



## Two new species of the snake eel genus *Bascanichthys* (Anguilliformes: Ophichthidae) from the northwestern Pacific

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### Abstract

Two new species of the elongate snake eel genus *Bascanichthys* are described from the northwestern Pacific. *Bascanichthys kabeyawan* **sp. nov.** is described based on a single specimen collected from estuary of southern Taiwan. It is characterized by having head 4.6% TL; tail 52.3% TL; body depth at gill opening 1.1% TL; predorsal-fin length 58.4% HL; snout length 10.9% HL; body bicolored, head without bands; lateral-line pores anterior to anus 104; vertebral formula 4-103-224. *Bascanichthys ryukyuensis* **sp. nov.** is described based on two specimens collected from the shallow water of Okinawa-jima Island, Ryukyu Islands of southern Japan. It is characterized by having head 3.7–4.3% TL; tail 43.3–44.2% TL; predorsal-fin length 40.7–45.4% HL; snout length 11.3–13.1% HL; body pale brown, head without distinct dark bands after preservation; lateral-line pores anterior to anus 114–118; total vertebrae 207–216, mean vertebral formula 2-116-212; and dorsal-fin origin before middle of head.

**Key words:** Ichthyology, Taxonomy, Elopomorpha, Taiwan, Ryukyu Islands, estuary

### Introduction

The very elongate, wipe-like eel genus *Bascanichthys* Jordan & Davis, 1892 is characterized by having body very slender; tail moderate long, about equal to trunk in length; head small; gill-openings lateral or low-lateral; width of isthmus about equal to length of gill opening; dorsal fin usually low, its origin well anterior to a vertical through the gill opening; pectoral fin present but minute; and body uniform or bicolored, not banded or spotted (Storey 1939; Smith & McCosker 1999). The genus currently comprises 17 valid species widely distributed in all three major oceans. All are known from shallow waters, but appears to be rare in the Indo-west Pacific Ocean. Less record has been known from this region than elsewhere, and no new species have been described for more than five decades (Hibino, pers. obse.). In the northwestern Pacific region, only three nominal species, *Bascanichthys kirkii* (Günther, 1870), *Bascanichthys longipinnis* (Kner & Steindachner, 1867) and *Bascanichthys myersi* (Herre, 1932), have been recognized from Taiwan, China and/or the Philippines (Zhang *et al.* 2010; McCosker 2014; Ho *et al.* 2015).

Recently, a unique elongate eels were collected from Taiwan and two from the Ryukyu Islands of Japan. These are herein described as two distinct new species.

### Materials and methods

All methods for counts and measurements follow McCosker (2010). Measurements for total, preanal and tail lengths are taken by 600-mm ruler and others by digital caliper to the nearest 0.1 mm. Vertebral counts were made from soft X-ray photos or a digital x-ray machine set up at National Museum of Marine Biology & Aquarium, Taiwan.

Mean vertebral formula (MVF) is expressed as the average of predorsal, preanal and total vertebrae. Institutional codes for materials follow Fricke & Eschmeyer (2022). Abbreviations: DFO, dorsal-fin origin; HL, head length; LL lateral-line pores; PAL, preanal length; PDL, predorsal length; TL, total length.

## Taxonomy

### Family Ophichthidae

#### *Bascanichthys* Jordan & Davis, 1891

*Bascanichthys* Jordan & Davis, 1891:621 (type species: *Caecula bascanium* Jordan, 1884, by original designation).

#### *Bascanichthys kabeyawan* Hibino & Ho, sp. nov.

English name: Kabeyawan Sand Eel

Figs. 1–2; Table 1

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**Holotype.** NMMB-P36052, 526 mm TL, ca. 22°03'42.3"N 120°42'23.6"E, mouth of Shi-Chong River, Pingtung, southwestern Taiwan, trap net (fyke net), 8 Jan. 2022.

**Diagnosis.** An extremely elongate species of *Bascanichthys* with the following combination of characters: head 4.6% TL; tail 52.3% TL; body depth at gill opening 1.1% TL; predorsal-fin length 58.4% HL; snout length 10.9% HL; body bicolored, head without bands; lateral-line pores anterior to anus 104; vertebral formula 4-103-224; and dorsal-fin origin slightly behind middle of head and above fourth lateral-line pore.

**Description.** Counts and measurements are shown in Table 1. Body extremely thin and slender (Fig. 1), nearly circular in cross-section to anterior part of tail, then becoming slightly compressed laterally, its depth at gill opening 92 times in TL. Skin mostly smooth on entire body, except for slightly wrinkling on cheek and anterior branchial basket regions; anus a long slit, situated at around middle of total length, preanal length 2.1 in TL. Head small; branchial basket well-expanded, clearly deeper than trunk, its deepest depth 3.1 times in HL.

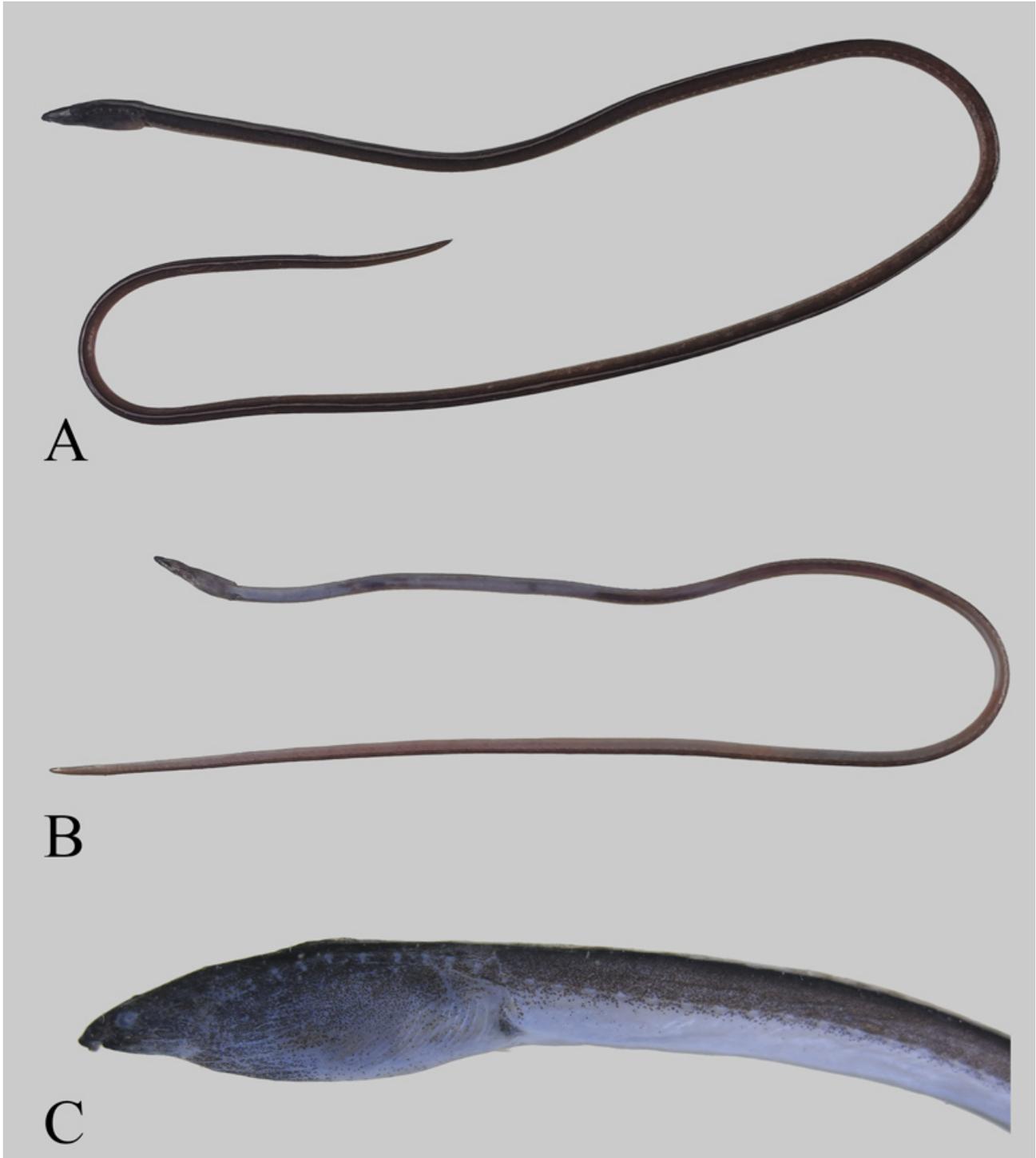
Snout short, bluntly pointed from dorsal view and slightly pointed from side, its length 9.2 in HL; posterior half of snout bisected by a deep groove ventrally (2 flashy vertical lamellae present). Eye small, its center behind mid-upper jaw, posterior margin of eye clearly before rictus, its diameter 4.0 in upper jaw length and 19.9 in HL; interorbital space narrow, its width 1.4 times eye diameter and 14.0 in HL; interbranchial space narrow, its width 13.4 in HL; numerous papillae present on anterior half of head, including snout, lips, chin, cheek, top of skull and interorbital space; anterior nostril tubular, extending rather downward than forward from the snout; posterior nostril a hole along upper lip, covered by broad flap extending slightly below edge of mouth gape, opening towards posteroventrally; a single compressed fleshy barbel in front of the posterior nostril. Rictus situated clearly behind a vertical through posterior margin of eye; no short fold at posterior end of mouth gape; lower jaw short, tip extends to near the posterior margin of anterior nostril tube, distance from tip of snout to anterior end of lower jaw slightly longer than eye diameter; gill opening lateral, located ventral half of body.

Sensory pores on head and body large and well apparent (Fig. 2A); supraorbital pores 1 (ethmoid)+3 on dorsal surface of snout and interorbital space, 4th pore above middle of eye; infraorbital pores 3+2 (right) or 3+3 (left), 1 above the barbel (in front of posterior nostril), 2 below eye along upper jaw, and 2 (right) or 3 (left) in a vertical row behind eye; mandibular pores 4, anterior 3 along lower jaw and the 4th slightly behind rictus; preopercular pores 2; interorbital pore 1; supratemporal pores 3 (single mid-temporal pore). A row of tiny sensory papillae on outer surface of gill basket. Lateral-line pores relatively large, opening clearly below the lateral-line canal, forming wave-shape; 3 pores before dorsal-fin origin; 10 before gill opening, forming an arch; 104 anterior to anus; total pores 213, the last at about 1/2 HL in advance of tail tip.

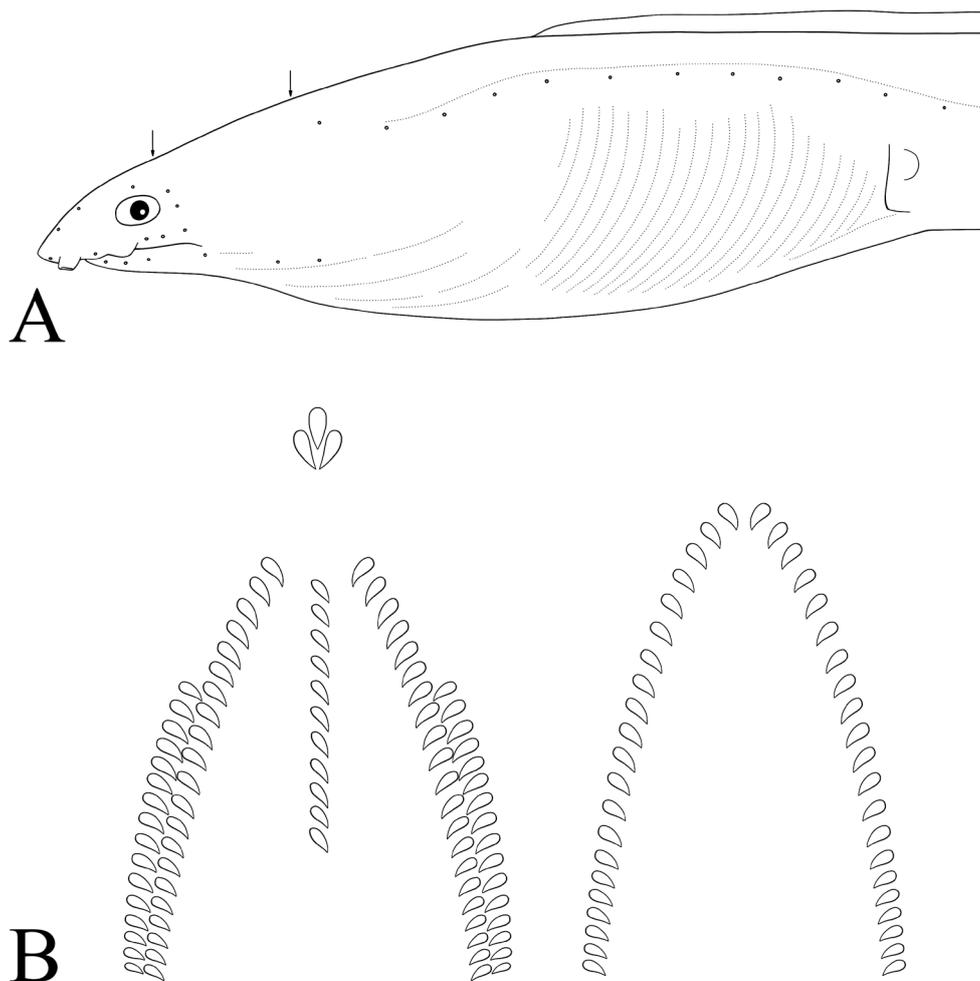
All teeth (Fig. 2B) moderately small, conical and closely spaced; intermaxillary with 3 large teeth arranged in a triangle, followed by a gape and then single row of 11 small teeth on vomer; maxilla with single row of teeth on anterior third, then biserial on the rest, 16 teeth on outer row and 21 on inner row; mandible with single row of 21 teeth on each side.

Dorsal and anal fins low but obvious, ending at near tip of tail; dorsal-fin origin slightly behind a vertical through middle of head, above fourth lateral-line pore, 0.4 HL before gill opening; pectoral fin minute, flap-like with about 3 short rays, located at upper corner of gill opening, its length 2.6% HL and base height 5.4% HL (best seen with magnification).

Color in both fresh and preserved condition (Figs. 1A–C): head uniformly grayish black with ventral surface slight paler; body grayish black dorsally and uniformly pale on ventral surface, forming clearly bicolored with the boundary slightly below lateral line; lateral-line pores and adjacent regions without pigments; all fins pale without pigments, except for some dark pigments on pectoral fin; a small cluster of pigments in front of anus; mouth cavity pale with few dark pigments.



**FIGURE 1.** *Bascanichthys kabeyawan* Hibino & Ho, **sp. nov.**, holotype, NMMB-P36052, 526 mm TL, Pingtung, southern Taiwan. A. Dorsal view. B. Ventral view. C. Lateral view of head. Photo by P.-N. Lee.



**FIGURE 2.** Drawings showing the head pores and tooth pattern of *Bascanichthys kabeyawan* **sp. nov.**, from the holotype. A, head pores; B, tooth pattern on upper jaw (left) and lower jaw (right). Arrows indicate the interorbital pore (left) and med-temporal pore (right).

**Etymology.** The scientific name *kabeyawan* (Taiwanese: ku-piah-uan), used as a noun, is an old name of the type locality Checheng, a territory of aboriginal Paiwan people documented in the Dutch occupation period (1624–1662).

**Distribution.** Currently only known from the single specimen collected from mouth of Shih-chong River, Pingtung, southern Taiwan at depth about 1 meter.

**Ecological note.** The specimen was collected by trap net operated by a local fisherman who targeted on glass eel of *Anguilla* spp. It was collected together with other snake eels, such as *Lamnostoma* sp. and *Ophichthus* sp., and was likely chasing the fish larvae to the river mouth.

***Bascanichthys ryukyuensis* Hibino, Yamashita & Sakurai, sp. nov.**

New standard Japanese name: Kazura-umihebi

New English name: Vine-like Sand Eel

Figs. 3–4; Table 1

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*Bascanichthys* sp.: Hibino *et al.* 2021: 17, fig. 6a (Okinawa-jima Island, Japan).



**FIGURE 3.** *Bascanichthys ryukyuensis* Hibino, Yamashita & Sakurai, **sp. nov.**, holotype, FRLM 52250, 627 mm TL, Okinawajima Island, Ryukyu Islands, Japan. A, whole lateral view; B, lateral view of head and anterior trunk; C, dorsal view of head and anterior trunk.

**Holotype.** FRLM 52250, 627 mm TL, female, Yakena, eastern coast of Yokatsu Peninsula, Okinawa-jima Island, Ryukyu Islands, Japan, stranded specimen found at beach (0–1 m depth) around seagrass bed, 26 Jan. 2016, coll. K. Yamashita.

**Paratype.** FRLM 52251, 516 mm TL, male, collected with holotype.

**Diagnosis.** An extremely elongate species of *Bascanichthys* with the following combination of characters: head 3.7–4.3% TL; tail 43.3–44.2% TL; predorsal-fin length 40.7–45.4% of head length; snout length 11.3–13.1% of head length; body pale brown, head without distinct dark bands after preservation; lateral-line pores anterior to anus 114–118; total vertebrae 207–216, mean vertebral formula 2-116-212; and dorsal-fin origin slightly before middle of head and before first lateral-line pore.

**TABLE 1.** Counts and measurements of two new *Bascanichthys* described in this study.

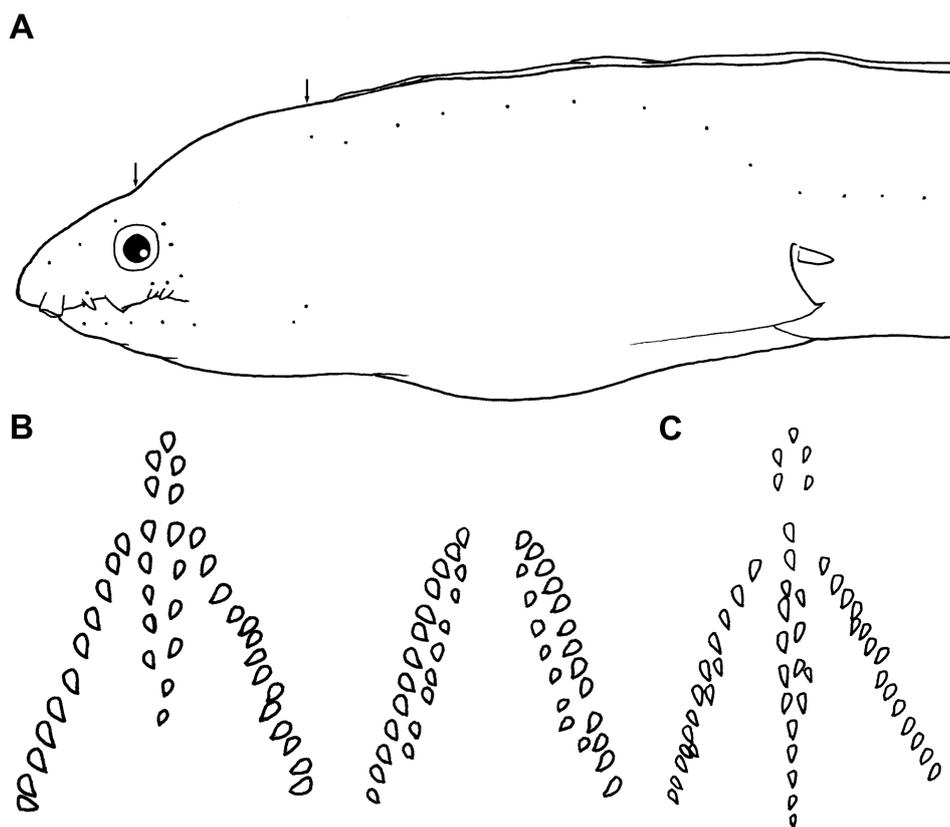
	<i>B. kabeyawan</i> sp. nov.		<i>B. ryukyuensis</i> sp. nov.	
	Holotype		Holotype	Paratype
Total length (TL, mm)	526		627	516
Counts				
Predorsal vertebrae	4		2	3
Preanal vertebrae	103		118	114
Total vertebrae	224		216	207
Lateral-line pores before gill opening	10		8	9
Lateral-line pores before anus	104		118	114
Total lateral-line pores	214		207	195
Measurements				
As % of TL				
Head length (HL)	4.6		3.7	4.3
Preanal length	47.7		56.7	55.8
Tail length	52.3		43.3	44.2
Predorsal length	2.7		1.5	1.9
Body depth at gill opening	1.1		1.1	1.2
Body width at gill opening	0.7		1	1.0
Body depth at mid-anus	0.8		1.1	1.3
Body width at mid-anus	0.6		1	1.2
As % of HL				
Predorsal length	58.4		40.7	45.4
Snout length	10.9		13.1	11.3
Eye diameter	5.0		5.1	5.4
Upper-jaw length	19.8		25.4	20.9
Gill-opening length	12.3		10.2	10.9
Interorbital width	7.2		10.6	8.6
Isthmus width	7.4		14	15.4
Body depth at gill opening	23.6		30.5	29.0
Body width at gill opening	14.2		26.3	23.1
Body depth at mid-anus	16.3		28.4	31.3
Body width at mid-anus	13.4		27.1	28.6
Pectoral-fin length	2.6		7.6	5.0
Pectoral-fin base	5.4		3.8	2.3

**Description.** Counts and measurements are shown in Table 1. Body extremely elongate (Fig. 3A), subcylindrical, tail laterally compressed posteriorly, its depth at gill opening 83–91 times in TL. Skin generally smooth, with weak

longitudinal wrinkles dorsally; tail shorter than head and trunk, preanal length 1.8 in TL. Head small, skin with many longitudinal wrinkles except snout; dorsal contour smoothly curved; branchial basket convex, well-expanded, its deepest depth 2.4–2.7 times in HL.

Snout stout and broad, tip weakly pointed and relatively pointed from dorsal view (Fig. 3B, C), its length 7.6–8.8 in HL; posterior half of snout bisected by a deep groove ventrally; interorbital region smooth, slightly convex. Eye small, positioned about mid-jaw, its diameter 3.8–5.0 in upper jaw length and 18.4–19.7 in HL; interorbital space narrow, its width 1.6–2.1 times eye diameter and 9.4–11.6 in HL; numerous papillae present on snout, interorbital space, temporal and lips, rather dense in holotype but scattered in paratype; anterior nostril tubular, extending downward; posterior nostril a hole covering by a compressed thin skin, its opening towards posteroventrally; upper lip with several fleshy thorn-shaped barbels (Fig. 4A), one between nostrils, very minute barbels along with the barbel in left side of holotype; and two posterior to posterior nostril (three in left side of paratype); rictus relatively short, behind posterior margin of eye; lower jaw short, distance from tip of snout to anterior end of lower jaw slightly longer than eye diameter; gill opening lateral, located at ventral half of body.

Sensory pores small but conspicuous (Fig. 4B); supraorbital pores 1 (ethmoid)+3; infraorbital pores 3+3, 1 between nostrils, 2 below eye along upper jaw, and 3 behind eye in a vertical row; mandibular pores 5, the last pore slightly behind rictus; preopercular pores 2; interorbital pore 1; supratemporal pore 3 (single mid-temporal pore). Lateral line nearly completed, pores conspicuous, 0 pore before dorsal-fin origin, 8 anterior to gill opening, 118 anterior to anus and total 207 in holotype (0, 9, 114 and 195, respectively, in paratype), the last just before tip of tail about 1/3 HL.



**FIGURE 4.** Drawings showing the head pores and tooth pattern of *Bascanichthys ryukyuensis* Hibino, Yamashita & Sakurai, **sp. nov.**, from the holotype (A, B) and paratype, FRLM 52251, 516 mm TL, collected with holotype (C). A, head pores; B, tooth pattern on upper jaw (left) and lower jaw (center); C, upper jaw (right). Arrows indicate the interorbital pore (left) and med-temporal pore (right).

All teeth small, conical, and relatively pointed; teeth on maxilla in holotype arranged uniserial, in paratype partly biserial but generally uniserial (Figs. 4B, C); dentary teeth biserial; 5 intermaxillary teeth arranged as chevron; vomerine teeth biserial in holotype, mid-part of vomer partly triserial in paratype.

Dorsal and anal fins very low, ending at near tip of tail, end of anal fin slightly behind that of dorsal fin; dorsal-

fin origin before middle of head, right behind the mid-temporal pore and before the first lateral-line pore; pectoral fin extremely minute, flap-like, located at anterior corner of gill opening, its length 13.1–20.4% HL and base height 26.2–44.1% HL.

Color when fresh condition (after refrigeration; Fig. 3): body purplish pale brown, darker dorsally; head yellowish, snout and lower jaw deep, tip of snout yellowish brown; fins dusky white. Color in preserved condition: purplish and yellowish color faded. Body pale brown, darker dorsally; head slightly paler than body, in paratype tip of snout dark brown and pale dusky white band between tip of snout and eye; fins dusky white.

**Etymology.** The specific name *ryukyuensis* is derived from the type locality.

**Distribution.** Only known from the two specimens collected from shore of Okinawa-jima Island, Ryukyu Islands, Japan.

**Ecological note.** The present specimens were collected as stranded specimens caused by the extremely low temperatures by a serous cold wave coming from the Arctic (Hibino *et al.* 2021). In the type locality, several species of Muraenidae, Ophichthidae, Apogonidae, Syganidae, etc., were also collected at the same time.

**TABLE 2.** Comparative characters of *Bascanichthys* in the Indo-Pacific region. \*measured both gill opening and mid-anus.

	Type locality	HL/TL	Tail length/TL	PDL/HL	Position of DFO		
<i>B. kabeyawan</i> sp. nov.	Pingtung, Taiwan	4.6	52.3	58.4	behind middle of head		
<i>B. ryukyuensis</i> sp. nov.	Okinawa, Japan	3.7–4.3	43.3–44.2	40.7–45.4	before middle of head		
<i>B. deraniyagalai</i>	SE India	5.1–6.7	52.4–54.5	66.7–83.3	behind middle of head		
<i>B. fijiensis</i>	Viti, Fiji	4.2	51.3	57.1–64.5	behind middle of head		
<i>B. filaria</i>	Misool Island, Indonesia	4.7	49.4	54.0	behind middle of head		
<i>B. kirkii</i>	Eastern Africa	4.9–5.9	50.8–52.9	66.2–82.6	behind middle of head		
<i>B. longipinnis</i>	Samoa	4.8	47.6	54.1	behind middle of head		
<i>B. myersi</i>	Philippines	4.4	48.8	62.5	behind middle of head		
<i>B. pusillus</i>	Viti, Fiji	6.8	47.6	50.0	about middle of head		
<i>B. sibogae</i>	Timor, Indonesia	5.4	38.8	-	before middle of head		

	Body depth (%TL)	Snout length (%HL)	Upper-jaw length (%HL)	Preanal vertebrae	Preanal LL	Total vertebrae	Date sources
<i>B. kabeyawan</i> sp. nov.	1.1	10.9	19.8	103	104	224	1
<i>B. ryukyuensis</i> sp. nov.	1.1–1.2	11.3–13.1	20.9–25.4	114–118	114–117	207–216	1
<i>B. deraniyagalai</i>	1.1–1.5*	12.0–17.9	ca. 20.0–24.4	72–83	73–84	177–196	2
<i>B. fijiensis</i>	1.0	10.6–12.0	23.3–24.7	126	-	233	3
<i>B. filaria</i>	1.0	10.4	19.3	100	-	-	1, 3, 4
<i>B. kirkii</i>	1.3–1.7	12.0–13.6	23.7–25.7	-	82–90	193–202	1, 5
<i>B. longipinnis</i>	1.3	-	33.3	-	-	-	3, 6
<i>B. myersi</i>	1.5	9.7	19.5	102	-	215	1, 7
<i>B. pusillus</i>	1.5	14.3	32.3	-	-	-	3, 8
<i>B. sibogae</i>	ca. 1.3	-	19.2	-	-	-	9

Data sources: 1, this study; 2, Mohapatra *et al.* (2019); 3, Storey (1939); 4, McCosker (1977); 5, McCosker (1986); 6, Kner & Steindachner (1867); 7, Herre (1932); 8, Seale (1917); 9, Weber (1913).

## Discussion

*Bascanichthys* was reviewed by Storey (1939) who recognized 13 valid species within the genus. Menon (1961), Blache & Cadenat (1971), McCosker *et al.* (1989) and Moreno *et al.* (2016) described new species, respectively. One

of them, *Bascanichthys congoensis* Blache & Cadenat, 1971, was subsequently synonymized with *Bascanichthys paulensis* Storey, 1939 by McCosker *et al.* (1989). McCosker (1998) transferred another nominal species *Callechelys sibogae* Weber, 1913 to *Bascanichthys*. Currently, 17 valid species are recognized, 8 species are distributed in the Indo-Pacific Ocean (Hibino, pers. data). Table 2 gives the selected diagnostic characters for comparing our new species and those Indo-west Pacific members of *Bascanichthys*.

*Bascanichthys kabeyawan* **sp. nov.** can be easily distinguished from *Bascanichthys deraniyagalai* Menon, 1961 and *B. kirkii* by having 224 total vertebrae (vs. 177–196 in *B. deraniyagalai* and 193–202 in *B. kirkii*) (McCosker 1986; Mohapatra *et al.* 2019). The bicolored body coloration of *B. kabeyawan* is similar to *B. kirkii*, but the former has a shorter head (4.6% TL, vs. 4.9–5.9% TL), a shorter snout (10.9% HL, vs. 12.0–13.6% HL), a relatively slender body (body depth at gill opening 1.1% TL, vs. 1.3–1.7% TL), and more numerous lateral-line pores before anus (104, vs. 82–90). *Bascanichthys filaria* (Günther, 1872), *B. longipinnis*, *B. myersi*, *Bascanichthys pusillus* Seale, 1917, and *Bascanichthys sibogae* (Weber, 1913) have their tails slightly shorter than length of head and trunk (Weber 1913; Storey 1939), whereas the new species has its tail longer than head and trunk.

*Bascanichthys fijiensis* (Seale, 1935) has its tail slightly longer than head and trunk, and is also similar to *B. kabeyawan*. It differs from *B. kabeyawan* in having a less slender body (body depth 1.5% TL, vs. 1.1% TL in *B. kabeyawan*); a longer upper jaw (23.3–24.7% HL, vs. 19.8% HL); uniserial teeth on maxilla (vs. uniserial on anterior third and biserial on posterior two-third); body distinctly red when fresh (vs. grayish black dorsally, pale ventrally) (Seale 1935; Storey 1939).

*Bascanichthys ryukyuensis* **sp. nov.** can also be easily distinguished from *B. deraniyagalai* and *B. kirkii* by relatively more total vertebrae (207–216, vs. 177–196 in *B. deraniyagalai* and 193–202 in *B. kirkii*), and from *B. myersi* in lacking bands on head (vs. dark bands on head in *B. myersi*), a shorter tail (43.3–44.2% TL, vs. 48.8% TL), and teeth arrangement on maxilla (uniserial or biserial vs. uniserial) (Herre 1932; this study). The new species also differs from *B. fijiensis* and *B. longipinnis* in having a shorter tail (43.3–44.2% TL, vs. 51.3% TL in *B. fijiensis* and 47.6% TL in *B. longipinnis*) and the position of the dorsal-fin origin well before middle of head (predorsal length 40.7–45.4% HL, vs. 57.1–64.5% HL and 54.1% HL, respectively) (Storey 1939). At present, few information is available for *Bascanichthys sibogae* which was placed in *Bascanichthys* by McCosker (1998) without further explanation. From the brief original description, *B. sibogae* has longer head (5.4% TL) and a distinct shorter tail (38.8% TL) compared to these of *B. ryukyuensis* (Weber 1913).

The new species is also closely similar to *B. filaria* in having similar tooth arrangement and head length, but can be distinguished by a shorter tail (43.3–44.2% TL, vs. 49.4% TL in *B. filaria*), position of the dorsal-fin origin (predorsal length 40.7–45.4% HL, before middle of head, vs. 54.0% HL, behind middle of head), and more preanal vertebrae (114–118, vs. 100) (Storey 1939; McCosker 1977; this study). Although the new species is also similar to *B. pusillus* Seale, 1917 in similar tail length, it differs from *B. pusillus* in having a shorter head (3.7–4.3% TL, vs. 6.8% TL), rather forward dorsal-fin origin (predorsal length 40.7–45.4% HL, vs. 50% HL), teeth on vomer uniserial (vs. biserial), and a shorter snout (11.3–13.1% HL, vs. 14.3% HL) (Seale 1917).

The other nine species are known from the Atlantic and eastern Pacific oceans. One Atlantic species, *Bascanichthys inopinatus* McCosker, Böhlke & Böhlke, 1989 shares high total vertebral count (198–205) with *B. ryukyuensis*. However, the new species can be easily separated from *B. inopinatus* in having 114–118 preanal vertebrae (101–105) (McCosker *et al.* 1989).

**Comparative materials.** *Bascanichthys fijiensis*: CAS 5500, holotype, 350 mm TL, Suva, Fiji. *Bascanichthys filaria*: BMNH 1870.8.31.66, holotype, 601 mm TL, Misool Island, Irian Jaya, Indonesia. *Bascanichthys kirkii*: BMNH 1864.1.9.50–51, 1864.5.13.9–11, syntypes, 5 specimens, 204–352 mm TL, Rovuma Bay, eastern Africa. *Bascanichthys myersi*: CAS-SU 26828, holotype, 786 mm TL, Dumaguete, Negros, Philippines.

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