

Range Extensions and New Records from Alaska and British Columbia for Two Skates, *Bathyraja spinosissima* and *Bathyraja microtrachys*

Authors: James W Orr, Duane E Stevenson, Gavin Hanke, Ingrid B Spies, James A Boutillier, et. al.

Source: *Northwestern Naturalist*, 100(1) : 37-47

Published By: Society for Northwestern Vertebrate Biology

URL: <https://doi.org/10.1898/NWN18-21>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

RANGE EXTENSIONS AND NEW RECORDS FROM ALASKA AND BRITISH COLUMBIA FOR TWO SKATES, *BATHYRAJA SPINOSISSIMA* AND *BATHYRAJA MICROTRACHYS*

JAMES W ORR, DUANE E STEVENSON, GAVIN HANKE, INGRID B SPIES, JAMES A BOUTILLIER, AND GERALD R HOFF

ABSTRACT—Recent deep-water surveys of the continental slope in the Bering Sea and the eastern North Pacific, conducted by the US National Marine Fisheries Service, Alaska Fisheries Science Center, and Fisheries and Oceans Canada, have broadened our understanding of the ichthyofauna in the region. Herein, we report significant new records of 2 species of skates based on morphological and molecular data. For *Bathyrāja spinosissima*, the White Skate, we describe 2 specimens: a neonate male that constitutes a northern range extension for the species to Alaska in the Bering Sea; and an adult male representing a new record for the species in British Columbia. For *B. microtrachys*, the Fine-spined Skate, we describe 5 males taken in a single haul that represent the 1st record of the species in British Columbia. These specimens had been previously misidentified as *B. violacea*, the Okhotsk Skate, a species known only from the western Aleutian Islands and the western North Pacific.

Key words: Alaska, Arhynchobatidae, *Bathyrāja violacea*, Bering Sea, British Columbia, Fine-spined Skate, Pacific White Skate, Rajiformes

The skates (Rajiformes) of the eastern North Pacific Ocean and Bering Sea have been the subject of recent taxonomic and distributional studies, leading to the descriptions of new species (Stevenson and others 2004; Orr and others 2011) and the identification of other species newly documented in the region (Hoff 2002; Stevenson and Orr 2005; Stevenson and others 2007). Five genera of skates in 2 families (Arhynchobatidae and Rajidae) are known in the eastern North Pacific. Fifteen species in 4 genera have been recognized from Alaska (Stevenson and others 2007; Orr and others 2011; Ishihara and others 2012; Table 1), and morphological and molecular variation among specimens collected from the eastern North Pacific and Bering Sea suggest the presence of additional undescribed species in the area (Spies and others 2006, 2011; Stevenson and others 2007). Just to the south of Alaska, surveys of the ichthyofauna of British Columbia and in the Salish Sea have

identified 10 species of skates in 4 genera (Ebert 2003; Pietsch and Orr 2015; King and others in press; Table 1).

Recent surveys of the continental slope in the eastern North Pacific and Bering Sea have broadened our understanding of the ichthyofauna in the region. Unusual specimens collected on the eastern Bering Sea slope have resulted in the descriptions of new species of fishes (Stevenson and Anderson 2005; Stevenson and Orr 2006; Baldwin and Orr 2010; Orr 2012) and the identification of others as new to Alaska or to the Bering Sea or both (Hoff 2002; Orr and Stevenson 2005; Orr and others 2005; Kenaley and Orr 2006; Maslenikov and others 2013). Specimens collected in recent surveys of the continental slope of British Columbia (Hanke and others 2015) have also resulted in additions to the Canadian ichthyofauna (Hanke and Roias 2012; Hanke and others 2014, 2015; Milkova and others 2016; King and others in press). Among these unusual specimens, an unidentified juvenile skate of the genus *Bathyrāja* was collected in the eastern Bering Sea and later identified as *B. spinosissima*. This specimen represents the 1st record of the species from the Bering Sea and Alaska. In addition, a large adult skate collected off British Columbia, initially identified as *B. abyssicola* based on morphology and then as *B. spinicauda* based on DNA barcoding (Steinke and others 2009, supplement), was subsequently reidentified as *B. spinosissima*, a new record also for British Columbia. Additionally, we discovered 5 specimens of *B. microtrachys*, initially identified as *B. violacea*, from collections off the west coast of Vancouver Island, which represent the 1st records of the species from Canada.

Bathyrāja spinosissima (Beebe and Tee-Van 1941), the Pacific White Skate, is a rare arhynchobatid skate known from only a few specimens around the world, ranging from the type locality off Cocos Island, Costa Rica, and the Galapagos Ridge to Waldport, Oregon, in the

TABLE 1. Skates (Rajiformes) reported from waters of Alaska and British Columbia, supported by archived specimens. UBC = University of British Columbia, Beatty Biodiversity Museum.

Species	Common name	Geographic range	Depth range (m)	Citation
<i>Amblyraja badia</i>	Broad Skate	Arctic Ocean, Bering Sea to Central America, western Pacific	1061–2322	Stevenson and others (2007)
<i>Bathyraja abyssicola</i>	Deepsea Skate	Bering Sea to southern California, western Pacific	362–2904	Stevenson and others (2007)
<i>B. aleutica</i>	Aleutian Skate	Bering Sea to northern California, western Pacific	15–1602	Stevenson and others (2007)
<i>B. interrupta</i>	Bering Skate	Bering Sea to Washington	26–1050	Stevenson and others (2007); Pietsch and Orr (2015)
<i>B. kincaidii</i>	Sandpaper Skate	British Columbia to California	18–500	Pietsch and Orr (2015)
<i>B. lindbergi</i>	Commander Skate	Bering Sea to British Columbia, western Pacific	126–1193	Stevenson and others (2007); King and others (in press)
<i>B. maculata</i>	Whiteblotched Skate	Bering Sea to Gulf of Alaska, western Pacific	73–1193	Stevenson and others (2007)
<i>B. mariposa</i>	Butterfly Skate	central Aleutian Islands	90–448	Stevenson and others (2007)
<i>B. microtrachys</i>	Fine-spined Skate	British Columbia to California	2000–3300	Stevenson and others (2004, 2007)
<i>B. minispinosa</i>	Whitebrow Skate	Bering Sea to Gulf of Alaska, western Pacific	150–1420	this publication
<i>B. panthera</i>	Leopard Skate	western Aleutian Islands	48–396	Stevenson and others (2007)
<i>B. parmitifera</i>	Alaska Skate	Bering Sea to British Columbia, western Pacific	17–392	Orr and others (2011); UBC 13720
<i>B. spinosissima</i>	Pacific White Skate	Bering Sea to California, western Pacific	800–2938	this publication
<i>B. taranetzi</i>	Mud Skate	Bering Sea, Aleutian Islands, western Pacific	58–1054	Stevenson and others (2007)
<i>B. trachura</i>	Roughtail Skate	Bering Sea to Baja California, western Pacific	213–2550	Stevenson and others (2007)
<i>B. violacea</i>	Okhotsk Skate	western Aleutian Islands, western Pacific	124–510	Stevenson and others (2007); Pietsch and Orr (2015)
<i>Beringraja binoculata</i>	Big Skate	Bering Sea to Baja California	16–402	Stevenson and others (2007); Pietsch and Orr (2015)
<i>Raja rhina</i>	Longnose Skate	Bering Sea to Baja and Gulf of California	9–1294	Stevenson and others (2007); Pietsch and Orr (2015)

eastern Pacific (Beebe 1926; Provost and others 2015; Last and others 2016; Eschmeyer and others 2017; Salinas-de-León and others 2018). It has also been reported from the Sea of Okhotsk off Kamchatka (Dudnik and Dolganov 1992; Dolganov 1999; Dolganov and Tuponogov 1999; Sheiko and Fedorov 2000; Parin 2001; Fedorov and others 2003; Grigorov and Orlov 2013; Parin and others 2014; Ebert and others 2017) and the northern Kuril Islands (Pitruk and Fedorov 1990) in the western Pacific, although these records may represent a different species (Ebert 2003; Provost and others 2015; Last and others 2016). Living at depths of 800 to 2938 m, *B. spinosissima* is thought to be one of the deepest-dwelling skates worldwide (Ebert 2003; Salinas-de-León and others 2018), second only to *B. microtrachys*. Its preference for these great depths, which lie outside the range of most benthic survey efforts, combined with its preference for rocky habitat (Provost and others 2015), may explain why it is so rarely encountered.

Bathyraja microtrachys (Osburn and Nichols 1916), the Fine-spined Skate, is thought to be the deepest-dwelling skate, commonly found living below 2000 m to a maximum depth of 3300 m (Ebert and others 2017). It ranges from off central Baja California to Washington (Ebert 2003; Love and others 2005; Carlisle and others 2015; Last and others 2016; Ebert and others 2017). As for *B. spinosissima*, few specimens have been collected.

Methods of measuring and counting for this study follow Orr and others (2011). Specimens were either frozen or fixed in 10% formalin at sea and stored in 70% ethanol. Before whole specimens were preserved, tissues were taken for genetic analysis, preserved in 95% ethanol, and stored at -80°C . Newly collected specimens are archived at the University of Washington, Burke Museum of Natural History and Culture, Fish Collection (UW) and the Royal British Columbia Museum (RBCM). The holotype of *B. spinosissima* is archived at the California Academy of Sciences (CAS). Measurements and counts of the holotype were recorded from the original description or taken from photographs and radiographs provided by CAS, available at <https://www.calacademy.org/scientists/ichthyology-collections>. Sequence data from the cytochrome *c* oxidase subunit I (COI) region were obtained following the procedures of Spies

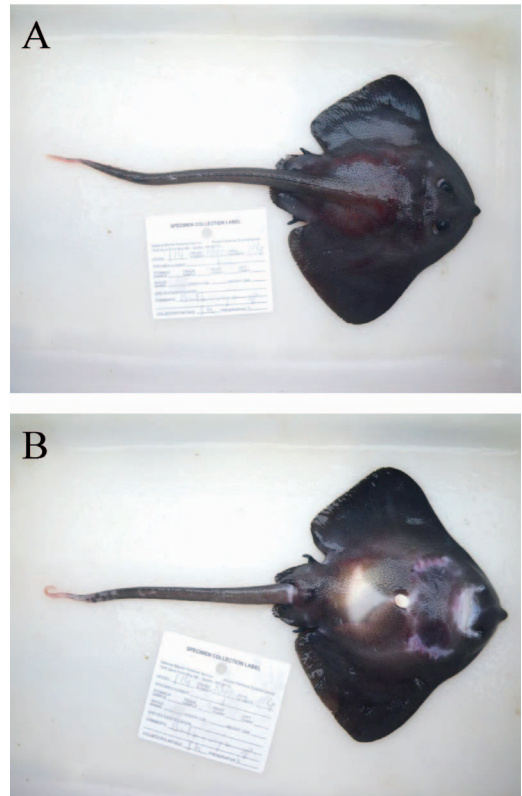


FIGURE 1. New specimen of *Bathyraja spinosissima*, the Pacific White Skate, from the Bering Sea, Alaska (UW 157183, 255 mm TL, Alaska, Bering Sea, 56.1039°N , 169.2296°W , 1066 m depth, 30 June 2010): (A) live dorsal view; (B) live ventral view.

and others (2006) and were deposited in the Barcode of Life database (BOLD) and Genbank.

Bathyraja spinosissima (Beebe and Tee-Van 1941) Pacific White Skate; Figures 1–3

Description of New Specimen from Bering Sea.—UW 157183, 225 mm TL without caudal filament, 255 mm with caudal filament, male, 56.1039°N , 169.2300°W , 1066 m depth, 30 June 2010, F/V *Vesteraalen*, cruise 2010-01, haul 114, collected by GR Hoff and S Kotwicki, BOLD accession number NPSKT002-18, GenBank MH427012 (Fig. 1). Morphometric and meristic data are presented in Table 2.

Neonate with vestige of yolk sac. Disc wider than long, margins of pectoral fins broadly rounded; anterior lobe of pelvic fins slender, pointed; tail longer than disc; snout soft, flexible, especially near tip, internal supporting rostral

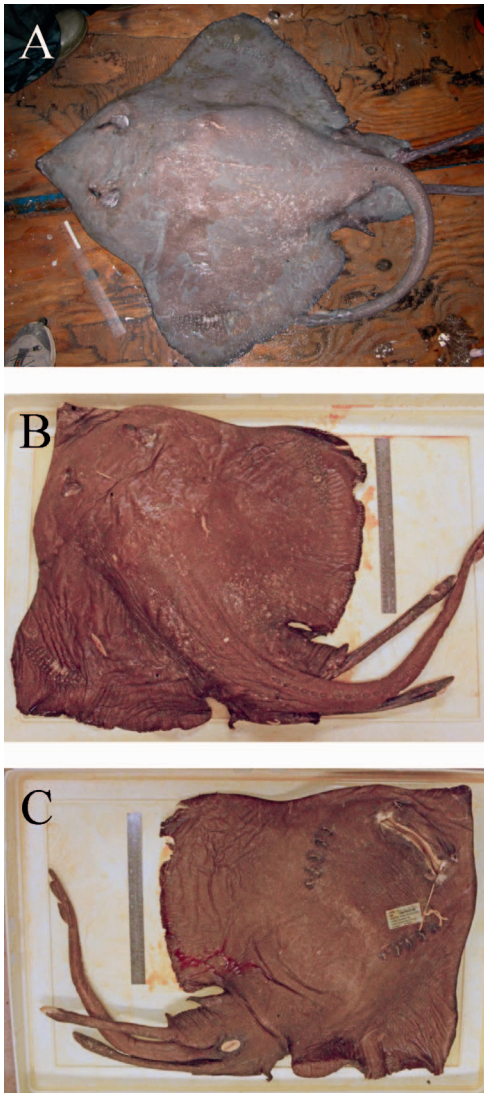


FIGURE 2. New specimen of *Bathyraja spinosissima*, the Pacific White Skate, from British Columbia, west of Vancouver Island (RBCM 16121, 1461 mm, 1951 m depth): (A) live dorsal view; (B) preserved dorsal view; and (C) preserved ventral view.

cartilage slender and weak; teeth small, numerous, 32 rows in upper jaw; interorbital space wide, slightly convex; thorns absent from disc; tail thorns 29, interdorsal thorns 2; dorsal and ventral surface of head and body uniformly covered with small denticles; 2 small, well-separated dorsal fins, about equal in height and length; predorsal vertebrae between pelvic girdle and origin of first dorsal fin about 86.

In life, dorsal surface uniform dark plum gray (Fig. 1A); ventral surface dark brown with patches of white around mouth, gill slits, and cloaca, white band at base of tail; clasper tips white; caudal filament with dark dorsal ridge, pale to translucent ventrally (Fig. 1B). In preservation, dorsal surface uniform dark; ventral surface dark with light areas around mouth, gill slits, and cloaca, light band at base of tail; clasper tips light.

Description of New Specimen from British Columbia.—RBCM 16121, 1461 mm TL, 48.5940°N, 126.9008°W, 1951 m depth, 18 October 2005, F/V *Frosti*, haul 20, benthic trawl, collected by J Boutillier, BOLD accession number TZFPB359-05 (Fig. 2). Morphometric and meristic data are presented in Table 2.

Adult male with well-developed claspers. Disc wider than long, margins of pectoral fins broadly rounded; anterior lobes of pelvic fins slender, pointed; disc longer than tail; snout soft, flexible, especially near tip, internal supporting rostral cartilage slender and weak; teeth small, numerous, 28 rows in upper jaw; interorbital space wide, flat to slightly concave; thorns absent from disc; tail thorns 29, interdorsal thorns 0; dorsal and ventral surface of head and body uniformly covered with small denticles; dorsal fins small, well separated, about equal in height and length.

In life, dorsum uniform dark brownish gray, slightly darker at pectoral and pelvic fin margin (Fig. 2A); ventrum dark brownish gray, margin of gill openings, pectoral and pelvic fins slightly darker, with patches of white around the mouth, cloaca, and clasper tips. In preservation, dorsum uniform dark brown, slightly darker at pectoral- and pelvic-fin margins (Fig. 2B); ventrum dark brown, margin of gill openings and pectoral and pelvic fins slightly darker, with patches of white around the mouth, cloaca, and clasper tips (Fig. 2C).

Sequence Data.—The specimen from British Columbia (RBCM 16121, previously as RBCM 006-034-024) was originally identified as *Bathyraja abyssicola*, the only other species of skate known from British Columbia waters with denticles on the ventral surface, but is 1.6% divergent from *B. abyssicola* sequences in BOLD (MFC328-08, TZFPB311-05, TZFPB421-05). The identification was later changed to *B. spinicauda* because the sequence is only 0.6% divergent from numerous sequences labeled as *B. spinicauda*.

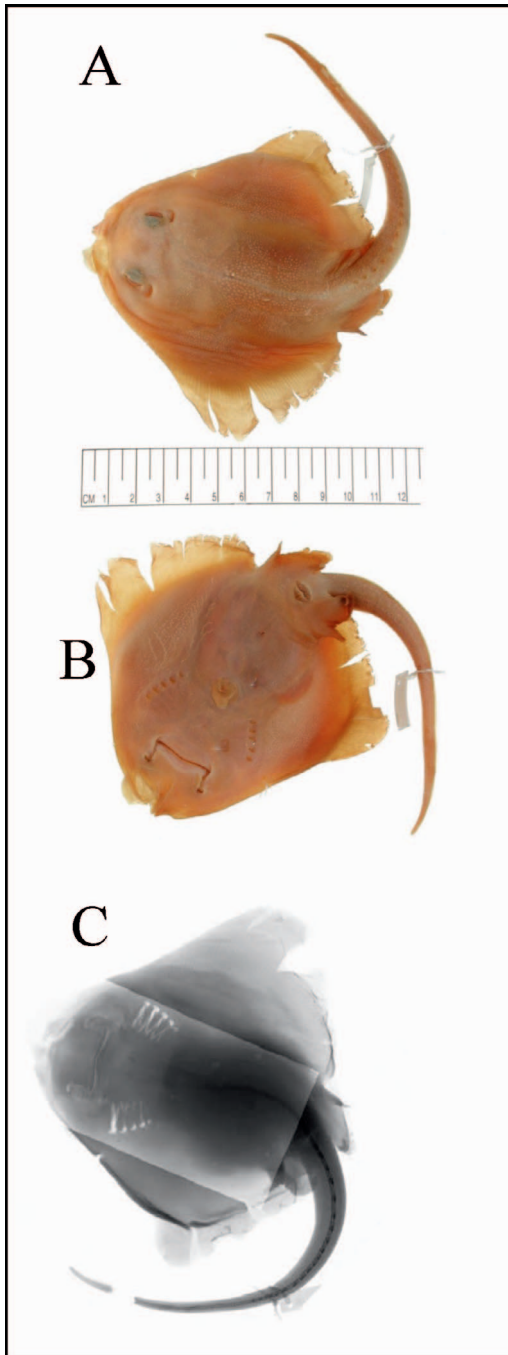


FIGURE 3. Holotype of *Bathyraja spinosissima*, the Pacific White Skate, from Costa Rica, 60 miles south of Cocos Island (CAS-SU 46500, 248 mm TL, 4°50'N, 87°0'W, 1399 m, 765 fms), 3 June 1925): (A) preserved dorsal view; (B) preserved ventral view; and (C) radiograph. All images available courtesy of CAS at <http://researcharchive.calacademy.org/research/ichthyology/types/Index.asp>.

da in BOLD (Steinke and others 2009, supplement; GH, pers. obs.; GBGC10833-10861, RNEZ001-010), even though *B. spinicauda* is known only from the North Atlantic and Barents Sea. The COI sequence obtained for RBCM 16121 is 100% identical (652/652 bases) to the COI sequence obtained for the specimen from the Bering Sea (UW 157183). There are no previously documented reference sequences in BOLD or GenBank for *B. spinosissima* with which to compare these sequences.

Discussion.—The holotype of *B. spinosissima* (CAS-SU 46500; Fig. 3) is a neonate that was collected enclosed in its egg case, but the egg case has since been lost (Ebert and Davis 2007). It is very similar to the specimen reported here from the Bering Sea. Nearly all proportional measurements and meristic counts are close to or identical to those of the holotype (Table 2). Slight differences from published descriptions are the presence of 2 interdorsal thorns (rather than their absence; Ebert 2003) and a higher count of about 86 to 90 predorsal vertebrae (vs. 82; Ebert 2003).

Bathyraja spinosissima is similar to the Deepsea Skate, *B. abyssicola*, of the North Pacific in having the ventral surface covered with denticles, forming a shagreen-like surface. However, it differs from *B. abyssicola* in lacking nuchal and middorsal thorns, which are both present and relatively strong in *B. abyssicola*, and in having more slender and pointed anterior pelvic-fin lobes, a narrower interspiracular width in preorbital snout length of 0.8–1.3 (Miller and Lea 1972; new data) (vs. 1.4–2.7 in *B. abyssicola*; Miller and Lea 1972; Zorzi and Anderson 1988; Stevenson and Orr 2005), and a wider interorbital width of 5.8–6.6 % TL (Table 2) vs. 3.8–4.6 % TL in *B. abyssicola* (Stevenson and Orr 2005). It can also be distinguished from other skates in the area by its lack of scapular thorns and in having a uniform salty gray coloration both dorsally and ventrally in adults, as well as a ventral surface covered with denticles (Ebert 2003).

Bathyraja microtrachys (Osburn and Nichols 1916) Fine-spined Skate; Figure 4

Description of New Specimens from British Columbia.—Five specimens (RBCM 005-0137-001, -002, -003, -004 [Fig. 4], -005); 670–695 mm TL, SW of Tofino, Vancouver Island, 48.5830°N, 126.8838°W, 1939–1951 m depth, 10 October 2005, F/V *Frosti*, haul 20, benthic trawl, collected by J Boutillier. BOLD accession numbers are

TABLE 2. Measurements in millimeters (mm), proportions of total length (TL) with or without caudal filament (cf), and meristic counts for the holotype of *Bathyraja spinosissima* and new specimens from the eastern Bering Sea and British Columbia. Values for the holotype were taken from the original description, counted from the radiograph and photo, or measured from the photo (in **bold**). Missing entries for the holotype were not available. RBCM 16121 was not radiographed; vertebral counts are not known.

	UW 157183			CAS-SU 46500		RBCM 16121	
	mm	% TL w/o cf	%TL w/cf	mm	%TL w/cf	mm	% of TL
Total length	225	—	—	—	—	1461	—
Total length + caudal filament	255	—	—	248	—	1461	—
Disk width	146	64.89	57.25	145	58.47	906	62.01
Disk length	117	52.00	45.88	115	46.37	773	52.90
Snout to end of pelvic fin length	118	52.44	46.27	125	50.40	824	56.39
Snout to maximum disk width	72	32.00	28.24	72	29.03	487	33.33
Dorsal snout length	27	12.00	10.59	23	9.27	165	11.29
Head length	40.6	18.04	15.92	30	12.10	275	18.82
Orbit length	8.6	3.82	3.37	8	3.23	43	2.94
Eyeball length	6.8	3.02	2.67	7	2.82	23	1.57
Orbit to spiracle length	12.1	5.38	4.75	12	4.84	65	4.44
Spiracle length	4.6	2.04	1.80	5	2.02	37	2.53
Interorbital width	14.8	6.58	5.80	14	5.65	151	10.33
IOW (outer orbital margin)	28.6	12.71	11.22	23	9.27	172	11.77
Interspiracular width	21.6	9.60	8.47	25	10.08	150	10.26
Pretail length	104	46.22	40.78	103	41.53	735	50.30
Tail length to D1 origin	92	40.89	36.08	82	33.06	530	36.27
Tail length to D2 origin	106	47.11	41.57	92	37.10	585	40.04
Interdorsal length	4.8	2.13	1.88	3	1.21	7	0.47
Tail length	125	55.56	49.02	135	54.44	618	42.29
Caudal-fin length	—	—	—	—	—	26	1.77
Ventral snout length	22.6	10.04	8.86	27	10.89	147	10.06
Prenasal length	21.5	9.56	8.43	20	8.06	145	9.24
Snout to gill slit 5 length	59	26.22	23.14	48	19.35	400	27.37
Snout to gill slit 1 length	48.5	21.56	19.02	47	18.95	315	21.56
Mouth width	26.2	11.64	10.27	21	8.47	175	11.97
Internarial distance	20.3	9.02	7.96	23	9.27	142	9.71
Nasal curtain length	6.9	3.07	2.71	7	2.82	29	1.98
Width of 1st gill slit	3.2	1.42	1.25	3	1.21	32	2.19
Width of 5th gill slit	2.7	1.20	1.06	2	0.81	22	1.50
Distance between 1st gill slits	45.8	20.36	17.96	44	17.74	294	20.12
Distance between 5th gill slits	32.8	14.58	12.86	30	12.10	202	13.82
Anterior pelvic-fin lobe length	19.4	8.62	7.61	17	6.85	40	2.73
Posterior pelvic-fin lobe length	27.8	12.36	10.90	25	10.08	96	6.57
Tail width at axil	9.5	4.22	3.73	13	5.24	64	4.38
Dorsal-fin 1 length	6.4	2.84	2.51	6	2.42	58	3.96
Dorsal-fin 1 height	3.1	1.38	1.22	—	—	18	1.23
Dorsal-fin 2 length	6.6	2.93	2.59	7	2.82	61	4.17
Dorsal-fin 2 height	3.9	1.73	1.53	—	—	20	1.36
Dorsal-fin 1 to caudal tip	28.3	12.58	11.10	39	15.73	141	3.16
Dorsal-fin 2 to caudal tip	16.9	7.51	6.63	—	—	82	5.61
Teeth	32	—	—	30	—	28	—
Pseudobranchial folds	17	—	—	—	—	18	—
Predorsal vertebrae	~86	—	—	~90	—	—	—
Vertebrae (total)	107	—	—	112	—	—	—
Tail thorns	29	—	—	25	—	29	—
Interdorsal thorns	2	—	—	0	—	0	—
Total thorns	31	—	—	25	—	29	—

TZFPB352-05, TZFPB353-05, TZFPB355-05, TZFPB351-05, and TZFPB354-05, respectively. Catalog numbers in BOLD differ from the correct numbers presented here because of

duplicated records at RBCM. Morphometric and meristic data are presented in Table 3; 1 specimen (RBCM 005-0137-001) with a truncated tail was not included.

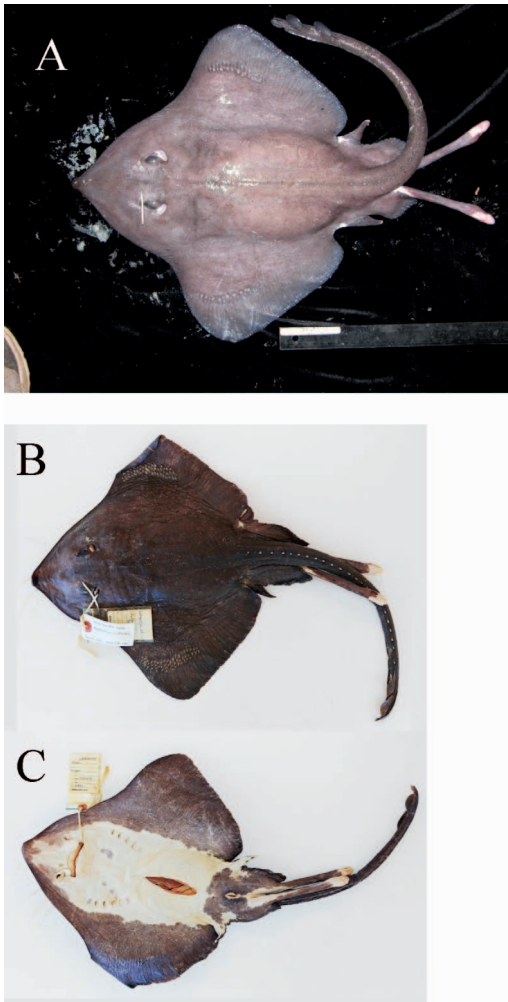


FIGURE 4. One of 5 specimens of *Bathyraja microtrachys*, the Fine-spined Skate, recorded from British Columbia (RBCM 005-00137-004): (A) live dorsal view; (B) preserved dorsal view; and (C) preserved ventral view.

All adult males with fully developed claspers. Disc wider than long, anterior margin moderately to strongly scalloped, apices of pectoral fins moderately rounded; anterior lobes of pelvic fins moderately rounded; disc shorter than tail; snout soft, flexible, especially near tip, internal supporting rostral cartilage slender and weak; teeth small, numerous, 21–28 rows in upper jaw; interorbital space flat to slightly concave; thorns absent from disc; tail thorns 19–24, interdorsal thorns 0; dorsal surface of head and body uniformly covered

with small denticles, ventral surface naked; dorsal fins small, well separated, about equal in height and length.

In life and preservation, dorsal surface uniform light to darker brown (Fig. 4AB); ventral surface of body mostly dark (Fig. 4C), central part of body and anterior lobes of pelvic fins white, with scattered darker mottling, ventral surface of pectoral fins from their bases to tips dark to lighter brown, area around cloaca to base of tail and posterior lobes of pelvic fins typically dark, claspers dark except for light tips; tail entirely dark in 3 specimens, with lighter mottling in 2 specimens.

Sequence Data.—The specimens from British Columbia were originally identified as *Bathyraja violacea*. However, sequence data are 3.3% divergent from the *B. violacea* sequence in the GenBank and BOLD databases (DQ665298.2/GBGC1479-06), which was taken from a specimen (UW 113488) identified and sequenced as *B. violacea* by Spies and others (2006) and Stevenson and others (2007). This sequence is the only publicly available data from a confirmed specimen of *B. violacea*.

Discussion.—Other similar skates known from deep waters (>2000 m) of the region include *Amblyraja badia* (Garman), *Bathyraja abyssicola*, *B. trachura* (Gilbert), and now *B. spinosissima*. All except *B. trachura* and *B. spinosissima* have thorns on the disc, and *B. abyssicola* and *B. spinosissima* have denticles on the ventrum, unlike *B. microtrachys*. In *B. trachura*, the tail is longer than the disc length, larger denticles are present on the disc and especially the tail, and the dorsal surface is darker brown to black—all characters that differ from *B. microtrachys*.

Presumably because of the absence of thorns on the disc combined with its brown dorsal coloration, Steinke and others (2009, supplement) and Coulson and others (2011) misidentified these specimens as *B. violacea*, and Coulson and others (2011) questioned the identifications of *B. violacea* by Spies and others (2006) and Stevenson and others (2007). However, Suvorov (1935), author of the original description of *B. violacea*, described the species (as *Raja violacea*) from the Sea of Okhotsk based on 2 specimens, captured at depths of 47 m and 100 m. The English summary of this description includes the phrase “Ventral side white” (Suvorov, 1935:433). The specimen (UW 113488) reported by Spies and others (2006) and Steven-

TABLE 3. Proportional measurements and meristic counts for new specimens of *Bathyraja microtrachys* from British Columbia. Morphometric data are given in percent TL (total length) and presented as the range, followed by the mean \pm standard deviation (SD).

Category	<i>n</i>	Range	Mean \pm SD
Total length	4	670–695	680 \pm 10.8
Disk width	4	55.6–59.3	56.8 \pm 1.7
Disk length	4	48.9–50.8	50.1 \pm 0.9
Snout to maximum disk width	4	29.6–33.1	31.2 \pm 1.8
Dorsal snout length	4	12.6–13.3	12.9 \pm 0.3
Head length	4	18.5–20.1	19.3 \pm 0.6
Orbit length	4	2.4–3.0	2.8 \pm 0.2
Eyeball length	4	1.6–2.2	2.0 \pm 0.3
Orbit to spiracle length	4	4.2–4.8	4.5 \pm 0.2
Spiracle length	4	2.0–2.4	2.2 \pm 0.2
Interorbital width	4	4.1–5.5	4.7 \pm 0.6
Interorbital width (outer orbital margin)	4	5.9–6.7	6.3 \pm 0.4
Interspiracular width	4	6.6–7.7	7.1 \pm 0.5
Pretail length	4	45.9–48.8	47.5 \pm 1.2
Tail length to D1 origin	4	38.8–42.2	40.9 \pm 1.5
Tail length to D2 origin	4	44.6–47.1	45.9 \pm 1.1
Interdorsal length	4	0.9–1.4	1.0 \pm 0.2
Tail length	4	51.3–54.1	53.0 \pm 1.2
Caudal-fin length	4	1.9–4.5	3.2 \pm 1.1
Ventral snout length	4	11.1–12.2	11.8 \pm 0.5
Prenasal length	4	10.2–11	10.7 \pm 0.3
Snout to gill slit 5 length	4	25.9–27.2	26.7 \pm 0.6
Mouth width	4	9.3–9.8	9.5 \pm 0.3
Internarial distance	4	7.5–8.8	8.3 \pm 0.6
Nasal curtain length	4	3.4–4.1	3.7 \pm 0.4
Width of 1st gill slit	4	1.3–1.3	1.3 \pm 0
Width of 5th gill slit	4	0.9–1.0	0.9 \pm 0.1
Distance between 1st gill slits	4	14–15.6	14.6 \pm 0.7
Distance between 5th gill slits	4	10.1–10.9	10.4 \pm 0.4
Anterior pelvic-fin length	4	9.2–9.7	9.4 \pm 0.2
Posterior pelvic-fin lobe length	4	15.6–16.2	15.9 \pm 0.2
Tail width at axil	4	4.1–5.0	4.6 \pm 0.4
Dorsal-fin 1 length	4	3.3–4.9	3.9 \pm 0.7
Dorsal-fin 1 height	4	1.6–2.2	2.0 \pm 0.3
Dorsal-fin 2 length	4	3.3–4.1	3.7 \pm 0.4
Dorsal-fin 2 height	4	1.9–2.4	2.1 \pm 0.2
Dorsal-fin 1 to caudal tip	4	9.9–14.5	11.9 \pm 1.9
Dorsal-fin 2 to caudal tip	4	5.5–9.1	7.1 \pm 1.5
Teeth	4	21–28	23.8 \pm 3.1
Tail thorns	4	19–24	21.3 \pm 2.2
Interdorsal thorns	4	0	0
Pseudobranchial folds	4	12–17	13.8 \pm 2.4
Total thorns	4	19–24	21.3 \pm 2.2

son and others (2007) was collected in the western Aleutian Islands within 2000 km of the type locality, at a depth of 261 m, and has a white ventrum. In contrast, the 5 specimens labeled “*Bathyraja violacea*” by Steinke and others (2009, supplement) and Coulson and others (2011) were collected some 9000 km from the type locality, at a depth of 1945 m, and have a heavily pigmented ventrum with a distinct white central band, as described for *B. microtrachys* by Last and others (2016). In addition,

the specimen identified by Spies and others (2006) and Stevenson and others (2007) matches the original and other descriptions of *B. violacea* in all other particulars, including most significantly in lacking a pseudosiphon (Ishihara and Ishiyama 1985; Stevenson and others 2004). The 5 specimens from British Columbia are males with a clearly defined pseudosiphon. These specimens also have a COI sequence 3.3% divergent from the *B. violacea* from the Aleutian Islands. Thus, we agree with the assessment of

Coulson and others (2011) that “a possible misidentification” lies at the root of this discrepancy, but the misidentification was theirs. The specimen from the Aleutian Islands (UW 113488) represents *B. violacea*, and based on our examination of the specimens, the RBCM material from British Columbia represents *B. microtrachys*.

Acknowledgments.—We thank K Maslenikov and L Tornabene for collections support, G McFarlane for discussions, and T Pietsch, N Laman, and M Love for their critical reviews of the manuscript. This project was funded in part by the North Pacific Research Board, grant number 1509.

LITERATURE CITED

- BALDWIN ZH, ORR JW. 2010. A new species of the snailfish genus *Paraliparis* (Scorpaeniformes: Liparidae) from the eastern Bering Sea. *Copeia* 2010:640–643.
- BEEBE W. 1926. *Arcturus Adventure: An account of the New York Zoological Society's first oceanographic expedition*. New York, NY: GP Putnam's Sons. 439 p.
- BEEBE W, TEE-VAN J. 1941. Part 3: Fishes from the tropical eastern Pacific, rays, mantas and chimaeras. *Zoologica* 26:245–280.
- CARLISLE AB, LAUNER AL, EBERT DA. 2015. *Bathyraja microtrachys*. The IUCN Red List of Threatened Species 2015: e.T161683A80675182. <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T161683A80675182.en>. Last accessed 23 July 2018.
- COULSON MW, DENTI D, VAN GUELLEN L, MIRI C, KENCHINGTON E, BENTZEN P. 2011. DNA barcoding of Canada's skates. *Molecular Ecology Resources* 11:968–978. doi: 10.1111/j.1755-0998.2011.03034.x.
- DOLGANOV VN. 1999. Geographical and bathymetric distribution of the skates of the Rajidae family in the far eastern seas of Russia and adjacent waters. *Voprosy Ikhtiologii* 39:428–430. [In Russian. English translation in *Journal of Ichthyology* 39:340–342.]
- DOLGANOV VN, TUPONOGOV VN. 1999. Opredelitel' nye tablitsy skatov rodov *Bathyraja* i *Rhinoraja* (sem. Rajidae) dal'nevostochnykh morei Rossii. *Izvestia Tikhookeanskogo Nauchno-Issledovatel'skogo Instituta Rybnogo Khozyaystva i Okeanografii* 126:657–664. [In Russian.]
- DUDNIK YUI, DOLGANOV VN. 1992. Distribution and stocks of fishes on the continental slope of the Sea of Okhotsk and Kuril Islands in summer of 1989. *Voprosy Ikhtiologii* 32:83–98. [In Russian.]
- EBERT DA. 2003. *Sharks, rays, and chimaeras of California*. Berkeley, CA: University of California Press. 284 p.
- EBERT DA, DAVIS CD. 2007. Description of skate egg cases (Chondrichthyes: Rajiformes: Rajoidei) from the eastern North Pacific. *Zootaxa* 1393:1–18.
- EBERT DA, BIGMAN JS, LAWSON JM. 2017. Biodiversity, life history, and conservation of northeastern Pacific chondrichthyans. *Advances in Marine Biology* 77:9–78.
- ESCHMEYER WN, FRICKE R, VAN DER LAAN R (eds). 2017. *Catalog of Fishes: Genera, species, references*. <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>. Electronic version last accessed 23 July 2018.
- FEDOROV VV, CHERESHEV IA, NAZARKIN MV, SHESTAKOV AV, VOLOBUEV VV. 2003. *Catalog of Marine and Freshwater Fishes of the Northern Part of the Sea of Okhotsk*. Vladivostok, Russia: Dalnauka. 204 p. [In Russian.]
- GRIGOROV IV, ORLOV AM. 2013. Species diversity and conservation status of cartilaginous fishes (Chondrichthyes) of Russian waters. *Journal of Ichthyology* 53:923–936.
- HANKE GF, ROIAS SM. 2012. First specimens of the marine eels *Venefica ocella* and *V. tentaculata* (Nettastomatidae) from British Columbia. *Canadian Field-Naturalist* 126:210–216.
- HANKE GF, GILLESPIE G, FONG K, BOUTILLIER J, PEDEN AE, BEDARD JM. 2014. New records of spiny eels (Albuliformes), true eels (Anguilliformes), and bobtail eels (Saccopharyngiformes) in British Columbia, Canada. *Northwestern Naturalist* 95:63–76.
- HANKE GF, GILLESPIE G, FONG K, BOUTILLIER J, NIELSEN J, MØLLER P, BEDARD J, RILEY J. 2015. New records of seven cusk-eels (Ophidiidae) and brotulas (Bythitidae) in coastal waters of British Columbia, Canada. *Northwestern Naturalist* 96:71–80.
- HOFF GR. 2002. New records of the Aleutian skate, *Bathyraja aleutica* from northern California. *California Department of Fish and Game Fish Bulletin* 88:145–148.
- ISHIHARA H, ISHIYAMA, R. 1985. Two new North Pacific skates (Rajidae) and a revised key to *Bathyraja* in the area. *Japanese Journal of Ichthyology* 32:143–179.
- ISHIHARA H, TRELOAR M, BOR PHF, SENOU H, JEONG CH. 2012. The comparative morphology of skate egg capsules (Chondrichthyes: Elasmobranchii: Rajiformes). *Bulletin of the Kanagawa Prefectural Museum (Natural Science)* 41:9–25.
- KENALEY CP, ORR JW. 2006. *Rouleina attrita* (Teleostei: Osmeriformes: Alepocephalidae): New records for the eastern North Pacific and Bering Sea. *Ichthyological Research* 53:200–202.
- KING JR, MCFARLANE GA, ZUBKOWSKI TB. In Press. First record of Commander Skate (*Bathyraja lindbergi* Ishiyama and Ishihara 1977) in Canadian Pacific waters. *Canadian Field Naturalist*.
- LAST PR, WHITE WT, DE CARVALHO MR, SERET B, STEHMANN MFW, NAYLOR GJP. 2016. Rays of the

- world. Clayton, Victoria, Australia: CSIRO Publishing. 373 p.
- LOVE MS, MECKLENBURG CW, MECKLENBURG TA, THORSTEINSON LK. 2005. Resource inventory of marine and estuarine fishes of the West Coast and Alaska: A checklist of North Pacific and Arctic Ocean species from Baja California to the Alaska-Yukon border. OCS Study MMS 2005-030 and USGS/NBII 2005-001. Seattle, WA: US Geological Survey, Biological Resources Division. 288 p.
- MASLENIKOV KP, ORR JW, STEVENSON DE. 2013. Range extensions and significant distributional records for 82 species of fishes in Alaskan marine waters. *Northwestern Naturalist* 94:1–21.
- MILKOVA V, HANKE G, GILLESPIE G, FONG K, BOUTILLIER J, BEDARD J. 2016. Range records for ten species of stomiiform, aulopiform, and myctophiform fishes in British Columbia, Canada. *Northwestern Naturalist* 97:113–123.
- MILLER DJ, LEA RN. 1972. Guide to the coastal marine fishes of California. *California Fish Bulletin* 157. 249 p.
- ORR JW. 2012. Two new species of *Careproctus* (Scorpaeniformes: Liparidae) from the eastern North Pacific. *Copeia* 2012:257–265.
- ORR JW, SINCLAIR EH, WALKER WW. 2005. *Bassozetes zenkevitchi* (Ophidiidae: Teleostei) and *Paraliparis paucidens* (Liparidae: Teleostei): New records for Alaska from the Bering Sea. *Northwestern Naturalist* 86:65–71.
- ORR JW, STEVENSON DE, HOFF GR, SPIES I, MCEACHRAN JD. 2011. *Bathyrāja panthera*, a new species of skate (Rajidae: Arhynchobatinae) from the western Aleutian Islands, and resurrection of the subgenus *Arctoraja* Ishiyama. NOAA Professional Papers NMFS 11. 50 p.
- OSBURN RC, NICHOLS JT. 1916. Shore fishes collected by the “Albatross” expedition in Lower California, with descriptions of new species. *Bulletin of the American Museum of Natural History* 35:139–181.
- PARIN NV. 2001. An annotated catalog of fishlike vertebrates and fishes of the seas of Russia and adjacent countries. Pt. 1. Orders Myxiniformes-Gasterosteiformes. *Journal of Ichthyology* 41(supplement 1):51–131.
- PARIN NV, EVSEENKO SA, VASIL'VA ED. 2014. Fishes of Russian Seas Annotated Catalogue. Moscow: KMK Scientific Press. 733 p.
- PIETSCH TW, ORR JW. 2015. Fishes of the Salish Sea: A compilation and distributional analysis. NOAA Professional Papers NMFS 18. 106 p.
- PITRUK DL, FEDOROV VV. 1990. A new species of the genus *Osteodiscus* Stein (Liparididae) from the Sea of Okhotsk. *Voprosy Ikhtologii* 30:856–859. [In Russian. English translation in *Journal of Ichthyology* 30:112–118.]
- PROVOST C, EBERT DA, ORLOV A. 2015. *Bathyrāja spinosissima*. In IUCN 2017. IUCN Red List of Threatened Species. Version 2010.4. Available from <http://www.iucnredlist.org>. Accessed 23 July 2018.
- SALINAS-DE-LEÓN P, PHILLIPS B, EBERT D, SHIVJI M, CERUTTI-PEREYRA F, RUCK C, MARSH L. 2018. Deep-sea hydrothermal vents as natural egg-case incubators at the Galapagos Rift. *Scientific Reports* 8 (1788):1–7.
- SHEIKO BA, FEDOROV VV. 2000. Chapter 1. Class Cephalaspidomorphi—lampreys. Class Chondrichthyes—cartilaginous fishes. Class Holocephali—Chimaeras. Class Osteichthyes—bony fishes. In Artyukhin YuB, Sheiko BA, editors. *Catalog of vertebrates of Kamchatka and adjacent waters. Petropavlovsk-Kamchatsky, Russia: Kamchatskiy Petchatniy Dvor*. p 7–69. [In Russian.]
- SPIES IB, GAICHAS S, STEVENSON DE, ORR JW, CANINO MF. 2006. DNA-based identification of Alaska skates (*Amblyraja*, *Bathyrāja* and *Raja*: Rajidae) using cytochrome *c* oxidase subunit 1 (COI) variation. *Journal of Fish Biology* 69(Supplement B):283–292.
- SPIES I, STEVENSON DE, ORR JW, HOFF GR. 2011. Molecular systematics of the skate subgenus *Arctoraja* (*Bathyrāja*: Rajidae): Monophyly, cryptic speciation, and genetic support for a newly described species. *Ichthyological Research* 58:77–83.
- STEINKE D, ZEMLAK TS, BOUTILLIER JA, HEBERT PDN. 2009. DNA barcoding of Pacific Canada's fishes. *Marine Biology* 156:2641–2647.
- STEVENSON DE, ANDERSON ME. 2005. *Bothrocara nyx*: A new species of eelpout (Perciformes: Zoarcidae) from the Bering Sea. *Zootaxa* 1094:53–64.
- STEVENSON DE, ORR JW. 2005. New records of two deepwater skate species from the eastern Bering Sea. *Northwestern Naturalist* 86:71–81.
- STEVENSON DE, ORR JW. 2006. *Lycodes akuugun*, a new species of eelpout (Perciformes: Zoarcidae) from the Aleutian Islands. *Copeia* 2006:77–82.
- STEVENSON DE, ORR JW, HOFF GR, MCEACHRAN JD. 2004. *Bathyrāja mariposa*: a new species of skate (Rajidae: Arhynchobatinae) from the Aleutian Islands. *Copeia* 2004:305–314.
- STEVENSON DE, ORR JW, HOFF GR, MCEACHRAN JD. 2007. Sharks, skates, and rattfish of Alaska. Fairbanks, AK: Alaska Sea Grant, University of Alaska. 77 p.
- SUVOROV EK. 1935. *Raja violacea*, a new species of ray from the Okhotsk Sea. *Bulletin de l'Académie des Sciences de l'URSS, Classe des Sciences Mathématiques et Naturelles* 1935:431–433. [In Russian; English summary, p 433.]
- ZORZI GD, ANDERSON ME. 1988. Records of the deep-sea skates, *Raja* (*Amblyraja*) *badia* Garman, 1899 and *Bathyrāja abyssicola* (Gilbert, 1896) in the eastern North Pacific, with a new key to California skates. *California Fish and Game* 74:87–105.

NOAA, National Marine Fisheries Service, Alaska Fisheries Science Center, Resource Assessment and Conservation Engineering Division, 7600 Sand Point Way NE, Seattle, WA 98115 USA (JWO, DES, GRH); james.orr@noaa.gov; Royal British Columbia Museum, 675 Belleville Street, Victoria, British Columbia, BC V8W 9W2 Canada (GH); NOAA, National Marine Fisheries Service, Alaska Fisheries Science Center, Resource Ecology and Fisheries Management Division, 7600 Sand Point Way NE, Seattle, WA 98115 USA (IS); Fisheries and Oceans Canada, Pacific Biological Station, 3190 Hammond Bay Rd, Nanaimo, BC V9T6N7 Canada (JAB). Submitted 9 October 2018, accepted 17 November 2018. Corresponding Editor: Robert Hoffman.