

SCIENTIFIC RESULTS OF EXPLORATIONS BY THE U. S. FISH  
COMMISSION STEAMER ALBATROSS.

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No. XXII.—DESCRIPTIONS OF THIRTY-FOUR NEW SPECIES OF FISHES  
COLLECTED IN 1888 AND 1889, PRINCIPALLY AMONG THE SANTA  
BARBARA ISLANDS AND IN THE GULF OF CALIFORNIA.

BY  
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The following forms are here described as new :

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| 1. <i>Raia trachura</i> .                                      | 18. <i>Pomacentrus leucorus</i> .     |
| 2. <i>Catulus xaninrus</i> .                                   | 19. <i>Gobius micradon</i> .          |
| 3. <i>Catulus cephalus</i> .                                   | 20. <i>Bollmannia ocellata</i> .      |
| 4. <i>Catulus brunneus</i> .                                   | 21. <i>Bollmannia macropoma</i> .     |
| 5. <i>Eulamia</i> ( <i>Platypodon</i> ) <i>platyrhynchus</i> . | 22. <i>Bollmannia stigmatura</i> .    |
| 6. <i>Stolephorus cultratus</i> .                              | 23. <i>Gobiosoma crescentalis</i> .   |
| 7. <i>Myctophum regale</i> .                                   | <i>Chriolepis</i> , gen. nov.         |
| 8. <i>Alepocephalus tenebrosus</i> .                           | 24. <i>Chriolepis minutillus</i> .    |
| 9. <i>Porogadus promelas</i> .                                 | 25. <i>Gillellus ornatus</i> .        |
| 10. <i>Siphostoma carinatum</i> .                              | 26. <i>Prionotus gymnostethus</i> .   |
| 11. <i>Callechelys peninsulae</i> .                            | 27. <i>Careproctus melanurus</i> .    |
| 12. <i>Atherinops insularum</i> .                              | 28. <i>Paraliparis cephalus</i> .     |
| 13. <i>Mugil setosus</i> .                                     | 29. <i>Paraliparis mento</i> .        |
| 14. <i>Diplectrum sciurus</i> .                                | 30. <i>Trachyrhynchus helolepis</i> . |
| 15. <i>Mycteroperca pardalis</i> .                             | 31. <i>Macrurus pectoralis</i> .      |
| 16. <i>Bodianus acanthistiis</i> .                             | 32. <i>Lycodes diapterus</i> .        |
| 17. <i>Upeneus xanthogrammus</i> .                             | 33. <i>Symphurus fasciolaris</i> .    |
|  | 34. <i>Antennarius reticularis</i> .  |

1. *Raia trachura* sp. nov.

This species is most nearly related to *Raia isotrachys*, but the disk is broader, with the snout much blunter, the angle of latter much greater than a right angle.

Top of disk sparsely but evenly covered with small sharp prickles with stellate base, which become crowded on interorbital space, in a broad band along anterior margin of disk, on middle of disk behind shoulders, and especially on sides of tail. No spines on orbital rim or shoulders. A single small spine on middle of back between shoulders, heavier but not longer than the prickles. A series of strong spines on middle of tail, 23 in number, diminishing in size posteriorly.

Outer pectoral angles broadly rounded, placed more anteriorly than in *isotrachys*. Anterior outline strongly undulated, very convex near tip of snout, which projects slightly beyond the profile. Snout very broad, its anterior angle about 120 degrees. Length of disk (to opposite posterior insertion of pectorals)  $1\frac{1}{2}$  in its width. Interorbital space concave,  $1\frac{1}{6}$  times longitudinal diameter of eye, which is contained  $3\frac{2}{5}$  times in snout. Distance from front of eye to nearest point on margin of disk  $1\frac{2}{5}$  in length of snout (less than half snout in *isotrachys*).

Teeth very small, each with a single minute cusp directed backwards, eight oblique series in each half of upper jaw.

Distance between gill openings of first pair, one-third length of disk including the ventrals. Tail longer than body by half length of snout. Dorsal fins small, of about equal size, covered with prickles. Base of ventrals smooth above, a few prickles on distal half.

Uniform plum-color above, slightly darker at margin of disk. Below brown, lighter on body, becoming blackish on lateral margins of pectorals and ventrals.

A single specimen, 18 inches long, from station 2923, in 822 fathoms.

## 2. *Catulus xaniurus* sp. nov.

Snout short and broadly rounded, much as in *Catulus canescens* Günther, the distance from snout to front of mouth one half greatest width of snout, the latter equaling width of mouth. Nostril valves separate, the width of isthmus nearly half width of nostrils, the valve with a short cirrus. Distance from inner edge of nostrils to mouth one-third their distance from tip of snout. Lips with a well-developed fold around angle of mouth, that on lower jaw extending two-sevenths to one-fourth distance to symphysis, the fold on upper lip about half as long as that on lower.

Teeth small, acute, about five series functional in each jaw. Teeth similar in both jaws, the median and the extreme lateral teeth much reduced, those along greater extent of jaw with a prominent median cusp, and two small lateral ones on each side. Towards angles of jaws, the median cusps become much smaller and are little larger than the lateral ones.

Snout and sides of head soft, with numerous mucous pores, those on lower side of snout in an oval patch. Eyes large, their horizontal diameter more than half the interorbital width, or than distance from tip of snout to their front margins.

Anterior gill slit separated slightly more than the posterior ones, the distance between them equaling length of slit. Last two gill slits above the base of pectorals.

Pectoral small, not notched, its angles rounded, a wide strip along its upper posterior border devoid of prickles. Length of its anterior border equaling that of snout and eye. Posterior margin of ventrals very oblique. In one young male, 30 centimetres long, the claspers

are small and undeveloped, not extending backwards as far as posterior ends of ventrals; in another, 38 centimeters long, they are fully developed, and extend backwards as far as origin of anal.

First dorsal over the ventrals, its base shorter than that of the anal, contained twice in the interspace between dorsals. Its posterior insertion is vertically above that of the ventrals. Second dorsal slightly shorter and lower than the first, its base wholly above that of the anal, which overlaps it in front and behind. Base of second dorsal  $1\frac{2}{3}$  in that of anal. Base of anal twice the space separating it from lower lobe of caudal, and about equaling its distance from ventrals. Height of first dorsal (measured along longest rays) equals distance from tip of snout to front of pupil.

Caudal not deeply notched, its length equaling distance from tip of snout to fourth or fifth gill slit, and contained  $4\frac{1}{3}$  in total length.

Head, body, and fins covered with small triangular prickles, with broad base and usually a single backwardly directed point. They are rather sparsely distributed, except on end of snout and along margins of fins, especially along upper edge of caudal, where they are closely crowded to form a dense rough band. These caudal plates are broad and densely overlapping, each with three equal cusps. This approximates the arrangement characteristic of *Pristiurus*, between which and *Catulus* this species forms a partial transition. In young specimens 5 to 6 inches long, the band of enlarged prickles on back of caudal has not yet developed.

Color dark slaty-brown, uniform on head body and fins, the latter without appreciably lighter margins in some specimens, in others broadly or narrowly margined with white, or with spots or large irregular areas of whitish. One specimen shows small white spots on dorsal region.

Described largely from a female specimen, 23 inches long, with well-developed eggs. The egg cases are narrow and flattened, one-third as wide as long, becoming much more narrowed at the posterior than at the anterior end.

Very abundant in deep water off the coast of Southern and Lower California, specimens being taken at stations 2891, 2892, 2896, 2903, 2948, and 3045, in depths ranging from 184 to 684 fathoms.

### 3. *Catulus cephalus* sp. nov.

A number of small specimens, dredged in deep water near the Revilagigedo Islands and in the Gulf of California, strongly resemble *Catulus raniurus*, but differ constantly in the following respects:

The head appears much wider and the snout is shorter, the length of preoral portion being less than one-half its greatest width.

The fins are different in relative size and position, the dorsals being larger, the second dorsal more posteriorly inserted, and the anal smaller. The second dorsal is thus about equal to the anal in size, and terminates slightly behind it.

The pores on head are of larger size than in *xaniurus*, and are regularly arranged in series instead of in patches.

The coloration is darker, the lower portion being uniformly brown like the upper, instead of much paler.

None of our specimens show any trace of the band of rough plates on back of tail characteristic of *xaniurus*, and developed in the young of the latter of even smaller size. The adult of *cephalus* may or may not agree with *xaniurus* in this respect.

The teeth have mostly three cusps, the inner one often with a fourth one at the base, a fifth sometimes present on the outer side.

A specimen 24 centimetres long, from station 2992, is a young male, and shows the elaspers very fully developed, reaching the base of the anal fin. This specimen is apparently nearly sexually mature, while in specimens of *xaniurus* of even larger size, the elaspers are much less developed.

In the position of the second dorsal this species agrees with *Scyllium caucscens* Günther, but differs in the much more anterior insertion of the first dorsal, which terminates above the ventrals instead of behind them.

Several small specimens from station 3007 (362 fathoms), in the Gulf of California, and a larger specimen from station 2992, at a depth of 460 fathoms.

#### 4. *Catulus brunneus* sp. nov.

Body deeper, the head narrower, the snout longer and sharper than in *Catulus xaniurus*. Length of snout before mouth three-fourths greatest width of snout and seven-eighths width of mouth. Nostrils large, the flap with a broadly rounded lobe, the inner ends of nostrils separated by a space equaling three-fourths length of nostril. Distance from inner end of nostril slits to mouth slightly less than one-third their distance from tip of snout.

Angle of mouth with a well-developed labial fold, that of lower lip slightly shorter than that of upper, and extending half way to symphysis.

Teeth similar in both jaws, with two or three rows functional in the upper jaw and four or five in the lower. Median cusp of teeth long, sharp, and strongly curved backwards and outwards. A single basal cusp on each side, the inner cusp having frequently a smaller one at base.

Diameter of orbit about one-third snout, the spiracle separated from it by nearly one-third its length.

Gill openings of moderate width, the last two over base of pectorals as usual.

Pectorals more extensively connate with body than usual, the angles rounded, but the posterior margin nearly straight. Length of their upper margin one-half distance from snout to third gill slit.

First dorsal small, narrow, and high, extending but little beyond ventrals. The length of its base is contained  $1\frac{1}{2}$  times in the interspace between dorsals. Second dorsal slightly larger than first and extending a little beyond the base of anal. When depressed it reaches beyond origin of caudal.

Anal very long, a short grooved channel behind ventrals reaching its base, as do also the tips of the ventrals themselves. The length of its base is  $2\frac{1}{2}$  times that of first dorsal, and the basal portion of fin is continuous with the fold which rises to form the lower caudal lobe. Caudal fin  $3\frac{2}{3}$  in total length, its terminal lobe but little more than one-sixth its length.

Head, body, and fins uniformly covered with minute close-set plates, each of which is triangular and furnished with three subequal spinous points. These are wanting on the posterior third of the upper face of the pectoral, and on the free edges of all the fins. No modified plates on the upper edge of the caudal.

Color uniform warm brown above and below, the snout and the margins of the fins blackish.

The only specimen secured is a female 50 centimetres long, and contains a pair of fully developed eggs, the cases showing a peculiar constriction towards each end.

##### 5. *Eulamia* (*Platypodon*) *platyrhynchus* sp. nov.

*Carcharias* sp. incog. Jordan and Gilbert, Procs. U. S. Nat. Mus., 1882, 107 (description of jaw only).

*Eulamia lamiella* Jordan and Bollman, Procs. U. S. Nat. Mus. (not of Jordan and Gilbert).

Snout very flat and broadly rounded, of moderate length, its preoral portion slightly longer than width of mouth, and less than width of snout opposite nostrils. Middle of nostrils midway between front of mouth and tip of snout. Nostril flap without sharp lobe. No labial folds, the angle of mouth with two short creases.

Teeth in upper jaw broadly triangular and coarsely serrate, the inner edge oblique, the outer definitely notched in most cases, merely concave in others, the two kinds found together in the same jaw. The serræ are coarsest below notch on outer side of tooth. Lower teeth narrow, erect, serrulate.

Eye moderate, three-fourth width of gill-openings. Interorbital width greater than length of snout in front of eye by a distance equaling the diameter of the orbit.

Pectorals but little falcate, long, reaching beyond the base of first dorsal. The inner margin is two-sevenths length of the outer, and the greatest width is half the length.

First dorsal inserted close behind pectorals, its distance from root of pectorals two-fifth its base, the fin much nearer pectorals than ventrals. Its base is two-fifths the length of interspace between dorsals, and is less than its height, which is less than the depth of body.

Second dorsal inserted over the anal, its base one-third that of first dorsal, and less than one-half its distance from base of upper caudal lobe. Its upper margin is much less concave than that of anal, and the fin is smaller.

Lower caudal lobe nearly half the upper, which is  $3\frac{1}{2}$  in total length.

Light gray above, whitish below, the fins conspicuously margined with white in the largest specimen obtained, without margins in the others.

This species is very abundant at the Revillagigedo Islands, specimens being secured at Clarion and Socorro. A single individual was also obtained at Magdalena Bay, Lower California. It reaches a length of at least 8 feet. This is the species recorded by Jordan and Bollman from the Galapagos Islands as *Eulamia lamiella*. From *lamiella* it differs in the notched teeth and the anterior position of the first dorsal.

#### 6. *Stolephorus cultratus* sp. nov.

Body compressed, of medium depth, the abdomen compressed to an edge both in front of and behind the ventral fins, but without serrations. Behind the ventrals the edge is sharply carinate.

Head slender and sharp, the snout long and compressed, extending beyond tip of lower jaw for a distance nearly equaling diameter of orbit. Maxillary abruptly widened behind angle of mouth, then tapering to a rather sharp point which extends beyond mandibular articulation nearly to gill-opening.

Teeth in lower jaw small but distinctly visible; in upper jaw growing larger towards tip of maxillary, where they are directed forwards.

Opercle narrow, scarcely as wide as exposed portion of preopercle, the margin moderately oblique, not wavy.

Front of dorsal midway between base of caudal and front of pupil. Base of ventrals midway between origin of anal and articulation of mandible. Origin of anal behind last ray of dorsal.

Scales closely adherent, rather thick and firm.

Head  $3\frac{2}{3}$  in length; depth  $4\frac{1}{6}$ . D. 12; A. 20. Lat. 1. 40.

Color olivaceous, the dorsal region with black specking. A silvery band along middle of sides very narrow anteriorly but increasing in width to opposite anal fin, where it is as wide as eye. Snout and margin of caudal lobes dusky.

A single specimen,  $3\frac{3}{8}$  inches long, from Santa Margarita Island, off the coast of Lower California.

#### 7. *Myctophum regale* sp. nov.

In the type specimen the scales are wholly wanting, with the exception of two or three along the base of the anal, which have entire margins. The scars in the skin indicate that the scales along the lateral line were enlarged, those on middle of tail being twice the size of the ordinary scales. The species closely resembles in appearance *Myctophum* (*Nannobrachium*) *niger* Günther, but differs in the relative posi-

tion of the dorsal and anal. As the scales were wanting and the skin largely abraded in the type of *niger*, it may be that the scales along lateral line were in reality enlarged in that species.

Lateral line 37. D. 16; A. 19. Head  $3\frac{3}{5}$  in length; depth  $5\frac{1}{3}$ .

Eye small, slightly longer than snout,  $5\frac{1}{2}$  in head. In three specimens smaller than the type, the eye is  $5\frac{3}{4}$  in the head instead of larger, but they agree in all other respects.

Interorbital width  $3\frac{3}{4}$  in head. Maxillary not quite reaching anterior margin of preopercle, dilated slightly at extreme tip. Preopercular margin very oblique. Gill-rakers distant, slender, toothed, 5 + 10 in number, the anterior two very small. A deep oval depression without median crest on interorbital space and occiput, apparently covered in the fresh state by membrane. Ethmoidal ridge not high.

Teeth on vomer evident, separated by a median groove into two distinct patches, each of which is separated from the palatine patch by a very short interspace.

Front of dorsal slightly nearer adipose fin than eye. Base of fin equals length of maxillary; its origin is over axil of ventrals, and its last ray is over the sixth of the anal. Height of dorsal equals the length of its base.

Origin of anal falls under the fourth from the last ray of the dorsal, and its last ray is slightly behind the adipose dorsal.

Pectorals very slender, with fourteen rays, the upper filamentous and produced to opposite base of ventrals.

Ventrals with nine rays, the outer rudimentary, their tips reaching vent.

Scales entire, those along lateral line enlarged.

Color in spirits, uniform black on head, body, and fins, the inner rays of ventrals with a white blotch; a cream-colored streak on upper and one on lower side of tail. These streaks include three scales on back of tail, and eight below.

Three pairs of phosphorescent spots visible behind shoulder girdle, one of these on base of pectorals. A spot on the fourth scale behind pectorals, and another behind it and nearer the lateral line. Six pairs of spots in front of ventrals, three between ventrals and anal, and eleven at base of anal, seven along base of caudal peduncle, and three at base of lower caudal lobe. A spot is present half way between vent and lateral line, and one above fourth to last anal ray.

The type is a large specimen, about 5 inches long, taken at Station 2923, in 822 fathoms. Three smaller specimens were taken at Stations 2980 and 3070, in 603 and 636 fathoms.

#### 8. *Alepocephalus tenebrosus* sp. nov.

Most nearly related to *Alepocephalus agassizii*, differing in the following respects:

Scales in a series from front of dorsal to lateral line more numerous, 15 or 16 in number (instead of 10).

Lower jaw not produced, shorter than the upper, and fitting well within it.

Eye smaller,  $4\frac{1}{4}$  in head. Pectoral larger,  $1\frac{2}{7}$  times orbit.

Body compressed, elongate, the depth  $4\frac{2}{3}$  to 5 in length; head 3 to  $3\frac{1}{4}$ . Symphysis of lower jaw produced downwards and forwards to form a short sharp point. Mouth moderately oblique, the maxillary reaching vertical behind front of pupil, its length (measured from tip of snout)  $2\frac{4}{5}$  in head. Mandible  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in head,  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times length of snout.

Teeth in single series in premaxillaries, mandibles, and palatines. The lower jaw is well included, and its teeth shut between the series on premaxillaries and that on the palatines.

Snout short and compressed,  $3\frac{3}{4}$  in head. Eye moderate, nearly as long as snout,  $4\frac{1}{4}$  in head. Interorbital space nearly flat, with a low rounded ridge above each eye. The width above middle of orbit is contained  $1\frac{2}{3}$  times in diameter of eye. Preopercle with margin more or less free, marked with radiating striæ.

Dorsal fin beginning and ending a trifle in advance of the anal, the bases of the two fins equal. Distance from front of dorsal to base of median caudal rays equals one-third length of body.

D. 17; A. 17; V. 7; P. 10.

Pectorals long,  $2\frac{1}{2}$  in head, much longer than eye.

Distance of ventral fins from head equals length of head behind pupil.

Scales small, in about 90 cross-series; 16 scales between lateral line and front of dorsal and anal respectively. Scales of lateral line much enlarged, 55 in number, the tube forming a conspicuous raised ridge. Dorsal and anal scaled for one-third their height.

Color uniform blue-black.

Numerous specimens from Stations 2839, 2923, 2936, and 2980, in depths of 359 to 822 fathoms.

#### 9. *Porogadus promelas* sp. nov.

Closely resembling *Porogadus gracilis* Günther, but differing in the following respects:

Depth 3 in trunk (in *gracilis*  $3\frac{1}{2}$ ).

Eye 6 in head (in *gracilis*  $5\frac{1}{2}$ ).

Vomerine patch of teeth with the two arms incurved (U-shaped in *gracilis*).

Dorsal fin beginning behind the pectoral (over root of pectoral in *gracilis*).

An additional series of large scales (lateral line) along middle of sides, and another along ventral outline.

Trunk  $2\frac{1}{3}$  in tail ( $2\frac{2}{3}$  in *gracilis*).

Ventrals shorter, not reaching past tips of pectorals.



*Description.*—Tail produced into a filament, the caudal basis extremely narrow, supporting 5 long slender rays which are firmly bound together.

Head 2 in trunk; depth 3. Body  $3\frac{1}{3}$  to  $3\frac{1}{2}$  in tail.

Mouth terminal, large, the maxillary much dilated at tip, reaching well behind the eye,  $1\frac{2}{3}$  in head. Lower jaw included, the tip slightly produced.

Teeth in villiform bands on mandible, premaxillary, vomer, and palatines, the band on mandible, very narrow, that on vomer with the diverging arms much incurved, the anterior angle rounded. Tongue toothless, some of the basibranchials forming a sharply elevated dentigerous crest. Gill laminae extremely narrow, the gill rakers of outer arch very long and slender, 1 (with 4 rudiments) above angle, 15 below.

Infraorbital chain with six mucous sinuses, the mandible with five, preopercle with five, and a number on top of head. These are all bridged over with very delicate membrane which is easily ruptured.

A row of low strong spinous points directed posteriorly on the ridge running backwards from the eye. No other spines on head, though a number of short spinous points are made evident when the skin is removed. Opercular spine rather weak.

A distinct membranous flap runs along the projecting edge of shoulder girdle, connecting pectorals with upper end of gill flap.

Pectorals slender, equaling postorbital part of head.

Ventrals each of a bifid filament, the two branches joined at the base for a very short distance. They are variable in length, reaching to or nearly to tips of pectorals, usually contained about  $1\frac{1}{3}$  times in head.

Dorsal beginning a trifle behind base of pectorals, its distance from occiput equaling distance of latter from front of eye.

Scales very small, apparently covering a part of top of head. Three series of large pores on sides; one from upper end of gill slit backwards parallel with dorsal outline; a second along middle of sides; the third beginning half way between base of pectorals and ventral outline, extending backwards on belly and along base of anal fin. These lines are all somewhat indistinct, and it can not be determined how far they extend backwards.

Color light brown, head (except occiput), mouth, gill-cavity, and abdomen jet-black. Fins dusky.

Five specimens, the largest  $9\frac{1}{2}$  inches long, from Station 3010, at a depth of 1005 fathoms, in the Gulf of California.

#### 10. *Siphostoma carinatum* sp. nov.

Closely related to *Siphostoma californiense* and *griseolineatum*, differing in the very slender sharply keeled snout, in the height and sharpness of the body ridges, the upper and lateral faces being all concave, and in the coloration.

No ridge on opercle. Breast and belly with a low median keel. Snout sharply keeled, the ridge ceasing on interorbital space to reappear on

occiput and first nuchal plate. Lateral ridge interrupted immediately above the vent.

Snout very slender, compressed, its length  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times rest of head. Eye  $2\frac{1}{10}$  in postorbital part of head. Head and trunk contained  $1\frac{1}{2}$  to  $1\frac{2}{3}$  in tail. Trunk  $2\frac{1}{3}$  in tail.

Base of dorsal equaling length of head, covering nine and one-half rings, only the first of which is in front of the vent. The fin contains 39 to 44 rays, usually 43 or 44. Pectorals short, with 14 rays, the longest of which is one-third length of snout.

Body rings 17 or 18 + 40 to 42. Food pouch on twenty-two anal plates. The keels on body are sharp and high, and the interspaces are transversely concave. In this respect the species differs conspicuously from *griseolineatum* and *californiense*, in both of which the dorsal surface is transversely convex, and the lateral faces flat or convex.

Color light olive or grayish, the back and upper part of sides mottled with brown, this frequently taking the form of rather wide ill-defined bars. In many specimens, the interspace between the bars is marked with a narrow pearly-white cross-bar. On lower portion of sides of tail, a brown streak between each two plates. Lower parts immaculate. Dorsal light, its basal portion with oblique brown streaks and spots. Central portion of caudal dusky, the fin broadly margined all around with white.

Many specimens, including both males and females, were taken at Stations 3027 and 3028, in the Gulf of California. The largest specimen is  $8\frac{1}{2}$  inches long.

This species differs from *S. aciculare* Jenyns, in the much longer snout and shorter pectoral fin.

#### 11. *Callechelys peninsulæ* sp. nov.

A single specimen,  $10\frac{1}{2}$  inches long, from La Paz Bay, Gulf of California.

Color light yellowish (probably olivaceous in life), a series of large round brownish-black spots nearly as wide as interspaces between lateral line and base of dorsal. A second series of similar but much fainter spots alternating with the first below the lateral line. Top and sides of head with similar smaller spots, those on snout the smallest. Lower jaw with dusky mottlings. Anal translucent, unmarked. Dorsal with a dusky streak.

Head small,  $3\frac{2}{7}$  in trunk (without head). Snout projecting beyond lower jaw for a distance equaling diameter of eye. Cleft of mouth extending beyond eye, its length (from tip of snout)  $3\frac{1}{4}$  in head. Anterior nostril in a long tube (near tip of snout), the posterior on inner side of upper lip opposite front of eye.

Teeth in double series on all the dentary bones; those on maxillary, shaft of vomer and sides of mandible small, bluntly conic; those on head of vomer and front of mandible much broader though little longer, and also very blunt.

Eye very small, slightly less than half snout, and one-twelfth length of head. Snout  $5\frac{1}{2}$  in head. Gill-openings short, vertical, the length of the slit but one-half of the broad isthmus.

Vent much in advance of the middle of the length, the body contained  $1\frac{2}{3}$  times in the tail.

Dorsal fin beginning well forward on top of head, its origin equidistant between gill-slit and front of eye. Tip of tail sharp, free from fins for a distance equaling length of snout. Pectoral developed as a short deep membranous flap as wide as gill-slit; its length less than half its width. Delicate rays are visible with the aid of a lens.

#### 12. *Atherinops insularum* sp. nov.

Closely allied to *Atherinops affinis*, differing in the darker color, the slenderer form, the much smaller scales, and the shorter spinous dorsal, which is inserted farther forwards.

The lateral line contains 62 to 68 scales (52 to 56 in *affinis*); 5 scales between upper edge of silvery band and front of spinous dorsal (4 in *affinis*).

Front of dorsal much nearer tip of snout than is front of anal, the distance between base of last dorsal spine and front of soft dorsal greater than length of base of soft dorsal (much less than length of dorsal in *affinis*). Spinous dorsal constantly with 5 spines (6 or 7 in *affinis*).

Otherwise, in fins, dentition, and general proportions as in *affinis*. As in *affinis*, the inner fork of teeth is occasionally shorter than the outer, approaching the case of *Atherinops regis*, where this is the rule.

Found very abundant at San Clemente and San Nicholas Islands of the Santa Barbara Group, and farther south at Guadalupe Island. No specimens of *affinis* were taken at these islands, nor were any of *insularum* found on the shores of the mainland.

#### 13. *Mugil setosus* sp. nov.

Closely resembling *Mugil curema*, from which it differs widely in its much larger multiserial setæ, the longer narrower mouth, and the deeply falcate fins.

The mandibular angle is less than 90 degrees, and the length of the cleft of the mouth but little (about one tenth) less than its width. The premaxillary setæ are in a narrow band, not arranged in definite cross-lines as in *Chaenomugil*. Those of the outer row are very long and numerous, curved and closely crowded; the inner setæ are much shorter, but can be readily seen without a lens, and are arranged in several irregular series. The mandibular setæ are shorter and slenderer than those on premaxillaries, but are larger than the premaxillary setæ of *M. curema*. They are in a single series. A narrow strip only of the maxillary is visible in the closed mouth.

Upper lip thick. Preorbital denticulated. Adipose eyelid partly covering pupil, but much thinner than in *curema* and related species,

the whole eye being visible through it in alcoholic specimens. The adipose mass lying behind the eye is also less developed, and encroaches but little on the opercle.

Eye large, equaling or slightly exceeding the length of the snout,  $3\frac{4}{5}$  to 4 in the head,  $1\frac{3}{4}$  in interorbital width. Suborbital very wide, as in *Mugil trichodon*.

Scales moderate, 20 in front of dorsal, 37 or 38 in the lateral line, 11 in an oblique series from vent to base of dorsal. Accessory scale on each side of spinous dorsal usually longer than the base of the fin. Axillary scale exceedingly thin and membranous. Soft portions of all the vertical fins scaled to tip; basal portions of the pectorals and ventrals also scaled.

Pectorals pointed, slightly falcate, as long as head behind front of pupil reaching tenth or eleventh scale on sides, failing to reach front of spinous dorsal by about one-fifth its own length.

Spinous dorsal lower than soft dorsal. Both soft dorsal and anal strongly falcate, the last rays much higher than middle rays, the anterior rays when depressed nearly reaching tips of last rays. Soft dorsal inserted over fourth or fifth ray of anal. Caudal longer than head, the lobes long and pointed.

Head  $3\frac{2}{3}$  to  $3\frac{3}{4}$  in length; depth 4. D. IV-I, 8; A. III, 9. Lat. l. 37.

Plain grayish above, silvery on sides and below, without stripes or other markings. Ventrals unmarked, the other fins slightly dusky, the caudal with a distinct black margin.

Very abundant at Clarion Island, of the Revillagigedo Group; not obtained elsewhere.

#### 14. *Diplectrum sciurus* sp. nov.

Most closely resembling *D. macropoma*, but differing strongly from this and all other species of the genus in the very numerous, long and slender gill-rakers, which are two thirds the diameter of the eye, even in young specimens; they are about 25 in number on the horizontal limb of the outer arch, instead of 12 as in *radiale* and *macropoma*, or 9 as in *formosum*.

A single rather wide cluster of spines at angle of preopercle, much as in *macropoma*, the width of the cluster  $4\frac{1}{3}$  to 5 in head, in specimens 5 inches long.

Scales on cheeks small, in 7 or 8 rather regular rows. Lateral line with about 52 pores; about 75 vertical rows of scales above it.

Vertical fins low, the height of soft dorsal one-third length of head.

Head  $2\frac{4}{5}$  to 3 in length; depth  $3\frac{1}{5}$  (in specimens 5 inches long). D. X, 12; A. III, 8.

In color this species differs from its near relatives in having no black on the inside of gill-cover, and in having a very light blue line below the orbit. The snout is without spots or streaks. The upper part of body is crossed with irregular dusky bars, and the soft dorsal and cau-

dal are marked with round yellow spots half as large as the pupil, ocellated with blue or dusky.

Small specimens only of this species have been secured, but these in considerable numbers, at Stations 3014, 3015, 3021, 3026, and 3033, all in shallow water in the Gulf of California.

15. *Mycteroperca pardalis* sp. nov.

Not very closely related to any of the known species of this genus, being well distinguished by the following combination of characters:

Nostrils close together, the posterior the larger, as in all typical species of *Mycteroperca*. Dorsal spines low, the fourth the longest, the third equalling the fifth, the second still shorter. Soft dorsal and anal rounded, not falcate. Caudal rather deeply emarginate. Gill-rakers long, in increased number, the longest five-sixths the diameter of orbit, 23 or 24 rakers present on horizontal limb of outer arch.

Lower jaw strongly projecting. Teeth small, the outer row in mandible rigid, smaller than those of the inner series, which are depressible. The inner series widens into a patch at symphysis, in front of which stands the pair of very small inconspicuous canines. Outer series of teeth in upper jaw enlarged, canine-like, growing larger towards median line, where they terminate in two strong canines on each side. A patch of depressible teeth behind these canines in front of jaw, rapidly diminishing in size and becoming finely villiform on middle of premaxillaries. A U-shaped patch of villiform teeth on vomer, those laterally the largest, and a very narrow band on palatines. Tongue covered with minute teeth.

Maxillary reaching vertical behind middle of eye,  $2\frac{1}{4}$  in head. Snout  $3\frac{1}{2}$ ; eye 6. Interorbital space strongly convex transversely,  $4\frac{1}{4}$  in head.

Fourth dorsal spine the longest,  $3\frac{1}{5}$  in head; the second two-thirds its height. Longest ray of soft dorsal  $2\frac{1}{3}$  in head, the outline of fin everywhere convexly rounded.

Anal spines strong and low, the second half the height of the third, which equals length of eye and snout. Soft rays high, the angle rounded, the posterior portion of fin straight, not concave. Longest anal ray half head. Caudal lunate, the longest ray  $1\frac{2}{5}$  in head.

Scales small, not arranged in regular series, partially imbedded, those on head and hinder part of body smooth. Head wholly scaled, except premaxillaries and anterior part of maxillaries. Fins naked, except basal half of caudal. Sides covered with very minute numerous accessory scales. Scales apparently in about 90 transverse series above the lateral line, but extremely difficult to determine. Scales on cheeks, top of head, and above the lateral line anteriorly much reduced in size.

Head  $2\frac{1}{5}$  in length; depth 3. D. XI, 17; A. III, 11.

Color in spirits: Sides of head and body everywhere profusely covered with round brown spots, those on caudal peduncle largest, half the diameter of the pupil, those anteriorly and above becoming much

smaller, those on top of head about the size of a pin head. On sides these spots are surrounded with reticulations of grayish-silvery, this ground color darker and brownish on upper parts. A dark brown streak behind the maxillary, and one on membrane of premaxillary. Vertical fins light, soft dorsal and anal with brown streaks on membranes between the rays on basal half, and a few indistinct brown spots on middle of fin. Caudal brown-spotted, with a narrow white margin. Pectorals light at base, the distal half blackish, with a wide pale border posteriorly. Ventrals with brown streaks along membranes on inner face.

A single specimen, about 20 inches long, from La Paz Bay, Lower California.

16. *Bodianus acanthistius* sp. nov.

Characterized by its convex caudal, plain coloration (varied only by a black streak behind maxillary), its comparatively large scales, and the very high spinous dorsal with its deeply incised membranes.

Head  $2\frac{2}{5}$  in length; depth  $2\frac{3}{7}$ . D. IX, 17; A. III, 9; Lat. l. (pores) 56; 75 oblique series of scales along sides above lateral line.

Mouth oblique, with mandible strongly projecting, the mandibular canines shutting outside of premaxillaries in closed mouth. Maxillary reaching vertical from behind pupil, its length half that of head.

Teeth in sides of mandible in two perfectly defined series, separated by a narrow groove-like interval. The outer teeth are nearly erect and rigid, the inner series directed obliquely inwards and very slightly movable (not strictly depressible). A patch of smaller movable teeth at symphysis, with the customary pair of canines in front of them. Premaxillaries with an outer series of strong teeth, terminating anteriorly in the double pair of enlarged canines. Behind this series is a wide band of minute villiform teeth, only slightly movable. Wide bands of similar villiform teeth on vomer and palatines, the vomerine patch without backward prolongation along median line. Tongue smooth.

Eye large, equaling length of snout, 5 in length of head. Interorbital space narrow, convex,  $6\frac{1}{5}$  in head.

Nostrils close together, the posterior round and much the larger, the anterior with a flap.

Preopercle minutely serrulate on hinder margin, which is convexly rounded. There is a shallow notch above the angle, and the latter is provided with two or three irregular lobes, coarsely toothed, lower margin smooth, entire.

Gill-rakers long and strong, 17 on horizontal limb of outer arch, the anterior short but scarcely rudimentary. Opercle with three flat spinous points.

Scales with entire edges, those on opercles and on middle of sides the largest, smaller above lateral line and along ventral outline, becoming

much reduced on breast and head (except opercles). Mandible with a few imbedded scales, maxillary and premaxillary wholly naked. Top and sides of head wholly scaled, including both limbs of preopercle and the opercular membrane.

First dorsal spine very short, the third the highest, half length of head, the fourth but little shorter. In the type specimen the fifth and sixth are rapidly shortened, while seventh, eighth, and ninth are again lengthened, thus forming a decided notch in the course of the spinous dorsal. The spines all have pungent tips, and seem to be uninjured. Dorsal membranes from third to sixth spines very deeply incised, that between third and fourth joining latter on the basal two-fifths of its length.

Soft dorsal and anal pointed, not falcate, the outline behind angle straight. The anal is higher than the dorsal, but is shorter than the spinous dorsal. Caudal rounded,  $1\frac{2}{5}$  in the head. Pectorals long, reaching beyond the ventrals, and nearly to front of anal. First anal spine concealed in our single specimen, probably mutilated, the second stronger but much shorter than the third, which is contained  $4\frac{1}{4}$  in the length of the head.

Color of head and body uniform, probably red in life; a black streak on cheeks, following hinder edge of maxillary. Fins all blackish on distal half. Basal part of fins scaly.

A single specimen, 16 inches long, from Station 3017, in 58 fathoms, near Cape Lobos, on the eastern shore of the Gulf of California.

#### 17. *Upeneus xanthogrammus* sp. nov.

A number of adult specimens secured in the harbor of La Paz, Lower California, agree closely with *Upeneus martinicus* from the West Indies, but differ constantly in the much smaller eye and the slightly smaller head.

In life they were red with a broad yellow streak along sides. The barbels reach the vertical from the preopercle. The teeth are in a narrow band anteriorly in each jaw, and in a single series laterally. Maxillary very wide posteriorly, projecting well beyond the border of the preorbital, its width two-thirds orbit. Eye  $1\frac{2}{3}$  in snout,  $3\frac{5}{8}$  in head, in specimens  $10\frac{1}{2}$  inches long ( $1\frac{1}{2}$  in snout,  $3\frac{1}{4}$  in head, in *martinicus* of the same size).

Head  $3\frac{2}{3}$  in length ( $3\frac{1}{2}$  in *martinicus*); depth 4 to  $4\frac{1}{4}$ . D. VII, 1, 8; A. I, 6. Pores in lateral line 38, not counting two on base of caudal. Two and one-half rows of scales between lateral line and base of spinous dorsal. Fifteen developed gill-rakers on horizontal limb of outer arch, with 5 smaller rudiments.

Spinous dorsal not high, less than depth of body,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  in head. Pectorals pointed, scarcely reaching tips of ventrals,  $1\frac{1}{2}$  in head. Ventrals reaching half way to front of anal. Caudal very deeply forked, the lobes sharp, the upper the longer, equaling the length of head.

This species seems to differ from *Upeneus flavolineatus*, from the Indian Ocean and Chinese Seas, in its lower dorsal fin and smaller scales, but I have had no opportunity to make a direct comparison.

18. *Pomacentrus leucorus* sp. nov.

Closely allied to *Pomacentrus fuscus*, but adults differing in the color, and in the length of the second anal spine.

Head and sides brown, darker on the upper half of body. No blue spots or lines, and no yellow. Caudal peduncle brown like rest of body. All the fins jet-black, the pectorals abruptly margined behind with pure white.

Posterior margin of preopercle and lower edge of suborbital ring serrulate. Second anal spine very strong; measured from base of sheath much higher than any of the dorsal spines, and as high as highest soft anal ray, its length contained  $1\frac{1}{2}$  times in head. Margin of anal rather bluntly rounded; the soft dorsal pointed, but not much produced, the longest ray  $1\frac{1}{3}$  in head. Caudal lunate, the lobes very bluntly rounded, the upper longer than the lower. Ventrals with the outer ray produced, reaching past vent. Pectorals broad, rounded,  $1\frac{1}{7}$  in head.

Lateral line with 20 pores; 7 to 9 cross-rows of scales behind its end.

Interorbital region transversely convex. Anterior profile arched, a slight depression usually to be recognized on nape and on snout.

Head  $3\frac{1}{3}$  in length; depth 2. D. XII, 16; A. II, 13.

Numerous specimens,  $4\frac{1}{2}$  to  $5\frac{1}{2}$  inches long, were taken at Socorro Island, one of the Revillagigedo Group, off the coast of Mexico.

19. *Gobius microdon* sp. nov.

Allied to *Gobius sagittula*, but much less elongate, with plain coloration, and with minute teeth, those in the upper jaw in a single series. The species belongs apparently to the section called by Bleeker *Oxyurichthys*, but differs from the typical species in the much less elongate form and the horizontal mouth.

Head and body compressed, everywhere deeper than wide. Mouth at lower profile of snout, nearly horizontal, the lower jaw extremely weak, broadly rounded anteriorly. Maxillary reaching vertical from hinder margin of pupil, nearly half length of head.

Teeth minute, scarcely perceptible without the use of a lens, those in upper jaw in a single series. Mandible with a close set outer series of teeth, separated by an interval from an inner narrow band of still smaller teeth.

Interorbital space narrow, less than diameter of pupil. Isthmus wide, the gill-slits extending little below base of pectorals.

Scales minute and cycloid anteriorly and on belly, becoming larger posteriorly; on sides they are everywhere ctenoid behind the middle of



spinous dorsal. Belly wholly scaled; nape scaled forwards nearly to orbits, but with a narrow median naked streak running back to front of dorsal. Breast and sides of head naked.

Dorsal fins not connected. First four spines filamentous, the longest longer than head, reaching when depressed to base of third ray of soft dorsal. Soft dorsal and anal similar, not high, the last rays not extending beyond the base of caudal. Caudal lanceolate, much longer than head. Pectorals and ventrals about equal, reaching vent.

Head  $4\frac{1}{8}$  in length; depth 5. D. VI-13; A. 14. Lat. l., 62.

Color nearly uniform light olive, with minute darker punctulations which sometimes form darker margins to the scales. An oblique dusky streak on opercle. Three or four oblique obscure dark cross-bars on spinous dorsal, and four or five on tail. Ventrals with white pigment,

Two specimens, each about 2 inches long, from the San Juan Lagoon, immediately north of the Rio Ahomè, Mexico.

#### KEY TO SPECIES OF BOLLMANNIA.

- a. A conspicuous black spot on posterior portion of spinous dorsal. Body deep, the least depth of caudal peduncle greater than diameter of orbit.
- b. Filamentous dorsal spines very long, reaching beyond middle of soft dorsal when depressed. Lower caudal rays black. Dorsal spot conspicuously ocellated. Eye large, 3 to  $3\frac{1}{2}$  in head..... OCELLATA.
- bb. Filamentous dorsal spines shorter. Lower caudal rays not black, and dorsal spot not ocellated. Eye smaller,  $3\frac{3}{4}$  to 4 in head..... CHLAMYDES.
- aa. No black spot on spinous dorsal. Body slender, the depth one-fifth the length. Least depth of caudal peduncle not greater than diameter of orbit.
- c. Head large, 3 to  $3\frac{1}{2}$  in length. No black spot at base of caudal. Fins low.  
MACROPOMA.
- cc. Head smaller,  $3\frac{1}{2}$  in length. A black spot at base of caudal. Fins higher,  
STIGMATURA.

#### 20. *Bollmannia ocellata* sp. nov.

Very close to *Bollmannia chlamydes*, the numerous specimens differing from the latter constantly in the following respects:

The eye is larger, 3 to  $3\frac{1}{2}$  in head ( $3\frac{3}{4}$  to 4 in *chlamydes*). The filamentous rays of spinous dorsal are much longer, reaching in adults, when laid back, to or nearly to end of base of soft dorsal,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  times length of head. Rarely the filamentous dorsal rays are little more elongate than in *chlamydes*. Black spot on posterior part of spinous dorsal jet black, conspicuously ocellated with white. A black streak along lower margin of caudal, including several of the lower rays, and running from base to tip of fin. No dusky bars visible on sides in any of the types. Fins dusky; membranes uniting outer rays of ventrals white, instead of black, as in *chlamydes*. No black spot at base of caudal. Branchiostegal membrane with a medial black streak. Anal blackish.

Head,  $3\frac{1}{2}$  to  $3\frac{2}{3}$  in length; depth,  $4\frac{1}{2}$ . D. VII—14 or 15; A. 14. Lat. l. 27.

Teeth in a narrow band in both jaws, the outer series in upper jaw and both outer and inner series in lower jaw enlarged but not canine-

like. Maxillary not reaching vertical from middle of pupil, half length of head. Interorbital width less than half diameter of pupil. Opercle short, its length being less than the diameter of the eye.

Pectorals nearly as long as head, a trifle more than length of ventrals, which scarcely reach vent. Caudal much longer than head in adults, 7 or 8 scales before dorsal.

Numerous specimens from the northern part of the Gulf of California, at Stations 3031 and 3035, in 30 and 33 fathoms.

This species may vary into the typical *chlamydes*, but the material before us does not justify us in so identifying it.

#### 21. *Bollmania macropoma* sp. nov.

This species, represented by numerous specimens, is characterized by its slender form, low fins, large opercle, and comparatively plain coloration.

The depth is one-fifth the length; the caudal peduncle is correspondingly slender, its least height equaling the diameter of the eye. The head is very large and heavy, contained 3 to  $3\frac{1}{2}$  times in the length. The opercle is conspicuously larger than in *ocellata*, agreeing in this respect more nearly with *chlamydes*. Dentition as in other species of the genus. Eye large,  $3\frac{1}{4}$  to  $3\frac{1}{3}$  in the head.

Dorsal spines slender, comparatively little produced, the longest usually not reaching the base of the first ray of second dorsal, and never beyond the base of the second or third ray.

Soft dorsal and anal low, the posterior rays usually not reaching the rudimentary caudal rays when depressed, about half length of head.

Pectoral long, extending beyond front of anal; the ventrals to or nearly to vent. Middle caudal rays produced as usual, varying in length.

Color in spirits: Light brownish, the sides with three vertical dusky bars. Spinous dorsal dusky, but without distinct black spot. Caudal slightly dusky, with rather large elliptical light spots, as in *chlamydes*, the lower rays not black and no black spot at its base. Ventrals blackish, including anterior membrane. Second dorsal and anal dusky, without evident light spots. Branchiostegal membranes sometimes slightly dusky, but not black.

Scales as in *chlamydes*; 28 vertical rows along sides, 8 to 10 in front of dorsal.

Many specimens from the Gulf of California just north of La Paz Bay, at Station 2996, in 112 fathoms.

#### 22. *Bollmannia stigmatura* sp. nov.

This species agrees with *macropoma* in its elongate form, comparatively low fins, and in the absence of a black spot on the spinous dorsal. It differs conspicuously in the very short head and narrow opercle and in the presence of a black spot at base of tail. The eye is also larger

and the fins higher. None of the specimens show dusky bars on the sides; this a conspicuous feature in *macropoma*.

Head short,  $3\frac{2}{3}$  in length; depth 5. Least depth of caudal peduncle slightly less than the diameter of the eye. Eye large,  $2\frac{1}{2}$  in head. D. VII 15; A. 11. Lat. 1. 28.

Dorsal spines filamentous, longer than in *macropoma*, the longest reaching base of fifth to seventh ray of second dorsal. Posterior rays of second dorsal and anal often reaching base of median rays when depressed. Pectorals not reaching beyond front of anal.

The color in spirits is almost uniform light brownish. The lips are black, the fins only slightly dusky, the caudal with elliptical light spots. A roundish dusky spot at base of caudal. Branchiostegal membranes not black.

Many specimens from the northern part of the Gulf of California, at Stations 3016 and 3017, in 76 and 58 fathoms.

### 23. *Gobiosoma crescentalis* sp. nov.

Head  $3\frac{3}{4}$  in length; depth  $6\frac{1}{4}$ . D. VII-12; A. 11.

Body very slender, the head depressed, broad and flattened above, the head and body of nearly equal depth throughout.

Mouth small, oblique, the maxillary not extending beyond the vertical from posterior border of orbit,  $2\frac{1}{2}$  in head. Eyes small, equaling length of snout,  $5\frac{1}{3}$  in head,  $1\frac{2}{3}$  in the rather broad interorbital space. Teeth in bands in both jaws, the outer series enlarged, canine-like, and distant.

Fins all small, the caudal short and rounded from a broad base. Pectoral as long as head without snout. Ventrals short, not reaching two-thirds the distance from their base to vent. Dorsal spines not filamentous.

Skin wholly naked.

Color in spirits: Lower half of head and body uniform warm brown, the back much lighter, the two areas separated by a well-defined line along middle of sides. This line passes through the orbit and through the middle of the base of the pectoral fin. Back light grayish, with brownish reticulations, which tend to form five or six indistinct darker bars uniting with the darker area below the lateral line. A conspicuous brown crescent at base of caudal and pectorals, broad below, narrowing above, margined in front with whitish. Anal brown at base. Dorsal and caudal with small brown spots forming faint cross series.

A single specimen,  $1\frac{1}{2}$  inches long, from Station 2825.

### *Chriolepis* gen. nov. (Gobiidae).

Closely related to *Gymnelcotris* Bleeker, differing in the total absence of scales, and the absence of enlarged canines in the front of the mandible.

Head and body compressed, the former as deep as wide.

Ventrals separate, near together, the inner rays longest, each with one spine and five soft rays.

Teeth in a rather wide band in upper jaw, the outer series somewhat enlarged. Teeth in mandible in a single series, similar to outer row in upper jaw, none of them canine-like. Gill-slits narrow; no dermal flaps on inner edge of shoulder girdle. Body scaleless.

(Type, *Chriolepis minutillus* sp. nov.)

24. *Chriolepis minutillus* sp. nov.

Depth  $4\frac{1}{3}$  in length; head  $3\frac{1}{3}$ . D. VII-12; A. 11.

Mouth oblique, the maxillary reaching to below middle of orbit,  $2\frac{1}{2}$  in head. Eyes high up, but with lateral range, separated by a narrow interorbital space less than diameter of pupil. Diameter of orbit nearly twice length of snout,  $3\frac{1}{3}$  in head.

Dorsal spines high and slender, but not filamentous, the longest half length of head. Soft dorsal rays higher, nearly two-thirds length of head; the anal lower. Caudal short, broadly rounded, the depth of caudal peduncle half length of head. Length of pectoral equaling that of head without snout.

Uniform light brown on head and body, above and below. Fins dusky, the anal blackish.

A single specimen, 1 inch long, from Station 2825.

25. *Gillellus ornatus* sp. nov.

With the elongate form and general appearance of *Gillellus arenicolus*, but differing in the subequal jaws and in the long anterior portion of the lateral line.

The head is conical, acute, very small; the jaws nearly equal, the lower slightly longer than the upper, but not noticeably protruding. In this respect the species resembles most strongly *G. semicinctus*, from which it varies widely in the general form and proportions. Snout extremely short, scarcely equaling the diameter of the minute eye; diameter of orbit about one-seventh of the length of the head.

Mouth oblique, the maxillary one-fourth length of head, reaching nearly to vertical from posterior margin of orbit. Lips without fringes. Eyes separated by a narrow septum, the interorbital width being less than the diameter of the pupil. Opercular fringes few and small, flat, and not terminating evident ridges as in *Dactyloscopus*.

Head  $4\frac{1}{3}$  in length; depth 8. D. III-IX, 31; A. II, 34.

Dorsal beginning well forwards, its origin less than diameter of orbit behind the posterior line of occiput. The anterior detached part of fin consists apparently of three rays, the first of which is the longest, the second and third equal and short. The fourth spine again is longer. The spines are as usual slenderer than the rays, and show no articulations, but are with some difficulty discriminated from them. Pectoral as long as head.

The anterior part of lateral line runs immediately along base of dorsal, without intervening scales, as in other members of this genus.

It is much longer than in *arenicolus*, and is contained  $1\frac{1}{4}$  times in the posterior median portion. There are three scales between the posterior part of lateral line and base of the dorsal.

Color similar to that of *arenicolus* and *semicinetus*. Light olivaceous, unmarked below middle of the sides, the back and upper half of sides with eight brown bars which extend downwards to lateral line. The upper part of each bar has a lighter central area. The light areas between the bars are marked more or less with brown, which sometimes forms indistinct secondary bars. A blackish bar at base of caudal, and a faint streak below eye. A large pearly blotch on opercle.

A single specimen, about 2 inches long, from Station 2828 in the Gulf of California.

#### 26. *Prionotus gymnostethus* sp. nov.

Closely related to *Prionotus venisma*, differing conspicuously in the wholly naked breast and belly.

The largest specimen is  $3\frac{1}{2}$  inches long. Head 0.43 of length to base of caudal; depth 0.30; eye 0.11; interorbital width 0.045; snout 0.18; mouth 0.16; length of pectorals 0.30; length of ventrals 0.25; length of second dorsal spine 0.21.

Body heavy anteriorly, tapering rapidly to the slender tail. Head large; striae fine, numerous, scarcely to be distinguished on top of head, which is finely granular. Snout long; profile concave; the orbital region abruptly elevated. Preorbital on each side projecting beyond the mouth in a narrow lobe, which is usually sharply triangular, the two lobes strongly divergent. Free edge of preorbital with a row of very fine serrae. Anterior nostril with a long flap. Mouth small, the maxillary one-third length of head, a naked area behind it. Eyes very prominent, the preocular ridge high, bearing one strong spine. Interorbital space very narrow, concave, one-tenth length of head. A deep transverse groove on top of head behind eyes.

Supraocular spine short and blunt. Occipital and nuchal spines flat, bluntnish. Temporal ridge with two spinous projections. Opercular, preopercular, and humeral spines, long and sharp. Preopercular spine with a very strong accessory spine at base, from which a low ridge extends forwards to middle of cheeks, where it ends in a weak spine. Gill rakers 1+7, slender, of moderate length.

D. X or XI-10 or 11; A. 11.

Second dorsal spine the highest, the first two spines minutely serrulated in front. Pectorals very short, one third the length, reaching but little past front of anal. Caudal slightly lunate.

Scales very small, none on breast or belly, the naked area extending upwards behind pectoral fin to humeral spine, and narrowing backwards to front of anal. Region in front of spinous dorsal naked.

Color in spirits, brownish above, light below, the dorsal region and top of head often with small dark spots. One, or rarely two, small

black ocellated spots between fourth and fifth dorsal spines. Pectoral mostly dusky, light at base below, and edged with white. A dusky blotch on outer portion of lower caudal lobe.

Several specimens taken in shallow water in the Gulf of California.

27. *Careproctus melanurus* sp. nov.

*Diagnosis.*—Sucking disk very small, three-fifths diameter of eye, immediately below which it is inserted. It is separated from the vent by less than its own diameter. Eye 4 in head (in specimens 6 to 7 inches long). Mouth very broad, horizontal. Pectorals not notched, the lower rays exerted and elongate, but the median ones not evidently shortened. Gill openings confined to region above base of pectorals.

Color light rose-red; the tail with the posterior portions of dorsal and anal, the inner face of pectorals, the mouth and gill cavities jet-black.

*Description.*—Head heavy, with vertical cheeks, short bluntly-rounded snout, and very broad flat interorbital space. Width of interorbital space slightly more than half length of head.

Mouth very broad, horizontal, with short lateral cleft, the maxillary reaching to below middle of eye. Width of mouth equals length of snout and eye. Teeth short and strong, in narrow bands in both jaws; except at symphysis, the teeth of the bands are arranged in regular series running from inner edge of jaw forwards and sideways. Tongue and roof of mouth papillose and toothless. Gill rakers tubercular.

Nostrils single, in a very short wide tube, which is nearer eye than cleft of mouth.

Gill opening oblique, entirely above base of pectorals, the length of slit equaling snout and half eye.

A series of six pores along under side of mandible and interopercle; none on preopercle. Three above premaxillary, and two pairs on snout. No pores along side of body.

Sucking disk extremely small, little more than half diameter of orbit, its center and the middle of pupil equidistant from tip of snout. The disk is separated from vent by a trifle less than its own diameter.

Pectorals forming a continuous lamella, following the margin of gill flap and lower jaw, the two fins becoming closely approximated in front of sucking disk. The fin is not notched, the rays decreasing regularly forwards. Eight to ten of the anterior rays are exerted and elongated, the anterior four or five becoming again shorter and thicker, and wholly free from the membrane. Pectorals scarcely reaching front of anal, two-thirds to three-fourths length of head.

Dorsal beginning over gill slit, the distance from origin of anal to snout,  $2\frac{1}{2}$  in length. Dorsal about 58; A. 50; P. 30. The fins are enveloped in thin lax skin, so that it is impossible to count rays accurately without dissection. Posterior dorsal and anal rays well overlapping base of caudal, their membranes joining middle of caudal rays.

Head  $4\frac{1}{2}$  to  $4\frac{2}{3}$  in length; depth  $4\frac{1}{4}$  to  $4\frac{1}{2}$ .

Color light rose-red on body and fins, the abdomen usually dusky. Inner face of pectorals, the caudal, the posterior portions of dorsal and anal, and the inside of mouth and gill openings, black. The peritoneum is silvery, with more or less black-specking, sometimes nearly black.

Several specimens, the longest about 6 inches long, from Stations 2840, 2891, 2892, 2925, and 3076, in depths from 178 to 339 fathoms off the coast of California and Oregon.

28. *Paraliparis cephalus* sp. nov.

Head very large, high, and compressed, the upper profile descending in a strong convex curve behind the occiput; body tapering posteriorly to a very narrow thread-like tail. Sides of head vertical or inclining inwards below. Height of head twice height of body opposite origin of anal. Interorbital space transversely rounded, its width slightly less than length of snout and eye. Eye of moderate size, 4 in head, without vertical range. Mouth oblique, the premaxillaries but little below lower margin of eye. Lower jaw longest, with the tip protruding. Maxillary reaching vertical from the posterior margin of the eye, slightly more than the length of the head.

Gill slits narrow, confined to a region above the base of the pectorals. The membrane connecting the branchiostegal rays with the shoulder girdle very delicate and easily ruptured, broken in all but one of the specimens. The vent is distant less than a diameter of the orbit from this point, being below the front margin of the preopercle.

Teeth in narrow bands in both jaws, the teeth of the bands arranged in oblique series running outward and forwards. Palate toothless.

Head  $4\frac{1}{2}$  in length, greatest depth (at occiput)  $4\frac{3}{4}$ .

Pectoral small, without about fourteen rays, the upper ones closest and forming a projecting lobe, which extends backwards to beyond origin of anal. The succeeding rays are shortened and wide-set, and have the tips free from the membrane. The fin is somewhat mutilated, but is apparently notched, not however to the base, the median portion having wide-set rays. Upper margin of pectorals on a level with tip of lower jaw.

The dorsal begins slightly behind the head, and the first ray of anal is under the eighth of the dorsal.

Color light reddish, the abdomen blue-black. Inside of mouth and gill opening white. In the smallest specimens, 2 inches long, the color is dusky on head and body, and on inside of mouth. Longest specimen  $3\frac{1}{2}$  inches.

This species differs from *Paraliparis membranaceus* in the structure of the pectoral fins and their much fewer rays, in the position of the vent (below the posterior margin of the orbit in *membranaceus*), the different outline of head, and in the larger more oblique mouth. In none of the specimens of *cephalus* are there fin-folds extending forwards from front of dorsal and anal, as described in *membranaceus*.

Several specimens from stations 2839, 2892, 3070, and 3071, in 284 to 685 fathoms off the coast of California and Oregon.

29. *Paraliparis mento* sp. nov.

Closely allied to *Paraliparis membranaceus* Günther, but with very heavy lower jaw, which projects beyond the upper. The premaxillaries are high, on the level of the lower rim of the orbit, and the form is much more elongate. The pectorals are inserted much lower, and the vent is farther forwards.

Head  $5\frac{3}{4}$  in length without caudal, equaling the greatest depth. Eye a trifle less than interorbital width, greater than snout, 3 in head. Mouth oblique, with lateral cleft, the maxillary reaching slightly beyond the middle of the orbit, half as long as the head. Chin very prominent, the mandible with a wide membranous border, which forms anteriorly a broad free fold over anterior portion of base of pectorals.

Teeth in both jaws comparatively long and slender, not tricuspid, arranged in bands, those in upper jaw at least in oblique rows, as usual in *Liparids*. Nostril with a single opening and without tube. Gill opening but little wider than diameter of eye, confined to region above base of pectorals.

D. 57; A. 43; P. 16.

Pectorals inserted very low, their upper rays below level of angle of mouth. The base is almost horizontal, and the anterior ends of shoulder girdle form prominent projections below tips of mandibles. The fins are very deeply notched, the upper lobe extending slightly beyond origin of anal, the shortest middle ray about one-fourth that length; a few of the lower rays elongate and partly free from the membrane, the longest equaling the length of the upper lobe. The middle pectoral rays are wide-set, but there is no rayless interval between the lobes. The two pectorals converge to immediately behind symphysis of lower jaw, where their bases meet.

The anal opening is vertically below middle of orbit.

Dorsal beginning a trifle behind the upper angle of gill opening, the anal origin under its eighth ray.

Skin loosely investing the head and body.

Light reddish, made dusky by minute dark dots. Abdomen blue-black. Mouth and gill cavity light or dusky.

A single specimen,  $3\frac{1}{4}$  inches long, from station 3071, in 685 fathoms off the coast of Oregon.

30. *Trachyrhynchus helolepis* sp. nov.

Snout depressed, flat, narrowly triangular, tapering to a sharp point, its lateral ridges continuous backwards over suborbital chain and across cheeks. Interorbital space wide and flat. Ethmoidal ridge not prominent. Snout  $2\frac{1}{2}$  in head, its greatest width  $1\frac{2}{7}$  in its length. Eye large, equaling interorbital width, 4 in head.



Mouth wholly inferior, U-shaped, overpassed by the snout by a distance contained  $3\frac{1}{4}$  in head. Barbel slender, short, less than one-fifth diameter of orbit. Teeth finely villiform, in very broad bands in both jaws, none of them enlarged. Maxillary reaching to or almost to vertical from hinder margin of orbit,  $3\frac{1}{4}$  in head. Opercle very small, triangular, its length behind preopercular margin scarcely more than half diameter of orbit. Outer arch not aduate to the opercle, its lower limb with seventeen short gill rakers, which are not tubercular.

Distance of dorsal fin from nape  $3\frac{1}{4}$  in head; the two dorsal fins closely approximated. Second dorsal ray not spinelike, soft and flexible, and not longer than the succeeding rays, its length two-thirds the diameter of orbit.

Vent located immediately in front of origin of anal fin, its distance from ventrals contained  $1\frac{1}{2}$  times in length of head.

Ventrals short, inserted well in advance of base of pectorals, the outer ray little produced, its length  $1\frac{1}{3}$  in diameter of orbit.

Scales all with their margins embedded, and therefore appearing non-imbricated; the central portion of each projecting tubercle-like, and bearing a single strong central spine, with sometimes two or three smaller ones. Belly and breast sometimes covered with much smaller scales similarly armed. No naked area between bases of ventrals. Enlarged plates along bases of dorsals and anal bearing each a strong compressed backwardly-curved spine, usually without distinct serrations; from the base of the central spine, radiate lines of short spinous points. The dorsal series of plates are continued forwards to the nape, the predorsal portion of the included groove covered with scales. The ventral series scarcely extend beyond vent, but extend farther posteriorly than do the dorsal plates. Scales on top of head with a median serrated ridge. Temporal fossæ small but evident, naked.

Head  $3\frac{1}{2}$  in total; depth 7. D. 11.

Color apparently dark brown; gill cavity and peritoneum black.

A single specimen, 18 inches long, from Station 2818, in deep water off the coast of Central America.

31. *Macrurus* (*Malacocephalus*) *pectoralis* sp. nov.

Mouth wide, lateral, the short snout projecting beyond premaxillaries for a distance about equaling one half diameter of orbit. Sub-orbital ridge and lateral ridge on snout inconspicuous. A strong median ridge on snout, and a pair of parallel ridges forwards from above nostrils. Maxillary reaching well behind vertical from posterior margin of orbit,  $2\frac{1}{4}$  in head. Teeth in two somewhat irregular series in front of premaxillaries, the outer series enlarged, the inner directed obliquely inwards, the two series merging into one laterally. Mandible with a single row, similar to inner series of upper jaw. Barbel short, three-fifths to two sevenths diameter of orbit. Eye moderate,  $1\frac{1}{4}$  in snout,  $4\frac{1}{2}$  to 5 in head. Angle of preopercle bluntly rounded, not pro-

duced. Outer gill arch adnate, as usual in *Macrurus*, seven short tubercular gill rakers present on its free portion.

Head 6 in total length, the tail frequently mutilated, however; the head then appearing larger in proportion. Depth  $1\frac{2}{3}$  in head; D. 10.

First dorsal spine slender and weak, with one or two small retrorse prickles near its middle. Distance between dorsals equal to two-fifths base of first. Ventrals with seven rays. Pectorals with seventeen.

Vent immediately in front of anal origin, its distance from base of ventrals slightly more than half head.

Pectorals long and narrow, reaching vertical from ninth or tenth ray of second dorsal, more than half length of head. Outer ventral ray produced into a long slender filament reaching five-sixths the distance from its base to front of anal.

Scales rather small, ten or eleven in a series between lateral line and origin of second dorsal or middle of first dorsal. Scales on sides very thin and flexible, readily deciduous, each furnished with low diverging ridges, usually three in number, bearing few minute spinules, and projecting but little beyond the margins of the scales. Entire head, including snout and mandibles, invested with much smaller scales irregularly imbricated, those on opercles marked similarly to those on sides, the others usually each with a single median ridge terminating in a spinous point. No naked spots or pits on head or between ventral fins. A small naked area behind and below axil of pectorals.

Color light grayish, darker on belly and head. Mouth, gill cavity, and peritoneum black. Lateral line black. Dorsals and ventrals dusky. Anal lighter, edged with blackish. Pectorals black.

It is not evident whether this species should be placed in *Optonurus* (with serrated dorsal spine) or in *Malacocephalus*. The value of the character separating them does not seem to be great.

Specimens have been taken at Stations 3071, 3074, and 3075, in depths of 685 to 877 fathoms, off the coast of Oregon.

### 32. *Lycodes diapterus* sp. nov.

Body slender, the depth 12 in length; head  $5\frac{2}{3}$  to 6.

Mouth small, somewhat variable in length, the maxillary reaching vertical from between front and middle of pupil,  $2\frac{1}{2}$  to 3 in head.

Teeth in premaxillaries in a double row throughout, the two series well separated, rarely with one or two teeth intercalated showing traces of a third row. The teeth of inner series are small and directed obliquely inwards; those of outer series anteriorly enlarged, becoming smaller on sides of jaw.

On front of mandible the teeth are in a broad band, in which traces of three or four irregular series can be made out; none of these enlarged. Laterally the teeth are arranged in a single series, those opposite middle of cleft considerably enlarged. A small patch of from two to five teeth on vomer. Palatines with a single row much shorter than premaxillary patch.

Eye large, usually longer than snout, 3 to  $3\frac{2}{3}$  in head; snout  $3\frac{1}{2}$  to  $3\frac{2}{3}$ ; interorbital width about 10. Nostrils with a short inconspicuous tube. Mandible and preopercular border with deep pitlike excavations, which are not evident in fresh specimens; no evident mucous pores on head.

Gill openings wide, extending below base of pectorals, the gill membranes joined to isthmus for a distance equaling two-fifths length of slit. Gill rakers very short, almost tubercular, but compressed and slightly movable, about fifteen present on anterior limb of outer arch. A wide slit behind fourth gill.

Distance from origin of dorsal to tip of snout  $4\frac{1}{2}$  to  $4\frac{1}{4}$  in length. The dorsal rays are simply forked, the divisions remaining closely connected. Distance from origin of anal to tip of snout equals one-third the length.

Ventrals short, inserted under middle of opercle. Pectorals deeply notched in both young and adults, the median rays much shorter than either upper or lower. The lobe produced by the elongate lower rays varies in length, being sometimes shorter than upper lobe, sometimes longer. The rays of lower lobe are thickened, and undoubtedly serve as a support to the fish when resting on the bottom, as has been observed in so many other forms. The pectorals contain twenty or twenty-one rays. In the structure of this fin the present species seems to differ from all previously described forms, with the exception of *L. esmarki*, in which the notched condition of the fin does not persist in the adults.

Scales small, embedded, covering entire body and vertical fins. The scales on nape are much reduced in size, and in two specimens ( $11\frac{1}{2}$  and  $7\frac{1}{2}$  inches long) are continued onto occiput, which they entirely cover. In another specimen, 9 inches long, the occiput is naked, and in one 5 inches long the anterior part of nape is likewise naked. In the latter, as in other specimens, the dorsal and anal are well scaled.

Lateral line single, wavy, extending from above gill slit obliquely downwards to near base of anal, along which it is continued for a variable distance, not reaching base of caudal.

*Color*.—Dusky brownish, blue-black on belly, and along anterior portion of base of anal. Eight or nine narrow white bars on sides, most conspicuous in the young, in which they are continued up on dorsal fin, and become forked below on middle of sides, forming  $\Lambda$ -shaped marks. In adults, these bars become faint, or wholly disappear. When present, they are not continued on dorsal, and are usually vertically divided by a streak of the ground color. In the small specimen there is a distinct black blotch on margin of anterior dorsal rays. In adults, the vertical fins are brownish on basal portion, their distal half black. Pectorals and ventrals deep blue-black. Mouth, gill cavity, and peritoneum, dusky or black.

Several specimens, from Stations 2892, 2896, 3067, and 3077, in depths from 82 to 376 fathoms, off the coasts of California and Oregon.

33. *Symphurus fasciolaris* sp. nov.

Depth  $3\frac{2}{5}$  in length. Head  $5\frac{1}{5}$ . D. 94; A. 77. Lat. l. 95.

Eye small, 7 in head. Cleft of mouth reaching to below middle of lower eye.

Color light olive, with numerous roundish brownish-black spots much larger than eyes, the largest of which are arranged in five vertical dusky crossbars, the spots being connected by a darker ground color. A vertical dusky streak through eye. A wide dusky crossbar, bounded by darker lines on cheeks. Dorsal and anal posteriorly black, with narrow white margin. Caudal jet black, with white edge. Ventral white.

Several specimens were dredged in shallow water in the Gulf of California.

34. *Antennarius reticularis* sp. nov.

First dorsal spine short, very slender, and filiform, not reaching tip of second, terminating in a short, fleshy flap. Second spine moderately robust, flexible, not curved backwards, wholly free, and without membrane. Third spine nearly erect, not free, depressible with difficulty; not curved as in *Antennarius sanguineus*.

D. III, 12; A. 7.

Spines on body rather coarse and shagreen-like, with expanded undivided tips.

Color in spirits: Top of head, including dorsal spines and front of soft dorsal, coral-red; the body otherwise light gray, broadly reticulated on sides and below with heavy black lines, which inclose 5 or 6 large pale spots. Pectorals, ventrals, and anal with narrow terminal and wide medial black bars. Soft dorsal uniformly light.

This species resembles closely *Antennarius sanguineus*, but differs in the straight erect spines, the color, and the character of the plates on the body.

A single specimen,  $1\frac{1}{4}$  inches long, from Station 2825, Gulf of California.