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A REVISION OF THE FISHES OF THE SUBFAMILY OLIGOCOTTINAE

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This group of cottoids comprises several genera which have always been associated,[1] but never formally united into a subfamily. These fishes are all members of the reef-pool fauna of the west coast of North America, of which they form an important element.

The **Oligocottinae**[2] may be defined as cottoid fishes having three soft pelvic rays; a moderate number of dorsal spines; the body naked or with prickly scales; the preopercular spines without antler-like processes; the gill-membranes separated from the isthmus; the palatines with bands of teeth.

Several genera from Japan[3] may be related to the Oligocottinae, since the dentition and the structure of the penis is

[1] The best published account of the group is that of Greeley (Bull. U. S. Fish Comm., 1899, pp. 7–19). Many of the generic characters used in the following analysis were first indicated in Mr. Greeley's key, which, however, is largely artificial.

[2] Oligocottinae, new subfamily name.

[3] See Jordan and Starks, Proc. U. S. Nat. Mus., 27, 1904, pp. 234, 235, 296–320; in the key to the genera on p. 235, Cottiusculus is indicated as an ally of Oligocottus, but it apparently does not belong near the Oligocottinae.

similar, but differ consistently in having but two soft rays in the pelvic fin. These genera are Ocynectes, Bero, Pseudoblennius, Furcina, Elaphichthys, and Alcichthys; *Vellitor centropomus,* also Japanese, is a modified offshoot from this group. *Crossias allisi,* another Japanese species, has the habitus of the Oligocottinae, but is described as lacking both palatine teeth and penis, and presumably is not closely related.

The Oligocottinae were probably derived from one of the genera clustering about Myoxocephalus. The Japanese genera named above probably compose another group of independent origin.

Analysis of the Genera of the Oligocottinae

Tribe I. Anus immediately in advance of the anal fin. Penis very slender and flexible. The first one to three anal rays enlarged in the male. (**Oligocottini,** new tribe name)

a.[1]—Preopercular spine unbranched. Body covered with prickly scales at all ages. Cirri of head single, or rarely doubled; no cirri on body above lateral line. Dorsal spines IX.—First two anal rays of male enlarged, subequal, not separated from the other rays ..... 1. *Rusciculus*

a.[2]—Preopercular spine branched. Body wholly scaleless at all ages. Cirri of head multifid. Dorsal spines usually VIII.

b.[1]—First three or four anal rays of male enlarged, subequal, grading into and not separated from the normal rays. Body without developed cirri above lateral line. Snout slightly blunter. Nasal spines somewhat weaker.—Preopercular spine bifid, or rarely trifid ..... 2. *Oligocottus*

b.[2]—First anal ray of male much larger than the second, the two partly or wholly separated from the normal rays. Body with multifid cirri above lateral line. Snout sharper. Nasal spines stronger.

c.[1]—Second anal ray of male somewhat enlarged, only partly separated from rest of fin in adult; membrane between the first two

rays markedly thickened and conspicuously folded distally. Rays of second dorsal usually 15. Preopercular spine normally trifid in adult (rarely bifid or quadrifid). Nasal spines stronger. Eye larger. Body moderately compressed. Light spots on throat barely distinct. Mucous glands apparently better developed, as more mucous is given off at death ..... 3. *Greeleya*

c.[2]—Second anal ray of male not at all enlarged, wholly separated from rest of fin in adult; membrane between the first two rays thin and little folded. Rays of second dorsal usually 17 or 18. Preopercular spine normally bifid (rarely trifid). Nasal spines not quite so strong. Eye smaller. Body more strongly compressed. Light spots on throat conspicuous. Less mucous given off at death ..... 4. *Dialarchus*

Tribe II. Anus in advance of normal position before anal fin. Penis conic or cylindric, thicker. Anterior anal rays of male normal. (**Clinocottini**, new tribe name)

d.[1]—Anus located in middle third of distance between origin of anal and insertion of pelvic fin. Penis thick. Lateral line with a slight anterior curve.

e.[1]—Intestine short and little coiled. Teeth of jaws conic, without definite arrangement. Head rather sharply pointed anteriorly. Mouth strictly terminal; with wide lateral gape. Skin not especially thickened.

f.[1]—Penis conic, without terminal appendages. Anus of female about midway between origin of anal and insertion of pelvic fin. Dorsal spines usually IX.

g.[1]—Upper half of body covered with prickly scales in young; these becoming almost obsolescent with extreme age. Preopercular spine bifid. Banner-like flaps frequently

developed on the dorsal spines in adults, especially in the males. Cirri usually simple or double; very numerous on upper anterior sides of adults; those on the preopercular margin forming a comblike fringe ..... 5. *Clinocottus*

g.[2]—Body wholly scaleless. Preopercular spines small and simple. Banner-like flaps never developed on dorsal spines. Cirri mossy; on body reduced to a series along the anterior portion of the lateral line; not developed along preopercular margin ..... 6. *Allocottus*

f.[2]—Penis cylindric, bearing "at its end a pair of short lateral horns anteriorly and a median horn between them"[4] (as in Pseudoblennius and its allies of Japan).[5] Anus of female much nearer pelvic insertion than anal origin. Dorsal spines usually VIII ..... 7. *Oxycottus*

e.[2]—Intestine elongate and considerably coiled. Teeth of jaws triangular, more or less definitely arranged in straight rows. Head very blunt, and broadly rounded in both frontal and sagittal planes. Mouth subinferior; with restricted lateral gape. Skin leathery.—Penis cylindric, abruptly constricted into a slender median appendage at tip. Anus in adult somewhat nearer anal origin than pelvic insertion. Dorsal spines IX. Cirri mossy.

h.[1]—Head less bluntly rounded, more nearly square in lateral outline. Suborbital, as wide as orbit, or

[4] As described by Gilbert and Burke, Bull. U. S. Bur. Fish., 30, 1910 (1912), p. 63; also described by Bean and Bean, Proc. U. S. Nat. Mus., 21, 1898, p. 655.

[5] Described by Sindo, in Jordan and Starks, Proc. U. S. Nat. Mus., 27, 1904, p. 309.

wider. Mouth barely inferior. Nasal spine weak. Preopercular spine barely evident, almost concealed in membrane. Cirri of head and scapular region few and scattered ..... 8. *Montereya*

h.[2]—Head very bluntly rounded. Suborbital decidedly narrower than orbit. Mouth decidedly inferior. Nasal spine moderately strong. Preopercular spine well developed, curved upward. Cirri of head and scapular region densely developed ..... 9. *Blennicottus*

d.[2]—Anus very close to insertion of pelvic fin. Penis comparatively slender, without terminal appendages. Lateral line sigmoid. —Preopercular spine unbranched, slender, curved. Mouth terminal, with wide lateral gape. Body wholly naked. Dorsal spines IX ..... 10. *Sigmistes*

Genus 1. Rusciculus Greeley

This monotypic genus Rusciculus is seemingly the most primitive of the Oligocottinae, retaining an almost complete investment of prickly scales, a simple preopercular spine, a short penis, and a relatively generalized structure of the anal fin in the male. In the last respect, however, Oligocottus is less specialized.

1. *Rusciculus rimensis* Greeley

Rusciculus rimensis Greeley, Bull. U. S. Fish Comm., 1899, p. 13, fig. 3; Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 4, 1900, p. 3179 (after Greeley).

Range: Crescent City, Del Norte County, to Gorda, Monterey County, California.

The fin-rays are nearly constant in this species, so far as counted. Dorsal, IX, 17 (sometimes 16); anal, 13; pectoral, 14 (the last ray of the vertical fins counted as double).

Genus 2. Oligocottus Girard

Next to Rusciculus, Oligocottus is the most primitive genus of the Oligocottus-tribe of the subfamily. The anal fin, in fact, is less specialized than in any other genus of the tribe.

2. *Oligocottus maculosus* Girard

Oligocottus maculosus Girard, Proc. Acad. Nat. Sci. Phila., 8, 1856, p. 133; Boston Journ. Nat. Hist., 6, 1857, p. 533, pl. 24, fig. 7; U. S. Pac. R. R. Surv., 6, pt. 4, 1857, p. 11; 10, pt. 4, 1858, p. 56; Suckley, *ibid.*, 12, book 2, 1860, p. 352; Sauvage, Nouv. Arch. Mus. Hist. Nat. Paris, (2) 1, 1878, p. 140; Jordan and Gilbert, Proc. U. S. Nat. Mus., 3, 1880, p. 265; 3, 1880 (1881), p. 455 (in part); Jordan and Jouy, *ibid.*, 4, 1881, p. 6 (in part); Jordan and Gilbert, *ibid.*, p. 59 (in part); Bean, *ibid.*, p. 251; 4, 1881 (1882), p. 472; 6, 1883, p. 355; Jordan and Gilbert, Bull. U. S. Nat. Mus., 16, 1883, p. 718 (in part); Jordan, Rept. U. S. Comm. Fish., 1885, p. 901; Eigenmann and Eigenmann, Ann. N. Y. Acad. Sci., 6, 1892, p. 356 (in part); Jordan and Starks, Proc. Cal. Acad. Sci., (2) 5, 1895, p. 810; Gilbert, Rept. U. S. Comm. Fish., 1893 (1896), p. 476 (not p. 469); Grebnitsky, Messager Pêche, 12, 1897, p. 329 (in Russian); Rutter, Bull. U. S. Fish Comm., 1898 (1899), p. 190; Greeley, *ibid.*, 1899, p. 16; Osgood, N. Am. Fauna, 21, 1901, p. 20; Jordan, Guide to the Study of Fishes, 2, 1905, p. 449, fig. 397; Evermann and Goldsborough, Bull. U. S. Bur. Fish., 26, 1906 (1907), p. 320; Starks and Morris, Univ. Cal. Publ. Zool., 3, 1907, p. 222; Starks, Ann. Carn. Mus., 7, 1911, p. 192; Shelford and Powers, Biol. Bull., 28, 1915, pp. 317, 321; Miles, Publ. Puget Sound Biol. Sta., 2, 1918, p. 86; Jordan, The Genera of Fishes, pt. 2, 1919, p. 269; Kincaid, Annotated List Puget Sound Fishes, 1919, p. 31, fig. 72; Bean and Weed, Trans. Roy. Soc. Canada, (3) 13, 1919 (1920), pp. 75, 76.

Centridermichthys maculosus Günther, Cat. Fishes Brit. Mus., 2, 1860, pp. 171, 523.

Oligocottus borealis Jordan and Snyder, Proc. Cal. Acad. Sci., (2) 6, 1896, p. 225; Starks, *ibid.*, p. 557; Jordan and Evermann, Rept. U. S. Comm. Fish., 1895 (1896), p. 444; Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 2014; Schmidt, Pisces Marium Orientalium, 1904, p. 93; Halkett, Check List Fishes Canada, 1913, p. 101; Bean and Weed, Trans. Roy. Soc. Canada, (3) 13, 1919 (1920), p. 75.

Oligocottus wosnessenskyi Schmidt, Bull. Imp. Russ. Geo. Soc., St. Petersb., (in Russian), 58, 1902 (1903), p. 518 (strict *nomen nudum*).

??*Oligocottus alaskanus* Miles, Publ. Puget Sound Biol. Sta., 2, 1918, p. 93.

Range: Okhotsk Sea and southern Alaska south to near Tunitas, San Mateo County, California.

Genus 3. GREELEYA Jordan

Starks and Morris have united Greeley's genus Eximia (name preoccupied; replaced by Greeleya Jordan[6]) with Oligocottus, noting that the character of the trifid preopercular spine is not wholly constant. As these authors indicated, the number of branches to the upper preopercular spine varies from two to four. In the adult, however, the variation from the normal trifid spine is very rare; the occurrence of a bifid spine in several of the specimens recorded by Starks and Morris is due to immaturity, as the following facts indicate (the specimens referred to have been re-examined by the writer). As in other cottoids investigated in this regard, the uppermost and largest preopercular spine is unbranched in the very young of *Greeleya rubellio* (one such specimen 10 mm. long to caudal examined). The spine first branches dichotomously at its extreme tip; then the branches become widely separated (specimens 15 to 23 mm. long from central California, and similar young from Point Loma, recorded by Starks and Morris, have a bifid spine). The lower branch of the spine then divides at its tip, rendering the spine trifid, as usually in the adult (a specimen 26 mm. long, from Carmel, has the lower branch of the spine narrowly bifid). Rarely the forking of the lower branch is suppressed in the adult; rarely also, the lower fork of the lower branch is again divided, rendering the spine quadrifid.

Greeleya, moreover, as indicated in the key to the genera of the Oligocottinae, is much more closely related to Dialarchus than to Oligocottus, and is distinguished further by other important characters. It is, however, more closely related to the relatively generalized Oligocottus than is Dialarchus.

3. *Greeleya rubellio* Greeley

Eximia rubellio Greeley, Bull. U. S. Fish. Comm., 1899, p. 18, fig. 5; Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 4, 1900, p. 3182 (after Greeley).

[6] Jordan, The Genera of Fishes, pt. 4, 1920, pp. 493, 571.

Oligocottus rubellio Starks and Morris, Univ. Cal. Publ. Zool., 3, 1907, p. 221; Starks, Ann. Carn. Mus., 7, 1911, p. 192.

Range: Fort Bragg, Mendocino County, to Point Loma, San Diego County, California.

Genus 4. DIALARCHUS Greeley

The type and only known species of this genus, *Dialarchus snyderi,* although it may be regarded as generically distinct, is very closely related to *Greeleya rubellio,* as already indicated in the key to the genera of the Oligocottinae, and in the discussion of the status of the genus Greeleya.

4. *Dialarchus snyderi* Greeley

Centridermichthys maculosus Günther, Cat. Fishes Brit. Mus., 2, 1860, p. 171 (not *Oligocottus maculosus* Girard).

Oligocottus maculosus Jordan and Gilbert, Proc. U. S. Nat. Mus., 3, 1880, p. 139; 3, 1880 (1881), p. 455 (in part); Jordan and Jouy, *ibid.,* 4, 1881, p. 6 (in part); Jordan and Gilbert, *ibid.,* p. 59 (in part); Bull. U. S. Nat. Mus., 16, 1883, p. 718 (in part); Eigenmann and Eigenmann, Ann. N. Y. Acad. Sci., 6, 1892, p. 356 (in part); Jordan and Snyder, Proc. Cal. Acad. Sci., (2) 6, 1896, p. 227; Gilbert, Rept. U. S. Comm. Fish., 1893 (1896), p. 469; Jordan and Evermann, *ibid.,* 1895 (1896), p. 444; Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 2013.

Oligocottus snyderi Greeley, in Jordan and Evermann, *ibid.,* 3, 1898, p. 2871.

Dialarchus snyderi Greeley, Bull. U. S. Fish. Comm., 1899, p. 14; Jordan and Evermann, *l. c.,* 4, 1900, p. 3181 (after Greeley); Jordan, Guide to the Study of Fishes, 2, 1905, p. 448; Starks and Morris, Univ. Cal. Publ. Zool., 3, 1907, p. 222; Starks, Ann. Carn. Mus., 7, 1911, p. 192; Bean and Weed, Trans. Roy. Soc. Canada, (3) 13, 1919 (1920), p. 76.

Range: Ucluelet, British Columbia, to Point Loma, San Diego County, California.

In young about 10 mm. long to caudal the preopercular spine is simple; in the half-grown and adult, it is normally bifid. Rarely, however, the lower branch of the spine, as usually in *Greeleya rubellio,* is again divided. Rarely one or two dorsal rays are bifid.

Genus 5. Clinocottus Gill

Two subspecies of *Clinocottus analis* (the only species of the genus), hitherto not distinguished from one another, abound along the fore-shore of California. They are compared in the account of the new form, *Clinocottus analis australis*.

5a. *Clinocottus analis analis* Girard

Oligocottus analis Girard, Proc. Acad. Nat. Sci. Phila., 9, 1857 (1858), p. 201; U. S. Pac. R. R. Surv., 10, pt. 4, 1858, p. 57; Tappan, Cat. Trowbridge Coll. . . . Univ. Mich., 1861, p. 22; Sauvage, Nouv. Arch. Mus. Hist. Nat. Paris, (2) 1, 1878, p. 140; Jordan and Gilbert, Proc. U. S. Nat. Mus., 3, 1880 (1881), p. 455 (in part); 4, 1881, p. 59 (in part); Bull. U. S. Nat. Mus., 16, 1883, p. 718 (in part); Jordan, Rept. U. S. Comm. Fish., 1885, p. 901 (in part); Eigenmann and Eigenmann, Ann. N. Y. Acad. Sci., 6, 1892, p. 356 (in part); Gilbert, Rept. U. S. Comm. Fish., 1893 (1896), p. 469.

Centridermichthys analis Günther, Cat. Fishes Brit. Mus., 2, 1860, p. 171.

Clinocottus analis Gill, Proc. Acad. Nat. Sci. Phila., 1861, p. 166; Yarrow and Henshaw, Ann. Rept. U. S. Geog. Surv. West 100th Mer., 1878, p. 202; Jordan and Evermann, Rept. U. S. Comm. Fish., 1895 (1896), p. 444 (in part); Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 2013 (in part); Greeley, Bull. U. S. Fish Comm., 1899, p. 17; Jordan, Guide to the Study of Fishes, 2, 1905, p. 448; Starks and Morris, Univ. Cal. Publ. Zool., 3, 1907, p. 220 (in part); Allen, Am. Journ. Anat., 11, 1910, p. 1, fig. 1, 12.

Cottus criniger Günther, Cat. Fishes Brit. Mus., 2, 1860, p. 522.

Rusulus saburrae Starks and Mann, Univ. Cal. Publ. Zool., 7, 1911, p. 14, fig. 2.

Three specific names have been based on examples of this subspecies. *Oligocottus analis* Girard and *Cottus criniger* Günther have long been recognized as identical, the type of each having been taken at Monterey. A re-examination of the type of *Rusulus saburrae* Starks and Mann shows it to be a young specimen of *Clinocottus analis analis*. The larger (and more numerous) spinules on the body, the absence of cirri on the back and at the base of the dorsal fins, and the fewer cirri on the top of the head, characters given as diagnostic of the nominal genus Rusulus, are merely features of the young of Clinocottus, a multitude of which have been

examined in comparison. The type-species of Rusulus, *R. saburrae,* is subspecifically referable to *Clinocottus analis analis,* the type specimen differing from the many examined of like size of *C. analis australis* in the higher, rounder, smaller eye (4.25 in head, rather than 3.5); in the shallower interorbital; in the thicker, heavier head with more nearly horizontal dorsal profile, and more obtuse snout, and in the deeper caudal peduncle.

This type-specimen of *Rusulus saburrae*[7] may be redescribed as follows: Dorsal rays, IX, 16; anal rays, 13 (last ray counted as double); pectoral, 15; pelvic, I, 3; pores in lateral line 36. Cirri small on top of head, on preopercle and on maxillary, represented by papillae along dorsal base. Anus but slightly nearer origin of anal fin than the insertion of the pelvic fin; anal papilla small, indicating the specimen to be an immature male. Length to caudal base, 32.5 mm.; length of head, 33 hundredths of this length; eye, 9; snout, 9; maxillary, 12; interorbital, 3; suborbital, 3; height of spinous dorsal, 11; height of soft dorsal, 16; of anal, 13; length of pectoral, 34; of pelvic, 20; of caudal, 26; depth of caudal peduncle, 10; greatest depth of body, 23.

Clinocottus analis analis is confined to the state of California, so far as known, ranging from Fort Bragg southward to Santa Cruz Island (Yarrow and Henshaw; material reexamined in National Museum) and to the mouth of the Ventura River, within the tidal zone, and southward to San Diego in the sublittoral zone. The only specimen known from south of Ventura is the type of the nominal species *Rusulus saburrae,* described above, which was dredged in the mouth of San Diego Bay at a depth of 18 meters. *C. analis analis* probably intergrades with *C. a. australis* along the reefs of northern Los Angeles County; in respect to the number of fin rays only, the specimens from the Santa Barbara Channel are intermediate between the two subspecies.

The most striking changes in the postlarval development of *Clinocottus a. analis* are those involved in the development of

[7] The writer is indebted to the authorities of the Scripps Institution for Biological Research for the loan of this specimen.

the scales and the cirri. In young less than 25 mm. long the scales cover the body almost as completely as in both young and adult of *Rusciculus rimensis,* but gradually become obsolete over the entire body, except in an area between the second dorsal fin and the lateral line, and often obsolescent even in this area in old individuals. The cirri develop, first as papillae, at a length of about 25 or 30 mm., and gradually increase in length and number, often until the top of the head and the cirri-covered strip of the anterior dorsum appear almost like fur.

Rarely one or two of the dorsal or anal rays are bifid.

The elongate conic penis of the male is replaced in the female by a tube having the lateral and anterior margins fringe-like. The anus of the female is about midway between the origin of the anal and the insertion of the pelvic fin; in the male, nearer the pelvic fin. The anus attains this anterior position in the adult only; in the young of both sexes it is nearer the anal fin.

5b. **Clinocottus analis australis,** new subspecies

Oligocottus analis Jordan and Gilbert, Proc. U. S. Nat. Mus., 3, 1880, p. 25; Smith, *ibid.,* p. 147; A List of the Fishes of San Diego, California, no pag.; Jordan and Gilbert, Proc. U. S. Nat. Mus., 3, 1880 (1881), p. 455 (in part); 4, 1881, p. 59 (in part); Smith, *ibid.,* 6, 1883, p. 235; 7, 1884 (1885), p. 553; West Am. Sci., 1, 1885, p. 46; Jordan, Rept. U. S. Comm. Fish., 1885, p. 901 (in part); Eigenmann and Eigenmann, West Am. Sci., 6, 1889, p. 45; Zoe, 1, 1890, p. 182; Eigenmann, Am. Nat., 25, 1891, pp. 113, 118, pl. 6, fig. 35, 36; Proc. U. S. Nat. Mus., 15, 1892, pp. 126, 131, 168, 171; Eigenmann and Eigenmann, Ann. N. Y. Acad. Sci., 6, 1892, p. 356 (in part).

Clinocottus analis, Jordan and Evermann, Rept. U. S. Comm. Fish., 1895 (1896), p. 444 (in part); Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 2013 (in part); Gilbert, Rept. U. S. Comm. Fish., 1898 (1899), p. 27; Jordan and McGregor, *ibid.,* p. 284; Thoburn, Fur seals and Fur-seal Islands, pt. 3, 1899, p. 277; Starks and Morris, Publ. Univ. Cal., Zool., 3, 1907, p. 220; Metz, Ann. Rept. Laguna Mar. Lab., 1, 1911 (1912), pp. 36 to 39, fig. 9, 10, 10a; Osburn and Nichols, Bull. Am. Mus. Nat. Hist., 35, 1916, p. 174; Fowler, Proc. Acad. Nat. Sci. Phila., 75, 1923, pp. 291 and 299; Copeia, No. 120, 1923, p. 79.

Rusciculus rimensis Bean and Weed, Trans. Roy. Soc. Canada, (3) 13, 1919 (1920), p. 76 (not of Greeley).

Although *Clinocottus analis* has been known within its range for about forty years, and although considerable information concerning its ecology and development has been published, this subspecies has never been distinguished by name or indication. *Clinocottus analis australis* is very closely related to, and apparently not completely differentiated from, the northern form, *Clinocottus analis analis*. The distinctive features of the two forms comprise the average differences discussed below.

Clinocottus analis analis

Head relatively thicker and heavier, the dorsal profile forming a less obtuse angle above the eye; head averaging proportionately shorter, its length in adult contained 4.0 to 4.4 times in the standard length.

Snout usually blunter.

Eye higher, rounder, and smaller in most cases (orbit in adult contained 4.3 to 5.2, usually more than 4.5 times in the head).

Interorbital averaging flatter and broader.

Caudal peduncle usually deeper, its least depth .09 to .11 of standard length.

Cirri usually larger and more numerous, in older adults frequently forming a thick, fur-like mat on top of head and on upper anterior sides.

Prickles becoming more nearly obsolete with age, even between the second dorsal fin and the lateral line.

Banner-like flap on third dorsal spine of male frequently very large.

Size larger, frequently more than 100 mm. to caudal; the larg-

Clinocottus analis australis

Head usually more nearly triangular in lateral aspect, the dorsal profile forming a very obtuse and rounded angle above the eye; length of head in adult contained 3.8 to 4.3 times (usually about 4.0 times) in the standard length.

Snout usually sharper.

Eye usually lower, more oval, and larger (orbit in adult contained 4.0 to 4.6, usually less than 4.5 times in the head).

Interorbital groove usually deeper, the sides more elevated.

Caudal peduncle averaging more slender, its least depth .08 to .10 of standard length.

Cirri averaging everywhere smaller and fewer, never forming a thick fur-like mat on top of head and on upper anterior sides.

Prickles persisting quite strong at all stages, between the second dorsal fin and the lateral line.

Banner-like flap on third dorsal spine of male never large.

Size smaller, rarely more than 100 mm. to caudal; the largest

est specimen among hundreds examined 154 mm. long.

Fin rays averaging more numerous; dorsal soft rays more frequently 17 than 15; anal rays rarely 12, usually 13.

specimen among hundreds examined 118 mm. long.

Fin rays averaging less numerous; dorsal soft rays more frequently 15 than 17; anal rays nearly as frequently 12 as 13.

Holotype: Cat. No. 55002, Museum of Zoology, University of Michigan: an adult male 102 mm. long to caudal base, collected by Carl L. Hubbs on July 31, 1916, in one of the higher tide-pools with a sandy bottom on the reef along the ocean side of Point Loma, San Diego, California. Paratypes in the collections of the Museum of Zoology, the U. S. National Museum, The British Museum, American Museum, Philadelphia Academy, and Stanford University.

The diagnosis of *Clinocottus analis australis,* presented in the comparison given above, is based upon a very large number of specimens. It is supplemented here by a description of the type-specimen.

Depth, 3.9 in standard length; depth of caudal peduncle, 4.2 in head, or .095 of standard length. Head, 4.0; orbit, 4.3; interorbital V-shaped, its least width 2.6 in orbit, a little narrower than the suborbital; upper jaw, 2.3 in head, teeth in bands on jaws, vomer and palatines. Clumps of cirri on top of head between eyes and occiput; a row along preopercular margin, and two cirri on tip of maxillary; a row of cirri near dorsals, between the middle of the base of each fin; a band of cirri from lateral line near origin to front part of second dorsal base, and a row of compound cirri along the first half of the lateral line, one at each pore. Total number of pores in lateral line, 36. Prickly scales evident on upper sides between lateral line and base of second dorsal. First two dorsal spines with bases approximate, each a little longer than orbit; third to fifth spines longest, 3.5 in head, the third bearing a very small flap distally (smaller than in many other males); longest dorsal soft ray, 2.05; penultimate and longest anal ray, 2.6; anal base nearly as long as head; caudal fin, 1.6; pectoral, 1.3; pelvic, 2.0. Fin rays: dorsal, IX, 16 (last ray

branched); anal, 13; caudal, 9 (branched rays); pectorals, 15–15; pelvics, each I, 3. Anus one-third distance from pelvic insertion to origin of anal, followed by a conic penis longer than the eye.

The southern representative of *Clinocottus analis* ranges from Los Angeles County and Santa Catalina Island (material typical) southward along the coast of California to the Mexican boundary and beyond, along the mainland coast and on offshore islands of Lower California (specimens from Todos Santos, San Martin, San Benito and Guadalupe islands are typical of *australis*).

Genus 6. **Allocottus,** new genus

Orthotype: *Oligocottus embryum* Jordan and Starks.

The relationships of this genus to the others of the Oligocottinae are indicated in the key to the genera of this subfamily. Although probably related most closely to *Clinocottus analis* the type species has been referred successively to Oligocottus, Blennicottus and Oxycottus.

Allocottus may be characterized as follows: An oligocottine genus having the anus located midway between the origin of the anal fin and the insertion of the pelvic fin; the penis large and thick, of conic form, without distal processes; the anal fin alike in the two sexes; the preopercular spine simple, short and blunt; the snout sharp and the mouth terminal, with a well developed lateral cleft; nasal tentacle minute; no ocular tentacle; four pairs of mossy occipital cirri; multifid flaps along lateral line anteriorly, not extended backward to front of anal; no cirri above lateral line; body at all ages without trace of scales; the lateral line with the usual curve; the dorsal spines nine in number, never provided with banner-like flaps.

(Allocottus: another Cottus.)

6. *Allocottus embryum* Jordan and Starks

Oligocottus embryum Jordan and Starks, Proc. Cal. Acad. Sci., (2) 5, 1895, p. 808, pl. 82; Starks, *ibid.*, (2) 6, 1896, p. 557.

Blennicottus embryum, Jordan and Evermann, Rept. U. S. Comm. Fish., 1895 (1896), p. 444; Bull. U. S. Nat. Mus., 47, pt. 3, 1898, p. 2864; pt. 4, 1900, fig. 735; Evermann and Goldsborough, Bull. U. S. Bur. Fish., 26, 1906 (1907), p. 322, fig. 84; Gilbert and Burke, *ibid.*, 30, 1910 (1912), p. 63.

Oxycottus embryum, Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 2016; Greeley, Bull. U. S. Fish Comm., 1899, p. 12; Starks, Ann. Carn. Mus., 7, 1911, p. 191; Kincaid, Annotated List Puget Sound Fishes, 1919, p. 31, fig. 73; Bean and Weed, Trans. Roy. Soc. Canada, (3) 13, 1919 (1920), p. 77.

Allocottus embryum is an abundant reef species from the Aleutian Islands to Puget Sound. Farther south it has been recorded only from Point Lobos, Monterey County, California.

Genus 7. Oxycottus Jordan and Evermann

Oxycottus acuticeps is the type and only known species of this genus, *O. embryum* being now removed to the new genus Allocottus, described above.

7. *Oxycottus acuticeps* Gilbert

Oligocottus globiceps Bean, Proc. U. S. Nat. Mus., 4, 1881, p. 251 (records from Adak and Amchitka; not *O. globiceps* Girard; material re-examined).

Blennicottus globiceps Jordan and Gilbert, Fur Seal Report, 3, 1899, p. 467; Evermann and Goldsborough, Bull. U. S. Bur. Fish., 26, 1906 (1907), p. 322.(Adak and Amchitka records; after Bean.)

Oligocottus acuticeps Gilbert, Rept. U. S. Comm. Fish., 1893 (1896), p. 432; Jordan and Evermann, *ibid.*, 1895 (1896), p. 144.

Oxycottus acuticeps Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 2015; Bean and Bean, Proc. U. S. Nat. Mus., 21, 1898, p. 655; Rutter, Bull. U. S. Fish Comm., 1898 (1899), p. 191; Jordan and Gilbert, Fur Seals and Fur Seal Islands, 3, 1899, p. 467; Starks, Ann. Carn. Mus., 7, 1911, p. 189; Gilbert and Burke, Bull. U. S. Bur. Fish., 30, 1910 (1912), p. 63.

Blennicottus acuticeps Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 3, 1898, p. 2864; Evermann and Goldsborough, Bull. U. S. Bur. Fish., 26, 1906 (1907), pp. 310, 321.

Range: Aleutian Islands south to Sausalito, Marin County, California.

Genus 8. **Montereya,** new genus

Type: *Blennicottus recalvus* Greeley.

The two species commonly referred to Blennicottus differ so widely that they are here referred to distinct genera. They are compared in the following table, and likewise in the preceding key to the genera, in which they both are contrasted with the other genera of the Oligocottinae.

Comparison of the Species of Blennicottus and Montereya

Character	*Blennicottus (globiceps)*	*Montereya (recalva)*
Head:	Very bluntly rounded (in outline suggestive of that of *Salarias*)	Less bluntly rounded, more nearly square in lateral outline
Snout:	Blunter	Sharper
Suborbital width:	Decidedly less than length of orbit	Equal to, or greater than, length of orbit
Mouth:	Decidedly inferior	Barely inferior
Length of upper jaw:[8]	2.1 to 2.4 in head	2.4 to 2.8 in head
Nasal spine:	Moderately strong	Weak
Preopercular spine:	Well developed, curved upward	Barely evident, almost concealed in membrane
Cirri of head and scapular region:	Very numerous (see Greeley's figure)	Few and scattered (see type-figure and type-description)
Dorsal rays:	14 to 16, usually 15	14 or 15
Anal rays:	9 to 11, usually 10	10 or 11, usually 11
Greatest known size (length to caudal):	152 mm. (Puget Sound); 140 mm. (Carmel, Cal.)	98 mm. (Carmel, California)

(Montereya: named for Monterey Bay, California, the center of abundance for the species.)

[8] Character erroneously described by Greeley.

8. *Montereya recalva* Greeley

Centridermichthys globiceps Günther, Cat. Fishes Brit. Mus., 3, 1860, p. 171 (not *Oligocottus globiceps* Girard).

Oligocottus globiceps Jordan and Gilbert, Proc. U. S. Nat. Mus., 3, 1880 (1881), p. 455 (in part); 4, 1881, p. 59 (in part); Bull. U. S. Nat. Mus., 16, 1883, p. 719 ("southern form"); Jordan, Rept. U. S. Comm. Fish., 1885, p. 901 (in part); Eigenmann and Eigenmann, Ann. N. Y. Acad. Sci., 6, 1892, p. 356 (in part).

Blennicottus globiceps Jordan and Starks, Proc. Cal. Acad. Sci., (2) 5, 1895, p. 808; Jordan and Evermann, Rept. U. S. Comm. Fish., 1895 (1896), p. 444; Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 2017; Bean and Bean, Proc. U. S. Nat. Mus., 21, 1898, p. 655 (in part).

Blennicottus recalvus Greeley, Bull. U. S. Fish Comm., 1899, p. 9, fig. 1; Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 4, 1900, p. 3178 (after Greeley); Starks and Morris, Univ. Cal. Publ. Zool., 3, 1907, p. 222; Metz, Ann. Rept. Laguna Mar. Lab., 1, 1911 (1912), p. 40.

Montereya recalva occurs along the central coast of California, from the San Francisco Peninsula to Point Conception. Farther south it has not been taken along the mainland, but is known from Los Coronados Islands, near the coast just south of the international boundary.

Genus 9. Blennicottus Gill

Three species are currently referred to Blennicottus. Of these the type species (*B. globiceps*) only remains in the genus. The second species, *B. recalvus,* is here made the type of Montereya, differentiated on the preceding pages. A third species referred to Blennicottus, namely the Alaskan *B. clarki,*[9] was based on the young of some species of Artediellus, a widely unrelated group.

9. *Blennicottus globiceps* Girard

Oligocottus globiceps Girard, U. S. Pac. R. R. Surv., 6, pt. 4, 1857, p. 12;[10] 10, pt. 4, 1858, p. 58; Proc. Acad. Nat. Sci. Phila., 9, 1857 (1858), p. 202; Sauvage, Nouv. Arch. Mus. Hist. Nat. Paris, (2) 1, 1878, p. 140; Jordan and Gilbert, Proc. U. S. Nat. Mus., 3, 1880, p. 265; 3, 1880 (1881), p. 455 (in part); 4, 1881, p. 59 (in part); Bean, *ibid.*, p. 251 (Adak and Amchitka records excepted, these being based on

[9] Evermann and Goldsborough, Bull. U. S. Bur. Fish., 26, 1906 (1907), p. 323, fig. 85.

[10] Types re-examined; they are *B. globiceps,* not *M. recalva.*

Oxycottus acuticeps); Jordan and Gilbert, Bull. U. S. Nat. Mus., 16, 1883, p. 719 ("northern specimens"); Jordan, Rept. U. S. Comm. Fish., 1885, p. 901 (in part); Eigenmann and Eigenmann, Ann. N. Y. Acad. Sci., 6, 1892, p. 356 (in part); Gilbert, Rept. U. S. Comm. Fish., 1893 (1896), p. 432; Kermode, Provincial Museum of Natural History and Ethnology, Victoria, 1909, p. 87.

Blennicottus globiceps Gill, Proc. Acad. Nat. Sci. Phila., 1861, p. 67; Jordan and Jouy, Proc. U. S. Nat. Mus., 4, 1881, p. 6; Jordan and Evermann, Rept. U. S. Comm. Fish., 1895 (1896), p. 444; Bean and Bean, Proc. U. S. Nat. Mus., 21, 1898, p. 655; Jordan and Gilbert, Fur Seal Report, 3, 1899, p. 467 (Kodiak record only); Greeley, Bull. U. S. Fish Comm., 1899, p. 11, fig. 2; Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 4, 1900, p. 3179; Osgood, N. Am. Fauna, 21, 1901, p. 20; Evermann and Goldsborough, Bull. U. S. Bur. Fish., 26, 1906 (1907), p. 322 (Adak and Amchitka records excepted); Starks, Ann. Carn. Mus., 7, 1911, p. 191; Kincaid, Annotated List Puget Sound Fishes, 1919, p. 31; Bean and Weed, Trans, Roy. Soc. Canada, (3) 13, 1919 (1920), p. 77; Fowler, Proc. Acad. Nat. Sci. Phila., 75, 1923, p. 283.

Blennicottus globiceps bryosus Jordan and Starks, Proc. Cal. Acad. Sci., (2) 5, 1895, p. 808; Jordan and Evermann, Rept. U. S. Comm. Fish., 1895 (1896), p. 445; Bull. U. S. Nat. Mus., 47, pt. 2, 1898, p. 2017; Halkett, Check List Fishes Canada, 1913, p. 104.

Blennicottus globiceps ranges from Point Conception in California northward to Kodiak Island, Alaska. The records from Adak and Amchitka, Alaska (Bean, 1881), were based on examples of *Oxycottus acuticeps,* which have been re-examined in the National Museum (examples recorded from Kodiak Island in the same paper were correctly identified as *B. globiceps*). Pavlenko's[11] record of *Blennicottus globiceps bryosus* from Bay of Peter the Great, Siberia, was obviously based on some unrelated cottid, the figure not resembling *globiceps.*

Genus 10. SIGMISTES Rutter

10. *Sigmistes caulias* Rutter

Sigmistes caulias Rutter, in Jordan and Evermann, Bull. U. S. Nat. Mus., 47, pt. 3, 1898, p. 2863; Rutter, Bull. U. S. Fish Comm., 18, 1898 (1899), p. 190, fig.; Evermann and Goldsborough, Bull. U. S. Bur. Fish., 26, 1906 (1907), p. 321, fig. 83 (after Rutter); Gilbert and Burke, *ibid.*, 30, 1910, p. 63.

Range: Kodiak Island to Agattu Island, Alaska.

[11] Kazani Trd. Obšč., jest. 42, 1910, p. 33, fig. 4.