

NOTES ON A COLLECTION OF TIDE-POOL FISHES FROM KADIAK ISLAND IN ALASKA.

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The collection on which the following report is based was made by the writer in May, 1897, mainly at Karluk, Kadiak Island, Alaska. The beach there is composed of bowlders more or less overgrown with fucus and kelp, or of coarse gravel, and is exposed to the open sea, there being no harbor. In some places the tide recedes as much as 100 yards, in which case there are a few true tide pools. Most of the fishes, however, were obtained among the bowlders. Just west of Karluk Head are a few good tide pools, and there a new species of *Neoliparis* was found.

Uyak Bay contains a number of good collecting-places, one near the Pacific Steam Whaling Company's cannery and another near the mouth of Larsen Inlet. At both places the rocks are cavernous, and good pools, with seaweed, are left at low tide. Many specimens were obtained at the foot of an island on the east side of the bay, where a broad rocky beach is exposed at low tide.

Some collecting was done in Alitak Bay, at the southern end of Kadiak Island, but it is a very unsatisfactory place.

The collection is now in the museum of Leland Stanford Junior University, where it was studied.

The descriptions of the new genus and species, which this collection contains, were first published in Jordan & Evermann's Fishes of North and Middle America.

Notes on the fresh-water *Cottus* and the sticklebacks found in Karluk and Alitak lakes are included.

1. *Pygosteus pungitius* (Linnaeus). *Nine-spined Stickleback*.

Two specimens from a brook near the mouth of Alitak Bay agree with the variety *brachypoda* in having the dorsal spines x-1 and in having the ventral spines one-third length of head, but it may be that the same tendency to variation exists in this species as in the following species of *Gasterosteus*, in which case the shortening of the spines in fresh water will hardly justify systematic distinction.

2. *Gasterosteus cataphractus* (Pallas). *Stickleback*.

Common in the lakes and in Karluk estuary: From Karluk estuary 157 specimens were obtained, which show all possible gradations between the typical *cataphractus*, with its long, slender, and fully armed body, slender and acute spines, narrow pubic plate and thoracic area, and the form heretofore known as *microcephalus*, with its heavy and but partly armed body, short, heavy spines, and broad pubic plate and thoracic area. Of the 157 specimens 35 have the sides but partly plated, and only about as many more can be distinctly classed as typical *cataphractus*. Those of the lakes are all of the form *microcephalus*.

The two southern forms will have to be known as *Gasterosteus cataphractus microcephalus* and *Gasterosteus cataphractus williamsoni*. It seems evident that specimens typical of *microcephalus* are independently derived from the parent species in different localities. It seems more probable that the parent species has entered the fresh water in California and at Kadiak Island and independently changed into the fresh-water form in the two places than that the variety has kept distinct from the parent species while migrating from one place to the other. It is even more probable that the parent species has entered the two lakes, Karluk and Alitak, on Kadiak Island, and produced the fresh-water form independently, than that the variety

has kept distinct from the parent species while migrating from one lake to the other through salt water. The name *microcephalus* therefore becomes a mere convenience, and does not represent a true variety.

The form known as *williamsoni* is limited in its distribution, and, so far as is now known, represents a true variety. To put these forms in their true relation the name *microcephalus* would have to be abandoned and the forms represented by it considered as transitional between the species *cataphractus* and the variety *williamsoni*.

3. *Cottus aleuticus* Gilbert.

Found in Karluk River and Lake and in Alitak Lake. Common. The following table shows the measurements of eleven specimens from the two lakes, the head and depth being expressed in hundredths of the body. Length of specimens from 1.8 inches to 2.7 inches, the caudal fin not included.

Head.		Depth.		Dorsal.		Anal.	
No. of specimens.	Proportion of body.	No. of specimens.	Proportion of body.	No. of specimens.	No. of rays.	No. of specimens.	No. of rays.
1	0.29	1	0.19	10	IX-19	1	12
6	0.30	4	0.20	1	IX-20	6	13
2	0.31	5	0.21			4	14
2	0.32	1	0.23				

4. *Myoxocephalus polyacanthocephalus* (Pallas).

Common at Karluk; often taken in the seine when fishing for salmon, but not often found in the rock pools. The following are measurements of two specimens, the head and depth being expressed in hundredths of the body:

	Specimen 2 inches long.	Specimen 13 inches long.
Head	0.44	0.46
Depth	0.27	0.22
Dorsal	X-15	X-14
Anal	13	12

5. *Leptocottus armatus* Girard. Not very common. Only two specimens found at Karluk.

6. *Oligocottus maculosus* Girard.

Oligocottus borealis Jordan & Snyder, Proc. Cal. Ac. Sci. 1896, 225, Neah Bay, Washington.
Common at Karluk.

SIGMISTES Rutter.

Sigmistes Rutter, in Jordan & Evermann, Fishes of North and Middle America, part III, 2863, 1898 (*caulias*).

This genus differs from *Oxycottus*, to which it is most closely related, in the deep, compressed body, strongly arched lateral line, long dorsal fin, and large mouth; body deep and compressed; skin smooth; lateral line strongly arched anteriorly; gill membranes united, free from isthmus; no slit behind last gill; preopercular spine simple, short, strongly curved upward; anal papilla large; vent immediately behind ventral fins, about three-fifths of distance from gill membrane to anal fin; ventrals, 1, 3.

(*σιγμα*, the letter *s*, from the form of the lateral line.)

7. *Sigmistes caulias* Rutter.

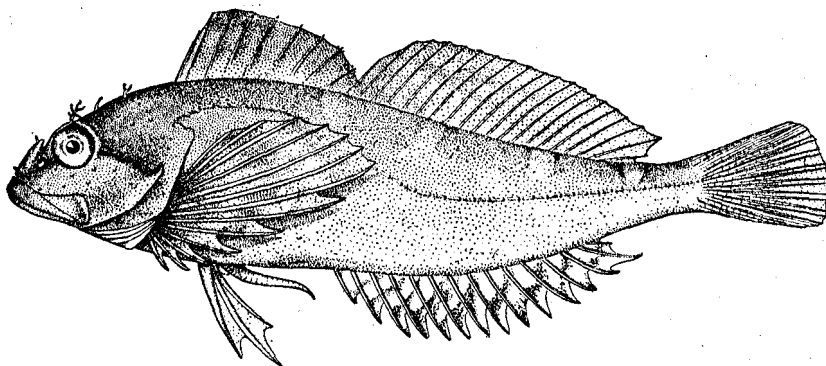
Sigmistes caulias Rutter, in Jordan & Evermann, Fishes of North and Middle America, part III, 2863, 1898, Karluk, Alaska.

Head 3.4; depth 3.5; D. ix, 20 (ix, 21 in one specimen); A. 15 (14 in two specimens); P. 13, Back elevated, body compressed; eyes lateral, 4.34 in head; snout 3.50; cleft of mouth lateral; maxillary 2 in head, reaching to below pupil (only a little past front of eye in one specimen); teeth coarse, cardiform, the inner row of upper jaw enlarged, almost canine-like; a pair of similar teeth near symphysis of lower jaw; a small patch on vomer, one on front of palatines; preopercular spine small, sharp, appressed, strongly curved upward, the preopercular margin without spines or tubercles below it; nostrils in tubes, one pair directly behind nasal spines, the other lateral, directly in front of eyes; nasal spines strong, sharp; a pair of tufted cirri above eyes, a pair simple or branched at occiput, and a pair of simple cirri halfway between

these; a filament on nasal spines; a series of three or four short filaments on margin of preopercle and at opercular angle; a series of pores around under side of jaw and along edge of preopercle, two concentric series under eye and across cheek, and others scattered on head behind eye and across cheek; skin smooth, lateral line strongly arched. Dorsal fins connected at base, third spine longest, 2.75 in head, margin of fin even from third to sixth spines, origin of spinous dorsal over upper edge of gill-opening; soft dorsal higher, longest rays 2 in head, its base two-fifths length of body; tips of anal rays free, longest 2.34 in head; origin of anal under third ray of soft dorsal; longest pectoral ray a little longer than head; caudal truncate, 1.5 in head; ventral about reaching anal, about same length as anal papilla; tail slender, least depth slightly less than eye, length from anal 1.80 in head, its length from dorsal about equal to its depth. Color in life pale-pinkish, spinous dorsal dusky, nearly black along the margin, soft dorsal plain, or with dusky crossbars; anal with about seven dusky crossbars, extending downward and forward almost at right angles to the rays; three or four pale blotches surrounded by a black ring along base of dorsal, one between dorsals, one at end of soft dorsal and others at base of soft dorsal (some or all sometimes absent); a curved dark line from snout through eye to preopercular spine.

Six specimens, $1\frac{1}{2}$ to 3 inches long, from rock pools at Karluk, Alaska. The type is in Leland Stanford Junior University Museum, No. 5884; cotypes are in United States Fish Commission and United States National Museum.

Kavlos, stem, from the many dorsal rays.



Signistes caulis Rutter.

8. *Oxycottus acuticeps* (Gilbert).

Common in the rock pools at Karluk. Largest specimen taken, 2.5 inches. Slate color, varying to pink; pectoral with cross blotches around the margin; anal papilla very large, tridigitate at tip; female with a free membrane around vent. The following are measurements on nine specimens 1.6 to 2.1 inches long, not including caudal fin, the head and depth being expressed in hundredths of the body.

Head.		Depth.				Dorsal and anal fin formulae.					
		Male.		Female.		Spinous dorsal.		Soft dorsal.		Anal.	
No. of specimens.	Proportion of body.	No. of specimens.	Proportion of body.	No. of specimens.	Proportion of body.	No. of specimens.	Rays.	No. of specimens.	Rays.	No. of specimens.	Rays.
1	0.27	1	0.23	1	0.24	8	VIII	1	14	3	11
2	0.28	2	0.24	2	0.27	1	IX	3	15	4	12
4	0.29			2	0.28			5	16	2	13
2	0.30			1	0.29						

9. *Porocottus bradfordi* Rutter.

Porocottus bradfordi Rutter, in Jordan & Evermann, Fishes of North and Middle America, part III, 2862, 1898, Karluk, Alaska.

This species differs from *Porocottus sellaris* in the presence of cirri on top of head; it has more numerous fin rays and more cirri on head than *Porocottus quadrifilis*.

Head 3; depth 3.75 to 4.25; eye 4; D. ix, 15 or 16; A. 11 to 13; P. 13 or 14; B. 6. Head broad, somewhat depressed; bones of head cavernous; lower jaw included; maxillary to below middle or hinder edge of pupil, 2.34 in head; teeth in jaws and in a narrow crescent on vomer; eye equal to snout; nasal spines blunt, covered by the skin, no ocular, opercular, nor suprascapular spines; preopercular spines three, upper slender, curved upward; lower straight, pointing downward; middle one short, blunt, a mere tubercle; a very slight tubercle represents the fourth spine belonging to the genus; no slit behind last gill; three pairs of cirri on top of head, one above eye multifid, another at occiput single or bifid, the other between them trifold to multifid; a minute barbel on tip of maxillary; whole top and side of head, lower jaw, and edge of preopercle thickly covered with pores; a double series of pores, 34 to 36 each, along lateral line, many accessory pores arranged in groups of one to five between the pairs of the lateral line, the larger number anteriorly; nostrils with short tubes; dorsals united at base, the spines with short filaments, middle spines 3 in head, middle rays of soft dorsal 2.5 in head; caudal and ventral three-fifths in head, ventrals usually reaching vent or anal, but sometimes falling short of both; pectoral three-fourths of head, reaching to or beyond anal. Color dusky, colorless below, a pale bar across occiput (often absent), another between dorsals, two across body under soft dorsal, and another behind soft dorsal; sometimes the pale portion predominates and the dusky portion is left as four bars, sometimes plain dusky without bars; spinous dorsal dusky with three or four colorless spaces on web; other fins barred with series of dusky blotches, ventrals sometimes colorless; five to eight oval white spots behind pectoral, sometimes obscure; males with inner ray of ventrals tuberculate or serrate.

The most common fish in the rock pools at Karluk.

The type is in Leland Stanford Junior University Museum, No. 6063; cotypes are in the Fish Commission and the U. S. National Museum.

Named for Mr. William B. Bradford, secretary of the Alaska Packers' Association.

Dorsal.		Anal.	
No. of specimens.	Fin rays.	No. of specimens.	Fin rays.
11	IX, 15	1	11
12	IX, 16	22	12
1	IX, 17	2	13
1	VIII, 17		

10. *Neoliparis callyodon* (Pallas). Very common at Karluk and Uyak Bay.

11. *Neoliparis rutteri* Gilbert & Snyder.

Neoliparis rutteri Gilbert & Snyder, in Jordan & Evermann, Fishes of North and Middle America, part II, 2108, 1898, Uyak Bay, Kadiak Island, Alaska.

Rare; three specimens from Karluk and three from Uyak Bay. The species is distinguished from *Neoliparis callyodon*, with which it is found, by the large size of the ventral disk, fewer rays of dorsal and anal, and the elevated spines of the male.

12. *Pholis ornatus* (Girard). Common at Karluk, Uyak Bay, and Alitak Bay.

13. *Anoplarchus atropurpureus* (Kittlitz). Crest well developed; color very dark, markings indistinct. Common at Karluk, Uyak Bay, and Alitak Bay.

14. *Gymnelis viridis* (Fabricius).

Head 6.5 to 7; depth 10 to 11; eye equal to snout, 4.34 to 5 in head; maxillary reaching to posterior margin of eye, 2.2 to 2.5 in head; D. 90 to 98; A. 70 to 77; B. 5.

Body long and slender, compressed; width of head equal to its depth, 1.75 in its length; interorbital space narrow, width of bone less than half length of eye; teeth strong, blunt, a single series in side of each jaw, none on vomer or palatines; pseudobranchia small; pectoral broad, nearly circular when spread, 2.50 in head; dorsal even, its height, measured vertically, 1.50 times eye; anal half as high as dorsal, both confluent with caudal; ventrals wanting. Plain olive, paler below; an irregular white stripe along side of head under eye from middle of maxillary to preopercle; often one or more small round black spots on dorsal, but at no definite portion, these usually not occurring in individuals with the white stripes on cheeks.

Numerous specimens from Karluk, the longest about 4.25 inches. One specimen has the depth 14, maxillary slightly more than 2 in head; width of head 1.2 in its depth, 2.34 in its length; upper ray of pectoral 1.5 times lower ray. Length 4.25 inches.