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Taxonomy of *Lycodes matsubarai* Toyoshima, 1985 and *Lycodes yamatoi* Toyoshima, 1985 (Perciformes, Zoarcidae)

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Abstract Two nominal eelpouts, *Lycodes matsubarai* Toyoshima, 1985 from the southern Sea of Okhotsk and *Lycodes yamatoi* Toyoshima, 1985 from the Sea of Japan, were reinvestigated based on the types and additional specimens collected from Japan and adjacent waters. Several disagreements were recognized between the original descriptions and type specimens for *L. yamatoi*, and its diagnostic distinctions from *L. matsubarai* were no longer valid. *Lycodes yamatoi* is identical with *L. matsubarai*, and the latter name is kept for this species. A redescription is provided with some taxonomic remarks.
Key words: Teleostei, Zoarcidae, eelpouts, synonymy, redescription, Sea of Japan, Sea of Okhotsk.

Introduction

Two very similar nominal eelpouts, *Lycodes matsubarai* and *Lycodes yamatoi*, were simultaneously described in the same publication (Toyoshima, 1985). Both taxa belong to Toyoshima's species group D with a ventrolateral lateral line, and are characterized by submental crests moderately high and not fused anteriorly, pectoral fin without a notch, brownish peritoneum, body coloration with several light vertical stripes and vertebral numbers usually more than 100.

According to Toyoshima (1985), *Lycodes matsubarai* is known only from the area of southern shelf of the Sea of Okhotsk, adjoining northeastern Hokkaido where it was collected at depths of 128–480 m, and attains 364 mm total length (TL). Nanbu *et al.* (1992) reported this species from the Sea of Japan for the first time. On the other hand, *Lycodes yamatoi* is common and widely distributed in the Sea of Japan on the bottom at depths of 155–600 m (Toyoshima, 1985; Balanov and Solomatov, 2008; Balanov and Kukhlevsky, 2011; Savely'ev *et al.*, 2011; Sokolovsky *et al.*, 2011; Shinohara *et al.*, 2011). *Lycodes yamatoi* attains 403 mm TL (Savely'ev *et al.*, 2011).

During joint research on the demersal fish fauna of the Sea of Japan and the Sea of Okhotsk, we had an opportunity to examine the type specimens of *L. matsubarai* and *L. yamatoi* and additional specimens from Japan and adjacent waters (Fig. 1). Several disagreements were revealed between the original descriptions of *L. yamatoi* and the type specimens. The holotypes of both eelpouts are considerably decalcificated, and it was impossible to count vertebrae. But the paratypes of *L. yamatoi* have almost the same vertebral counts as those of *L. matsubarai*. All characters reinvestigated here, including diagnoses given by Toyoshima (1985), were found to widely overlap between the two nominal species, thus *L. yamatoi* is identical with *L. matsubarai*. According to the International Code of Zoological Nomenclature (1999), at the simultaneous description of taxa with equal rank, priority is

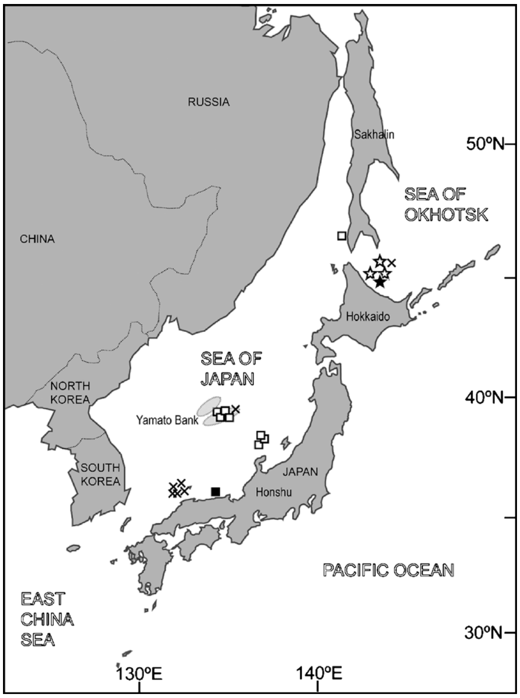

Fig. 1. Collection localities of *Lycodes matsubarai* (stars), *Lycodes yamatoi* (squares) and additional specimens examined here (crosses). — Solid star and square, holotypes; open stars and squares, paratypes.

established by the First Reviser (Article 24.2.1 and 24.2.2). In the present work, we prefer to use *L. matsubarai* (discussed below), and redescribed the species.

Materials and methods

Methods for making counts and measurements follow Anderson (1994) except for isthmus width which is measured between lower ends of the gill openings. The first postorbital head pore (postorbital 1 *sensu* Anderson, 1994) in this species, as well as in some other species of *Lycodes*, actually connects with the suborbital canal. This pore is thus identical with part of the suborbital head pore series, but we follow Anderson (1994) for head pore terminology for comparable results. Head pores were observed by staining with Methylene Blue (Kanto Chemical Co., Inc., Tokyo). Vertebrae and other osteological elements were examined from radiographs. Measurements were made with calipers to the nearest 0.1 mm. Head length (HL) and standard length (SL) are used throughout with total length (TL). Specimens are deposited in the following institutions: Hokkaido University Museum, Hakodate, Japan (HUMZ); Maizuru Fisheries Research Station, Kyoto University, Maizuru (FAKU); National Museum of Nature and Science, Tokyo (NSMT); Osaka Museum of Natural History (OMNH). All specimens were collected from the Sea of Japan or the Sea of Okhotsk (Fig. 1).

Order Perciformes

Suborder Zoarcoidei

Family Zoarcidae

Lycodes matsubarai Toyoshima, 1985

[Japanese name: Matsubara-genge]

(Figs. 2–3, Tables 1–3)

Lycodes matsubarai Toyoshima, 1985, p. 218, fig. 53; Maeda and Maruyama, 1991, p. 372; Nanbu *et al.*, 1992, p. 71, fig. 1; Hatooka, 1993, p. 908, fig.; Anderson, 1994, p. 118; Amaoka *et al.*, 1995, p. 247; Hatooka, 2000, p. 1039, fig.; Hatooka, 2002, p. 1039, fig; Maeda and Tsutsui, 2003, p. 499; Müller and Gravlund, 2003, p. 383; Anderson and Fedorov, 2004, p. 26; Fedorov, 2004: p. S93; Nazarkin, 2010a, p. 9.

Lycodes yamatoi Toyoshima, 1985, p. 208, fig. 49; Maeda and Maruyama, 1991, p. 372; Hatooka, 1993, p. 908, fig.; Anderson, 1994, p. 119; Amaoka *et al.*, 1995, p. 246; Hatooka, 2000, p. 1039, fig.; Hatooka, 2002, p. 1039; Maeda and Tsutsui, 2003, p. 499; Møller and Gravlund, 2003, p. 385; Anderson and Fedorov, 2004, p. 31; Fedorov, 2004, p. S93; Nazarkin, 2010b, p. 603; Balanov and Kukhlevsky, 2011, p. 447; Savely'ev *et al.*, 2011, p. 31; Sokolovsky *et al.*, 2011, p. 246, fig. 94B; Shinohara *et al.*, 2011, p. 52.

Lycodes cf. *yamatoi*: Balanov and Solomatov, 2008, p. 14.

Materials examined. Sea of Okhotsk specimens–HUMZ 33970 (holotype of *Lycodes matsubarai*): 324 mm TL, male, southern part of Kitami-Yamato Bank (44°47′N, 144°01.5′E), 200 m depth, 31 Oct. 1974; HUMZ 33948, 33971–33972, 33974–33979, 33981, 33983

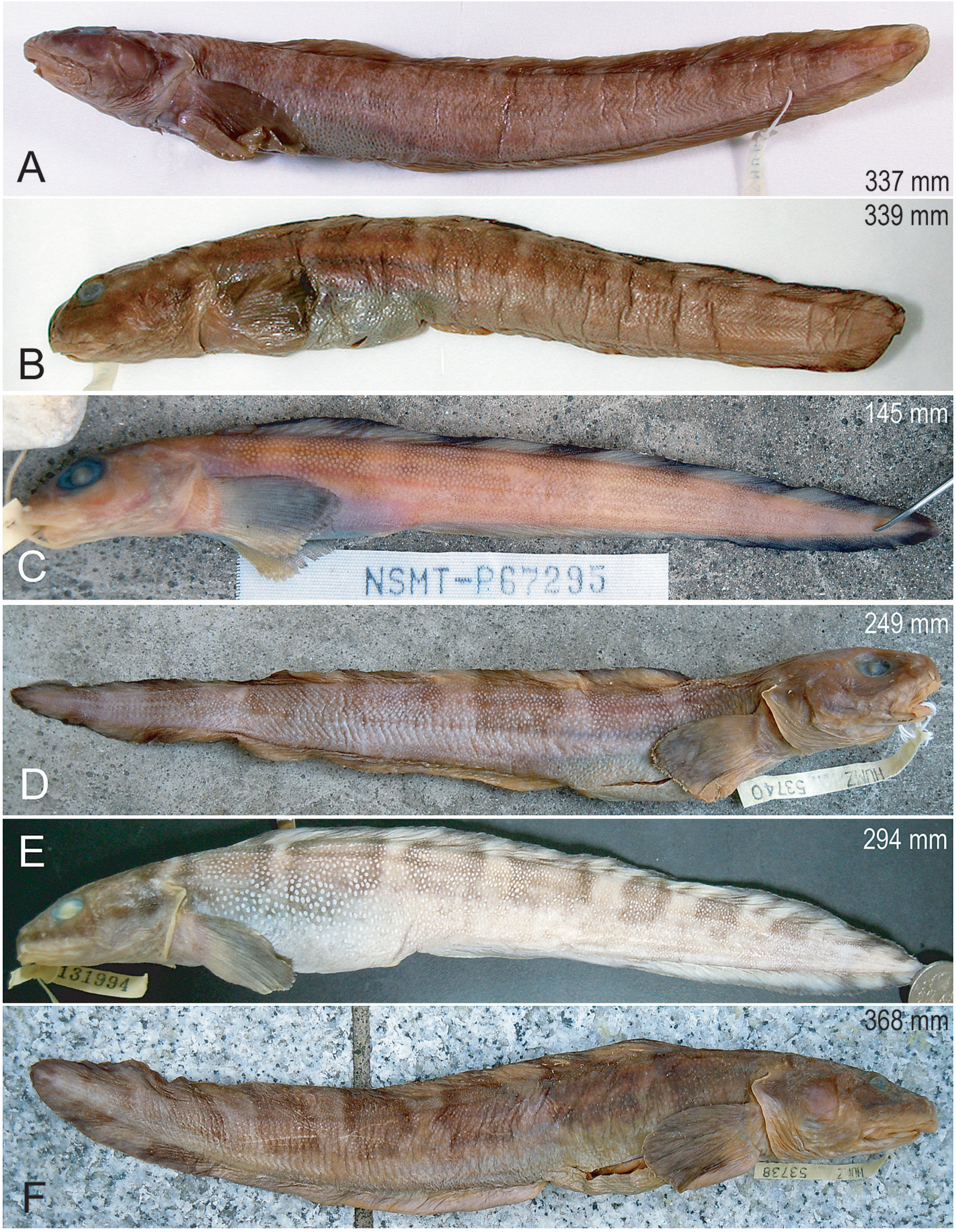

Fig. 2. Type and additional specimens of *Lycodes matsubarai*. — A, HUMZ 33970, male (holotype of *L. matsubarai*, Sea of Okhotsk); B, HUMZ 41094, male (holotype of *Lycodes yamatoi*, Sea of Japan); C, NSMT-P 67295, female (Sea of Japan); D, HUMZ 53740, female (paratype of *L. yamatoi*, Sea of Japan); E, FAKU 131994, female (Sea of Japan); F, HUMZ 53738, male (paratype of *L. yamatoi*, Sea of Japan). Sizes showing TL.

Fig. 3. Color changes from fresh condition (insets) just after capture to alcohol preserved condition in *Lycodes matsubarai*. — A, NSMT-P 99968 (309 mm TL, female, Sea of Japan near Oki Islands, 250–251 m); B, NSMT-P 67247 (252 mm TL, female, Sea of Japan, Yamato Bank, 619–623 m). bs, branchial stripe.

(paratypes of *L. matsubarai*): 268–332 mm TL, 10 males and 1 female, (45°12.5′N, 143°6.5′E), 128 m, 27 Oct. 1975; HUMZ 33950, 33960, 33968–33969 (paratypes of *L. matsubarai*): 316–364 mm TL, 3 males and 1 female, (45°2.5′N, 144°5′E), 235 m, 31 Oct. 1974; HUMZ 49095 (nontype): 301 mm TL, male, 45°37′N, 143°53′E; HUMZ 49096 (paratype of *L. matsubarai*): 314 mm TL, female, (45°37′N, 143°53′E), 290–480 m, 8 Oct. 1975.

Sea of Japan specimens–NSMT-P 61212: 322–342 mm TL, 2 sex unknown, Honshu, off Shimane Pref. (35°38.9′N, 132°1.1′E), 210–220 m, 17 Sep. 1982; NSMT-P 64992: 198–321 mm TL, 2 males and 2 females, R/V *Tanshu-maru*, 2 July 2002; NSMT-P 67247: 252 mm TL, female, Yamato Bank (39°31.41′N, 135°45.71′E), 619–623 m, 26 Aug. 2003; NSMT-P 67295: 125–145 mm TL, 1 juvenile (sex unknown) and 1 female, Yamato Bank, 28 Mar. 2003; NSMT-P 99968, 310 mm TL, female, near Oki Island (36°1.75′N, 132°34.25′E), 250–251 m, 14 May 2009; OMNH-P 17943–17947: 257–282 mm TL, 3 males and 2 sex unknown, Sea of Japan, Kita-yamato Bank; FAKU 3841, 3842: 254 mm, female and 247 mm TL, male, Yamato Bank, (39°04′N, 134°32′E), 363–480 m, 20 June 1982; FAKU 3850: 257 mm TL, male, Yamato Bank (39°05′N, 134°30′E), 354–401 m depth, 19 July 1982; FAKU 3923: 323 mm TL, female, Oki Bank, (37°44′N, 133°46′E), 380–514 m depth, 7 June 1982; FAKU 3924: 262 mm TL, sex

Table 1. Proportional measurements of *Lycodes matsubarai* and *Lycodes yamatoi* with additional specimens.

	Lycodes matsubarai		*Lycodes yamatoi*		Additional specimens
	Holotype 324.0 mm TL	Paratypes ($n=16$) 268.0–364.0 mm TL	Holotype 323.0 mm TL	Paratypes ($n=29$) 156.5–368.0 mm TL	Nontypes ($n=27$) 203.0–335.0 mm TL
% TL					
Predorsal length	22.5	21.5–24.7 (23.1)	26.0	21.9–28.3 (25.6)	23.1–27.4 (25.5)
Preanal length	38.8	38.6–41.5 (39.9)	41.7	38.1–44.2 (41.5)	38.9–45.3 (41.9)
Prepectoral length	20.1	18.4–21.5 (20.1)	21.4	19.7–24.6 (21.6)	18.5–24.5 (21.4)
Prepelvic length	16.2	14.4–18.1 (16.4)	17.2	14.7–21.5 (17.1)	14.2–22.2 (16.8)
Pectoral fin length	12.3	10.9–14.6 (12.3)	11.7	11.1–15.7 (12.5)	10.8–14.2 (12.1)
Pelvic fin length	1.1	1.0–1.5 (1.2)	1.1	0.4–1.7 (0.9)	0.6–1.5 (1.0)
Pectoral fin base height	5.3	4.6–5.7 (5.2)	5.6	4.7–6.7 (5.5)	4.1–6.2 (5.4)
Gill slit length	7.0	6.7–7.9 (7.2)	8.2	6.8–9.2 (7.8)	6.4–9.1 (8.0)
Isthmus width	4.3	3.4–4.7 (4.1)	4.8	3.6–6.0 (4.5)	3.1–5.6 (4.6)
Longest dorsal fin ray length	4.9	3.9–4.9 (4.3)	4.6	3.7–6.1 (4.7)	3.9–6.0 (4.8)
Longest anal fin ray length	3.2	3.2–4.3 (3.7)	3.9	3.3–5.0 (4.2)	3.1–5.1 (4.1)
Caudal fin length	2.1	1.9–2.7 (2.2)	1.7	1.4–3.0 (2.1)	1.3–2.6 (2.1)
Body depth at anal origin	10.5	9.7–10.9 (10.2)	10.4	8.9–10.8 (9.8)	8.8–11.4 (10.1)
Head length (HL)	19.4	18.1–20.9 (19.5)	21.2	18.8–24.6 (20.8)	18.3–22.5 (20.5)
% HL					
Snout length	33.2	28.8–33.1 (31.7)	32.5	27.1–33.9 (31.4)	28.0–33.0 (31.0)
Eye diameter	15.8	14.7–18.9 (16.5)	15.6	12.1–19.7 (16.4)	13.8–21.2 (16.7)
Interorbital width (skin)	17.9	12.3–19.8 (16.1)	15.2	11.9–17.6 (14.7)	12.3–22.1 (15.8)
Interorbital width (bone)	3.2	3.2–5.2 (3.8)	3.4	3.1–5.0 (3.9)	2.9–5.0 (4.1)
Upper jaw length	47.5	37.5–51.4 (45.4)	42.5	33.4–51.3 (40.7)	34.5–47.7 (42.1)

Numbers in parentheses indicating average.

unknown, Oki Bank, (37°44′N, 133°46′E), 380–514 m depth, 7 June 1982; FAKU 131989: 321 mm TL, 1 female, Shimane Pref., west of Oki Islands (35°46.28′N, 132°36.63′E), 210 m, 2 July 2009; FAKU 131993–131995: 266–319 mm TL, 1 male and 2 females, Shimane Pref., west of Oki Islands (35°59.53′N, 132°27.98′E), 319 m, 1 July 2009; FAKU 132007: 335 mm TL, 1 male, Shimane Pref., west of Oki Islands (35°40.55′N, 132°18.18′E), 282 m, 26 June 2009; FAKU 132070: 329 mm TL, off Kannuki-jima Island, Maizuru, Kyoto (36°05′N, 135°25′E), ca. 300 m, 3 Aug. 2009; HUMZ 41094 (holotype of *Lycodes yamatoi*): 323 mm TL, male, Hyogo Pref., off Kasumi, 13 Mar. 1975; HUMZ 41125, 41126: 203–271 mm TL, males, (35°41′N, 132°11′E), 482–650 m, 27.03.1972; HUMZ 42480 (paratype of *L. yamatoi*): 323 mm TL, female, near Okushiri Island (42°8.6′N, 139°41.1′E), 560 m, 4 June 1975; HUMZ 53191 (paratype of *L. yamatoi*): 357 mm TL, male, (46°43′N, 141°33′E), 26 Mar. 1976; HUMZ 53597, 53598, 53601, 53611 (paratypes of *L. yamatoi*): 228.5–288 mm TL, 3 males and 1 female, Yamato Bank (39°17′N, 135°3.5′E), 375 m, 30 May 1976; HUMZ 53618, 53620, 53630 (paratypes of *L. yamatoi*): 179.5–274 mm TL, 3 males, Yamato Bank (39°16.7′N, 135°2.8′E), 31 May 1976; HUMZ 53658, 53668, 53672, 53684 (paratypes of *L. yamatoi*): 209–278 mm TL, 2 males and 2 females, Yamato Bank (39°7.9′N, 135°4.6′E), 435 m, 30 May 1976; HUMZ 53726 (paratypes of *L. yamatoi*): 250.5 mm TL, female, (38°24′N, 137°23′E), 450 m, 4 June 1976; HUMZ 53734–53735, 53737–53738, 53740–53742 (paratypes of *L. yamatoi*): 156.5–368 mm TL, 4 males and 3 females, Yamato Bank (38°23′N, 137°18.3′E), 315 m, 5 June 1976; HUMZ 53856, 53866 (paratypes of *L. yamatoi*): 304 mm TL, male, 243 mm TL, female, Yamato Bank (39°16.8′N, 135°4′E), 450 m, 30 May 1976; HUMZ 53911, 53917–53918, 53921, 53923, 53925 (paratypes of *L.

Table 2. Counts and morphological conditions of *Lycodes matsubarai* and *Lycodes yamatoi* with additional specimens.

	Lycodes matsubarai		*Lycodes yamatoi*		Additional specimens
	Holotype	Paratypes ($n=16$)	Holotype	Paratypes ($n=29$)	Nontypes ($n=27$)
Abdominal vertebrae	20	20–23 (21.2)	21	21–23 (21.6)	21–23 (21.4)
Caudal vertebrae	U	79–84 (82.0)	U (>75)	77–83 (80.5)	77–85 (80.4)
Total vertebrae	—	101–105 (103.2)	—	99–105 (102.1)	100–107 (101.8)
Dorsal fin rays	U	93–99 (96.3)	U	92–98 (95.1)	93–99 (94.8)
Anal fin rays	U	79–84 (81.9)	U	78–83 (80.4)	78–84 (80.4)
Pectoral fin rays	19	18–20 (19.1)	19	19–21 (19.9)	19–21 (19.7)
Caudal fin rays	U	2+4+5=11	U	2+4–5+5=11–12	2+4+4–5=10–11
Vertebra associated with 1st dorsal pterygiophore	U	4–5 (4.8)	6	5–7 (5.5)	5–6 (5.4)
Pleurals	U	20–22 (20.7)	21	20–23 (21.4)	20–22 (21.2)
Epipleurals	U	14–17 (15.5)	15	13–17 (14.6)	12–16 (14.2)
Nasal pores	3	2–3 (2.8)	3	2–3 (3.0)	2–3 (2.0)
Interorbital pores	0	0–1 (0.2)	0	0	0–1 (0.1)
Suborbital pores	9	8–11 (9.0)	9	8–10 (9.1)	8–10 (9.3)
Postorbital pores	4	4–5 (4.0)	4	4–5 (4.0)	3–5 (4.0)
Preoperculomandibular pores	7–8	8 (8.0)	8	8 (8.0)	8 (8.0)
Occipital pores	3	2–4 (3.1)	3	3–4 (3.2)	3–4 (3.1)
Scales rows on nape	17	8–21 (14.2)	25	0–28 (12.9)	0–35 (14.2)
Scales rows between dorsal fin base and anal fin origin	29	22–30 (25.6)	30	21–31 (24.7)	19–30 (25.7)
Scales on belly	To pelvic base	To pelvic base	To pelvic base	From absent to pelvic base	From absent to pelvic base
Scales on pectoral fin base	Present	Present [5]/ absent [12]	Absent	Absent	
Tooth rows in palatine	1	1–2 (1.5)	2	1–2 (1.3)	
Pseudobranch filaments	7	6–9 (7.1)	9	6–9 (7.4)	—
Branchial stripe	0	0	1	0–1 (0.5)	0–1 (0.4)
Body light stripes	7	1–8 (6.1)	8	6–10 (7.5)	6–10 (8.0)
Upper gill rakers	3	3–4 (3.1)	4	2–4 (3.4)	3–4 (3.5)
Lower gill rakers	12	11–14 (12.3)	12	11–16 (12.5)	11–13 (12.0)
Tip of submental crest: blunt /straight/pointed	Pointed	[0/5/12]	Blunt	[19/10/3]	[10/16/1]

Numbers in parentheses indicating average, those in brackets number of specimens.
U, uncountable; — no data.

yamatoi): 205–315 mm TL, Yamato Bank (38°7.5′N, 136°52.2′E), 506 m, 18 June 1976.

Diagnosis. A species of *Lycodes* with the following combination of characters: lateral line ventrolateral; total vertebrae 99–107, usually more than 100; dorsal fin rays 92–99; anal fin rays 79–84; caudal fin rays 10–12; pectoral fin without notch, rays 19–21; pelvic fin very short; submental crests on both sides well developed and free anteriorly; head pores small, without tubes; body with 6–10 light vertical stripes; peritoneum brownish.

Description. Proportional measurements (% SL): body depth at anal origin 8.6–11.7; predorsal length 22.0–29.0; preanal length 38.9–46.3; prepectoral length 14.7–25.0; prepelvic length 13.5–22.7; pectoral fin length 11.0–16.0; gill slit length 6.5–9.4; isthmus width 3.1–6.1; longest dorsal fin ray 3.8–6.2; longest anal fin ray 3.2–5.3; caudal fin length 1.4–3.4; head length 18.4–25.0; snout length 5.5–8.5; eye diameter 2.7–4.8; interorbital width (skin) 2.3–4.1 and (bone) 0.6; upper jaw length 6.5–12.5. Body moderately elongated; its depth at level of anal fin origin usually about 10 times in SL. Head about 4–5 times in SL. Interorbital space very narrow, much smaller than eye diameter. Eye small, its diameter less than half of snout length. Upper jaw moderately protruding forward: all premaxillary teeth not covered by lower jaw as seen from

Table 3. Comparison of original description and reexamination of type specimens in *Lycodes matsubarai* and *Lycodes yamatoi*.

	Lycodes matsubarai		*Lycodes yamatoi*	
	Original description $n=20$	Reexamination $n=17$	Original description $n=36$	Reexamination $n=30$
Proportions				
Times in total length				
Head length	4.8–6.2	4.8–5.5	5.0–5.7	4.1–5.3*
Body depth	9.5–11.1	9.1–10.3*	9.3–10.8	9.3–11.2*
Predorsal length	4.1–4.9	4.0–4.6*	4.0–4.6	3.5–4.6*
Preanal length	2.3–2.7	2.4–2.6	2.4–2.6	2.3–2.6*
Times in head length				
Snout length	3.3–4.0	3.0–3.5*	3.2–3.9	2.9–3.7*
Eye diameter	5.1–6.8	5.3–6.8	5.6–7.2	5.1–8.3*
Isthmus width	3.5–4.9	4.0–5.8*	3.4–4.9	3.2–6.3*
Body depth	1.7–2.1	1.7–2.0	1.6–2.2	1.8–2.5*
Gill opening height	2.2–2.8	2.3–2.9*	2.2–2.5	2.2–2.9*
Times in snout length				
Eye diameter	1.3–2.0	1.5–2.2*	1.4–2.0	1.4–2.8*
Times in eye diameter				
Pelvic fin length	1.7–2.7	2.0–3.5*	2.0–3.0	2.2–8.5*
Counts				
Dorsal fin rays	93–99	93–99	107–111	92–98**
Anal fin rays	77–84	79–84	92–97	78–83**
Pectoral fin rays	17–19	18–20*	19–20	19–21*
Vertebrae	102–107	101–105*	113–120	99–105**

* Wider range values than original description.
** Incongruous values between original description and reexamination.

below.

Posterior margin of maxilla located from vertical through anterior margin of pupil in small specimens (<262 mm TL) to slightly behind eye in larger ones, its length sexually dimorphic (Fig. 4). Oral valve absent. Nostril very short, its height approximately equal to pupil diameter. Submental crests comparatively high and not fused to each other anteriorly; anterior lobes usually blunt or straight but rarely slightly pointed, as in holotype. Labial lobe of lower lip well developed. Gill opening relatively large, its lower end at level or slightly beneath lower end of pectoral fin base. Isthmus width more than 1.5 times of eye diameter. Pseudobranch filaments 6–9. A slit behind 4th gill arch. Gill rakers flat and triangular without spinules on first gill arch, with $2–5+11–16=14–18$; internally 12–17 blunt rakers. Pyloric caeca 2, short and nub-like.

Jaw teeth conical and blunt. Tooth counts on upper jaw in outer row 5–24 (average 12.6) increasing anteriorly. Anterior part of upper jaw with 1 inner row (very rarely 2), containing up to 8 teeth. Lower jaw with 6–23 teeth in inner row, and 2–16 teeth in 1–4 outer rows. Vomerine teeth 1–9 in a patch. Palatine teeth 1–24 in 1–2 rows.

Vertebrae $20–23+77–85=99–107$. Vertebrae moderately elongated horizontally; abdominal ones usually slightly asymmetrical. Pleural ribs present to last or penultimate abdominal vertebra; epipleurals to vertebrae 12–17. First dorsal pterigiophore associated with 4th to 7th neural spines, usually on vertebrae 5–6. Zero to 3 anal fin pterigiophores present before first haemal spine.

Dorsal and anal fins not high, lower than half of body depth. Dorsal fin rays 92–99, branched except anterior 1–5 and posterior 0–2 rays; anal fin rays 78–84, branched except anterior 0–2 and posterior 0–1 rays. Caudal fin short, with 10–12 rays: 2 on epural and 4–5 on upper and lower hypurals, all rays usually branched, sometimes one or both epural rays unbranched. Pectoral fin rays 18–21, branched except lowermost one

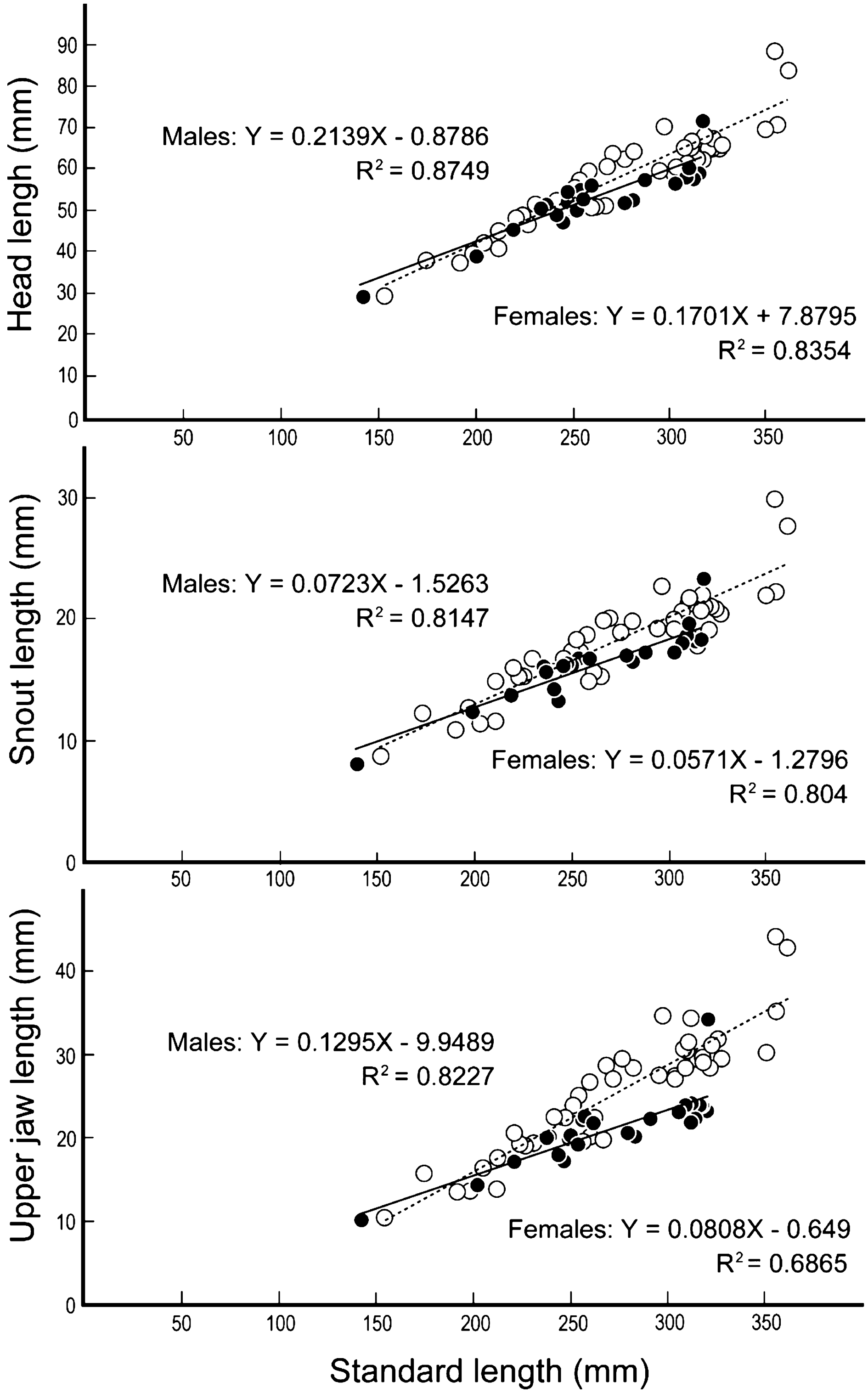

Fig. 4. Sexual dimorphisms of head length, snout length and upper jaw length in *Lycodes matsubarai*. — Open circles, males; solid circles, females. Broken line, regression line for males; straight line, regression line for females.

sometimes unbranched. Posterior margin of pectoral fin rounded without notch. Pelvic fin base in front of a line connecting lower ends of gill openings, on line or slightly behind. Pelvic fin very short with 3 segmented rays.

Body covered with cycloid scales. Between anal fin origin and dorsal fin base 19–31 scale rows. Nape before dorsal fin origin naked in 15% specimens; 1–35 cross-rows of scales in other specimens, usually reaching forward up to a level of gill opening. Scales on belly usually reaching pectoral and pelvic fin bases; sometimes belly naked. Scaled areas of both sides rarely joined on belly ahead of anus forming only 1–10 cross-rows. Scales on pectoral fin base usually absent; a few scattered scales (forming up to 4 rows) in about 1/3 of specimens from Sea of Okhotsk, including holotype. Vertical fin bases scaled anteriorly; up to 90% their height posteriorly.

All head pores noticeably smaller than nostril diameter. Nasal pores usually 3. Interorbital pore usually absent. Postorbital pores 4; very rarely some pores doubled or posteriormost pore absent. Occipital pores 2–4, usually 3. Suborbital pores 9–11: 7 below and 2–4 behind eye. Preoperculomandibular pores usually 8: 4 from dentary, 1 from anguloarticular and 3 from preopercle.

Free head neuromasts: 5–6 in semicircle under nostril base, 5 in postorbital series, 1 above upper preopercular pore and 1 from each side behind occipital commissure. Main branch of trunk lateral line configuration ventrolateral, containing 30–47 neuromasts in abdominal (descending) part. Main branch running posteroventally to a level from anterior margin of anus to 7th anal fin ray base, then running medially. Medial part visible almost up to caudal fin base, containing up to 77 neuromasts. Up to 19 neuromasts in dorsolateral line, running to a level of posterior 1/5 of anal fin. Predorsal line with 4–7 neuromasts.

Color in alcohol. Color variation is shown in Fig. 2 and color when fresh in Fig. 3. Head and body dark brown dorsally. Belly and bottom of head, lips, nostrils and edge of gill slit lightly grey. Head pores frequently surrounded by light dots. Gill openings connected by a straight light stripe (= branchial stripe; Fig. 3) in half of Sea of Japan specimens; Sea of Okhotsk specimens without branchial stripe. Six to 10 light vertical stripes on sides of body, dorsally reaching almost to edge of dorsal fin. Large individuals sometimes having dark areas on top of light Y-shaped stripes. Light vertical stripes reaching to mid-body ventrally, making dark brown rectangular saddles. Almost all specimens with 2–4 dark spots on anal fin opposite posterior dark body regions. Pectoral fin dark brown with light edged rays; a few lower rays and ventral part of base light. Mouth and branchial cavities and peritoneum dusky brown with dense dots.

Distribution. Southern part of the Sea of Okhotsk off Hokkaido, Sea of Japan coast off Promorskii Krai to Peter the Great Bay, off southern Sakhalin to western Honshu Island, Japan and Yamato Bank (Toyoshima, 1985; Balanov and Solomatov, 2008; Savely'ev *et al.*, 2011; Present study). Depths: 128–623 m.

Discussion

According to Toyoshima (1985), *Lycodes yamatoi* can be reliably distinguished from *Lycodes matsubarai* by vertebral number and vertical fin ray counts, i.e. total vertebrae 113–120 with 107–111 caudal (vs. 102–107 with 81–85 in the latter species), dorsal fin rays 107–111 (vs. 93–99) and anal fin rays 92–97 (vs. 77–84). These differences were followed by Hatooka (2002). But our reexamination revealed that Toyoshima (1985) showed incorrect values for these characters and *L. yamatoi* cannot be separated from *L. matsubarai* by any meristic or morphometric characters (Table 3).

Although a slightly higher frequency of citations of the name *Lycodes yamatoi* can be found in previous studies, we prefer to adopt *Lycodes matsubarai* for this species for two reasons. First, the original description of *L. yamatoi* contained a larger number of errors than that of *L. matsubarai* (Table 3). The original description of *L. matsubarai* is more rigorous than that of *L. yamatoi*.

Second, the name *L. yamatoi* was derived from the type locality, Yamato Bank (Yamato-tai in Japanese). Yamato Bank was named after the research vessel *Yamato* of the Imperial Japanese Navy, which discovered this bank. In this case not -*i* but -*ensis* or no suffix is usually used. The specific name "*yamatoi*" sounds imperfect to us because it is clearly not based on a personal name.

Balanov and Solomatov (2008) reported a relatively abundant eelpout, *Lycodes* cf. *yamatoi*, from the Sea of Japan off Primorsky Krai and Sakhalin, Russia, stating "*L. yamatoi* is most closely related to them in coloration and the pattern of scales location on the body, however, slightly differing in meristic characters (Toyoshima, 1985; our unpublished data)." Because Savely'ev *et al.* (2011) used same specimens for their investigation and identified them as *L. yamatoi*, *L.* cf. *yamatoi* should be included in the synonymy.

The high variation of scaled areas found in the Sea of Japan specimens is thought to be very unusual among species of *Lycodes*. Presence or absence of abdominal scales was found in both sexes and various sizes (125–323 mm TL). Lack of abdominal scales is related to the development of scales on the nape because approximately 1/3 of our specimens with naked abdomens lack scales on the nape (the other 2/3 had 1–14 rows across the nape before the dorsal fin origin).

Savely'ev *et al.* (2011) demonstrated some sexual dimorphism in the Sea of Japan specimens, involving head length (21.9% TL in males vs. 20.8% TL in females), snout length (7.0% TL vs. 6.6% TL) and upper jaw length (45.4% HL vs. 41.3% HL). The growth lines of these characters look different between males and females in our specimens (Fig. 4), especially larger than 200 mm SL. Although the regression line slopes of males and females indicate a significant difference ($t=3.049$, $df=66$, $P<0.01$) in upper jaw length and head length ($t=1.998$, $df=66$, $P<0.05$), snout length was not significant (data given in Appendix 1). But the male and female discrimination is superficially difficult to observe because some females have prominently longer head and upper jaws than similarly-sized males.

Taxonomic remarks. Toyoshima (1985) designated 6 more paratypes (HUMZ 53610, 53634, 53682, 53798, 53805 and 53817) for *L. yamatoi* and 3 more paratypes (HUMZ 33974, 49045 and 33950) for *L. matsubarai* than we found. These paratypes were not examined, as they could not be found at HUMZ. Raw data for existing type specimens are shown in Appendices 2–3.

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Appendix 1. Specimens used in Fig. 4. Males ($n=45$): FAKU 3850, 3842, 131995, 132007, 132070; HUMZ 33970*, 33948*, 33071*, 33972*, 33975*, 33976*, 33977*, 33978*, 33979*, 33981*, 33983*, 33950*, 33960*, 33968*, 41094*, 41125, 41126, 49095, 53591*, 53598*, 53611*, 53618*, 53620*, 53630*, 53668*, 53684*, 53734*, 53735*, 53738*, 53742*, 53856*, 53911*, 53925*; NSMT-P 64992 (2 of 4) ; OMNH 17943, 17944, 17947. Females ($n=25$): FAKU 3841, 3923, 131989, 131993, 131994; HUMZ 33969*, 49096*, 42480*, 53597*,53658*, 53672*, 53726*, 53737*, 53740*, 53741*, 53866*, 53917*, 53918*, 53921*, 53923*; NSMT-P 64992 (2 of 4), 67247, 67295 (1 of 2), 99968. Asterisks indicate type specimens and data are extractable from Appendices 2–3. Raw data (mm) of nontypes are shown below.

Males

	FAKU 131995	FAKU 132007	FAKU 132070	FAKU 3850	FAKU 3842	HUMZ 41125	HUMZ 41126	HUMZ 49095	NSMT-P 64992	NSMT-P 64992	OMNH 17943	OMNH 17944	OMNH 17947
SL	259.6	327	322.1	251.4	241.5	198.2	266.1	294.7	310	191.7	253.5	276	259
HL	50.9	65.9	67.6	55.6	52.7	39.7	51.4	59.7	61.4	37.4	253.5	62.5	59.6
SN	15	20.5	21.2	17.5	15.8	12.8	15.4	19.3	19.2	11	253.5	19	18.8
UJ	20	29.5	31.2	23.9	22.5	13.7	19.7	27.5	23.1	13.6	253.5	29.5	26.7

Females

	FAKU 131989	FAKU 131993	FAKU 131994	FAKU 3841	FAKU 3923	NSMT-P 64992	NSMT-P 64992	NSMT-P 67295	NSMT-P 67247	NSMT-P 99968
SL	316.7	314	288.4	248.2	317.7	311.8	277.5	141.9	254	303.1
HL	59	58.4	57.2	54.4	71.5	57.5	51.8	29.2	54.7	56.9
SN	18.4	17.9	17.3	16.4	23.3	18.1	17	8.2	16.6	17.3
UJ	23.5	23.7	22.2	20.5	34.1	22.3	20.5	10.1	22.1	23.1

SN, snout length; UJ, upper jaw length.

Appendix 2. Measurements (mm) and counts of type specimens in *Lycodes matsubarai* Toyoshima, 1985.

HUMZ	33970*	33948	33971	33972	33974	33975	33976	33977	33978	33979	33981	33983	33950	33960	33968	33969	49096
#01	317.2	303.1	308.5	319.7	325.3	307.5	314.6	262.2	308.1	303.2	281.2	321.3	355.3	310	311.3	309.4	306.7
#02	72.9	69	75.3	76.2	76.8	73.9	74	64.5	74.4	71.9	62	79.3	81.1	72	79.1	70	67.8
#03	125.6	124.1	128.4	132.4	134.5	126.5	127	103.5	123.3	123.5	112.6	132.4	140.6	129	132.8	125.9	124
#04	65	62	63.5	65.3	70.1	66.5	64.5	53	63.5	62.2	53.1	66.8	72.4	68	68.6	58.8	60.1
#05	52.5	50.5	51.9	51.6	58.1	53	51.6	42.3	52.3	47.7	41.4	59.3	61	55	54.5	47.4	51.7
#06	39.8	36.8	40.4	38.2	40.2	40.5	36.3	39	38.6	38.5	31.4	41.9	41.6	38.8	43.1	37.3	38.2
#07	3.7	3.8	3.7	3.4	3.8	4.8	3.8	4	3.8	4.6	3.4	4.9	4	3.3	3.2	3.5	3.4
#08	17.3	15.4	14.4	16.3	15.7	17	17	14.5	17.1	16.1	15.3	16.3	19.5	16.7	18.1	16.5	14.7
#09	22.7	21.3	22.4	24.1	23.5	22.4	23.3	18.6	22.7	20.9	22.8	24.5	26.4	23.2	23.5	22.4	21
#10	14	14.3	12.7	11.2	15	12.1	13.2	12.6	12.4	11.2	10.7	13.6	15.4	13.6	11.6	12.6	14.2
#11	15.9	14.2	14.2	13.6	13.8	14.5	14	10.9	13.6	14.5	11.2	16.2	14.9	—	14.8	12.5	12.4
#12	10.3	12.2	12.5	13.1	11.7	10.1	12.3	9.2	10.1	13.3	10.1	12.1	12.3	—	13	10.4	12.3
#13	6.8	6.9	6	7.3	6.7	7.5	7.4	5.8	5.9	7.8	6.8	6.7	8.7	7	8.7	6.6	7.3
#14	34	32.4	30.5	33.7	35	32.8	31.9	26.7	30.5	32.3	30	33.5	35.3	34.7	34.1	31.3	31.2
#15	62.7	58.6	62	65.2	65.6	65.2	62.4	51	61.7	60.8	52.1	64.8	70.8	65.3	66.9	58.2	57.8
#16	20.8	19.3	19.8	21.2	20.9	20.8	18	15.8	19.7	20.1	16.6	19.2	22.4	21.4	21.8	18.7	18.1
#17	9.9	9.6	10.7	9.8	10.1	11.2	11.8	9.6	9.5	9.3	8.8	10.6	10.4	10.4	11.1	9.7	9.7
#18	11.2	10	10	10.2	11	11.2	11.8	9.2	9.4	10.5	9.3	12.8	9.8	9.1	10.3	7.6	7.1
#19	2	2	2.3	2.3	2.5	2.5	2.3	1.8	2	2	1.7	2.2	3.2	2.6	3.5	2.2	2.3
#20	29.8	27	28.4	28.5	31.9	30.7	29.4	22.4	30.4	27.5	20	28.3	35.2	31.6	34.4	21.8	23.7
#21	20+U	22+82	21+84	21+>83	21+80	20+82	22+83	21+81	21+83	21+83	20+84	22+81	20+83	21+80	U	22+83	23+79
#22	U	97	99	U	93	96	97	96	96	98	U	97	95	95	U	98	95
#23	U	81	84	U	80	83	84	81	83	83	U	82	82	79	U	83	80
#24	19	19	19	18/19	19	19	19/20	19	19	19	19/20	19	19	19	19	19	19
#25	U	U	2+4+5	U	2+4+5	2+4+5	U	U	U	U	U	U	2+4+5	2+4+5	U	2+4+5	U
#26	U	4	5	5	5	4	5	5	5	5	5	5	5	4	U	5	5
#27	U	21	21	21	20	20	21	21	21	21	20	22	20	20	U	22	20
#28	U	17	17	16	15	16	16	15	16	15	15	14	16	15	U	15	14
#29	3	3	2	3	3	3	3	3	3	3	3	2	3	2	3	3	2
#30	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0
#31	9	9	9	9	9	9	9	9	9	9	9	9	8/9	9	9	11/9	9
#32	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4/5	4
#33	7/8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
#34	3	3	3	4	3	3	3	3	3	4	3	3	3	4	3	3	3
#35	17	15	8	21	14	13	17	19	11	14	12	11	15	13	21	13	10
#36	29	24	23	25	26	24	29	27	30	25	26	23	26	22	28	24	23
#37	1	1	2	2	—	2	2	1	2	2/1	1	2	1	1	1	2	2
#38	7	7	8	6	6	9	6	8	7	7	6	7	7	7	—	7	—
#39	3 + 12	3 + 11	3 + 11	3 + 14	3 + 13	3 + 13	3 + 13	3 + 12	3 + 11	4 + 13	3 + 13	3 + 13	3 + 11	3 + 13	3 + 12	3 + 11	4 + 12

#01, standard length; #02, predorsal length; #03, preanal length; #04, prepectoral length; #05, prepelvic length; #06, pectoral fin length; #07, pelvic fin length; #08, pectoral fin base height; #09, gill slit length; #10, isthmus width; #11, dorsal fin height; #12, anal fin height; #13, caudal fin length; #14, body depth; #15, head length; #16, snout length; #17, eye diameter; #18, interorbital width (skin); #19, interorbital width (bone); #20, upper jaw length; #21, vertebrae (abdominal + caudal); #22, dorsal fin rays; #23, anal fin rays; #24, pectoral fin rays (left/right); #25, caudal fin rays (epural + upper hypural + lower hypural); #26, vertebra associated with 1st dorsal pterygiophore; #27, pleurals; #28, epipleurals; #29, nasal pores; #30, interorbital pore; #31, suborbital pores (left/right); #32, postorbital pores; #33, preoperculomandibular pores; #34, occipital pores; #35, scale rows on nape; #36, scale rows between dorsal fin base and anal fin origin; #37, branchial stripe (left/right); #38, pseudobranch filaments; #39, gill rakers (upper + lower).

U, uncountable; —, no data.

* Holotype.

Appendix 3. Measurements (mm) and counts of type specimens in *Lycodes yamatoi* Toyoshima, 1985.

HUMZ	41094*	42480	53191	53597	53598	53601	53611	53618	53620	53630	53658	53668	53672	53684	53726	53734	53735
#01	317.5	317.8	349.9	255	281.7	223.7	230.7	267.6	220.8	174.5	212.1	270.7	237.6	204.5	246.9	247.1	354.2
#02	84	79.6	88.2	67.6	77.5	60.5	61.2	70.3	58.7	46.5	57.6	78.1	62.7	52.7	67.1	63	101
#03	134.8	129.3	136.1	111.1	123	96.5	102.9	121.2	96.3	73.5	92.5	117.6	100	86.5	101	106.2	154.2
#04	69.2	64.5	70.2	56.1	64	48.8	53	64.8	51.7	40.8	45.6	63.8	51.3	43.1	52.6	56.2	88.4
#05	55.5	50	56.8	43.8	49.6	38.2	39.6	59	42.2	33.3	35.7	50.2	38.1	34.4	40.9	48.9	69.2
#06	37.8	42	41	29	37.4	30.5	31.6	32.8	30.9	23.2	27.3	34.4	31.5	26	30.5	32.6	48.5
#07	3.4	2.7	3.8	2	1.7	2.3	3.5	1.1	2.5	2.4	2.5	2.4	3.2	1.7	2.3	2.4	1.9
#08	18.1	17.3	20.5	13.3	15.5	15.2	13.2	15.3	12.8	9.3	12.5	16.5	13.8	10.8	13.1	15	18.7
#09	26.4	26.5	27.6	23.3	23.6	18.3	18.8	23.2	17.5	13.7	17.2	23.6	19.5	14.9	18	19.1	30.1
#10	15.4	13.3	12.8	12.8	13.5	10.3	9.5	12.6	9.2	8.2	9.9	12.3	10.8	9	12	13.6	14.1
#11	14.7	17.3	18.2	11.6	14.5	12.2	9.5	11.5	10.2	8.4	10.2	16.9	14.7	9.7	11	13.5	16
#12	12.7	12.8	17.5	9.5	14	10.1	8.9	10.8	8.5	8.5	9.5	13.7	10.5	9	8.5	12.2	15
#13	5.5	5.2	7.1	5	6.3	4.8	5.3	6.4	5.2	5	6.4	7.3	6.4	4.5	3.6	4.9	5.8
#14	33.7	33.2	38.5	26.4	28	22.2	21.7	26.9	20.2	17.8	21.7	29.3	25.2	19.4	25.2	25	36.5
#15	68.4	63.8	69.7	52.3	64.3	49.3	51.9	60.9	48.6	38	45	63.8	51.6	42.4	52.6	50.7	88.4
#16	22.2	18.4	22.1	17	20	15.3	16.9	20	16.1	12.3	15	20.2	15.7	11.5	16.3	16.8	30
#17	10.7	10.1	9.5	9	9.8	8.7	9.6	9.4	8.5	6.8	7.7	9	7.9	8.2	6.7	8.2	12.5
#18	10.4	9.2	10.5	9.2	8.5	7.8	6.2	9	7.5	6.2	6.8	9.4	8	6.2	7.7	8.3	12.3
#19	2.3	2.3	2.9	2.2	2.4	1.9	1.9	2.1	1.8	1.2	1.7	2.1	2	1.3	1.9	1.9	4.4
#20	29.1	23.2	30.2	22.8	28.4	19.2	19.4	28.7	20.6	15.6	17.6	27	20.1	16.4	19.8	22.4	44.3
#21	21+>75	U	22+83	21+80	22+77	22+80	22+78	22+79	21+80	22+78	22+80	21+80	21+80	22+79	22+81	23+80	22+80
#22	U	U	98	94	92	94	94	93	93	93	94	94	93	94	97	95	97
#23	U	U	83	80	78	80	78	79	80	78	80	80	80	78	82	80	82
#24	19	20	21	20	19	20	20	20	20	20	20	20	20	20	20	20	19
#25	U	U	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+5+5
#26	6	U	6	6	6	5	5	5	6	6	6	6	5	6	6	5	5
#27	21	U	22	21	22	21	22	21	21	21	22	21	21	22	22	23	20
#28	15	U	14	14	16	15	14	13	16	15	14	14	14	15	14	U	14
#29	3	2/3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
#30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
#31	9	8/9	9	10	9	9	9/10	9	10	9	9	9	9	10	9	10/9	9
#32	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
#33	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
#34	3	3	3	4	3	3	3	3	3	3	3	3	3	3	3	4	3
#35	25	24	28	0	9	0	11	13	4	0	3	11	0	12	22	18	18
#36	30	28	29	24	21	23	26	21	23	23	23	26	25	24	25	25	26
#37	2	1	2	1	2	2	1	2/1	1	1	2	2	2/1	1	1	2/1	2/1
#38	9	8	>5	—	8	7	6	—	8	—	—	6	—	—	8	7	7
#39	4 + 12	3 + 13	3 + 11	—	3 + 13	4 + 12	4 + 13	—	3 + 12	—	—	4 + 13	—	—	4 + 13	3 + 12	4 + 13

HUMZ	53737	53738	53740	53741	53742	53856	53866	53911	53917	53918	53921	53923	53925
#01	252.3	360.8	244.7	219.9	153.4	296.9	235.8	212.1	200.7	259.9	242	309.4	226.2
#02	62.3	97.4	58.7	58.3	34.3	86	65	50.3	49.3	69.5	58.3	79.2	55.9
#03	105.6	153.3	102.2	95	61.8	131.9	103.2	84.6	79	115.7	102.5	124.5	92
#04	55.2	84.8	49.7	48.4	32.2	69.7	52.1	43	41.6	59.3	51.9	64	49
#05	47.4	63.2	40.9	40.8	25.2	55	39.5	31.8	31.7	43.5	39	50	42.5
#06	30.7	44	39.1	30.5	18	37.7	31	24.9	23	31.9	27.2	37.7	28.3
#07	2.3	2.2	1.5	2	2.6	2.7	2.1	2.7	2.1	2.9	1.7	2.9	2.4
#08	13.9	19.7	14.9	12.2	8.7	18	14.1	10.4	10.9	13.5	12.5	15.4	10.9
#09	18	31.5	17.4	16.8	10.7	27.9	19.7	15.8	14.6	20.8	17.5	24.5	16.1
#10	15.5	18.2	10.5	10.9	6.3	13.9	12.7	8.6	7.6	11.3	10	13.1	12.1
#11	12	16	10.7	12.3	6	14	11.3	9	7.6	13	11	16.6	9.8
#12	10.9	15.9	10.1	11.3	5.6	12.9	10.6	8.5	6.8	11.2	10.5	12.5	11
#13	5.7	7.2	4.3	5.1	3.1	7.1	7.2	4.4	4.3	5.1	4	5.6	4.8
#14	26.5	38.4	25.4	21.3	14.2	28.6	24.7	19.6	18.7	27	22.6	33.7	21
#15	50	83.8	47.2	45	29.5	70.2	50.8	41	39	55.9	48.8	60	46.6
#16	16.3	27.8	13.4	13.8	8.8	22.8	16.2	11.7	12.4	16.9	14.3	19.6	15.4
#17	8	10.1	7.5	8.5	5.8	11.3	8.8	7.7	6.8	9.1	8.4	9.6	7.8
#18	7.2	14.7	6.9	6.2	4.3	10.2	6.4	5.5	6	7	6.6	9.3	6.7
#19	2.1	3.3	2.2	1.7	1.1	2.9	2.2	1.8	1.7	2.4	2	2.8	1.8
#20	19.2	43	17.1	17	10.4	34.7	19.9	13.7	14.2	21.7	17.9	24.1	19
#21	21+82	21+82	22+83	22+81	21+82	22+79	22+79	21+82	21+81	22+81	21+83	21+83	22+80
#22	98	97	97	96	97	94	93	96	94	96	96	97	96
#23	81	82	82	81	81	79	80	82	80	81	81	82	81
#24	20/19	20	20	20	20	19	20	20	19/20	19	20	20	20
#25	2+4+5	2+4+5	2+5+5	2+5+5	2+4+5	2+4+5	2+4+5	2+4+5	2+4+5	2+5+5	2+4+5	2+5+5	2+4+5
#26	5	5	7	5	5	6	6	5	6	5	5	5	5
#27	21	21	22	22	21	22	21	21	21	21	21	21	21
#28	15	13	15	14	15	17	15	16	14	16	13	15	15

Appendix 3. (Continued).

HUMZ	53737	53738	53740	53741	53742	53856	53866	53911	53917	53918	53921	53923	53925
#29	3	3	3	3	3	2	3	3	3	3	3	3	3
#30	0	0	0	0	0	0	0	0	0	0	0	0	0
#31	9	9	9	9	9	U	9	9	9	10/9	9	9	9
#32	4	4	5	4	4	4	4	4	4	4	4	4	4
#33	8	8	8	8	8	8	8	8	8	8	8	8	8
#34	3	4	4	3	3	3	3	3	3	3	3	4	3
#35	15	16	11	17	18	4	0	18	24	27	20	17	14
#36	21	31	27	24	24	26	25	25	23	22	28	26	22
#37	1	1	1	1	1	1	2	1	1	1	1	1	1
#38	7	9	9	7	7	6	—	—	7	8	8	≧4	8
#39	3 + 13	4 + 13	4 + 12	4 + 12	3 + 12	3 + 12	—	4 + 13	3 + 12	4 + 12	2 + 16	2 + 12	4 + 12

#01, standard length; #02, predorsal length; #03, preanal length; #04, prepectoral length; #05, prepelvic length; #06, pectoral fin length; #07, pelvic fin length; #08, pectoral fin base height; #09, gill slit length; #10, isthmus width; #11, dorsal fin height; #12, anal fin height; #13, caudal fin length; #14, body depth; #15, head length; #16, snout length; #17, eye diameter; #18, interorbital width (skin); #19, interobital width (bone); #20, upper jaw length; #21, vertebrae (abdominal + caudal); #22, dorsal fin rays; #23, anal fin rays; #24, pectoral fin rays (left/right); #25, caudal fin rays (epural + upper hypural + lower hypural); #26, vertebra associated with 1st dorsal fin pterygiophore; #27, pleurals; #28, epipleurals; #29, nasal pores; #30, interorbital pore; #31, suborbital pores (left/right); #32, postorbital pores; #33, preoperculomandibular pores; #34, occipital pores; #35, scale rows on nape; #36, scale rows between dorsal fin base and anal fin origin; #37, branchial stripe (left/right); #38, pseudobranch filaments; #39, gill rakers (upper + lower).

U, uncountable; —, no data.

* Holotype.