

A REVISION OF THE FISHES OF THE SUBFAMILY SEBASTINÆ OF THE PACIFIC COAST OF AMERICA.*

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THE primary object of the present paper is to present analytical keys, synonymy, and bibliography of the viviparous genera of Pacific Sebastinæ. For the sake of convenience the oviparous genera of Sebastinæ have also been added. The Scorpenidæ fall naturally into two groups or subfamilies: the tropical Scorpeninæ with twenty-four vertebrae, of which *Scorpena* is found in all tropical seas; and the much more numerous Sebastinæ inhabiting both of the temperate and both of the colder zones, and which invariably have an increased number of vertebrae. While this subfamily has a wide distribution, the number of species found in the north temperate regions of the Pacific Ocean is much larger than that of all other regions combined.

The Scorpeninæ in the region covered by this paper are all shore fishes in the most restricted sense of the word. The Sebastinæ, on the other hand, are rarely found in less than 100 feet of water, except while young, and much more frequently are found in a depth of 600 feet. Some of the species live in more than twice this depth. The horizontal as well as vertical distribution of any given species is usually quite limited; but a single species, *Sebastosomus ruber*, seems to range from San Diego to Alaska, and only one species, *Sebastobus macrochir*, a deep sea form, is found off the coasts of both Japan and the United States. The widest range is that of *Sebastomus capensis*, found in Chilean and Cape seas. The following notes by Prof. Eigenmann on the habitat of the San Diego species describe their vertical range:†

The members of this family seem to live at definite depths, and on bottom peculiar to each species or group of species. This does not imply that their distribution is narrowly limited, but that a given species may or may not be found at any point within the limits of its habitat, as the peculiarities of the bottom at a

*The classification adopted by the authors of this paper is based on their own peculiar interpretation of the importance of certain structural characters. The arrangement and nomenclature proposed will not be, at present at least, followed in the National Museum.—EDITOR.

†Proc. Cal. Acad. Sci., 2nd ser., III, 1890, 11 p.

given depth are fitted for it or not. To this cause is to be attributed, in part, the fact that so many northern forms have but lately been added to the fauna of San Diego, and that a given species may be caught for several days in succession, and then not appear again for some time. As the different rock-cod boats have found new conditions, even within a few hundred yards of their usual fishing grounds, they invariably have brought novelties. Thus on one day, *S. proriger* [= *macdonaldi*], *rufus*, *eos* and *melanostomus* * * * were all brought by one boat which had accidentally found new conditions. [All were new to science.] * * * *S. ruber* and *leris* are frequently associated, while *rubrinotus*, *elongatus*, *chlorostictus*, *constellatus*, *rosaceus*, *verillaris*, *chrysomelas* and *serriceps* form another group.

The Sebastinæ are seemingly as abundant on the coast of Japan as they are on the coast of the United States. Few species extend further south than the boundary of the United States and they are entirely absent from Mexico and other tropical coasts, but reappear on the coast of Chile in *Sebastomus oculatus*, which is synonymous with *S. capensis* of the Cape seas.

We have examined most of the American species, but none of the Japanese forms. We are fully aware of the hazardous nature of attempting a generic subdivision of a large number of species when a good percentage of the whole number is not available for study, and especially when the absent members practically all belong to a particular region; but an examination of the skeletons of a large number of species warrants us, in the absence of other evidence, to considerably increase the number of genera heretofore admitted. The condition of the parietals has been taken as the primary character for generic division and the constant presence or absence of certain cranial spines, associated with a number of minor characters, have been drawn upon to furnish definitions for the genera heretofore united under the names *Sebastodes*, *Sebastomus*, *Sebastosomus*, and *Sebastichthys*.

The cranial spines used in generic definitions are located as follows: (1) The preocular is the continuation of the upper posterior angle of the prefrontal into a spine. It is usually present. (2) The supraocular, (3) the postocular, and (4) the tympanic are always near the outer border of the frontal. The last of this series of spines always over-arches a mucous pore and is present and homologous throughout the group. The postocular, on the other hand, is absent in several genera. (5) The coronals are also on the frontals, but nearer their middle and directly in front of the parietal ridges. They are developed in but few species. There seems to have been a confusion of this name in the Scorpeninæ and the spine called coronal in *Scorpena* does not seem homologous with the spine called coronal in *Auctospina*, which has just been described. (6) The parietals (occipital of Jordan and Gilbert), as their name implies, are on the parietal bones and form the spine at the end of the ridge running near the middle of these bones. (7) The nuchals are much less constant and their taxonomic value consequently much less than that of the other spines. They are formed by the transverse division of the parietal ridges.

This revision is based:

(1) On a collection made by Prof. Eigenmann during a three years' stay in California. Many of the species were here examined in large numbers as they were brought to the markets. Collections were made at San Diego, Cortes Bank, Monterey, and San Francisco. A nearly complete series of these were presented to the National Museum.

(2) On many of the specimens collected by Jordan and Gilbert, which now belong to the National Museum and to the Indiana University.

(3) A series of skulls and skeletons belonging to Mrs. Eigenmann's collection formed the basis for the classification into genera.

We are indebted to Dr. G. Brown Goode for the use of species belonging to the National Museum and not otherwise accessible to us.

To Messrs. Gilbert and Test we are indebted for examinations of otherwise inaccessible specimens, and to Messrs. Gill and Jordan for suggestions and criticisms.

HISTORICAL NOTE ON THE VIVIPAROUS GENERA.

The species of *Sebastodes*, *Sebastichthys*, etc., were originally included in the long known genus *Sebastes*. Dr. Gill first distinguished between genera in the following historical sequence:

1. *Sebastodes*, GILL, Proc. Phila. Acad. Sci., 1861, p. 165 (*Sebastes paucispinis*, AYRES).
2. *Sebastichthys*, GILL, l. c. 1862, pp. 278, 329 (*S. nigrocinctus*, AYRES, type; *S. nebulosus*, AYRES, *S. auriculatus*, GIRARD, *S. ocellatus*, CUVIER, *S. helvromaculatus*, AYRES, *S. melanops*, GIRARD, and *S. rosaceus*, AYRES).
3. *Sebastosomus*, GILL, l. c. 1864, pp. 59, 147 (*S. melanops*, GIRARD), to include also *Sebastosomus pinniger*, GILL.
4. *Sebastomus*, GILL, l. c. 1864, pp. 59, 147 (*S. rosaceus*, GIRARD).

In the last paper quoted, Dr. Gill says:

In conclusion, the genus *Sebastichthys* includes at least three genera. The *Sebastichthys nigrocinctus* is somewhat related to *Scorpana*, and is distinguished by elevated, serrated coronal [parietal] crests. Other California species represented by the *Sebastes melanops*, seen by me, differ so much that they may be separated and combined for the present under a genus *Sebastosomus*, of which the *Sebastes melanops* of Ayres may be taken as the type. Still others, distinguished by the texture of the bones of the skull, armed orbital ridges, prefrontals, etc., and represented by *Sebastes rosaceus*, Girard, may be named *Sebastomus*.

In 1880 Jordan and Gilbert* retained *Sebastodes* as a distinct genus, but united all the other known species under the name *Sebastichthys*, retaining *Sebastosomus* as a subgenus.

These genera, *Sebastodes*, *Sebastichthys*, *Sebastosomus*, *Sebastomus*, were again united by Jordan and Gilbert† in 1882, under the generic name *Sebastodes*, with the remark, "the species differ greatly in form of armature, but the genera based on these differences intergrade too closely to be worthy of retention."

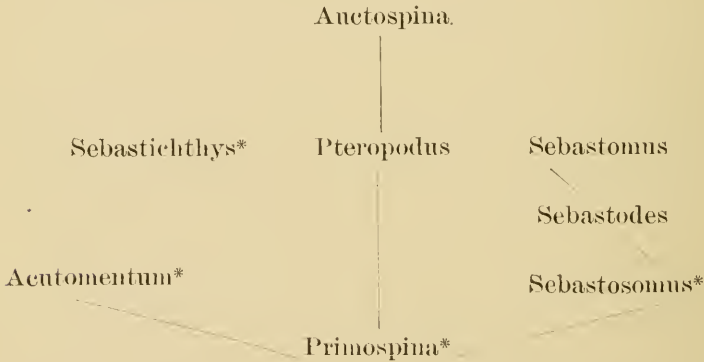
*Proc. U. S. Nat. Mus. III, 1880, p. 287 (1881).

†Bull. U. S. Nat. Mus., XVI, 1883.

In 1885 Dr. Jordan* again separated the genus *Sebastodes* from the other species which remained united under the name *Sebastichthys*.

More recently Eigenmann,† after describing *S. goodei*, remarked "the genus *Sebastodes* will either have to be merged with *Sebastichthys* or the latter divided into other genera." The material for this further division was not at hand at the time and *Sebastodes* was adopted as defined by Jordan and Gilbert. The present examination of skulls has shown that the intergradation of the armature of the head noticed by them is of secondary importance only, and largely due to their arrangement of the species to emphasize this intergradation in armature, and that, as soon as the large number of species are separated on the more essential relation of the parietals to the supraoccipital, the intergradations largely vanish, and the groups originally defined by Gill come to the foreground as valid genera, with the addition of several other genera. An outline of the classification, here more fully treated, was published by us in the *American Naturalist* for July, 1893.

The interrelation of the various genera is complex. Our conception of it may be illustrated by the following diagram, the genera with united parietals being marked with an asterisk.



The last general account of these forms to appear was that of Jordan and Gilbert in the *Synopsis of the Fishes of North America*. At that time only about 30 species were known. Since then about 20 species have been described. This large increase in the number of known species, and the observed incongruity of grouping were the chief agents leading to the present revision, which we hope to be a step in the right direction. The synonymy is all simple, and the species have been for the most part well described. We have therefore omitted any further discussion of the former and confined the descriptions to the keys.

*Cat. Fish. N. Am., 1885; Rept. U. S. Comr. of Fish and Fisheries, 1884 (1885).

†Proc. Cal. Acad. Sci., 2nd ser., III., p. 12, 1890.

ANALYSIS OF THE PACIFIC COAST GENERA OF SEBASTINÆ.

- a. Vertebrae 27 or more (SEBASTINÆ).
- b. Dorsal spines 14-16; the lower pectoral rays thickened, unbranched, and produced; ventrals directly under pectorals. Suborbital stay strong, spiniferous. SEBASTOLOBUS, I.
- bb. Dorsal spines 13; vertebrae 27.
- c. Palatines with teeth. Lower pectoral rays unbranched, their tips projecting.
- d. Parietals meeting above the supraoccipital,* except sometimes in *Primospina*.
- e. Jaws equal; head narrow above; high and prominent cranial keels ending in spines. Preocular, supraocular, tympanic, and parietal present. Gill-rakers usually short, spatulate or clavate, their broadened tips spiniferous. Scales usually very strongly etenoid; accessory scales numerous; suborbital stay directed obliquely downward and backward; second anal spine much heavier than and at least as long as third. Body short and deep, back arched, mouth very large but rather narrow, head heavy. Inter- and sub-opercle without spine. Branchiostegals and lower jaw naked. Three or four large pores along each ramus of the lower jaw. Species usually with cross bands SEBASTICHTHYS, II.
- ee. Lower jaw much projecting; head broad, skull usually convex; cranial ridges when present usually low. Gill-rakers very long and slender; scales usually smooth, few if any accessory scales. Branchiostegals and lower jaw scaled. Pores of lower jaw concealed except in some species of *Acutomentum*.
- f. Preocular spines well developed. Peritoneum black.
- g. Postocular spine present. Supraocular, tympanic and occipital spines well developed. Second anal spine stronger and usually longer than the third. Symphyseal knob strong, projecting forward. Dorsal low. Lower pectoral rays normal, not thickened. No spines on inter- and sub-opercles. (Mandible and maxillary sealed) ACUTOMENTUM, III.
- gg. Postocular spines not developed. Supraocular and tympanic sometimes present, always concealed by the skin. Occipitals ending in spines or not. Interorbital wide, convex. Lower pectoral rays thickened, their tips projecting beyond the membrane. Bones of the skull striate and pitted. Mouth small, narrow. Spines on inter- and sub-opercle sometimes present. Peritoneum black PRIMOSPINA, IV.
- ff. Preocular without spine; skull smooth, without spines. Lower pectoral rays normal. No spines on inter- or sub-opercle. Peritoneum usually white SEBASTOSOMUS, V.
- dd. Parietals separated by the supra occipital.†
- h. Cranium with parietal ridges only. Lower jaw much projecting, entering the profile; a prominent symphyseal knob directed forward. Head broad, convex. Interorbital convex, nearly smooth. Lower pectoral rays normal; no spines on inter- and sub-opercles. Exposed branchiostegals, maxillary and mandibles densely sealed. Pores of lower jaw concealed by the scales. SEBASTODES, VI.

* See *Sebastomus areus* and *elongatus*.† Except in *areus* and sometimes in *elongatus*.

- hh. Cranium with many ridges all ending in spines. Branchiostegals (except in *A. aurora*, *S. proriger*, and *S. rufus*) and usually the lower jaw naked. Pores of lower jaw, except in *Auctospina*, very large, conspicuous, slit-like.
- i. Postocular and tympanic spines both present. Lower pectoral rays thickened (except in *Sebastomus rufus*). Interopercle and subopercle usually with spines.
- j. Coronal spines, nuchal spines; a spine below, another in front of eye.....Genus. (?) (single species MATZUBARAE), VII.
- jj. Coronal spines not developed.....SEBASTOMUS, VIII.
- ii. Postocular spine not developed; interopercle and subopercle each with a spine at their approximated corners.
- k. Coronal spines not developed; lower pectoral rays usually thickened; interorbital usually with a groove in its middle. The large pores (4) along each ramus of the lower jaw open. Maxillary, mandible, and branchiostegals usually naked or with minute embedded scales.....PTEROPODUS, IX.
- kk. Coronal spines developed; interorbital with a median ridge; gill-rakers long; lower pectoral rays normal, not thickened and fleshy. Pores of lower jaw (in *auriculatus*) entirely closed by a thin membrane.....AUCTOSPINA, X.
- cc. Palatines without teeth. Preocular, supraocular, postocular, tympanic, parietal, nuchal, and coronal spines developed. Suborbital stay with a sharp spiniferous ridge.....SEBASTOPSIS, XI.

I. Genus SEBASTOLOBUS, Gill.

Sebastolobus, GILL, Rep. Smithsonian Institution, 1880 (*macrochir*).

TYPE.—*Sebastes macrochir*, GÜNTHER.

This genus is known from two species found in deep water. It is characterized by the position of its ventrals and by the peculiar shape of its pectorals. The upper rays are the longer and the lower five are thickened and prolonged beyond the membranes much as in many species of *Pteropodus*, *Sebastichthys*, and other genera.

ANALYSIS OF THE SPECIES OF SEBASTOLOBUS.

- a. Second anal spine one-seventh of the length; highest dorsal spine, $2\frac{1}{2}$ in the head; eye $1\frac{1}{2}$ times as long as snout; a large black spot on the posterior half of the spinous dorsal, and another between the anal spines. D. XV, 6-9; A. III, 5. Lat. 1, ca. 45 (Günther).....MACROCHIR, 1.
- aa. Second anal spine one-fifth of the length; highest dorsal spine three in head; eye twice as long as snout; a dark blotch on membranes between first and third dorsal spines, and one from sixth to eleventh spine (Bean).....ALASCANUS, 2.

1. SEBASTOLOBUS MACROCHIR (Günther).

Sebastes macrochir, GÜNTHER, Ann. Mag. Nat. Hist. (4), XX, 434 (Japan); *id.*, *Challenger* shore fishes, p. 65, pl. xxvi, 1880 (Inland Sea of Japan, off Inosima, 345 fathoms). This species, first described from Japan, has been found to be quite abundant off the coast of the United States.

2. SEBASTOLOBUS ALASCANUS, Bean.

Sebastolobus alascanus, BEAN, Proc. U. S. Nat. Mus., XIII, 1890, p. 44 (1891). (Off Trinity Island, West Long. 154° , North Lat. 56° , at a depth of 159 fathoms.) It is probable that this is only the young of *macrochir*.

II. Genus SEBASTICHTHYS, Gill.

Sebastichthys, GILL, Proc. Acad. Nat. Sci. Phila. 1862, p. 278 (*nigrocinctus*).

Sebastichthys, JORDAN and GILBERT, Proc. U. S. Nat. Mus. III., 1880, p. 287 (sp.) (1881).

TYPE.—*Sebastes nigrocinctus*, AYRES.

When originally defining it Dr. Gill included in this genus the types which he afterwards* separated under other generic names. As here understood it comprises three species which are well separated from all other related genera by the prominent characters set forth in the key. The parietals in all three species cover all but a small posterior part of the supraoccipital. A fourth species which I have not seen (*diploproa*) seems to form an aberrant member of the genus.

ANALYSIS OF THE SPECIES OF SEBASTICHTHYS.

- a. Gill-rakers short spatulate or clavate, their broadened tips spiniferous. Lower pectoral rays thickened and fleshy. Sides with cross bands.
- b. Cranial ridges very rough, spinous; frontals with high crests between the eyes which sometimes end in coronal spines. Orange red, with 5 jet black vertical bars. A. III, 7; D. XIII, 15 NIGROCINCTUS, 1.
- bb. Cranial ridges smooth; frontals without crests.
- c. Scales of head ctenoid; cranial ridges very high, their spines isolated, high and heavy. Nuchal spines distinct from parietal spines. Dark olive, with about 7 oblique black cross bands. A. III, 5; D. XIII, 13.....SERRICEPS, 2.
- cc. Scales of head cycloid; cranial ridges very low and long, the spines slender, acute. No nuchal spines. Pink or rose red with brilliant crimson cross bands RUBRIVINCTUS, 3.
- aa. Gill-rakers long, slender, the longest half length of eye. Lower pectoral rays not enlarged.
- d. Premaxillaries produced on each side of median line, forming two forwardly-projecting denticerous lobes in the deep emargination, between which fits the tip of the mandible. Preorbital one-third pupil, with two strong diverging spines. Eye larger, 3-3½ in head: interorbital, 1½ in orbit, slightly concave. Longest dorsal spine, 2½ in head. Second anal spine longer and stronger than third, 2½-3 in head. Scales large, minutely spinous, and readily deciduous, very small and cycloid on maxillary, mandible, and breast. Fin membranes thick and scaled. Uniform rose-red above, bright silvery below, sparsely black-punctate. Peritoneum jet black. Spinous dorsal with dusky margins, the fins otherwise unmarked. Depth, 2¾; head, 2½. D. XIII, 12 or 13; A. III, 7; tubes, 35 (Gilbert) DIPLOPROA, 4.

1. SEBASTICHTHYS NIGROCINCTUS (Ayres).

Sebastes nigrocinctus, AYRES, Proc. Cal. Acad. Sci., II, 1859, pp. 25, 217, fig. 31.

Sebastichthys nigrocinctus, GILL, Proc. Acad. Nat. Sci. Phila., 1862, pp. 278, 329.—JORDAN and GILBERT, Proc. U. S. Nat. Mus. III, 1880, p. 455 (1881) (Puget Sound, Monterey Bay).—JORDAN and JOUY, Proc. U. S. Nat. Mus. 1881, p. 7, IV (1882) (Monterey and Puget Sound).—JORDAN and GILBERT, *l. c.*, p. 59.—BEAN, *l. c.*, p. 264 (Puget Sound, Vancouver Island); Proc. U. S. Nat. Mus. VI, 1883, p. 260. (1884), (Near St. Mary Island, Alaska).—JORDAN, Cat. Fish. N. Am., 1885, p. 108 (California).

Sebastodes nigrocinctus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 677, 1883, (San Francisco to Vancouver Island).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Monterey, San Francisco, Puget Sound).

HABITAT.—Monterey to Alaska. Rare.

* Proc. Acad. Nat. Sci., Phila., 1863, p. 147.

The spines of the cranium in this species are as high as those in *serriceps*. To those of *serriceps* are added median frontal ridges. With age the spines, as well as the frontal ridges, become broken into a large number of tubercles or spines so that the individuals of the primary spines can hardly be separated from each other. The frontal ridges in this way sometimes give rise to a tubercle corresponding in position to the coronal spines of *Auctospina*. The mucous canal system is very highly developed in this species. The specimens examined are from San Francisco and Monterey.

2. SEBASTICHTHYS SERRICEPS, Jordan and Gilbert.

Sebasticthys serriceps, JORDAN and GILBERT, Proc. U. S. Nat. Mus. III, 1880, p. 38 (1881) (Santa Catalina; Santa Barbara); *op. cit.*, p. 455 (San Francisco, Monterey, Santa Barbara, San Pedro, San Diego).—JORDAN and JOUY, Proc. U. S. Nat. Mus. IV, 1881, p. 7, (1882).—JORDAN and GILBERT, *l. c.*, p. 59 (San Diego to San Francisco).—JORDAN, Cat. Fish. N. Am., p. 108, 1885 (name).—EIGENMANN and EIGENMANN, Notes, San Diego Biol. Lab. I, p. 7, 1889 (San Diego).

Sebastes serriceps, JORDAN and GILBERT, Syn. Fish. N. Am., p. 676, 1883 (San Francisco to Cerros Island).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus. XV., 1892, p. 168 (1893), San Diego; *id.*, Ann. N. Y. Acad. Sci., 1892, 355 (San Diego, Cortes Bank, San Pedro, Santa Barbara, Monterey, San Francisco).

HABITAT.—San Diego to San Francisco.

This is one of the smaller species and is abundant in shallow water. On the Cortes Bank I have taken it in 15 fathoms.

3. SEBASTICHTHYS RUBRIVINCTUS, Jordan and Gilbert.

Sebasticthys rubrivinctus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 146 (1881), (Monterey); *op. cit.*, p. 291 (Santa Barbara, Monterey, San Francisco); *op. cit.*, p. 455.—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 7 (1882), (Monterey)—JORDAN and GILBERT, *l. c.*, p. 57.—EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 7, and II, p. 1, 1889 (San Diego).

Sebastes rubrivinctus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 670, 1883 (Santa Barbara to Monterey)—JORDAN, Cat. Fish. N. Am., p. 108, 1885 (name)—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., 1892, p. 167 (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, Cortes Bank, Santa Barbara, Monterey).

HABITAT.—San Diego to Monterey.

This species is only occasionally taken. The specimens examined are from San Francisco, San Diego, and Cortes Bank.

4. SEBASTICHTHYS DIPLOPROA, Gilbert.

Sebasticthys diploproa, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, p. 79 (1891), (coast of California, south of Point Conception).

Sebastes diploproa, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Santa Barbara).

HABITAT.—Coast of California, south of Point Conception.

This species has not been seen by us, and we place it in this genus with some hesitation. Dr. Gilbert informs us that the parietals are united.

III. Genus ACUTOMENTUM, Eigenmann and Beeson.

Acutomentum, EIGENMANN and BEESON, Amer. Nat., July, 1893 (*oralis*).

TYPE.—*Sebastes oralis*, AYRES.

This genus is composed of about four species. While these agree with each other in the technical characters distinguishing the genus, they show considerable variation in other characters. *A. melanostomus* approaches *Sebastichthys* in shape of head and body. *A. oralis*, on the other hand, is a compressed fish with narrow head. In this last species the sharp chin from which the genus derives its name is most conspicuous.

ANALYSIS OF THE SPECIES OF ACUTOMENTUM.

- a.* Nuchal spines; skull wide, concave between the large postocular spines. Lining of mouth and of gill-cavity black. Short and deep; head heavy; mouth large; lower jaw projecting, maxillary reaching to below posterior border of pupil. Eye equal to snout, $3\frac{3}{5}$ in head. Interorbital $4\frac{2}{5}$ in head, preorbital 3 in orbit, with an anterior simple and a posterior many pointed spine. Maxillary, mandible, preorbital, and snout scaly. Scales of opercle rather large; scales of the sides very large; accessory scales few. Gill rakers $3\frac{1}{2}$ in orbit. Dorsal spines very low, about 4 in head; anal spines graduated. Scarlet, shading into madder brown or blackish red above the lateral line. Fins vermilion, the first dorsal, with its membranes, narrowly black edged. All other fins more or less black on distal half, the caudal most so. Head vermilion, tinged with black. Head $3\frac{1}{2}$ in the total length; D. XIII, 13; A. III, 7; lat. 1. 43. MELANOSTOMUM, 1.
- aa.* Nuchal spines or none; gill cavity dusky. Elongate. General appearance of *Sebastes proriger*. Head pointed, lower jaw projecting, maxillary reaching to below posterior margin of eye, 2 in head. Interorbital slightly convex, without ridges. Cranial ridges low, obscure, but all terminating in sharp spines; pre-supra- and postocular, tympanic and occipital spines present. Eye small; orbit $1\frac{3}{5}$ in snout, $4\frac{2}{5}$ in head, $1\frac{1}{5}$ in interorbital. Preorbital $\frac{2}{3}$ of an orbital diameter, with 3 retrorse spines below, the posterior the smallest; a retrorse spine just below the orbit. Opercular spines simple and strong. Mandible, maxillaries, suborbitals, and entire snout scaled. Scales of the head small and strongly etenoid, those of the body larger. Outlines of spinous dorsal regularly arched, the 4th and 5th spines highest, 3 in the head; highest articulate ray $3\frac{2}{5}$ in the head. Anal spines graduated, the second being stronger but considerably shorter than the third, which is $5\frac{1}{5}$ in the head; highest ray 3 in the head. Pectorals extending somewhat beyond the ventrals. Peritoneum black. Top of head and back chiefly black, lateral line vermilion; a blackish band just below the lateral line becoming much wider forward and extending on the sides below the fifth dorsal spine. A large opercular spot, a broad band downward and backward from eye, a narrow one across cheeks below the eye, lips and tip of lower jaw chiefly black; the rest of the head and sides chiefly vermilion. Anal and ventrals vermilion; pectorals and caudal blackish; dorsals nearly black. Axils dusky. Head 3 in the total length; depth $3\frac{2}{5}$; D. XIII, $13\frac{1}{2}$; A. III, $7\frac{1}{2}$ MACDONALDI, 2.
- aaa.* No nuchal spine; skull convex between the postocular spines. Lining of mouth and of gill-cavity pale. Cranial ridges low. Dorsals low.

- Lower spines of preopercle short and flat, the second not reaching base of third. Highest dorsal spine $2\frac{1}{2}$ in head. Oval, deep, compressed. Lower jaw with an acute, antrorse symphyseal knob. Preorbital narrow, with a sharp retrorse spine. Gill rakers long, $1\frac{1}{2}$ in orbit. Eye little longer than snout. Second anal spine longer and stronger than third, $2\frac{1}{3}$ in head. Maxillary and mandible sealy. Peritoneum black. Head olivaceus, strongly tinged with creamy red, especially below; membrane of both dorsals covered with many small, round, black spots; similar spots usually on the body. Head 3; depth $2\frac{1}{4}$; D. XIII, 14; A. III, 8; tubes 70. OVALIS, 3.
- bb. Lower spines of preopercle large, the second reaching beyond base of third. Second anal spine enlarged, much stronger and longer than third, $2\frac{2}{3}$ in head; highest dorsal spine $2\frac{3}{4}$ in head. Caudal peduncle $\frac{1}{4}$ the depth; maxillary extending to middle of pupil, $2\frac{2}{5}$ in head; interorbital space flat, $1\frac{1}{8}$ in orbit. Eye $3\frac{1}{4}$ in head. Preorbital very narrow, lobate, but without spines. Scales small, rough; those above lateral line much smaller than others and irregularly disposed; those on breast, snout, maxillary, and mandible smooth. Gill rakers 2 in orbit. Dusky above, with faint traces of darker blotches along back. A dark blotch on opercle, one on subopercle, and one on upper half of axil. Top of head, including membrane of premaxillary, dusky. Spinous dorsal with a dark marginal band; other fins, except pectorals, margined with black. Peritoneum black. Head $3\frac{2}{3}$; depth $3\frac{1}{5}$; D. XIII, 15; A. III, 8; tubes 50 [Gilbert] ALUTUM, 4.

1. ACUTOMENTUM MELANOSTOMUM, Eigenmann and Eigenmann.

- Sebastes melanostomus*, EIGENMANN and EIGENMANN, Proc. Cal., Acad. Sci. 2d Ser., III, p. 17, 1890 (San Diego); *id.* Proc. U. S. Nat. Mus., xv, 1892, p. 164, (1893), (San Diego); *id.* Ann. N. Y. Acad. Sci. 1892, p. 355.
- Sebastichthys introniger*, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, p. 81 (1891) (coast of California south of Point Conception).
- Sebastes introniger*, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355.

HABITAT.—Coast of California south of Point Conception.

2. ACUTOMENTUM MACDONALDI, Eigenmann and Beeson.

- Sebastes proriger*, EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 2d Ser. III, p. 15 (San Diego), not *S. proriger*, JORDAN and GILBERT.
- Acutomentum macdonaldi*, EIGENMANN and BEESON, Amer. Nat., July, 1893 (San Diego).

HABITAT.—Off San Diego in 100 fathoms.

This species is known from a single specimen in the National Museum. In general appearance it resembles *S. proriger*, with which it was for a time confounded. The original description is reproduced in the key.

3. ACUTOMENTUM OVALIS (Ayres).

- Sebastes ovalis*, AYRES, Proc. Cal. Acad. Sci., 1862, p. 212, fig. 65—JORDAN and GILBERT, Syn. Fish. N. Am., p. 660 (coast of California)—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., xv, 1892, p. 163 (1893), (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, Cortes Bank, Santa Barbara, Monterey).
- Sebastichthys ovalis*, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 143 (Monterey Bay); p. 455 (Monterey Bay, Santa Barbara)—JORDAN and JOUY,

Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882), (Monterey)—JORDAN and GILBERT, *l. c.*, p. 56; JORDAN, Cat. Fish. N. Am., p. 107, 1885—EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 7, and II, p. 1, 1889 (San Diego).

HABITAT.—San Diego to Monterey.

4. ACUTOMENTUM ALUTUM, Gilbert.

Sebastichthys alutum, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, p. 76 (1891) (coast of California south of Point Conception).

Sebastes alutum, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 354.

HABITAT.—Coast of Southern California.

This species seems to resemble *S. rufus*. If the parietals are separate it must be transferred to *Sebastomus*. The species is known from the types only.

IV. Genus PRIMOSPINA, Eigenmann and Beeson.

Primospina, EIGENMANN and BEESON, Amer. Nat., July, 1893 (*mystinus*).

TYPE.—*Sebastichthys mystinus*, JORDAN and GILBERT.

This genus is composed of only two variable species. The skull is thick, and there is greater variation in the presence or absence of spines in different individuals of the same species, than in any other genus. Preocular spines are always developed, but supraocular and tympanic spine are present in some individuals and not in others. The parietal ridges end in spines in one species but not in the other. From this genus as a center have been developed in one direction the genera *Sebastosomus*, *Sebastes*, and *Sebastomus*. In another direction *Pteropodus*, *Auctospina*, and still in another *Acutomentum* and *Sebastichthys* have become differentiated.

ANALYSIS OF THE SPECIES OF PRIMOSPINA.

- a.* Parietal ridges not terminating in spines. Oblong, depth $2\frac{2}{3}$; slaty black, paler below the lateral line; sides more or less mottled MYSTINUS, 1.
aa. Parietal ridges ending in spines. Oblong elongate, depth $3\frac{1}{4}$; dull olive green; sides with obscure round, rusty spots ENTOMELAS, 2.

1. PRIMOSPINA MYSTINUS (Jordan and Gilbert).

Sebastes variabilis, AYRES, Proc. Cal. Acad. Sci., I, p. 7, 1854 (San Francisco).
 [not of Pallas.]

Sebastes melanops, AYRES, Proc. Cal. Acad. Sci., II, p. 216 (in part).

Sebastichthys melanops, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 287.—EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 5, and II, p. 1, 1889 (Cortes Bank, San Diego).

Sebastichthys mystinus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 455 (1881), (Puget Sound, San Francisco, Monterey, Santa Barbara, San Pedro, San Diego).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882), (Monterey, San Francisco).—JORDAN and GILBERT, *l. c.*, p. 70.—BEAN, *l. c.*, p. 265 (Puget Sound).—JORDAN, Cat. Fish. N. Am., p. 107, 1885 (California).

Sebastes mystinus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 659, 1883 (Puget Sound to San Diego).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus.,

xv, 1892, p. 163 (1893), (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, Cortes Bank, San Pedro, Santa Barbara, Monterey, San Francisco, Puget Sound).

HABITAT.—San Diego to Puget Sound.

This species varies more than any other in its armature and in the degree of convergence of the parietals, facts which lend weight to the supposition that it is the central species about which the others are grouped. The specimens examined are from San Francisco and show the following variations:

Individual variations in Primospina mystinus.

Catalogue No. of specimen.	Parietals.	Inter- and sub-opercular spines.		Postocular spines.	Tympanic spines.
1085.....	Separate.....				Knob.
1360.....	Joined.....	Slight.....	Present.....		Do.
1171.....	do.....		Slight.....		Do.
1193.....	do.....	Slight.....	do.....		1 spine.
1087.....	do.....	Present.....	Present.....	Present.....	Knobs.
1092.....	Separate.....			1 present.....	Do.
1137.....	Joined.....		Present.....	1 knob.....	Knob.
1190.....	do.....	Present.....	do.....	do.....	2 spines.
1115.....	Separate.....	do.....	do.....	2 short spines.....	2 knobs.

2. PRIMOSPINA ENTOMELAS (Jordan and Gilbert).

Sebastichthys entomelas, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 142 (1881), (Monterey Bay); *op. cit.*, p. 455 (San Francisco, Monterey Bay).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8, (1882), (Monterey).—JORDAN and GILBERT, *l. c.*, p. 56.—JORDAN, Cat. Fish. N. Am., p. 107, 1885. *Sebatoöas entomelas*, JORDAN and GILBERT, Syn. Fish. N. Am., p. 659, 1883 (Monterey).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 35 (Port Harford, Monterey, San Francisco).

HABITAT.—Port Harford to San Francisco, Cal.

This species is only provisionally placed here. We have not examined it, but Mr. F. C. Test informs us that the parietals are united, and that the parietal ridges end in minute spines. In the last point this species agrees with the genus *Acutomentum*, but the absence of postocular and the occasional absence of supraocular and tympanic spines unite this variable species with the variable *Primospina*.

V. Genus SEBASTOSOMUS (Gill).

Sebastosomus, GILL, Proc. Acad. Nat. Sci. Phila., 1864, p. 147 (*melanops*).—EIGENMANN and BEESON, Amer. Nat., July, 1893 (redefined).

TYPE.—*Sebastes melanops*, Girard.

This genus differs from all others in the fact that no cranial spines are developed.

ANALYSIS OF THE SPECIES OF SEBASTOSOMUS.

a. Peritoneum white.

b. Snout acuminate, the lower jaw strongly projecting, entering the profile. Anal truncate or subtruncate.

c. Eye large, 1 in snout, 1 in interorbital, 4 in head. Tips of nasal spines free. Parietal ridges well developed. Highest dorsal spine $2\frac{2}{3}$ – $2\frac{3}{4}$ in head. Pala-

- tine band of teeth of nearly uniform width. Olivaceous, yellowish on sides, lighter below. Sides with rusty spots usually near the tips of scales. Base of spinous dorsal sometimes spotted. Second dorsal, caudal, and anal bright orange, margined with black. An orangestreak down and back from eye, a broader one back from eye, a narrow one on maxillary. Pectorals and ventrals orange or brassy, blackish tipped. Head 3; depth about 3; D. XIII, 14½; A. III, 8½.....FLAVIDUS, 1.
- cc. Eye smaller, 1½ in snout, 1¼-1½ in interorbital, 4½ in head. Tips of nasal spines concealed. Highest dorsal spine 2¼-3 in the head. Band of palatine teeth usually much narrower at the middle than at the ends. Gray, darker above, with a series of large light spots on the back. Fins colored like the body, the second dorsal, the caudal, and anal yellowish. Head 3; depth 3½-3¾. D. XIII, 15½; A. III, 9½.....SERRANOIDES, 2.
- bb. Snout blunt, lower jaw scarcely projecting. Anal rounded. Eye slightly more than 4 in the head. Highest dorsal spine 2½-3 in head. Pectorals rounded, not reaching tips of ventrals. Dark gray, with small darker spots. Black spots on base of spinous dorsal. Head 3; depth 3-3½; D. XIII, 13½; A. III, 7½-8½.....MELANOPS, 3.
- aa. Peritoneum black. Mouth smaller than in *melanops*, the maxillary reaching to below posterior margin of pupil; lower jaw somewhat projecting but without prominent knob at the symphysis; preorbital narrow without spine; lower jaw fully scaled; highest dorsal spine a little less than half head. Gill rakers numerous, very long and slender, nearly as long as the eye. Head 3½; depth 3½; D. XIII, 15½; A. III, 8½. Blackish green, the sides rather pale, much mixed with darker; fins dusky, the upper mottled; dark shades from eye backward. (Jordan and Gilbert).....CILIATUS, 4.

1. SEBASTOSOMUS FLAVIDUS (A yres).

Sebastes flavidus, AYERS, Proc. Cal. Acad. Sci., p. 209, fig. 64, 1862.—LOCKINGTON, Proc. Cal. Acad. Sci., VII, p. 81, 1876 (San Francisco).—JORDAN and GILBERT, Syn. Fish. N. Am., p. 657, 1882 (coast of California).—EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 5, 1889, in part (San Diego); *id.*, Proc. Cal. Acad. Sci., 2d ser., III, p. 36, 1890 (San Diego); *id.*, Proc. U. S. Nat. Mus., 1892, p. 163 (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 354 (San Diego, Cortes Bank, Santa Barbara, Monterey, and San Francisco).

Sebasticthys flavidus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 455 (San Francisco, Monterey, San Pedro, San Diego).—JORDON and JOUY, Proc. U. S. Nat. Mus., 1881, p. 8 (Monterey, and San Francisco).—JORDAN and GILBERT, Proc. U. S. Nat. Mus., 1881, p. 55 (San Diego to Cape Mendocino, Monterey).—JORDAN, Cat. Fish. N. Am., p. 107 (California).

HABITAT.—San Diego to Puget Sound.

2. SEBASTOSOMUS SERRANOIDES (Eigenmann and Eigenmann).

Sebastes flavidus, EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 5, 1889 (San Diego), in part [not *flavidus* of Ayres]; *id.*, Proc. U. S. Nat. Mus., 1892, p. 163 (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 354 (San Diego).

Sebastes serranoides, EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 2d ser., III, p. 35, 1890 (San Diego); *id.*, Proc. U. S. Nat. Mus., 1892, p. 163 (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 354 (San Diego, Cortes Bank, Monterey, San Francisco).

HABITAT.—San Diego to San Francisco, in rather shallow water.

The specimens examined are from San Diego and San Francisco.

3. SEBASTOSOMUS MELANOPS (Girard).

Sebastes melanops, GIRARD, Proc. Acad. Nat. Sci. Phila., 1854, VIII, p. 135.—GIRARD, U. S. Pac. R. R. Surv., 1858, X, p. 81 (Cape Flattery to Astoria).—GÜNTHER, II, p. 98, 1860 (copied).—SUCKLEY, U. S. Pac. R. R. Surv., 1860, XII, p. 354 (Puget Sound).—AYRES, Proc. Cal. Acad. Sci., fig. 66, 1862.—LOCKINGTON, Proc. Cal. Acad. Sci., 1876, p. 81 (San Francisco).

Sebastichthys melanops, GIRARD, Proc. Acad. Nat. Sci., Phila., 1862, p. 278.—JORDAN & JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882) (Neah Bay, Washington, Monterey, San Francisco).—JORDAN and GILBERT, Proc. U. S. Nat. Mus., IV, 1881, p. 56 (1882) (Monterey northward).—BEAN, Proc. U. S. Nat. Mus., IV, 1881, p. 252 (1882) (Monterey, San Francisco, Puget Sound, Sitka); and p. 269 (Alaskan peninsula to or beyond San Francisco).—JORDAN, Cat. Fish. N. Am., p. 107, 1885 (California).

Sebastes melanops, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., VI, 1892, p. 354 (Monterey, Alaska).

Sebastesomus simulans, GILL, Proc. Acad. Nat. Sci., Phila., 1864, p. 147 (Cape Flattery).

HABITAT.—Monterey to Alaska.

We have been unable to recognize *S. simulans* from the following note constituting its sole description “* * * two species are apparently confounded by Girard and the name *Sebastes melanops*, one with ‘a small spine upon the suprascapular bone, two others upon the edge of the opercle,’ and another from Cape Flattery with the lower opercular spine as well as the supraorbital ridges obsolete, and the forehead between the eyes perfectly arched.”

4. SEBASTOSOMUS CILIATUS (Tiles).

Epinephelus ciliatus, TILES, Mém. Acad. Sci., St. Petersburg, IV, p. 474, 1810.

Sebastichthys ciliatus, JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882) (Kodiak).—BEAN, Proc. U. S. Nat. Mus., IV, 1881, p. 252 (1882) (Aleutians; Kodiak); and pp. 267 and 271 (Alaska); *op. cit.*, 1883, p. 359 (Mary Island; Tolstoi Bay, Alaska; Nakat Harbor, Pt. Chester, Alaska).—JORDAN, Cat. Fish. N. Am., p. 107, 1885 (Alaska).

Sebastes ciliatus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 658, 1883 (Alaska).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Alaska).

Perca variabilis, PALLAS, Zoogr. Rosso. Asiat., III, p. 241, 1811.

Sebastes variabilis, CUVIER and VAL., IV, p. 347, 1829.—GÜNTHER, Cat. Fish. Brit. Mus., II, p. 99, 1860.

HABITAT.—Alaska.

VI. Genus SEBASTODES, Gill.

Sebastes, GILL, Proc. Acad. Nat. Sci., Phila., 1861, p. 165 (*paucispinis*); EIGENMANN and BEESON, Amer. Nat., July, 1893 (redefined).

TYPE.—*Sebastes paucispinis*, AYRES.

Dr. Gill rightly insisted that *Sebastes paucispinis*, Ayres is generically distinct from *S. nigrocinctus*, etc. Such a separation is, however, admissible only if the heterogenous species, usually lumped under the generic name *Sebastichthys*, are relegated to their respective genera. The genus approaches *Sebastesomus* through *S. goodii*. The genus *Sebastesomus*, on the other hand, closely approaches this genus through *S.*

elongatus. In the weak cranial armature it closely approaches *Sebastomus flavidus*, etc.

ANALYSIS OF THE SPECIES OF SEBASTODES.

- a. Preopercular spines radiating, the two lowest directed downward. Head heavy, broad, the lower jaw not greatly projecting. Posterior angle of mandible below middle of orbit. Clear vermilion, no black anywhere; fins vermilion, membranes of dorsal dusky. A. III, 8; tubes in lateral line 54.... GOODEI, 7.
- aa. Preopercular spines all directed caudad, the two lower ones remote from the rest and much smaller. Head long, pointed, the lower jaw much projecting. Posterior angle of mandible behind the orbit orange red, darker above, many irregular dark blotches and dots; young olivaceous. A. III, 9; tubes in lateral line 65-80, scales 90-100 PAUCISPINIS, 2.

1. SEBASTODES GOODEI, Eigenmann and Eigenmann.

Sebastodes goodei, EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 2d ser., III, p. 12, 1890 (San Diego), p. 36 (San Francisco); *id.*, Proc. U. S. Nat. Mus., xv, 1892, p. 163 (1893) (San Diego); *id.*, Ann., N. Y. Acad. Sci., 1892, p. 354 (San Diego, Monterey, San Francisco).

Sebastichthys goodei, GILBERT, Proc. U. S. Nat. Mus., XII, 1890, p. 75 (1891) (Coast of California, south of Point Conception).

HABITAT.—San Diego to San Francisco. Locally abundant.

2. SEBASTODES PAUCISPINIS (Ayres).

Sebastes paucispinis, AYRES, Proc. Cal. Acad. Sci., I, p. 6, 1854 (San Francisco).—GIRARD, U. S. Pac. R. R. Surv., VI, p. 15, pl. xxiiia, figs. 1-4, 1855 (San Francisco); *op. cit.*, X, p. 83, pl. xiiia, figs. 1-4, 1858.—GÜNTHER, Cat. Fish. Brit. Mus., II, p. 98, 1860.

Sebastodes paucispinis, GILL, Proc. Acad. Nat. Sci., Phila., 1861, p. 165.—AYRES, Proc. Cal. Acad. Sci., 1862, p. 215.—GILL, Proc. Acad. Nat. Sci., Phila., 1862, p. 278 (California).—JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 455 (1881) (San Francisco, Monterey, San Luis Obispo, Santa Barbara, San Pedro).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882) (Santa Barbara, Monterey, San Francisco).—JORDAN and GILBERT, *l. c.*, p. 55 (from San Francisco to the Santa Barbara Islands).—BEAN, *l. c.*, p. 472 (Port McLaughlin, Brit. Columbia).—JORDAN and GILBERT, Syn. Fish. N. Am., p. 656, 1883 (Coast of California).—JORDAN, Cat. Fish. N. Am., p. 107, 1885.—EIGENMANN and EIGENMANN Note, San Diego Biol. Lab., I, p. 5, 1889 (Cortes Bank); *id.*, Proc. U. S. Nat. Mus., xv, 1892, p. 163 (1893) (Cortes Bank, San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 354 (San Diego, Cortes Bank, San Pedro, Santa Barbara, Port Harford, Monterey, San Francisco).

HABITAT.—San Diego to British Columbia. Abundant.

VII. GENUS ALLIED TO SEBASTOMUS.

Perca variabilis, PALLAS, Zoogr. Rosso. Asiat., III, p. 241, 1811 (in part).

Sebastes matzubarae, HILGENDORF, Sitzber. Gesellschaft Naturforschender Freunde Berlin 1880, p. 170.

Sebastodes matzubarae, JORDAN, Proc. Acad. Nat. Sci., Phila., 1883, 291.

HABITAT.—Aleutian Islands.

This species is known to us from descriptions only. It seems to form the type of a genus related to *Sebastomus*, but we leave the

determination of its generic relationships to some one who has specimens.

VIII. GENUS SEBASTOMUS, Gill.

Sebastomus, GILL, Proc. Acad. Nat. Sci., Phila., 1864, p. 147 (*rosaceus*).

TYPE.—*Sebastes rosaceus*, Girard.

The species of this genus are all closely related. The armature of the skull varies but little. *S. ruber*, with broken cranial ridges, stands at one extreme, *S. levis* at the other. The bulk of the species have several pale spots on the sides which are similarly arranged in the different species.

ANALYSIS OF THE SPECIES OF SEBASTOMUS.

- a. Cranial ridges entire.
- b. Median portion of interorbital with a convex ridge. Cranial ridges low, bones of cranium striate or granular; symphyseal knob projecting nearly as in *Sebastosomus flavidus*; second anal spine little longer or stronger than third.
- c. Gill-rakers very long, $1\frac{1}{2}$ in orbit; scales all ctenoid.
- d. Supraocular, postocular, and tympanic spines tubercular or pyramidal, very broad and short, directed upward more than backward. Dorsal spines $2\frac{3}{4}$ in head. Symphyseal knob very sharp. Numerous accessory scales above lateral line and on tail. Anal spines graduated, slightly more than 3 in head. Outlines of spinous dorsal little arched. Compressed, elongate. Maxillary reaching to middle of eye. Interorbital slightly convex, as wide as orbit or little wider. Eye longer than snout $3\frac{1}{2}$ –4 in head. Preorbital 4 in orbit, with 2 small, backward directed spines. Head entirely covered with moderate-sized scales, body with larger ones. Rufous, variously marked with brown. Lateral line rufous. Upper angle of opercle, a line from eye to upper half of pectoral, another parallel to it from upper angle of maxillary backward, and tips of jaws dark brown. Axil black. Margin of spinous dorsal and greater part of membranes of soft dorsal black. Caudal dusky. Membranes of remaining fins chiefly black. Head 3; depth $3\frac{1}{2}$; D. XIII, 14; A. III, 8. Tubes in lat. 1. 56 RUFUS, 1.
- dd. Supraocular, postocular and tympanic spines all slender, conical, their acute tips directed backward more than upward. Dorsal spines about $2\frac{1}{4}$ in head. Symphyseal knob blunt. Accessory scales few. Head broad, the interorbital 3 in the distance from tip of snout to base of occipital crest. Mandible, maxillary, and tip of snout scaly. Membranes of spinous dorsal not greatly incised.
- e. Scales of mandible very rough; color chiefly brick red. MINIATUS, 2.
- ee. Scales of mandible smooth; color chiefly orange. PINNIGER, 3.
- cc. Gill-rakers short, not more than three times as high as wide. Scales of head cycloid, those of body weakly ctenoid; accessory scales numerous. Head narrow, the interorbital $4\frac{3}{8}$ in the distance from tip of snout to base of occipital crest. Mandible, maxillary, and tip of snout naked. Highest dorsal spine little less than half length of head, the mem-

- brane of the first three spines meeting the succeeding spines at their basal fifth. Second anal spine thick. Pink. Four interrupted crossbars of black. . . . LEVIS, 4:
- bb.* Median portion of the interorbital deeply grooved; bones of cranium smooth polished; gill-rakers rather short; accessory scales numerous; second anal spine usually much stronger and longer than third. Upper parts (except in *gilli* and *rupestris*) with three to five pink blotches, one below end and one below origin of soft dorsal; one below middle of spinous dorsal just above the lateral line, frequently a smaller one above this near the base of the fin; usually one at the base of the fourth dorsal spine.*
- j.* Dorsal spines moderate, considerably less than half length of head.
- g.* Preorbital with three flat spines. Maxillary and mandible entirely sealed; second anal spine little longer than third, considerably shorter than the rays, $2\frac{1}{3}$ in the head. Pink overlaid with bronze; top of head, and back above lateral line bronze, the five spots pink. Sides below the lateral line finely vermiculated with bronze, which occupies more space than the ground color. Dorsal light bluish-pink clouded with bronze, the rays of all the other fins pink, the membrane bronze. D. XIII, 12-13; A. III, 6; tubes 37-40.EREUS, 5.
- gg.* Preorbital with two flat spines.
- h.* Upper half of body everywhere with conspicuous small round pink spots. Scales of the cheeks all minute, a few scales on upper part of maxillary and at angle on lower jaw. Interorbital narrow and very deeply concave. CONSTELLATUS, 6.
- hh.* Not marked with small round white or pink spots.
- i.* Gill-rakers two in orbit; both jaws with smooth, small scales, interorbital $\frac{2}{3}$ width of eye, supraocular ridge low. Many accessory scales. Pectoral not reaching vent. Light orange, everywhere overlaid with blackish, the latter color forming fine reticulations on lower part of sides. Light spots of sides large, ill defined. Head, $2\frac{3}{5}$; depth, $2\frac{1}{5}$; D. XIII, 12; A. III, 6UMBROSUS, 7.
- ii.* Gill-rakers three or more in orbit.

* *Sebastes capensis* (LINNÆUS).

Sebastes capensis, LINNÆUS GMELIN, III, 1219.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, p. 341.—QUOY & GAIMARD, Astrol. Poiss., p. 690, pl. ii, fig. 3.—SMITH, S. Afr. Pisc., pl. 22, fig. 1.—GÜNTHER, Cat. Fish. Brit. Mus., II, 96, 1860 (Cape seas).—STEINDACHNER, Ichthyol. Beitr., X, 38, 1881 (Chilian and Cape seas).

Sebastes oculatus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IX, p. 466, 1833 (Valparaiso).—JENYNS, Zool. Beagle Fishes, p. 37 (Valparaiso).—GAY, Hist. Chil. Zool., II, p. 178 (Coast of Chili).—CUVIER, Regne Anim., III, Poiss., pl. 23, fig. 3.—GÜNTHER, Cat. Fish. Brit. Mus., II, 105, 1860 (copied).

Sebastes maculatus, SMITH, *l. c.*, fig. 2 (not of Cuvier and Valenciennes).
HABITAT.—Chilian and Cape seas.

Dr. Steindachner has, after direct comparison of specimens from Chili and from the Cape seas, identified the *S. oculatus* with *S. capensis*.

Head 3 in the total length; depth about $3\frac{1}{2}$; D. XIII, 14; A. III, 6. The interocular space equals rather more than half the diameter of the eye, is concave, with two longitudinal ridges. Second anal spine longest and strongest. Red, back brownish, with five round, red spots.

- j. Without bronze spots.
- k. Mandible naked; second anal spine moderate; pale blotches on sides surrounded by purple. Orange red, tinged or mottled with golden yellow. Fins rosy, mottled with orange; head with radiating stripes of orange and rosy; nape with alternating bars of yellowish and deep red. Second anal spine $2\frac{1}{2}$ in head; head, $2\frac{2}{3}$; depth, 3; D.XIII, 13; A.III, 6. ROSACEUS, 8.
- kk. Mandible finely scaled near its base; second anal spine equal to maxillary, 2 in head. Bright rose red; region above lateral line with much deep green, the green replaced by golden below the lateral line. Top of head with cross bars of green and red. Green streaks radiating from eyes. Head, $2\frac{1}{2}$; depth, 3; D.XIII, 14; A.III, 6; tubes, 58. RIODOCHLORIS, 9.
- jj. Dorsal surface rather closely covered with small, round, bronze spots, which extend upon the membrane of the soft dorsal. Series of confluent bronze spots form radiating streaks on sides of head; lower lip and anterior part of maxillary dusky. A few conspicuous spots on base of pectoral. A light spot under last dorsal spine, one on opercular flap. Mandible entirely naked; maxillary with a few scales medially. Preorbital with an anterior and a posterior spine. Interorbital nearly evenly concave, the median groove shallow. Upper three preopercular spines directed backward. Second anal spine $3\frac{1}{2}$ in head. Lower jaw projecting; no symphyseal knob. Head, 3; depth, 3; D.XIII, $13\frac{1}{2}$; A.III, $7\frac{1}{2}$. Pores in lateral line, 44 or 45 . . . GILLI, 10.
- ggg. Preorbital very narrow, its least width less than one-fourth pupil, lobate and without spine. Jaws equal, maxillary reaching beyond middle of pupil; eye $2\frac{1}{2}$ in head, longer than snout or interorbital, whose least width is one-half the orbit. Nuchal spines present. Longest dorsal spines 3 in head, second anal spine $2\frac{2}{3}$ in head. Pectorals short, $1\frac{1}{6}$ -2 in head. Snout naked or nearly so. Scales on maxillary and mandible minute and smooth, little evident. Fins with a thick membrane covered with fine scales. Five dark bars on back, two elongate black streaks below lateral line. A black blotch on middle of ventrals, a bar at base of pectoral and in axil. Head, $2\frac{1}{2}$; depth, $2\frac{2}{3}$ -3; D.XIII, 13; A.III, 7. Pores in lateral line, 31. RUPESTRIS, 11.
- ff. Dorsal spines little if any less than half length of head.
- l. Mandibles scaled, except about the pores; maxillary evenly scaled. Preorbital with a posterior spine only; interorbital flattish, with a deep median groove, $1\frac{2}{3}$ in orbit; orbit 4 in head; second anal spine $2\frac{2}{3}$ -3 in length of head. Peritoneum white or dusky. Spinous dorsal deeply incised, the membrane of the fifth spine meeting the sixth spine near its basal fourth. Highest spine 2 - $2\frac{1}{2}$ in head. Head and body intense rose pink. Back and dorsal fin indistinctly marked with raw sienna, fins colored like the body. D. XIII, 13; A. III, 16; tubes in lateral line, 37. EOS, 12.
- ll. Mandibles entirely naked; maxillary with a few scales above; preorbital with an anterior simple spine, or a pos-

terior sinuate 3 to 4-pointed spine. Interorbital deeply concave with a deep median groove, $1\frac{3}{4}$ in orbit; orbit $3\frac{1}{2}$ in head. Second anal spine $2\frac{1}{2}$ in length of head. Peritoneum very dark, olivaceous above, sides pinkish and golden; four pink spots placed as in *rosaceus* but less distinct. Body above lateral line with numerous well-defined spots of olive green. Fins nearly plain red; base of dorsal spotted with olive. D.XIII, 13; A.III, 6; tubes, 50 CHLOROSTICTUS, 13.

aa. Cranial ridges of the adult broken and armed with accessory spines. Gill-rakers short clavate. Accessory scales numerous. Second anal spine little larger or longer than third. Jaws naked. Interorbital with a median groove. Color chiefly deep vermilion. D.XIII, 14; A.III, 7; tubes in lateral line, 50. RUBER, 14.

1. SEBASTOMUS RUFUS (Eigenmann and Eigenmann).

Sebastes rufus, EIGENMANN and EIGENMANN, Proc. Cal. Acad. Nat. Sci., 2d ser., III., p. 13, 1890 (San Diego); *id.* Proc. U. S. Nat. Mus., XV, 1892, p. 163, 1893 (San Diego); *id.* Ann. N. Y. Acad. Nat. Sci., 1892, p. 355 (San Diego).

HABITAT.—San Diego.

This species is known from the types only. In many of its characters it greatly resembles *Acutomentum*. The parietals are nearly touching for a considerable distance in the single specimen at hand. It is probable that the parietals are normally united and that this species should be placed near *Acutomentum alatum*, Gilbert.

2. SEBASTOMUS MINIATUS (Jordan and Gilbert).

Sebastichthys miniatus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 70, (1881) (Santa Barbara, Monterey, San Francisco); *op. cit.*, p. 455 (San Francisco, Monterey, San Pedro, Santa Barbara).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882) (Monterey, San Francisco).—JORDAN and GILBERT, *l. c.*, p. 57 (Santa Barbara to San Francisco).—JORDAN, Cat. Fish. N. Am., p. 108, 1885.—EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 5, 1889 (Cortes Bank).

Sebastes miniatus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 663, 1882 (San Francisco to San Diego).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XV, 1892, p. 164 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355. (San Diego, Cortes Bank, San Pedro, Santa Barbara, Port Harford, Monterey, San Francisco).

HABITAT.—San Diego to San Francisco.

This species is very abundant in the waters of southern California. The specimens examined are from San Diego and San Francisco.

3. SEBASTOMUS PINNIGER (Gill).

Sebastes rosaceus, AYERS, Proc. Cal. Acad. Sci., 1862, p. 216, fig. 62 (not *Sebastes rosaceus*, GIRARD).

Sebastosomus pinniger, GILL, Proc. Acad. Nat. Sci., Phila., 1864, pp. 59, 147.

Sebastichthys pinniger, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, pp. 72, 455 (1881) (Puget Sound, San Francisco, Monterey).—JORDAN and JOUY, Proc. U. S. Nat. Mus., 1881, p. 8 (Monterey, Neah Bay, San Francisco, Puget Sound).—JORDAN and GILBERT, Proc. U. S. Nat. Mus., IV, 1881, p. 57 (1882) (Monterey northward).—BEAN, *l. c.*, 1881, p. 265 (Puget Sound).—JORDAN, Cat. Fish. N. Am., p. 107, 1885.

Sebastes pinniger, JORDAN and GILBERT, Syn. Fish. N. Am., p. 662, 1883. (Monterey northward).—EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci. 2d ser., III, p. 16, 1890 (San Diego); *id.*, Proc. U. S. Nat. Mus., xv, 1892, p. 164 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego to Puget Sound).

HABITAT.—San Diego to Puget Sound.

This species is the northern form of *miniatus*. It is rare in the South but abundant northward.

4. SEBASTOMUS LEVIS (Eigenmann and Eigenmann).

Sebastichthys leris, EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 6, and II, p. 1 (Cortes Bank, San Diego).

Sebastes leris, EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 2d Ser., III, p. 36 (Monterey); *id.*, Proc. U. S. Nat. Mus., xv, 1892, p. 165 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Nat. Sci., 1892, p. 355 (San Diego, Cortes Bank).

HABITAT.—San Diego north to San Francisco.

This is the largest of the rock cod, reaching a weight of 30 pounds. It is abundant on the coast of southern California.

5. SEBASTOMUS ÆREUS (Eigenmann and Eigenmann).

Sebastes æreus, EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 2d ser., III, p. 20 (San Diego); *id.*, Proc. U. S. Nat. Mus., xv, 1892, p. 165 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego).

HABITAT.—San Diego.

This species is rather rare at San Diego. In all characters but the parietals the single specimen now in the National Museum agrees with this genus. The parietals are, however, unquestionably united in this specimen. The other specimens we have not been able to examine in this respect. For the present we have thought best to place this species in the genus *Sebastes*.

6. SEBASTOMUS CONSTELLATUS (Jordan and Gilbert).

Sebastichthys constellatus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 295 and 455 (1881) (Santa Barbara Channel, San Francisco, Monterey).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882).—JORDAN and GILBERT, *l. c.*, p. 57.—JORDAN, Cat. Fish. N. Am., p. 108 (1885).—EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 7 (Cortes Bank).

Sebastes constellatus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 655, 1883 (Coast of California, San Francisco southward).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., xv, 1892, p. 165 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Francisco, Monterey, Santa Barbara, San Diego).

HABITAT.—San Diego to San Francisco. Abundant.

The specimens examined are from San Diego, Santa Barbara, and San Francisco.

7. SEBASTOMUS UMBROSUS (Jordan and Gilbert).

Sebastichthys umbrosus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., v, 1882, p. 410 (1883) (Santa Barbara).—JORDAN, Cat. Fish. N. Am., p. 108, 1885 (California).

Sebastes umbrosus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 950, 1883 (Santa Barbara).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Santa Barbara).

HABITAT.—Santa Barbara.

This species is known from the types only.

8. SEBASTOMUS ROSACEUS (Girard).

Sebastes rosaceus, GIRARD, Proc. Acad. Nat. Sci., Phila., 1851, p. 116; U. S. Pac. R. R. Surv., VI, 1855, p. 14, pl. xxi (San Francisco); *l. c.*, X, 1858, p. 78, pl. xxi (poor figure from specimen in bad condition).—GÜNTHER, Cat. Fish. Brit. Mus., II, p. 98, 1860 (copied).—LOCKINGTON, Proc. Cal. Acad. Sci., 1876, p. 79 (San Francisco).

Sebastichthys rosaceus, GILL, Proc. Acad. Nat. Sci., Phila., 1862, p. 278.—JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 455 (1881) (San Francisco, Monterey, Santa Barbara).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882) (San Francisco, Monterey).—JORDAN and GILBERT, *l. c.*, 1881, p. 57 (San Francisco to Santa Barbara).—JORDAN, Cat. Fish. N. Am., p. 108, 1885 (California).—EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 7, and II, p. 1, 1889 (Cortes Bank, San Diego).

Sebastes rosaceus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 666, 1882 (Coast of California).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XV, 1892, p. 164 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, Cortes Bank, Santa Barbara, Monterey, San Francisco).

Sebastes helromaculatus, AYRES, Proc. Cal. Acad. Sci., II, p. 26, 1859, fig. 8.—LOCKINGTON, Proc. Cal. Acad. Sci., 1876, p. 79 (San Francisco).

HABITAT.—San Diego to San Francisco.

The specimens examined are from San Diego and San Francisco.

9. SEBASTOMUS RHODOCHLORIS (Jordan and Gilbert).

Sebastichthys rhodochloris, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 144 (1881) (Monterey); and p. 455 (San Francisco and Monterey Bay).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 7 (1882) (San Francisco, Monterey).—JORDAN and GILBERT, *l. c.*, 1881, p. 57 (Monterey and Farallones).—JORDAN, Cat. Fish. N. Am., p. 108, 1885 (California).

Sebastes rhodochloris, JORDAN and GILBERT, Syn. Fish. N. Am., p. 667, 1882 (Monterey and San Francisco).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Monterey, San Francisco).

HABITAT.—Monterey to San Francisco, off the coast.

This species is abundant in the San Francisco markets, where it is confounded with the closely allied *rosaceus*.

10. SEBASTOMUS GILLI (R. S. Eigenmann).

Sebastes gilli, R. S. EIGENMANN, Amer. Nat., XXV, p. 154, 1891 (Point Loma).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XV, 1892, p. 165 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego).

HABITAT.—San Diego, in about 100 fathoms. Known from the types only.

11. SEBASTOMUS RUPESTRIS (Gilbert).

Sebastichthys rupestris, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, p. 76 (1891) (Coast of California, south of Point Conception).

Sebastes rupestris, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355.

HABITAT.—Off southern California, in deep water. Known only from the collections of the U. S. F. C. steamer *Albatross*.

12. SEBASTOMUS EOS (Eigenmann and Eigenmann).

Sebastes eos, EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 1890, 2d ser., III, p. 18 (San Diego); *id.*, Proc. U. S. Nat. Mus., xv, 1892, p. 165 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1890, p. 355 (San Diego).

HABITAT.—Off San Diego in deep water; not rare.

13. SEBASTOMUS CHLOROSTICTUS (Jordan and Gilbert).

Sebastichthys chlorostictus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 294 (1881) (Monterey); and p. 455 (San Francisco and Monterey); *op cit.*, 1881, p. 57 (Monterey and Farallones).—JORDAN, Cat. Fish. N. Am., p. 108, 1885 (California).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XI, 1888, p. 465 (1889) (San Diego); *id.*, Notes San Diego Biol. Lab., I, p. 7 (San Diego).

Sebastes chlorostictus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 668, 1882 (Monterey and San Francisco).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., xv, 1892, p. 165 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, Cortes Bank, Port Harford, Monterey, San Francisco).

HABITAT.—San Diego to San Francisco; abundant.

14. SEBASTOMUS RUBER (Ayres).

Sebastes ruber, AYRES, Proc. Cal. Acad. Sci., 1854, pp. 5, 7 (San Francisco); *id.*, Proc. Boston Soc. Nat. Hist., 1855, p. 97; *id.*, Proc. Cal. Acad. Sci., 1862, p. 215.—LOCKINGTON, Cal. Acad. Sci., 1876, p. 79.

Sebastichthys ruber, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 455 (1881) (Puget Sound, San Francisco, Monterey, Santa Barbara).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882) (Monterey, San Francisco, Puget Sound).—JORDAN and GILBERT, *l. c.*, 1881, p. 57 (Santa Barbara northward).—BEAN, *l. c.*, 1881, p. 252 (Santa Barbara, Monterey, San Francisco, off Port Bingham, Jacob's Island, Gulf of Alaska) and pp. 269, 271, 472 (Alaska to or beyond San Francisco; Kygani St., Alaska).—JORDAN, Cat. Fishes N. Am., p. 108, 1885 (California).—EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 6, and II, p. 1, 1889 (San Diego).

Sebastes ruber, JORDAN and GILBERT, Syn. Fish. N. Am., p. 665, 1882 (Pacific Coast, Santa Barbara northward).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., xv, 1892, p. 164 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, Cortes Bank, San Pedro, Monterey, San Francisco, Alaska).

HABITAT.—San Diego to Alaska; abundant, and one of the largest species.

IX. Genus PTEROPODUS, Eigenmann and Beeson.

Pteropodus, EIGENMANN and BEESON, Amer. Nat., July, 1893 (*maliger*).

TYPE.—*Sebastichthys maliger*, JORDAN and GILBERT

This genus is composed of a number of species showing considerable variations in the gill-rakers and in the cranial structure. The gill-rakers are shortest in *rastrelliger* and longest and slenderest in *maliger*. The cranial spines are lowest in *rastrelliger* and highest in *nebulosus*. In the shape of the body *elongatus* is closely related to *saxicola* and *proriger*. The latter species are long and slender and have

thin pectoral rays. They probably live off the bottom. Those with thickened pectoral rays are, for the most part, heavy, and probably live on the bottom much of the time. The genus approaches *Sebasticthys* in its cranial armature, usually naked branchiostegals and lower jaw, and in the large mucous pores of the lower jaw. It differs from that genus in its separate parietals.

ANALYSIS OF THE SPECIES OF PTEROPODUS.

a. Lower pectoral rays not thickened. Maxillary, mandible, and branchiostegals more or less scaled.

b. Buccal and gill cavities and peritoneum jet black. Pale below, dusky above, blotched with reddish and black; a blackish blotch on opercle; fins dull reddish, irregularly marked with blackish, caudal mostly red, sometimes with a black terminal bar. Short and deep, heavy anteriorly with slender caudal peduncle. Maxillary reaching beyond pupil, $2\frac{1}{2}$ in head; jaws equal, the lower mostly included, but with a projecting symphyseal knob. Eye, $2\frac{3}{4}$ -3 in head; snout, $4\frac{3}{8}$ -6. The two lower preopercular spines directed downward and backward, the others back. Two or three strong preorbital spines. Gill-rakers short, 5 in orbit. Highest dorsal spine, $2\frac{1}{2}$ in head. Second anal spine, 2 in head. Scales small, not regularly imbricated, smooth and cycloid, except those on occiput and a few along the lateral line on posterior part of body; snout naked, maxillary and mandible only partly scaled. Head, $2\frac{1}{2}$; depth, 3; D.XIII, 12; A.III, 5; tubes, 40-45. (Gilbert)..... SINENSIS, 1.

bb. Buccal and gill cavity white.

c. Three or four brownish bars on sides, reduced to dorsal blotches in the adult; one on occiput, one including front of dorsal, one under posterior rays of dorsal, one under soft dorsal, and one on back of tail. Conspicuous olive-brown spots on caudal, usually confined to base and upper lobe of fin. Maxillary reaching to posterior margin of pupil, $2\frac{1}{4}$ in head. Eye, $2\frac{3}{4}$ - $3\frac{1}{4}$ in head, much longer than snout or interorbital width. Interorbital flattish, without ridges. Preorbital one-third pupil, with two strong triangular lobes ending in spines. Cranial ridges low. Preopercular spines directed backward. Gill-rakers slender, $2\frac{1}{2}$ in orbit. Highest dorsal spine, $2\frac{1}{2}$ in head. Second anal spine, $2-2\frac{1}{8}$ in head. Scales rough-ctenoid on breast, maxillary, mandible, and snout. Head, $2\frac{2}{3}-2\frac{2}{3}$; depth, $3-3\frac{1}{4}$ in the length. D.XIII, 12 or 13; A.III, 7; tubes, 45, (Gilbert)..... SAXICOLA, 2.

cc. No crossbars.

d. Olive-green, marbled with darker; sometimes brownish; no red anywhere. Body oblong, not tapering rapidly. The lower jaw somewhat projecting. Maxillary extending to beyond pupil, 2 in head. Eye, $3\frac{1}{2}$ in head. Cranial ridges low. Preorbital very narrow, with two stout spines. Second preopercular spine longer and slen-

derer than the others. Interorbital space broad and slightly convex, widened backward, a little depressed on each side next the superocular spine. Gill-rakers slender, 3 in eye. Preorbital scaly; maxillary partly scaly; mandible with some smooth scales. Dorsal deeply emarginate, the highest spine 2 in head. Head, 3; depth, $2\frac{1}{3}$; D. XIII, 14; A. III, 6; Lat.

l., 52..... ATROVIRENS, 3.

dd. Interrupted longitudinal, olive-green bands on the sides over a ground of light red; upper fins blotched with olive, lower pale red. Maxillary reaching to posterior part of orbit, $2\frac{1}{3}$ in head. Eye, $3\frac{1}{3}$ in head; interorbital concave. Gill-rakers about 3 in eye. Highest dorsal spine, $2\frac{3}{4}$ in head. Second anal spine, 2 in head. Peritoneum dusky. Head, $2\frac{3}{4}$; depth, $3\frac{1}{2}$; D. XIII, 13;

A. III, 6..... ELONGATUS, 4.

aa. Lower pectoral rays thick and fleshy.

e. Elongate, lower jaw projecting and with a strong symphyseal knob. Maxillary, mandible, and branchiostegals densely scaled. Light red blotches under third dorsal spine and under the first and last dorsal rays. General color bright light red, mottled above with dusky olive-green; opercle with a dusky blotch; caudal bright red, speckled with dark olive. Mouth small, the short maxillary extending to beyond the middle of the eye, $2\frac{1}{4}$ in head. Eye very large, longer than snout; preorbital narrow. Interorbital convex, nearly as broad as eye. Gill-rakers slender, 2 in orbit. Highest dorsal spine, 3 in head.

f. Second anal spine much longer and stronger than the third, $2\frac{1}{2}$ in the head. Peritoneum black. Head 3; depth $3\frac{1}{2}$; D. XIII, 13; A. III, 7..... PRORIGER, 5.

ff. Second anal spine shorter than the third; peritoneum white.

BREVISPINIS, 6.

cc. Body short and deep; lower jaw scarcely projecting, or, the jaws equal.

g. Gill-rakers long, about 2 in orbit.

h. Peritoneum jet black; dorsal spines low, $2\frac{1}{3}$ - $2\frac{1}{2}$ in head. Elongate, caudal peduncle $3\frac{3}{8}$ in depth of body. Maxillary reaching vertical from middle of pupil, $2\frac{1}{3}$ in head. Lower jaw slightly the longer. Eye much longer than snout, 3 - $3\frac{1}{4}$ in head. Interorbital somewhat concave, $1\frac{3}{8}$ in diameter of orbit. Preorbital without spines, extremely narrow, its least width two-sevenths pupil. Preopercular spines directed backward. Second anal spine very long, $1\frac{1}{2}$ - $1\frac{1}{5}$ in head. Scales rough ctenoid, those on maxillary, mandible, and breast smoother. Five vaguely defined black bars on back. Two black streaks backward from eye, the upper terminating in a conspicuous blotch on opercle. Head $2\frac{1}{4}$; depth $3\frac{1}{2}$; D. XIII, 14 or 15; A. III, 7 or 8; tubes 42 (Gilbert)..... ZACENTRUS, 7.

hh. Peritoneum pale; median part of interorbital with a deep groove.

i. Dorsal spines high, little less than head less opercle, their membranes deeply incised. Jaws equal. Yellowish brown, anterior part of the back and sides usually clear yellow; breast yellow; anterior part of body closely covered

- with round spots of orange. Soft fins slaty black, the pectorals and dorsal paler at base and speckled. Head $2\frac{3}{8}$; profile steep; depth $2\frac{1}{4}$. D. XIII, 13; A. III, 6. Tubes in lateral line 47.....MALIGER, 8.
- ii. Dorsal spines moderate, 2 in head; lower jaw projecting. Three straight dark crossbars, one from nape across base of pectoral, one from between sixth and seventh dorsal spines toward anus, a half one from eighth to tenth dorsal spines to lateral line, a broader one below soft dorsal. These bars extend onto the dorsal fin. A few small dark spots on base of pectorals and on shoulder; sides of tail more or less mottled. Dark streaks radiating from eye. Maxillary extending beyond eye, about $2\frac{1}{2}$ in head. Eye equals snout, $3\frac{1}{2}$ in head; considerably more than interorbital width. Interorbital concave; two strong ridges dividing it into a median and two lateral grooves. Preorbital narrow, with two flat processes. Preopercular spines directed backward. Gill-rakers about 2 in orbit. Second anal spine $2\frac{3}{8}$ in head. Maxillary, mandibles, and snout naked. Scales mostly cycloid. Head 3; depth 3; D. XIII, $14\frac{1}{2}$; A. III, $6\frac{1}{2}$DALLI, 9.
- gg. Gill-rakers, four or more in eye.
- j. Interorbital nearly flat, the supraocular ridges scarcely raised, cranial ridges all low, the spines directed backward.
- k. Gill-rakers higher than wide. Peritoneum white. Dorsal spines 2 in head or longer.
- l. Dark brown varied with light brown.....CAURINUS, 10.
- ll. Lemon yellow to dark brick red, color variable. Frequently light blotches arranged as in *chrysomelas*. D. XIII, 16; A. III, 6.....VENILLARIS, 11.
- kk. Gill-rakers scarcely higher than they are wide. Peritoneum brownish. Dorsal spines about $2\frac{1}{2}$ in head. Blackish green, spotted with darker and with lighter. D. XIII, 13; A. III, 6.....RASTRELLIGER, 12.
- jj. Interorbital deeply concave, the supraocular ridges high. Cranial ridges all high, the spines directed backward and usually upward and outward.
- m. Dorsal spine a little more than half length of head; parietal ridges very high; pale blotches on sides, forming a continuous lateral band. Body and fins profusely speckled with pale; dark markings black, pale markings yellow. Head 3; depth $2\frac{3}{4}$; D. XIII, 13; A. III, 7; tubes 49.....NEBULOSUS, 13.
- mm. Dorsal spines not more than half length of head; pale blotches on sides not forming a continuous lateral band. Occipital ridges moderate. A series of four light spots along the base of the dorsals.
- n. Pale markings flesh-color; dark markings olivaceous. Scales rougher, cranial ridges lower, parietal spines lower and narrower. Spinous dorsal higher, 2 in head, its membranes more deeply incised than in *chrysomelas*.....CARNATUS, 14.
- nn. Pale markings yellow, dark markings blackish. Dorsal spines $2\frac{1}{4}$ in head. Head $2\frac{3}{4}$; depth $2\frac{3}{4}$; D. XIII, 13; A. III, 6; tubes 46.....CHRYSOMELAS, 15.

1. PTEROPODUS SINENSIS (Gilbert).

Sebastichthys sinensis, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, p. 81 (1891)
(Santa Barbara).

Sebastodes sinensis, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p.
355 (Santa Barbara).

HABITAT.—Santa Barbara.

This species is known only from the types collected by the *Albatross*.

2. PTEROPODUS SAXICOLA (Gilbert).

Sebastichthys saxicola, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, p. 78 (1891)
(Coast of California south of Point Conception).

Sebastodes saxicola, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p.
355 (Santa Barbara).

HABITAT.—Coast of southern California; known only from the types.

3. PTEROPODUS ATROVIRENS (Jordan and Gilbert).

Sebastichthys atrovirens, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880,
pp. 27, 289, & 455 (1881) (San Diego, Catalina Island, San Pedro, Santa
Barbara, San Luis Obispo, Monterey, San Francisco)—JORDAN and JOUY,
Proc. U. S. Nat. Mus., IV, 1881, p. 8 (1882) (San Pedro, Santa Barbara, Mon-
terey, San Francisco)—JORDAN and GILBERT, *l. c.*, p. 561 (San Francisco to
San Diego)—JORDAN, Cat. Fish. N. Am., p. 107, 1885.

Sebastodes atrovirens, JORDAN and GILBERT, Syn. Fish. N. Am., p. 662, 1883 (Coast
of California)—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XV,
1892, p. 164 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355, (San
Diego, Cortes Bank, Santa Barbara, Port Harford, Monterey, San Francisco).

HABITAT.—Coast of California from San Diego to San Francisco.

We are indebted to Mr. F. C. Test for an examination of the skull of
this species.

4. PTEROPODUS ELONGATUS (Ayres).

Sebastes elongatus, AYRES, Proc. Cal. Acad. Sci., 1859, p. 26, fig. 9.

Sebastichthys elongatus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, pp.
143 & 455 (1881) (Monterey, San Francisco)—JORDAN and JOUY, Proc. U. S.
Nat. Mus., IV, 1881, p. 8 (1882) (Monterey, San Francisco)—JORDAN and
GILBERT, *l. c.*, p. 56—JORDAN, Cat. Fish. N. Am., p. 108, 1885 (California)—
EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab. I, p. 7 & II, p. 1,
1889 (Cortes Bank, San Diego).

Sebastodes elongatus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 668, 1883 (Mon-
terey and San Francisco)—EIGENMANN and EIGENMANN, Proc. U. S. Nat.
Mus., XV, 1892, p. 165 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p.
355 (San Diego, Cortes Bank, Monterey, San Francisco).

HABITAT.—San Diego to San Francisco; abundant.

This is one of the smaller species.

5. PTEROPODUS PRORIGER (Jordan and Gilbert).

Sebastichthys proriger, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, pp.
327 and 455 (Monterey, Farallones, San Francisco)—JORDAN and JOUY, Proc.
U. S. Nat. Mus., IV, 1881, p. 8 (1882) (Monterey, San Francisco)—JORDAN and
GILBERT, *l. c.*, p. 56, (Monterey and Farallones)—JORDAN, Cat. Fish. N. Am.,
p. 107, 1885.

Sebastes proriger, JORDAN and GILBERT, Syn. Fish. N. Am., pp. 661 & 950, 1883 (Coast of California)—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Monterey and San Francisco).

HABITAT.—Monterey to San Francisco.

The specimen recorded by us as *Sebastes proriger* from San Diego is *Acutomentum macdonaldi*.

6. PTEROPODUS BREVISPINIS (Bean).

Sebastichthys proriger brevispinis, BEAN, Proc. U. S. Nat. Mus., VI, 1883, p. 359, (Hassler Harbor).

Sebastichthys brevispinis, JORDAN, Cat. Fish. N. Am., p. 107, 1885 (Alaska).

Sebastes proriger, JORDAN and GILBERT, Syn. Fish. N. Am., p. 950, 1883 (Alaska).
HABITAT.—Alaska.

This species replaces *proriger* in Northern waters.

7. PTEROPODUS ZACENTRUS (Gilbert).

Sebastichthys zacentrus, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, p. 77 (1891), (Santa Barbara).

Sebastes zacentrus, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Santa Barbara).

HABITAT.—Santa Barbara.

This species is known only from the types.

8. PTEROPODUS MALIGER (Jordan and Gilbert).

Sebastichthys maliger, JORDAN and GILBERT, Proc. U. S. Nat. Mus., 1880, III, pp. 322 and 455 (1881), (Farallones, Monterey Bay, Straits of Fuca).—JORDAN and JOUY, Proc. U. S. Nat. Mus., 1881, p. 7 (1882), (Puget Sound, Monterey, San Francisco).—JORDAN and GILBERT, *l. c.*, p. 58 (Monterey northward).—BEAN, *l. c.*, pp. 252, 269, 271–472 (Sitka, Port McLaughlin, B. C.)—BEAN, Proc. U. S. Nat. Mus., VI, 1883, p. 360 (1884), (Safety Cove, B. C.).—JORDAN, Cat. Fish. N. Am., p. 108, 1885.

Sebastes maliger, JORDAN and GILBERT, Syn. Fish. N. Am., p. 673, 1883 (Monterey to Sitka).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Monterey, San Francisco, Puget Sound, Alaska).

HABITAT.—Monterey to Alaska.

This, one of the prettiest of the Scorpenida, is not rare at San Francisco. The specimens examined are from that place.

9. PTEROPODUS DALLII (Eigenmann and Beeson).

Pteropodus dallii, EIGENMANN and BEESON, Amer. Nat., 1894, p. 66 (San Francisco).

The single specimen of this species known is 200 mm. long. It belongs to the Indiana University and was probably collected by Mr. W. G. W. Harford, of the University of California. It is labeled *S. auriculatus*, var., and in general appearance it resembles that species. The sculpturing of the skull and absence of coronal spines separate it distinctly from *Auctospina*. In coloration it seems to approach *P. saxicola*, but it differs from that species in the naked snout and mandible, in the grooved interorbital, etc. In its gill-rakers, white peritoneum, grooved

interorbital it approaches *P. maliger*, from which it differs in many features.

We have taken the liberty to name this species for Mr. William Healey Dall, of the U. S. Geological Survey, who has been intimately identified with west-coast zoology for many years.

10. PTEROPODUS CAURINUS (Jordan and Gilbert)

Sebastes caurinus, RICHARDSON, Voy. Sulph., p. 77, pl. 41, fig. 1, 1845.

Sebastichthys caurinus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, pp. 455, 466 (1881), (Puget Sound).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 7 (Puget Sound).—JORDAN and GILBERT, Proc. U. S. Nat. Mus. IV, 1881, p. 58 (Puget Sound northward).—BEAN, Proc. U. S. Nat. Mus., IV, 1881, pp. 252, 271, and 472 (1882), (Puget Sound, Old Sitka, Departure Bay, B. C., Rose Harbor, Queen Charlotte Island, Chacac, Alaska); Proc. U. S. Nat. Mus., VI, 1883 p. 360, (Duncans Bay, B. C., Departure Bay, St. Mary Island, Alaska).—JORDAN, Cat. Fish. N. Am., p. 108, 1885.

Sebastes caurinus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 672, 1883 (Puget Sound to Sitka).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Puget Sound, Alaska).

HABITAT.—Puget Sound to Alaska.

11. PTEROPODUS VEXILLARIS (Jordan and Gilbert)

Sebastichthys vexillaris, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 292 (1881), (Santa Barbara Channel).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 7 (1882), (Monterey, San Francisco).—JORDAN and GILBERT, *l. c.* p. 58 (San Diego to Puget Sound).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XI, 1888, p. 465 (1889), (San Diego).

Sebastichthys caurinus vexillaris, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, pp. 455, 466 (1881), (Puget Sound).—JORDAN, Cat. Fish. N. Am., p. 108 (California).

Sebastes caurinus vexillaris, JORDAN and GILBERT, Syn. Fish. N. Am., p. 672, 1883 (California).

Sebastes vexillaris, EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XV, 1892 p. 167 (1893), (San Diego).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, Cortes Bank, San Pedro, Santa Barbara, Monterey, San Francisco).

Sebastichthys carnatus, EIGENMANN and EIGENMANN, Notes San Diego Biol. Lab., I, p. 7, 1889 (Cortes Bank) not *carnatus* of JORDAN and GILBERT.

HABITAT.—San Diego to Puget Sound.

Everywhere abundant and very variable. The specimens examined are from San Diego.

12. PTEROPODUS RASTRELLIGER (Jordan and Gilbert)

Sebastichthys rastrelliger, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, pp. 296, 455 (1881), (San Francisco, Monterey, San Luis Obispo, Santa Barbara, San Pedro, Santa Catalina Island).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 7 (1882).—JORDAN and GILBERT, Proc. U. S. Nat. Mus., IV, 1881, p. 58 (1882), (Humboldt Bay).—JORDAN, Cat. Fish. N. Am., p. 108, 1885.

Sebastes rastrelliger, JORDAN and GILBERT, Syn. Fish. N. Am., p. 671, 1883, (Coast of California).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XV, 1892, p. 167 (1893), (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, San Pedro, Santa Barbara, Port Harford, Monterey, San Francisco).

HABITAT.—San Diego to Humboldt Bay.

This is an aberrant species with very short gill-rakers and very thick lower pectoral rays. In its gill-rakers it approaches some of the species of *Sebastes*. The specimens are from San Francisco and San Diego.

13. PTEROPODUS NEBULOSUS (Ayres).

Sebastes nebulosus, AYRES, Proc. Cal. Acad. Sci., 1854, p. 5, (San Francisco).—AYRES, Proc. Bost. Soc. Nat. Hist., 1854, p. 96.

Sebastichthys nebulosus, GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 278.—JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 455, (Puget Sound, San Francisco, Monterey).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, p. 7 (1882), (Neah Bay, Monterey, San Francisco, Puget Sound).—JORDAN and GILBERT, *l. c.*, p. 58, (Monterey to Puget Sound).—BEAN, Proc. U. S. Nat. Mus., 1881, p. 265, and 1883, p. 360, (Puget Sound, Vancouver Island, near St. Mary Island, Alaska).—JORDAN, Cat. Fish. N. Am., p. 108, 1885.

Sebastes nebulosus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 676, 1883 (Vancouver Island to Monterey).—EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355 (Monterey, San Francisco, Puget Sound).

Sebastes fasciatus, GIRARD, Proc. Acad. Nat. Sci. Phila., 1854, p. 146; *id.*, U. S. Pac. R. R. Surv., VI, p. 15, 1855 (San Francisco); *op. cit.*, p. 78, pl. XXII, 1858, (Presidio Bay, San Francisco).—GÜNTHER, Cat. Fish. Brit. Mus., II, p. 104, 1860.

Sebastichthys fasciolaris (LOCKINGTON), JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 297 (1881), (San Francisco).

HABITAT.—Port Harford to Puget Sound.

The specimens examined are from Port Harford.

14. PTEROPODUS CARNATUS (Jordan and Gilbert).

Sebastichthys carnatus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, pp. 73, 455 (1881), (Monterey, San Francisco, San Luis Obispo, Santa Barbara, San Pedro).—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 7 (1882), (San Francisco, Monterey).—JORDAN and GILBERT, *l. c.*, p. 58.—JORDAN, Cat. Fish. N. Am., p. 108, 1885.

Sebastes carnatus, JORDAN and GILBERT, Syn. Fish. N. Am., p. 674, 1883 (Coast of California).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XV., 1892, p. 168 (1893), (San Diego): *id.*, Ann. N. Y. Acad. Nat. Sci., 1892, p. 355 (San Diego, San Pedro, Santa Barbara, Port Harford, Monterey, San Francisco).

HABITAT.—San Diego to San Francisco.

The specimens examined were collected at San Francisco and San Diego.

15. PTEROPODUS CHRYSOMELAS (Jordan and Gilbert).

Sebastichthys nebulosus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 73 (1881) (not *S. nebulosus* of AYRES).

Sebastichthys chrysomelas, JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, pp. 455 and 465 (1881) (from San Nicolas to Cape Mendocino)—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 58 (1882) (Santa Barbara, San Francisco).

Sebastichthys carnatus chrysomelas, JORDAN, Cat. Fish. N. Am., p. 108, 1885.

Sebastes chrysomelas, JORDAN and GILBERT, Syn. Fish. N. Am., p. 672, 1883. (San Francisco to San Diego)—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., XV, 1892, p. 167 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, San Pedro, Santa Barbara, Monterey, San Francisco).

Sebasticthys chrysomelas purpureus, EIGENMANN and EIGENMANN. Notes San Diego Biol. Lab. I, p. 8, 1879 (Cortes Bank).

HABITAT.—San Diego to San Francisco. Abundant and variable.

The specimens examined are from San Francisco.

X. Genus AUCTOSPINA (Eigenmann and Beeson).

Auctospina, EIGENMANN and BEESON, Amer. Nat., July, 1893 (*auriculatus*).

TYPE.—*Sebastes auriculatus*, Girard.

This genus is now known from two species. One of these inhabits the shallow bays and generally shallow waters not frequented by other species of this group. The other is as yet known from deep water only, 260 fathoms.

The genus seems to us to be well characterized by the presence of coronal spines, a pair of spines on the frontals anterior to the origin of the parietal ridges. In *auriculatus* there is a blunt knob on the frontals between the coronal spines and the parietal ridges.

ANALYSIS OF THE SPECIES OF AUCTOSPINA.

- a. Peritoneum black; maxillary nearly reaching vertical from posterior margin of orbit, $2\frac{1}{2}$ in head; eye large, $3\frac{1}{3}$ in head, much longer than snout or interorbital width; interorbital with a pair of strong ridges. Preopercular spines radiating; highest dorsal spine, $2\frac{1}{2}$ in head; mandible sealed; scales very rough ctenoid, those on breast, branchiostegal rays, and mandible rough. Uniform light below, a narrow black streak along edge of spinous dorsal, the triangular incised portion of membrane above it white (?). Depth, $2\frac{3}{4}$; head, $2\frac{1}{2}$; D. XIII, 13 or 14; A. III, 6. Lat. line, 29..... AURORA, 1.
- aa. Peritoneum white; maxillary reaching beyond eye, $2\frac{1}{2}$ in head; eye, $4\frac{1}{2}$ in head, little longer than snout; interorbital with a median ridge; preopercular spines all directed backward; highest dorsal spine 2 in head; mandible naked; few scales on breast and maxillary. Blackish brown, mottled; flushed brownish red. Depth, $2\frac{1}{2}$; head, $3\frac{1}{5}$; D. XIII, 13; A. III, 7. Lat. line, 45.
..... AURICULATUS, 2.

1. AUCTOSPINA AURORA (Gilbert).

Sebasticthys aurora, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, p. 80 (1891) (Point Conception).

Sebastes aurora, EIGENMANN and EIGENMANN, Ann. N. Y. Acad. Sci., 1892, p. 355.

HABITAT.—Coast of southern California in deep water.

This species is known only from the *Albatross'* collections.

2. AUCTOSPINA AURICULATUS (Girard).

Sebastes auriculatus, GIRARD, Proc. Acad. Nat. Sci., Phila., 1854, pp. 131, 146; *id.*, U. S. Pac. R. R. Surv., VI, p. 14, 1855 (San Francisco); *id.*, X, p. 80, 1858 (Presidio, San Francisco)—AYRES, Proc. Cal. Acad. Sci., 1867, p. 215, fig. 68.

Sebasticthys auriculatus, GILL, Proc. Acad. Nat. Sci., Phila., 1862, p. 278—JORDAN and GILBERT, Proc. U. S. Nat. Mus., III, 1880, p. 455 (1881) (Puget Sound, San Luis Obispo, Santa Barbara)—JORDAN and JOUY, Proc. U. S. Nat. Mus., IV, 1881, p. 7 (1882) (mouth Russian River, Santa Barbara, San Francisco, Puget Sound)—JORDAN and GILBERT, *l. c.*, p. 58 (Santa Barbara to Puget

Sound)—BEAN, l. c., p. 265 (Vancouver Island)—JORDAN, Cat. Fish. N. Am., p. 108, 1885 (California).

Sebastes auriculatus, JORDAN and GILBERT, Syn. Fishes N. Am., p. 670, 1882 (Vancouver to Cerros Island)—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., xv, p. 1892, 167 (1893) (San Diego); *id.*, Proc. U. S. Nat. Mus., xv, 1892, p. 167 (1893) (San Diego); *id.*, Ann. N. Y. Acad. Sci., 1892, p. 355 (San Diego, Santa Barbara, Port Harford, Monterey, San Francisco, Columbia River, Puget Sound).

Sebastes ruber var. *parrvus*, AYRES, Proc. Cal. Acad. Sci., 1854, p. 7 (San Francisco). HABITAT.—San Diego to Puget Sound, in shallow water. Cerros Island.

The specimens examined are from San Diego, Monterey, and San Francisco.

XI. Genus SEBASTOPSIS, Gill.

Sebastopsis, GILL, Proc. Acad. Nat. Sci., Phila., 1862, p. 278 (*polylepis*), 1863, p. 207, Sauvage Nouv. Arch. Mus. (2), 1 p.—Ann. Sci. Nat. (5), xvii, art. 5, 1875 (*minutus*).

TYPE.—*Sebastes minutus*, CUVIER and VALENCIENNES = *Sebastes polylepis*, BLEEKER.

1. SEBASTOPSIS XYRIS, Jordan and Gilbert.

Sebastopsis xyris, JORDAN and GILBERT, Proc. U. S. Nat. Mus., v, 1882, p. 369 (1883) (Cape San Lucas)—JORDAN, Proc. U. S. Nat. Mus., VIII, 1885, p. 387 (1886) (name).

Head, $2\frac{1}{2}$; depth, $3\frac{1}{2}$; D. XIII, 10; A. III, 5; lat. 1., 24 (pores). Mouth large, oblique, the maxillary extending to beyond pupil, its length $1\frac{1}{6}$ in head. Jaws naked. Preorbital narrow, its edge lobate, not spinous. Eye about $3\frac{1}{4}$ in head. Cranial ridges very short, sharp, and high. Interorbital space narrow, very deeply concave, with two longitudinal ridges. Preocular, supraocular, postocular, tympanic, parietal, nuchal, and coronal spines present. Suborbital stay forming a sharp elevated ridge, with a sharp spine near its front, under the eye, and another near its junction with the preopercle. Gill rakers very short. Dorsal fin deeply notched, the longest $2\frac{3}{8}$ in head. Second anal spine much longer than third. Vertical fins with bands and blotches of dark brown; a large dark blotch on last dorsal spines. (Jordan and Gilbert.)

HISTORICAL LIST OF SPECIES AND THEIR PRESENT EQUIVALENTS.

1810. *Epinephelus ciliatus*, Tiles = *Sebastesomus ciliatus*.
 1811. *Percu variabilis*, Pallas = *Sebastesomus ciliatus*.
 1845. *Sebastes caurinus*, Richardson = *Pteropodus caurinus*.
 1854. *Sebastes auriculatus*, Girard = *Auctospina auriculatus*.
 1854. *Sebastes melanops*, Girard = *Sebastesomus melanops*.
 1854. *Sebastes rosaceus*, Girard = *Sebastesomus rosaceus*.
 1854. *Sebastes fasciatus*, Girard = *Pteropodus nebulosus*.
 1854. *Sebastes nebulosus*, Ayres = *Pteropodus nebulosus*.
 1854. *Sebastes ruber*, Ayres = *Sebastesomus ruber*.
 1854. *Sebastes paucispinis*, Ayres = *Sebastesomus paucispinis*.
 1854. *Sebastes parrvus*, Ayres = *Auctospina auriculatus*.
 1859. *Sebastes nigrocinctus*, Ayres = *Sebastesichthys nigrocinctus*.
 1859. *Sebastes helvromaculatus*, Ayres = *Sebastesomus rosaceus*.
 1862. *Sebastes flavidus*, Ayres = *Sebastesomus flavidus*.
 1862. *Sebastes ovalis*, Ayres = *Acutomentum ovalis*.
 1864. *Sebastesomus pinniger*, Gill = *Sebastesomus pinniger*.
 1864. *Sebastesomus simulans*, Gill = *Sebastesomus melanops*.

1880. *Sebastes matzubaræ*, Hilgendorf= ——— *matzubaræ*.
 1880. *Sebastes macrochir*, Günther=*Sebastolobus macrochir*.
 1880. *Sebastichthys serriceps*, Jordan and Gilbert=*Sebastichthys serriceps*.
 1880. *Sebastichthys miniatus*, Jordan and Gilbert=*Sebastomus miniatus*.
 1880. *Sebastichthys carnatus*, Jordan and Gilbert=*Pteropodus carnatus*.
 1880. *Sebastichthys entomelas*, Jordan and Gilbert=*Primospina entomelas*.
 1880. *Sebastichthys rhodochloris*, Jordan and Gilbert=*Sebastomus rhodochloris*.
 1880. *Sebastichthys atrovireus*, Jordan and Gilbert=*Pteropodus atrovireus*.
 1880. *Sebastichthys rubrivinctus*, Jordan and Gilbert=*Sebastichthys rubrivinctus*.
 1880. *Sebastichthys vexillaris*, Jordan and Gilbert=*Pteropodus vexillaris*.
 1880. *Sebastichthys chlorostictus*, Jordan and Gilbert=*Sebastomus chlorostictus*.
 1880. *Sebastichthys constellatus*, Jordan and Gilbert=*Sebastomus constellatus*.
 1880. *Sebastichthys rastrelliger*, Jordan and Gilbert=*Pteropodus rastrelliger*.
 1880. *Sebastichthys fasciolaris*, Lockington=*Pteropodus nebulosus*.
 1880. *Sebastichthys maliger*, Jordan and Gilbert=*Pteropodus maliger*.
 1880. *Sebastichthys proriger*, Jordan and Gilbert=*Pteropodus proriger*.
 1880. *Sebastichthys chrysomelas*, Jordan and Gilbert=*Pteropodus chrysomelas*.
 1881. *Sebastichthys mystinus*, Jordan and Gilbert=*Primospina mystinus*.
 1882. *Sebastopsis xyris*, Jordan and Gilbert=*Sebastopsis xyris*.
 1882. *Sebastichthys umbrosus*, Jordan and Gilbert=*Sebastomus umbrosus*.
 1885. *Sebastichthys brevispinis*, Bean=*Pteropodus brevispinis*.
 1889. *Sebastichthys lewis*, Eigenmann and Eigenmann=*Sebastomus lewis*.
 1889. *Sebastichthys purpureus*, Eigenmann and Eigenmann=*Pteropodus chrysomelas*.
 1890. *Sebastodes goodii*, Eigenmann and Eigenmann=*Sebastodes goodii*.
 1890. *Sebastodes rufus*, Eigenmann and Eigenmann=*Sebastomus rufus*.
 1890. *Sebastomus melanoostomus*, Eigenmann and Eigenmann=*Acutomentum melanoostomus*.
 1890. *Sebastodes eos*, Eigenmann and Eigenmann=*Sebastomus eos*.
 1890. *Sebastodes areus*, Eigenmann and Eigenmann=*Sebastomus areus*.
 1890. *Sebastodes serranoides*, Eigenmann and Eigenmann=*Sebastosomus serranoides*.
 1890. *Sebastolobus alascanus*, Bean=*Sebastolobus alascanus*.
 1890. *Sebastichthys alutus*, Gilbert=*Acutomentum alutus*.
 1890. *Sebastichthys rupestris*, Gilbert=*Sebastomus rupestris*.
 1890. *Sebastichthys zacentrus*, Gilbert=*Pteropodus zacentrus*.
 1890. *Sebastichthys saxicola*, Gilbert=*Pteropodus saxicola*.
 1890. *Sebastichthys diplaproa*, Gilbert=*Sebastichthys diplaproa*.
 1890. *Sebastichthys aurora*, Gilbert=*Auctospina aurora*.
 1890. *Sebastichthys introniger*, Gilbert=*Acutomentum melanoostomum*.
 1890. *Sebastichthys sinensis*, Gilbert=*Pteropodus sinensis*.
 1891. *Sebastodes gilli*, R. S. Eigenmann=*Sebastomus gilli*.
 1893. *Acutomentum macdonaldi*, Eigenmann and Beeson=*Acutomentum macdonaldi*.
 1893. *Pteropodus dallii*, Eigenmann and Beeson=*Pteropodus dallii*.

SYSTEMATIC LIST OF THE SPECIES OF SCORPÆNIDÆ, BASED UPON THE PRESENT REVISION.

I. SEBASTOLOBUS, Gill.

Sebastolobus macrochir (Günther).

Sebastolobus alascanus, Bean.

II. SEBASTICHTHYS, Gill.

Sebastichthys nigrocinctus (Ayres).

Sebastichthys serriceps, Jordan and Gilbert.

Sebastichthys rubrivinctus, Jordan and Gilbert.

Sebastichthys diplaproa, Gilbert.

III. ACUTOMENTUM, Eigenmann and Beeson.

Acutomentum melanostomum (Eigenmann and Eigenmann)*Acutomentum macdonaldi*, Eigenmann and Beeson.*Acutomentum oralis* (Ayres).*Acutomentum alutum* (Gilbert).

IV. PRIMOSPINA, Eigenmann and Beeson.

Primospina mystinus (Jordan and Gilbert).*Primospina entomelas* (Jordan and Gilbert).

V. SEBASTOSOMUS, Gill.

Sebastosomus flavidus (Ayres).*Sebastosomus serranoides* (Eigenmann and Eigenmann).*Sebastosomus melanops* (Girard).*Sebastosomus eiliatus* (Tiles).

VI. SEBASTODES, Gill.

Sebastodes goodii, Eigenmann and Eigenmann.*Sebastodes paucispinis* (Ayres).

VII. GENUS ALLIED TO SEBASTOMUS.

? *matzubaræ*, Hilgendorf.

VIII. SEBASTOMUS, Gill.

Sebastomus capensis (Linnæus).*Sebastomus rufus* (Eigenmann and Eigenmann).*Sebastomus miniatus* (Jordan and Gilbert).*Sebastomus pinniger* (Gill).*Sebastomus leris* (Eigenmann and Eigenmann).*Sebastomus areus* (Eigenmann and Eigenmann).*Sebastomus constellatus* (Jordan and Gilbert).*Sebastomus umbrosus* (Jordan and Gilbert).*Sebastomus rosaceus* (Girard).*Sebastomus rhodochloris* (Jordan and Gilbert).*Sebastomus gilli* (R. S. Eigenmann).*Sebastomus rupestris* (Gilbert).*Sebastomus eos* (Eigenmann and Eigenmann).*Sebastomus chlorostictus* (Jordan and Gilbert).*Sebastomus ruber* (Ayres).

IX. PTEROPODUS, Eigenmann and Beeson.

Pteropodus sinensis (Gilbert).*Pteropodus saricæola* (Gilbert).*Pteropodus atrovirens* (Jordan and Gilbert).*Pteropodus elongatus* (Ayres).*Pteropodus proriger* (Jordan and Gilbert).*Pteropodus brerispinis* (Bean).*Pteropodus zacentrus* (Gilbert).*Pteropodus maliger* (Jordan and Gilbert).*Pteropodus dallii*, Eigenmann and Beeson.*Pteropodus caurinus* (Jordan and Gilbert).*Pteropodus reillaris* (Jordan and Gilbert).*Pteropodus rastrelliger* (Jordan and Gilbert).*Pteropodus nebulosus* (Ayres).*Pteropodus carnatus* (Jordan and Gilbert).*Pteropodus chrysomelas* (Jordan and Gilbert)

X. AUCTOSPINA, Eigenmann and Beeson.

Auctospina aurora (Gilbert).*Auctospina auriculatus* (Girard).

XI. SEBASTOPSIS, Gill.

Sebastopsis xyris, Jordan and Gilbert.