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A new cottid species, *Icelus sekii* (Perciformes: Cottoidei) from Hokkaido, Japan

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Abstract A new cottid species, *Icelus sekii*, is described on the basis of six specimens collected from off Rausu and Urakawa, Hokkaido Island, Japan. This species is distinguished from its congeners by the following combination of characters: supraocular and parietal spines absent; nuchal spine obscure; uppermost preopercular spine unbranched; no scales between dorsal scale row and lateral-line scale row, and no scales below lateral-line scale row; supraocular, parietal, and nuchal cirri present; five dark brown saddles dorsolaterally; anal-fin rays 13; pectoral-fin rays 15; vertebrae 12 + 24–25 = 36–37. *Icelus sekii* can be mature at the smallest size among the species of *Icelus*. As a secondary sexual character, the male holotype has unique ensiform flaps on the distal tips of the first dorsal fin.

Key words Perciformes • Cottidae • New species • *Icelus sekii* • Japan

The cottid genus *Icelus* Krøyer, 1845, is characterized by having 4 preopercular spines, teeth on vomer and palatines, tubed scales with serrated margins or a spiny process forming a distinct lateral line scale row, enlarged plate-like scales with serrated margins or a spiny process forming one or a few dorsal scale rows, and the pelvic fin with 1 spine and 3 soft rays (Nelson, 1984). Sixteen species, widely distributed in the northern North Pacific, northern North Atlantic, and Arctic oceans, are currently recognized, and nine of which are recorded from Japan (Yabe, 1983; Yabe et al., 1983; Nelson, 1984; Yabe, 1984; Tsutsui and Yabe, 1996; Nakabo, 2000).

In 1999, a diving photographer, K. Seki, brought an underwater photograph of a cottid fish taken off Rausu, Shiretoko Peninsula, eastern part of Hokkaido Island, Japan. This fish appeared similar to *Icelus gilberti* Taranetz, 1936, but differed from the latter by having an elongated flap on the tip of each spine of the first dorsal fin. We subsequently collected 6 specimens of this species from shallow waters off Rausu and Urakawa, Hokkaido, and described new species of *Icelus*, based on them.

Material and Methods

Standard length (SL) is used throughout unless indicated otherwise. The methods used for taking both counts and measurements follow Hubbs and Lagler (1958) and Yabe (1991). All fin-ray elements were counted except caudal fin in which only branched rays were counted. Vertebrae and caudal-fin rays were observed and counted from radiographs. Sex was determined by observation of the urogenital papilla and gonads. Terminology for head spines and cirri follows Nelson (1984). The higher classification of the family Cottidae follows that presented by Imamura and Yabe (2002). Symbolic codes for institutions are those provided by Eschmeyer (1998).

***Icelus sekii* sp. nov.**

(New Japanese name: Rausu-kajika)

(Figs. 1, 2; Table 1)

Holotype. HUMZ 187896, male, 40.9 mm, 44°02.1' N, 145°13.2' E, off Rausu, Shiretoko Peninsula, Hokkaido Island, Japan, 20 m depth, 8 Dec. 2003, hand-net, coll. by O. Tsuruoka, T. Abe, H. Munehara, K. Seki, and A. Kawahara.

Paratypes. HUMZ 179902, male, 49.4 mm, off Rausu, Hokkaido, 30 Oct. 2000,

hand-net, coll. by K. Seki; HUMZ 187897, 188573, 2 females, 42.0–49.8 mm, collected with the holotype; HUMZ 187898, male, 53.3 mm, 42°07.7' N, 143°45.3' E, off Urakawa, Hokkaido, 60 m, 26 Aug. 2003, dredge, coll. by K. Maeda; HUMZ 188505, male, 52.3 mm SL, 42°06.3' N, 142°46.3' E, off Urakawa, 73 m, 27 Aug. 2003, dredge, coll. by K. Maeda.

Diagnosis. A smallest species of *Icelus*, probably less than 53 mm SL in maximum, distinguished from congeners by having the following combination of characters: supraocular and parietal spines absent; nuchal spine obscure; uppermost preopercular spine unbranched; a single dorsal scale row; scales of lateral line and dorsal rows with serrated margins; no scales between dorsal scale row and lateral line, nor below lateral line; a small, simple cirrus on upper rim of eye; supraocular, parietal and nuchal cirri present; five saddles on dorsolateral surface of body; anal fin rays mostly 13; pectoral fin rays 15; vertebrae $12 + 24-25 = 36-37$.

Description. Proportional measurements and counts are given in Table 1. Data for paratypes are indicated in parentheses.

Body relatively short, compressed. Head large, slightly compressed, width 1.9

(1.7–2.3) in its length. Caudal peduncle slender, compressed, depth 3.5 (2.8–3.7) in its length. Upper profile of snout steep. Nasal spine short, sharp, directed posterodorsally. Anterior nostril on outer base of nasal spine, forming a short tube. Posterior nostril on anterior margin of orbit, with a low rim. Mouth large; lower jaw extending anteriorly slightly beyond upper jaw. Maxilla extending to a vertical below base of supraocular cirrus. Small conical teeth on jaws, vomer, and palatines. Orbit diameter equal to snout length. Interorbital space narrow, concave, width 3.1 (2.3–3.6) in orbit diameter. Uppermost preopercular spine simple, sharp, directed posterodorsally; lower three spines small, blunt. No spines on lateral surface of infraorbital bones. Branchiostegal membranes united, free from isthmus. Terminal sensory pores of mandibular series opening separately on either side of symphysis. Three pairs of cirri on dorsal surface of head; supraocular cirri developed, exhibiting a narrowly based dermal flap bearing numerous short appendages along distal margin; parietal and nuchal cirri with short appendages along distal margins. A simple short cirrus on dorsal margin of eye. Two simple cirri on posterior end of maxilla. A small cirrus with branched tips on suborbital stay and posterior region of opercle. A cirrus on base of each preopercular spine; cirri on upper two spines branched, those on lower two spines unbranched. A single cirrus present on several lateral line scales.

Numerous small scales scattered on dorsolateral surface of head above suborbital stay. No scales on eye. Both jaws and ventral surface of head naked. Lateral line descending in slight arch from upper border of supracleithrum to level of vertical above seventh anal-fin ray, then running horizontally along body axis. Lateral-line scales large, tubular, with serrated margins dorsally and posteriorly. Mid-sized scales with serrated dorsal margins forming a dorsal scale row. Dorsal scale row originating beneath second spine of first dorsal fin, and extending posteriorly to a vertical above antepenultimate lateral-line scale. Small scales with serrated margins scattered above dorsal scale row, and some on dorsal fin soft-rays. No scales in pectoral axilla, between dorsal scale row and lateral line or below lateral line. Belly naked.

First dorsal fin originating at a vertical above anterodorsal corner of gill opening; base 1.8 (1.7–1.9) in that of second dorsal fin. Third (or fourth) spine of first dorsal fin longest; ensiform (sword-shaped) flaps extending from tips of first to sixth spines (obscure). First and second dorsal fins joined by a low membrane. Second dorsal fin originating above ninth lateral-line scale. Pectoral fin large, rounded; base of uppermost ray beneath third spine of first dorsal fin; seventh ray longest, extending posteriorly to vertical below sixth ray of second dorsal fin; lower six (or seven) rays slightly thickened. Pelvic fin slender, originating beneath second spine of first dorsal

fin; middle ray longest. Anal fin originating below base of fourth ray of second dorsal fin, ending below base of antepenultimate dorsal ray; base 1.4 (1.3–1.5) in that of second dorsal fin. Erect profiles of second dorsal and anal fins with a gently rounded distal margin. Caudal fin slightly rounded, length 3.8 (3.9–4.2) in SL; 11 rays supported by hypural plate; uppermost and lowermost rays unbranched, other middle rays branched; five (5–6) upper and four (4) lower procurrent rays. Soft rays of each fin except for middle rays of caudal fin unbranched. Anus located approximately midway between origins of pelvic and anal fins. Urogenital papilla of male large, conical (absent in females).

Color when fresh.—Ground color of body cream white. Five dark brown saddles across back; one below anterior part of first dorsal fin, three below second dorsal fin, one on caudal peduncle. Body below lateral line, except for both pectoral axilla and belly, reddish brown, with numerous creamy spots. Head below orbit reddish brown. A vertical brown stripe on middle of upper jaw. Occipital region pale brown, with a few small reddish brown spots. Pupil with greenish markings. Ground color of first dorsal fin pale creamy white, bearing reddish brown vermiculations; a circular black blotch on posterior margin. Ensiform flaps of first dorsal fin pale yellow. Second dorsal fin transparent, bearing reddish brown oblique stripes. A black triangular blotch

on base of pectoral fin. Pelvic fin white, with slightly darker spots on base. Anal fin transparent with yellowish brown spots on middle part and edge. Caudal fin transparent, with reddish brown lateral stripes. Cirri darkly pigmented except on lateral-line scales. Urogenital papilla white.

Color in alcohol. - Body pale brown, with five dark saddles dorsolaterally; below lateral line except for pectoral axilla and belly with numerous pale spots. Head darker than body; suborbital region especially dark; three dark blotches on cheek. First dorsal fin transparent with a large dark blotch on posterior margin. Second dorsal fin transparent with oblique dark stripes. Ensiform flaps of first dorsal fin pale. Pectoral fin translucent with triangle dark blotch on base, some dark blotches on each ray. Pelvic fin pale with slightly darker base. Anal fin transparent with dark stripes except for basal part. Caudal fin pale with some dark blotches on each ray. Cirri on head darkly pigmented, those on lateral line scales pale. Urogenital papilla pale.

Distribution. Currently known from off Rausu on the Shiretoko Peninsula and off Urakawa on the Pacific coast of Hokkaido, Japan.

Etymology. The new species is named for Mr. Katsunori Seki, who provided us with the first information of the species.

Comparison. Nelson (1984) recognized 13 valid species in the genus *Icelus*. After

his taxonomic review two more species, (*Icelus mandibularis* Yabe, 1983 and *Icelus ecornis* Tsutsui and Yabe, 1996) were described from the western North Pacific and Okhotsk Sea. Recently, Nakabo (2000) placed *Ricuzenius toyamensis* Matsubara and Iwai, 1951 in *Icelus*. Therefore, 16 species can be currently recognized in the genus. *Icelus sekii* sp. nov. differs from all species of *Icelus*, except for both *I. ecornis* and *I. gilberti* in having a blunt or obscure nuchal spine, and in lacking supraocular and parietal spines (at least the nuchal spine is distinct and well developed in other species). *Icelus sekii* is more similar to *I. gilberti* than to *I. ecornis* in body proportion and counts, but it is distinguished from *I. gilberti* in having a supraocular cirrus, a narrowly based dermal flap bearing numerous short appendages along its distal margin (a stout cylindrical appendage divided distally into several branches in *I. gilberti*), no scales on eye (small scales on anterior and dorsal margin of eye), no scales between the dorsal scale row and the lateral line (several scales present), 5 saddles dorsolaterally (4 saddles), and 15 pectoral fin rays (16). The new species also differs from *I. ecornis* in having a simple uppermost preopercular spine (bifurcate in *I. ecornis*), cirri on the dorsal margin of the eye, suborbital stay, posterior margin of the maxilla, and several lateral line scales (absent), no scales on the eye (small scales scattered on anterior and dorsal margin of the eye), no scales on the pectoral axilla (spiny scales present), five

saddles dorsolaterally (four saddles), 17–19 second dorsal fin rays (19–22), and 13 anal fin rays (16–20). *Icelus ecornis* previously has been known as the smallest species (92.2 mm SL in maximum) among the genus. *Icelus sekii* is smaller than *I. ecornis*, and it can be matured at the smallest size among the genus.

Remarks. In the coastal water off Rausu, adults inhabit cracks in rocks at depths of more than 15 m. The breeding season is in the winter (in December). One of the paratypes (HUMZ 188573, 49.8 mm) has mature eggs (1.7–1.8 mm in diameter). The eggs obtained from a female collected during the breeding season initiated embryonic development and later hatched without the involvement of a male. These facts suggest that the reproductive mode of *Icelus sekii* is internal gametic association and external fertilization as described for other copulating cottid species (Munehara et al., 1989; Koya et al., 2002).

There is no sexual dimorphism except for flaps on first dorsal fin and unogenital papilla. The holotype, a male, has a large ensiform flap extending from distal tip of each spine of anterior part of the first dorsal fin, although such a flap is obscure in the paratypes including 3 males and 2 females. Such flaps have not been described previously in *Icelus*. The second author observed that males of another cottid *Alcichthys elongatus* have elongated flaps on the first dorsal fin concurrently with

sexual maturation. The large ensiform flaps in the holotype of *I. sekii* are a presumably second sexual character for males as observed in *A. elongatus*.

Comparative materials. *Icelus ecornis*: HUMZ 125990 (holotype), a male, 82.3 mm SL; HUMZ 125975, 126002, 126006, 126020, and 126021 (5 paratypes), 2 males and 3 females, 53.4–71.3 mm SL. *Icelus gilberti*: ZISP 25514 (syntype), a female, 90.9 mm; ZISP 25328 (syntype), a male, 75.5 mm SL; HUMZ 87726, and HUMZ 140590, 2 males, 49.0–71.8 mm SL.

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Table 1. Comparative measurements and counts of the holotype and paratypes of *Icelus sekii* sp. nov., *I. gilberti*, and *I. ecornis*

	<i>Icelus sekii</i> sp. nov.		<i>Icelus gilberti</i>	<i>Icelus ecornis</i>
	Holotype HUMZ 187896	Paratypes <i>n</i> = 5	<i>n</i> = 4 ^a	<i>n</i> = 6 ^b
Standard length (mm)	40.4	40.4–53.3	49.0–90.9	53.4–81.8
Measurements (% SL)				
Body depth at first dorsal fin origin	24.8	22.5–24.8	25.7–30.1	21.3–26.2
Body depth at anal fin origin	20.8	17.3–22.3	20.6–21.4	14.0–17.4
Body width at first dorsal fin origin	18.6	16.5–19.6	19.1–24.2	15.7–19.2
Body width at anal fin origin	13.1	9.4–13.6	12.8–13.1	8.9–12.1
Head length	37.4	35.7–38.9	39.0–42.0	33.7–38.0
Head depth	22.5	18.8–22.5	21.0–27.7	19.3–20.2
Head width	19.6	15.6–22.9	22.5–33.0	17.2–21.3
Predorsal length	30.4	30.4–35.6	35.5–37.5	30.1–33.0
Preanal length	54.0	48.6–57.1	48.7–56.1	50.5–54.4
Prepelvic length	32.9	30.4–32.6	29.6–34.4	27.3–29.0
Length of first dorsal fin base	19.8	19.3–23.3	21.8–25.0	15.2–20.1
Length of second dorsal fin base	35.1	35.1–38.5	32.7–37.9	34.1–40.6
Length of anal fin base	25.7	25.2–30.0	27.0–30.1	28.5–36.1
Length of pectoral fin base	13.1	11.4–13.8	24.8–31.9	13.3–13.7
Length of caudal peduncle	23.3	20.2–24.1	18.4–21.9	15.0–21.3
Depth of caudal peduncle	6.7	6.0–7.4	5.7–7.1	4.5–5.1
Snout length	9.4	8.6–11.3	11.2–14.3	8.3–9.8
Length of orbit	10.9	9.0–10.9	10.2–11.6	10.9–12.6
Interorbital width	3.5	2.8–3.9	3.8–4.1	2.4–2.8
Length of upper jaw	17.6	15.6–17.6	17.6–19.7	15.0–18.0
Length of mandible	16.8	14.4–16.8	16.7–18.5	14.5–17.6
Postorbital length of head	17.8	17.4–18.8	18.7–20.0	15.6–17.8
Length of longest pectoral fin ray	31.9	31.9–34.8	26.2–31.9	24.5–29.1
Pelvic fin length	18.3	17.1–20.3	18.5–23.1	14.6–16.6
Caudal fin length	26.0	24.0–26.0	19.4–25.2	17.5–20.7
Counts				
First dorsal fin spines	9	9	9	8–9
Second dorsal fin rays	18	17–19	17–18	20–22
Anal fin rays	13	12–13	12–13	17–20
Pectoral fin rays	15	15	16	18–19
Pelvic fin rays	I, 3	I, 3	I, 3	I, 3
Branched rays of caudal fin	9	9	9	9
Lateral line scales	39	39–40	39	42–45
Scales on dorsal row	39	39–40	35–38	33–36
Vertebrae (abdominal + caudal)	12 + 24	12 + 24–25	12 + 24–25	11–12 + 28–30

^a Consist of two syntypes and two non-types

^b Consist of holotype and five paratypes

Figure captions

Fig. 1. *Icelus sekii* sp. nov., collected from off Rausu, eastern Hokkaido, Japan, depth 20 m. Above holotype, HUMZ 187896, male, 40.9 mm SL, below paratype, HUMZ 187897, female, 42.0 mm SL

Fig. 2. An underwater photograph of *Icelus sekii* sp. nov., male, at off Rausu, depth 20 m (taken by K. Seki, 1 Oct. 1990)

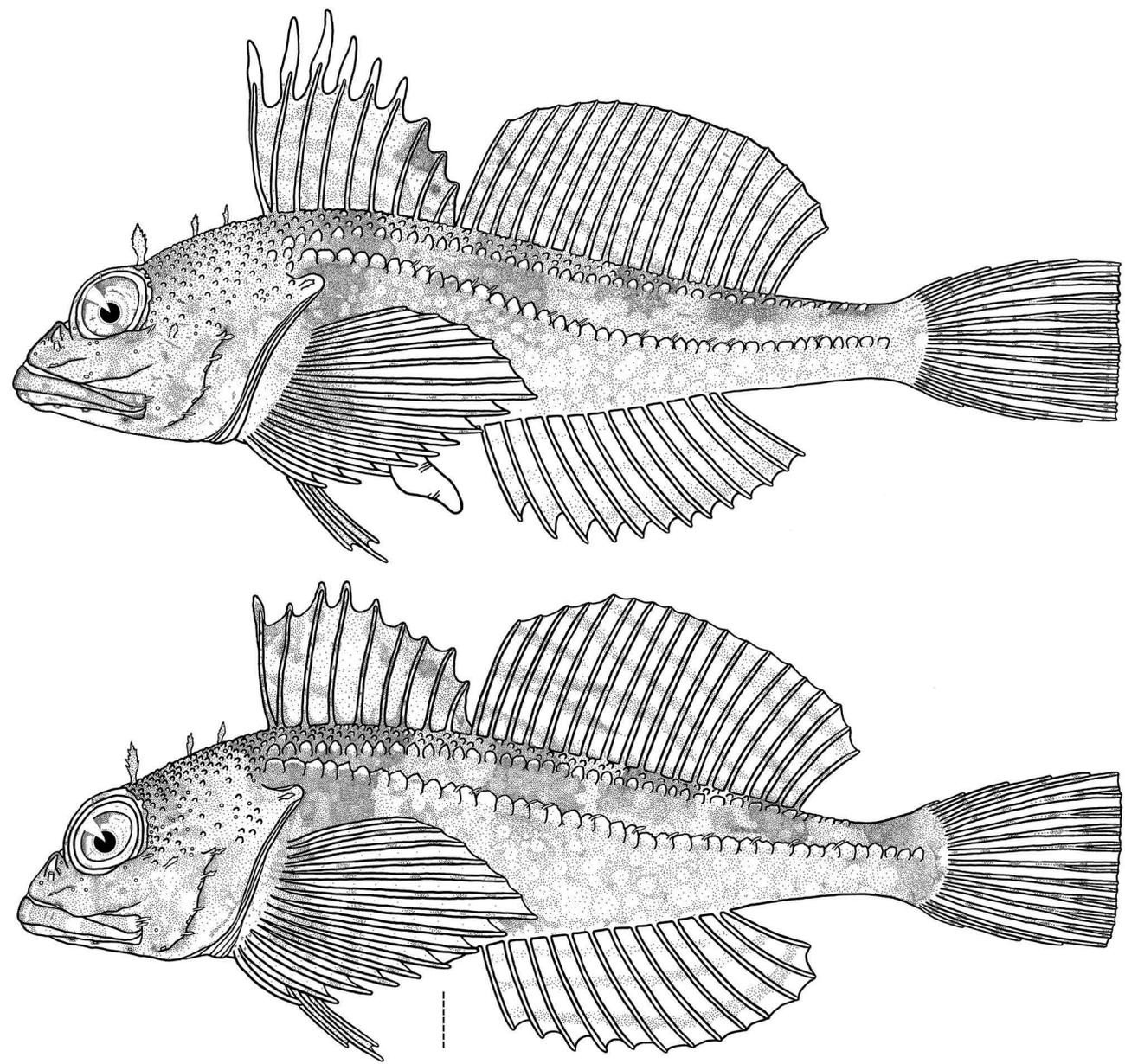


Fig. 1, Tsuruoka et al.,
A new cottid species from Japan,
scale ratio 100%, two-column width



Fig. 2, Tsuruoka et al., A new cottid species from Japan, scale ratio 100%, two-column width