

## THE FISHES OF PUGET SOUND.\*

BY DAVID STARR JORDAN AND EDWIN CHAPIN STARKS.

(With Plates lxxvi-civ.)

The present paper contains an enumeration of the fishes known to inhabit the waters of Puget Sound, a large estuary or fjord entering the northwestern part of the State of Washington. The paper is based primarily on a collection made by the junior author in July, 1895, under the auspices of the Hopkins Laboratory of the Leland Stanford Junior University, he being the guest of the "Young Naturalists' Society of Seattle."

This society undertook at this time a dredging expedition for the special purpose of collecting invertebrates. Through the interest of Mr. Timothy Hopkins, the junior author was enabled to take part in this work.

Nearly two weeks in July were devoted to dredging. A small steamer was chartered for this purpose. A camp was established at Point Orchard on Admiralty Inlet, and collecting and dredging were carried on within a radius of twenty miles from that point.

Besides the fishes that were brought up in the dredge, collections were made of "rock-pool" fishes at low tide, and seines were worked along the beaches.

After the return of the dredging expedition, the fresh waters about Seattle were seined, with the help of different members of the Naturalists' Society. This fresh water collection is described by Mr. Alvin Seale, in an appendix to the present paper.

Besides the work done about Seattle, a week was spent by the junior author at Neah Bay, near Cape Flattery, in the Straits of Juan de Fuca. Here a collection of the rock-pool fishes was made. A rich field for this work

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was found on Waadda Island, a small rocky islet, lying about half a mile from the shore, near Neah Bay. In this same locality large collections were made in 1880 by Professors Jordan and Gilbert.

Previous to this expedition a small but very valuable collection of fishes had been presented to the Leland Stanford Jr. University by the Young Naturalists' Society. The new forms in this collection are described in the present paper by Jordan and Williams. In the present list are also included the species enumerated by previous writers as occurring in Puget Sound and the Straits of Juan de Fuca. In the list published in 1880 by Jordan and Gilbert ninety species are mentioned as found in these waters. From this list we have drawn freely in our present records of the habits of species. In a later list by Dr. Carl H. Eigenmann (1892), 106 species are recorded. In the present list 141 species are recorded from these waters.

The junior author wishes to express here his obligations for the many favors extended to him by the different members of the Young Naturalists' Society, who did all that was in their power to make his part of the expedition a success. He is under particular obligations to Mr. Charles L. Denny and Mr. Edward S. Meany, who helped him in many ways, both in the dredging trip and on his trip to Neah Bay. He is indebted also to Mr. Henry H. Hindshaw for entertainment in Seattle and help of various kinds. Valuable aid was also given by Mr. Adam Hubbert, Miss Adella M. Parker, Miss Maud Parker, Mr. Trevor Kincaid, Mr. J. W. Busby, Mr. Albert Bryan, Miss Robeson, Mrs. J. E. Chilberg, Mrs. H. H. Hindshaw, Prof. O. B. Johnson, Prof. C. V. Piper, Mr. Oscar Piper, and Miss Newell, members of the society in question. Further acknowledgment is due to

the kindly interest of Messrs. Goodall & Perkins, representing the Pacific Coast Steamship Company.

The following species are here described as new to science, the types of all of them being deposited in the Museum of the Leland Stanford Junior University as gifts from the Hopkins Laboratory or from the Young Naturalists' Society of Seattle. The new genera are indicated in full-face type.

- Ruscarius** *meanyi*. No. 3127.  
*Oligocottus embryum*. No. 3128.  
**Gilbertina** *sigalutes*. No. 3129.  
**Averruncus** *emmelane*. No. 3135.  
**Xystes** *axinophrys*. No. 3130.  
**Lethotremus** *vinolentus*. No. 3131.  
*Neoliparis flore*. No. 3019, 3133.  
*Liparis dennysi*. No. 3703.  
**Bryostemma** *nugator*. No. 3134.  
**Xiphistes** *ulvæ*. No. 3132.

Besides these species, the following additional new species are described from other localities:

- Zalarges** *nimbarius*. No. 3125. Open sea.  
*Hexagrammus otakii*. Tokio, Japan.  
*Podothecus veterinus*. Robin Island, Alaska.  
*Podothecus accipiter*. Robin Island, Alaska.

The following additional generic names are here used for the first time:

**Astrolytes**, **Pallasina**, **Stelgis**, **Quietula**, **Ronquilus** and **Xererpes**.

The fish fauna of Puget Sound marks a transition from the California fauna characterized by the abundance of *Scorpenidæ*, *Embiotocidæ*, etc., to that of Alaska, in which *Cottidæ*, *Agonidæ* and the Arctic types of *Blennies* are dominant. Here both classes occur, though less abundant than in their respective regions. The present collection is chiefly from depths greater than those reached by Jordan and Gilbert, who collected largely in Puget

Sound in 1880. The extensive collections made by the Albatross in the north have been mostly from much greater depths.

The plates of the present paper are all drawn by Miss Anna L. Brown, artist of the Hopkins Seaside Laboratory.

Family PETROMYZONIDÆ.

1. *Entosphenus tridentatus* (Gairdner).

Common; ascending the fresh waters in spring to spawn, reaching a length of over 2 feet. It is not used as food. Not taken by us.

2. *Lampetra cibaria* (Girard).

Not rare; ascending streams, reaching a length of 8 inches; not used as food. Not taken by us.

Family HEXANCHIDÆ.

3. *Notorhynchus maculatus* Ayres.

Recorded (as *Notorhynchus borealis*) from Nisqually, Washington, by Dr. Gill. Not taken by us.

4. *Hexanchus corinus* Jordan & Gilbert.

Originally described from Neah Bay and from the Bay of Monterey. Not seen by us.

Family GALEIDÆ.

5. *Prionace glauca* (Linnæus). BLUE SHARK.

Recorded by Jordan & Gilbert; rare. Not seen by us.

Family DALATIIDÆ.

6. *Somniosus microcephalus* (Bloch). GROUND SHARK.

Not uncommon. A very sluggish shark. Recorded by Jordan & Gilbert from Victoria. A stuffed specimen from Seattle in the Museum of the Young Naturalists' Society.

## Family SQUALIDÆ.

7. *Squalus sucklii* (Girard). DOG-FISH.

Exceedingly abundant. Taken in great numbers with set lines. It is valued for the oil extracted from its liver.

## Family RAJIDÆ.

8. *Raja rhina* Jordan & Gilbert.

Not uncommon; reaches a length of 32 inches. Not taken by us.

9. *Raja binoculata* (Girard). COMMON SKATE; RAY.

Common on sandy shores. Reaches a length of 6 feet and a weight of over 60 pounds. One small specimen obtained, very prettily marked with large ocellated spot on the base of pectorals, which fades in the adult. Several of the egg cases of this species were dredged from deep water, where they lie apparently unprotected on the sandy bottom.

## Family CHIMÆRIDÆ.

10. *Hydrolagus colliæi* (Lay & Bennett). RAT-FISH.

Numerous specimens taken on sandy beaches at night with a seine, where they were attracted by a camp-fire. It reaches a length of 2½ feet.

## Family ACIPENSERIDÆ.

11. *Acipenser transmontanus* Richardson. WHITE STURGEON.

Common; running up the rivers in the spring. It reaches a length of 15 feet and a weight of 300 to 400 pounds. Used largely as food, although its flesh is coarse. Not taken by us.

12. *Acipenser medirostris* Ayres. GREEN STURGEON.

Not common. Reaches a large size, but is not used as food. Not taken by us.

## Family NEMICHTHYIDÆ.

13. *Nemichthys avocetta* Jordan & Gilbert.

The type of this species was taken near Port Gamble in 1880, by Prof. O. B. Johnson of the University of Washington. It was presented to the U. S. National Museum by President A. J. Anderson. Mr. Ashdown H. Green of Victoria, B. C., reports a second specimen as recently taken near Victoria and preserved in the museum of that town.

## Family CLUPEIDÆ.

14. *Clupea pallasii* Cuvier & Valenciennes. HERRING.

Exceedingly abundant. Smoked and salted in large numbers. Mr. J. P. Hammond\* states that from 18 to 25 years ago it was not an uncommon occurrence for a "gang" of fishermen to catch from 200 to 300 barrels of herring in a night on Puget Sound. Now the largest night's work is 20 barrels.

15. *Clupanodon cæruleus* (Girard). SARDINE.

This sardine occurs in large numbers in the warmer part of the season.

[*Alosa sapidissima* (Wilson). SHAD.]

This species was introduced into the Pacific about 1878, and was first noticed in Puget Sound in 1884. They are slowly increasing in number, although the catch is as yet unimportant. Specimens of 6½ pounds in weight have been taken in the Sound. Not seen by us.]

## Family ENGRAULIDÆ.

16. *Engraulis mordax* Girard. ANCHOVY.

Abundant; occurring in immense schools. Chiefly used for bait. Not taken by us.

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\* American Angler, December 18, 1886.

## Family SALMONIDÆ.

17. *Oncorhynchus tshawytscha* (Walbaum). QUINNAT SALMON; CHINNOOK SALMON; TYEE\* SALMON.

The first salmon to appear each season, abundant from August to October. It commonly weighs about 17 (11 to 20) pounds, but specimens weighing 70 pounds are on record. The most important fish on the Pacific Coast. In Puget Sound it is not very abundant, and being obtained late in the season, its flesh is somewhat lean and dry, ranking with the silver salmon, with which it is usually canned. In the Columbia River this species is canned early in the season, and its quality then is much superior to that of any salmon canned in Puget Sound.

18. *Oncorhynchus kisutch* (Walbaum). SILVER SALMON; SKOWITZ.

Abundant from August to November. It reaches a length of 30 inches and a weight of 4 to 8 pounds. It is largely canned at Seattle under the name of Red Salmon. Its flesh is very red, but dry and not richly flavored, being much inferior to the Quinnat or "Tyee."

19. *Oncorhynchus keta* (Walbaum). DOG SALMON; LE KAY.

Abundant; reaches a weight of 20 pounds. It is only eaten by the Indians, as it runs late in the fall when its flesh is very dry and poor. One small specimen taken.

20. *Oncorhynchus gorbuscha* (Walbaum). HUMPBACK SALMON; HADDO.

The smallest of the salmon, reaching a weight of 7 pounds. It is very abundant on alternate years in the Sound (1893, 1895, etc.), being wholly unknown in even

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\*Tyee, the common Chinook name for this species on Puget Sound, is said to mean *king* or *chief*.

years. It is dark in color, with pale flesh and is regarded as the poorest of the salmon, although its inferiority to the silver salmon is in appearance rather than in taste. It is, however, canned in large numbers, and is of economic importance.

21. *Oncorhynchus nerka* (Walbaum). SUKKEGH; BLUEBACK SALMON.

Abundant, reaching a weight of from 4 to 8 pounds. Often landlocked in the lakes. In value intermediate between the "Tyee" and the "Skowitz" or Silver Salmon. The male in the fall is known as "red-fish."

22. *Salmo mykiss* Walbaum. CUT-THROAT TROUT.

Found in abundance in salt water in Puget Sound. It often reaches 8 or 10 pounds, but specimens weighing much more have been taken.

23. *Salmo gairdneri* Richardson. STEELHEAD.

Common near the head of Puget Sound. Considerable quantities are taken for the market. It sometimes reaches 14 to 18 pounds in weight. It is now canned regularly with the silver salmon.

24. *Salvelinus malma* (Walbaum). DOLLY VARDEN TROUT.

Abundant. In Puget Sound it is taken from salt water in large numbers. An excellent food fish, reaching in salt water a weight of 11 pounds or more. Locally known as bull trout or salmon trout.

Family ARGENTINIDÆ.

25. *Hypomesus pretiosus* (Girard). SURF SMELT.

Very common on sandy beaches in Puget Sound. It reaches a length of a foot and becomes very fat. It is a food fish of great value. Several specimens obtained. A beautiful, symmetrical little fish.

26. **Thaleichthys pacificus** (Richardson). EULACHON;  
CANDLE-FISH.

Abundant in the spring; not taken by us. A fine food fish. Reaches a length of about 10 inches. A fisherman at Olympia says that this species buries itself in the sand of the beach, in the same fashion as the species of *Ammodytes*.

27. **Osmerus thaleichthys** Ayres. SMELT.

Common, but not of great importance as a food fish. Length about 6 inches. Not taken by us.

Family MYCTOPHIDÆ.

28. **Tarletonbeania crenularis** (Jordan & Gilbert).

A specimen taken off Vancouver Island in 1880 by Dr. Tarleton H. Bean, who gave it the manuscript name of *Myctophum procellarum*. Not taken by us.

29. **Myctophum californiense** Eigenmann & Eigenmann.

Recorded from Vancouver Island by Dr. Günther under the name of "*Scopelus boops*;" more common southward in deep water. It is perhaps not distinct from *Myctophum humboldti*.

Family CHAULIODONTIDÆ.

30. **Zalarges nimbarius** Jordan & Williams, n. gen. and sp. Plate lxxvi.

Head 4 in length to base of caudal; depth 5; D. 9, A. 15. Scales probably present in life, but no traces left except a few impressions. Muscular bands about 42.

Body moderately elongate, subfusiform, formed somewhat as in a stickleback, the tail tapering and slender, the belly broad and not carinate, the sides moderately compressed. Anterior profile of head rising evenly, not

convex; a slight depression before eye. Mouth large, low, oblique, the lower jaw somewhat projecting. Pre-maxillaries short; maxillaries long, expanded, the lower edge curved, overlapping the dentary bones. Maxillaries extending beyond eye, to angle of preopercle, as in *Stolephorus*, their length  $1\frac{2}{3}$  in head, their tip acutish. Eye very large, 3 in head; snout 4. Bones of lower jaw thin, broadly expanded, meeting across the throat at the articular joint, leaving a club-shaped naked area under the chin. Entire edge of maxillary armed with a single series of slender sharp teeth, somewhat unequal, some of them forming slender canines, which are however but little longer than the other teeth and not fang-like. Teeth in lower jaw similar, those of both jaws largely directed forward. No teeth on vomer or tongue; a row of small slender teeth on each palatine bone. No pseudobranchiæ. Gill-rakers rather long and slender, about  $5+17$  in number, the longest about half eye. Branchiostegals short, 8 in number. Opercle short and thin; scarcely striated; subopercle and interopercle developed.

Photophores large and conspicuous, forming convex pearly bodies on a dark background. Two series in a straight line along lower part of sides, making four series in all. The two lower series run from chin to the caudal fin, 47 in each series,  $10+13+9+8+7=47$ . The two upper rows begin under chin at front of isthmus and extend to front of anal fin, 24 in each row,  $10+13+11$ ; 8 photophores along branchiostegal membranes, one for each ray, all overlapped but not hidden by the broad transparent rami of the lower jaw; one photophore on preopercle, one on subopercle, one on preorbital, and one at lower posterior margin of eye; 2 under tip of chin.

Dorsal fin low, inserted on posterior half of body, some-

what behind ventrals, at a point midway between preopercle and base of caudal, its last rays extending over the anterior third or fourth of anal; adipose fin not evident, perhaps obliterated. Caudal apparently lunate,  $1\frac{2}{3}$  in head. Anal low, its base  $1\frac{1}{3}$  in head. Ventrals  $2\frac{1}{4}$  in head, inserted midway between front of eye and base of caudal. Pectorals inserted very low, narrow and pointed,  $1\frac{2}{3}$  in head.

Back brownish, the sides burnished silvery; silvery area on cheeks Y-shaped, the Y placed obliquely. Fins with some dark dots, these forming obscure bars across caudal; dark specks on back of caudal peduncle, and across base of caudal; some dark dots elsewhere on body.

Type two specimens, each  $2\frac{3}{8}$  inches long, and in good condition, numbered 3125 on the register of Leland Stanford Jr. Museum. They were cast up in a storm and thrown by the waves on the deck of a vessel coming in from Australia. The exact locality in the open Pacific is not known. The types were presented by the Young Naturalists' Society to the Museum of Stanford University.

The new genus *Zalarges* seems to belong to the *Chauliodontidae*, near the Atlantic genus *Yarrella* Goode & Bean. It may be thus defined: Body subfusiform, moderately compressed, probably covered in life with thin caducous scales. Head subacute, the membrane bones normal, thin; mouth large, with expanded maxillary and mandibular bones; lower jaw projecting. Teeth very slender, unequal, uniserial, none on tongue or vomer; no fangs. Eye large. Gill openings very wide; gill-rakers long and slender; branchiostegals 8; no pseudo-branchiæ. Photophores conspicuous, in two rows on each side of belly, the upper row ceasing at front of anal; some

detached photophores on head. Dorsal short, on posterior half of body, slightly overlapping the short anal. Ventrals inserted before dorsal. Pectorals narrow and low. Coloration silvery. (*Zάλη*, surges; *ἀργίς*, silvery.)

Family ALEPISAURIDÆ.

31. *Alepisaurus borealis* Gill.

Very rare; in deep water. A head from Puget Sound is in the Museum of the California Academy of Sciences.

Family PARALEPIDÆ.

32. *Arctozenus coruscans* (Jordan & Gilbert).

The sole specimen known was taken at Port Townsend in 1880, by Jordan & Gilbert. It is in the U. S. National Museum.

Family AMMODYTIDÆ.

33. *Ammodytes personatus* Girard. SAND LANCE.

Found in immense schools along sandy beaches in Puget Sound. It burrows in the sand between tide marks. It reaches a length of 5 or 6 inches. Two specimens taken.

Family AULORHYNCHIDÆ.

34. *Aulorhynchus flavidus* Gill.

Abundant in sheltered bays. It reaches a length of 5 or 6 inches.

Family GASTEROSTEIDÆ.

35. *Gasterosteus microcephalus* Girard.

Abundant. Specimens obtained in brackish water near Ballard, Seattle. Length 2 inches.

36. *Gasterosteus catraphractus* Pallas.

Specimens obtained in abundance, from 3 to 3½ inches in length. It lives on sandy beaches and spawns in the latter part of July and in August.

## Family SYNGNATHIDÆ.

37. *Siphostoma californiense* (Storer). PIPE FISH.  
Not very common. It reaches a length of 18 inches.

## Family STROMATEIDÆ.

38. *Rhombus simillimus* (Ayres). PÁMPANO.  
Rare in Puget Sound. Not taken by us.

## Family BRAMIDÆ.

39. *Brama raii* Bloch. POMFRET.

A specimen taken at Port Townsend by Mr. James G. Swan, and reported by him as being not uncommon off Vancouver Island. It reaches a length of about 20 inches. Recently numerous specimens have been taken off San Francisco and Monterey. Not taken by us.

## Family EMBIOTOCIDÆ.

40. *Damalichthys argyrosomus* (Girard). WHITE PERCH.

Very abundant; many specimens obtained. It reaches a weight of 2 pounds, and is a common food fish, though not of high quality.

41. *Tæniotoca lateralis* (Agassiz). STRIPED PERCH.

Very common; a brilliantly colored fish. A number of specimens taken. It reaches a weight of 2 pounds, and is an important food fish, finding a ready sale, although the flesh is somewhat poor.

42. *Embiotoca jacksoni* Agassiz. BLUE PERCH; SURF FISH.

Somewhat scarce. It reaches a weight of 1½ pounds. Its flesh is poor. A few specimens obtained.

43. *Brachyistius frenatus* Gill.

Not very abundant; not used as food. Weight ¼ pound.

44. *Cymatogaster aggregatus* Gibbons. SHINER.

The most abundant species of the group. It is small in size and is only used for bait. Several specimens taken.

Family SCORPÆNIDÆ.

45. *Sebastes melanops* (Girard). "BLACK BASS."

Abundant in Puget Sound and a food fish of value.

46. *Sebastes mystinus* (Jordan & Gilbert). PRIEST FISH.

Scarce, but more common farther south. No specimens taken by us.

47. *Sebastes pinniger* (Gill). RED ROCK COD.

Abundant in rather deep water. Not taken by us.

48. *Sebastes ruberrimus* Cramer. RED ROCK FISH; TAMBOR.

Taken with hook and line in some abundance in Puget Sound.

49. *Sebastes caurinus* (Richardson).

Very common; brought into the market in abundance. This species has not been found south of Puget Sound, being replaced southward by the very closely allied *Sebastes vexillaris*. Several specimens obtained by us in the seine.

50. *Sebastes auriculatus dalli* (Eigenmann & Beeson).

Common; a shallow water species. Many specimens taken with a seine. The specimens of *Sebastes auriculatus* from Puget Sound are very dark in color, and about half of them lack the coronal spines which are especially characteristic of *Sebastes auriculatus* on the coast of California. The name *dalli* seems to have been given to a specimen of this type taken at San Francisco. Pend-

ing investigation we may adopt the subspecific name *dalli* for the Puget Sound form of this species.

51. *Sebastes maliger* (Jordan & Gilbert).

Found by Jordan & Gilbert to be a common species in the Straits of Juan de Fuca. Reaches a weight of 6 pounds. Not taken by us.

52. *Sebastes nebulosus* (Ayres). ROCK COD.

Rather common. No specimens taken by us.

53. *Sebastes nigrocinctus* (Ayres).

This peculiarly marked rock fish was found by Jordan & Gilbert to be common in the entrance to the Straits of Juan de Fuca, in deep water. No specimens obtained in Puget Sound.

Family HEXAGRAMMIDÆ.

54. *Hexagrammus decagrammus* (Pallas).

Said to be quite common, but less abundant than *Hexagrammus asper*. Not taken by us.

55. *Hexagrammus ordinatus* (Cope).

Taken at Port Angeles, on the south shore of the Straits of Juan de Fuca, by the Albatross. Not seen by us.

56. *Hexagrammus asper* Steller. *Hexagrammus superciliosus* (Pallas).

Not abundant and not taken by us.

57. *Hexagrammus hexagrammus* (Pallas). STARLING.

Abundant everywhere in Puget Sound. It lives about rocky places, and is taken in large numbers with hook and line and nets. It reaches a length of about 16 inches and a weight of 2 or 3 pounds. It is a food fish of fair quality, but inferior to the species of *Sebastes*. This is the southern limit of this species. Several specimens were obtained by us.

We may here record a new species of *Hexagrammus* from Tokio, Japan, hitherto confounded with the American species *Hexagrammus hexagrammus*.

***Hexagrammus otakii*** Jordan & Starks, n sp. Plate lxxvii.

Head 4 in length to base of caudal; depth  $4\frac{1}{3}$ ; dorsal XIX-23; anal 21; scales 21-106-34; eye  $4\frac{1}{2}$  in head; snout  $3\frac{1}{3}$ ; highest dorsal spine  $2\frac{1}{2}$ ; highest dorsal ray  $2\frac{1}{3}$ ; highest anal ray 3; pectoral  $1\frac{1}{4}$ ; ventral  $1\frac{2}{3}$ ; caudal  $1\frac{1}{2}$ .

Body elongate, not greatly compressed, the head small and pointed. Mouth not large, the maxillary reaching slightly past the vertical from anterior rim of orbit; jaws subequal; teeth conical and sharp, the outer row enlarged, smaller on vomer, none on palatines; interorbital space broadly convex; a wide, short, multifid dermal flap over posterior edge of each eye.

Head scaled above to slightly in front of eyes, opercle and cheek entirely and densely covered with small scales; snout, preorbital, suborbital, lower jaw and interopercle naked. Scales everywhere, except on cheeks and opercles, strongly ctenoid.

Lateral lines 5 on each side; the upper one from nape parallel with dorsal, stopping under the beginning of posterior fourth of soft dorsal, sometimes uniting with the second lateral line at this point, not joining its fellow of the opposite side in front of dorsal; the second running parallel with it, continued to base of caudal, situated below the first in distance equal to half eye; the third, parallel with curve of back, running from the upper end of the gill-opening to the base of the caudal; the fourth short, beginning slightly in front of ventral, past the outer edge of its base, not reaching to its tips; the fifth parallel to anal, in distance above it equal to space between upper lateral lines, barely reaching base of caudal posteriorly,

anteriorly joining its fellow of the opposite side between vent and base of anal, continuing simple forward. Of four specimens examined, in two it stops at the base of ventrals, in the others it ends midway between that point and isthmus.

First and second dorsal and anal subequal in length of base; spinous dorsal very slightly higher than soft dorsal, its origin slightly behind upper end of gill-opening, the notch between it and soft dorsal shallow; origin of anal midway between front of eye and base of caudal, its rays shorter than those of soft dorsal; pectoral short and wide, the rays toward the upper edge the longest, the tips of which reach to end of ventrals; origin of ventrals behind that of pectorals a space equal in distance to length of snout; caudal short, shallowly lunate.

Color light brown above, white or yellowish below, variously marked with irregular dark brown mottlings and spots arranged chain-like; top of head and snout dark; dorsals dark and mottled; pectorals crossed with irregular bars; ventrals dusky, not black at tips; anal dusky and mottled, the end of each ray white.

Four specimens, collected by Mr. Keinosuke Otaki, a graduate of the Department of Zoology in Stanford University, now a member of the Fish Commission of Japan. They are from the markets at Tokio, Japan, the largest about 9 inches in length.

This is the species recorded from Tokio by Dr. Steindachner (Beitr. Kenntniss Fische Japans, iv, 66) as *Hexagrammus asper*. It is not likely that the latter American species occurs in Japan.

**58. *Ophiodon elongatus* Girard. CULTUS COD; BLUE COD.**

Abundant. An important food fish, reaching a weight of 60 pounds.

59. *Oxylebius pictus* Gill. Plate lxxviii.

Not uncommon, living among the rocks near shore. Not taken by us.

60. *Zaniolepis latipinnis* Girard.

Rare in Puget Sound. It reaches a length of a foot. Two specimens obtained by Prof. O. B. Johnson are in the Museum of the Young Naturalists' Society.

61. *Anoplopoma fimbria* (Pallas). BLACK COD; BESHOWE.

Common in Puget Sound, where it is valued as a food fish. It reaches a length of 40 inches.

## Family COTTIDÆ.

62. *Jordania zonope* Starks. Plate lxxix.

*Jordania zonope* Starks, Proc. Ac. Nat. Sci., Phila., 1895, p. 410. The three type specimens of this singular fish were collected in channel rocks near Point Orchard. The largest specimen (No. 3124 L. S. Jr. Univ.) is 4 inches long. This species has  $10+36=46$  vertebræ, a number considerably in excess of that found in the related genera *Icelus* and *Artedius*.

The following is the original description of *Jordania zonope*:

Genus JORDANIA Starks.

Allied but not closely to *Triglops* and *Chitonotus*.

Body elongate, not greatly compressed; head moderate, partly scaled, with dermal flaps above. Mouth moderate, with bands of villiform teeth on jaws, vomer, and palatines. Body above lateral line closely covered with strongly ctenoid scales; lower half of body with narrow, parallel plate-like folds of skin, running obliquely downward and backward from lateral line to within a short distance of anal fin, the posterior edge of each fold finely

and sharply serrate. Gill-membranes united, free from isthmus; a slit behind last gill. Spinous dorsal with very long base of about 17 spines, longer than the soft dorsal; anal long; ventrals 1, 5, inserted behind base of pectorals.

JORDANIA ZONOPE Starks.

Head  $3\frac{1}{2}$  in length of body; depth  $5\frac{1}{2}$ ; dorsal XVII-15; anal 22; lateral line 50; orbit  $3\frac{2}{3}$  in head; maxillary  $3\frac{1}{3}$ ; longest dorsal spine  $1\frac{5}{6}$ ; longest dorsal ray  $2\frac{1}{5}$ ; longest anal ray  $2\frac{1}{3}$ ; length of ventrals  $1\frac{3}{4}$ ; pectorals  $\frac{1}{4}$  longer than head; caudal  $1\frac{4}{5}$ .

Body rather elongate, compressed posteriorly, not much anteriorly, the back not elevated; dorsal and ventral outlines almost straight from head to caudal peduncle.

Head not large, profile from front of dorsal to eyes nearly horizontal and straight, then abruptly turning steeply downward to end of snout, lower profile gently curved from chin to ventral fins.

Mouth small, the maxillary not reaching the vertical from front of orbit; jaws about equal or the lower slightly projecting; teeth in villiform bands on jaws, vomer, and palatines; eyes large, set high in head, a little shorter than snout; interorbital space deeply concave, half as wide as eye; a slip of skin, half as long as the diameter of the eye, over the anterior edge of each eye, and a longer one over the posterior edge; a few minute fleshy slips on nape; nasal spines long and sharp, somewhat curved back; spine on preopercle simple, hooked up, a minute spine above it, and a blunt spine below; posterior end of interopercle prominent, forming a blunt spine; opercle produced posteriorly in a flap, which lies in a shallow groove in the shoulder girdle; no opercular spine; gill-membranes united, but not joined to the isthmus; a distinct slit behind fourth gill arch; branchiostegals 5.

Top of head to middle of eyes, opercles and upper part of preopercles closely covered with small rough scales; head otherwise naked; body above lateral line completely covered with ctenoid scales, not very regular in size, arranged in about 67 series; lower half of body covered to within a short distance of anal with about 50 oblique plate-like folds of skin, the posterior edges of which are finely and sharply serrate, the pores of lateral line are situated in the upper end of these folds; pectoral base, belly and a narrow space along base of anal, naked; fins, with the exception of pectoral, which has a few rough scales on the rays, naked.

Dorsal spines slender, the first one inserted in advance of pectoral base, directly over the upper end of gill-opening, the fin somewhat round in outline, the spines not varying greatly in length, with the exception of two or three on each side; soft dorsal a little lower than spinous, the rays subequal, its base is a little shorter than the base of first dorsal, and slightly longer than the length of head; ventral fins long, their tips reaching past front of anal fin, their length equal to the distance from snout to edge of preopercle, the pubic bone very prominent; pectoral fins long and curved upward, the middle rays the longest, reaching far past tips of ventrals and front of anal to the space between dorsals; the ends of lower rays free, the width of the fin at its base is contained three times in the length of the head; caudal rounded.

Color in spirits blackish, with traces of 4 or 5 darker cross-bars on back, sides below lateral line mottled, faint dark spots along lateral line, more conspicuous posteriorly; a dark bar half as wide as eye, running from eye downward across cheek to anterior end of interopercle; bordered on each side by a light streak, a similar bordered bar running across top of head, slightly turning

around posterior margin of orbit, downward along margin of preopercle, and ending on posterior end of interopercle; snout abruptly black, lips dark; fins all dark and slightly mottled, tips of ventral, anal, and caudal rays a little lighter; caudal and pectoral dark at base; slips on top of head black; belly very finely dusted with minute dark points.

This species is not uncommon in Puget Sound; the types are three specimens taken in channel rocks at Point Orchard, near Seattle, by Miss Maud Parker and Mr. Adam Hubbert; members of the Young Naturalists' Society of Seattle. The largest of these is 4 inches in length. The types are in the Museum of the Leland Stanford Junior University, numbered 3124. Unfortunately the life colors of this brilliant species were not taken. There is in life much red on the lateral plates and elsewhere on the body and fins. This disappears at once in alcohol.

**63. *Radulinus asprellus* Gilbert. Plate lxxxi.**

Not common; two specimens dredged near Seattle, the larger about 4 inches in length.

**64. *Chitonotus pugettensis* (Steindachner).**

Not common; two specimens obtained with a seine. It reaches a length of 9 inches.

**65. *Ruscarius meanyi* Jordan & Starks, n. gen. and sp. Plate lxxx.**

Head  $2\frac{1}{2}$  in length; depth  $3\frac{1}{2}$ ; dorsal X-14; anal 12; lateral line 6-32; orbit 4 in head; maxillary 2; snout 4; highest dorsal spine 3; highest dorsal ray 3; pectoral  $1\frac{1}{2}$ ; ventrals  $2\frac{2}{3}$ ; caudal  $2\frac{1}{3}$ .

Body robust, deepest and broadest at shoulders, tapering quickly backwards into a slender caudal peduncle; back somewhat elevated; ventral outline nearly straight

from chin to caudal fin; dorsal outline gently and evenly curved from snout to caudal peduncle.

Mouth terminal and nearly horizontal, maxillary reaching past pupil nearly to posterior edge of orbit; jaws subequal; teeth in narrow villiform bands on jaws, vomer and palatines; process of premaxillary prominent, extending between and above nasal spines; preopercular process well developed, long, near its tip a very small second spine is developed, making the process bifurcate, 3 or 4 short spines below on edge of preopercle; opercle ending in a flap; top of head with dermal flaps, one over anterior margin of eye, and a group of 2 or 3 over posterior margin; a few shorter ones on nape; mucous pores around mandible, large; opercle, upper part of preopercle, top of head to eyes, and the orbital ring covered with sharply ctenoid scales, upper part of eyeball with small rough scales, balance of head naked.

Lateral line with a row of rough plates; upper half of body completely covered with scales, their anterior edge imbedded, coarsely ctenoid on their posterior edge; lower half of body naked.

Dorsal spines slender, those in the middle highest, the fin without a notch, the longest spines reaching to front of soft dorsal where fin is depressed, well separated from soft dorsal; first dorsal ray inserted over first anal ray, the fin longer and higher than anal; pectorals somewhat pointed posteriorly, reaching just past the space between dorsals; ventrals inserted behind the base of pectorals a distance equal to the length of snout, their tips reaching to the front of the anal; caudal slender, rounded behind.

Color olive gray, belly dusky; back with dark cross shades, irregular in number and size, below lateral line light with small wavy bars running across to within a short distance of anal fin, then fading out; head with cross

shades above; a dark bar from eye to side of snout, one from eye downwards past end of maxillary, another behind it across posterior edge of preopercle; some dark markings on maxillary; lower lip dark; pectorals light, with dark wavy lines across them; dorsal fins dark and mottled; anal and ventrals varying from white to black; caudal with a dark bar at base, light with irregular dark cross markings.

Two specimens dredged, about  $1\frac{1}{2}$  inches in length. They are in the Leland Stanford Jr. University Museum, No. 3127.

This species is the type of the new genus *Ruscarius*, allied to *Chitonotus*, but distinguished by the continuous dorsal, scaly back, and weak armature of the preopercle. It is named for Mr. Edmond Stephen Meany, Secretary of the University of Washington, in recognition of his work in the Young Naturalists' Society.

**66. *Astrolytes fenestralis* (Jordan & Gilbert).**

Common; several specimens obtained with a seine. It is not found in rock pools. It reaches a length of 5 inches. Vertebrae  $8 + 25 = 33$ . This species is the type of a distinct genus, *Astrolytes*, distinguished from *Artedius* by the scaly, rough, uneven cranium, and more strongly armed preopercle.

**67. *Artedius lateralis* Girard.**

Two specimens obtained with a seine; probably not abundant.

Color in alcohol very dark; the head black; the body dark olive green, with faint pale markings on sides above lateral line; below with numerous clear-cut white spots, irregular in size, none of them half as large as pupil; belly dusky or white; fins all jet black; first dorsal with 2 or 3 faint light bars across the spines running backward

and downward; soft dorsal with 7 or 8 series of spots on the membrane, not involving the rays, running obliquely backward and downward; other fins plain black.

**68. *Hemilepidotus hemilepidotus* (Tilesius).**

Very abundant in shallow water among weeds, and in rocky places. It reaches a length of 15 inches; rarely used for food. Several specimens obtained with hook and line.

**69. *Acanthocottus polyacanthocephalus* (Pallas).**

Abundant. One of the largest cottoids, reaching a length of 2 feet. Specimens collected with the seine.

**70. *Enophrys bison* (Girard).**

Abundant. An exceedingly ugly-looking fish, reaching a length of 12 inches. It is not used for food. Several specimens obtained with the seine on sandy beaches.

**71. *Leptocottus armatus* Girard.**

The most common large cottoid in Puget Sound. It reaches the length of a foot, and is seldom used for food. Specimens obtained in abundance.

**72. *Scorpaenichthys marmoratus* (Girard).**

Not uncommon; said to reach a weight of 20 to 25 pounds in Puget Sound. It is not valued as a food fish.

**73. *Blennicottus globiceps* (Girard).**

Rather common, in pools left in the sand by the tide. Several specimens taken near Neah Bay. The largest was  $6\frac{1}{2}$  inches long, this being the largest of this species on record. These specimens (subspecies *bryosus*) have many more cirri on the head than southern specimens.

**74. *Oligocottus embryum* Jordan & Starks, n. sp. Plate lxxxii.**

Head 4 in length; depth  $4\frac{1}{4}$ ; dorsal IX-15; anal 10;

orbit 4 in head; snout 4; maxillary  $2\frac{5}{8}$ ; highest dorsal spine  $2\frac{1}{2}$ ; dorsal ray  $1\frac{3}{4}$ ; anal ray  $1\frac{3}{4}$ ; length of caudal fin  $1\frac{2}{3}$ ; ventrals  $1\frac{1}{8}$ ; pectorals  $2\frac{1}{2}$  in body.

Body elongate, compressed, back slightly elevated, deepest under spinous dorsal; caudal peduncle moderately slender. Skin perfectly smooth.

Head small, tapering rapidly forward to the rather sharp snout as viewed from above; profile of head, straight below, acutely and evenly rounded above; mouth terminal, horizontal; maxillary reaching to the vertical from the middle of pupil; lower jaw included; teeth on jaws, vomer and palatines, in narrow villiform bands; process of premaxillary prominent, extending slightly above nasal spines, giving the appearance of three spines above snout; eye set high in head, the orbit as long as snout; preopercular spine short, blunt and triangular, entirely covered with the skin; edge of preopercle below, entire; opercle ending in a short flap; top of head with two rows of "mossy" cirri, running from the superior orbital margin, curving over head and continuing on lateral line; they disappear on its anterior third.

Dorsal spines rather stout, the fin lower than soft dorsal, rounded in outline; soft dorsal well separated from spinous, the front of fin the highest; pectorals long, the eighth ray the longest, rendering the fin pointed behind; it reaches to the base of about the seventh dorsal ray. The pectoral rays below the eighth are swollen, and posteriorly free from the membrane; anal about as high as soft dorsal, the rays somewhat swollen and more or less free; ventrals long, reaching about to front of anal, their insertion behind base of pectoral, a distance equal to the snout and eye; caudal fin slightly rounded.

Color varying from light green to a rich maroon; traces of 5 or 6 dark cross-bars on back, lower parts dusky with small light spots; belly white; a dark bar from eye to

side of snout, one from eye to edge of preopercle behind end of maxillary, and another from eye to below preopercular spine; lips black; lower rays of pectorals crossed with black and white bars, which fade out above; ventrals light with some dusky mottlings; dorsal dark above, light at base, no markings; anal with black and white bars running across the rays, caudal fin mottled.

Two specimens collected in the tide pools left in the sand on a beach a couple of miles east of Neah Bay, the largest  $2\frac{3}{4}$  inches in length. They are now in the Leland Stanford Jr. University collection, No. 3128.

A third specimen has been collected at Point Lobos, Monterey County, California, on Carmelo Bay, by Mr. John O. Snyder. This specimen is considerably brighter in color and the markings are more distinct.

**75. *Oligocottus maculosus* Girard.**

Very abundant. Specimens taken in large numbers in a muddy lagoon near Point Orchard. It is one of the smallest of the marine *Cottidae*, not over 3 inches in length. A number of specimens were also taken at Neah Bay in tide pools. These differ from the others in being lighter in color, and in having many more cirri on the top of the head.

**76. *Dasycottus setiger* Bean. Plate lxxxiii.**

One small specimen brought up in the dredge,  $1\frac{1}{2}$  inches in length. Probably rare.

**77. *Nautichthys oculofasciatus* (Girard).**

Apparently not uncommon. Several small specimens collected in the rock pools and dredged from deep water. It reaches a length of 6 or 8 inches.

**78. *Blepsias cirrhosus* (Pallas).**

Not rare in Puget Sound, where it is taken in seines. It reaches a length of 6 inches. Not taken by us.

79. *Ascelichthys rhodorus* Jordan & Gilbert. Plate lxxxiv.

Plentiful at Waadda Island, Neah Bay. It is found under rocks between tide marks. Not a very active fish. This is the type locality where it was first taken by Jordan & Gilbert in 1880. It reaches a length of 3 inches. It occurs also on the rocky coast about Cape Mendocino in California.

Family PSYCHROLUTIDÆ.

80. *Psychrolutes paradoxus* Günther.

The original type from the Gulf of Georgia. Not obtained by recent collectors. Dr. Boulenger informs us that twelve dorsal rays are present in the original type, three of them entirely hidden by the skin.

81. *Psychrolutes zebra* Bean. Plate lxxxv.

Probably rare. One small specimen obtained, about an inch and a half in length.

82. *Gilbertina sigalutes* Jordan & Starks, n. gen. and sp. Plate lxxxvi.

Head 3 in length of body; depth 4; dorsal VIII, 18; anal 14; ventrals I, 3; pectoral 15; eye 6 in head; interorbital  $2\frac{1}{2}$ ; maxillary  $2\frac{1}{3}$ ; ventrals 2; pectorals 1; caudal  $2\frac{1}{4}$ ; base of dorsal  $1\frac{3}{8}$  in length of body; base of anal 3.

Body rather slender, robust anteriorly, compressed posteriorly, the greatest breadth and depth at shoulders. Head large, the nape slightly produced; mouth large and broadly rounded, oblique, the jaws about equal; maxillary extending to posterior margin of eye, its end buried under the skin of the cheek; eyes placed high, the interorbital space very wide and slightly convex, its width about  $2\frac{1}{2}$  times that of the eye; the posterior end of mandible very prom-

inent; bones of head cavernous, largely made up of cartilage; anterior end of preorbital forming a blunt spine over mouth; process of premaxillary prominent; a couple of blunt projections behind each eye; upper part of shoulder girdle projecting, forming a blunt spine on nape above gill-slit; a row of large pores around suborbital ring, and along under part of mandible; no opercular spines.

Head and body covered with a very loose, naked, movable skin; dorsal fin continuous; no notch between spines and soft rays; the spines very slender, the first one inserted over end of opercular flap; the last rays reach to the base of caudal fin; anal lower than dorsal, its origin midway between base of caudal fin and posterior margin of eye, ending at about the same point that dorsal does, but not reaching so far; pectorals long and slender, reaching past front of anal and over half way between their bases and base of caudal fin; they are adnate to the body for the anterior third or fourth of their length; ventrals long, not quite reaching to vent, adnate to the body for half their length; caudal fin rounded.

Color light olivaceous; body and head with innumerable dark points giving the fish a dusky appearance; a large dark blotch across body at the posterior end of the dorsal and anal; a similar spot under pectoral; head uniform dusky, lighter below; belly white, middle of pectoral dark; dorsals dark; lower fins white.

A single small specimen dredged,  $1\frac{1}{2}$  inches in length. It is numbered 3129 on the register of the Leland Stanford Jr. University Museum.

This species is the type of a strongly marked genus, distinguished from *Psychrolutes* by the very long dorsal and anal fins and by the form of the mouth. It is named for Dr. Charles Henry Gilbert, who has contributed

more than any one else to the knowledge of the fishes of the Northern Pacific.

Family RHAMPHOCOTTIDÆ.

83. *Rhamphocottus richardsoni* Günther. Plate lxxxvii.

Head 2; depth 2; dorsal VII, 13; anal 6; pectoral 14; orbit 6 in head; maxillary 4; snout 3; highest dorsal spine  $6\frac{1}{3}$ ; dorsal ray 4; anal ray 4; pectoral  $2\frac{1}{6}$ ; ventral 2; caudal 3.

Body short, compressed, the back elevated, its greatest depth just in front of spinous dorsal.

Head large, as long as the rest of the body; snout long and narrow; mouth U-shaped, its gape longer than wide, lips thick, their surface broken up into papillæ; maxillary reaching the nasal spine; lower jaw included; teeth in villiform bands on jaws and vomer, none on palatines; eye placed high, its diameter contained twice in the snout, once and a half in the interorbital; a branched dermal flap, as long as pupil, at tip of the snout; head with two large bony ridges above, continuous with the orbital rim and ending in strong blunt spines at occiput, head deeply concave between these ridges; nasal spine sharp and re-curved; a pair of strong spines over the eyes; a sharp spine just above opercle, a blunt one on opercle below flap, and a long sharp one at angle of preopercle; a low bony ridge leads to each of these spines; a long sharp spine on clavicle just behind gill-opening; a blunt bony knob at posterior end of mandible; gill-openings extending upward from upper pectoral ray, their length equal to the length of the snout.

The entire head and body covered with multifid spines, those on head much smaller than the ones on sides; a few simple spines along cephalic ridges; the first dorsal spine covered with spinules, and each dorsal ray has a

row on its side; a few spines on the base of the pectoral and anal rays.

Dorsal spines very weak, fitting in a groove in the back; soft dorsal higher than spinous, the tips of the rays reaching the base of caudal fin; anal short, few rayed, reaching slightly beyond soft dorsal; pectorals pointed, their lower rays entirely free, reaching about to the base of the third anal ray; ventrals reaching to ends of pectorals, their origin behind the lower part of pectoral base a distance equal to the length of snout; caudal rounded behind.

Body creamy yellow, with conspicuous irregular dark stripes, edged with black, running obliquely across the body; similar stripes radiating from the eye in all directions, one to end of snout, a triangular one downwards, one running backwards and downwards, to middle of preopercle, then turning upwards and running nearly to occipital spine, two or three short ones above; each of these involving the membrane of eye; 2 or 3 black-bordered dark spots on edge of opercle; a light yellow streak surrounded by black across caudal peduncle, behind which all is bright cherry-red to the end of caudal fin; two similar spots on base of pectoral; top of head crossed with wavy black-edged dark bars; tip of lower jaw black; a line of black spots running along under parts of mandible; fins all bright red, each ray of dorsal with a sharp black spot at its base, a few spots on dorsal spines; anal, pectorals, and ventrals, dark at base.

One specimen, 3 inches in length, collected in a rock pool, on Channel Rocks near Point Orchard, by Miss Adella M. Parker of Seattle; a second specimen, presented by the Young Naturalists' Society. The skeleton of this specimen has been prepared. It shows the following characters:

The posterior end of the prominent ridge, which runs backward from the superior orbital rim on each side, is formed by the epiotic process. It ends in the form of a long "occipital spine;" almost directly under it is the short parotic process.

The post-temporal is short, wide and flat; its upper end is attached to the inner side of the epiotic spine, and for the whole length of its anterior edge, to the skull between the epiotic and parotic processes. From its lower inner surface it sends a wide thin bone, which is firmly fastened to the base of the skull. It bears a backward projecting spine on its lower end, inside of which the supra-clavicle is attached.

Actinosts large, wide and thin, without an opening between them. Subopercle absent; preopercle large, sending a spine backwards; opercle triangular on its lower inner angle, the interopercle is developed and strongly coossified with it; it sends a slender process forward under the preopercle; a projection downward from the posterior end of the articular; suborbital wide, thin and concavo-convex, its convex surface outwards. Skull without basal chamber; vertebræ 10+14.

#### Family AGONIDÆ.

#### 84. *Aspidophoroides inermis* Günther.

The type from Vancouver Island recorded by Günther.

#### 85. *Bothragonus swani* (Steindachner).

Known only from the type taken near Port Townsend.

#### 86. *Pallasina barbata* (Steindachner).

• Taken at Port Angeles by the Albatross.

This species is the type of the genus *Pallasina* Cramer, distinguished from *Brachyopsis* by the long, Syngnathus-like body, and by the presence of a long barbel at the

chin. The genus *Siphagonus*, to which Dr. Steindachner refers it, is based on *Agonus segaliensis*, which seems to be a true *Brachyopsis*.

### 87. *Podothecus acipenserinus* (Pallas).

Very abundant on sand beaches, where it is taken with seines. It reaches a foot in length. Many specimens taken.

Two additional new species of *Podothecus*, presented by the Alaska Commercial Company, collected by Capt. J. G. Blair at Robin Island, in the Gulf of Patience, Saghalien, may be here recorded:

### *Podothecus accipiter* Jordan & Starks, n. sp. Plate lxxxviii.

Head  $3\frac{3}{5}$  in length; depth  $6\frac{1}{2}$ ; dorsal VIII-9; anal 10; pectoral 15; lateral plates 36; eye  $4\frac{1}{2}$  in head; snout  $2\frac{1}{6}$ ; second dorsal spine  $1\frac{5}{6}$ ; second dorsal ray  $1\frac{1}{2}$ ; third anal ray  $1\frac{3}{5}$ ; caudal  $1\frac{4}{5}$ ; upper ray of pectoral  $1\frac{1}{7}$ ; ventrals  $2\frac{1}{3}$ .

Body elongate, not compressed; head triangular as viewed from above; the mouth wide, entirely inferior;  $\square$ -shaped, the lower jaw shutting behind the upper by a distance equal to half eye; maxillary not reaching quite to anterior orbital rim; distance of anterior edge of upper lip from tip of rostral spines a little more than half eye; teeth in upper jaw almost obsolete; villiform band of teeth in lower jaw, wide in front becoming narrow at sides; vomer and palatines toothless; a patch of thick barbels below snout in front of mouth, the longest equal to vertical diameter of eye, a similar patch at end of maxillary, about equal in length to the shortest on snout; two short barbels on each side of lower lip between symphysis and angle of mouth. A pair of short, sharp, rostral spines, pointing directly forwards; at their base and much wider

apart is a pair of spines which point upwards, backwards and slightly outwards; running backwards from these are the ridges that bound the wide groove in which the maxillary process fits; these approach each other behind and end in sharp spines which point backwards and upwards; these spines are midway between middle of eye and the spines behind rostral spines; no median or movable spine at tip of snout; a pair of large spines above posterior third of eye and a pair of larger ones at occiput, these are continuous with the dorsal ridges; a curved ridge running from superior orbital rim and ending in a small spine just above opercle; a small ridge on opercle; preopercle with a large spine; a couple of spines below eye at lower edge of suborbitals, running from them to tip of snout is a ridge along lower edge of preorbitals; it is somewhat irregular but without spines; interorbital space wide and deeply concave, a pair of ridges on each side, converging forwards; supraorbital rim prominent; anterior nostril ending in a short, wide, conical papilla, with a small opening at the apex; no noticeable depression at occiput.

Dorsal ridges converging from the occiput to behind the soft dorsal; they unite on the second plate behind the base of last dorsal ray, this is continued as a single ridge on about 8 plates where it becomes obsolete; the upper lateral ridge follows the course of the lateral line to about the middle of spinous dorsal, where it slants sharply upward and is continued to tail above lateral line; lateral line midway between upper and lower lateral ridges posteriorly; a single spine above base of pectoral indicating an obsolete ridge between the lateral ridges; lower lateral ridge becoming obsolete under pectoral on 2 or 3 plates behind its base; abdominal ridges widest apart behind base of ventrals, uniting directly behind anal base and

running simple backwards, becoming obsolete on caudal peduncle; all the ridges with sharp recurved spines, with the exception of abdominal ridges behind part of anal; where the dorsal and anal ridges disappear the caudal peduncle assumes a quadrangular shape, the corners being formed by the spines of the lateral ridges; no row of spines around base of caudal or pectoral.

Fins all very high, origin of dorsal between the fourth and fifth dorsal plates, the fin to base of last spine covering 6 plates, the membrane covering  $2\frac{1}{2}$  more; the second and third spines the longest, a membrane connecting the last spine to the body for its whole length; when fin is depressed the ends of the last spines reach to the front of second dorsal; the second dorsal to end of last ray covers 8 plates, the membrane covers one more; the second and third rays are the longest, the last ray is connected to the body for about a third of its length; base of anal covering  $8\frac{1}{2}$  plates; the rays are very long and not differing much in length, the last ray not connected to body by a membrane; the fin begins in front of soft dorsal but is about coterminous with it, its rays when depressed reaching past ends of soft dorsal, 6 plates past base of its last ray; pectorals barely reaching to tip of last dorsal spine, the fin pointed above, first and second rays the longest, the lower rays produced beyond the membrane, making a notch in posterior outline of fin; origin of ventrals directly below base of pectoral, their tips reaching 6 plates beyond their base; caudal long and truncated; vent directly behind base of ventrals.

Color light brown above, white below; back with many narrow brown bars placed at irregular distances apart; head with many blended brown spots, one under eye, one on front margin of eye, one or two on top of head, one behind eye, one on preorbital, a similar spot on base of

pectoral rays; pectoral dusky. First dorsal with 3 rows of spots across the rays, a very narrow brown border to fin; second dorsal with similar spots, not arranged in rows; anal light above, uniform brown below; ventrals white; caudal fin dark at base with 3 or four dark spots towards middle of fin.

One specimen collected at Robin Island, by Capt. J. G. Blair. It is 8 inches in length.

**Podothecus veternus** Jordan & Starks, n. sp. Plate  
LXXXIX.

Head  $3\frac{2}{3}$  in length; depth  $7\frac{1}{3}$ ; dorsal IX-8; anal 8; pectoral 15; lateral plates 36; orbit  $4\frac{1}{3}$  in head; snout  $2\frac{1}{5}$ ; upper rays of pectoral  $1\frac{1}{2}$ ; highest dorsal spine  $2\frac{1}{3}$ ; highest dorsal ray  $2\frac{3}{5}$ ; highest anal ray  $2\frac{3}{5}$ ; caudal  $2\frac{1}{2}$ .

Body elongate, about as wide as deep anteriorly, much wider than deep posteriorly; mouth inferior, the lower jaw shutting far behind the upper; teeth on jaws, vomer, and palatines obsolete; a few short barbels beneath snout in front of mouth, and at angle of mouth; their length about equal to pupil; bones of lower jaw extensively cavernous.

A pair of short blunt rostral spines pointing directly forwards; at their base and wider apart is a pair of sharp spines curving outwards, backwards and upwards; at the posterior end of the rather wide rostral groove are a pair of small spines pointing upwards and backwards; from their base a pair of diverging ridges run through the interorbital to above posterior margin of orbit. No median or movable spine at tip of snout. A strong spine over eye, and a longer one at occiput; a low sharp ridge on side of head, running from ocular spine and ending in a low spine at upper end of gill-opening; a very low ridge on opercle not ending in a spine; preopercle with a strong spine with a wide keel-like base; a hooked

spine below eye on suborbital, from which a ridge runs along lower edge of preorbital to end of snout, below posterior end of rostral groove; on this ridge is a triangular spine pointing backwards; between this and the suborbital spine is an acute outward pointing spine not much widened at its base; interorbital concave, its width equal to the length of the eye, 2 in snout; supraorbital rim prominent. The dorsal ridge of body is continuous with occipital and supraorbital spines, it joins its fellow of the opposite side posteriorly, directly behind the second dorsal, and is continued simple on caudal peduncle; the spines are large and strongly hooked back anteriorly, becoming nearly obsolete posteriorly, only traceable on caudal peduncle by the center of each plate on the median line being slightly produced; spines on lateral ridges with stronger spines near middle of body than anteriorly or posteriorly; two or three blunt spines above base of pectoral, indicating an obsolete ridge between lateral ridges; lateral line at end of pectoral fin running along the upper lateral ridge a short distance, and becoming obsolete anteriorly; spines of abdominal ridge low and blunt, nearly obsolete posteriorly; the ridge joins its fellow of the opposite side directly behind base of anal fin and continues as a single low ridge on caudal peduncle; a small plate before base of each ventral; a median row of three running forward to gill membrane, three on each side of these, a row around base of pectorals. Origin of dorsal behind the fourth dorsal plate; including the membrane behind, it covers 9 plates; one plate between dorsals; the second dorsal covers 8 plates, behind which are 14 plates; the last ray of first and second dorsal and anal, are connected to the body by a membrane; upper ray of pectoral the longest, reaching to below the ninth or tenth spine of dorsal ridge, the lower rays slightly produced beyond the membrane.

Color in spirits, reddish-brown above, light below; narrow, irregular, transverse dark streaks across back and sides; a longitudinal dark bar along each side of base of both dorsals; a dark streak forward from eye; margin of spinous dorsal blackish; soft dorsal with a small spot behind, a dark spot on pectoral rays near their base and some dark bars behind it across rays; anal and ventrals colorless; caudal dusky.

A single specimen collected by Capt. J. G. Blair at Robin Island, about 8 inches in length.

Related to *P. acipenserinus* and *P. gilberti*. It differs from the former in having fewer and shorter barbels, teeth on jaws obsolete, keel and preopercle larger; dorsal ridges without spines posteriorly, and the spines on the preorbital ridge different in shape; from the latter in having the body different in shape, not everywhere deeper than wide, but the reverse posteriorly; anal much shorter and lower; no teeth on jaws, and the spines on preorbital ridge better developed and different in shape.

Allied to *Podothecus* is the genus *Stelgis* Cramer, of which *Podothecus vulsus* is the type. It is distinguished from *Podothecus* mainly by the comparative lack of barbels and by details of armature. We present a figure of the species drawn from the original type of *Stelgis vulsus*, the only specimen yet known. (Plate xc.)

88. **Averruncus emmelane** Jordan & Starks, n. gen. and sp. Plate xci.

Head from tips of rostral spines 4 in length of body; depth  $7\frac{1}{2}$ ; dorsal VIII or IX-8; anal 11; pectoral 14; lateral line 35; orbit 4 in head; snout to tips of rostral spines  $3\frac{1}{8}$ ; maxillary  $3\frac{3}{4}$ ; interorbital  $6\frac{1}{4}$ ; pectoral  $1\frac{2}{5}$ ; second dorsal spine  $2\frac{3}{5}$ ; third dorsal ray  $2\frac{1}{3}$ ; longest anal ray  $2\frac{3}{5}$ ; caudal fin 2.

Body elongate, subcylindrical, the caudal peduncle long

and slender, very slightly depressed, about three plates in front of caudal fin it widens slightly and is compressed; belly somewhat prominent, breaking the otherwise straight vertical outline from chin to caudal fin; dorsal outline straight from occiput to caudal fin.

Head as viewed from above almost regularly triangular, the prominent preopercular spines and the snout forming the angles; its dorsal profile irregular, much broken by spines.

Mouth inferior, broadly U-shaped, maxillary reaching just past the vertical from front of orbit; lips thick, covered with short, fine papillæ; upper jaw protractile; teeth small, in villiform bands, on the jaws, vomer and palatines; the distance from the anterior edge of premaxillary to end of the rostral spines is less than half the length of snout; two cirri as long as pupil under rostral spines, anterior lower edge of preorbitals with cirri, a group of 3 cirri on end of maxillary, and a group of 4 or 5 on posterior end of mandible; one on the middle of each branchiostegal ray, these forming a line from isthmus to opercle an area on chin from the mouth to the hyal bones "woolly" with short cirri; 2 or 3 cirri on lower edge of opercle and interopercle. A pair of parallel rostral spines pointing forward, their tips covered with skin; behind them is a deep oval pit, on the anterior outer edge of which are a pair of spines that point upward and outward and are slightly hooked backwards; at the posterior end of the pit are two spines, smaller than those above, and slightly curved backward; no median nor movable spine at tip of snout; a group of four short spines around anterior edge of eye, and one large triangular spine over posterior edge; the interorbital space is deeply concave, with a low sharp ridge on each side of the median line; preopercle very rough with irregular spines and tubercles;

middle of suborbital stay with a strong hooked spine; below the stay, on the naked area, are 2 or 3 plates with spines on their centers; angle of preopercle with a large sharp spine; along the lower edge of preopercle are 3 or 4 blunt spines; a ridge of 4 spines running back from each eye, corresponding with the dorsal keels of body; below this on each side is a ridge, somewhat irregular but not broken into spines, terminating in a spine that points between the dorsal and upper lateral keel of body; a small ridge on upper edge of opercle which does not end in a spine; a few small spines around posterior edge of opercle; a few minute spines along median line of top of head, the upper part of the eye covered with minute prickles. At the occiput is a deep pit, broader and deeper than long, divided by a low ridge through its middle.

Body with four ridges on each side, formed by the body plates, each plate ending in a strong recurved spine, except those of the abdominal ridge, which are smooth; a row of minute spines along median dorsal line from first dorsal to occiput; small spines following the lateral line; no trace of keels or spines in front of ventrals. The abdominal ridges are widest apart on the belly, they unite on the tenth plate in front of the caudal fin. The dorsal ridges unite on the ninth scale in front of the caudal fin, but the spines continue double to the tail; a row of sharp, small spines around the base of the pectoral and caudal fins.

Dorsal spines slender, the fin highest in front, the second spine the longest, its tip reaching to the base of the next to the last spine when the fin is depressed; third dorsal ray the highest, its tip reaching nearly to the last ray when depressed; the last ray is very short and adnate to the body for the whole of its length. Lower rays

of pectoral fins produced, extending beyond the membrane, the longest extending beyond the upper ray of the fin; anal longer and lower than soft dorsal, ending at the same corresponding place; last ray reaching to the fifteenth plate before caudal fin. Ventrals differing in length in the different sexes, reaching from slightly beyond vent to nearly half its length beyond; inserted slightly behind pectorals; caudal fin rounded behind; vent anterior, situated on the tenth plate in front of anal.

Color dark brown, belly white; sides crossed with irregular white bars, giving the fish a mottled appearance, besides dark dashes as though the fish had been bathed in ink (ἔν μελάνῃ); snout black; a black streak along lower edge of preopercle; a black spot on iris above; dorsals light, mottled with black; anal white with dark mottlings, a dark bar across the posterior rays, the tips of all the rays white; ventrals black, abruptly white at tips; pectoral and caudal dark with a white border, a light spot in the center of fins, and many white spots on the rays; a black spot at base of pectoral.

Two specimens collected with a seine near Point Orchard, the largest 7 inches in length. They are in the Museum of the Leland Stanford Jr. University, No. 3135.

This species is the type of a distinct genus, *Averrun-cus*, allied to *Podotheucus*, but with teeth on the vomer and palatines. The lack of the median movable rostral spine separates it from *Odontopyxis*, in which genus the dorsal fins are very small.

89. *Xystes axinophrys* Jordan and Starks, n. gen and sp. Plate xcii.

Head  $3\frac{1}{2}$  in length of body; depth 5; dorsal IX-8; anal 10; pectoral 15; lateral line 38; orbit 4 in head; snout to tip of rostral spines  $3\frac{1}{6}$ ; maxillary  $3\frac{1}{6}$ ; interorbital  $3\frac{1}{2}$ ; pectoral  $1\frac{1}{2}$ ; highest dorsal spine  $2\frac{1}{2}$ ; highest

dorsal ray 2; highest anal ray  $2\frac{3}{4}$ ; length of caudal fin  $1\frac{2}{3}$ .

Body elongate, subcylindrical, deepest and broadest at shoulders; belly prominent; dorsal outline straight from first dorsal spine to caudal fin, curved up anteriorly to occiput. Head very irregular, much broken by large spines; mouth inferior, rather broad, maxillary reaching to the vertical from front of orbit; lips thin, not broken up in papillæ; upper jaw protractile; teeth small, in villiform bands on jaws, vomer and palatines; the anterior edge of premaxillary is directly under the base of rostral spines; a few very small blunt papillæ behind chin; a barbel at end of maxillary, not half so long as diameter of pupil.

A pair of sharp rostral spines pointing forward and upward; behind these is a pair of curved spines pointing upward, outward and backward; no median spine or movable spine at tip of snout; between these and behind the rostral spines is an almost circular pit, which is entirely occupied by the upper end of the premaxillary process; interorbital wide and concave, a slight median ridge running from the rostral pit to a point above pupil, on each side of which is an outward curved ridge ending in a minute spine; over each eye is the largest spine on the head or body, the large triangular orbital spine, its base occupying nearly the whole space above eye; it is sharp, compressed and strongly hooked back; on the anterior part of its base is a small, sharp, preorbital spine, pointing upward; a series of minute spines running medially along the top of the head and body from a point between the orbital spines to the first dorsal spine; on each side of these are two large blunt spines, with the traces of a smaller one between them, they are continuous with the dorsal keels of body; farther down and continuous with

the upper lateral keel of body is a ridge broken up into 4 irregular spines, larger than the body spines; 4 triangular spines on edge of preopercle, the upper one the largest; a very irregular ridge running from upper preopercular spine, under eye, to snout; a ridge on upper part of opercle.

Body with 4 ridges on each side, formed by the scales, each of which ends in a spine; traces of a ridge between lateral ridges; the spines on abdominal ridges as sharp as those on rest of body; a Y-shaped ridge of spines in front of ventrals, the forks toward the ventrals and the base ending at gill-membrane; a raised area between ventral fins, running from their base to opposite their tips, which is entirely covered with small prickles; the anus is in the posterior end of this; the dorsal and abdominal ridges coalesce with their fellows of the opposite side, but they come together so gradually that it is impossible to tell exactly where they unite, as the spines continue distinct to the caudal fin. Small spines covering the outer part of the base of the pectoral; a ring of spines around caudal base; a few minute spines on eye above pupil; occiput abruptly lower than body, but scarcely forming a pit, as the body is about level behind it.

Spinous dorsal highest in front, the second spine reaching to base of last spine when fin is depressed; the dorsal rays subequal in length, the last not shortened and not adnate to body; last ray reaching to the tenth plate before caudal fin; pectoral fin posteriorly rounded in outline, the lower rays not produced; it reaches to the second plate before anal fin; ventrals small, reaching just past vent; anal longer and lower than soft dorsal; dorsal and anal ending at the same corresponding place; caudal fin rounded behind.

Color, in spirits, gray, with 7 or 8 dark cross-bars; head

uniform gray with the exception of a dark spot at occiput; belly dusky; dorsals somewhat mottled; anal black, with a white spot near its middle; pectorals white, with a large black spot on base of rays; ventral black, abruptly white at tips; caudal black, edged with white.

One specimen brought up in the dredge,  $1\frac{1}{2}$  inches in length. It is in the Leland Stanford Jr. University Museum, number 3130.

This species seems to represent a new subgeneric or generic type, allied to *Averruncus*, distinguished by the supraocular spine and by the subequal rays of both dorsals, the last of each not adnate to the body.

90. *Xenochirus triacanthus* Gilbert. Plate xciii.

Rare; brought up in the dredge in company with *Odontopyxis trispinosus*. One specimen obtained,  $3\frac{1}{2}$  inches in length. In this young example, here figured, the lower rays of the pectoral are not produced.

91. *Odontopyxis trispinosus* Lockington.

Abundant in deep water; the most common species brought up by the dredge. Length 4 inches. In this genus and in *Xenochirus* there is a movable spine or long plate on median line at tip of snout.

Family CYCLOPTERIDÆ.

92. *Lethotremus vinolentus* Jordan and Starks, n. sp.  
Plate xciv.

Head  $2\frac{1}{4}$  in length; depth  $2\frac{1}{4}$ ; dorsal V-7; anal 6; eye 3 in head; snout nearly 4; maxillary  $2\frac{1}{2}$ ; interorbital  $2\frac{1}{3}$ ; ventral disk  $1\frac{1}{3}$ ; height of spinous dorsal  $2\frac{1}{3}$ ; length of pectoral  $2\frac{3}{4}$ .

Body short and thick, broadest at head, deepest in front of first dorsal spine, abruptly compressed at vent; back somewhat elevated.

Mouth terminal, oblique, the jaws about equal; snout very blunt; maxillary reaching slightly past the vertical from front of eye; teeth in narrow villiform bands; teeth on vomer (the specimen is so small, we cannot be sure of the palatine teeth); eye large, set high in the head, its diameter greater than the length of the snout; inter-orbital wide and flat, the diameter contained  $1\frac{1}{2}$  times in the width; gill-opening oblique, about as wide as eye and on a level with eye; disk  $\frac{1}{4}$  longer than broad, its length about equal to distance from gill-opening to anterior edge of eye.

Skin thick; head and body nearly naked, a few spines scattered over it; spinous dorsal with 3 or 4 small spines, a minute simple spine in front of eye and 2 or 3 above it; 4 multifid spines following the curve of back, under spinous dorsal, and 1 under the front of second dorsal, 2 similar spines on each side of nape, just above opercles; 2 on edge of opercle and 3 on edge of preopercle; an irregular row of 6 running from above base of pectoral to front of anal fin, and a couple of small ones behind gill-opening; body otherwise naked. All the above spines, with the exception of those noted as simple, are long sharp spines in groups of from 3 to 6 with a common base, generally the length of each spine exceeds the length of the base. No lateral line.

Spinous dorsal reaching to the first ray of soft dorsal when fin is depressed, higher than soft dorsal; anal and soft dorsal similar; caudal small, truncate or slightly rounded; pectorals very short, reaching to the posterior edge of ventral disk.

Color bright wine-red, slightly lighter below, without markings, sides dusted over with very small dark points; spinous dorsal dusky; other fins colorless. Colors disappear in alcohol.

One specimen brought up from deep water in the dredge,  $\frac{1}{2}$  inch in length. Numbered 3131 on the register of the Leland Stanford Jr. University Museum.

This species seems to belong to the genus *Lethotremus* Gilbert, MS. From *L. muticus*, type of the genus, it is distinguished by its few-rayed fins and by its scanty prickles.

93. *Eumicrotremus orbis* (Günther).

One specimen of this interesting fish taken, 2 inches in length.

Family LIPARIDIDÆ.

94. *Neoliparis greeni* Jordan and Starks, n. sp. Plate xcvi.

Head  $3\frac{1}{5}$ ; depth 4; depth at disk 5; dorsal VI-34; anal 30; pectoral 35; caudal 15; eye small, about 10 in head; snout  $2\frac{3}{4}$ ; longest pectoral ray  $1\frac{3}{4}$ ; disk  $2\frac{1}{2}$ ; longest dorsal ray  $2\frac{1}{6}$ ; longest anal ray  $2\frac{1}{6}$ ; caudal  $1\frac{3}{4}$ .

Body elongate, posteriorly compressed; profile undulate, over snout blunt and rounded, depressed over eyes, well rounded from eyes over occipital region. Skin thin and exceedingly loose, nearly to the end of the dorsal and anal rays.

Jaws equal; maxillary extending to posterior margin of eye; teeth small, nearly simple, depressible and blunt, slightly hooked back, arranged in oblique series, those in the front running nearly straight in, but towards the sides of the jaw they grow more and more oblique till they are nearly parallel with the jaw at the sides; superior pharyngeal teeth conical and sharp, slightly longer than the teeth in the jaws, arranged in a single round patch on each side; inferior pharyngeals separate, with small teeth. (Teeth probably tricuspid in young specimens.)

Posterior nostrils in a short wide tube; cheeks well

rounded; gill-rakers short and thick, no longer on the outer side of the first arch than on the other arches, fourth arch not free; gill-slit short, its length contained about 3 times in head, its lower edge extending in front of pectoral to about the third ray; opercles with a blunt spine which is covered by the skin.

Dorsals two, connected by a low membrane; first dorsal about twice as high as anterior part of second dorsal; the first rays of pectorals inserted under eye and in front of disk; the anterior rays short, graduated to the sixth ray, which is about 4 times longer than the first, the next few rays again short and gradually lengthening posteriorly; posterior rays  $\frac{1}{3}$  longer than anterior, fin broadly rounded behind; ventral disk nearly round, its posterior edge reaching the vertical from gill-slit; its distance from tip of lower jaw  $1\frac{1}{3}$  times its length; caudal truncate or slightly rounded; vent under ends of pectorals.

Color, in alcohol, uniform brown, breast and lower parts of head creamy, fins slightly darker. When fresh the sides were blotched with pinkish.

The type of this species is a specimen 10 inches long, in the Leland Stanford Jr. University Museum, number 3019. It was collected in the Harbor of Victoria by Mr. Ashdown H. Green, of Victoria, President of the Natural History Society of that town.

95. *Neoliparis floræ* Jordan & Starks n. sp. Plate xcvi.

Head  $3\frac{3}{5}$  in length of body; depth at ventral disk  $5\frac{1}{2}$ ; depth under middle of soft dorsal  $4\frac{1}{2}$ ; dorsal VI-27; anal 21 to 23; caudal 15; pectoral 30; eye 7 in head; interorbital space  $2\frac{3}{4}$ ; maxillary  $2\frac{1}{2}$ ; pectoral  $1\frac{3}{5}$ ; ventral disk  $2\frac{1}{4}$ .

A small specimen collected at Waadda Island, Neah

Bay. No. 3133, Leland Stanford Jr. University Museum.

Body moderately elongate, much compressed posteriorly, about as wide as deep anteriorly, its greatest depth under middle of soft dorsal where the back is elevated. Flesh very firm, the body retaining its form, the skin loose but not flaccid.

Head small, the nape not produced; mouth moderate, the maxillary extending to below the anterior margin of orbit; jaws subequal; teeth tricuspid, arranged in series which are nearly transverse on middle of jaws, becoming more and more oblique towards the sides, the outermost series nearly parallel with the sides of jaws; nostrils ending in a short wide tube; gill-opening short, extending downward to about the fifth pectoral ray, its length about half interorbital space; opercle ending in a flap, which extends over middle of gill-opening; ventral disk slightly longer than wide, its distance from tip of lower jaw once and a half its length; vent equidistant from posterior edge of ventral disk and front of anal; skin thick and not very loose.

Origin of spinous dorsal a little in front of the vertical from vent, its distance from snout 3 in length of body; anterior part of dorsal separated by a notch; origin of anal about equidistant from snout and base of caudal fin; some of the lower rays of pectoral produced forming a notch in the lower posterior margin of fin, the fourth to the tenth of the upper rays the longest, forming a rounded point behind, extending slightly past the vertical from snout; dorsal and anal scarcely connected with the caudal; caudal long and slender, rounded behind.

Color a uniform dark olive green, under parts white, a light streak medially along back from dorsal to occiput, a light spot over opercle; pectoral light at base, dusky behind; other fins colored like the body; lips white.

This small specimen taken in a rock pool on Waadda Island, Neah Bay. Length 2 inches.

A second specimen, about 5 inches long, is in the Museum of the California Academy of Sciences. It was collected off San Francisco by Mr. H. D. Dunn. In this specimen, the dorsal rays are VI-27; anal 25; pectoral 30; caudal 15; teeth blunt. Flesh firm; form and color of the young specimens above described. The species is named for Mrs. Flora Hartley Greene, Assistant Curator of the Museum of Leland Stanford Jr. University.

In the Museum of the California Academy is the only specimen we have ever seen of the rare *Neoliparis mucosus* (Ayres), likewise obtained at San Francisco by Mr. H. D. Dunn. We here present a description and figure of this specimen (No. 360):

***Neoliparis mucosus* (Ayres).** Plate xcv.

Head 4 in length; depth  $4\frac{1}{3}$ ; dorsal VI-26; anal 26; pectoral 29; caudal 12; eye 7 in head; snout 3; ventral disk  $1\frac{1}{2}$ ; pectoral  $1\frac{3}{5}$ ; longest dorsal ray 2; highest anal ray 2; caudal  $1\frac{1}{4}$ .

Body not greatly elongate, rather robust, compressed posteriorly, holding its width well past middle of body; head short and thick, broader than body,  $\frac{1}{3}$  longer than broad, its length  $1\frac{3}{5}$  times its depth; mouth small, truncate, its cleft almost entirely anterior, scarcely extending laterally; end of maxillary buried under the skin, barely reaching to eye; nostrils not ending in tubes; lower jaw slightly the shorter; teeth sharp, tricuspid, the middle cusp much the highest and longest, arranged in nine oblique series in both jaws, becoming more and more oblique toward the sides; interorbital space moderately wide, about  $3\frac{1}{2}$  in head, a little convex; gill-slit not extending below upper edge of pectoral, its length about  $1\frac{1}{2}$  times eye and 3 in ventral disk.

Pectoral broadly rounded when spread, its notch comparatively very shallow, its tip reaches past vent but not to notch in dorsal; ventral disk large, slightly longer than broad, its posterior margin almost midway between its anterior and front of anal, its anterior margin half its length from chin; dorsal with a shallow notch; origin of fin over posterior margin of ventral disk, its longest rays in its posterior half; origin of anal a little nearer snout than base of caudal, the last four or five rays rapidly shortened, making the fin truncate behind; dorsal and anal scarcely joined to caudal; caudal long and slender, rounded behind.

Color olive brown, light below; indistinctly mottled; dorsal and anal darker at their margins; pectorals uniform dark brown; caudal light, with indistinct cross-lines; lips dark.

Here described from the only specimen known to us, five inches in length; from near San Francisco. It is now in the collection of the California Academy of Sciences (No. 360). Collected by H. D. Dunn, off San Francisco.

#### 96. *Neoliparis callyodon* (Pallas).

Obtained by the Albatross at Port Angeles.

This is the species figured by Mr. Garman (monograph of the *Discoboli*) as *Liparis mucosus*. His description seems, in part at least, to have been drawn from *Neoliparis floræ*. The latter has larger gill-openings than either *Neoliparis mucosus* or *N. callyodon*.

*Neoliparis callyodon* is extremely abundant about the Aleutian Islands. The coloration, form of mouth, small gill-opening and the number of fin-rays all point out this as the original *callyodon* of Pallas.

The following is an analysis of the species of *Neoliparis*, as far as known:

- a. Gill-opening very narrow, almost entirely above base of pectoral, the lower edge not below third pectoral ray.
- b. Anterior nostrils with distinct tubes.
- c. Dorsal rays about 30; anal rays about 24; form robust; ventral disk  $2\frac{1}{4}$  in head; color brownish, clouded or banded. North Atlantic on both coasts, south to Cape Cod. *montagui*.\*
- cc. Dorsal rays 34 to 36; anal rays 25 to 28; lower jaw included; form rather elongate, the head depressed; ventral disk  $2\frac{1}{8}$  in head; color pale, irregularly dotted with darker, sometimes plain brownish. Alaska, south to Puget Sound. *callydon*.
- bb. Anterior nostrils with a raised rim, and without distinct tubes; head short, blunt, 4 in length; ventral disk very large,  $1\frac{1}{2}$  in head; snout blunt; mouth very short, its cleft almost entirely anterior, the maxillary scarcely reaching eye. Dorsal rays 32; anal 26. Color plain rosy or brownish, not spotted. Off San Francisco. *mucosus*.
- aa. Gill-opening rather large, its base opposite 4 or 5 upper rays of pectoral; body deep posteriorly; nostrils with raised rim, but without distinct tubes; ventral disk moderate,  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in head; head about  $3\frac{3}{4}$  in body, depressed above; cleft of mouth broader, partly lateral, nearly 3 in head; color plain brownish or reddish.
- d. Dorsal rays VI-27; anal 21 to 23; pectoral 30; flesh firm. Puget Sound to Monterey. *floræ*.
- dd. Dorsal rays VI-34; anal 30; pectoral 35; flesh lax. Puget Sound. *greeni*.

### 97. *Liparis cyclopus* Günther. Plate xcvi.

Head  $4\frac{1}{6}$ ; depth  $4\frac{1}{2}$ ; dorsal 34; anal 29; pectoral 30; caudal 12.

Body much depressed and rather broad anteriorly, deep and much compressed posteriorly; head a third longer than broad and a third broader than deep. Flesh much more firm and the skin less lax than in most species of *Liparis*. Opercles with a rather strong spine concealed by the skin; mouth rather large, terminal; jaws subequal; teeth small, tricuspid, in broad bands; eye small, 6 in head; snout 3, flattish and broad above; interorbital space  $4\frac{2}{3}$  in head; ventral disk oval,  $2\frac{1}{3}$  in head, its anterior edge half the length of the eye behind postorbital margin; gill-opening moderate,  $3\frac{1}{2}$  in head, extending

\* *Liparis montagui* Donovan.

downward to the third or fourth ray of pectoral. Dorsal fin low, continuous, not joined to caudal, beginning slightly before anal, on a vertical with vent; vent midway between edge of ventral disk and front of anal. Pectoral fin emarginate, the upper lobe  $1\frac{3}{5}$  in head, the lower 2, the shortest intervening rays 3. Anal long and low, barely joined to caudal. Caudal  $1\frac{1}{2}$  in head.

Color olivaceous, darker above; body and pectoral fin finely speckled with olive brown; fins dotted; bases of the fins paler than their tips; belly white.

Two specimens  $4\frac{1}{2}$  inches long, in excellent condition, taken in Elliot Bay, near Seattle, were received from the Young Naturalists' Society. They are numbered 3126 in the register of the Leland Stanford Jr. University Museum. This species, not been previously recognized since its original description, is recorded by Dr. Gilbert from Unalaska.

**98. *Liparis dennyi* Jordan and Starks, n. sp. Plate xcvi.**

Head  $3\frac{3}{5}$  in length of body; depth  $4\frac{1}{2}$ ; dorsal 39; anal 30; pectoral 36; caudal 12; eye 8 in head; maxillary  $2\frac{1}{5}$ ; snout  $2\frac{3}{4}$ ; gill-opening  $2\frac{2}{5}$ ; upper pectoral lobe  $\frac{1}{3}$ ; lower lobe  $1\frac{1}{2}$ ; intervening rays  $2\frac{1}{4}$ ; ventral disk  $2\frac{1}{3}$ ; highest dorsal rays  $2\frac{2}{5}$ ; highest anal rays  $2\frac{2}{5}$ ; caudal rays  $1\frac{3}{4}$ .

Body moderately elongate, much compressed posteriorly, slightly so anteriorly; head moderate, the cheeks and nape prominent. Mouth wide, with little lateral cleft; maxillary extending to below the anterior margin of eye, its end covered with the skin of the head; the lower jaw slightly the longer; the teeth tricuspid, those on the inner part of jaw largest, arranged in about 14 series in each jaw; series nearly transverse on middle of jaw, becoming more and more oblique towards the sides, where they are nearly parallel with the sides of the jaws; interorbital

wide, slightly concave; nostrils ending in very short, wide tubes, the posterior over the anterior margin of eye, the anterior in front of it a distance equal to the diameter of eye; opercle ending in a short, wide spine covered with skin; it is situated slightly above the middle of gill-opening; gill-opening running from about the eleventh pectoral ray to a level with the eye.

Origin of dorsal slightly behind base of pectoral, its distance from the snout  $3\frac{1}{3}$  in length of body, its anterior rays short, gradually lengthening posteriorly, the rays from the anterior third to near the end about equal, the last ray abruptly shortened, forming a slight notch where the fin joins the caudal; posterior two-thirds of caudal free above; anal similar to dorsal, about the same height, its origin nearer snout than base of caudal, about under the base of the tenth dorsal ray, posteriorly it is longer than the dorsal, joining the caudal at about half its length; ventral disk nearly round, its distance from tip of lower jaw  $1\frac{1}{3}$  in its diameter, 1 in distance from vent, 2 from first anal ray; vent midway between front of anal and edge of disk; upper lobe of pectoral broadly rounded, reaching to two-thirds of the distance between vent and front of anal; lower lobe long, reaching nearly to vent; caudal long and slender, rounded behind. Skin very thin and loose on body and head, covering the anterior parts of dorsal and anal, attached at about the middle of rays posteriorly and covering the base of caudal rays.

Color light brown, lighter below, thickly covered with minute brown points, which form spots and mottlings on sides; upper part of head dark, lips spotted with brown; dorsal and anal dark brown, slightly mottled with lighter; pectoral light, with irregular brown spots and bars running across it. Caudal dark brown, mottled at base, two light bars crossing it towards its end, leaving a narrow posterior margin of brown.

The type specimen, 8 inches in length, was collected in Admiralty Inlet by the Young Naturalists' Society and presented by them to the Leland Stanford Jr. University. The species is named for Mr. Charles L. Denny, of Seattle, in recognition of his active and intelligent interest in the natural history of Washington.

**99. *Liparis fucensis* Gilbert.**

Taken in the Straits of Juan de Fuca by the Albatross. Locally abundant. This seems to be the species described and figured by Mr. Garman (Monograph of the *Discoboli*), under the erroneous name of *Liparis calliodon*. It will be described by Dr. Gilbert in the current number of the Proceedings of the United States National Museum.

**100. *Liparis pulchellus* Ayres.**

Rather rare. Three or four small specimens brought up in the dredge.

The following analysis will serve to distinguish the North American species of *Liparis*:

- a. *Liparis*. Vertebræ in moderate number, about 39; dorsal rays about 35; anal rays 27 to 30.
  - b. Gill-openings very narrow, entirely above base of pectoral; pectoral rays from 34 to 37; head a little shorter than broad, and a little longer than deep; dorsal and anal slightly joined to caudal; caudal narrow, its rays 12. North Atlantic, south to Cape Cod. *liparis*.
  - bb. Gill-openings broad, the lower part considerably below base of upper ray of pectoral.
    - c. Pectoral rays 30; head low, flattish, a third longer than broad, a third broader than deep; jaws subequal; dorsal free from caudal, which is slightly joined to anal; caudal narrow, of 12 rays. Puget Sound to Unalaska. *cyclopus*.
    - cc. Pectoral rays 41 to 43; head short, not quite as wide as long; caudal 15 to 20; the dorsal and anal slightly joined to its base. Puget Sound. *fucensis*.
- aa. *Careliparis* Garman. Vertebræ about 46; dorsal rays 40 to 44; anal rays 35 or 36; dorsal and anal largely joined to caudal.
  - d. Pectoral rays 35 or 36.
  - e. Gill-opening small, its lower edge not below first ray of pectoral; nostrils small, the tubes short or absent.

- f.* Fins plain, not distinctly mottled or barred; body robust, its color plain brownish or with dark spots. Coasts of Greenland. *tunicatus.*
- ff.* Fins more or less mottled or barred, body moderately elongate; lower rays of pectoral rather short, not half head, not reaching beyond ventral disk; body mottled, usually with concentric rings. Aleutian Islands to Eastern Siberia. *agassizii.*
- ee.* Gill-opening rather large, extending downward to about fourth ray of pectoral; nostrils with short tubes; lower lobe of pectoral long, reaching much beyond disk, nearly to vent; color brown, the body and fins mottled and clouded. Puget Sound. *dennyi.*
- dd.* Pectoral rays 42; gill-opening large, its lower edge below upper part of pectoral; body robust; surface covered with round yellowish spots. Aleutian Islands. *cyclostigma.*
- aaa.* *Actinochir* Gill. Vertebrae about 52; dorsal rays 45 to 48; anal rays 38 to 40; pectoral rays 34 to 37; dorsal and anal largely joined to caudal; gill-opening large, about one-third its length before pectoral; anterior nostril tubular.
- g.* Head broad, flattened above; body rather elongate; skin usually with wavy, concentric longitudinal streaks, sometimes spotted. Unalaska to Monterey. *pulchellus.*
- gg.* Head high, boldly rounded, with prominent nape; color olivaceous, clouded and dotted, but without wavy streaks. Coasts of Greenland. *major.*

#### Family BATHYMASTERIDÆ.

##### 101. *Ronquilus jordani* (Gilbert). Plate xcix.

Not common; occurring in deep water. Reaches a length of 8 inches. A fine specimen presented by the Young Naturalists' Society.

The genus *Ronquilus* is distinguished from *Bathymaster* by its scaly cheeks, enlarged scales on lateral line, and especially by its increased number of simple rays or spines in the dorsal.

#### Family GOBIIDÆ.

##### 102. *Gobius nicholsi* Bean.

Not rare about Vancouver Island. Not taken by us.

**103. *Lepidogobius lepidus* (Girard).**

Three specimens dredged, the largest 4 inches in length.

**104. *Gillichthys mirabilis* Cooper. MUD FISH.**

Not common this far north. Found in the mud in lagoons. No specimens taken by us.

**105. *Quietula y-cauda* (Jenkins & Evermann).**

This little goby was taken in Saanich Arm, Vancouver Island, by Jordan & Gilbert. One of the two specimens taken from the stomach of *Hexagrammus hexagrammus* and recorded as *Gobiosoma ios* belongs to it. The other is the type of the latter species. This species is the type of the genus *Quietula* Jordan & Evermann, distinguished from *Gillichthys* by the presence of dermal flaps on the shoulder girdle.

**106. *Clevelandia ios* (Jordan & Gilbert). Plate c.**

The original type of this species was obtained from the stomach of *Hexagrammus hexagrammus*, in Saanich Arm, by Jordan & Gilbert, in 1880. It was not in good condition and the description is defective. Two specimens were dredged near Seattle by us. A description is here appended:

Head  $3\frac{1}{2}$  in length of body; depth 6; D. V-16; A. 14; eye  $6\frac{1}{2}$  in head; maxillary  $1\frac{4}{5}$ ; pectoral  $1\frac{3}{5}$ ; ventrals  $1\frac{7}{8}$ ; caudal  $1\frac{1}{3}$ ; base of soft dorsal 3 in length of body; base of anal  $3\frac{1}{2}$ .

Body long and slender, compressed, the back not elevated; caudal peduncle moderately wide. Head long, profile steep to within a short distance of the front of the eye, thence horizontal. Mouth very large, not very oblique, the maxillary projecting to opposite the middle of the cheek; jaws subequal; teeth in narrow villiform

bands, eye small, longer than wide, set high in head; interorbital space narrow, about as wide as eye. Body covered with very small cycloid scales, impossible to count. Spinous dorsal well separated from soft dorsal, the spines slender; soft dorsal the higher, its origin a little nearer base of caudal fin than tip of snout; anal about equal to soft dorsal in height, its origin a little behind first dorsal ray, nearly coterminous with soft dorsal; ventrals inserted slightly behind pectorals, reaching midway between their base and front of anal; caudal short, its end rounded.

Color light olivaceous, the cheeks and sides with many dark points which form mottlings; snout dark; a dark spot on upper part of opercle; top of head black; dorsals pale, with three or four dark lines running across the rays; some dark spots on base of anal; pectorals crossed with dark wavy lines; caudal with about five irregular cross-bars.

Two specimens obtained, each 2 inches in length.

#### Family BATRACHIDÆ.

#### 107. *Porichthys notatus* Girard.

Very common in shallow water. It attaches its eggs to the rocks just above low-tide mark, and watches them till they hatch and the young are quite well matured. The young fasten themselves to the rocks by means of a ventral disk, which soon disappears. It makes a peculiar grunting noise when disturbed. It reaches a length of over a foot. Several specimens taken.

Apparently the type of *Porichthys margaritatus* Richardson was the tropical species since described as *Porichthys nautopædium*. The name *margaritatus* should not be used for the northern form.

## Family GOBIESOCIDÆ.

108. *Caularchus mæandricus* (Girard).

Very abundant under the rocks between tide marks. It feeds on small shells and crustacea. A large number of specimens obtained at Neah Bay and in the vicinity of Seattle; the largest  $4\frac{1}{2}$  inches in length; said to reach a length of 6 inches.

Specimens from Neah Bay varied from light olive to bright cherry-red.

This species has  $13 + 19 = 32$  vertebræ. The species referred to *Gobiesox* have, so far as known,  $10 + 16 = 26$ . This increased number, associated with its northern distribution, may define the genus *Caularchus*.

## Family XIPHIDIONTIDÆ.

109. *Bryostemma polyactocephalum* (Pallas).

This species has been referred to the genus *Chirolophis* (*Blenniops*). It, however, differs from the latter in the entire absence of the true or median lateral line, and may be made the type of a distinct genus, for which we suggest the name of *Bryostemma*. In *Bryostemma*, as in *Chirolophis*, there is a short series of large pores above the pectoral.

The following is a description of our specimen from Seattle:

Head  $6\frac{1}{2}$ ; depth 6; D. LXI; A. 61. P. 14. V. 1, 3. Fifteen pores above pectoral.

Body elongate, much compressed, covered with small, smooth, imbedded scales. Head very short, blunt in profile; mouth short, terminal; lower jaw heavy, projecting, its lip with two small cirri; teeth subequal, small, bluntish, close set, in one row in each jaw; eyes 4 in head, near together; snout 4; supraorbital cirri,  $2\frac{1}{2}$  in head; interorbital space with two large superciliary cirri; top

of head and nape covered with series of erect cirri, the longest nearly as long as eye; about 15 minute cirri along dorsal edge of lateral pores, one on each pore. Rows of pores running around eye, under preopercle, and along entire length of the short lateral series; about 15 in lateral series, which is 2 in length of head; gill-rakers not developed; gill-membranes not joined to the isthmus. Dorsal fin beginning over pectoral and running to caudal; anterior rays fringed with fleshy cirri; first ray, including cirri, 2 in length of head; anal beginning close behind vent and running to caudal, lower than dorsal; vent about  $\frac{1}{3}$  distance from tip of snout to tip of caudal; distance from base of ventral to vent  $4\frac{3}{4}$  in length of body; pectoral fin but little shorter than head, its breadth at base not half its length.

Color, in spirits, pale brownish, with about 13 dark blotches along dorsal and anal fins; more distinct on dorsal; a black spot on fourth to sixth dorsal spines very distinct; a very faint spot on anterior part of anal; a few dark markings about head and nape. Cirri mostly pale.

One fine specimen,  $6\frac{1}{2}$  inches long, from Point Orchard, near Seattle. Collected by Prof. O. B. Johnson.

This species seems to belong to *Bryostemma polyactcephalum*. As figured by Mr. Nelson, the latter species seems to differ in the absence of the lateral pores and in the much shorter and broader pectoral fin; the proportions of the body before the vent are also different.

A number of young specimens collected by the Albatross in Alaska seem to belong to the same species. These are more elongate and less compressed, the body much mottled and vaguely barred, the ventral fins chequered in fine pattern; head sand color; a black blotch on fourth to sixth dorsal spine; anterior dorsal spines little elevated and with few fringes; sides of head with few

cirri, except in one specimen in which the cheeks are covered with cirri densely matted. Evidently the species is very variable.

110. *Bryostemma nugator* Jordan and Williams, n. sp.  
Plate ci.

Head  $5\frac{1}{2}$ ; depth  $5\frac{1}{2}$ ; dorsal LIV; anal 41; ventral 1, 3; pores of lateral series 25.

Body elongate, formed as in *Pholis*, less compressed than in *Bryostemma polyactcephalum*, covered with small, smooth, imbedded scales. Head short, very obtuse, almost truncate; top of head from nostrils to near front of dorsal covered with fleshy cirri, much smaller than in *Bryostemma polyactcephalum*; only two or three small ones extending on first dorsal spine; supraorbital cirrus short, 4 to 5 in head; two small cirri placed at the sides of snout, with a larger median one behind them, forming a triangle; jaws equal; mouth horizontal, the angle extending to below pupil; eyes small, 4 in head; snout very short, almost vertically truncate,  $\frac{2}{3}$  of eye; teeth of both jaws subequal, short, bluntish and close set. Lateral series short,  $7\frac{1}{2}$  in length of body, concurrent with the dorsal outline of body. A line of pores begins in front of eye on a level with pupil, runs under eye and to a level with pupil again, then back to and along the entire length of the short lateral series. Gill-rakers not developed; gill-membranes free from isthmus. Vent  $\frac{1}{3}$  distance from tip of snout to tip of caudal; distance from origin of ventral to anus  $4\frac{1}{2}$  in length of body. Pectoral fin  $5\frac{1}{2}$  in body, as long as head. Dorsal fin beginning in front of the pectoral, highest along the posterior half; the longest spine,  $2\frac{2}{3}$  in head, the fin higher than anal; dorsal slightly joined to caudal; anal separated from caudal; caudal rounded,  $1\frac{2}{3}$  in head; first dorsal spine  $4\frac{1}{2}$  in head, its surface with 2 or 3 small cirri.

Color of one specimen, probably male, dark brown, with 13 pale cross-bars along back, extending on dorsal fin; along sides these become obsolete; on belly they become increased in number and broadened below; dorsal fin with 13 large, very distinct, black ocelli, with yellowish rings, one between each pair of the pale blotches; anal with about 7 small blackish spots at base on posterior part, the fin otherwise nearly plain; caudal faintly barred with light and dark; pectorals pale, with two dark pale-edged oblique bars before them; sides of head with irregular dark vertical bars, one of them forming an inverted  $\lambda$  below eye, this and others extending across lower jaw; cirri mostly black.

The other specimen, probably the female, has the body nearly plain brown, the dorsal with but 4 ocelli, the anterior nine being replaced by dark bars on the fin; anal with dark oblique cross-bars; pectorals barred with black. Markings on head more sharply defined, coloration otherwise similar. This second specimen is  $4\frac{3}{4}$  inches in length; the other, 4.

These two specimens were taken near Seattle and presented by the Young Naturalists' Society. They are numbered 3134 on the register of the Leland Stanford Jr. University Museum.

Three additional specimens of *Bryostemma nugator* were taken by Mr. Starks in rock pools on Channel Rocks. The life colors of these were as follows:

Color, dark red above, orange-brown below, belly cream color; sides below with cream-colored cross-bars, wider than eye, running from the axis of body downward and fading into the general color below; a  $\lambda$ -shaped mark downwards from eye, across branchiostegals to isthmus, a similar mark behind eyes, across edge of preopercle this last sometimes broken up and chain-like; top of head

dark; snout light; 2 oblique dark bars at base of pectoral; dorsal with 12 or 13 sharp dark brown spots as large as eye, edged with bright red, these arranged regularly along the whole length of fin; pectorals and caudal bright red, with wavy irregular brown lines running across the rays; anal red, with dark brown bars as wide as the interspaces running obliquely downwards and forwards; ventrals light brown.

### III. *Pholis ornatus* (Girard).

This blenny is extremely abundant in Puget Sound, where many specimens were taken. It is found under rocks between tide marks, reaching a length of a foot. No specimens were found at Neah Bay. The species varies much in color, being typically yellowish-green with dark markings, but varying to brown or cherry red with the markings faint or obsolete. One specimen is notably different in color: Body purplish red, lighter on the belly; two conspicuous black-bordered white spots on front of dorsal; a light streak bordered with black from eye to nape; pectorals one-fourth shorter than in the others. Dr. Gill tells us that the generic name *Pholio Scopoli* is equivalent to the later *Muraenoides*.

### II2. *Apodichthys flavidus* Girard.

Common in shallow water among the kelp. It varies from bright green to red, orange or violet. Two specimens belonging to the green form (var. *virescens*) were taken by us in Puget Sound; the larger 10 inches in length, the smaller 3 inches. These differ in color from the typical examples. The large one is a bright grass-green, mottled with light gray; a series of blended white spots, as large as eye, along the axis of body from the pectoral fin to the middle of caudal peduncle; belly with many similar spots smaller in size and somewhat sharper in

outline; a row of conspicuous black spots, irregular in size, shape and position, along back at the base of dorsal spines; a black line as wide as pupil from nape to eye, a similar line from eye to posterior end of maxillary; a faint light streak across cheek posteriorly; cheek and base of pectoral dusted with fine dark points.

The small one is bright green without distinct markings on body; a silvery bar, running posteriorly from tip of snout through eye, across cheek, to the middle of opercle; no bar downward from eye to maxillary, or from eye to nape as in the large one.

**113. *Xererpes fucorum* (Jordan & Gilbert).**

Recorded by Jordan & Gilbert as rather rare on Waadda Island. No specimens obtained by us. The new genus *Xererpes* Jordan & Gilbert is distinguished from *Apodichthys* by the small anal spine, which is not grooved in front.

**114. *Anoplarchus atropurpureus* (Kittlitz).**

Taken at Neah Bay and in the vicinity of Seattle. Abundant under rocks, above low tide mark, in company with *Xiphidion xiphistes* and *Pholis*. It reaches a length of 8 inches. These specimens are scaled on the posterior half of the body only, which is probably true of the genus as a whole.

**115. *Xiphistes chirus* (Jordan & Gilbert).**

The most common blenny in Puget Sound, where we obtained specimens in abundance. At Neah Bay *Xiphidion mucosum* and *rupestris* were found. We found neither of these in the vicinity of Seattle. Variable in color, running from dull brown to bright red. This species is the type of a distinct genus, *Xiphistes*, distinguished from *Xiphidion* by the well-developed pectoral.

116. *Xiphistes ulvæ* Jordan & Starks, n. gen. and n. sp.  
Plate cii.

Head 8 in length of body; depth 10; dorsal LXXIV; anal III, 48; eye 5 in head; maxillary  $2\frac{3}{4}$ ; pectoral  $3\frac{1}{2}$ .

Body eel-shaped as in the related species *X. chirus*; head short; mouth small, oblique, maxillary extending to below posterior margin of eye; jaws subequal, with canine teeth; 4 enlarged canines in front of lower jaw; teeth in upper jaw gradually enlarged from behind forwards; eye moderate, equal to length of snout; interorbital space prominent, sharply convex, narrower than width of eye; nape not constricted.

Five mucous canals radiating downwards and backwards from eye, not reaching to edge of preopercle; the branches running upwards from upper lateral line ending on the membrane of dorsal, the lower lateral line not connected with the abdominal line. Lateral line otherwise as in *Xiphistes chirus*. Origin of dorsal at a distance behind nape equal to distance from nape to middle of eye; the fin posteriorly barely connecting with caudal, anal with 3 spines, its origin about a head's length nearer snout than base of caudal, connected with caudal posteriorly; pectorals equal in length to snout and half eye, slightly shorter than caudal; caudal rounded, fan-shaped.

Color olive-green above, very bright green below; sides along middle and lateral line posteriorly, with conspicuous white spots, half as large as pupil, each with a black spot before and behind it; a black streak from tip of snout, through eye, to nape, a streak starting from eye behind quickly fading out; dorsal darker than body, unmarked; the anterior third of anal green without markings, behind this, faint cross-bars of brown appear, these grow broader and darker posteriorly; caudal olive green with a light bar across base; pectorals green without markings.

One specimen obtained on Waadda Island, Neah Bay. It was found high on the rocks, among algæ just below high water mark. Length 5 inches.

This species is very closely related to *Xiphistes chirus*. It differs from it chiefly in having 3 anal spines, in the branches of the upper lateral line running higher, and in coloration. It is numbered 3132 on the register of the Leland Stanford Jr. University Museum.

**117. *Xiphidion rupestre* (Jordan & Gilbert). Plate ciii.**

Equally abundant with *Xiphidion mucosum* under rocks about Neah Bay. It does not reach such a large size as the latter.

**118. *Xiphidion mucosum* Girard.**

Abundant at Neah Bay, where it was found under rocks between tide marks, in company with *X. rupestre*. Reaches a length of 18 inches.

Family STICHLÆIDÆ.

**119. *Lumpenus anguillaris* (Pallas).**

Taken in abundance with seines along sandy beaches in Puget Sound. It reaches a length of 20 inches.

Family CRYPTACANTHODIDÆ.

**120. *Delolepis virgatus* Bean.**

A stuffed skin from near Seattle is in the collection of the Young Naturalists' Society, collected by Prof. O. B. Johnson.

Family ANARRHICHADIDÆ.

**121. *Anarrhichthys ocellatus* (Ayres). WOLF FISH.**

Rare in Puget Sound; more common southward. It reaches a length of 8 feet, and is sometimes eaten. It feeds on crustacea and mussels, which it pulls off from the rocks and crushes between its powerful jaws.

## Family ZOARCIDÆ.

122. *Lycodopsis paucidens* (Lockington).

Abundant in Puget Sound. Length about 10 inches. Not taken by us. The large-mouthed specimens, called by Jordan & Gilbert *paucidens*, are the male and the small-mouthed ones, called *pacificus*, the female of the same species.

## Family SCYTALINIDÆ.

123. *Scytalina cerdale* Jordan & Gilbert. Plate civ.

Specimens were found in abundance in the loose gravel under boulders at Waadda Island, Neah Bay. It has not been taken since 1881, when Drs. Jordan & Gilbert took the two type specimens (one of which was afterwards destroyed by fire) in this locality.

The skeleton does not differ essentially from that of *Lycodopsis paucidens*, with which it has been compared. The skull is not at all depressed, the wide depressed form of the head of the fish is due to the fleshy cheeks. The frontals take up the greater part of the top of the skull, the parietals are separated by the supraoccipital, which extends forward to the frontals. Opercles all present. Lower jaw large and strong, Post-temporal scarcely so firmly attached as in *Lycodes*; the clavicle long and slender.

## Family GADIDÆ.

124. *Microgadus proximus* (Girard). TOMCOD.

A few specimens obtained. Very abundant. Taken in large numbers by the fishermen. It is a food fish of some value, and meets with a ready sale. It reaches a length of a foot.

125. *Gadus macrocephalus* Tilesius. ALASKA COD.

Not uncommon in certain localities near Cape Flattery. This is probably its southern limit.

**126. *Pollachius fucencis* (Jordan & Gilbert).**

Occasionally taken in deep water in Puget Sound.  
Not obtained by us.

## Family MERLUCCIIDÆ.

**127. *Merluccius productus* Ayres. HAKE.**

Abundant. It does not rank high as a food fish, as its flesh is soft and watery. It reaches a length of over 2 feet.

## Family TRACHYPTERIDÆ.

**128. *Trachypterus rex-salmonorum* Jordan & Gilbert.**

## KING OF THE SALMON.

Very rare. Two specimens recorded from Neah Bay, where it is regarded by the Indians as a sacred fish, the King of the Salmon.

## Family PLEURONECTIDÆ.

**129. *Hippoglossus hippoglossus* (Linnæus). HALIBUT.**

One of the most valuable fish taken in the region. It is found most abundant off Cape Flattery. Several fishing schooners are engaged in the halibut fishery. It reaches a weight of over 200 pounds, and a length of 5 or 6 feet.

**130. *Eopsetta jordani* (Lockington).**

Not abundant in Puget Sound. It reaches a length of 18 inches and a weight of 3 to 5 pounds. A fine food fish. Not seen by us.

**131. *Hippoglossoides elassodon* Jordan & Gilbert.**

Common. The types of this species were first obtained at Seattle and Tacoma, where it was taken with hook and line from the wharves. Length about a foot.

**132. *Lyopsetta exilis* (Jordan & Gilbert).**

A small flounder; not very abundant. It does not reach a length of over 9 inches. It is of no value as a food fish. A specimen in the collection of the Young Naturalists' Society has the right pectoral black, but it is not otherwise peculiar.

**133. *Psettichthys melanostictus* Girard.**

Abundant. It is one of the best of the flounders for food. It reaches a length of 20 inches.

**134. *Citharichthys sordidus* (Girard).**

Very common in deep water in the sound; weight 1½ pounds.

**135. *Isopsetta isolepis* (Lockington).**

Common in rather deep water. It reaches a length of 15 inches. Not taken by us.

**136. *Isopsetta ischyra* (Jordan & Gilbert).**

Not common. The type from Elliot Bay, near Seattle, where it was taken with a seine. Length 18 inches.

**137. *Parophrys vetulus* Girard.**

Very abundant. Many specimens collected with a seine in shallow water. It is a good market fish, and reaches a length of 14 inches. The young are spotted with blackish.

**138. *Lepidopsetta bilineata* (Ayes).**

Very common. Specimens secured in abundance on sandy beaches. About 18 inches in length. Puget Sound specimens are rougher than those found farther south.

**139. *Platichthys stellatus* (Pallas). DIAMOND FLOUNDER.**

The commonest flounder in the sound. It is not held in as high esteem as a food fish as some of the other

flounders. It reaches a length of 2 feet. A few specimens preserved by us.

140. *Microstomus pacificus* (Lockington).

One specimen dredged from deep water in Puget Sound.

141. *Pleuronichthys cænosus* Girard.

Rather common. The specimens taken show a black spot on sides and one on tail. It reaches a length of about a foot.

### SUPPLEMENTARY.

LIST OF FRESH-WATER FISHES COLLECTED IN THE VICINITY OF SEATTLE, WASHINGTON, BY EDWIN C. STARKS.

BY ALVIN SEALE.

1. *Entosphenus tridentatus* (Gairdner). LAMPREY.

Three young specimens about 30 mm. in length were taken July 7 in a small stream which flows into Green Lake. Lamprey are reported as being very abundant in this lake during the spring. Great numbers, not only of *E. tridentatus*, but also of *Lampetra cibaria*, spawn in the small stream mentioned above.

2. *Catostomus macrocheilus* Girard.

A few small specimens collected in Green Lake, Seattle, 4 to 9 inches in length.

3. *Mylocheilus caurinus* (Richardson). "CHUB."

D. 8. A. 8. Head  $4\frac{3}{4}$ ; depth  $4\frac{1}{2}$ ; scales 13-76-9; eye  $4\frac{1}{2}$  in length of head; snout  $3\frac{1}{2}$ ; teeth 1, 5-5, 1.

Fourteen specimens, 3 to 10 inches in length, were taken in Lake Washington, July 14. A very common species.