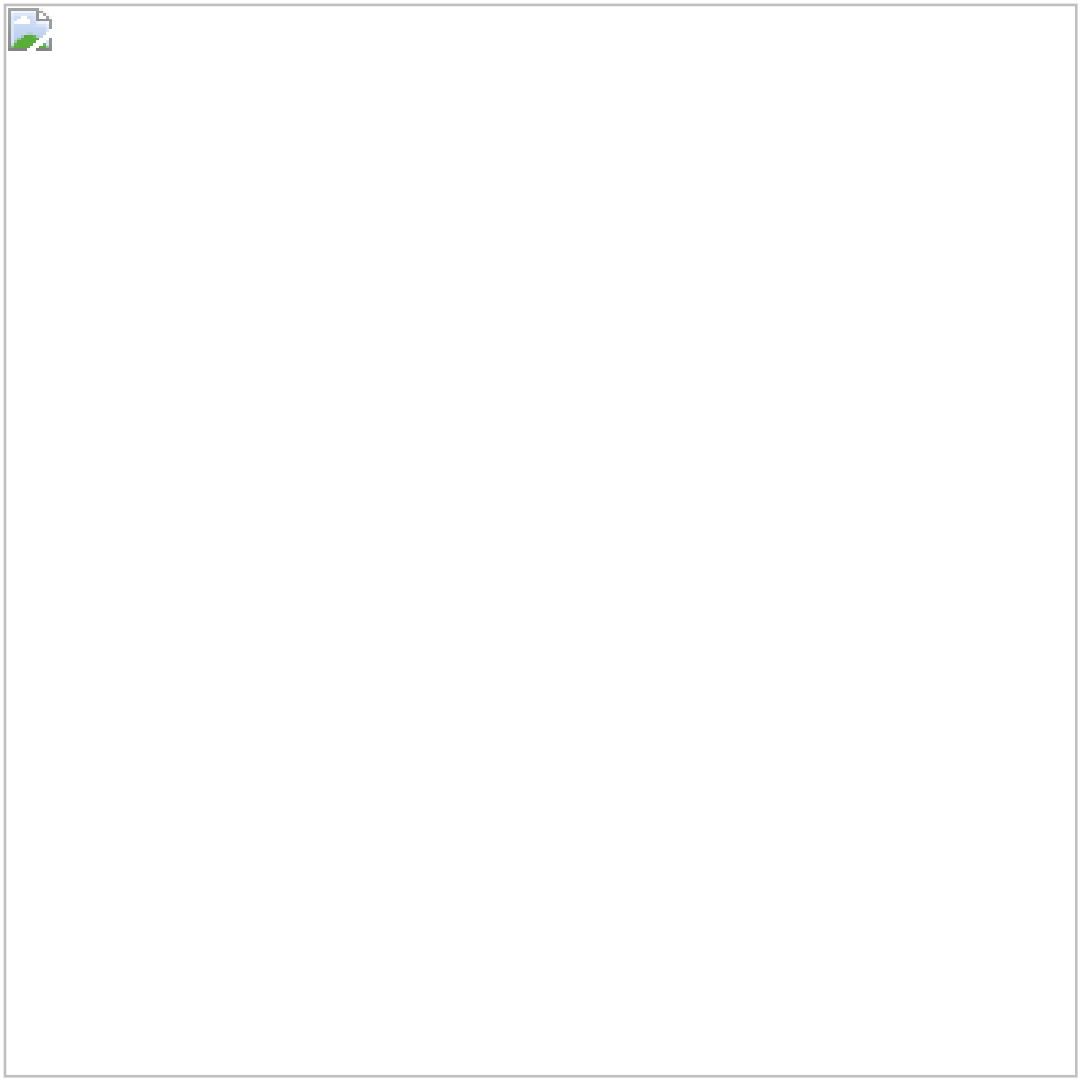

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A New Snailfish of the Genus *Careproctus* (Cottiformes: Liparidae) from the Beaufort Sea

James Wilder Orr[1]

A new species of *Careproctus* is described on the basis of two individuals collected from the eastern Beaufort Sea during the U.S.–Canada 2013 Transboundary Cruise. It is distinguished from all known species of *Careproctus* primarily by its elongate deeply exserted filamentous rays in the middle part of the pectoral fin, an unlobed dorsal fin, protruding snout, and counts of dorsal- (58–60) and anal-fin rays (52–54) and vertebrae (64–65). The two known specimens were collected at depths of 488–599 m. Among other liparids of the Arctic and North Pacific Oceans, the new species is most similar to *Careproctus mica*, from which it can be readily distinguished by the filamentous rays of the pectoral fin and higher counts of median-fin rays and vertebrae.

THE snailfish family Liparidae encompasses over 430 species in about 32 genera worldwide (Chernova et al., 2004; Orr et al., 2019). Its most species-rich genus, *Careproctus*, comprises over 100 species, about 50 of which are known from the North Pacific (Chernova et al., 2004), where they are found mainly in the deeper waters of the continental slope. Although demonstrably paraphyletic (Orr et al., 2019), members now recognized in the genus can be distinguished from other genera in the family by the possession of a distinct pelvic disc, one pair of nares, and the absence of pseudobranchs among other characters (Orr and Maslenikov, 2007).

With climate changes in the Arctic and increased interest in understanding its marine ecosystem, additional survey efforts in the region have been undertaken in recent decades (Mecklenburg et al., 2018). Many new species of snailfishes in the Arctic have been and continue to be discovered, particularly through the work of Andriashev and Chernova (1997, 2011), Chernova (1999, 2005a, 2005b, 2014, 2015), and Knudsen and Møller (2008). The specimens of the new species described here were collected in 2013 during surveys of the U.S.–Canada Transboundary Area conducted by the University of Alaska Fairbanks and the Canadian Department of Fisheries and Oceans in waters currently claimed by both the United States and Canada (Byers, 2013). I provide a diagnosis and description of the new species.

MATERIALS AND METHODS

The two specimens examined of the new species were obtained from benthic otter trawls conducted during the 2013 Transboundary Cruise in the eastern Beaufort Sea. Counts, measurements, and descriptive terminology follow Andriashev and Stein (1998), with the exception of the cephalic sensory-pore series, which follows Stein et al. (2001), and pectoral girdle morphology, which follows Orr and Maslenikov (2007). Counts of median-fin rays and vertebrae were taken from radiographs. Counts of teeth were made according to methods of Able and McAllister (1980). Counts of gill rakers were taken from the first gill arch on the right side. In the paratype, the right gill membrane and abdomen were cut to examine the branchial and visceral cavities, and the right pectoral girdle was dissected, cleared, and counterstained following Potthoff (1984). The holotype was not dissected. Lengths are presented as standard length (SL) and proportions as percent SL, unless otherwise indicated as percent head length (HL), orbit length (OL), or caudal length (CL). Fleshy interorbital width is taken at the greatest width, including tissue extending dorsally over the eye; bony interorbital width is the narrowest bony width. Suborbital depth to upper jaw is measured from the ventral rim of the orbit to the end of the maxilla; suborbital depth to lower jaw, to the mandibular articulation. Caudal fin depth was measured at the caudal-fin base. Measurements and counts are presented in species accounts as the value for the holotype and, in parentheses, the paratype. Institutional abbreviations are those provided by Sabaj (2020).

Careproctus canusocius, new species

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Transboundary Snailfish
Figures 1–3, Table 1

Holotype.—UAM 47901, 81.0 mm, Beaufort Sea, 70.4151°N, 140.3560°W, 488 m depth, L. Edenfield, 24 August 2013.

Paratype.—UAM 47917, 60.1 mm, female, Beaufort Sea, 70.5632°N, 140.4501°W, 599 m depth, L. Edenfield, 24 August 2013.

Diagnosis.—*Careproctus canusocius* is distinguished from all known species of *Careproctus* by elongate filamentous rays in the middle part of the pectoral fin that are about 50% free from the membrane. Among other liparids of the Arctic and North Pacific Oceans, the new species is most similar to *C. mica*, which is also a slender species with an unlobed dorsal fin and protruding snout, but from which it can be further distinguished on the basis of its higher counts of vertebrae (64–65 vs. 62 in *C. mica*), counts of dorsal-fin rays (58–60 vs. 57), and stomach color (pale vs. dark gray-green), as well as pelvic disk length shorter than orbit length (vs. longer), and anus closer to the pelvic disk (2.1–2.3 % vs. 2.8 %) and closer to anal-fin origin (8.3–12.1 % vs. 15.4 %).

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Fig. 1. *Careproctus canusocius*, new species, holotype, UAM 47901, 81.0 mm SL, Beaufort Sea, U.S.–Canada Transboundary waters, photographed after preservation.

Description.—Body slender, tapering posteriorly to slender tail, moderately compressed, depth at dorsal-fin origin 77.7 (72.8) % HL. Head moderately large, moderately depressed, slightly swollen nape, dorsal profile gradually sloping from nape to snout. Snout rounded, projecting beyond upper jaw. Mouth inferior, moderate in size, maxilla 52.6 (42.6) % HL, extending to mid-orbit, oral cleft extending anterior to orbit. Premaxillary tooth plates matching mandibular tooth plates. Premaxillary and mandibular teeth simple in 17 widely spaced oblique rows, increasing from five teeth in anteromedial rows to seven teeth in more posterior rows. Small diastema at symphysis of upper and lower jaws. Orbit large, 33.1 (31.6) % HL, dorsal margin slightly below dorsal contour of head, suborbital depth to oral cleft 43.1 (55.8) % OL; pupil large, round. Bony interorbital width narrow, 22.9 (19.9) % HL; fleshy interorbital space broad, 48.6 (35.3) % HL, slightly convex. Snout length longer than orbit length, 37.7 (33.8) % HL. Nostril single, with base of tube level with middle of orbit; nostril tube length 1.7 (1.5) % HL.

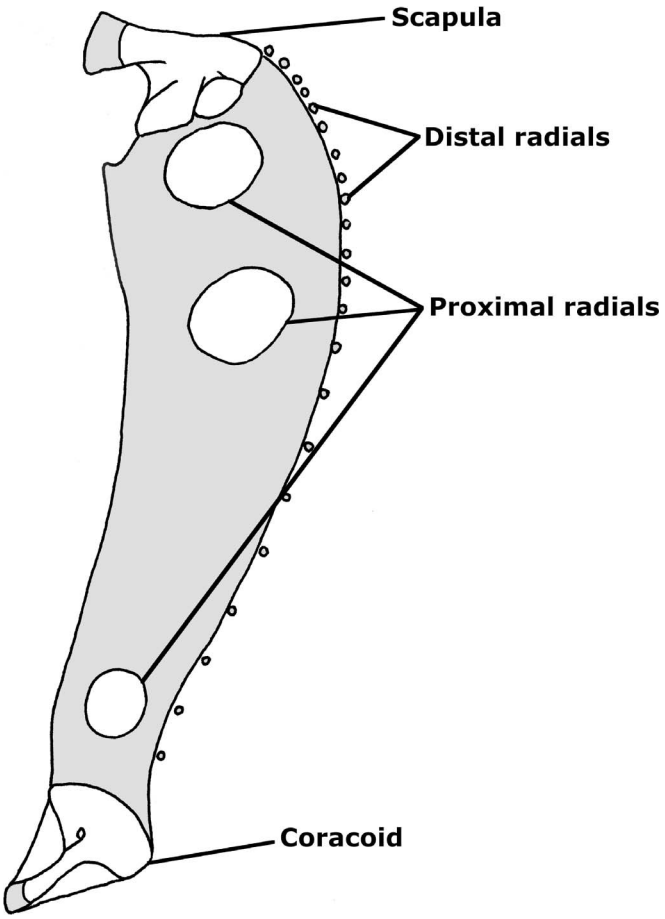

Fig. 2. Right medial view of pectoral girdle of *Careproctus canusocius*, new species, paratype, UAM 47917, 60.1 mm SL, maturing female. Gray areas represent cartilage.

Pores of cephalic lateralis system of moderate size: nasal pores two, maxillary pores six, preoperculomandibular pores seven, suprabranchial pores one (pore pattern 2-6-7-1); chin pores paired in separate pits. Interorbital pore absent. Free neuromasts (Andriashev and Stein, 1998) about 5 or 6, small and difficult to discern, extending from above gill slit and to above a level with the anus on the mid-body.

Gill opening small, 24.0 (22.1) % HL, upper margin at level of midorbit, ventral margin just above pectoral fin. Opercular flap rounded. Branchiostegal rays six.

Dorsal-fin rays 58 (60), anterior rays slightly longer than posterior; anterior 5 (4) rays uniserial, apparently unsegmented; all rays simple (unbranched). Predorsal present or absent, when present inserted between neural spines two and three, anteriormost dorsal-fin pterygiophore inserted between neural spines three and four, bearing a single ray.

Anal-fin rays 52 (54), all rays biserial and segmented; all rays simple. One anal-fin pterygiophore anterior to first haemal spine bearing a single ray. Anal-fin origin below vertebrae 12–13 (caudal vertebrae 2–3).

Pectoral fin strongly notched, with 28 (27) rays. Upper lobe of 20 rays extending to anal-fin ray three, rays 3–5 longest , more ventral rays gradually shortening to shortest ray of notch. Lower lobe long, slightly shorter than upper lobe (ca. 95% of upper lobe length), with 8 (7) rays, extending well past anus, about half the distance to anal-fin origin; dorsal rays gradually lengthening to long thin rays 3–4, ventral rays gradually shortening to ventralmost ray near pectoral symphysis. Tips of dorsalmost 16 rays 5–7 % free of

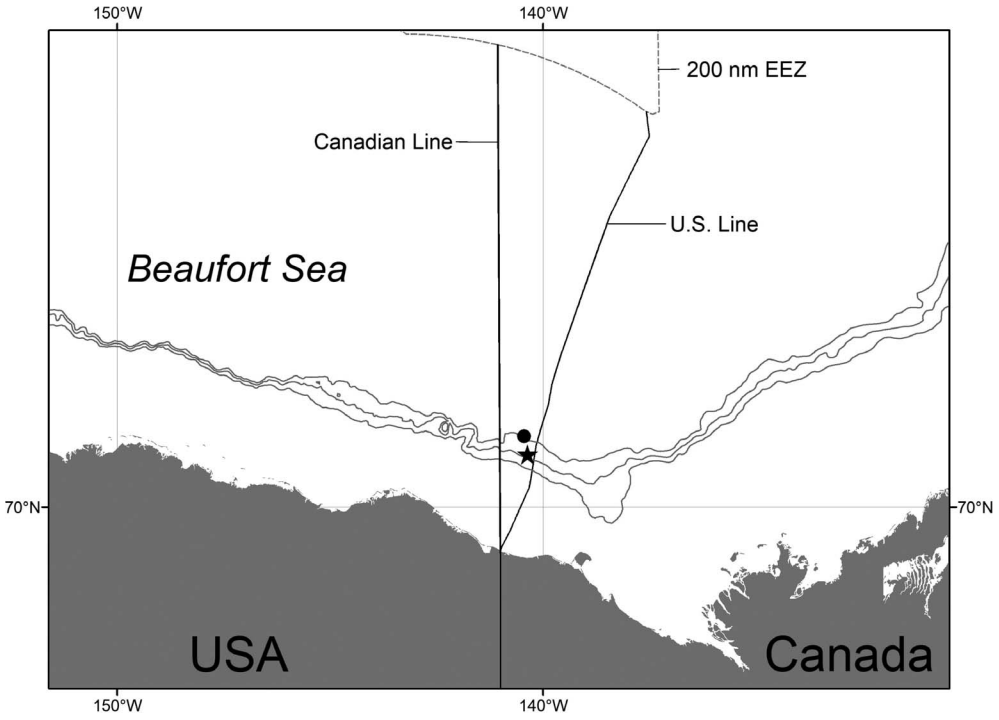

Fig. 3. Distribution of *Careproctus canusocius*, new species, in the Beaufort Sea, U.S.–Canada Transboundary waters. Star = holotype (UAM 47901), circle = paratype (UAM 47917). Bottom contours illustrated are 200, 400, and 600 m.

membrane, tips of rays 17 to 28 (27) 30–50 % free of membrane; ventral rays of dorsal lobe, notch, and lower lobe most strongly exserted. Three to five rays in notch more widely spaced than rays of lobes. Uppermost pectoral-fin ray level with cleft or ventral rim of orbit. Lowermost pectoral-fin ray below anterior part of orbit. Proximal pectoral radials three (2+1), small: all radials round, unnotched; ventralmost radial three widely spaced from radial two (Fig. 2). Scapular fenestra small, other fenestrae absent. Scapula with strong helve; coracoid triangular with broad lamina. Distal radials present at base of pectoral-fin rays 2 to 23, more ventral distal radials reduced, absent from base of ventralmost five rays, which articulate with non-staining fibrocartilage.

Pelvic disk smaller than orbit, 84.5 (81.4) % OL, 28.0 (25.7) % HL, flat, slightly longer than wide, anterior lobe strongly developed. Anus closer to pelvic disk than to anal-fin origin.

Principal caudal-fin rays 10, dorsal procurrent rays 1, ventral procurrent rays 1 (0). Membrane of posterior dorsal- and anal-fin rays attached to caudal fin 16.9 (16.7) % CL; caudal fin depth 9.0 (13.3) % CL.

Vertebrae 64 (65), 10 precaudal, 54 (55) caudal. Pleural ribs 2 (1), when present on vertebrae 8–9, long and thin. Body naked, with thin skin over gelatinous layer.

The largest specimen examined was the holotype of 81.0 mm (UAM 47901, sex not determined). The paratype is a 60.1 mm female with small white eggs (UAM 47917).

Coloration in preservation.—Body pale, faintly speckled (Fig. 1), slightly darker posteriorly in holotype, more so in paratype. All fin membranes unpigmented. Peritoneum, orobranchial cavity, stomach, intestines, pyloric caeca, and urogenital papilla pale.

Distribution.—*Careproctus canusocius* has been collected only in the Beaufort Sea within the U.S./Canada transborder area at 70.4151°N, 140.356°W and 70.5632°N, 140.450°W at depths of 488–599 m (Fig. 3).

Etymology.—The specific epithet *canusocius*, to be treated as a noun in apposition, is a combination of "canus," an amalgamation of the abbreviated names of Canada and the United States, with the Latin word "socius" meaning "ally." The name alludes to the collections of the types during a collaborative cruise conducted by the United States and Canada in the Beaufort Sea Transboundary Region. The region is claimed by both the United States and Canada, who have remained historic allies in the face of global challenges.

Comparisons.—Among species of *Careproctus*, *C. reinhardti* and *C. lerikimae* are the only species previously recorded from the Beaufort Sea (Orr et al., 2015, 2019; Mecklenburg et al., 2018). *Careproctus canusocius* is easily distinguished from both by its slender body, protruding snout, and elongate middle pectoral-fin rays. Among similar species known from the Arctic (Chernova, 2015), *C. canusocius* is most similar to *C. mica* from the Kara Sea but differs from it in having elongate filamentous rays in the middle part of the pectoral fin, more vertebrae (64–65 vs. 62 in *C. mica*), more dorsal-fin rays (58–60 vs. 57), and a pale (vs. dark gray-green) stomach, as well as in several morphometric characters. *Careproctus canusocius* is distinguished from most other species of the Arctic by its protruding snout and high counts of vertebrae and medial fin rays. Those species with similar high counts of vertebrae (Chernova, 2015) include *C. kidoi* (62 vertebrae), *C. knipowitschi* (63), *C. latiosus* (59–60), *C. macrophthalmus* (59–62), and *C. moskalevi* (59–62). *Careproctus moskalevi* is the most similar among these species, but *C. canusocius* differs from it, as well as from *C. latiosus*, in having a protruding snout, higher median fin ray and vertebral counts, and a pale body and peritoneum.

The two specimens of *C. canusocius* were collected at depths of about 500–600 m. This is deeper than the recorded depth of the holotype and only known specimen of *C. mica* at 204 m (Chernova, 2015) and much shallower than the collection depths of the deep-water species *C. moskalevi* at

Table 1. Proportional morphometric and meristic characters of the holotype (UAM 47901) and paratype (UAM 47917) of *Careproctus canusocius*, new species. Morphometric data are given in percent standard length.

	Holotype	Paratype
Standard length (mm)	81.0	60.1
%SL		
Head length	21.6	22.6
Head width	16.4	12.3
Greatest body depth	16.8	16.5
Body depth at anal-fin origin	14.4	12.0
Body depth from anal-fin origin to dorsal-fin origin	18.6	17.1
Body depth at pelvic fin	16.4	15.5
Body depth at dorsal-fin origin	16.8	16.5
Snout length	8.1	7.7
Orbit length	7.2	7.2
Interorbital width (bony)	4.9	4.5
Interorbital width (fleshy)	10.5	8.0
Suborbital depth to upper jaw	3.1	4.0
Suborbital depth to lower jaw	5.8	6.0
Mouth width	17.3	13.5
Maxilla length	11.4	9.7
Mandible length	12.1	11.6
Gill slit length	5.2	5.0
Pectoral-fin length	15.9	15.3
Length of lower lobe of pectoral fin	14.6	15.0
Length of notch ray of pectoral fin	9.9	7.7
Predorsal length	24.4	23.1
Preanal length	31.5	29.0
Snout to pelvic disc length	10.9	11.1
Snout to anal fin length	19.1	18.5
Pelvic disc length	6.0	5.8
Pelvic disc width	5.3	4.3
Pelvic disc to anus length	2.1	2.3
Anus to anal fin length	12.1	8.3
Caudal-fin length	11.0	10.0
Length of dorsal-fin attachment to caudal fin	1.9	1.7
Length of anal-fin attachment to caudal fin	1.9	1.7
Depth of caudal-fin base	1.0	1.3
Nasal tube length	0.4	0.3
Meristics		
Dorsal-fin rays	58	60
Anal-fin rays	52	54
Pectoral-fin rays	28	27
Pectoral-fin lower lobe rays	8	7
Principal caudal-fin rays	10	—
Precaudal vertebrae	10	10
Caudal vertebrae	54	55
Total vertebrae	64	65
Pleural ribs	2	1
Pterygiophores anterior to haemal spine I	1	1
Tooth count	7	7
Tooth rows	17	12
Gill rakers	8	6

1,589–1,579 m and *C. latiosus* at 1,478–1,540 m (Andriashev and Chernova, 2011).

The pectoral girdle in *C. canusocius* is similar to those of species within the clade Melanura of Orr et al. (2019) in having three radials, the two dorsal being widely separated from the ventral, and a small scapular fenestra. In the Orr et al. (2019) molecular analysis, the Arctic species *C. micropus* and *C. kidoi* formed a clade with the subarctic North Pacific species *C. simus*. *Careproctus simus* shares the similar overall morphology of a long slender body, protruding snout, and large eyes. However, *C. canusocius* has higher counts of vertebrae (64–65 vs. 59–64 in *C. simus*) and median fin rays (dorsal: 58–60 vs. 54–60 and anal: 52–54 vs. 47–53) and fewer pectoral-fin rays (27–30 vs. 31–37).

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