan (USNM 29243). Jordan (1895, p. 418, pl. 32) recorded and poorly figured the second specimen (Stanford 2689) from Mazatlan; however, our re-examination of this individual has shown that it is not *Eurystole eriarcha*, but instead is undoubtedly our new species, *Nectarges nepenthe*. The specimen apparently was not in good condition when collected, but Jordan's description based on it served for the account of *Eurystole eriarcha* in Jordan and Evermann's general work (1896, p. 803). These authors also copy (as fig. 339, vol. 4) Jordan's inaccurate 1895 plate.

In Jordan and Hubbs' review of the Atherinidae (1919, p. 63), this same Mazatlan specimen of *Nectarges nepenthe* seems to have been the basis of the account of *Eurystole eriarcha*, and the old, inaccurate 1895 plate of it was again reproduced (pl. 5, fig. 19). It will be noted that Jordan and Hubbs state, "There are 52 scales in the median longitudinal series in the type specimen of *E. eriarcha*." That some sort of error occurred in this statement will be evident from the counts of the holotype of *eriarcha* given above. It is our belief that the count of 52 scales (undoubtedly erroneous) was taken from this same second specimen (Stanford 2689) of *Nectarges nepenthe*, which is now (and presumably was in 1919 as well) in such poor condition that an exact count is not possible, and that this example was taken by Jordan and Hubbs to be the type of *Eurystole eriarcha* through some sort of *lapsus calami* or *mentalis*.

So far as we have been able to determine, there have been only four other published records of fishes identified as *Eurystole eriarcha*. Osburn and Nichols (1916, p. 156) recorded six specimens from Cape San Lucas and one from Santa Catalina Island in the Gulf of California. Their material may be either *Eurystole eriarcha* or *Nectarges nepenthe*, or possibly both species, although we can scarcely believe that any ichthyologist could fail to recognize the distinctness of these two if he had both in his hand at the same time. These same remarks apply also to Breder's (1936, p. 6) record of five specimens from San José del Cabo, but his mention of the "type figure" is a *lapsus* in referring to the oft-repeated 1895 figure of *Nectarges nepenthe*. Nichols and Murphy (1922, p. 506) record without comment 18 specimens seined on the beach at North Chincha Island,

Peru, in 1919. From the locality, we consider it almost certain that these fish from the colder coastal waters of Peru belong to our new species, *Nectarges nocturnus*, since one of us (Myers) collected a single small specimen of that species at North Chincha Island in 1938. *Eurystole eriarcha* is known from as far south as the coast of Choco Province, Colombia, but we doubt that it crosses the strong break between the Panamanian and Peruvian zoological provinces at or near Cape Aguja (see Myers, 1941, p. 206). Finally, Seale (1940, p. 14) records two specimens of *Eurystole eriarcha* from Port Utria, Colombia, and four from Black Beach Anchorage, Charles Island, Galapagos. Judging by our specimens from Port Utria, Seale's material from that locality should be *Eurystole eriarcha*, while his Galapagos individuals should be our *Nectarges nesiotus*. We searched for this material in the California Academy but could not find the Port Utria fish. Two of the four Black Beach specimens were present (CAS 6039) but in very poor condition; they belong to the genus *Nectarges* and almost certainly to *N. nesiotus*.

#### Genus NECTARGES, new

Genotype.—*Nectarges nepenthe*, new species.

Anal fin with a single elongate spine and 24-29 rays, its origin in advance of that of second dorsal. Dorsal fins widely separated, the height of the first being less than the distance between the origins of the two fins. First dorsal with from II to V flexible spines, its origin from slightly before to slightly behind anal origin. Caudal fin forked. Insertion of ventrals farther from upper angle of pectoral base than from anal origin.

Premaxillaries dilated posteriorly, the anterior part not separated by a notch from the posterior, and protractile, the skin covering them separated by a deep fold from that of the head. Gape strongly curved, restricted at the corners of the mouth by a membrane between the jaws. Rami of mandibles scarcely elevated. Teeth well developed in both jaws, in a narrow band of small, pointed teeth. Lower jaw very slightly included at tip when mouth is tightly closed.

Sides of head and trunk scaled. Scales small, 55-63 in a lateral series from above gill-openings to caudal base. Predorsal scales along the midline of back 23-26. Scales around caudal peduncle 16-18. Anal sheath present, composed of two rows of scales on the basal part of the rays of most or all of the fin. Lateral band wide, not or only slightly constricted on caudal peduncle, never constricted to a fine line.

Head and body compressed, especially ventrally. Head truncate posteriorly. Preopercular angle ending in a small, flat, blunt, closely appressed "spine." Interorbital convex. Eye moderate, equal to or slightly less than shortest distance between orbit and angle of preopercle.

(*Nectarges*, from Νηκτῆς, ον, ό, a swimmer, and Ἀργής, ἦτος, ό, bright or silvery.)

This genus is closely allied to *Eurystole* and, with *Eurystole*, keys down to that genus in Jordan and Hubbs' 1919 analysis of Atherinid genera—as would be expected, since their account was apparently based on *Nectarges nepenthe*. Other than in the fundamental and trenchant characters utilized in our key, *Nectarges* differs from *Eurystole* in the more compressed body and the decidedly narrower cranium, in addition to a number of lesser characteristics.

It is possible that the remarkable *Notocheirus hubbsi* Clark (1937, p. 89, fig., Valparaiso, Chile) is related to *Nectarges* and *Eurystole*. Excepting for the inordinately high pectoral and the absence of the first dorsal fin, *Notocheirus* shows considerable resemblance to *Nectarges nesiotis*, but almost no characters that would enable one to determine its phylogenetic relationships to other Atherinid genera are given in the original description, nor was any attempt made to suggest such relationships. Through the courtesy of Mr. Clark, we had a brief opportunity to examine the holotype of *N. hubbsi* and the single, stained and cleared paratype in the California Academy. However, our time was so short and the condition of the two known specimens so poor that we were unable to form an opinion. It is probable that *Notocheirus* is either a very specialized relative of the genus *Iso* (known from Japan, Australia, and South Africa) or a terminal, highly modified development of the *Eurystole-Nectarges* line.

Returning to *Nectarges*, it seems clear that this genus and *Eurystole* form a very distinctive and rather isolated group of the subfamily Atherinopsinae, within which no genus approaches them closely enough to make direct relationship discernible. The combination of a deep, short, "truncated" head and a wide lateral band is duplicated elsewhere only in *Iso* (and *Notocheirus*), but Jordan and Hubbs place *Iso* in the subfamily Atherininae, and it seems probable that these characters are more recent and specialized than fundamental. The deep, short head of *Melanorhinus* (concerning which genus see below) does not seem to indicate relationship to the present group. Upon purely geographical grounds, one might suspect *Eurystole* and *Nectarges* to have arisen from *Melaniris* (=Thy-

*rina*, preoccupied) or its progenitor, but in the present state of our knowledge this is pure speculation.

### Subgenus EURYARGES, new

Genotype.—*Nectarges nesiotes*, new species.

This new subgenus is proposed for the sole reception of *Nectarges nesiotes*. It is defined above, in our key, and discussed below, under the relationships of *N. nesiotes*.

(*Euryarges*, from Εὐρύς, broad, and Ἀργής, ἤτος, ὁ, bright or silvery, with reference to the wide, silvery band.)

### *Nectarges nesiotes*, new species

Plate 18

*Eurystole eriarcha* (in part, *nec* Jordan and Gilbert) Seale, 1940, p. 44  
(Black Beach Anchorage, Charles Island, Galapagos).

*Holotype*.—AHF no. 17.

*Type locality*.—Station 809-38; Academy Bay, Indefatigable Island, Galapagos, January 25, 1938, dip-net under electric light, from *Velero III* at anchor, G. S. Myers, collector.

*Paratypes*.—Five specimens,<sup>2</sup> 31.5-50.5 mm, same data as holotype.—Station 805-38: 2 specimens,<sup>3</sup> 31.5-51.5 mm, Black Beach Anchorage, Charles Island, Galapagos, January 23, 1938, dip-net under electric light, from *Velero III* at anchor, G. S. Myers, collector.

*Other material examined*.—CAS 6039: 2 specimens, Black Beach Anchorage, Charles Island, Galapagos, January 17, 1934, *Velero III*, in poor condition.

*Range*.—Known only from the Galapagos Archipelago.

*Measurements of holotype in mm*.—Standard length 48.8, depth 12.4, head length 11, head width 6, eye 4, maxillary 3.8, interorbital 3.9, caudal peduncle length 10.5, caudal peduncle depth 4.7, tip of snout to anal origin 25.1, anal origin to caudal base 25.1, predorsal length 24.8, origin of first dorsal to caudal base 25.1, caudal base to origin second dorsal 18.5, postorbital length 4.1, pectoral length 8.1.

*Description*.—Body elongate, compressed, deep anteriorly, tapering to a narrow caudal peduncle, depth 3.9-4.2 in standard length. Dorsal outline of body curving moderately and evenly, or with only a slight

<sup>2</sup> Two of this lot in Stanford Natural History Museum (no. 37058).

<sup>3</sup> One of this lot in Stanford Natural History Museum (no. 37059).

break at second dorsal, for its entire length, the predorsal profile sometimes slightly flattened. Ventral outline deeply curved, the curve somewhat flattened on the abdomen. Abdomen compressed, but not sharply so; preventral edge flatly rounded, not keeled. Caudal peduncle length (from last anal ray to end of hypural fan) 4.3-4.75 in standard length, caudal peduncle depth 2.2-2.5 in its length.

Sides of head and body scaled; 58-61 scales in a lateral series from over gill-opening to caudal base. Predorsal scales along mid-line of back 23-26. Scales around caudal peduncle 16-18. Preventral scales 14-16. Base of caudal scaled. Anal sheath present on basal part of rays, composed of a distal row of scarcely or not at all modified scales, large and rounded in form, extending along the base of the entire fin, and a proximal row of highly modified, very oblique scales. Second dorsal in some specimens with a few irregularly placed, small, modified scales at base of anterior rays. Three complete rows of scales included in the lateral band under the first dorsal and part of another row both above and below. Lateral line of several incomplete series of pores.

Head short, truncated posteriorly, 4.32-4.58 in standard length; head width 1.75-1.92 in its length. Snout short and bluntly rounded from both dorsal and lateral aspects, 3.25-3.86 in standard length. Eye large, 2.45-2.86 in head. Upper edge of orbit not rising above dorsal outline of head, its diameter equal to or slightly more than shortest distance from orbit to angle of preopercle. Adipose eyelid present. Postorbital narrow, 2.41-2.68 in head. Interorbital slightly convex, its width 2.58-2.86 in head. Preopercle with a small, flat, rounded, closely appressed "spine" at its angle. Branchiostegal rays 6.

Mouth terminal, very oblique, the gape curved. Lower jaw slightly included at tip when mouth is tightly closed. Maxillary narrow, not or barely reaching front of eye when mouth is tightly closed, its length 2.45-2.86 in head. Premaxillaries protractile, widely dilated posteriorly. Gape restricted at corners of mouth by a membrane between the jaws. Teeth of upper jaw in a narrow band of small, pointed, slightly curved, depressible teeth, narrowing to a single row laterally in the jaws. Mandibular teeth similar to upper. No vomerine or palatine teeth. Gill-membranes not united, free from isthmus. Gill-rakers 14-16 on lower limb of first arch. Pseudobranchiae present.

Dorsal II to V-I, 11. First dorsal short, the spines flexible, its origin above to slightly in advance of anal origin, and slightly before to slightly behind mid-length of body. Origin of second dorsal over about thirteenth

anal ray and ending slightly before last anal ray. Caudal base to origin of second dorsal 2.6-3.02 in standard length. Anal fin elongate, its rays I, 26-29, its margin slightly falcate, the posterior rays 2.1-2.35 in greatest height of fin. Origin of anal nearer caudal base than to tip of snout by one half the length of snout. Caudal fin moderately forked, the lower lobe slightly the longer. Pectoral rays 13-14, the fin broad and short, 1.4-1.53 in head. Ventral rays I, 5, the fin short, not reaching anal opening. The closely approximated inner ray of each fin is joined by a membrane to the mid-line of the abdomen. Insertion of ventrals nearer anal origin than to upper angle of pectoral base.

Color in alcohol pale yellowish. Lateral band brilliant silvery, very wide, bordered above by a dark line, not or only slightly constricted on caudal peduncle. Scales along mid-line of back faintly and irregularly bordered with small black dots. Caudal fin margin dusky. First dorsal colorless, second dorsal sometimes with a few minute, dark, irregularly placed dots along the posterior edge of the anterior rays. Pectoral, ventral, and anal fins colorless. A few small, scattered spots at the bases of some of the anal rays. Cheeks and opercles brilliant silvery. Dorsal surface of head dark posteriorly, lighter anteriorly. Lips, tip of snout, and under surface of lower jaw faintly marked with small, scattered, dark brown spots.

(*Nesiotes*, from Νησιώτης, an islander.)

*History of the species*.—The history of this species is discussed together with that of *Eurystole eriarcha*, above.

*Relationships*.—This species differs strikingly from its two relatives, *nepenthe* and *nocturnus*, in its considerably more compressed and deeper form, the larger and deeper head (the muzzle being much more rounded in profile), and the broader lateral band, besides the important difference in the anal sheath as described in the key. These characters impress us as being of subgeneric value, and we therefore propose, for this species alone, the subgenus *Euryarges*.

#### Subgenus NECTARGES, *sensu stricto*

#### **Nectarges nepenthe**, new species

##### Plate 19

*Eurystole eriarcha* (*nec* Jordan and Gilbert) Jordan, 1895, p. 418, pl. 32 (Mazatlan; on Stanford 2689).—Jordan and Evermann, 1896-1900, p. 803, fig. 339 (description and figure copied from Jordan 1895).—Jordan and Hubbs, 1919, p. 63, pl. 5, fig. 19 (on Stanford 2689).

♀ *Eurystole eriarcha* (*nec* Jordan and Gilbert) Osburn and Nichols, 1916, p. 156 (Cape San Lucas, and Santa Catalina Island, Gulf of California).—Breder, 1936, p. 6 (San José del Cabo, Baja California).

*Holotype*.—Stanford 37060.

*Type locality*.—Off Arroyo de San Luis, Baja California, 23° 10' 30" N., 109° 27' 45" W., March 7, 1939, dip-net under electric light from *N. B. Scofield* at anchor in 5 fms, R. L. Bolin, collector.

*Paratypes*.—Stanford 37061: 10 specimens,<sup>4</sup> 63-76 mm, same data as holotype.—37062: 3 specimens, 62.5-64 mm, Santa Cruz Bay, Oaxaca, Mexico, 15° 45' N., 96° 07' 20" W., March 14, 1939, dip-net under electric light from *N. B. Scofield* at anchor in 8 fms, R. L. Bolin, collector.—37063: 1 specimen, 72.5 mm, off Fortuna Ranch, Baja California, 23° 08' N., 109° 30' W., March 5, 1939, dip-net under electric light from *N. B. Scofield* at anchor in 8 fms, R. L. Bolin, collector.—2689: 1 specimen, 56.5 mm, Mazatlan, Mexico, taken with a seine on a sandy beach south of the town, Hopkins Expedition of 1895.

*Range*.—Lower California to Oaxaca.

*Measurements of holotype in mm*.—Standard length 76.5, depth 15.3, head length 16, head width 8, eye 5.5, interorbital 5.5, snout 4.9, caudal peduncle length 15.5, caudal peduncle depth 6.5, tip of snout to anal origin 41, anal origin to caudal base 35, predorsal length 39, origin of first dorsal to caudal base 37, caudal base to origin of second dorsal 25, postorbital length 6.1, pectoral length 12.3.

*Description*.—Body elongate, compressed, deep anteriorly, tapering to a narrow caudal peduncle, depth 4.42-5.22 in standard length. Dorsal outline of body only slightly curved, much flattened before first dorsal, a definite break in the dorsal contour at origin of second dorsal. Ventral outline more strongly curved than dorsal, curve of abdomen flattened, almost horizontal. Abdomen compressed, but not sharply so, preventral edge thinly rounded, not keeled. Caudal peduncle length (from last anal ray to middle of end of hypural fan) 4.5-5.45 in standard length, caudal peduncle depth 2.3-2.39 in its length.

Sides of head and body scaled; 58-63 scales in a lateral series from above gill-opening to caudal base. Predorsal scales along mid-line of back 23-27. Scales around caudal peduncle 16 or 18, preventral scales about 17. Base of caudal fin scaled. Distal row of scales of anal sheath

<sup>4</sup> One of these paratypes has been sent to the U.S. National Museum, and two will be deposited in the Hancock Foundation.

more or less oblique, quadrilateral scales with the apexes forming a rounded angle at the postero-inferior corner of each scale, and a proximal row of very oblique scales, which are only partly on the anal rays. Sheath sometimes absent on posterior third of fin. Two complete rows of scales included in lateral band below first dorsal and part of another row both above and below. Lateral line of several incomplete series of pores along the sides.

Head short, rather truncate posteriorly, 4.63-4.93 in standard length; head width 1.79-1.95 in its length. Dorsal outline of head flattened, sloping slightly downward from nape to end of maxillary, tip of snout rather broadly rounded. Ventral outline of head broadly and evenly rounded from isthmus to tip of snout. Snout short, bluntly rounded from both dorsal and lateral aspects, 3-3.54 in head. Eye large, 2.58-3.02 in head. Upper edge of orbit reaching but not entering dorsal outline of head, its diameter equal to or slightly more than shortest distance from edge of orbit to preopercular angle. Adipose eyelid present, better developed anteriorly. Postorbital narrow, 2.42-2.72 in head. Interorbital broad, slightly convex, 2.7-3.21 in head. Preopercle with a small, weak, flat, closely appressed "spine" at its angle. Branchiostegal rays 6.

Mouth terminal, very oblique, the lower jaw slightly included at tip, the gape curved. Maxillary narrow, not or barely reaching anterior edge of orbit, never to edge of adipose eyelid when mouth is tightly closed, 2.58-3.02 in head. Premaxillaries protractile, broadly dilated posteriorly. Gape restricted at the corners of the mouth by a membrane between the jaws. Upper jaw teeth anteriorly in a narrow band of small, pointed, slightly curved, depressible teeth, narrowing laterally to a single row. Mandibular teeth similar to upper. No teeth on the vomer or palatines. Gill-membranes not united, free from isthmus. Gill-rakers 17-19 on lower limb of first arch. Pseudobranchiae present.

Dorsal II to V-I, 9-11. First dorsal short, spines flexible, origin over or slightly before anal origin and slightly before to slightly behind mid-point of standard length. Origin of second dorsal over about sixteenth anal ray, ending above next to last anal ray. Caudal base to origin of second dorsal 2.6-3 in standard length. Anal fin elongate, I, 24-28, the margin slightly falcate, the posterior ray 2.1-2.3 in greatest height of fin. Anal origin midway between caudal base and anterior edge of eye. Caudal fin moderately forked, lower lobe slightly longer. Pectoral rays 13 or 14, the fin short and broad, its length 1.08-1.14 in head. Ventral fins I, 5, closely approximated, short, not reaching anal opening, their insertion



nearer anal origin than upper angle of pectoral base. Inner ray of each fin joined by membrane to mid-line of abdomen.

Color in alcohol yellowish gray. Lateral band silvery, dorsally edged by a narrow dark line. Band not or only slightly constricted on caudal peduncle. Exposed portions of scales above lateral band outlined with small dark punctulations. Caudal fin dusky marginally. First dorsal colorless, second dorsal slightly dusky to colorless. Base of anal rays with several irregular rows of small black spots, rest of fin colorless. Pectoral and ventral fins colorless. Cheeks and opercles silvery. Dorsal surface of head dark, with small, scattered, black spots. Lips, tip of snout, and under side of lower jaw heavily smudged with small brown spots.

(*Nepenthe*, from *Νηπενθής*, *és*, something which banishes sorrow. To its users is left the interpretation of the name; let them consider the habits and bright appearance of the fish, the systematic tangle which its discovery cleared up, and the murky future of freedom and science in the world at large at the time the authors immersed themselves in its description.)

*History of the species.*—The history of this species is included with that of *Eurystole eriarcha*, above.

*Relationships.*—These are discussed under *N. nesiotés* and *N. nocturnus*.

### ***Nectarges nocturnus*, new species**

? *Eurystole eriarcha* (*nec* Jordan and Gilbert) Nichols and Murphy, 1922, p. 506 (N. Chincha Island, Peru).

*Holotype.*—USNM no. 88712.

*Type locality.*—Guayaquil, Ecuador, 1926, W. L. Schmitt, collector. Probably collected by fishermen off the Guayas Estuary.

*Paratypes.*—USNM 119019: 26 specimens,<sup>5</sup> 47.5-88.5 mm, same data as holotype.—USNM 88713: 1 specimen, 56 mm, Paita, Peru, 1926, W. L. Schmitt, collector.—Station 836-38: 1 specimen, 33 mm, North Chincha Island, Peru, dip-net under electric light at night, February 10, 1938, *Velero III*, G. S. Myers, collector.

*Range.*—Coasts of Ecuador and Peru.

*Measurements of holotype in mm.*—Standard length 79.5, depth 18.3, head length 17, head width 9, eye 6, maxillary 6, interorbital 6,

<sup>5</sup> Two of these paratypes have been retained by Stanford (no. 37064) and one by the Hancock Foundation, through the kindness of Dr. L. P. Schultz.

snout 4.5, caudal peduncle length 18, caudal peduncle depth 8, tip of snout to anal origin 42, anal origin to caudal base 38, predorsal length 42, origin of first dorsal to caudal base 38, center of caudal base to origin of second dorsal 24, postorbital 7, pectoral fin 15.5.

*Description.*—Body elongate, compressed, deep anteriorly, tapering to a narrow caudal peduncle, depth 4.2-4.5 in standard length. Dorsal profile curving slightly upward in a flat curve from tip of snout to about mid-point of total length, thence curving more abruptly downward through second dorsal base and becoming almost horizontal on caudal peduncle. Ventral outline deeply and evenly curved from tip of snout to posterior end of anal, thence flattened to end of caudal peduncle. Abdomen compressed, preventral edge thinly rounded, not keeled. Caudal peduncle length (from last anal ray to end of hypural fan) 4.6-5.4 in standard length, caudal peduncle depth 1.76-2.18 in its length.

Sides of head and body scaled; 55-59 scales in a lateral series from above gill-opening to caudal base. Predorsal scales along mid-line of back 23-27. Scales around caudal peduncle 16, preventral scales about 15. Base of caudal fin scaled. Anal sheath composed of a distal row of modified, more or less oblique quadrilateral scales with the apexes forming a rounded angle at the postero-inferior corner of each scale, and a proximal row of very oblique scales which are only partly on the rays. Sheath sometimes absent on the posterior third of the fin. Lateral band including one complete row of scales under first dorsal and two thirds of a row above and half a row below. Lateral line of several incomplete series of pores on sides.

Head short, truncate posteriorly, 4.66-4.88 in standard length; head width 1.83-1.95 in its length. Snout short, bluntly rounded from dorsal and lateral aspects, 3.53-3.84 in head. Eye large, 2.79-3 in head. Upper edge of orbit touching, but not entering, dorsal outline of head, its diameter equal to or slightly less than shortest distance between orbit and angle of preopercle. Adipose eyelid little evident. Postorbital narrow, 2.6-3 in head. Interorbital broad, slightly convex, 2.68-2.84 in head. Preopercle with a small, weak, rounded, closely appressed "spine" at its angle. Branchiostegal rays 6.

Mouth terminal, oblique, gape curved, lower jaw slightly included at tip when mouth is tightly closed. Maxillary narrow, not or barely reaching anterior edge of eye, never reaching edge of adipose eyelid when mouth is tightly closed, 2.7-2.95 in head. Premaxillary protractile, broadly dilated posteriorly. Gape restricted at corners of mouth by mem-

brane between the jaws. Teeth of upper jaw small, pointed, slightly curved, depressible; anteriorly in a narrow band of two irregular rows, narrowing to a single row laterally. Lower teeth similar to upper. No teeth on vomer or palatines. Gill-membranes not united, free from isthmus. Gill-rakers on lower limb of first arch 18-20. Pseudobranchiae present.

Dorsal III or IV-I, 9 or 10. First dorsal short, its spines flexible, its origin over or slightly behind anal origin, midway between caudal base and a point between the center and anterior edge of the eye. Origin of second dorsal over about seventeenth anal ray, ending above last anal ray. Caudal base to origin of second dorsal 3.25-3.32 in standard length. Anal fin elongate, I, 26-29, its margin slightly falcate, its origin slightly nearer caudal base than tip of snout. Caudal fin forked, lower lobe slightly longer. Pectoral rays 13, the fin broad and short, its length 1.03-1.1 in head. Ventrals I, 5, closely approximated, short, not reaching anal opening, their insertion nearer anal origin than upper angle of pectoral base. Inner ray of each fin joined by membrane to mid-line of abdominal wall.

Color of Guayaquil specimens much darkened by long preservation, the band plumbeous. The North Chincha specimen is pale yellowish, the lateral band bright silvery. Lateral band bordered above by a narrow dark line, not or barely constricted on caudal peduncle. Scales above lateral band with only a few small, punctulate spots. Caudal fin slightly darker distally. First and second dorsals with a few minute, dark punctulations along rays. Anal, pectorals, and ventrals colorless. Cheeks and opercles silvery. Nape and interorbital dark. Tip of snout, lips, and anterior portion of lower jaw finely speckled with minute dark spots. An irregular group of larger dots on preorbital before anterior edge of eye.

(*Nocturnus*, of the night, in reference to the nocturnal surface swimming habits of this species, as observed by the senior author at the Chincha Islands.)

*History of the species*.—This is dealt with under *Eurystole eriarcha*, above.

*Relationships*.—*N. nocturnus* is very closely related to *N. nepenthe*, differing only in its somewhat larger size and in the characters utilized in our key. The Guayaquil types are not in the best of condition. They are brown and distorted, the fins of most of them are badly broken, and the single small specimen collected by the senior author at North Chincha Island is not in too good condition. In spite of the vast distance which

separates the type localities of this species and its northern relative, it is wholly possible that *nocturnus* will eventually prove to be merely a subspecies of *nepenthe*.

*Notes on the type locality.*—The matter of the type locality of *N. nocturnus* has mildly disturbed us. We know from our North Chincha specimen that *nocturnus* is an inhabitant of the cold coastal waters of Peru, yet the main type series bears only the locality datum, "Guayaquil, Ecuador." It is, of course, evident that the fish were not taken in the perfectly fresh tropical Guayas River at Guayaquil, but must have been brought up to Guayaquil by fishermen and obtained in the fish market there by Dr. Schmitt. To the experienced collector the Guayaquil specimens look like market fish, long dead before preservation. But the Guayas Estuary is wholly within the tropical Panamanian zoogeographical region, and the cold-water fauna of the Humboldt Current is not usually encountered until one is south of Sechura Bay and Cape Aguja in Peru (see Myers, 1941). Unless *N. nocturnus* moves at will across this sharp faunal and oceanographic break, it would seem likely that the Guayaquil types were taken by fishermen far south of the Guayas Estuary or far enough out to sea to be within the influence of the Humboldt Current. Or perhaps the fluctuations of the ocean currents occasionally bring cold water into the Estuary (see Schweigger, 1941). Be this as it may, the senior author obtained a number of marine and brackish water fishes in the Guayaquil fish market, during the 1938 cruise of the *Velero III*. Most of them must have been caught a considerable distance down the Estuary, but the size of the fishing boats then supplying the market did not make it seem likely that many fishes were brought from as far as the open ocean.

### 3. A NEW GENUS FOR *MENIDIA STARKSI* FROM PANAMA

#### Genus **COLEOTROPIS**, new

Genotype.—*Menidia starksi* Meek and Hildebrand.

Meek and Hildebrand's description of *Menidia starksi* appeared in 1923, but they remarked in a footnote that their manuscript was completed prior to the publication of Jordan and Hubbs' 1919 review of the Atherinidae, and that they did not attempt to bring their arrangement of the Panama Atherinids into accord with Jordan and Hubbs' classifica-

tion. To this alone may be ascribed their reference of *starksi* to *Menidia* and their failure to recognize that this species represents a very distinctive genus which is only distantly related to *Menidia*.

Anal fin elongate, with a single spine and 24-28 rays, its origin in advance of that of first dorsal, midway between caudal base and hind border of orbit. Dorsal fins widely separated, the height of the first being less than the distance between the origins of the two fins. First dorsal with III or IV flexible spines, its origin over base of fourth or fifth anal ray. End of second dorsal over base of fourth from last anal ray. Caudal fin forked. Pectoral fin set high, falcate, slightly longer than the head, its tip extending beyond ventral base. Ventral fins posterior in position, their insertion farther from the upper angle of the pectoral base than from the anal origin. Anus normal in position, a short distance in front of anal fin.

Premaxillaries broadly dilated posteriorly, the anterior part not separated by a notch from the posterior, protractile, the skin covering them separated by a deep fold from that of the head. Gape strongly curved, restricted at the corners of the mouth by a membrane between the jaws. Rami of mandibles scarcely elevated. Teeth well developed in both jaws, in two rows of large, sharply pointed, slightly curved, widely spaced teeth, somewhat smaller and more close-set laterally, the first row of upper jaw enlarged. Lower jaw very slightly included at the tip of the mouth when mouth is tightly closed.

Sides of head and trunk scaled. Scales large, 39 or 40 in a lateral series from above opercular opening to caudal base. Predorsal scales about 18. Scales around caudal peduncle 12.

Head not abruptly truncate posteriorly. The lower, posterior angle of the preopercle is drawn out very slightly into a flat projection,<sup>6</sup> but this is not as much produced as the "spine" of *Eurystole* and *Nectarges*, and we do not believe that there is any close relationship with those genera. Interorbital slightly convex.

Scale borders entire, the nucleus centered, the circuli obsolete in visible sector of scale. Abdomen not greatly compressed, but this character is not easily observable in the single specimen available to us, owing to distortion. Air-bladder not produced backward into urosome. Peritoneum brownish black. Silvery lateral band present, very well marked and sharply delimited above and below, somewhat constricted on caudal peduncle, and bordered above with a dark line.

<sup>6</sup> On one side only of our single specimen. There is no projection on the opposite preopercle.

A deep, double sheath of scales at base of anal fin. The proximal sheath, which has a free straight edge exactly on the line of the ray-bases, is composed of the lower row of modified supra-anal scales. The second or distal sheath, entirely on the rays, is composed of two strong rows of scales. Of these two rows, the visible sectors of the scales of the proximal row are elongated obliquely in a dorso-posterior, antero-inferior direction, while the visible sectors of the scales of the distal row are elongated obliquely in a dorso-anterior, postero-inferior direction. After approximately the seventeenth anal ray the distal one of the two rows drops out, and the sheath is continued to the end of the fin-base by the proximal row. This two-rowed distal sheath is very deep. Posterior to the middle of the fin it extends halfway or slightly more to the tips of the rays. The front part of the base of the dorsal fin shows an incipient sheath of two to four small scales on the bases of the rays.

In Jordan and Hubbs' key, *Coleotropis starksi* keys down to the *Thyrina* group (*Thyrina*, *Thyrinops*, and *Atherinella*). It differs from all of these in its much larger size, the more curved gape, the considerably larger mouth (the maxillary reaching to below the front part of the eye), and very sharply in the deep anal sheath. None of the *Melaniris* (= *Thyrina*, preoccupied<sup>7</sup>) group appears to possess any anal sheath at all. It may be remarked that *Melaniris brasiliensis* possesses neither the pinched belly nor the posteriorly produced air-bladder of the other species of *Melaniris*, and it is a much larger fish. In these three characteristics *brasiliensis* resembles *starksi*, and it is possible that there is a close relationship. *M. brasiliensis*, however, has no anal sheath and possesses the small mouth of the other species of *Melaniris*. We therefore do not at this time disturb its generic assignment.

(*Coleotropis*, from Κολεός, ó, a sheath, and Τρόπις, η̄, a keel, in reference to the scaly anal sheath.)

### ***Coleotropis starksi* (Meek and Hildebrand)**

*Menidia starksi* Meek and Hildebrand, 1923, p. 267, pl. 20, fig. 2 (Taboga Island, Panama Bay).

This species is known only from nine specimens from the Pacific coast of Panama, preserved in the U. S. National Museum and Field Museum. Through the kindness of Dr. L. P. Schultz, we have examined one of the paratypes from Taboga Island in the National Museum (no. 79733).

<sup>7</sup> *Thyrina* Jordan and Culver 1895, is preoccupied by *Thyrina* Poujade 1886, Ann. Société Entomologique de France, ser. 6, vol. 6, Bull., cxliii, a Lepidopteron. The fish genus *Thyrina* must therefore be replaced by its synonym, *Melaniris* Meek 1902.

4. THE PACIFIC SPECIES OF *MELANORHINUS*Genus *MELANORHINUS* Metzelaar

*Melanorhinus* Metzelaar, 1919, p. 38 (type by original designation *M. boekei* Metzelaar).<sup>8</sup>

*Mugilops* Meek and Hildebrand, 1923, p. 271 (type by original designation *M. cyanellus* Meek and Hildebrand).

This strange genus has been described as new twice, but we are not aware that anyone has hitherto pointed out the identity of *Mugilops* with *Melanorhinus*. There are two species. The smaller, Caribbean species, *Melanorhinus boekei* Metzelaar 1919, was described from St. Martin, Dutch West Indies. *Mugilops marinus* Meek and Hildebrand 1923, based upon a single specimen from Porto Bello, Panama, is almost certainly a synonym of *boekei*. The Pacific species is *M. cyanellus*.

Metzelaar's description of *Melanorhinus* was published practically simultaneously with Jordan and Hubbs' 1919 revision of the Atherinidae and did not make use of that paper; and Meek and Hildebrand's work, having been prepared previous to 1919, also did not utilize that revision. Thus, the genus *Melanorhinus* has never been properly allocated in accordance with modern knowledge of the generic interrelationships of the Atherinidae, and we have therefore redescribed it and attempted to indicate its proper systematic position.

In the 1919 revision of Jordan and Hubbs, *Melanorhinus* runs down without trouble to the subfamily Atherinopsinae and possesses all the characters of that subfamily save the important one regarding the position of the pelvic fins. In *Melanorhinus* the pelvics are rather far forward, under the middle or last third of the appressed pectorals, and their origin is much closer to the upper angle of the pectoral base than to the origin of the anal fin. In this but in no other important character *Melanorhinus* approaches the subfamily Atherininae. Within the Atherinopsinae, *Melanorhinus* keys down without trouble through section "x<sub>1</sub>" of Jordan and Hubbs' key, but with section "y" the genus is thrown out of the key, since it agrees with neither of the alternatives. The head is certainly rather abruptly truncated, as in *Eurystole*, but the interorbital is not flat and there is no preopercular spine.

<sup>8</sup> Metzelaar described genus and species together, under the phrase: "*Melanorhinus boekei* nov. gen. et spec." Under the International Code, this is taken as a definite citation of genotype.

In truth, there is no known genus of the Atherinopsinae with which *Melanorhinus* appears to have any close relationship, and we are disposed to believe that it may not be phylogenetically close to this subfamily. We therefore erect for this genus the new subfamily Melanorhininae. The characters to which we especially wish to draw attention are the following:

The body is exceedingly compressed and deep for an Atherinid, much more so than in any genus of the Atherinopsinae, and the silvery lateral band is absent. The head is short and "truncated," but showing no relationship to *Eurystole*, and the pelvic fins are placed nearer to the upper angle of the pectoral base than to the anal origin. The mouth is smaller than in any genus of Atherinopsinae, being greatly restricted at the ricti by the lip membranes; but the premaxillaries are excessively protractile, their posterior processes long and strong. The preorbital region and snout, back as far as the eyes, are scaleless. The dentary bones, in spite of the small mouth, are long, and their lower surfaces are rather strongly *concave*. From all other genera of Atherinidae known to us, *Melanorhinus* differs in the excessive development of scaly axillary or alar flaps. These are composed of highly modified, greatly elongated, asymmetrical scales, several of which make up each flap. The pectoral flap, originating just above the upper angle of each pectoral base, is especially noticeable, and extends for half the length of the fin. Each pelvic fin has a flap, of about half its length, originating just above the outer, anterior edge of the fin origin. Between the two pelvics is another, zygous flap, extending nearly to the ends of the inner rays. Most remarkable of all are the flaps at each side of the base of the spinous dorsal fin; these are shorter than the others and resemble the rather similar structure in *Mugil*. In fact, *Melanorhinus* somewhat closely resembles *Mugil* in appearance, although there is certainly no direct relationship to the gray mullets. Both the soft dorsal and the anal bear a sheath of a single row of somewhat elongate scales on the bases of the rays, the sheath of each fin reaching the end of the fin base. The scales of *Melanorhinus* are most peculiar. They are heavy, closely adherent, and very hard to dislodge. In form, those of the mid-sides are twice as deep as long, the apical border irregularly crenulated, and the basal margin almost straight but with a small projection near the middle. The circuli are reduced to vertical marks on the hidden sector of the scale, but the visible sector bears concentric striations very much finer than the circuli. No well-defined nuclear area is present. Finally, *Melanorhinus* differs from most Atherinids in the greater number



of spines in the first dorsal (VI to IX). A few Atherinopsinae have VI spines, but this is the lower limit for *Melanorhinus* and is reported for the genus only in Metzelaar's original description of *M. boekei*. Since the last two or three spines are difficult to see, it is possible that Metzelaar missed some.

### **Melanorhinus cyanellus** (Meek and Hildebrand)

*Mugilops cyanellus* Meek and Hildebrand, 1923, p. 271, pl. 22, fig. 2  
(Balboa and Taboga Island, Panama).

*Mugilops cyanella* Breder, 1936, p. 10 (Perlas Islands, Panama).

Of this species, known only from the types and a single example recorded by Breder, we have examined one specimen (Stanford 35450) taken at the surface off Puntarenas, Costa Rica, February, 1937, by Captain Takahashi of the tuna boat *Marico*. It was presented to the Stanford Natural History Museum through the courtesy of the California State Fisheries Laboratory. There are also several specimens in the Allan Hancock Foundation, identified by the junior author, but these have not been re-examined at this time.

## 5. SUMMARY

This paper deals with the published records and available specimens of the Pacific American Atherinid genus *Eurystole*. It is shown that the one supposed species, *E. eriarcha*, is actually a complex of two related but very distinct genera and four species, all of which have at one time or another been identified as *Eurystole eriarcha*. *Eurystole* consists of one species, *eriarcha*, ranging from Lower California and the Revillagigedo Islands to Colombia. The other three species, all of them new, are placed in the new genus *Nectarges* (type *N. nepenthe*), which is divided into two subgenera. The subgenus *Nectarges* includes *N. nepenthe* from Mexico and *N. nocturnus* from Ecuador and Peru. The new subgenus *Euryarges* includes only *Nectarges nesiotus* from the Galapagos Archipelago. All are small inshore surface swimmers.

The new genus *Coleotropis* is described for *Menidia starksi* Meek and Hildebrand from the Pacific coast of Panama, related to the genus usually called *Thyrina*. It is shown that the preoccupied name *Thyrina* must be replaced by *Melaniris* Meek.

The relationships of the tropical American genus *Melanorhinus* Metzelaar among the Atherinidae in general is discussed for the first time

on the basis of the Pacific species, *M. cyanellus*. It is shown that *Mugilops* Meek and Hildebrand is a synonym of *Melanorhinus*, that *Mugilops marinus* Meek and Hildebrand of the Caribbean is probably a synonym of *Melanorhinus boekei* Metzelaar, and that *Mugilops cyanellus* Meek and Hildebrand must be known as *Melanorhinus cyanellus*. The new subfamily Melanorhininae is erected for *Melanorhinus*.

A description of the technique of night-fishing under an electric light rigged over the side of a ship at anchor or drifting is included.

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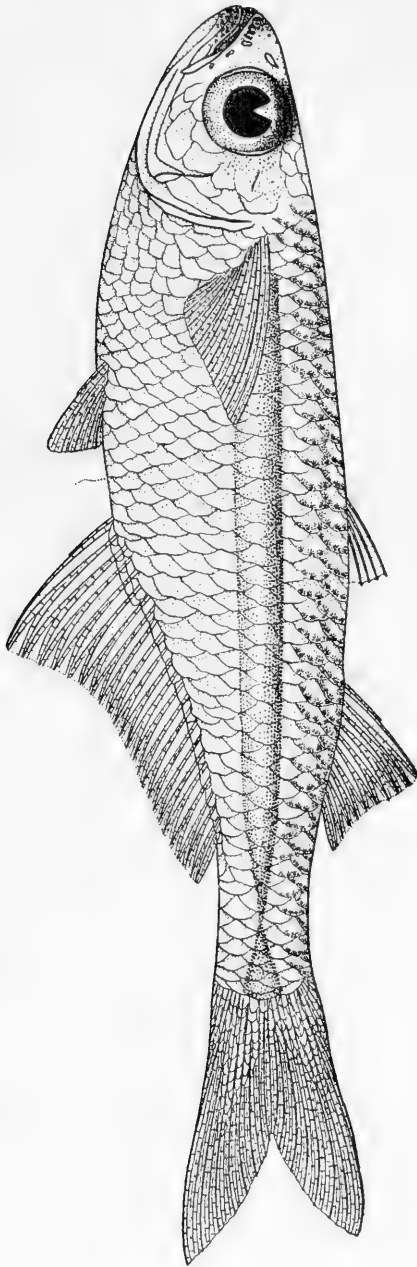
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## PLATE 17

*Eurystole eriarcha*

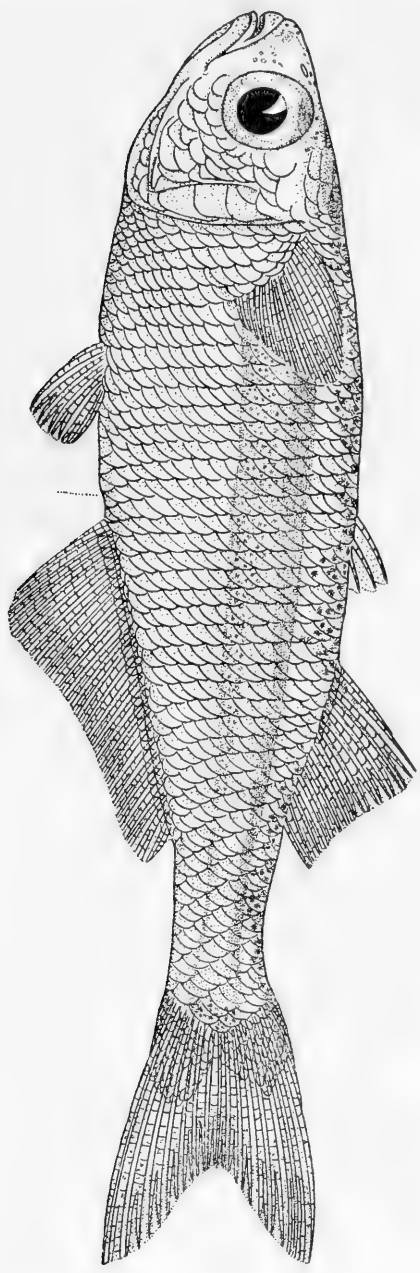
Specimen 63 mm in standard length, from off Arroyo de San Luis, Baja California; R. L. Bolin, collector. Stanford 37055. Drawn by Pascual Ortiz. What appears to be a complete proximal row of anal sheath scales, in the drawing, is actually on the body, not on the rays.



## PLATE 18

*Nectarges nesiotes*, new species

Holotype, 48.8 mm in standard length, from Academy Bay, Indefatigable Island, Galapagos; G. S. Myers, collector. AHF no. 17. Drawn by Helen Nojiri. Scale row directions and pectoral not strictly accurate.

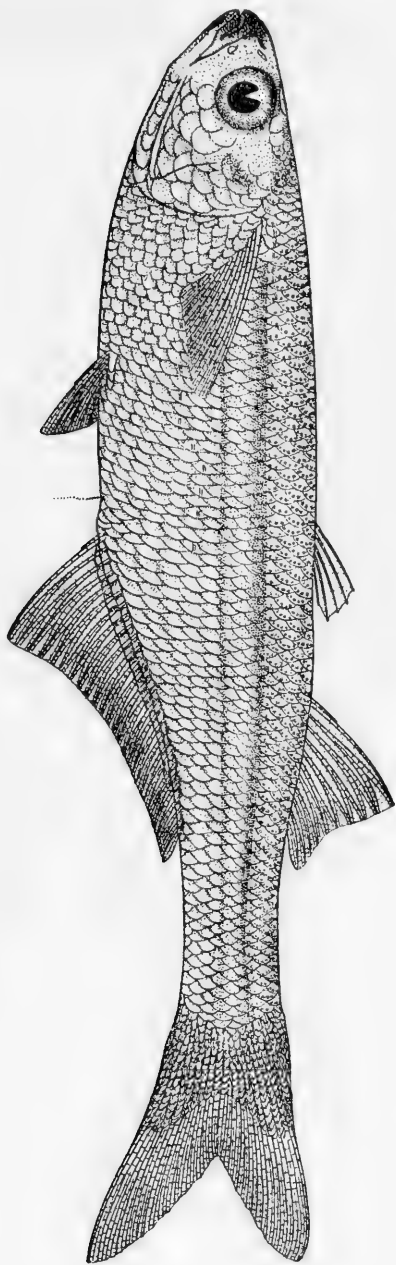


## PLATE 19

*Nectarges nepenthe*, new species

Paratype, 76.5 mm in standard length, from off Arroyo de San Luis, Baja California; R. L. Bolin, collector. Stanford 37061. Drawn by Pascual Ortiz.







NEW FISHES OF THE FAMILIES DACTYLOSCOPIDAE,  
MICRODESMIDAE, AND ANTENNARIIDAE

FROM THE WEST COAST OF MEXICO AND THE GALAPAGOS ISLANDS  
WITH A BRIEF ACCOUNT OF THE USE OF ROTENONE FISH POISONS  
IN ICHTHYOLOGICAL COLLECTING  
(PLATES 20-23)

GEORGE S. MEYERS AND CHARLES B. WADE

This is the fourth of a series of papers<sup>1</sup> on the fishes obtained by the senior author while serving as ichthyologist of the 1938 Hancock Pacific Expedition cruise in Eastern Pacific waters. Under the command of Captain Allan Hancock, the expedition, aboard the motor cruiser *Velero III*, sailed for the Galapagos Islands and the west coast of South America January 2, 1938, and returned to the United States some two and one-half months later. Although most of the collections were made at the Galapagos Islands and along the coasts of Peru, Ecuador, and Colombia, dredging and other stations were also established along the west coasts of Mexico and Central America, where several new forms were taken. (See Fraser, 1943, a, b, and c.)

A new genus and species of the family Dactyloscopidae, *Heteristius jalisconis*, is described in this paper, as well as three other new species of the same family, *Dactyloscopus elongatus*, *Myxodagnus sagitta*, and *Cokeridia lactea*. A new species of the family Microdesmidae, *Microdesmus reidi*, is described, as is a new Antennariid, *Antennarius ziesenhennei*.

In the list of specimens at the beginning of each description AHF refers to the catalogue numbers in the ichthyological collections of the Allan Hancock Foundation. All holotypes are in the collection of the Allan Hancock Foundation. When there is more than one paratype, one or more paratypes have been deposited in the collection of the Natural History Museum of Stanford University, where this paper was prepared.

The drawings were made by Pascual Ortiz. Although Mr. Ortiz has caught the general appearance of the fishes very well, there are, unfortunately, various inaccuracies in the illustrations. In those instances in which the description disagrees with the drawing, the description may be accepted as the more correct of the two.

<sup>1</sup> The previous reports of this series are all in the present volume of *Allan Hancock Pacific Expeditions*, as follows: no. 3, 1940 (Herald: Syngnathids); no. 4, 1941 (Myers and Wade, New eels); and no. 5, 1942 (Myers and Wade: Atherinids).

## USE OF ROTENONE FISH POISONS

In our paper on Atherinids (Allan Hancock Pacific Expeditions, vol. 9, no. 5) we have given notes on one effective method of marine ichthyological collecting, the use of the electric light in night collecting from the ship. We now present an even more useful method.

Some of the fishes described below were obtained by the use of vegetable "fish" poisons, which are perhaps the most useful of all tools to the ichthyological collector. Although the aborigines of most parts of the world use plant juices of many kinds to stupefy and kill fish to eat, the general use of fish poisons by the scientific fish collector is a relatively recent development. Probably the first ichthyologist to use fish poisons regularly was the late David Starr Jordan, and it is largely to this method that we may attribute the hitherto almost unheard of variety of small fishes he and his students obtained in Japan, Samoa, and other Pacific localities. Jordan usually used chloride of lime, and the method is mentioned in his *Guide to the Study of Fishes* (1905). The late Dr. Carl H. Eigenmann was apparently the first ichthyologist who made regular use of native vegetable fish poisons, and his classical account of his first results, in the introduction to his *Freshwater Fishes of British Guiana* (1912), should be read by every ichthyological collector. As a matter of fact, it was Eigenmann, and his student, Dr. William Ray Allen, who first suggested the importation of the dried roots of fish poison plants into the United States as an insecticide, the story having recently been published in their *Fishes of Western South America* (1942). The subsequent immense growth of the commerce in the roots both of the Asiatic *Derris elliptica* and of various tropical American fish poison plants (called *timbó* in Brazil, *barbasco* or *cubé* in Peru), for use in insecticides, provides the scientific fish collector with a ready means of supply. The first use of the commercial product was made by Dr. Carl L. Hubbs. The literature of economic entomology now abounds with papers on the various rotenone poisons. In addition to those given by Eigenmann and Allen (1942), we give only one (Holman, 1940) which, incidentally, mentions Allen's work in Peru.

The active principle in these roots is said to be rotenone, but Dr. A. W. Herre tells the senior author that one of the chemists of the Bureau of Science in Manila found other and even more potent piscicidal elements in derris root. In any event, the action on the fish is one of suffocation, a prevention of exchange of oxygen in the gills, and the gill filaments in derris-killed fish are of a peculiar bright red color. The "poison" does

not in the least affect the edibility of the fish killed, nor is a concentration lethal to fish poisonous to terrestrial vertebrate animals, including man, which drink the water. Moreover, organic decay destroys the effect of the derris after a few days. The dust of powdered derris does, however, have a very irritating and narcotic effect on the mucous membranes of the eyes, mouth, and nasal passages, and the user must exercise some care. Most of these remarks apply equally to the South American *timbó*, which is also now loosely called derris or "rotenone."

The senior author took a supply of both *timbó* and derris (powdered root, 5% rotenone content) on the 1938 cruise. These were put up before the trip in small cellophane sacks, three of which could be packed together in a watertight one-pound coffee tin. The cellophane and tins protected the powder sufficiently from damp, which quickly ruins the potency of the powder. One or more of the tins was taken ashore at each collecting place.

The powder was used as follows: After selecting a tide pool of reasonable size, the sacks were taken from the tin and the contents of one sack was dumped into the tin with some water and shaken vigorously until the mixture was of the consistency of thin, smooth, liquid mud. This was poured into the pool and stirred into all its recesses. Fish soon began to wobble and gyrate. If no effect was seen within a few minutes, another sack was used. One one-third pound sack was usually sufficient for a tide pool approximately 12 by 6 feet and two feet deep, but some soaking is necessary to produce the full effect, which seems to be reached in a half to one hour. At Academy Bay, a very large tide pool, of perhaps 25 by 100 feet, and from a foot deep at its margins to three feet deep at its center, was poisoned with less than two pounds of derris. This was far too weak a dose, and some fishes were still alive three hours later, but probably nine-tenths of the individual fishes were killed. Over a thousand fishes were taken from this one pool, and thousands more were discarded for lack of containers and preservative.

In the Galapagos pools, the Pomacentrids were the first fishes to be affected and killed, while some of the gobies and Eleotrids, notably *Bathygobius* and *Eleotrica*, resisted all but very strong derris. The fishes that habitually hide under stones, such as *Ogilbia*, and especially those that make burrows beneath large rocks (*e.g.*, certain Ophichthyid eels), take some time to come out, probably merely because the derris does not reach them at once. Some fishes float when killed, others sink. The two tiny, brilliant, banded gobies described by Snodgrass and Heller as *Gobius rhizophora* and *Gobius gilberti*, form cases in point. The former, much

the commoner, floats, the latter sinks and is hard to locate. A fine-meshed dipnet is always a necessity for securing fishes that sink or for catching those that would otherwise make off to hide and die in holes among rocks. Finally, some blennies often leave the water at the first whiff of poison, and skip over the rocks to other pools.

Although derris is used most effectively in pools, the senior author also used it with considerable effect on open rocky coasts where the surf was not great. While large quantities must be used, and the effect is soon dissipated by surging waves, many fishes will become more or less affected and can be caught with the dipnet before they escape or are carried away. Dr. L. P. Schultz and Dr. W. M. Chapman have recently used derris in large quantity and with great effectiveness upon the coral reefs of the central Pacific. As they have explained it to the senior author, liquid derris-mud was carried out to near the outer edge of the reef in large containers, at low tide, and was poured liberally along a section of the reef during the intervals between the breaking of the waves. The waves not only wash the solution over the surface of the reef towards the shore, but also carry dead and dying fishes shoreward. For operations as extensive as these, large quantities of derris powder must be taken to the field by the collector, in tight 25 or 50-gallon steel drums; the drums may then be used to preserve and pack the formalin-preserved fishes for shipment home. This type of collecting is expensive so far as the derris is concerned, but results in collections of such completeness and magnificence as to make previously used methods of obtaining the smaller shore or reef fishes seem a pure waste of valuable time. This is true especially when the ichthyologist goes on a long journey to reach his collecting locality. The cost of the derris is small compared to traveling expenses. Naturally, preservative and containers commensurate with the amount of derris to be used must be at hand. If proper care is used in selection of collecting places, at least one gallon of container space should be allowed for the preserved, wrapped, and packed smaller fishes resulting from the use of every pound of derris dust expended. It is possible that the rotenone extract now supplied commercially would greatly reduce the bulk of poison the collector must take with him, but we know of no one who has used it in ichthyological collecting.

Commercial rotenone fish poisons may also be used with great effect in fresh-water fish collecting. Their effect (using the fresh poison) has already been described by Eigenmann (1912, pp. 30-58) and by Eigenmann and Allen (1942, pp. 28-32). Eigenmann's account of taking 60 species of small fishes in an insignificant trickle of water on Gluck Island,

British Guiana, with native *hiari* poison, is a compelling illustration, not only of the previously unsuspected richness of a great tropical fresh-water fish fauna, but also of the comparative ineffectiveness of other types of collecting. When similar methods have been used in a number of selected small streams in tropical Africa, Asia, and the Malay Archipelago, we shall for the first time begin to know the real extent of the fish faunas of those areas. The senior author has used commercial *timbó* in South American streams with results comparable to those of Eigenmann. The liquid-mud solution is poured into a small brook one-half kilometer or more above the place where a fine meshed minnow seine is staked across the stream, care being used to select a good location where fish habitats of as many types as possible occur (riffles, holes, gravel or stone bottom, weeds, deep pools). The bottom of the net must be sunk into the gravel or held down by stones, so that no fishes can escape beneath it. The amount of poison used depends entirely upon the current and size of the stream, and must be determined by experiment. Two pounds of dust suffices for the average lowland brook of medium flow and size (5 to 15 feet in width and 6 inches to 3 feet depth). A man must be present at the seine and another must patrol the banks and pools, armed with a long-handled fine-meshed dipnet, to catch fishes not carried downstream and to watch for the tiny species which are often not over an inch in length when adult. Fishing must be carried on as long as dead fishes continue to appear (2 to 4 hours). Dr. Hubbs has used derris successfully on open lake shores where snags make seining impossible, by surrounding an area with a long seine and mixing poison into the enclosed area. Vestal (1942) has described the poisoning of an entire lake in the mountains of California (an occasion at which the senior author was present), when it was considered desirable to remove all the existing fishes before introducing certain game species.

Naturally, fish poisons, even those not dangerous to man or domestic animals, should be used with circumspection and with due regard to local laws, many of which forbid the use of any fish poison. In many places, the rarity or restricted range of certain species may contra-indicate the use of such wholesale collecting methods. However, in great tropical river systems, or on the open shores of the ocean, the occasional poisoning of a restricted area by an ichthyologist will seldom have any effect on the fauna as a whole, and the scientific results far outweigh the dangers.

Family **Dactyloscopidae**  
ARTIFICIAL KEY TO THE KNOWN GENERA

- 1a. Dorsal fin continuous.
- 2a. Dorsal origin on nape . . . . . *Dactyloscopus* Gill
- 2b. Dorsal origin far behind nape, over or behind anal opening.
- 3a. Head cuboid, bluntly truncated anteriorly; mouth vertical  
. . . . . *Dactylagnus* Gill
- 3b. Head elongate, acutely conical; mouth moderately oblique  
. . . . . *Myxodagnus* Gill
- 1b. Dorsal fin divided, anterior three or four spines separated from rest of fin.
- 4a. Total number of dorsal spines XXII; dorsal rays 19 to 20; abdomen scaled over ventral mid-line before vent; two anterior dorsal spines widely separated from the other dorsal spines; head conical; snout sharp and pointed; arched part of lateral line short . . . . . *Heteristius*, new genus
- 4b. Total number of dorsal spines X to XIV; dorsal rays 26 to 31; abdomen naked along ventral mid-line before vent; dorsal spines evenly spaced.
- 5a. Arched and median portions of lateral line about equal; a separate anterior dorsal of three spines, first spine highest, second and third spines shortened; labial fringe absent on upper lip, little evident on lower lip . . . *Gillellus* Gilbert
- 5b. Arched portion of lateral line much shorter than median portion; a separate anterior dorsal of four short, well-separated spines; labial fringe present on both lips . . .  
. . . . . *Cokeridia* Meek and Hildebrand

The Dactyloscopids form a small family of American marine shore fishes. They closely resemble certain more or less distantly related Australian fishes, such as *Crapatalus*. The southernmost species, *Gillellus australis* Fowler and Bean (1923, p. 23), is said to be from Valparaiso, Chile,<sup>2</sup> although the family is primarily tropical in habitat. Most of the species were described by T. N. Gill or C. H. Gilbert, and no modern monograph of the group has appeared. The majority of the known forms are, however, treated by Jordan and Evermann (1898, pp. 2297-2305) or

<sup>2</sup> This locality record needs confirmation. The species is known only from the types collected by the United States Exploring Expedition over 100 years ago, and the subsequent history of the fish collection made by this expedition lays any unusual record based on it open to suspicion.



by Meek and Hildebrand (1928, pp. 902-906), and are listed by Jordan, Evermann, & Clark (1930). Species that are not referred to in these three papers are the following:

*Dactyloscopus crossotus* Starks (1913). Natal, Brazil.

*Gillellus australis* Fowler and Bean (1923). Valparaiso, Chile.

*Gillellus rubellulus* Kendall and Radcliffe (1912). Galapagos Islands.

*Gillellus rubrocinctus* Longley (1934). Tortugas, Florida.

*Gillellus quadrocinctus* Beebe and Hollister (1935). Grenadines, British West Indies.

*Cokeridia fimbriata* Reid (1935).

*Myxodagnus macrognathus* Hildebrand (1936). Lobos de Tierra, Peru.

### ***Dactyloscopus elongatus*, new species**

Plate 20, fig. 1

*Holotype*.—AHF no. 907.

*Type locality*.—Station 763-38, off Black Rock, south of Cape Corrientes, Jalisco, Mexico ( $19^{\circ} 57'N$ ,  $105^{\circ} 32'W$ ), dredged in 5-10 fms, broken shell and sand bottom, January 7, 1938. Only the type known.

*Measurements of holotype in mm*.—Standard length (to tip of upper jaw) 35, depth 4.5, head 7.9, maxillary 2.8, eye 0.9, snout 0.9, inter-orbital 0.5, predorsal length 5.8, preanal length 9.

*Description*.—Body elongate, slender, somewhat rounded anteriorly, becoming compressed posteriorly, tapering gradually from greatest depth (through pectoral base) to base of caudal fin, the greatest depth 7.8 in standard length.

Dorsal X, 35, continuous; origin above upper edge of preopercle. Membranes of anterior dorsal spines deeply incised, barely reaching base of following spine. Dorsal rays more elevated than spines, posterior ray not joined by membrane to caudal base. Predorsal length 6 in standard length. Anal II, 39, origin under fifth dorsal spine, similar to soft dorsal. Preanal length 3.89 in standard length. Pectoral rays 13. Ventrals I, 3, inserted slightly before dorsal origin. Caudal fin with 10 articulated rays, distal edge rounded.

Scales cycloid, 53 in a lateral series. One and one-half scale rows between arch of lateral line and dorsal base. Five scale rows between lateral line and dorsal base at mid-length of body; four scale rows from the same point to anal base. Scales absent on head, abdomen, fins, and

from body immediately behind pectoral base. Lateral line complete, arched anteriorly for 12 scales, thence descending abruptly to mid-line of sides and continuing to caudal base.

Head moderate, cuboid, somewhat compressed, 4.4 in standard length. Dorsal outline flattened, curved slightly downward to tip of snout. Ventral outline of head curved steeply upward to tip of subsymphysial region. Lower jaw heavy, subsymphysial region projecting beyond mouth, forming a broad angle anteriorly. Mouth steeply oblique, almost vertical. Gape moderate, end of maxillary reaching to slightly behind posterior edge of eye, 2.9 in head. Lips fringed with small, close-set fimbriae. Eyes small, superior, 8.8 in head, placed on the outer ends of short, retractile stalks. Interorbital narrow, 16 in head. Snout short and blunt, 8.8 in head, equal to eye. Jaw teeth in narrow villiform bands of small, pointed teeth. No teeth on vomer or palatines. Nostrils paired; anterior nostrils tubular, placed anteriorly on snout just behind edge of upper lip. Opercular fringe of 13 fimbriae. Subopercular and interopercular membranes wide, flexible, and partially striated, covering throat and bases of pectoral and ventral fins. Gills 4, a small pore behind last gill-arch. Gill-rakers absent, slight granulations evident on first gill-arch. Branchiostegal rays 6. Pseudobranchiae absent.

Body color in alcohol light tan, with three darker lateral bands. The upper band at the base of the dorsal fin, the second band along the mid-line of the sides, and the lower band at the base of the anal fin. Head of same color as body, overlaid dorsally with a brown, reticulated pattern. Subsymphysial region with small, scattered, brownish punctations. Fins pale.

*Comparisons.*—*Dactyloscopus elongatus* differs from the other species of this genus, with the exception of *D. zelotes*, in the increased number of dorsal and anal rays. From *D. zelotes* it may be distinguished by the greater number of dorsal spines, smaller scales, more slender body, and different color pattern. This new species has fewer dorsal spines, smaller scales, more anteriorly inserted dorsal and anal fins, and a different color pattern than *D. pectoralis*, and may be distinguished from *D. lunaticus* by its smaller scales, fewer opercular filaments, and differently arranged mandibular teeth.

***Myxodagnus sagitta*, new species<sup>3</sup>**

Plate 20, fig. 2

*Holotype*.—AHF no. 908.

*Type locality*.—Station 807-38, Academy Bay, Indefatigable Island, Galapagos, dredged in 10-25 fms, January 24, 1938. Only the type known.

*Measurements of holotype in mm.*—Standard length (to tip of upper jaw) 34, depth 4.25, head length (including lower jaw) 8.1, head length (without lower jaw) 7.5, eye 1.3, snout 1.5, maxillary 1.5, pectoral length 11.5, ventral length 3, caudal 5.1, predorsal length 8, preanal length 8.

*Description*.—Body elongate, somewhat rounded anteriorly, becoming moderately compressed posteriorly and tapering gradually to caudal base. Greatest depth (behind pectoral base) 8 in standard length.

Dorsal fin XI, 27, origin slightly behind vent, over first anal spine; fin low and continuous, last ray not joined by membrane to caudal base. Predorsal length 4.25 in standard length. Anal fin II, 35, similar to dorsal but higher. Preanal length 4.25 in standard length. Caudal fin rounded, with 10 articulated rays, its length 1.47 in head. Pectoral rays 13, fin elongate and pointed, tip of longest ray extending one-half the length of fin behind curve of lateral line, to above eleventh anal ray. Head 1.35 in pectoral length. Ventral fins I, 3, inserted below vertical edge of preopercle, 2.5 in head, end of fin almost reaching vent.

Head elongate, acutely conical, 4.5 in standard length. Dorsal profile almost straight, curved slightly downward to tip of snout. Ventral profile curved steeply upward from ventral insertion to tip of snout. Lower jaw strongly projecting, a fleshy flap or papilla at symphysis. Mouth oblique, superior; end of maxillary extending slightly past anterior edge of eye, its length 5 in head. Edge of lower lip fringed with numerous, large fimbriae; upper lip without fringe. Teeth in jaws in narrow bands of small, pointed teeth; vomerine and palatine teeth absent. Nostrils paired, anterior nostrils tubular. Eyes moderate, superior, 6.22 in head. Interorbital narrow, reduced to a narrow septum between the eyes. Snout bluntly rounded anteriorly, slightly longer than eye, 5.4 in head including lower jaw.

<sup>3</sup> While our paper was in proof, Dr. Hildebrand's *A descriptive catalog of the shore fishes of Peru* (1946, U.S. Nat. Mus., Bull. 189) appeared. On p. 408 he describes a new species, *Myxodagnus macrognathus*, from Lobos de Tierra, Peru. This is close to our new species, but appears to differ from *sagitta* in the fringed upper lip, the much shorter pectoral fins, the smaller eye, the differently shaped mouth, and perhaps other characters.

Scales cycloid, 50 in a lateral series. One scale row above arch of lateral line, 8 rows below. Four scale rows between median portion of lateral line and dorsal base at middle of body length, and 3 scale rows between lateral line and anal base at the same point. Scales absent on head and abdomen. Lateral line complete, arched anteriorly for 12 scales, thence descending abruptly to mid-line of sides, and continuing to caudal base. Membrane of subopercle and interopercle expanded into a thin membrane covering the throat and the pectoral and ventral bases. Opercular fringe of 5 small fimbriae. Gill-rakers absent. Pseudo-branchiae well developed.

Color in alcohol light tan, with small, faint, brown markings along bases of dorsal rays. Edges of a few lateral scales with small, dark punctations. A small dark spot on mid-line of nape. Head same color as body. Fins pale.

*Comparison.*—*Myxodagnus sagitta* differs from the only other known species of this genus, *M. opercularis*, in having smaller scales, fewer scales above and below the lateral line, longer pectoral fins, fewer fimbriae in the opercular fringe, a more slender body, a longer head, and a posteriorly inserted dorsal fin.

#### Genus **HETERISTIUS**, new genus

*Genotype.*—*Heteristius jalisconis*, new species.

Body elongate, somewhat rounded anteriorly, becoming compressed posteriorly. Greatest depth through pectoral base, the body tapering gradually to caudal base. Head bluntly conical, not abruptly truncated anteriorly. Mouth moderately oblique. Lips fringed with small fimbriae, the fringe of the lower lip better developed than that of the upper. Lower jaw slightly projecting, without fimbria or flap of skin at its symphysis. Eyes superior, interorbital narrow. Narrow bands of small, pointed teeth in the jaws; vomerine and palatine teeth absent. Pseudo-branchiae present.

Scales cycloid. Body entirely scaled, including abdomen, sides of body behind pectoral base, and the area from above arch of lateral line to upper edge of opercle. Head and fins naked. Lateral line present, complete; arched anteriorly for about 19 scales, the length of the arch about one-half that of median portion.

Dorsal fin elongate, II-I-XIX or VIII, 19 or 20, its origin above vertical limb of preopercle. First two spines close-set, united by deeply incised membrane. Third spine short and blunt, free, placed in center of wide interspace between the two anterior spines and the continuous

dorsal. Membranes of continuous dorsal deeply incised anteriorly. Soft dorsal higher than the spines. Anal fin long, continuous, its origin beneath third spine of continuous dorsal.

Although *Heteristius* somewhat resembles both *Gillellus* and *Cokeridia*, it may be separated from those genera by the greatly increased number of dorsal spines, by the fewer dorsal rays, by having the abdomen scaled across ventral mid-line before vent, and by the manner in which the anterior dorsal spines are separated from the continuous dorsal fin. In addition, this genus may be distinguished from *Gillellus* by the much shorter arch of the lateral line and the greater development of the labial fringe, especially on the upper lip. From *Cokeridia* (see Meek and Hildebrand, 1928, p. 905; and Reid, 1935, p. 163) it differs also in the much more conical head, in the more nearly horizontal mouth, and in not having eyes placed on the ends of short, retractile eye stalks.

### ***Heteristius jalisconis*, new species**

Plate 21, fig. 4

*Holotype*.—AHF no. 914.

*Type locality*.—Station 763-38, off Black Rock, south of Cape Corrientes, Jalisco, Mexico ( $19^{\circ} 57'N$ ,  $105^{\circ} 32'W$ ), dredged in 5 to 10 fms, sand and broken shell bottom, January 7, 1938.

*Paratypes*.—AHF no. 915. Station 765-38, 3 specimens, 30.5 to 36 mm, Chacahua Bay, Oaxaca, Mexico, dredged in 5 to 10 fms on sand and shell bottom, January 9, 1938; one of these now in the Stanford Natural History Museum.

*Measurements of holotype in mm*.—Standard length 40.5, depth 7, head 10, head width 7.5, eye 2, snout 1.9, maxillary 4, interorbital 0.85, predorsal 8, preanal 13.5.

*Description*.—Posterior dorsal ray not joined by membrane to caudal base. Predorsal length 4.88 to 5.1 in standard length. Anal fin II, 34 or 35, origin under third spine of continuous dorsal. Similar to dorsal, last ray not joined by membrane to caudal base. Preanal length 2.9 to 3 in standard length. Caudal fin rounded, with 14 articulated rays. Pectoral rays 13, middle rays longest, extending backward to beneath twelfth or thirteenth spine of continuous dorsal. Ventral fins I, 3, inserted beneath first two dorsal spines. Membrane of subopercle and interopercle expanded and covering throat, and bases of pectoral and ventral fins.

Scales 50-52 in a lateral series. Body entirely scaled, scales absent on head and fins. Abdomen scaled across ventral mid-line before anal

opening. Lateral line complete, arched anteriorly for about 19 scales, thence descending abruptly to mid-line of sides and continuing to caudal base. Two scale rows between anterior end of lateral line arch and dorsal base and one row posteriorly. Four scale rows above and below the straight portion of the lateral line at the beginning of the soft dorsal.

Head bluntly conical, 3.62 to 4.5 in standard length. Greatest width of head (behind eyes) 1.3 to 1.5 in its length. Dorsal outline of head descending gradually from nape to tip of snout in a long, flattened curve. Ventral outline of head curving steeply upward from ventral insertion to symphysis of lower jaw. Eyes moderate, superior, closely approximated, 5 to 6.1 in head; extending slightly beyond dorsal outline of head but not placed on the end of stalks. Interorbital reduced to a septum between the eyes, 2.3 to 3.5 in eye, 17.6 to 20 in head. Snout moderately pointed, not abruptly cut off or truncated anteriorly. Mouth oblique ( $20^{\circ}$  to  $30^{\circ}$  from horizontal). Maxillary reaching to, or slightly past, posterior edge of eye, its length 2.5 to 2.75 in head. Premaxillaries slightly protractile. Lower jaw projecting, no papilla or flap of skin at symphysis of lower jaw. Fringe of upper lip developed anteriorly only, fringe of lower extending laterally to rictus. Branchiostegal rays 6. Gill-rakers absent.

Body color in alcohol a light yellowish buff with five irregular, darker transverse bars crossing the body. The first bar is immediately behind the base of the pectoral fin, the second under the thirteenth and fourteenth dorsal spines, the third at the mid-point of the body length, the fourth at the beginning of the posterior third of the body length, and the fifth under the posterior dorsal rays. A few, irregular, dark spots and blotches on the body between the crossbars. An elongate dark blotch at the base of the caudal fin. Head dorsally and laterally to below eye with irregular darker markings, becoming lighter ventrally. Fins and labial fringes pale.

### *Cokeridia lactea*, new species

Plate 21, fig. 3

*Holotype*.—AHF no. 909.

*Type locality*.—Station 789-38, South Seymour Island, Galapagos, poisoned with derris root in tide pool, January 19, 1938, by G. S. Myers.

*Paratypes*.—AHF no. 910. Station 782-38, 1 specimen, 34.5 mm, Darwin Bay, Tower Island, Galapagos, poisoned with derris root in tide pool, January 16, 1938.—AHF no. 911. Station 784-38, 2 specimens, 22 and 31 mm, Darwin Bay, Tower Island, Galapagos, poisoned with

derris root in tide pool, January 17, 1938.—AHF no. 912. Station 789-38, 2 specimens, 38 and 38.2 mm, same data as holotype.—AHF no. 913. Station 800-38, 4 specimens, 34 to 38 mm, Cartago Bay, Albe-marle Island, Galapagos, poisoned with derris root in tide pool, January 22, 1938.

*Measurements of holotype in mm.*—Standard length (to tip of upper jaw) 45.5, depth 9, head 12, eye 1.4, maxillary 5, snout 2, interorbital 1, predorsal length 9, preanal length 16.

*Description.*—Body elongate, rounded anteriorly, becoming compressed posteriorly and tapering gradually to caudal base. Greatest depth (behind pectoral base) 4.4 to 5.05 standard length.

Dorsal IV-VIII, 25 or 26, origin on nape over preopercular margin. Continuous dorsal preceded by four short, blunt, well-separated spines. Continuous dorsal of eight united spines and 25 or 26 articulated rays. Membranes of continuous dorsal spines incised, membrane of dorsal rays entire. Four anterior dorsal spines about one-half the height of united spines, which are less developed than dorsal rays. Posterior dorsal ray not joined by membrane to caudal base. Predorsal length 4.72 to 5 in standard length. Anal fin II, 27 or 28, similar to soft dorsal, origin under about fourth spine of continuous dorsal. Preanal length 2.83 to 2.84 in standard length. Caudal fin with 13 articulated rays, distal edge of fin rounded. Pectoral fin 13, fin broad and short, equal to head in length. Ventrals I, 3, inserted before pectoral base.

Scales cycloid, 42 or 43 in a lateral series. Scales absent on head, fins, abdomen, and sides of body immediately behind pectoral base. Scales absent between arched portion of lateral line and dorsal base. Three scale rows between dorsal (as well as anal) bases and the median portion of the lateral line at center of body length. Lateral line present, complete; origin at upper end of gill-opening, arched anteriorly for 12 or 13 scales, descending abruptly to mid-line of sides and continuing to caudal base.

Head moderate, slightly longer than deep, 3.63 to 3.79 in standard length. Dorsal outline of head almost horizontal. Ventral outline curved steeply upward from anterior edge of ventral base to tip of snout. Eyes small, superior, 8.5 to 9.3 in head; placed on the ends of short, retractile stalks. Interorbital narrow and concave, 12 to 13 in head. Dorsal aspect of head broad and flat, slightly convex posterior to eyes. Mouth almost vertical, lower jaw projecting beyond tip of snout. Lips fringed anteriorly, but not laterally. Maxillary reaching a vertical from posterior margin of eye (when retracted into head), 2.4 to 2.6 in head. Nostrils paired, anterior nostrils tubular. Snout short, 6 to 7.2 in head.

Teeth in jaws in narrow bands of very small, villiform teeth, teeth absent on vomer and palatines. Opercular fringe of 9 to 11 rays. Membrane of subopercle and interopercle expanded and covering throat and bases of pectoral and ventral fins. Branchiostegal rays 6. Pseudobranchiae present.

Body color in alcohol light tan; dorsally with six quadrate, dark brown spots lying close to dorsal base. A large, dark brown area on the mid-line of the nape before the dorsal fin. The lower edges of the dark, quadrate spots are united by a narrow, irregular, dark line, strong and sharply defined anteriorly, fading posteriorly, and entirely absent on some specimens. Several irregular, brown spots on side just behind and above pectoral base. Fins lighter than body. Head same color as body, a short thin dark line extending downward and backward from the lower edge of the orbit. Interorbital with a small, brown area between the eyes. In life milk-white, with fine, irregular, blackish marks.

*Comparisons.*—Two species of *Cokeridia* are known, *C. crossota*, the genotype (see Meek and Hildebrand, 1928, p. 905, pl. 89), and *C. fimbriata* (Reid, 1935, p. 163, fig. 1). The scales are smaller and there are more scales in a lateral series in *Cokeridia lactea* than in *C. crossota*, and *lactea* has a longer head, snout, and maxillary. There are fewer opercular fimbriae in *lactea*, the body is deeper, and the anal origin is farther back than in *crossota*. From *Cokeridia fimbriata* this species differs in having larger scales, fewer dorsal and anal rays, fewer fimbriae on the opercular fringe, no scales above the arch of the lateral line, and in many different proportions.

*Notes.*—This species is named from its milk-white color in life. It inhabits coarse, white, coral sand in shallow waters and tide pools in the Galapagos, and in these places is usually associated with another species of Dactyloscopid, *Gillellus rubellulus* Kendall and Radcliffe (1912, p. 148, pl. 6, fig. 3). The latter is usually the commoner. In life, these two species are so similar that it takes a sharp eye to distinguish them. The senior author first collected these fishes in the milk-white coral sand of the tide pools at Darwin Bay, while using derris. They were not seen at first, but the derris brought them out of the sand, in which they normally lie with only the tip of the snout, the nostrils, and the eyes protruding. It was noticed in the field that several of the individuals, out of some fifteen obtained that day, had stalked eyes, but it was not until the catch was sorted aboard ship in the afternoon, when the field preservative had already shrunk the eyes almost back into the retracted position, that the stalk-eyed fish were seen to be plainly different from the others.



*G. lactea* is a smaller, somewhat more delicate fish than *G. rubellulus*. Alive, the coloration of both is practically identical, milk-white with traces of an incomplete dark, reticulated pattern. Upon fixation in an alcohol-formalin mixture, the colors and patterns of *lactea* do not at once notably change, but the eye stalks retract. On the other hand, the pattern of *rubellulus* changes almost immediately, by the appearance of the wide reddish, black edged bars, of which the only previous indications were traces of the dark edges, so indistinct that they appeared as a part of a poorly developed reticulation. Probably the two close relatives of *G. rubellulus* from the Atlantic that have a similar color and pattern also inhabit white coral sand. These are *G. rubrocinctus* Longley (1934, p. 257) and *G. quadrocinctus* Beebe and Hollister (1935, p. 222). The relationships of these three species of *Gillellus* are close and need elucidation.

### Family Microdesmidae

This small family of blenniform fishes is known so far only from the coasts of tropical America and Cameroon. Three genera were recognized until recently, *Microdesmus*, *Cerdale*, and *Leptocerdale*, and the family appears in most ichthyological works under the name Cerdalidae. In a recent revision (1936), Reid has placed all the known species in a single genus, *Microdesmus*, of which the other two genera become synonyms. With the disappearance of the name *Cerdale*, the family name becomes Microdesmidae.

Reid has based his primary division of the species of *Microdesmus* on the position of the anus, which, in the known species, is placed either before or after the mid-point of the standard length. In our new species, and, indeed, in some of the others, the vent is so close to this mid-point that the value of the feature as a primary classificatory one becomes questionable. It seems possible that the restricted gill-openings of *ionthas* (the genotype of *Cerdale*) and *floridanus* may be of more importance in a phylogenetic system. If this be true, some authors may prefer to retain these two species in a separate genus, *Cerdale*, in which case the family name should revert to Cerdalidae.

#### *Microdesmus reidi*, new species

Plate 22, figs. 5, 6

*Holotype*.—AHF no. 916.

*Type locality*.—Station 784-38, Darwin Bay, Tower Island, Galapagos, poisoned with derris root in tide pool, January 17, 1938, by G. S. Myers.

*Measurements of holotype in mm.*—Standard length 67.5, depth 4, head 7, predorsal length 11.5, preanal length 33, anal opening to caudal base 34.5, preventral length 7, ventral base to anal opening 25.6, snout 1.2, eye 0.6.

*Description.*—Body elongate, compressed, especially posteriorly, depth 16.9 in standard length. Tail slightly longer than head and trunk, 1.95 in standard length. Body nearly equal in depth anteriorly, tapering slightly toward caudal base from anal opening.

Head short, 9.64 in standard length. Dorsal and ventral outlines almost evenly rounded anteriorly. Mouth small, oblique ( $45^{\circ}$  from horizontal), reaching to beneath edge of eye. Lower jaw projecting; lips fleshy, with lateral membranous flanges, free edges of the flanges confined to sides of the mouth. Eyes small, lateral, high on head, 11.6 in head. Interorbital narrow, wider than eye, 7 in head. Nostrils paired, anterior nostrils tubular, placed close to the tip of the snout. Posterior nostrils larger, in front of and slightly above the eye. Teeth small, even, slightly flattened, in two irregular rows in the jaws. Teeth absent on vomer and palatines. Gill-openings restricted to sides, extending downward and forward from slightly below upper edge of pectoral base to slightly below and anterior to lowest pectoral ray.

Dorsal 51, long and low, no marked differentiation between spines and rays, its origin slightly behind tip of pectoral fin. Predorsal length 5.86 in standard length. Last dorsal ray joined by membrane to caudal base. Anal fin 33, similar to dorsal, its last ray also joined to the caudal. Origin of anal slightly behind mid-point of standard length. Preanal length 2.04 in standard length. Pectoral fin 12, edge of fin rounded. Caudal fin rounded. Ventral fin I, 3, inserted beneath gill-openings. Ventral spine minute, lying close to base of first ray. Preventral length 9.64 in standard length. Ventral base to anal opening 2.64 in standard length. Body and head, except for snout and sides of lower jaw, covered with minute, imbedded, nonimbricated scales.

Color in alcohol light brown dorsally to mid-line of sides, becoming rather abruptly lighter ventrally. Head dorsally a continuation of body color, becoming lighter toward tip of snout. All fins pale.

*Comparison.*—In Reid's synopsis of the genus and family (Reid, 1936), the new species falls almost midway between his two main divisions, which are based on the position of the vent, either anterior or posterior to the middle of the standard length. *M. reidi* actually has the vent very slightly nearer the tip of the snout than the caudal base. It appears to fall close to *hildebrandi* and *intermedius*. To judge from

Reid's figures, the pectoral fin of *reidi* is set lower than in those two species. Moreover, the dorsal origin in *reidi* is more posterior than in *intermedius* and the fin-ray counts differ sharply. On the other hand, *hildebrandi*, which seems closer to *reidi*, has a more slender form and a considerably shorter abdominal and longer tail region.

*Microdesmus bilineatus* (Clark, 1936, p. 394) from the Galapagos, was described too late to be mentioned in Reid's revision except in a footnote. It has D. 47 and A. 28, which counts seem to bring it near *reidi*, but the depth is 10.1 in standard length and the head 7. The gill opening is said to be "a small pore before base of pectorals." If this fish is a *Microdesmus*, it would appear to be similar to the short-bodied *ionthas*, and to have nothing to do with *reidi*.

*Notes.*—The unique type of *reidi* was obtained in a small, open, sandy tide pool not over a foot deep. The senior author had poisoned this pool and believed he had gotten all the fishes from it, at least all that had not been snatched up by his collecting companion—a fearless and persistent little Galapagos rail who closely followed the collector and the "poisoning" operations from pool to pool and derived great benefit from the resulting miraculous draught of fishes. However, upon finishing the work, a last look was given all the pools and this solitary *Microdesmus* was seen swimming rapidly about in one of them. The live fish was a clear, very translucent, yellowish gray, the only real color being the pink belly.

Our figure of this fish is not accurate in some details. The pelvics are under the gill-openings, not behind them; the number of fin rays is not quite accurate; and the apparent freedom of the anal from the caudal fin is an artifact caused by breakage of the fin. The general appearance is correctly portrayed.

We take great pleasure in dedicating this fish to Earl D. Reid, U. S. Marine Corps, retired, who has recently also retired from a subsequent long period of useful, conscientious, and interested service as Scientific Aid in the Division of Fishes of the U. S. National Museum. It is to him that we owe thanks for a very helpful revision of these small and obscure little fishes.

Family **Antennariidae**  
**Antennarius ziesenhennei**, new species

Plate 23, fig. 7

*Holotype*.—AHF no. 917.

*Type locality*.—Station 796-38, Sullivan Bay, James Island, Galapagos, collected from a tide pool, January 21, 1938, by Fred Ziesenhenne.

*Measurements of holotype in mm.*—Standard length 79, greatest depth 25, head 17.5, eye 3, maxillary 10.6, snout 4, interorbital 6, length of first dorsal spine 7.8, length of second dorsal spine 6.5.

*Description*.—Body robust, squat, and fat, somewhat compressed posteriorly, wide anteriorly. Greatest depth (at base of third dorsal spine) 2 in standard length.

Dorsal III, 12: first spine (ilicium) slender, longer than second spine, its end (the "bait") expanded and divided into short fingerlike lobes. When depressed, the ilicium lies in a shallow groove around the right side of the base of the second spine. Second dorsal spine straight, conical, wholly free; lying in a shallow groove when depressed. Third dorsal spine entirely hidden beneath the skin, appearing as an obliquely pointed hump. Dorsal rays moderate, covered by heavy skin except at tips. Anal rays 7. Caudal 9, distal edge of fin rounded. Ventral fin with 5 short, flattened rays, inserted before pectoral base. Pectoral rays 10, placed at the outer end of a distinct wrist, pectoral (without wrist) 2.94 in head. Skin rough, thickly covered with small, bifid spines which, in their normal, mucus-covered state (as in our illustration) cannot be seen properly. Maxillary, mandible, and the grooves into which the first and second dorsal spines lie, when depressed, are naked.

Head short and blunt, 2.86 in standard length. Snout short and very blunt, 4.37 in head. Mouth vertical, lower jaw in advance of upper. Maxillary long, posterior and deeply covered by a fold of skin. End of maxillary extending backward almost to posterior margin of eye, 2.35 in head. Teeth small, pointed, in narrow bands in jaws and on palatines. Nostrils paired; anterior nostrils tubular, tube somewhat trumpet shaped. Posterior nostrils with raised rims. Eyes moderate, 5.8 in head.

The body color of the living fish was uniform grayish white, with a few, minute, widely scattered, blackish spots, the largest almost equal to pupil of eye. Fins of same color as body, slightly paler at tips of rays. The color has not changed appreciably in alcohol.

*Comparisons*.—The grayish white color distinguishes *A. ziesenhennei* from the other Eastern Pacific species, which are for the most part predominantly patterned in black, brown, or orange. The structure of the bait differs in this species, being composed of numerous fingerlike lobes

and not bifid as in *A. strigatus* or *sanguineus*. *Antennarius ziesenhenei* also differs from *A. strigatus* in having a much larger eye, shorter maxillary, and much shorter first dorsal spine. From *A. sanguineus* it differs in having a smaller eye, shorter maxillary, and longer first dorsal spine. Fowler (1938, pp. 248-261; and 1944, pp. 475-529) has given two lists which together mention most of the fishes of the Pacific coasts of tropical America, including the Antennariids. It is possible, of course, that *A. ziesenhenei* is closer to some of the central Pacific species, although we have not found it to be identical with any of them. While the number of nominal species of this genus has undoubtedly been too greatly multiplied, we do believe that many of them really represent distinct forms. The present seems to be one of these.

*Note.*—We are pleased to name this fish for Lt. Com. Fred Ziesenhene, formerly of the Hancock Foundation, now of the U.S. Navy, who accompanied many of the Allan Hancock Expeditions and worked on the echinoderms obtained by them. He collected the type. Those who know him will perceive other reasons why we have named the fish for him.

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## PLATE 20

Fig. 1. AHF 907. *Dactyloscopus elongatus*, holotype, x6.

Fig. 2. AHF 908. *Myrodagnus sagitta*, holotype, x6.



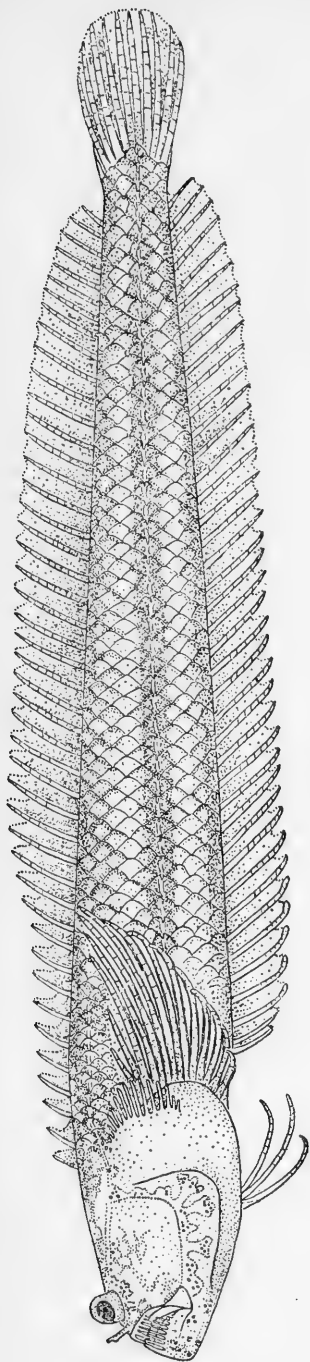


Fig. 1

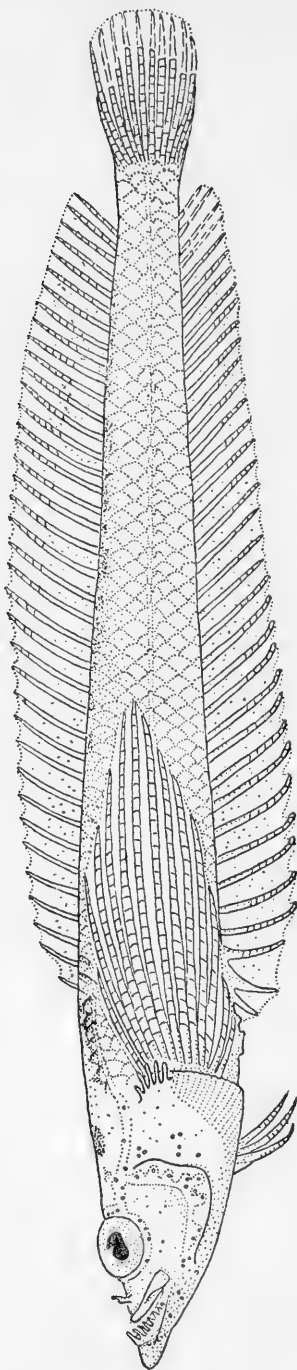


Fig. 2

## PLATE 21

Fig. 3. AHF 909. *Cokeridia lactea*, holotype, x4.

Fig. 4. AHF 914. *Heteristius jalisconis*, holotype, x5.

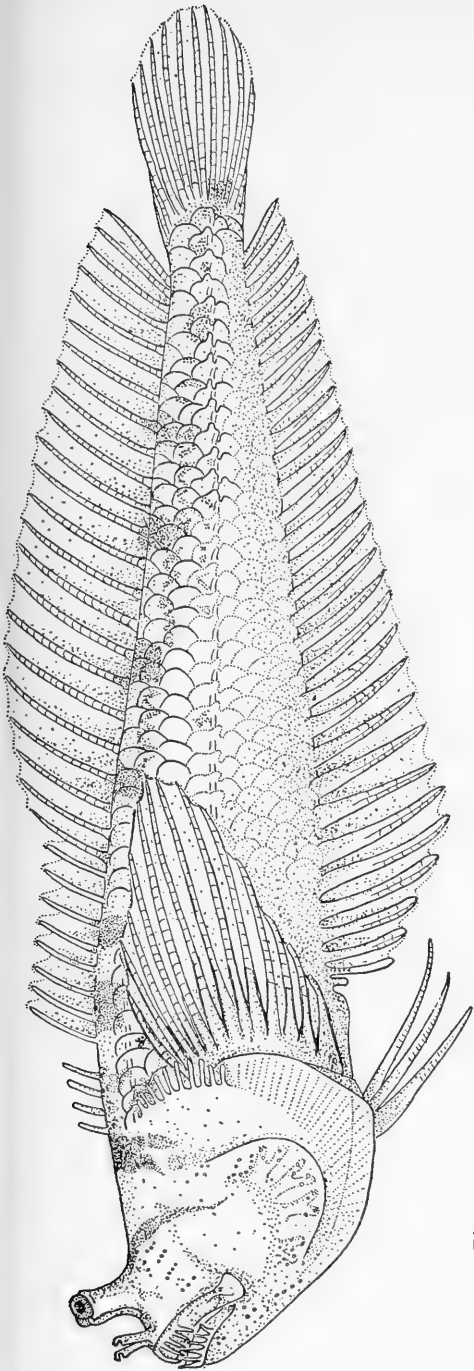


Fig. 3

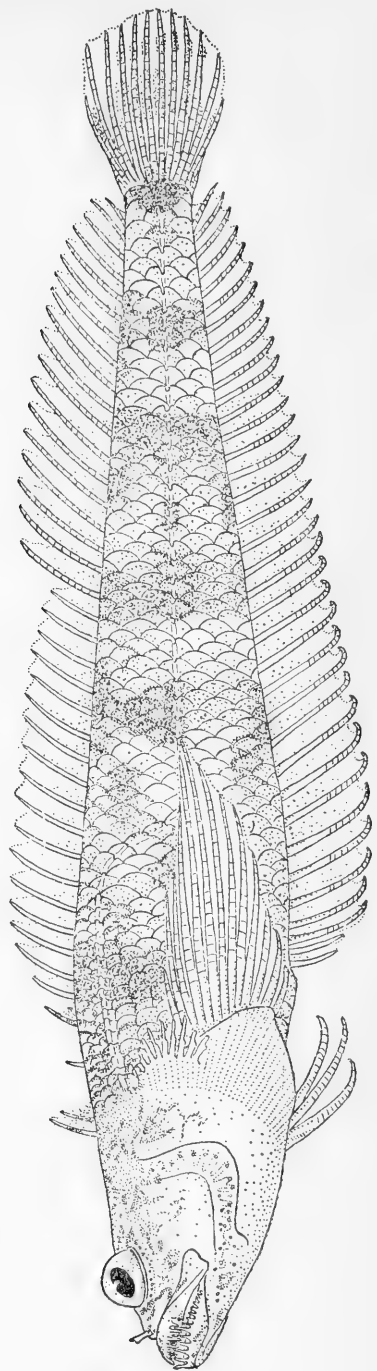


Fig. 4

## PLATE 22

Fig. 5. AHF 916. *Microdesmus reidi*, holotype, x8, head and pectoral region.

Fig. 6. AHF 916. *Microdesmus reidi*, holotype, x3, lateral view.

Fig. 5

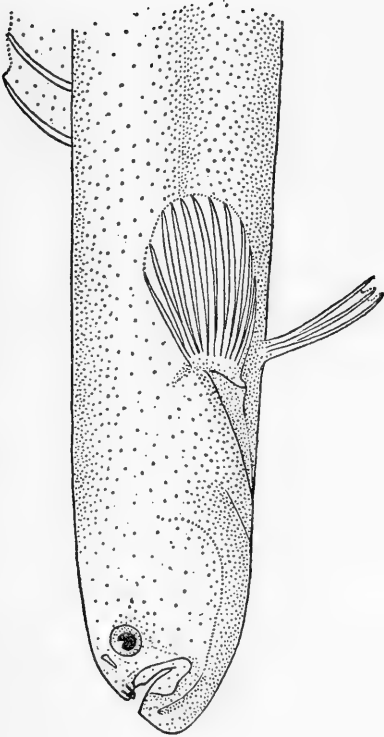
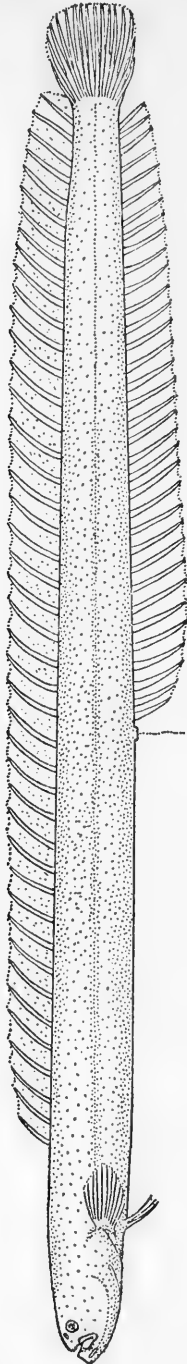
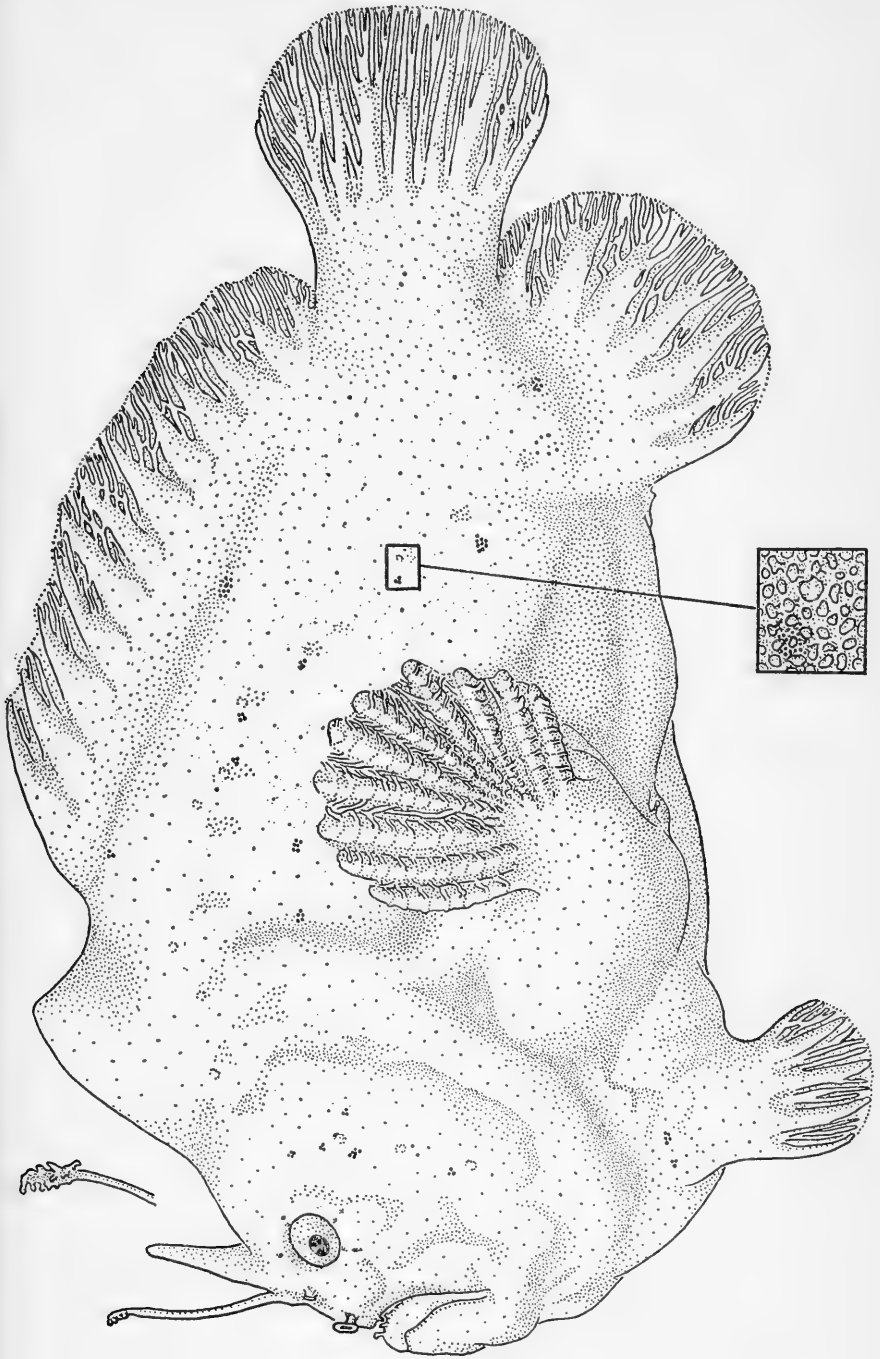


Fig. 6



## PLATE 23

Fig. 7. AHF 917. *Antennarius ziesenhenei*, holotype, x3.







# TWO NEW GENERA AND FIVE NEW SPECIES OF APODAL FISHES FROM THE EASTERN PACIFIC

(PLATES 24-28)

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Among the Apodal fishes collected by the extensive dredging operations of the Hancock Pacific Expeditions, and now in the collections of the Allan Hancock Foundation at The University of Southern California, are specimens which represent several new genera and species of this interesting order. The family Congridae is represented by a new genus and species, *Thyreconger hemiaspidus*, and two new species, *Chiloconger similis* and *Rhynchocymba catalinensis*. A new genus and species of the family Echelidae, *Pseudomyrophis micropinna*, is described, as is also a new species of Heterocongrid, *Taenioconger herrei*.

The author wishes to express his appreciation to Dr. George S. Myers, Dr. Albert W. Herre, and Miss Margaret Storey, all of the Natural History Museum of Stanford University, for their assistance and for the use of the library and comparative material of the Museum. The plates were prepared by Mr. Anker Petersen, staff artist, of the Allan Hancock Foundation.

## Family Congridae

Prior to Reid's (1934) revision of the available Congrid material in the collections of the U.S. National Museum, several investigators had attempted to clarify the systematic confusion surrounding this interesting and little-known family. In 1898, after studying the forms introduced between 1870 and 1898, as well as the material included in the Catalogue of Fishes (Günther, 1870), Ogilby introduced several new generic definitions based primarily upon the presence of acicular or granular teeth, the position of the vent, the dorsal origin, and other proportional measurements. Since Parr (1932, p. 21) has already completely analyzed Ogilby's work, it need not be discussed further here.

In 1925 Jordan and Hubbs revised the Japanese Congrids and introduced a system of classification based principally upon tooth characters. Since only Japanese forms were considered, several large and important genera were necessarily omitted, and therefore it is doubted by Parr (1932, p. 24) that their work could meet the test of universal application. Although a great improvement over Ogilby's work, the characters used

by Jordan and Hubbs are subject to personal interpretation and judgment and must be used with discretion. The wide range of possible variation in the interpretation of Jordan and Hubbs' tooth characters is discussed in detail by Parr (1932, p. 25).

At the same time, while adequately reviewing the Congrid literature, Parr did little to abate the taxonomic confusion in which the Congrids are so deeply mired. Without specimens for comparison, his work, based upon a study of the inadequate literature, cannot be accepted without reservation. Subsequent investigation by Reid (1934) has shown more exactly the relationships of several of these genera, and it is hoped that this paper will assist somewhat in the clarification of the confusion surrounding this family. It is well to remember, as Reid suggests, that Congrids can be properly classified only when studied upon a world-wide basis, as their generic relationships are widely distributed. Until such time as adequate material is available, their generic concepts must remain provisional and subject to change.

Reid, using characters hitherto overlooked by most investigators, based his generic differences upon the bony structure of the labial canal, the presence or absence of a free, upturned, labial flange, and the shape, position, and spacing of the dental bands. The bony structure of the labial canal was first described and figured by Bleeker (1864, p. 29) for *Uroconger lepturus*, and was recently more fully described by Schmidt (1929). Careful examination of his Congrid material convinced Reid that Schmidt was inaccurate in his description of the structure of the bony rays which project downward from the inferior edge of the canal. He found that these bony rays are articulate with the lower edge of the canal, and not free elements as Schmidt had described. Nor are the pore-like slits in the upper lip invaginations between the bony supports for the purpose of facilitating the expansion of the membrane, as Schmidt had supposed, but seem rather to be muciferous pores.

These bony processes extending downward from the inferior edge of the labial canal are present in all the genera studied by Reid, reaching their greatest development in *Uroconger lepturus*, where they serve as distensible supports for the membrane of the upper lip. The structure of the labial canal, as shown by Reid, is a longitudinal canal lying just above the edge of the upper lip, and extending posteriorly from the rostral cavity at the tip of the snout to beneath the eye and upward around its posterior edge. The inferior, superior, and interior walls of the canal are of bone, the external surface is covered by skin only. From the inferior edge of the canal, several small bony processes extend downward into the

labial membrane and appear as small dermal points on the oral edge of the upper lip. Partial dissection and careful examination of additional genera of Congrids reveal several modifications of this structure, which are described in this paper.

Projecting bony processes are entirely absent in the genus *Chiloconger* (Myers and Wade, 1941, p. 66), the inferior edge of the labial canal being entirely unmodified. In *Thyreoconger*, a new genus described here, the inferior edge of the labial canal is expanded into a broad shield or winglike plate, which extends outward and downward to the oral edge of the lip. The structure of the labial canal of a large (245 mm) specimen of *Alloconger flavirostris* (Stanford 21100), in the Natural History Museum of Stanford University, is similar to that of *Chiloconger*, the inferior edge of the canal being entirely unmodified. The genotype (Stanford 6469) and three paratypes (Stanford 6969) of *Rhynchocymba nystromi* from Japan possess several bony processes extending downward into the oral edge of the upper lip. A new species of the genus *Rhynchocymba*, described here, has the same structure as the Japanese species of the genus.

The following key to the Congrids has been adapted from Reid (1934, p. 3) and modified to include the genera *Chiloconger*, *Alloconger*, *Thyreoconger*, and *Rhynchocymba*. It is entirely provisional in character and subject to change with the accumulation of additional data.

PROVISIONAL KEY TO THE GENERA OF CONGRIDAE DISCUSSED  
IN THIS PAPER

- 1a. Edge of upper lip turned upward into a free flange, either narrow or broadly rounded; bony projections from the inferior edge of the labial canal either present or absent.
  - 2a. Bony processes from inferior edge of labial canal present; upturned labial flange narrow, with a free superior border; premaxillary teeth not separated from vomerine teeth by a narrow groove; snout longer than eye, not abruptly decurved . . . .  
. . . . . *Ariosoma* Swainson
  - 2b. Bony processes from inferior edge of labial canal absent.
    - 3a. Upturned labial flange expanded into a broadly rounded flap, the highest part reaching or covering the posterior nostrils; snout shorter than eye, abruptly decurved; premaxillary teeth separated from vomerine teeth by a narrow groove . . . .  
. . . . . *Chiloconger* Myers and Wade

- 3b. Uprturned labial flange narrow.
- 4a. Inferior edge of labial canal straight, not developed into a broad shield or winglike plate; dorsal origin before pectoral base; tail much longer than head and trunk . . . . .  
. . . . . *Alloconger* Jordan and Hubbs
- 4b. Inferior edge of labial canal expanded into a broad shield or winglike plate, reaching to oral edge of lip; dorsal origin over pectoral base; tail barely longer than head and trunk . . . . .  
. . . . . *Thyreconger*, new genus
- 1b. Edge of upper lip without a free, upturned, labial flange; bony projections from inferior edge of labial canal present.
- 5a. Vomerine teeth in a band, not extending backward on the shaft of the vomer in a single row; labial canal sending two or three short processes downward to the edge of the moderately extensible upper lip.
- 6a. Maxillary, premaxillary, and vomerine teeth closely united into a single patch at the tip of the upper jaw.
- 7a. Teeth very short, almost pavementlike in appearance; vomerine band widened posteriorly, covering much of the roof of the forepart of the mouth; tip of snout swollen; premaxillary teeth almost entirely inside of mouth when closed . . . . *Promyllantor* Alcock
- 7b. Teeth longer never pavementlike; vomerine band narrowed posteriorly; premaxillary teeth largely exposed when mouth is closed . . . . .  
. . . . . *Rhynchocymba* Jordan and Hubbs
- 6b. Premaxillary and vomerine teeth separated by a distinct interspace.
- 8a. Snout considerably projecting; all premaxillary teeth visible from directly below with mouth tightly closed; dentition normal, teeth not greatly enlarged; color not blackish . . . . .  
. . . . . *Congrina* Jordan and Hubbs
- 8b. Snout scarcely longer than lower jaw; nearly all of premaxillary teeth hidden when viewed from directly below with mouth tightly closed; dentition very strong; premaxillary teeth, anterior vomerine teeth, and front teeth of lower jaw greatly enlarged canines; blackish eels of deep water . . . . . *Bathyroconger* Fowler

- 5b. Teeth of vomer extending backward in a single series to below middle of eye; labial canal sending two or three long bony processes downward and backward to support the very extensible upper lip . . . . *Uroconger* Kaup

### Genus **CHILOCONGER** Myers and Wade

*Chiloconger* Myers and Wade, 1941, p. 65 (type by original designation *C. labiatus* Myers and Wade).

Body elongate, head roughly cylindrical. Body and especially the tail compressed. Tail much longer than head and trunk. Dorsal origin slightly behind gill-openings, confluent with anal around tip of tail. Pectoral fins well developed, ventral fins absent. Snout abruptly decurved, slightly shorter than eye. Upper edge of gill-opening reaching upper edge of pectoral base.

Flange of upper lip developed into a short, broadly rounded flap, the highest part of which reaches or covers the posterior nostrils. Maxillary teeth in a narrow band of small, close-set, pointed teeth, closely united to vomerine teeth anteriorly. Premaxillary teeth separated from vomerine teeth by a narrow groove.

Labial canal present, extending backward above edge of upper lip to beneath eye and upward around its posterior edge. Inferior, superior, and interior walls bony, external surface covered by skin only. No bony processes extending downward into lip from inferior edge of labial canal.

### **Chiloconger similis**, new species

Plate 24, figs. 1-3

*Holotype*.—AHF no. 903.

*Type locality*.—Station 1118-40, Inner Gorda Bank, Cape San Lucas, Lower California, Mexico (23° 2'30"N, 109° 3'07"W), dredged on sandy bottom, 59-78 fms, February 17, 1940.

*Measurements of holotype in mm.*—Total length 259, depth 16.5, head and trunk 113, tail 146, head 40.5, snout 7.1, eye 9, gape of mouth 13.5, isthmus 5.5, gill-opening 10.5, pectoral length 12.3, interorbital 2.3.

*Diagnosis*.—Head and trunk 1.29 in tail; tail 1.75 in total length. Head large, 2.9 in head and trunk, 6.4 in total length. Snout shorter than eye, 5.7 in head; eye 4.5, gape of mouth 2.95, pectorals 3.3. Depth 15.8 in total length, 2.5 in head. Dorsal origin behind pectoral base, at vertical through anterior third of pectoral fin. Gill-openings lateral, upper end

of gill-opening reaching upper end of pectoral base. Isthmus one-half of width of gill-opening. Labial flange greatly developed, covering posterior nostril when expanded.

*Description.*—Body elongate, heavy and bluntly pointed anteriorly, tapering gradually to tip of tail from greatest depth before gill-opening. Head and body subcylindrical anteriorly, becoming compressed posteriorly. Depth 15.8 in total length, 2.5 in head. Origin of lateral line on side of nape midway between gill-opening and posterior edge of eye; arches upward over pectoral base, thence gradually descending to mid-line of sides and continuing to tip of tail. Fifty pores from its origin to opposite vent, 130 pores in its entire length.

Anterior nostrils tubular, directed downward, placed just above edge of upper lip near tip of snout. Posterior nostrils small, elongate pores with slightly raised rims, placed half the diameter of the pupil before the eye at its mid-depth. A small, round pore immediately above each posterior nostril, but not in contact with it. Mouth moderate, its gape extending almost to posterior edge of eye, 2.95 in head. Snout projecting slightly beyond tip of lower jaw, abruptly decurved, shorter than eye, 5.7 in head. Eyes large, 4.5 in head, interorbital narrow, 2.9 in eye.

Flange of upper lip broad, developed into a high, rounded flap, up-turned against the sides of the snout and in its greatest height covering the posterior nostril and reaching the lower edge of the accompanying, dorsally placed pore. Normally the outer portion of the flange is folded downward behind the basal part, lying in the hollowed-out area covered by the flange. Anterior end of flange joins the snout well above edge of upper lip; immediately behind upper edge of anterior nostril. From this point dorsal edge of flange curves upward until it reaches the ventral edge of the small pore above posterior nostril, thence curving downward around edge of eye until it joins edge of upper lip at the rictus of the jaws. Lower lip flange well developed, slightly longer than maxillary flange but less expanded.

Labial canal present, extending backward from rostral cavity at tip of snout to behind posterior edge of eye and upward around its posterior edge. Inferior, superior, and interior surfaces bony, external surface covered by skin only. No bony processes extending downward into labial membrane from inferior edge of canal. Edge of lip without bony support. A series of four pores on each side of tip of snout. The two anterior pores placed before anterior nostrils at their upper edge. The third pore placed above and behind the upper edge of the anterior nostrils,

and the fourth pore at the anterior end of the labial flange. A short series of pores behind posterior edge of eye. Three pairs of pores below tip of mandible, followed by a series of eight pores along underside of lower jaw and throat. Inner lip with a finely fringed edge extending longitudinally between outer lip and maxillary tooth band.

Maxillary teeth in a narrow band anteriorly, tapering to three irregular rows laterally. Laterally two outer rows of maxillary teeth closely appressed, and separated from the third and inner row by a narrow interspace. Teeth of outer row pointed, straight, slender, mostly hidden in membrane at base of second row of teeth. Teeth of second row close set, slightly enlarged, pointed, and a little curved. Teeth of inner row small, blunt, irregularly placed. Vomerine teeth in an ovate patch of small, pointed teeth. Maxillary teeth closely united to vomerine teeth at the head of the patch. Premaxillary teeth numerous, similar to vomerine teeth but slightly larger, placed before symphysis of lower jaw, and separated from maxillary teeth by a narrow interspace. Mandibular teeth similar to maxillary teeth. Tongue well developed, edges free laterally and anteriorly.

Color in alcohol dull olive buff dorsally, shading into olive buff along mid-line of sides; underside of head and abdomen dark gray. Dorsal and anal fins light olive buff. Pectoral fins pale. Opercle and nape shaded with darker.

This species differs from *C. labiatus* in the more anteriorly inserted dorsal fin, shorter pectoral fin, more anterior insertion of the posterior nostril, narrower isthmus and different placement of the lateral maxillary teeth. The development of the labial flange of the upper lip is greater than in *C. labiatus*, and the hollowed-out area beneath the flange is not divided into two parts by a vertical partition.

### Genus **ALLOCONGER** Jordan and Hubbs

*Alloconger* Jordan and Hubbs, 1925, p. 195 (type by original designation *Leptocephalus flavirostris* Snyder).

Body elongate, tail much longer than head and trunk. Head large, subequal to trunk. Dorsal origin width of gill-opening before pectoral base; well developed, confluent with anal around tip of tail. Pectoral fins well developed; ventral fins absent. Snout projecting only slightly beyond premaxillary teeth. Anteroventral mid-line of snout smooth, without a keel or pocket. Anterior nostrils tubular, directed downward, placed on lower surface of snout beside premaxillary teeth, just within

anterior end of upper lip. Posterior nostrils an elongate pore without a raised rim, placed before eye at its mid-depth. A well-developed pore above posterior nostril. Two enlarged pores between anterior nostrils. A large pore placed immediately behind the base of the anterior nostril, its edge expanded into two leaflike flaps, which fold one over the other to partially close the opening.

Premaxillary, vomerine, and maxillary teeth closely united at front of upper jaw. No interspaces between the tooth bands. Premaxillary teeth almost entirely outside the mouth when it is tightly closed and seen from directly below. Maxillary teeth anteriorly in narrow bands of close-set, pointed teeth; tapering laterally to several irregular rows. Mandibular teeth similar to maxillary teeth. Vomerine teeth closely set and pointed anteriorly, becoming more widely spaced and conical posteriorly. A few anterior premaxillary teeth slightly enlarged. Upper lip with a narrow, upturned, labial flange. Labial canal present, no bony processes extending downward into the oral edge of the lip. Inferior edge of labial canal unmodified.

The above description was made from a 445 mm specimen (paratype) of *Alloconger flavirostris* (Stanford 21100) from Misaki, Sagami, Japan and in the collections of the Natural History Museum, Stanford University. Although Parr (1932, p. 27) placed *Alloconger* in provisional synonymy with *Ariosoma*, it may be easily distinguished from that genus by the absence of the two or three pointed, bony processes that extend downward into the edge of the upper lip.

### THYREOCONGER, new genus

*Genotype*.—*Thyreconger hemiaspidus*, new species

Body elongate, slender; dorsal and ventral outlines extending backward almost parallel to one another to posterior third of tail, thence gradually tapering to a moderately rounded caudal tip. Body sub-cylindrical anteriorly, becoming compressed posteriorly on tail. Tail slightly longer than head and trunk. Dorsal origin over pectoral base, confluent with anal around tip of tail. Pectoral fins well developed; ventral fins absent. Snout moderate, bluntly pointed, extending slightly beyond premaxillary teeth. Anterior nostrils tubular, directed downward on edge of upper lip, close to tip of snout. Posterior nostrils large, with thickened and slightly raised rims, placed before eye at its mid-depth. Pores on head large and numerous.



Maxillary and mandibular teeth in narrow bands of small, pointed, close-set teeth. Maxillary teeth united with slightly enlarged premaxillary teeth, and closely approaching the vomerine teeth at the head of the shaft of the vomer. Vomerine teeth in an elongate, triangular patch of small, pointed, close-set teeth anteriorly, tapering to an irregular row of conical teeth posteriorly. Vomerine teeth separated from premaxillary teeth by a narrow semicircular interspace.

Upper lip with a narrow, upturned labial flange. Labial canal present. Inferior edge of labial canal expanded into a broad shield or winglike plate, extending outward and downward to the oral edge of the upper lip.

*Thyreoconger* most closely resembles *Alloconger*, but differs from that genus in having the inferior edge of the labial canal expanded into a broad shield or winglike plate, a more posteriorly inserted dorsal, and the tail scarcely longer than the head and trunk. It also differs from *Alloconger* in the size and position and shape of the premaxillary patch of teeth. In *Alloconger* these teeth are in a large, conspicuous, circular patch, united posteriorly to the maxillary and vomerine bands of teeth. In *Thyreoconger* the premaxillary teeth are a continuation of the maxillary bands around the tip of the upper jaw, and are separated from the vomerine teeth by a narrow semicircular interspace.

### ***Thyreoconger hemiaspidus*, new species**

Plate 25, figs. 1-3

*Holotype*.—AHF no. 461.

*Type locality*.—Station 725-37, North of Point Lobos, Gulf of California, Sonora, Mexico, dredged in 10 fms, March 26, 1937.

*Paratypes*.—AHF no. 310. Station 767-38, 1 specimen, 105 mm, Chacahua Bay, Oaxaca, Mexico, dredged in 40-50 fms, January 9, 1938.

—AHF no. 299. Station 769-38, 1 specimen, 103 mm, off San Jose Point, Guatemala ( $13^{\circ} 46'N$ ,  $91^{\circ} 14'W$ ), 20 fms, January 11, 1938.

*Measurements of holotype in mm.*—Total length 158, depth 9.5, head and trunk 77.5, tail 82.5, head 28, snout 5.5, eye 5.5, gape of mouth 7.5, gill-opening 3, isthmus 4, pectoral length 11, interorbital 1.

*Diagnosis*.—Head and trunk 2.1 to 2.2 in total length, 1.09 to 1.2 in tail. Tail 1.83 to 1.92 in total length. Head 5.6 to 6.2 in total length, 2.5 to 2.85 in head and trunk. Snout 4.75 to 5.1 in head, eye 4.8 to 5.5, gape of mouth 3.7 to 3.9, pectoral length 2.54 to 3, gill-openings 8.25 to 9.39, isthmus 6.8 to 7.5. Depth 16.6 to 18.1 in total length, 2.94 to 3.1 in head.

Dorsal origin over upper edge of pectoral base. Upper lip with a narrow, upturned labial flange. Inferior edge of labial canal expanded into a shield or winglike plate.

*Description.*—Body elongate, slender; dorsal and ventral outlines extending backward in almost parallel lines to posterior third of tail, thence tapering gradually to a bluntly rounded caudal tip. Body sub-cylindrical anteriorly, becoming compressed posteriorly on tail. Depth 16.6 to 18.7 in total length, 2.93 to 3.1 in head. Lateral line well developed, origin on side of nape midway between eye and gill-opening, arching upward over gill-chamber and pectoral base, thence gradually descending to mid-line of sides and continuing almost to tip of tail. About 116 pores in its length, 51 pores to opposite vent.

Anterior nostrils tubular, directed downward, placed just above edge of upper lip near tip of snout. Posterior nostrils large, elliptical pores with slightly raised rims, placed before eye at its mid-depth. A small, round pore with a slightly raised rim directly above the posterior nostril, but their edges not in contact. Mouth moderate, end of maxillary reaching to or slightly past anterior edge of pupil, 3.7 to 3.9 in head. Snout projecting slightly beyond tip of mandible, bluntly pointed, equal to or slightly shorter than eye, 4.75 to 5.1 in head. Interorbital narrow.

Upper lip with a narrow flange, its free edge upturned against the side of the snout. Anterior end of flange at a pore behind the base of the anterior nostril, and extending posteriorly to rictus of jaws. Labial canal present, its inferior, superior, and interior surfaces bony, external surface covered by skin only. The inferior edge of labial canal expanded into a thin, broad, shield or platelike flange, extending downward and outward toward the oral edge of the upper lip. Pointed bony processes extending outward from the inferior edge of the labial canal entirely absent.

Two enlarged pores with heavy rims between the anterior nostrils. A large pore behind base of each anterior nostril, its rim expanded into two lips; dorsal lip small, ventral lip large and folded one over the other partly closing the opening. A series of small pores along labial canal, and continuing upward around posterior edge of eye. Anterior pore of this series beneath posterior nostril. Series of seven pores on each side of lower jaw and throat. A small pore behind rictus of jaws.

Maxillary teeth in a narrow band of small, close-set, pointed teeth anteriorly, becoming narrowed laterally. Maxillary band united with the somewhat enlarged, slightly recurved, depressible premaxillary teeth

anteriorly and closely approaching the vomerine teeth at the head of the shaft of the vomer. Vomerine teeth separated from premaxillary teeth by a narrow semicircular interspace. Vomerine band an elongate triangle; the teeth small, pointed, close set anteriorly, narrowing to a single row of bluntly conical teeth posteriorly. Premaxillary teeth arranged in a semicircular patch around tip of upper jaw, and partly exposed when mouth is tightly closed.

Color in alcohol ochraceous buff, the ventral surface lighter. Basal two-thirds of dorsal and anal fins pale, distal third of fins brown, becoming more intense posteriorly. Head body color, shaded with darker on interorbital and dorsal aspect of snout.

### Genus *RHYNCHOCYMBA* Jordan and Hubbs

*Rhynchocymba* Jordan and Hubbs, 1925, pp. 192 and 195 (type by original designation *Leptocephalus nystromi* Jordan and Snyder).

*Rhynchoconger* Jordan and Hubbs, 1925, pp. 192 and 196 (type by original designation *Leptocephalus ectenurus* Jordan and Richardson).

*Pseudoxenomystax* Breder, 1927, p. 6 (type by original designation *P. dubius* Breder).

Body elongate, head and trunk subcylindrical, becoming compressed posteriorly on tail. Tail much longer than head and trunk. Head large, subequal to trunk. Dorsal origin behind pectoral base, confluent with anal around tip of tail. Pectoral fins well developed, ventral fins absent. Snout projecting moderately beyond premaxillary teeth. Anterior nostrils tubular, directed downward, placed near tip of snout, close to lateral edge of lower surface. Posterior nostrils with a thickened rim, placed before eye at its mid-depth.

Maxillary, premaxillary, and vomerine teeth closely united at the tip of the upper jaw. Premaxillary teeth largely exposed when mouth is tightly closed. Vomerine teeth in an elongate band of small, pointed, close-set teeth anteriorly, becoming more widely spaced and conical posteriorly. Maxillary and mandibular teeth in narrow bands of small, pointed, close-set teeth. Labial canal present, its inferior edge with three pointed, bony processes extending downward into oral edge of upper lip. Two enlarged pores between anterior nostrils.

Although it is impossible at the present time to determine the exact generic relationships of the genus *Rhynchocymba*, one can indicate its probable affinities. The genus *Rhynchocymba* was erected by Jordan and

Hubbs (1925) for the Japanese Congrid, *Leptocephalus nystromi* Jordan and Snyder. The holotype of the genotypic species is in the collections of the Natural History Museum of Stanford University, (Stanford 6469), where it and three small paratypes of the species (Stanford 6969) were examined by the author. The validity of the genus was questioned by Parr (1932), when he provisionally placed it in the list of *genera inquirenda* of the genus *Ariosoma*. Although Reid (1934) mentions that he examined several Japanese genera, which according to Jordan and Hubbs were distinct, he did not attempt to determine their systematic position. In Reid's key the genus *Rhynchocymba* may be easily distinguished from *Ariosoma*, as the former does not possess the upturned labial flange with a free superior border characteristic of *Ariosoma*. Neither can *Rhynchocymba* be allocated to any of the other genera included in Reid's key.

Re-examination of the holotype of *nystromi* reveals several differences between the specimen and the original generic description. Originally described as without pores between the anterior nostrils, careful manipulation of the folded skin with a needle reveals the presence of two enlarged pores similar to those described for *Rhynchoconger*. The posterior nostrils were described as horizontal slits with entire edges; actually they are elliptical pores with raised rims that are very slightly fimbriate along the inner edge. In the three paratypes of *nystromi* studied, the posterior nostrils varied from a horizontal slit to an ovate pore with the raised rim having entire edges. Nor is the pocket, found on the anteroventral surface of the snout of the holotype, present in any of the three paratypes. The use of features so variable in character should be abandoned in favor of more stable features. It may also be doubted if such characters are of sufficient importance to be of generic rank.

Agreeing fully with Parr's statement that the arrangement of the tooth bands is a matter of personal judgment and interpretation, the author's analysis of the tooth bands of *Rhynchocymba* differs greatly from that of Jordan and Hubbs (1925, p. 191). Repeated re-examination of the available specimens of *Rhynchocymba nystromi* over a period of time shows that the anterior ends of the maxillary tooth bands do not separate the premaxillary-vomerine teeth, but instead are widely separated by the continuous premaxillary-vomerine teeth. Pressure applied anteriorly to the inner side of the maxillary bone forces the anterior end of the maxillary band away from its close contact with the premaxillary-vomerine teeth and reveals that the maxillary teeth end at that point.

Unless clearly evident interspaces occur between the tooth bands, or there are distinct and easily recognizable differences between the teeth of the various bands, it seems preferable to consider these closely united anterior teeth as a single unit and to abandon the unavoidable inconsistency of personal interpretation and judgment.

*Rhynchoconger* is almost certainly a synonym of *Rhynchocymba*. The principal differences between the two genera, according to Jordan and Hubbs (1925, p. 191), are the widely separated maxillary bands, a longer premaxillary patch of teeth, and a pair of enlarged pores between the anterior nostrils of *Rhynchoconger*. As already indicated, the premaxillary-vomerine teeth of *Rhynchocymba* are not divided by the anterior ends of the maxillary bands as formerly supposed, but are continuous. The maxillary bands are widely separated by the continuous premaxillary-vomerine teeth and are closely appressed to the sides of this band. The writer, for reasons already given, prefers to consider the anterior maxillary teeth of both of these genera as a single unit of closely united teeth, similar, if not identical, in structure. Contrary to the original generic description of *Rhynchocymba*, a pair of enlarged pores are present between the anterior nostrils and seem to be similar to those of *Rhynchoconger*. Differences in the length of the premaxillary patch of teeth would seem to be of specific rather than generic value. Two minor characters, the shape of the posterior nostrils and the presence of a keel or a pocket on the anteroventral surface of the snout, have already been discussed and, even if proved to be consistent in shape and structure, can hardly be considered of sufficient importance to be of generic rank. It is interesting to note that, in the new species of *Rhynchocymba* described in this paper, the ventral surface of the snout has a very shallow fold or pocket, which by careful manipulation of a needle can be raised into a so-called "fleshy keel." It is evident that the various stresses imposed upon the loose skin of the snout during the process of preservation play an important part in determining the structure of this character, as well as the shape of the posterior nostrils.

Erroneously placed in the family Muraenesocidae by Breder (1927, p. 6), *Pseudoxenomystax* was referred by Parr (1932) to the list of genera *inquirenda* of the Congrid genus *Ariosoma*. In 1934 Reid removed it from this genus and placed it in synonymy with *Congrina*, basing his decision upon a study of the original figure and description, and especially upon Parr's remarks concerning the genus. How Reid reached this conclusion is not clear to the present author, for the characters used by him in

his generic analysis of *Congrina* will not admit *Pseudoxenomystax*. Among the characters listed by Reid for the genus *Congrina* is the following, "vomerine teeth never widened but always narrowed posteriorly and *distinctly separated from the premaxillary patch.*"<sup>1</sup> Parr in his brief diagnosis of the premaxillary-vomerine teeth of *Pseudoxenomystax* makes the following statement, "the two patches in somewhat constricted contact with each other, thus separating the maxillary bands of the two sides." The difference in this character alone would preclude any similarity between the two genera.

Further evidence, while not conclusive, of the difference between these two genera is found in the shape of the vomerine band of teeth. In *Congrina* the vomerine teeth are apparently confined closely to the head of the shaft of the vomer, while in *Pseudoxenomystax* the vomerine teeth extend backward in an elongate band. Also, in *Congrina* the anterior nostrils are placed well above the edge of the upper lip, and in *Pseudoxenomystax* close to the edge.

Except that the rim of the posterior nostril was entire and the fleshy keel on the ventral surface of the snout did not end in a free process, Parr found that *Pseudoxenomystax* agreed with the Japanese genus *Rhynchoconger*. These minor characters of questionable stability, unsupported by more important characters, do not seem sufficient to warrant the separation of these two genera at the present time. Since without doubt *Rhynchoconger* is a synonym of *Rhynchocymba*, it follows that *Pseudoxenomystax* must also be a synonym of that genus. Additional evidence of the similarity among the three genera is shown in the structure and arrangement of the vomerine teeth and the relationship between the gill-openings and the pectoral base. In all three genera the vomerine teeth are small, close set, pointed anteriorly becoming few, widely spaced and bluntly conical posteriorly, and are arranged in an elongate, posteriorly pointed band. The gill-openings lie mostly below the lower end of the pectoral base in all three of the genera.

### ***Rhynchocymba catalinensis*, new species**

Plate 26, figs. 1-3

*Holotype*.—AHF no. 871.

*Type locality*.—White Cove, Santa Catalina Island, Los Angeles County, California, hand-line fishing in 5 fms from *Velero III*, 9 p.m., August 2, 1941.

<sup>1</sup> Italics author's.

*Measurements of holotype in mm.*—Total length 286, head and trunk 106, tail 180, head 48, snout 13.1, eye 9, cleft of mouth 15, depth 19, pectoral length 17, width of gill-opening 6.1, isthmus 14.5, bony inter-orbital 2.

*Diagnosis.*—Head and trunk 1.68 in tail, 2.7 in total length. Tail much longer than head and trunk, 1.59 total length. Depth 15.1 in total length. Head 1.2 in trunk, 5.95 in total length. Eye 1.45 in snout, 5.3 in head, mouth 3.2, snout 3.67. Dorsal origin slightly behind lower edge of pectoral base. Pectoral 2.82 in head. Maxillary, premaxillary, and vomerine teeth closely united at front of upper jaw.

*Description.*—Body elongate, subcylindrical anteriorly, becoming compressed posteriorly on tail. Dorsal and ventral outlines gradually tapering to bluntly rounded tail. Tail much longer than head and trunk, 1.59 in total length. Head 1.2 in trunk, 5.95 in total length. Eyes moderate, 1.45 in snout, 5.3 in head. Gape of mouth moderate, reaching to a vertical from anterior edge of pupil, 3.2 in head. Snout 3.67 in head, projecting moderately beyond tip of lower jaw. Dorsal origin slightly behind lower edge of pectoral base, confluent with anal around tip of tail. Low anteriorly, becoming higher posteriorly. Anal fin similar to dorsal. Pectoral fins well developed, 2.82 in head; ventral fins absent. Gill-openings low on sides, their free edges deeply curved anteriorly, obliquely placed. Pectoral base entirely above upper end of gill-opening. Anterior nostrils tubular, directed downward, placed near lateral edge of ventral surface of snout, close to premaxillary teeth. Posterior nostrils ovate pores with raised rims, placed before the eye at its mid-depth. Anteroventral surface of snout with an elongate, shallow groove on its mid-line.

Edge of upper lip not developed into an upturned flange. Lower lip with a small, evenly rounded flange. Labial canal present, beginning anteriorly at rostral cavity and extending backward above the edge of the upper lip to beneath the eye and upward around its posterior edge. Superior, inferior, and interior surfaces of canal bony, external surface covered by skin only. Inferior edge of canal with three small, pointed, bony processes extending downward into membrane of upper lip. Rostral cavity divided into two parts by a median septum, each half opening to the outside by one of the two enlarged pores between anterior nostrils. On each side, close to dorsal mid-line and opening into rostral cavity anteriorly, a small muciferous canal extends backward over upper surface of snout to behind eyes. Three round pores with slightly raised rims along the edge of the upper lip. Two small pores placed one above the other before each anterior nostril at tip of snout. A large, elongate pore,

the external opening of the rostral cavity, lies above and slightly before anterior nostril of each side. A series of nine pores on each side of ventral surface of lower jaw. Two small pores behind posterior edge of eye. Three widely spaced pores along each side of dorsal mid-line of snout and interorbital.

Lateral line complete, origin on mid-line of nape midway between eye and gill-opening. Descends abruptly to side of nape, thence bending sharply backward and arching slightly over gill-chamber and pectoral base and descending to mid-line of sides, continuing to tip of tail. Pores in its length 132, 33 pores from origin to above vent, dorsal origin above 10th pore. From upper and lower edges of lateral line short, posteriorly curved branches extend dorsally and ventrally. These branches occur opposite one another at approximately the center of interspaces between lateral line pores. Lying close to base of dorsal fin on each side and extending backward from a vertical through lower edge of pectoral base, a thin, pale line extends posteriorly almost to tip of tail. This line, though smaller and without external pores, is similar in appearance to lateral line and, while its function is not understood, it may be associated with that system. From its ventral edge numerous short branches curve backward and downward.

Maxillary teeth in a wide band of small, pointed, close-set teeth anteriorly, narrowing laterally to two irregular rows. Maxillary teeth closely united anteriorly to sides of the continuous premaxillary-vomerine teeth. Premaxillary teeth slightly enlarged anteriorly, almost entirely visible from directly below when mouth is tightly closed, and in slightly constricted contact with the vomerine teeth. Vomerine teeth in an elongate band of small, pointed, close-set teeth anteriorly, becoming bluntly conical and widely spaced posteriorly. Mandibular teeth similar to maxillary teeth, band narrowed to a single row laterally; not united across symphysis of lower jaw.

Color in alcohol brownish gray dorsally, becoming lighter ventrally before vent. Caudal region uniformly colored. Lateral line lighter than body color; dorsal branches dark, ventral branches pale. Dorsal fin body color, becoming darker posteriorly, blackish at tip of tail. Anal fin similar to dorsal. Pectoral fin colorless. Dorsal aspect of nape darker than body, this color extending downward over gill-covers as a narrow, anteriorly pointed crescent. Opercular area included with the crescent pale. Interorbital dark, snout lighter.

*Rhynchocymba catalinensis* may be distinguished from *R. dubius* by a longer, more tapering vomerine band of teeth, narrower maxillary tooth bands, dorsal fin inserted much closer to center of eye than to vent, longer



pectoral fin, and longer snout. From *R. nystromi* it differs in having a longer, more pointed vomerine band of teeth, smaller mouth, shorter eye, less projecting snout, and a more anteriorly inserted dorsal. From *R. ectenurus*, *catalinensis* differs in having a more posteriorly inserted dorsal fin, shorter head and trunk, heavier less tapering tail, and a shorter snout.

## Heterocongridae

Genus **TAENIOCONGER** Herre

*Taenioconger* Herre, 1923, p. 152 (type by original designation *T. chapmani* Herre).

Body greatly elongate, subcylindrical anteriorly, becoming compressed posteriorly on tail. Tail from nearly twice to more than twice length of head and trunk. Vent far behind gill-openings. Dorsal confluent with anal around tip of tail. Dorsal origin over or slightly behind gill-opening. Pectoral fins present, minute, ventral fins absent. Mouth oblique, lower jaw projecting. Teeth on vomer and jaws in narrow bands of small, pointed, close-set teeth. Tongue free. Gill-openings small, lateral.

Whether or not the nostrils are paired in this genus is not definitely known. The generic description was made from a single specimen in which the snout was badly damaged and the presence or absence of anterior nostrils could not be determined. In 1923 Pellegrin described the anterior nostrils of *T. digueti* as tubular, situated on the lip at the tip of the snout, near the median line, and close to the one of the opposite side. The specimen of *T. herrei* described here, while small, is large enough to easily distinguish the posterior nostrils and pores on the head, but a most careful examination fails to reveal the presence of anterior nostrils.

### ***Taenioconger herrei***, new species

Plate 27, figs. 1-3

*Holotype*.—AHF no. 904.

*Type locality*.—Station 516-36, San Francisco Island, Gulf of California, Mexico, dredged 125-150 fms, February 25, 1936.

*Measurements of holotype in mm.*—Total length 144.5, head and trunk 54, tail 90.5, head 12, eye 2.9, snout 1.15, gape of mouth 2.9, depth 3.1, gill-opening 0.9, pectoral length 1.

*Diagnosis*.—Body very elongate, tail much longer than head and trunk, 1.6 in total length. Dorsal origin over pectoral base, confluent with anal around tip of tail. Minute pectoral fins present. Lateral line

present, complete. Head and trunk 2.68 in total length, 1.68 in tail. Head 4.5 in head and trunk, 12 in total length, 7.5 in tail. Depth 46.8 in total length, 3.9 in head. Snout 7.5 in head, eye 4.5, mouth 4.5.

*Description.*—Body very elongate, slender, subcylindrical anteriorly, becoming compressed posteriorly on tail. Tail much longer than head and trunk, which is 1.68. Head and trunk 2.68 in total length, tail 1.6. Head 4.5 in head and trunk, 12 in total length, 7.5 in tail. Snout short, 10.5 in head, eye 4.5. Depth 46.8 in total length, 3.9 in head. Pectoral length 12 in head.

Dorsal origin over upper edge of pectoral base, confluent with anal around tip of tail. Anal origin immediately behind vent, similar to dorsal. Pectoral fins present, minute, of more than twenty rays, their outer edges rounded. Ventral fins absent. Gill-openings small, lateral. Gill-cover and gular region somewhat expanded, with many longitudinal folds. Lateral line well developed anteriorly, less distinctly so posteriorly. Origin on side of nape before gill-opening. Anterior pores close together, each faintly outlined in white; posterior pores body color and more widely spaced. Two pores on each side beneath outer edge of lower jaw; anterior pore at mid-length of jaw, posterior pore below rictus of jaws. Two pores on each side of dorsal mid-line of snout, a small pore lying just below anterior pore of each side.

Head long, bluntly rounded anteriorly. Mouth oblique, lower jaw projecting. Gape moderate, extending slightly past anterior edge of eye, 4.5 in head. Nostril an ovate pore at the anterodorsal edge of the eye. Anterior nostrils not evident, if present. Maxillary teeth in narrow bands of small, close-set, pointed teeth anteriorly, tapering to a single row posteriorly. Anterior ends of maxillary bands widely separated by vomerine teeth. Each maxillary band separated from vomerine teeth by a narrow interspace. Posterior maxillary teeth lie outside the mandibular teeth when the mouth is tightly closed, and are exposed. Vomerine teeth in an elongate band of small, pointed, close-set teeth anteriorly, extending backward in two irregular rows of slightly larger, more bluntly pointed teeth. Mandibular teeth similar to maxillary teeth, bands separated by a distinct interspace at symphysis of lower jaw.

Color in alcohol light brown, lighter ventrally on head and trunk. Dorsal and anal fins pale. Pectoral fins and gill-openings dark blackish brown. Posterior third of lower lip dark brown. Anterior pores of lateral line faintly outlined in white.

*Taenioconger herrei* is the third known species of this genus and the second species known from the Gulf of California. It differs from *T. digueti* in the placement of the tooth bands, which in *digueti* are completely and evenly united across the symphysis of both the upper and lower jaws. Anterior nostrils are not evident in *herrei*, the head is much longer, the body deeper, tail shorter, and the color pattern different. The bands of teeth are narrower in *herrei* and there are more pectoral rays. This species differs from *T. chapmani* in having a much shorter tail, longer head, larger mouth, and shorter snout. The head pores do not seem to be so numerous in *herrei* as in *chapmani*, the vomerine teeth seem to be less numerous and not so enlarged, and the color pattern differs.

This species is named for Dr. Albert W. Herre, of the Natural History Museum of Stanford University, who first described this genus.

## Echelidae

See Myers and Storey (1939, p. 156) for remarks on the classification of this family.

Further proof of Myers and Storey's contention that the Echelid genus *Ahlia* is not a synonym of *Myrophis*, as suggested by Parr (1930, p. 8) and also by Hildebrand (1941, p. 17), is shown by an examination of ten specimens (164-273 mm) of the genus *Ahlia* (uncatalogued) from the southern Caribbean and in the collections of the Allan Hancock Foundation. As reported by Myers and Storey, no vomerine teeth are present and the maxillary teeth are uniserial. Parr's suggestion that the vomerine teeth of the type of *Ahlia* may have been lost during growth is not borne out by this examination of additional specimens of the genus. Also, an examination of several specimens of the genus *Myrophis* (uncatalogued) from the Gulf of California shows that both the maxillary and vomerine teeth are in narrow bands.

## PSEUDOMYROPHIS, new genus

Genotype.—*Pseudomyrophis micropinna*, new species.

Body elongate, vermiform; subcylindrical anteriorly, becoming compressed posteriorly on tail. Tail much longer than head and trunk. Dorsal origin midway between gill-openings and vent; poorly developed anteriorly, becoming more elevated posteriorly, and confluent with anal around tip of tail. Anal fin well developed. Pectoral fins present, very minute. Ventral fins absent.

Head bluntly pointed, snout projecting beyond mouth. Anterior nostrils tubular, directed downward, near tip of snout. Posterior nostrils large, elongate pores, placed before the eye and above edge of upper lip. Branchial region swollen, jugostegalia present. Teeth in jaws small, pointed, slightly recurved, and in a single row. Premaxillary teeth in a small, ovate patch of five or six small, pointed teeth. Vomerine teeth in a single row. Lateral line present; well developed anteriorly, less so posteriorly and lying in a groove.

The author is hesitant in adding a new genus to the family Echelidae, but the two specimens at hand conform most closely to the accepted definition of this family, and cannot be assigned to any of the known genera. *Pseudomyrophis* differs from all other Echelid genera in having the posterior nostrils placed well above the edge of the upper lip, and not covered by a protective flap of membrane. From *Myrophis* it differs, in addition to the above character, in having uniserial vomerine and jaw teeth, and in the smaller pectoral fins. From *Ahlia* it differs in having vomerine teeth, a more anteriorly inserted dorsal fin, smaller pectoral fins, and differently placed posterior nostrils. From other Echelid genera this new genus differs still more greatly.

### ***Pseudomyrophis micropinna*, new species**

Plate 28, figs. 1-3

*Holotype*.—AHF no. 905.

*Type locality*.—Station 943-39, three miles south of Isla Ladronez, Gulf of Chiriqui, Panama, dredged in 54 fms, green mud bottom, March 27, 1939.

*Paratype*.—AHF no. 906, 1 specimen, 124 mm, same locality as holotype.

*Measurements of holotype in mm.*—Total length 139, depth 4.2, head and trunk 48.6, tail 90.4, head 15, snout 2.5, eye 1, gape of mouth 3.6, isthmus 1.8, gill-opening 1.95.

*Diagnosis*.—Body elongate, wormlike, depth 31.4 to 33.1 in total length. Tail much longer than head and trunk, 1.54 to 1.57 in total length. Head long, bluntly pointed, 8.85 to 9.25 in total length. Eyes small, 14 to 15 in head. Dorsal origin midway between gill-opening and vent. Pectoral fins minute. Posterior nostrils an elongate pore before eye and above edge of upper lip. Jaw teeth uniserial, premaxillary teeth in a small, ovate patch; vomerine teeth uniserial. Lateral line present, complete. Uniform light yellowish buff in color.

*Description.*—Body elongate, wormlike, subcylindrical anteriorly, becoming somewhat compressed posteriorly on tail. Greatest depth 31.4 to 33.1 in total length, 3.55 to 3.58 in head. Tail much longer than head and trunk, 1.54 to 1.57 in total length, head and trunk 1.75 to 1.85 in tail. Head long, bluntly pointed, 8.85 to 9.25 in total length, 2.21 to 2.24 in trunk. Snout short, projecting beyond tip of lower jaw, 6 to 6.7 in head. Eyes small, lateral, 14 to 15 in head, 2.1 to 2.5 in snout. Much nearer rictus of jaws than tip of snout. Gape of mouth extending diameter of eye behind its posterior edge, 3.95 to 4.16 in head.

Dorsal origin midway between vent and gill-opening. Low and poorly developed anteriorly, becoming higher posteriorly on tail and lying in a slight groove. Confluent with anal around tip of tail. Anal fin well developed, origin immediately behind vent. Pectoral fins present, minute, more than 18 pectoral rays, pectoral length equal to diameter of eye, distal edge of fin rounded. Ventral fins absent.

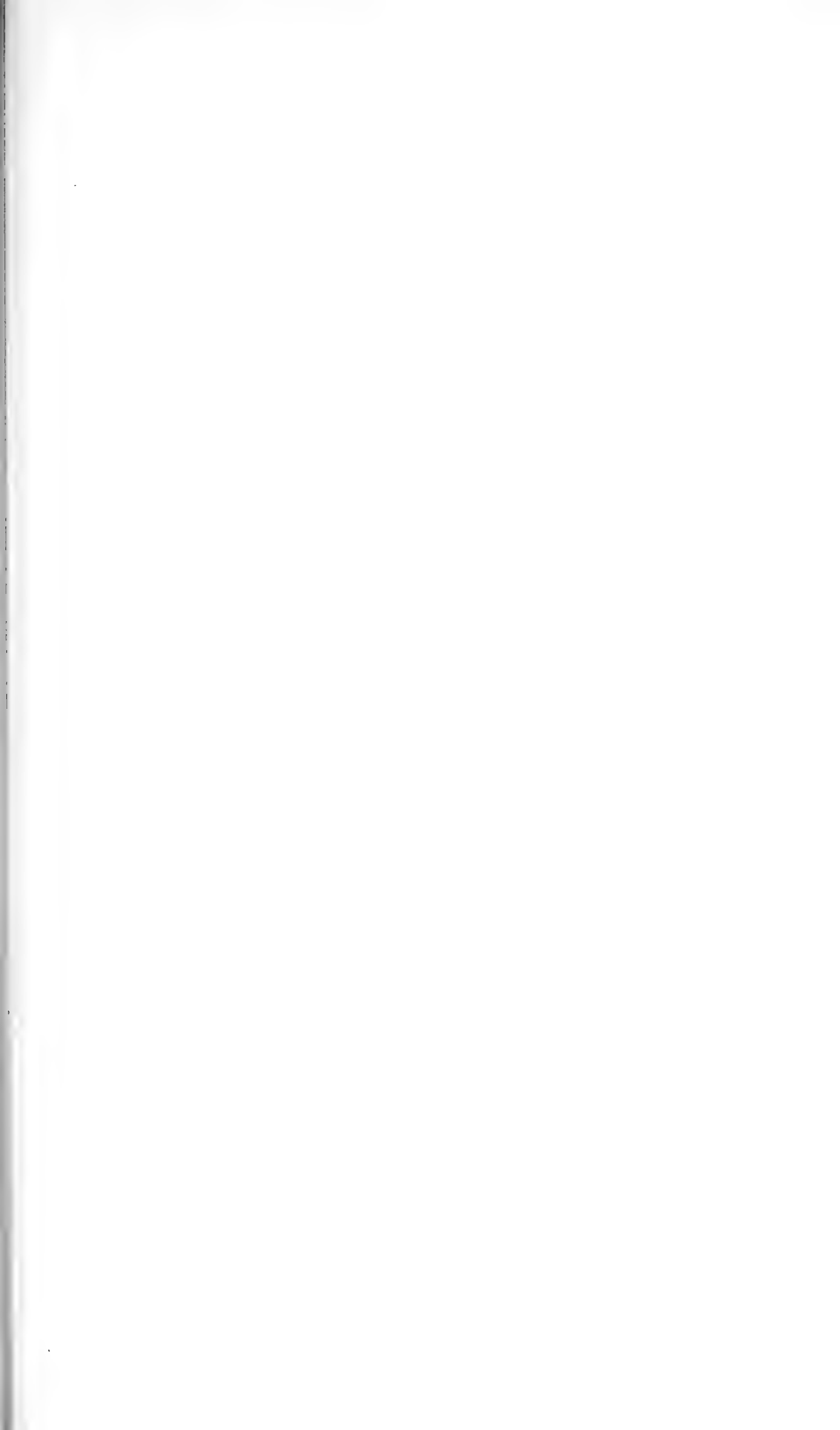
Anterior nostrils tubular, directed downward, placed on snout above symphysis of lower jaw. Posterior nostrils an elongate pore lying above edge of upper lip and before anterior edge of eye. Snout and interorbital with many small, bluntly rounded papillae. Gill-openings low on sides, slightly oblique. Upper end of gill-opening joined to upper joint of pectoral base. Branchial region expanded, jugostegalia present in a typical cross-hatched pattern.

Maxillary, mandibular, and vomerine teeth uniserial. All teeth small, pointed, close-set, and slightly recurved, slightly larger and more widely spaced anteriorly. Premaxillary teeth in a small, ovate cluster at symphysis of upper jaw. Lateral line present, complete, well developed anteriorly, more faintly developed posteriorly and lying in a groove. Continued forward above gill-opening; arching above gill-chamber, closely approaching dorsal mid-line, and continuing forward above eye to tip of snout. Short branches unite the lateral lines of the two sides across the nape and behind the posterior edge of the eye. A ventral branch from the nape extends downward and forward along the edge of the lower jaw. Another branch extends downward around the posterior border of the eye and forward along the edge of the upper jaw.

Color in alcohol a uniform light yellowish buff.

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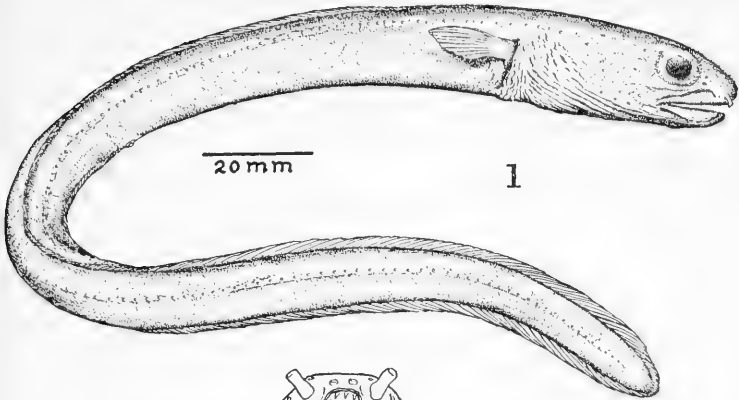


## PLATE 24

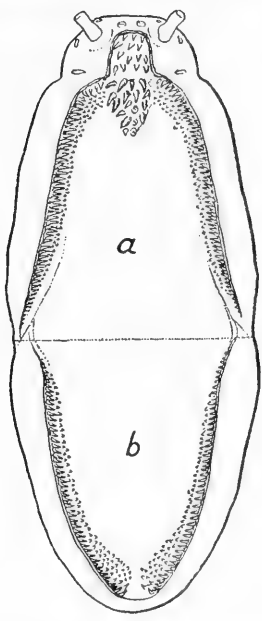
*Chiloconger similis*, new species

1. Lateral view.
2. Teeth arrangement.
  - a. Upper jaw x4.
  - b. Lower jaw x4.
3. Lateral view of head x2.

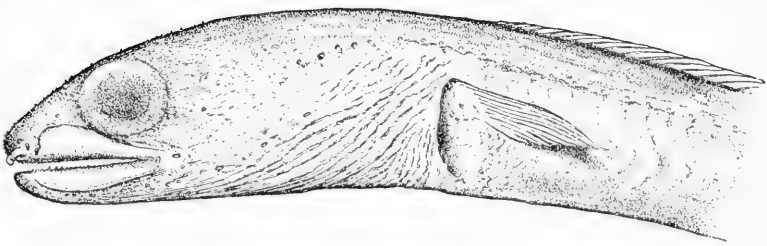




1



2



3

## PLATE 25

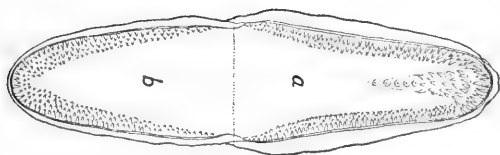
*Thyreconger hemiaspidus*, new species

1. Lateral view x2.
2. Lateral view of head x4.
3. Teeth arrangement.
  - a. Upper jaw.
  - b. Lower jaw x8.



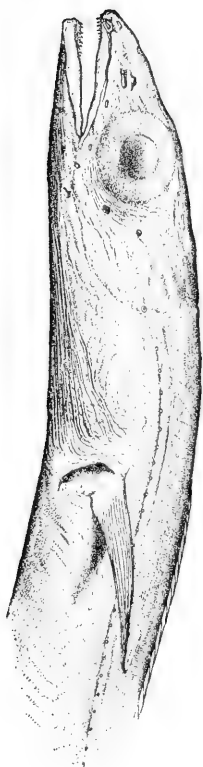
1

10 mm



2 mm

3



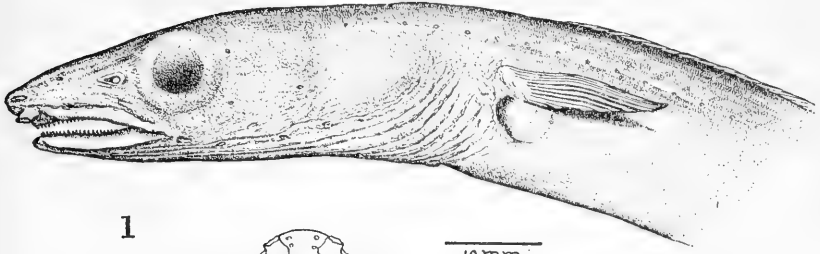
2

5 mm

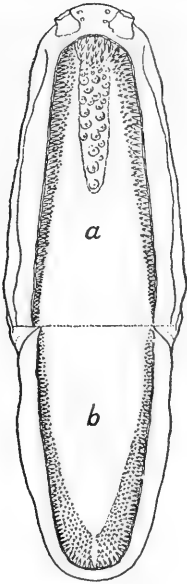
## PLATE 26

*Rhynchocymba catalinensis*, new species

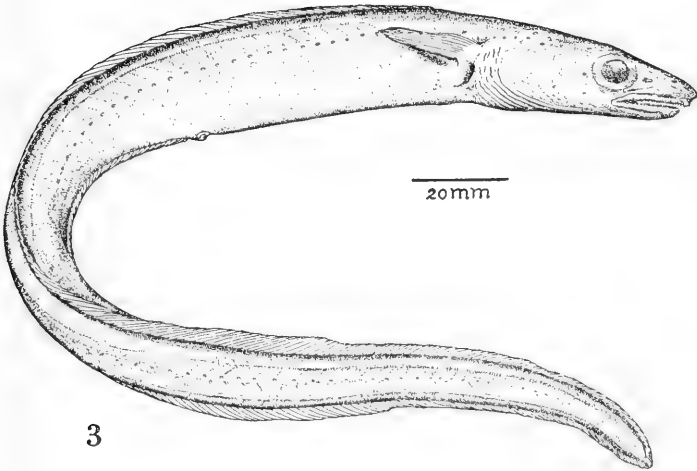
1. Side view of head.
2. Dentition of jaws.
  - a. Upper jaw.
  - b. Lower jaw.
3. Side view.



1



2

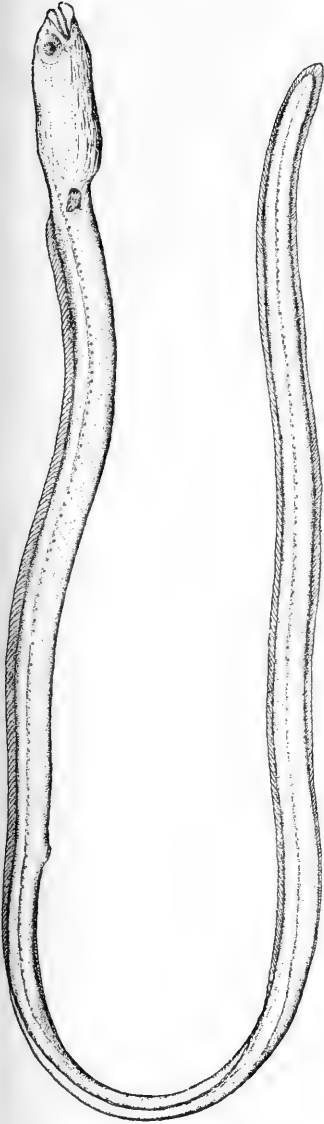


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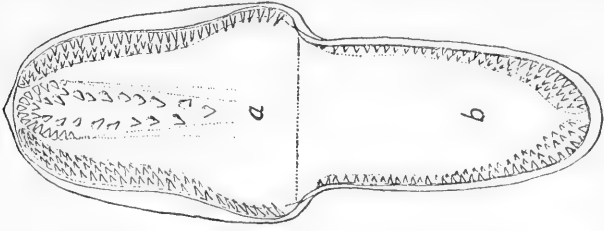
## PLATE 27

*Taenioconger herrei*, new species

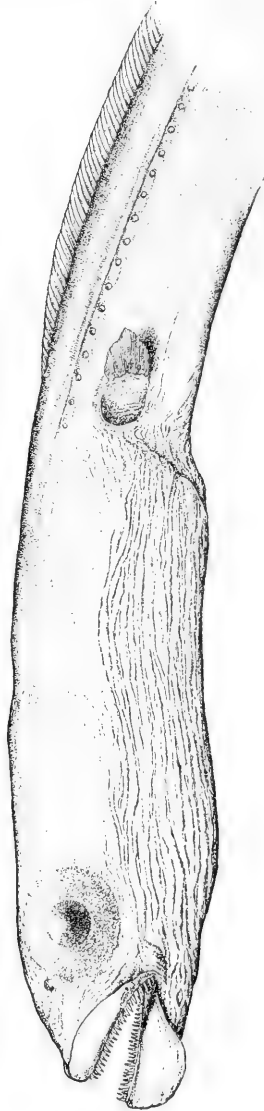
1. Lateral view x3.
2. Lateral view of head x11.
3. Teeth arrangement.
  - a. Upper jaw.
  - b. Lower jaw x24.



1



3



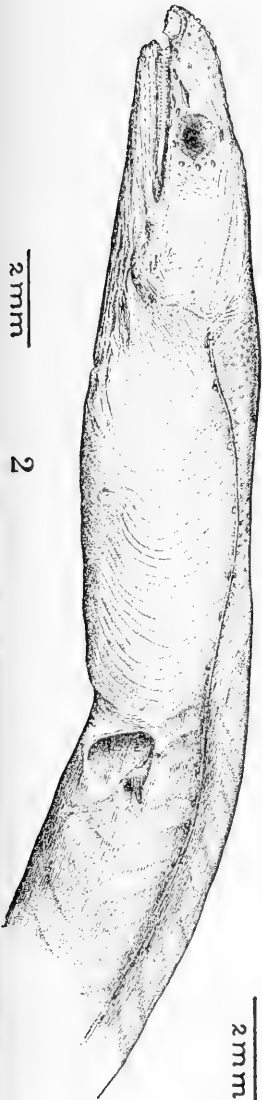
2

## PLATE 28

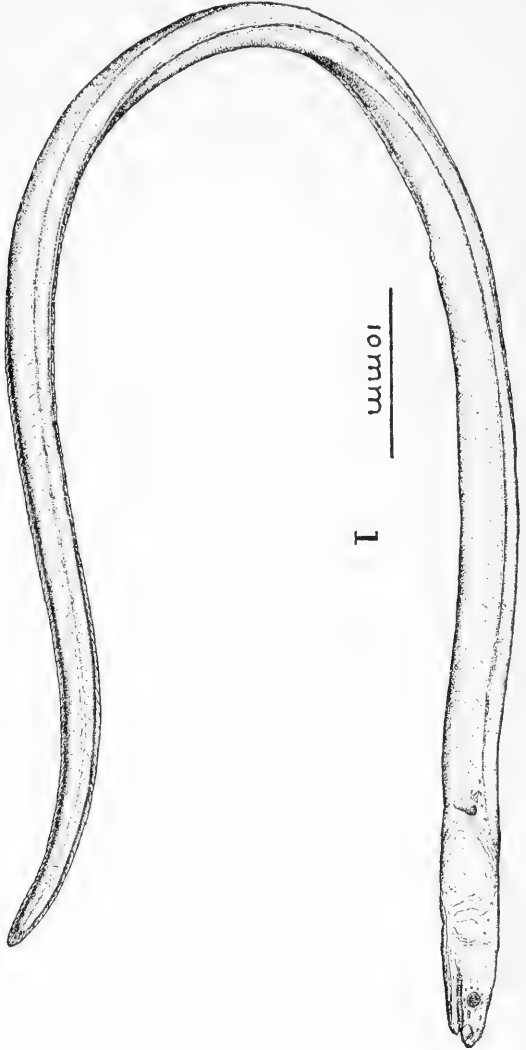
*Pseudomyrophis micropinna*, new species

1. Lateral view x3.
2. Lateral view of head x9.
3. Teeth arrangement.
  - a. Upper jaw.
  - b. Lower jaw.

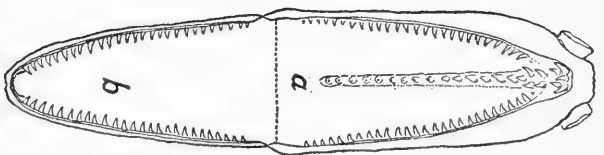




2



1



3



REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
AND GALAPOGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935,  
IN 1936, IN 1937, IN 1938, IN 1939, AND IN 1940.

NEW FISHES IN THE COLLECTIONS OF THE  
ALLAN HANCOCK FOUNDATION

(PLATES 29-32)

*By* CHARLES B. WADE

THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS

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LOS ANGELES, CALIFORNIA

# NEW FISHES IN THE COLLECTIONS OF THE ALLAN HANCOCK FOUNDATION

(PLATES 29-32)

CHARLES B. WADE  
*Allan Hancock Foundation*  
*The University of Southern California*

As a result of the scientific explorations of the Hancock Pacific Expeditions' motor cruiser *Vclero III* in Eastern Pacific waters and eastward along the north coast of South America as far as the island of Trinidad, considerable collections of fishes have been acquired. These fishes have been deposited in the collections of the Allan Hancock Foundation at The University of Southern California, Los Angeles, California. This paper is one of a series describing the new forms found while incorporating these fishes into the collections of the Foundation. From time to time, as new species are discovered, additional papers describing them will be published.

The following species are described in this paper as new to science: *Kathetostoma ornatus*, *Gobiosoma spiriti-sancti*, *Parrella ginsburgi*, and *Anthias gordensis*. All holotypes and the several paratypes are deposited in the collections of the Allan Hancock Foundation.

The author wishes to take this opportunity to thank Dr. George S. Myers, Natural History Museum, Stanford University, for his suggestions in preparing this paper. The drawings were made by Mr. Anker Petersen, staff artist, of the Allan Hancock Foundation.

## Uranoscopidae

Genus **KATHETOSTOMA** Günther

*Kathetostoma* Günther, 1860, p. 231 (type by monotype *Uranoscofus laeve* Bloch and Schneider).

Body short and robust, head large. Dorsal fin single, without spines. Ventral fins jugular, I, 5, not adnate to the abdomen. Pectoral rays branched. Some of the head bones armed with spines. Body entirely naked. Cleft mouth vertical or nearly so. Pseudobranchiae present. Branchiostegal rays 6. Air bladder absent.

**Kathetostoma ornatus**, new species

Plate 29

*Holotype*.—AHF no. 918.

*Type locality*.—Station 1119-40, 5 miles south of San Benito Islands, Lower California, Mexico, dredged in 87 fms, on sand bottom, February 19, 1940.

*Paratype*.—AHF no. 919. 1 specimen, 72 mm, same locality as holotype.

*Measurements of holotype in mm.*—Total length 113, standard length 90.5, depth 28.6, body width behind pectoral base 24, head 35, head width at preopercle 32, cheek depth 15, eye 7, interorbital 9.5, snout 6, width between bases of humeral spines 23.9, maxillary 17, length of premaxillary groove 7, width of premaxillary groove 5.5, predorsal length 48, dorsal base 33, dorsal height 17.2, anal base 28.5, pectoral length 27, ventral length 20.

*Diagnosis*.—Dorsal 15 or 16, spinous dorsal absent. Anal 13 or 14, pectorals 20 or 21, ventrals I, 5, caudal 20 or 21. Depth 3.17 to 3.28 in standard length, head 2.66 to 2.96. Predorsal length 1.85 to 1.96 in standard length. Maxillary 1.81 to 2.06 in head, eye 5 to 5.1, interorbital 3.65 to 3.9, snout 5.83 to 6.02.

*Description*.—Body heavy, robust, and depressed anteriorly, tapering rapidly to the slender, slightly compressed caudal peduncle. Dorsal and ventral outlines bluntly rounded anteriorly. Depth 3.17 to 3.28 in standard length. Head large, 2.66 to 2.96 in standard length; broadly flattened dorsally, width at preopercle almost equal to its length.

Dorsal 15 or 16, origin slightly nearer caudal base than tip of snout. Dorsal spines absent. Predorsal length 1.85 to 1.96 in standard length. Greatest dorsal height more than depth of cheek. Anal 13 or 14, origin under third or fourth dorsal ray. Anal base shorter than dorsal base. Ventrals I, 5, inserted before pectoral base midway between eye and humeral spine. Two small, antrorse spines on breast before base of ventral fins. Caudal 20 or 21, edge of fin rounded. Pectoral rays branched, 20 or 21, fin broadly rounded.

Mouth large, vertical. Maxillary 1.81 to 2.06 in head, barely reaching a vertical from anterior edge of eye. End of maxillary widely expanded and not hidden under the edge of the preorbital. Premaxillaries slightly protractile; premaxillary groove longer than wide, equal to or almost equal to diameter of eye. End of groove extending to

slightly behind pupil of eye. Eye small, superior, 5 to 5.1 in head. Interorbital wide, concave, 3.65 to 3.9 in head. Snout short, horizontal, bluntly rounded anteriorly, 5.83 to 6.02 in head.

Maxillary teeth in two series; outer series of several irregular rows of small, pointed teeth, inner series a single row of enlarged, pointed teeth. Vomerine teeth in a single row of about 15 small, close-set, and recurved teeth. Palatine teeth 3 or 4 small, close-set, and bluntly pointed; separated from vomerine teeth by a wide interspace. Mandibular teeth in a narrow band at symphysis of lower jaw, tapering rapidly to a single row laterally. The teeth larger, more pointed and recurved than maxillary teeth. Oral edges of upper and lower lips with a fringe of small papillae. Nostrils paired, anterior nostrils tubular, with a small papilla-like tentacle on posterior edge of each tube. Posterior nostrils with slightly raised rims.

Humeral spine above upper end of gill-opening, anterior edge of spine prolonged anteriorly and slightly medianly in a bony ridge to edge of nape. Edge of preorbital with three small spines, directed downward and forward. End of mandible with a single, sharp, antrorse spine followed immediately by a bluntly rounded, bony projection. Preopercle with three spines below angle, directed downward and forward. Dorsal surface of head coarsely granular; granules single, or united into irregular patches or lines, sometimes united to form a reticulated pattern. Rows of small granulations radiate from central points on either side of the mid-line of the occipital region. Opercle and orbital bones with small, irregularly placed granulations. Edge of opercular membrane partly ciliated.

Body entirely naked, skin of predorsal area finely granulated or pitted. Lateral line complete, origin near base of humeral spine, curving slightly upward and extending backward along base of dorsal fin almost to caudal base, thence curving abruptly downward to mid-depth of caudal peduncle and extending outward on caudal fin for almost half of its length. Gill-openings wide, narrowly attached to isthmus anteriorly, posterior edge in a wide fold across isthmus. Pseudobranchiae present. Gills 4, a narrow slit behind last gill-arch. Gill-rakers present, small. Branchiostegal rays 6.

Color in alcohol medium brown to mid-line of sides, spotted and mottled with light grayish brown. Body light grayish brown ventrally, dusted with minute brown punctations. Head brown dorsally, becoming lighter laterally and ventrally. Lips and gular region dark brown.

Dorsal fin light buff, enclosing elongate, grayish areas close to base of fin. Anal fin colorless or faintly shaded with brown posteriorly. Caudal fin light, with two wide dark cross-bars. Ventral fins pale. Pectoral fins pale distally, somewhat darker basally, with traces of two or three obliquely curved bars. Base of humeral spines with a wide, black band.

*Kathetostoma ornatus* is most closely related to *K. averruncus* from the west coast of Colombia, South America, but differs from that species in the increased number of dorsal rays, more slender body, and narrower premaxillary groove and interorbital. The mandibular teeth of *ornatus* are mostly in a single series, while in *averruncus* they are in two series with the inner row enlarged. Also, the vomerine teeth are smaller and more abundant in *ornatus* and the palatine teeth are smaller; the snout in relation to the eye is longer, the dorsal base is longer than the anal base, and the distance between the humeral spines is equal to and not longer than the top of the head. The color pattern also differs somewhat in *ornatus*.

From *Kathetostoma albigutta* this new species differs by having fewer anal than dorsal rays, vomerine teeth not in a villiform band, more posteriorly inserted ventral fins, and numerous other characters. The fewer dorsal and anal rays, and the absence of bands of teeth on the vomer and palatines distinguish *K. ornatus* from *K. laeve*.

## Gobiidae

### Genus GOBIOSOMA Girard

*Gobiosoma* Girard, 1859, p. 169 (type by subsequent designation *Gobiosoma bosci* Lacépède=*G. molestum* Girard).

Dorsal VII—11 to 14, dorsal spines very seldom one more or less than seven. Anal 10 to 13; dorsal normally with two (sometimes three) more rays than anal (subgenus *Elacatinus* in equal number). First dorsal spine not prolonged (except in subgenus *Nes*, where the first dorsal spine of the male is greatly prolonged beyond the following spines). All pectoral rays connected by membrane. Ventral fins completely united, free from abdomen, interspinal membrane well developed. Caudal fin short, rounded or truncate.

Scales entirely absent or two ctenoid scales present at base of caudal fin. Teeth in jaws in bands, outer series of both jaws enlarged (except in lower jaw of subgenus *Elacatinus*). Inner series of lower jaw, and in



some species inner row of upper jaw, with enlarged teeth. Tongue entire or emarginate. Maxillary moderate, generally not extended behind posterior margin of eye. Barbel-like flap of skin before eye at inner edge of upper lip, more or less developed or absent. Mental frenum present, often scarcely perceptible in preserved specimens, sometimes bilobed. Cutaneous papillae present on head in transverse and longitudinal rows.

### **Gobiosoma spiriti-sancti**, new species

Plate 30

*Holotype*.—AHF no. 920.

*Type locality*.—Station 634-37, San Gabriel Bay, Espiritu Santo Island, Gulf of California, Mexico, shore collecting on rocky beach, March 6, 1937.

*Paratypes*.—AHF no. 921. Station 634-37, 3 specimens, 21-25 mm, same data as holotype.—AHF no. 922. Station 604-36, 1 specimen, 19.1 mm, San Gabriel Bay, Espiritu Santo Island, Gulf of California, Mexico, shore collecting, March 20, 1936.

*Measurements of holotype in mm*.—Standard length 22.5, total length 27.9, length of caudal fin 5.4, length of ventral disk 5, longest pectoral ray 6.5, depth 4.2, head 6.4, postorbital part of head 3.4, head depth directly behind eye 3.25, head width at same point 4.3, maxillary 2.74, eye 1.8, snout 1.35, predorsal length 8.7.

*Diagnosis*.—Dorsal VII—11 (12 in one paratype); anal 10 (11 in one paratype); pectorals 17 or 18. Depth 5 to 5.68 in standard length, head 3.38 to 4.1. Head width 5.4 to 5.9 in standard length, head depth 6.9 to 7. Snout 4.49 to 4.74 in head, eye 3.5 to 3.9, maxillary 2.3 to 2.5. Mental frenum bilobed, tongue broadly emarginate. Scales absent. Barbule-like flap of skin present on inner edge of upper lip before eye. A small barbule also present midway between lower edge of eye and maxillary.

*Description*.—Body moderately elongate, slightly compressed anteriorly, more strongly so posteriorly. Head depressed, broader than deep directly behind eye. Greatest body depth 5 to 5.68 in standard length (17 to 20% of standard length). Dorsal and ventral outlines bluntly rounded anteriorly. Dorsal outline sloping slightly upward from above eye to dorsal origin, thence curving slightly downward to caudal base. Ventral outline extending almost horizontally backward to anal origin, thence, curving slightly upward to caudal base.

Dorsal VII—11 (12 in one paratype), origin slightly behind vertical through base of ventral fin. Dorsal spines flexible, moderate. First spine shorter than second, third spine reaching to origin of second dorsal when depressed. Predorsal length 2.6 to 2.84 in standard length, (35.2 to 37.7% of standard length). Soft dorsal moderate, rays not reaching beyond caudal base when depressed. Anal fin 10 (11 in one paratype), origin under second dorsal ray. Pectoral 17 or 18, longest ray barely reaching origin of second dorsal, 3.46 to 4.9 in standard length (26 to 29.8%). Ventrals completely united, free from abdomen; interspinal membrane well developed, 4.5 to 4.7 in standard length (22.2 to 24.8%). Posterior edge of disk not reaching vent by length of interdorsal space.

Body entirely naked, no scales at base of caudal fin. Head moderate, 3.38 to 4.1 in standard length (28.4 to 29.6%). Head width greater than depth immediately behind orbit, 5.4 to 5.9 in standard length (16.8 to 19.1%). Head depth 6.9 to 7 in standard length (14.3 to 14.5%). Dorsal and ventral outlines of head bluntly rounded to vertical through eye, thence extending backward almost horizontally to posterior edge of head. Snout short, blunt, 4.49 to 4.74 in head (6 to 6.6% of standard length). Eye moderate, 3.5 to 3.9 in head (7.6 to 8.4% of standard length). Mouth terminal, oblique, lower jaw slightly included at tip. End of maxillary reaching or almost reaching a vertical from center of eye, 2.3 to 2.48 in head (11.9 to 12.6% of standard length).

Teeth in jaws in villiform bands; wide anteriorly, becoming narrow laterally. Outer row of teeth in each jaw enlarged. Tongue broadly emarginate. Nostrils paired, tubular. Tube of anterior nostril conical, opening small, porelike. Tube of posterior nostril cylindrical. A small but distinct barbule present on inner edge of upper jaw below anterior nostrils. A small barbule also present below eye at a vertical through anterior edge of pupil, and just anterior to the first vertical row of cutaneous papillae. Mental frenum bilobed, the lobes widely separated and barbel-like.

Head with longitudinal and transverse rows of cutaneous papillae. Two rows ventrally on underside of lower jaw, continued posteriorly upward around edge of preopercle and ending in an enlarged pore at the level of the lower edge of the eye. On either side of the dorsal mid-line of the snout two short rows of papillae extend backward from the inner edge of the upper lip, between the anterior nostrils, and unite with an

enlarged pore just before the posterior nostrils. Three vertical rows of papillae on side of head beneath the eye, extending ventrally and closely approaching the papillae on the ventral surface of the lower jaw. These vertical rows crossed by a longitudinal row at about their mid-depth. Longitudinal row branched anteriorly, the lower branch consisting of a few scattered papillae extending anteriorly around the inner edge of the upper jaw and the second branch curving obliquely upward around the anterior edge of the eye to the base of the posterior nostril. These two branches united anteriorly by a short row of papillae extending upward from the inner edge of the lip around the outer edge of the anterior nostrils and joining the upper branch close to the posterior nostrils. The posterior vertical row of papillae beneath the eye has a short branch extending backward, then bending sharply upward and forward at a sharp angle to the posteroventral edge of the eye.

A transverse row of papillae crosses the interorbital at the posterior edge of the eye and extends laterally to about the mid-depth of the eye, thence bending sharply backward and extending posteriorly across the upper edge of the preopercle and opercle. From this dorsal longitudinal row a short branch extends downward toward the upper end of the preopercular papillae, but does not unite with it. Anterior edge of opercle with a single row of papillae which curves upward and backward around the edge of the opercle. Several short, horizontal rows of papillae on either side of the mid-line of the nape.

Color in alcohol light buff with longitudinal rows of close-set, roughly square, dark spots along the back and sides. Each irregular spot formed by an aggregation of minute black punctations. Anteriorly and dorsally the dark spots unite to form transverse bands across the nape and before the dorsal origin; several paratypes have these transverse bands continued past the dorsal origin, becoming fainter posteriorly. Spinous dorsal pale, with three slightly oblique, dark bars. The first bar lies at the base of the anterior dorsal spines. The second bar slopes downward and backward at the mid-depth of the fin, and the third bar lies just below the distal edge of the fin. The distal bar sometimes broken into irregular dark spots and blotches. Soft dorsal pale with dark, steeply oblique bars. Anal similar to soft dorsal, but more faintly marked. Caudal fin pale. Pectoral fins light, narrowly barred with brown, base of pectoral with an elongate, brownish blotch. Dorsal aspect of head behind eyes dark, becoming lighter on cheeks and opercles. Interorbital light, shading into slightly darker snout. Underside of head pale.

*Gobiosoma spiriti-sancti* seems to be most closely related to *G. histrio* and *G. occidentale*, agreeing with both in having a well-developed barbule on the inner edge of the upper lip in front of the eye, tongue not entire, body and base of caudal naked, head depressed, and the outer row of teeth in both jaws enlarged. From these two species *G. spiriti-sancti* differs in having a bilobed mental frenum, a broadly emarginate (not deeply cleft) tongue, a second, small but distinct, barbule beneath the eye just anterior to the first transverse row of cutaneous papillae, and in having the posterior nostrils tubular. It also differs from *histrio* and *occidentale* in fin ray counts, less depressed head, shorter snout, and larger eyes.

This species is named for Espiritu Santo Island, Gulf of California, where it was first collected.

### Genus PARRELLA Ginsburg

*Parrella* Ginsburg, 1938, p. 116 (type by original designation *P. maxillaris* Ginsburg).

Body slender, head subterete. Mouth terminal, moderately oblique. Maxillary elongate, but variable; extending from beneath center of eye in some species almost to edge of preopercle in others. Tongue moderately emarginate. Teeth in jaws in three or four irregular rows anteriorly, tapering to one or two rows laterally. Outer row of teeth in both jaws larger than the inner teeth. No papillae or flaps on the shoulder girdle. No crest or ridge along the predorsal mid-line. Scales large, 28 to 38, deciduous. Antedorsal area and ventral surface of abdomen naked or scaled. Sides of head pectoral, base and throat naked.

Dorsal spines VII, fin rather elevated, but not notably filamentous. Dorsal rays 12 or 13. Anal rays 11 to 13. Pectoral 16 to 21, fin long and pointed. Caudal fin elongate, from slightly less to more than one-half of standard length.

This genus, as now defined, is a heterogeneous group composed of five rather widely divergent species, seemingly more closely related to one another than to any other group. Ginsburg (1939, p. 57) is of the opinion that *Parrella*, as now constituted, bridges the gap in some important respects between *Microgobius* and *Bollmania*.

**Parella ginsburgi**, new species

Plate 31

*Holotype*.—AHF no. 923.

*Type locality*.—Balboa, Panama Canal Zone, Republic of Panama, shore collecting, January 11, 1933.

*Measurements of holotype in mm.*—Standard length 41.5, total length 59.9, caudal length 18.4, pectoral length 12.2, head 10.5, head width 7, head depth 6.9, eye 3, snout 2.25, maxillary 6.4, interorbital 0.35, predorsal length 13.

*Diagnosis*.—Dorsal VII—12, anal 12, pectoral 20, caudal 17. Depth 6.8 in standard length, head 3.95. Predorsal length 3.2 in standard length, caudal fin 2.25. Snout 6.5 in head, eye 3.5, maxillary 1.69. Head width 5.93 in standard length, depth 6.2. Scales 30-32 along mid-line of sides. Predorsal area scaled along dorsal mid-line, abdomen scaled.

*Description*.—Body slender, rounded anteriorly, compressed posteriorly. Greatest depth of body 6.8 in standard length (16.1%). Dorsal and ventral outline bluntly rounded anteriorly, tapering gradually to caudal base.

Dorsal VII—12. First dorsal of seven moderately elongate, flexible spines. Fifth spine reaching to origin of second dorsal when depressed. Origin of spinous dorsal behind pectoral base, predorsal length 3.2 in standard length (31.4%). No ridge or crest along predorsal mid-line. Anal fin 12, origin under second dorsal ray. Caudal fin long and pointed, 17 articulated rays, 2.25 in standard length (44.4%). Pectoral rays 20, end of fin reaching a vertical from third dorsal ray. Ventral fins united, free from abdomen, interspinal membrane well developed. End of fin almost reaching vent.

Scales large, between 30-32 in a lateral series. Most of scales absent in the single specimen examined and their description may have to be revised when other specimens become available. Predorsal area scaled with small, crowded scales extending forward along the dorsal mid-line to the posterior part of the head. Lateral body scales not approaching close behind base of pectoral fin, extending anteriorly to a vertical from origin of spinous dorsal. Abdomen scaled with small, crowded scales along ventral mid-line. Breast and pectoral base naked. Head naked except for posterior scales along dorsal mid-line.

Head subterete, moderate, 3.95 in standard length (25.3%). Head width almost equal to its depth, width 5.93 in standard length (16.8%), depth 6.02 (16.6%). Head bluntly pointed, dorsal and ventral outlines almost equally curved. Snout short, bluntly rounded from dorsal aspect, 6.47 in head (5.43% in standard length). Mouth terminal, jaws equal, moderately oblique. Tip of upper jaw at same level as a horizontal line through the center of the eye. Maxillary long, extending backward to a vertical from posterior margin of eye, 1.69 in head (15.4% of standard length). Longitudinal and transverse rows of cutaneous papillae present on head.

Maxillary teeth in two series. The outer series a single row of enlarged, widely spaced teeth around the edge of the jaw. Inner series a narrow, irregular band of small teeth; wide anteriorly, tapering laterally to a single, irregular row. Mandibular teeth similar to maxillary teeth. The outer series slightly smaller than those of the outer row of the maxillary. Tongue moderately emarginate. Nostrils paired, anterior nostrils with a short tube, posterior nostrils a round pore. Eyes moderate, dorsolateral in position, 3.5 in head (8.45% of standard length). Interorbital very narrow, deeply grooved, 8.5 in eye. Gill-membranes broadly united to isthmus. Attachment of gill-membranes at lower angle of pectoral base.

Color in alcohol uniform medium brown. An irregular, dark blotch at base of caudal fin. Abdomen pale. Head slightly darker than body. Membrane of dorsal, caudal, and pelvic fins slightly darker than body. Pectoral fin dark at base, lighter distally. Anal fin light.

*Parrella ginsburgi* differs from the other known species in having scales across the ventral mid-line of the abdomen. From *P. fusca* and *P. spiloteryx* it differs in having a longer maxillary, a much narrower interorbital, a more elevated dorsal, deeper body, longer caudal fin, and slightly larger scales. From *P. maxillaris* it differs in the shorter maxillary, scaled predorsal region, and a different color pattern. From *P. macropteryx* this new species differs in having slightly smaller scales, shorter pectoral and caudal fins, less elevated dorsal, shorter maxillary, and a different color pattern.

This species is named for Mr. Isaac Ginsburg, U.S. Fish and Wildlife Service, in recognition of his work with this difficult family.

## Serranidae

### Genus ANTHIAS Bloch

*Anthias* Bloch, 1782, p. 97 (type *Labrus anthias* Linnaeus=*Anthias sacer* Bloch).

*Aylopon* Rafinesque, 1810, p. 52 (type *Labrus anthias* Linnaeus).

*Pseudanthias* Bleeker, 1873, p. 158 (type by original designation *Anthias pleurotaenia* Bleeker).

Body oblong, strongly compressed. Covered with smooth, moderate, or large ctenoid scales. Lateral line complete, following dorsal outline, angulated below last dorsal rays. Lateral line tubes straight or with an ascending tubule and extending nearly the entire scale. Mouth large, protractile. Maxillary exposed, scaled; supplemental bone absent.

Jaw teeth villiform, intermixed with canines. Vomerine teeth in a triangular or round patch. Palatine teeth in a narrow elongate band. Tongue smooth or with a few teeth. Edge of preopercle serrate, serrations near angle enlarged, no antrorse spines on its lower edge. Gill-membranes separate, gill-rakers long and slender. Pseudobranchiae present. Branchiostegal rays 7. Dorsal fin X, 12 to 18. Anal III, 6 to 8. Caudal emarginate. Pectorals obtusely pointed, subsymmetrical, 17 or 18 rays. Ventrals long, inserted below pectoral base, each with a strong spine.

### *Anthias gordensis*, new species

#### Plate 32

*Holotype*.—AHF no. 924.

*Type locality*.—Station 1035-40, Inner Gorda Bank, Cape San Lucas, Lower California, Mexico, dredged in 70 to 78 fms, January 20, 1940.

*Paratype*.—AHF no. 925. Station 1035-40, 1 specimen, 129.5 mm, same data as holotype.

*Measurements of holotype in mm.*—Standard length 127, depth 42, head 42, eye 11.3, snout 8.5, interorbital 9, maxillary 20, pectoral length 35, ventral length 61.

*Diagnosis*.—Dorsal X, 15, continuous, dorsal spines moderate, third spine longest, twice height of first spine. Anal III, 7. Ventrals I, 5, second and third rays filamentous, tip of third ray reaching base of last anal ray. Caudal fin deeply emarginate, almost forked, lobes not pro-

duced. Depth 2.9 to 3 in standard length, head 3. Eyes 3.61 to 3.75 in head, maxillary 2 to 2.15, interorbital 4.66 to 4.78, snout 4.78 to 4.94. Scales moderate, ctenoid, 48 to 50 in a lateral series. Head scaled, fins naked. Three scales above lateral line at center of spinous dorsal, 14 scale rows from same point to anal base. Jaw teeth in narrow bands, teeth of outer row enlarged, widely spaced, and blunt. Inner teeth small, pointed, and close-set. Vomerine teeth in a diamond-shaped patch of small, pointed, close-set teeth. Palatine teeth in an elongate band. A few small granular teeth on tongue.

*Description.*—Body oblong, compressed; dorsal outline much more rounded than ventral. Dorsal profile rising steeply from tip of snout to fourth dorsal spine, thence curving downward to narrow caudal peduncle. Ventral outline curved downward from tip of lower jaw to before ventral base, thence extending backward in a flattened curve to anal origin, and gradually tapering to caudal base. Greatest depth through ventral base 2.9 to 3 in standard length.

Dorsal X, 15, continuous, origin above upper edge of gill-opening. Dorsal spines moderate, third spine longest, twice height of first spine, posterior spines becoming gradually shorter. Soft dorsal more greatly developed than spinous dorsal. Membranes between dorsal spines emarginate. Anal III, 7, origin beneath fourth dorsal ray. First anal spine small; second spine strong and heavy, slightly shorter than third dorsal spine; third anal spine equal to, but more slender than second spine. Pectorals 20, shorter than head, bluntly pointed. Ventrals I, 5, inserted beneath pectoral base. Second and third ventral rays filamentous, tip of third ray reaching base of last anal ray. Caudal fin deeply emarginate (forked), 14 divided rays.

Scales finely ctenoid, 48 to 50 in a lateral series. Three scale rows above arch of lateral line at middle of spinous dorsal, 14 scale rows from that point to anal base. Fins naked, except for bases of three or four median caudal rays. Head completely scaled. Lateral line complete; extending backward close to dorsal outline, angulated downward below posterior dorsal rays. Pores in lateral line 34 or 35, sensory tubes extending along almost entire scale, ascending posteriorly.

Head compressed, 3 in standard length; dorsal profile steep, ventral profile less so. Eyes moderate, lateral, placed high on sides of head, close to dorsal outline, 3.61 to 3.75 in head. Mouth oblique, lower jaw projecting, scaled. Maxillary scaled, extending backward to beneath posterior edge of pupil, 2.1 to 2.15 in head. Interorbital convex, slightly



wider than snout length, 4.66 to 4.78 in head. Snout obtuse, scaled, shorter than eye, 4.78 to 4.94 in head. Opercle and preopercle scaled. Posterior edge of preopercle finely serrate, serrations slightly enlarged at angle. Ventral edge of preopercle smooth. Opercular spines three, middle spine largest.

Maxillary teeth in narrow bands, outer teeth enlarged, widely spaced, and bluntly conical, inner teeth small, pointed and close-set. Maxillary teeth not crossing symphysis of upper jaw, anterior ends of maxillary bands separated by an interspace equal to one-half the pupil of eye. A small, recurved canine tooth, one on each side, at anterior end of maxillary bands. Mandibular teeth similar to maxillary teeth; two enlarged canines, one on each side, at front of lower jaw. Vomerine teeth in a diamond-shaped patch of small, pointed, close-set teeth. Palatine teeth in an elongate band of small, pointed teeth. Tongue with a few scattered, blunt teeth. Gills 4, a slit behind last gill-arch. Gill-rakers present, close-set, long, and slender, 27 on lower limb of first gill-arch. Pseudo-branchiae present. Branchiostegal rays 7.

Body color in alcohol light olive buff. Sides of body dorsally to midline of sides with the scale pattern irregularly outlined in a cross-hatched pattern of dark olive buff. Head body color, shaded slightly darker on opercle. An irregular, dark band extends anteriorly from front edge of eye to symphysis of lower jaw. All fins pale.

Although widely distributed in tropical and temperate seas, only one other species of this genus, *Anthias asperilinguis*, is known from the Western Hemisphere. The new species described here, *Anthias gordensis*, is the first record of this genus from the Eastern Pacific. It differs from *A. asperilinguis* in having smaller scales, longer snout, smaller eye, and in not having the outer rays of the caudal lobes produced into long filaments. From *A. kelloggi*, a Hawaiian species, it differs in the smaller scales, longer ventral rays, one less dorsal spine, and more deeply emarginate caudal fin. From the numerous Indo-Pacific species *A. gordensis* differs in having fewer dorsal rays and other characters too numerous to mention among the individual species.

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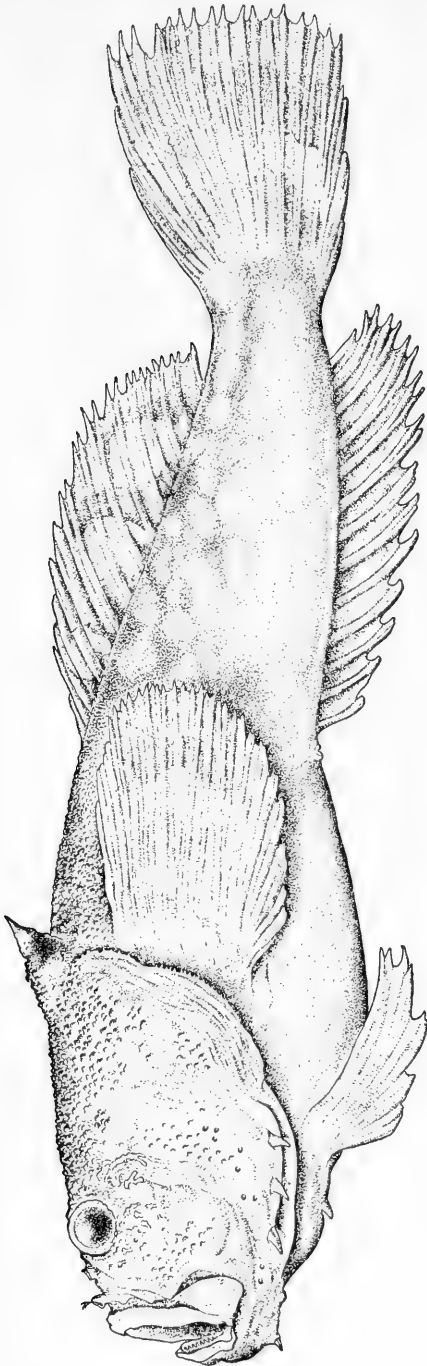
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## PLATE 29

*Kathetostoma ornatus*, new species x2.

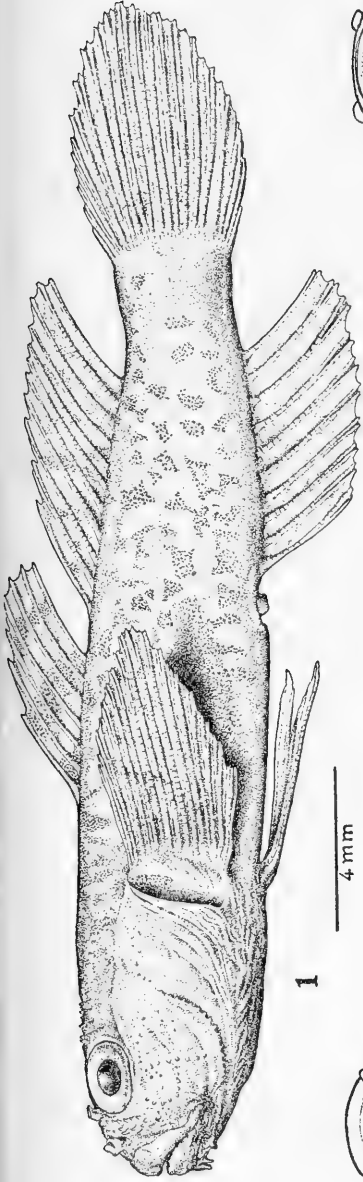


10 mm

## PLATE 30

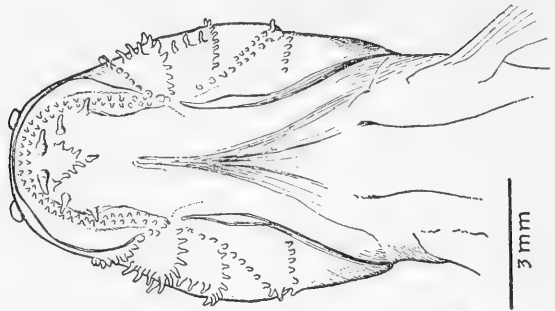
*Gobiosoma spiriti-sancti*, new species x9.

1. Lateral view, x9.
2. Lateral view of head showing papillar arrangement.
3. Dorsal view of head showing arrangement of papillae.
4. Ventral view of head showing arrangement of papillae.



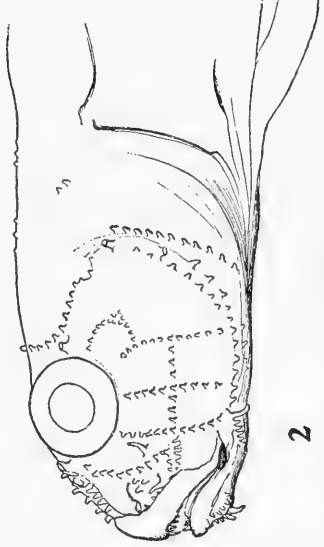
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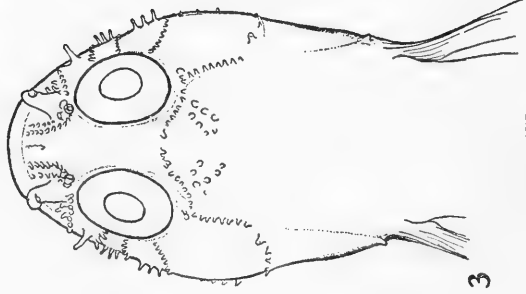
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3 mm



2

2 mm



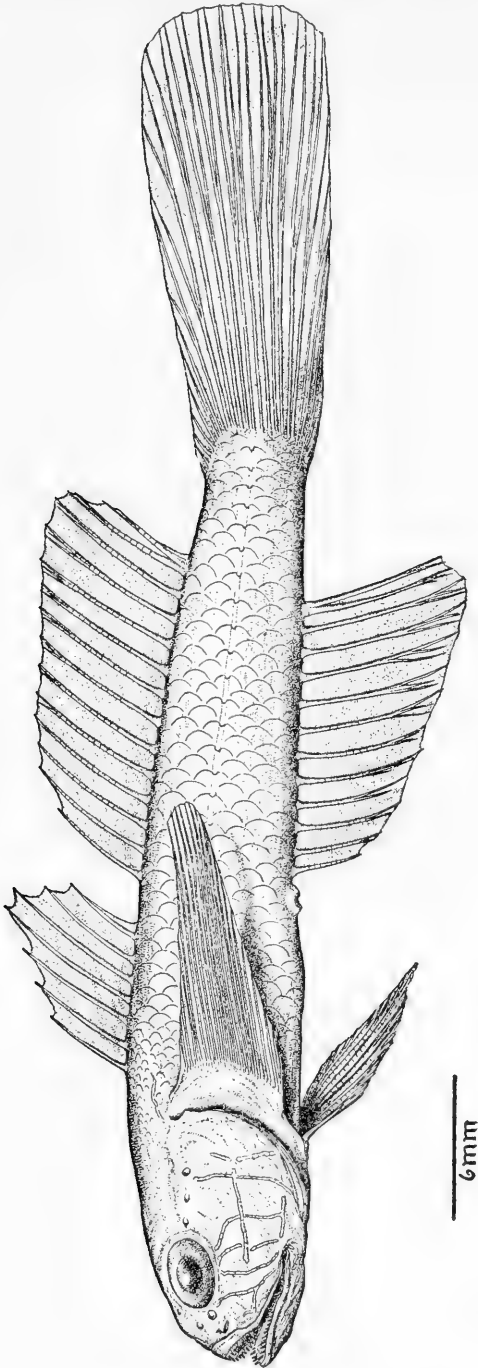
3

3 mm

## PLATE 31

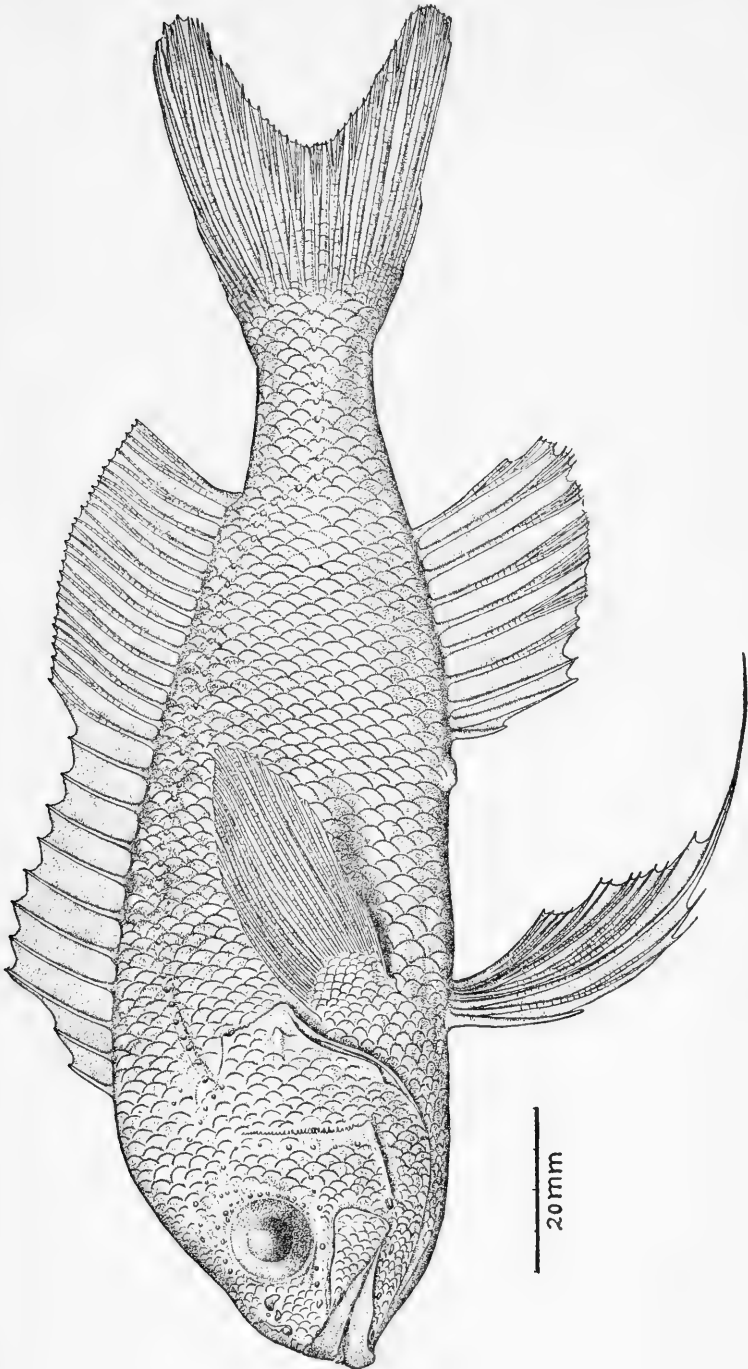
*Parrella ginsburgi*, new species x5.





## PLATE 32

*Anthias gordensis*, new species  $\times 1\frac{1}{4}$ .





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