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Phoxacromion kaneharai, a New Genus and Species of Gobiid Fish (Teleostei: Perciformes: Gobiidae) from the Ryukyu Islands, Japan

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Abstract A new marine goby genus and species of the gobiid subfamily Gobiinae, *Phoxacromion kaneharai*, is described based on 7 specimens (15.9–21.9 mm SL) from the Ryukyu Islands, Japan. It is unique amongst the gobiine genera in having the expanded lateral wing of the cleithrum with a distinct, anterolaterally-directed triangular mid-lateral margin. *Phoxacromion* is similar to *Palutrus* in general morphology, but distinguished from the latter in having the following features (including the cleithral modification previously noted): no distinct mental frenum (vs. present in *Palutrus*); a short transverse sensory papillae row on middle of cheek (vs. replaced by a single papilla only); 9 and 8 segmented dorsal and anal-fin rays (vs. 7–8 and 6–7, respectively); more slender body (body depth at anal-fin origin 15.0–16.6% of SL vs. more than 17.0%). A putative close affinity of *Phoxacromion* with *Palutrus* and/or *Drombus* (particularly the slender nominal species *D. simulus*) is suggested. *P. kaneharai* is a secretive bottom dweller, found under rubbles on sandy or gravel bottoms in shallow protected bays.

Key words: Gobiidae, Gobiinae, *Phoxacromion kaneharai*, New genus, New species, Ryukyu Islands.

In their pictorial book of Japanese gobies, Senou *et al.* (2004) reported several enigmatic gobies, putatively assigned to undetermined genera of Gobiidae. Of these, the species named "Gobiidae, indet. gen. and sp. 11" was subsequently described as new genus and species *Grallenia arenicola* by Shibukawa and Iwata (2007), and the other 4 ("4" to "7") were also described as new taxa in another article of this supplement (Shibukawa *et al*., 2010).

In this paper, the taxonomic status of "Gobiidae, indet. gen. and sp. 13" in Senou *et al.* (2004), is explored (Figs. 1 and 2). This is a small secretive bottom-dwelling goby (largest specimen examined is 21.9 mm SL), found under rubbles on sandy or gravel bottoms in shallow protected bays. Examination based on 7 specimens from the Ryukyu Islands reveals that the species, described herein as new, belongs to a new genus of the gobiid subfamily Gobiinae (*sensu* Pezold, 1993).

Materials and Methods

The examined specimens are deposited in the Australian Museum, Sydney (AMS), Kanagawa Prefectural Museum of Natural History, Odawara (KPM), National Museum of Nature and Science, Tokyo (NSMT), Osaka Museum of Natural History, Osaka (OMNH), and Yokosuka City Museum, Yokosuka (YCM).

All fish lengths given are standard lengths (SL). Measurements are made point-to-point with calipers under a dissecting microscope to the nearest 0.01 mm. The methods for measurements follow those of Hubbs and Lagler (1958), with exceptions given as follows (the snout tip refers to the mid-anteriormost point of the upper

Fig. 1. Freshly collected specimens of *Phoxacromion kaneharai* sp. nov., Amami-oshima Island, Amami Group of Ryukyu Islands, Japan. A) NSMT-P 94892, holotype, male, 21.9 mm SL; B) NSMT-P 94893, female, 20.1 mm SL. Photographed by T. Suzuki.

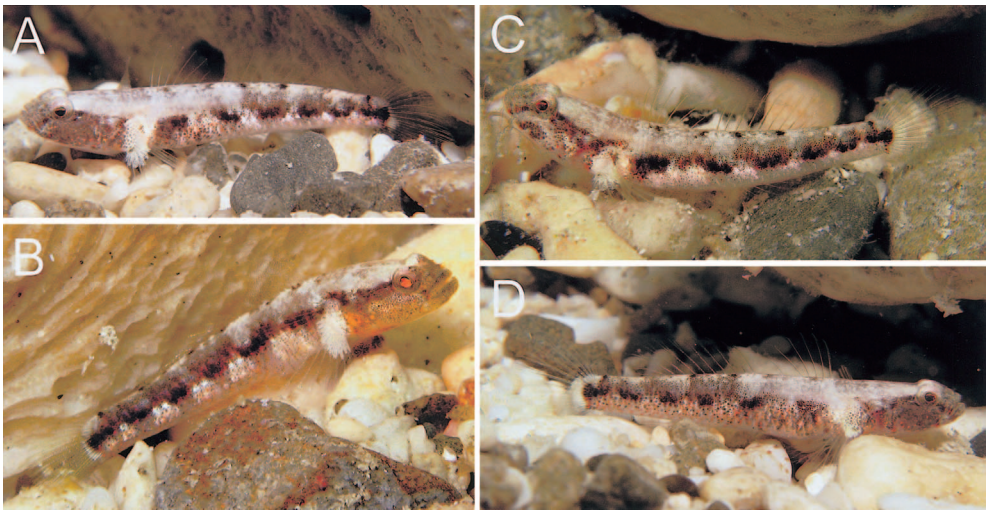

Fig. 2. Underwater photographs of *Phoxacromion kaneharai* sp. nov. (specimens not preserved), Kurasaki Beach, Kasari Bay, Amami-oshima Island, Amami Group of Ryukyu Islands, Japan, 2.5 m depth, 10 July 2007 (B) and 14 July 2009 (A, C and D). Photographed by H. Kanehara.

lip): head length is measured between the snout tip and posterior end of the head (including opercular membrane); interorbital width is the least width between the innermost rims of the right and left eyes; jaw length is measured between the snout tip and the posteriormost point of the lip; head width and depth are measured at the preopercular margin; nape width is measured between the dorsalmost margins of the gill openings; body depth is measured at 3 locations, the first at the

pelvic-fin origin, the second at the first dorsal-fin origin, and the third at the anal-fin origin; body width is the greatest width of body behind pectoral-fin base; preanal and prepelvic lengths are measured from the snout tip to the origin of each fin; pectoral-fin length is measured from the base to the tip of the longest ray; pelvic-fin length is measured between the base of the pelvic-fin spine and the distal tip of the longest segmented ray; caudal-fin length is measured from the base to the tip of the middle caudal-fin ray. The methods of counts follow Akihito (1984), except for the following: longitudinal-scale count includes all diagonal rows from the dorsal insertion of the pectoral fin to the mid base of the caudal fin; 3 different transverse scale count are taken (see descriptive accounts); the circumpeduncular scale count is the number of scales along a zigzag vertical line through the narrowest point of the caudal peduncle; gill rakers including all elements are counted on the outer side of the first arch; the counts of pseudobranchial filaments include all rudiments. Scales and paired-fin rays are counted on both sides, but gill rakers and pseudobranchial filaments are counted on the right side only. Osteological features are observed from radiographs (for all specimens) and a single cleared and stained specimen, following the method of Potthoff (1984). The methods of Akihito (1984) are used in describing the pattern of the interdigitation of the dorsal-fin pterygiophores between the neural spines ("P-V"). Cephalic sensory canals and papillae were observed on specimens stained with cyanine blue, and their notations follow Akihito (1984) and Miller (1986).

Phoxacromion gen. nov.

[New Japanese name: Matsuribi-haze-zoku]

Type species. *Phoxacromion kaneharai* Shibukawa, Suzuki and Senou, new species.

Diagnosis. The new genus *Phoxacromion* is unique within the Gobiinae in having the expanded lateral wing of the cleithrum with a distinct, anterolaterally-directed triangular mid-lateral margin (Figs. 3 and 4). It is also distinguished from the other gobiine genera by the following combination of characters: VI-I, 9 dorsal-fin rays; I, 8 anal-fin rays; head depressed (its depth 75.7–86.7% of width), with robust and prominent lower jaw; mental frenum undeveloped; gill opening narrow, extending dorsally to a horizontal line through base of third, fourth or fifth pectoral-fin ray; tongue relatively narrow, with

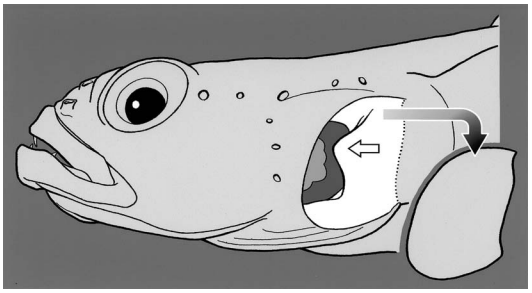

Fig. 3. Schematic illustration of lateral view of head of *Phoxacromion kaneharai* sp. nov.; a part of operculum is cut and removed to the bottom-right. Open arrow indicates the anterolaterally-directed triangular bony projection of lateral wing of cleithrum. Drawn by K. Shibukawa.

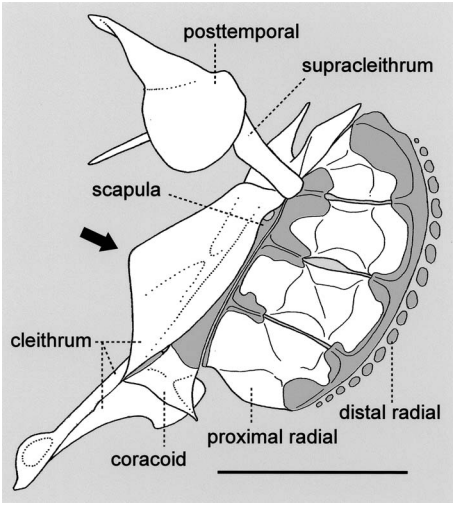

Fig. 4. Lateral view of pectoral girdle of *Phoxacromion kaneharai* sp. nov., NSMT-P 94894, male, 18.4 mm SL. Arrow indicates the anteriorly-directed triangular projection of lateral wing of cleithrum. Scale bar＝2 mm. Drawn by K. Shibukawa.

rounded or near pointed anterior tip; sensory-papillae rows on cheek representing essentially a longitudinal pattern, with short row *b* not extending anteriorly to a vertical through middle of eye; row *c* uniserial, long; row *cp* transverse, comprising 2–3 papillae; 2–4 (usually 3 or 4) sensory papillae forming a transverse row just behind chin (=row *f*); sensory canals on head well developed, with pores B′, C (unpaired), D (unpaired), E, F, G, H′, K′, L′, M′, N and O′; 10+16=26 vertebrae; P-V 3/II II I I 0/9.

Comparison. *Phoxacromion* is distinguished from all other gobiine genera in having a highly modified lateral wing of the cleithrum (Figs. 3 and 4).

Phoxacromion resembles *Palutrus* in general morphology. *Palutrus*, originally described by Smith (1959) for *P. reticulatus* Smith, 1959, is now being revised by Douglass F. Hoese of the Australian Museum, Sydney. It is not a well-defined genus, having: VI-I, 7–8 dorsal-fin rays; I, 6–7 anal-fin rays; 14–16 pectoral-fin rays; 23–25 longitudinal scales; 12 circumpeduncular scales; 10+16–17=26–27 vertebrae; P-V 3/II II I I 0/9; no free rays on pectoral fin; a depressed head; distinctive single-lobed mental frenum; anterior margin of tongue nearly truncate or weakly emarginated; cephalic sensory canals with pores B′, C (unpaired), D (unpaired), E, F, G, H′, K′, L′, M′, N, O′; reduced longitudinal pattern of sensory-papillae rows on cheek; row *a* relatively short, not extending, or barely extending, anteriorly to a vertical through middle of pupil; row *b* short, not reaching to a vertical through middle of eye; row *c* comprising sparsely-arranged papillae, long, extending posteriorly around a vertical through end of row *b*; and a pair of sensory papillae just behind chin (=row *f*) (D. F. Hoese, pers. comm.; KS, pers. obs.). None of these features is unique within the Gobiinae. *Palutrus* differs from *Phoxacromion* in having the lateral wing of the cleithrum not forming a distinct triangular projection (vs. mid-lateral part of lateral wing of the cleithrum triangular, projecting anterolateraly in *Phoxacromion*), well-developed, single-lobed mental frenum (vs. no distinct mental frenum developed) and sensory-papillae row *cp* comprising a single papilla (vs. row *cp* comprising 2–3 papillae, forming a vertical row), as well as the other minor discrepancies, e.g., 7–8 and 6–7 segmented dorsal and anal-fin rays, respectively (vs. 9 and 8, respectively), slightly higher body (body depth at anal-fin origin more than 17.0% vs. 15.0–16.6%), and a moderately wide gill opening, extending dorsally to a horizontal line through base of dorsalmost pectoral-fin ray (vs. extending dorsally to a horizontal line through base of third, fourth or fifth pectoral-fin ray). Other similar Indo-West Pacific gobiine genera are *Drombus* and *Hetereleotris*, although these genera have a typical transverse pattern of sensory-papillae rows on the cheek (see e.g., Akihito *et al.*, 2002; note that *D. simulus* represents a non-typical transverse pattern as shown in Suzuki *et al*., 2009, fig. 9) and usually have a non-modified lateral wing of cleithrum (vs. modified as noted above, see also "Remarks" below). The typical member of *Drombus* has a moderately-developed broad mental frenum (vs. undeveloped in *Phoxacromion*), longer sensory-papillae rows *a* and *b*, extending anteriorly to well beyond a vertical line through middle of eye (vs. not reaching, or just reaching, anteriorly to a vertical through middle of eye), and row *c* modified into some short transverse papillae rows (vs. simple longitudinal row). *Hetereleotris* has the ventral half, or more, of the first gill slit closed by membrane (vs. ventral two-fifths of the first gill slit closed by membrane in *Phoxacromion*), developed mental frenum (vs. undeveloped), and 10+17=27 vertebrae (vs. 10+16=26).

Remarks. *Drombus simulus*, originally described as a species of *Acentrogobius* based on 5 specimens from southeastern Mozambique (Smith, 1960), may have a close affinity to *Phoxacromion kaneharai*. Examination of recently collected *D. simulus* from Japan and Palau (see "Comparative Materials") revealed that some smaller specimens have a triangular lateral wing of the cleithrum, although, compared to *P. kaneharai*, this lateral wing is more obtuse and not so distinct. Larger specimens of *D. simulus* from

Japan have a rounded and non-projecting margin of the lateral wing of cleithrum, as found in typical *Drombus*. The other species of *Drombus* do not have such a cleithral modification at any development stages (KS, pers. obs.). *Drombus simulus* is heterogeneous from the other species of the genus in having: short sensory-papillae row *b*, just extending anteriorly to, or a little beyond, a vertical through middle of eye (vs. extending well beyond a vertical through middle of eye in typical *Drombus*); row *c* representing multiple longitudinal rows (rather than several transverse rows as found in typical *Drombus*); row *cp* (can be read to comprise the sensory papillae of ventral half of longest transverse row on cheek) just reaching to a horizontal through posteriormost sensory papilla of row *d* (vs. extending ventrally beyond a horizontal through posteriormost sensory papilla of row *d* in typical *Drombus*). All of these features appear to be similar to *Phoxacromion* rather than typical *Drombus*, although sensory-papillae rows *a* and *c* are uniserial in *Phoxacromion* (vs. multiple in *D. simulus*). Other discrepancies between *D. simulus* and *P. kaneharai* are found in coloration. For example, *D. simulus* has a distinct black dot on the dorsal half of caudal-fin base (vs. black spot at midlateral base of caudal fin in *P. kaneharai*), and a vivid orange-yellow wedge-shaped spot on the dorsal margin of the pectoral-fin base (vs. no such spot). For additional information about the coloration of *D. simulus*, see Suzuki *et al.* (2009: 9).

As with *Palutrus*, *Drombus* is a poorly-defined genus that needs extensive revisionary study; the taxonomic status of all nominal species are not well explored, and the generic limits are still ambiguous. Larson and Murdy (2001) placed *Ctenogobius globiceps* Hora, 1923, *Ctenogobius kranjiensis* Herre, 1940 and *Rhinogobius ocyurus* Jordan and Seale, 1907 in *Drombus*, but these nominal species lack any salient character of *Drombus* shown in the key to gobiid genera provided by them (viz. "1 vertical papilla row on midcheek extends ventrally past lowermost longitudinal cheek row" vs. not in these 3 nominal species). Also, Larson and Murdy (2001) did not include the type species of the genus, *Drombus palackyi* Jordan and Seale, 1905 (type locality: Negros, Philippines), in their list of marine and brackish-water gobies in the Western Central Pacific, although this species had been described earlier than all nominal species of *Drombus* they listed. Also note that *Gobius bontii* Bleeker, 1849, frequently mis-assigned to *Drombus*, is actually a species of *Amoya*, based on an examination of the holotype (RMNH 4658) made by the first author.

Although premature at this time, a phylogenetic analysis of *Drombus*, *Palutrus* and *Phoxacromion* is necessary to re-define the generic limits of each. Above-noted similarities suggest including *Drombus simulus* in *Phoxacromion*. Nevertheless, we here retain it as a pending matter, because we have not yet examined the holotype of *D. simulus*.

Etymology. The new generic name *Phoxacromion* is derived from the Greek *phoxos* (meaning "pointed") and *akromion* (meaning "point of the shoulderblade") in reference to the characteristic modification of cleithrum in the type species. The gender is neuter.

Phoxacromion kaneharai sp. nov.

[New Japanese name: Matsuribi-haze]

(Figs. 1–5; Table 1)

Gobiidae, indet. gen. and sp. 13. Senou *et al.*, 2004: 479 (Amami-oshima Island and Okinawa-jima Island, Ryukyu Islands, Japan; underwater photograph and brief account).

Holotype. NSMT-P 94892, male, 21.9 mm SL, Kurasaki Beach, Ashitoku, Tatsugo, Amami-oshima Island, Amami Group of Ryukyu Islands, Japan (28º26.07′N, 129º37.85′E), 17 Dec. 2003, collected by T. Yonezawa.

Paratypes. Total 6 specimens (5 males and 1 female), 15.9–20.1 mm SL: AMS I. 44870-001, 1 specimen (male), 19.8 mm SL, collected with holotype; NSMT-P 94893, 1 specimen (female), 20.1 mm SL, collected with holotype; NSMT-P 94894, 1 specimen (male, cleared and stained), 18.4 mm SL, collected with holotype; KPM-NI 4170, 1 specimen (male), 15.9 mm SL, Sunabe Beach, Chatan-cho, Nakagusuku-gun, Okinawa-jima Island, Okinawa Group of Ryukyu Islands, Japan, 20 m depth, Sep. 1997 (collected by M. Ikeda); OMNH 35379, 1 specimen

(male), 18.5 mm SL, collected with holotype; YCM-P 44206, 1 specimen (male), 18.2 mm SL, collected with holotype.

Diagnosis. See "Diagnosis" of the genus.

Description. In the following description, the counts of holotype have an asterisk, and the frequency of each count in given in the parentheses following relevant count. Dorsal-fin rays VI-I, 9* (7); anal-fin rays I, 8* (7); pectoral-fin rays 16 (4) or 17* (10); pelvic-fin rays I, 5* (12); segmented caudal-fin rays 9+8* (7), including 7+7* (7) branched rays (viz. ventralmost and dorsalmost 2 rays unbranched in all specimens); dorsal unsegmented caudal-fin rays 4* (2) or 5 (5); ventral unsegmented caudal-fin rays 3* (1), 4 (5), 5 (1); longitudinal scales 26* (6), 27 (6) or 28 (2); transverse scales from anal-fin origin dorsoanteriorly to base of first dorsal fin 9* (5), 10* (7) or 11 (2); transverse scales from anal-fin origin dorsoposteriorly to base of second dorsal fin 9* (13) or 10 (1) ; transverse scales from origin of second dorsal fin ventroposteriorly to base of second dorsal fin 8 (3) or 9* (11); predorsal scales 7 (1), 10* (4) or 11 (2); circumpeduncular scales 12* (7); gill rakers on outer surface of first arch 2+5 (2); pseudobranchial filaments 4 (1) or 5 (1); vertebrae 10+16=26* (7); epural 1* (7); anal-fin pterygiophores anterior to first haemal spine 2* (7); P-V 3/II II I I 0/9* (7).

Proportional measurements are given in Table 1. Body subcyrindrical, compressed posteriorly. Head well depressed, its depth 75.7–86.7% of width. Snout slightly shorter than eye diameter, its length 20.1–22.6% and 74.1–89.1% of head length and eye diameter, respectively. Eyes dorsolateral, moderately large, its diameter

Table 1. Proportional measurements of *Phoxacromion kaneharai* sp. nov.

	Holotype	Paratypes					
	NSMT-P 94892	AMS I. 44870-001	OMNH-P 353749	NSMT-P 94894	YCM-P 44206	KPM-NI 4170	NSMT-P 94893
	male	male	male	male	male	male	female
Standard length (mm)	21.9	19.8	18.5	18.4	18.2	15.9	20.1
In % of standard length							
Head length	30.0	29.2	30.0	29.6	30.3	31.2	29.9
Snout length	6.7	6.6	6.3	6.3	6.8	6.3	6.5
Eye diameter	7.7	7.4	7.7	8.0	7.7	8.5	8.0
Interorbital width	2.2	2.1	2.0	2.1	2.1	1.2	2.1
Jaw length	10.8	10.7	10.2	10.3	10.7	10.9	10.0
Head depth	14.8	13.5	13.6	14.6	14.3	15.8	14.3
Head width	17.5	17.6	16.3	16.8	19.0	18.8	18.5
Nape width	14.7	13.6	14.4	13.7	13.7	12.5	15.8
Body depth at P_2 origin	15.7	15.4	14.7	14.0	16.0	14.6	14.3
Body depth at D_1 origin	14.9	14.0	13.8	13.8	14.3	14.6	14.3
Body depth at A origin	16.6	15.3	15.3	15.0	15.2	16.0	16.0
Body width	13.0	11.7	11.9	11.6	12.3	13.4	13.6
Predorsal length	35.8	36.3	36.6	37.0	37.3	35.9	37.4
Prepelvic length	31.0	29.3	30.2	31.6	31.1	33.6	30.8
Preanal length	56.7	58.0	58.1	58.0	59.2	58.5	59.0
Caudal-peduncle length	23.7	23.0	23.5	24.1	21.5	22.3	23.8
Caudal-peduncle depth	11.9	11.5	11.1	10.5	11.1	11.9	11.0
Length of D_1 base	20.0	18.6	17.4	10.1	18.9	17.7	19.5
Length of D_2 base	25.5	26.1	25.3	25.1	25.4	26.1	26.4
Length of A base	20.4	21.5	19.9	19.5	21.1	21.2	20.7
P_1 length	26.3	24.9	25.6	25.5	27.4	—	26.0
P_2 length	24.2	21.7	21.5	21.2	23.2	21.2	23.3
C length	26.8	25.9	26.0	26.1	25.2	—	25.3

Abbreviations: A, anal fin; C, caudal fin; D_1, first dorsal fin; D_2, second dorsal fin; P_1, pectoral fin; P_2, pelvic fin.

25.4–27.2% of head length; interorbital width narrower than pupil diameter. Anterior naris opening at tip of short tube; posterior naris a simple pore with only a slightly elevated anterior margin, or opening at tip of very shot tube (shorter than anterior narial tube), closer to eye than anterior narial tube; no flaps at tip of narial tubes. Jaws moderate in size, its length 33.5–36.6% of head length; posterior end of jaws extending to a vertical through anterior margin or middle of pupil; lower jaw robust, projecting beyond upper jaw; gape oblique, forming an angle of about 35 degrees of body axis. No bony projections (e.g., spines or serrations) at posterior margin of preopercle. Tongue relatively narrow, with rounded or nearly pointed anterior margin; anterior part of tongue free from floor of buccal cavity. Chin slightly swollen, but not forming a distinct fleshy projection (=mental frenum). Ventroposterior margin of lower lip broadly interrupted at chin. Gill opening relatively narrow, extending dorsally and ventrally to horizontal lines through base of third, fourth or fifth pectoral-fin ray and a little beyond ventral margin of pectoral-fin base, respectively; gill membranes broadly attached to isthmus, no free rear fold of gill membranes across isthmus. Ventral two-fifths (approximate) of first gill slit closed by membrane. Gill rakers on outer surface of first arch reduced in size, forming small papilla-like projection in each. Mid-lateral part of lateral wing of cleithrum with a distinct, anterolaterally-directed triangular bony projection; no fleshy projections on lateral surface of cleithrum. No cutaneous ridge along predorsal midline. Dorsal fins closed but not confluent each other; heights of first and second dorsal fins subequal; second or third spine of first dorsal fin longest; all dorsal-fin spines slender and flexible; no elongate and filamentous dorsal-fin spines; all segmented dorsal-fin rays branched; ultimate dorsal-fin ray split to base (and counted as single ray). Anal fin slightly lower than second dorsal fin, and originates ventral to base of first to second segmented rays of dorsal fin; anal-fin spine slender and flexible; all anal-fin segmented rays branched; ultimate anal-fin ray split to base (and counted as single ray). Pectoral fin elliptical, almost symmetrical dorsoventrally; pectoral fin slightly longer than pelvic fin; almost all pectoral-fin rays branched, except for dorsalmost simple ray; ninth, tenth or eleventh pectoral-fin ray longest; pectoral fin usually extending posteriorly to, or just before, a vertical line through origin of anal fin (reaching to a vertical through anterior base of first segmented anal-fin ray in 1 specimen). Pelvic fin fused medially by well-developed frenum (between spines) and connecting membrane (between innermost rays); pelvic fin extending to anus; all pelvic-fin segmented rays multibranched; fourth pelvic-fin ray longest, slighly longer than fifth; pelvic frenum thin, with smooth and concave posterior margin; width of pelvic frenum greater than height. Caudal fin rounded, almost symmetrical dorsoventrally, shorter than head (caudal-fin length 83.0–89.4% of head length); no elongate caudal-fin rays.

Scales on body ctenoid with peripheral cteni, except for those on occipital region, nape, prepelvic region, belly, pectoral-fin base, narrow area along dorsal and anal fins and basal part of caudal fin with cycloid scales; no modified scales with enlarged cteni; scales on nape extending anteriorly beyond a vertical line through posterior margin of preopercle (usually reaching slightly behind a vertical through posterior margin of eye); head naked, exclusive of occipital region and nape.

Teeth on jaws slender, unicuspid; teeth on outermost row, restricted before a vertical line through anterior base of anterior narial tube, and distinctly larger than inner teeth in each jaw; 1–2 pairs of teeth on posteriormost part of outermost row of upper jaws largest; inner teeth on jaws forming tooth band anteriorly (ca. 3–4 and 3–6 irregular rows around upper and lower-jaw symphysises, respectively), narrowing to single row posteriorly; in lower jaw, posteriormost tooth on outermost row largest, similar in shape and size to largest teeth on upper-jaw; no teeth on vomer and palatine.

Cephalic sensory systems are illustrated in Fig. 5. Anterior oculoscapular canal usually with

pores B′, C (unpaired), D (unpaired), E, F, G and H′. Posterior oculoscapular well separated from anterior oculoscapular canal, with pores K′ and L′. Preopercular canal not continuous with oculoscapular canals, with pores M′, N and O′. All sensory-papillae rows uniserial in each. Four essentially longitudinal sensory-papillae rows on cheek, i.e. rows *a*, *b*, *c* and *d*; row *cp* comprising 2–3 vertically-arranged papillae; row *a* relatively short, extending anteriorly to a vertical through middle or posterior part of pupil; row *b* short, comprising 3–5 papillae, at middle of cheek; row *c* relatively long, extending posteriorly beyond a vertical through posterior end of row *b*; rows *c* and *d* interrupted at midway; row *e* and *i* interrupted at midway; 2–4 sensory papillae just behind chin (=row *f*), forming a transverse row. Sensory-papillae rows on midlateral body along axis uniserial, short and restricted on a single scale in each. Three sensory-papillae row on caudal fin, each arranged along ray and ending at middle of fin.

Color when alive (Fig. 2). Ground color of head and body grayish white, slightly darkened dorsally; snout and anterior parts of jaws light gray; eye grayish white dorsally, medium gray ventrally; blackish oblique band extending from eye to posterior part of lower jaw through upper jaw; blackish horizontal band extending from eye to dorsal edge of operculum; cheek dark grayish brown (e.g., Figs. 2A and D) or pearl white with a dark brownish gray mottle (Fig. 2C); operculum pearl white with some irregular-shaped dark brownish gray mottles; a series of six horizontally-elongate blackish blotches at midlateral body, last of which located at end of caudal peduncle; numerous minute reddish or orange chromatophores scattered on jaws, snout, cheek, operculum, pectoral-fin base and ventral half of body; 5–6 small black spots along dorsal profile of body; pectoral-fin base and basal part of pectoral fin with a vivid white blotch, larger than eye; remaining part of pectoral fin translucent; caudal fin translucent, except for whitish basal area; dorsal and anal fins translucent with numerous minute whitish or orange chromatophores.

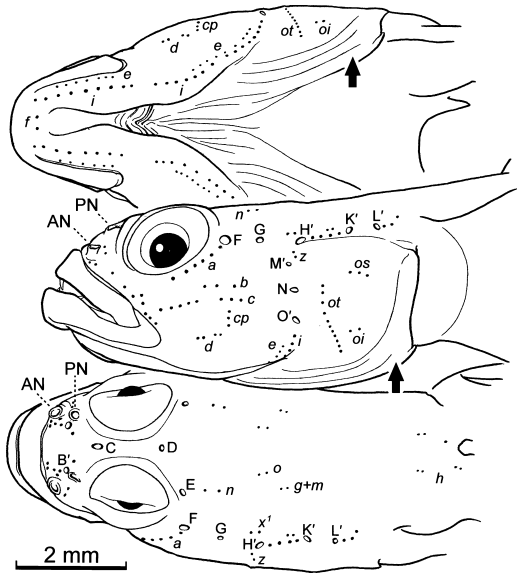

Fig. 5. Ventral (top), lateral (middle) and dorsal (bottom) views of head of *Phoxacromion kaneharai* sp. nov. (NSMT-P 94892, male, 21.9 mm SL), showing cephalic sensory papillae (dots). AN and PN, anterior and posterior nares, respectively. Arrows show position where gill membrane is attached to body. Drawn by K. Shibukawa.

According to Hiroyuki Kanehara (Amami-oshima Island, Ryukyu Islands of Japan), the specimens with bright yellowish-orange heads were sometimes found in the Amami-oshima Island, Ryukyu Islands of Japan (Fig. 2B); this appears to be nuptial color of males. The other color variant, possibly a transient color form exhibited by specimens in an excited state (see “Remarks”), was illustrated by Senou *et al*. (2004: 479); the specimen has paler body with a series of six deep reddish-orange blotches mid-laterally, in addition to a reddish orange band from the eye to the dorsal part of pectoral-fin base.

Color when fresh (Fig. 1). Ground color of head and body beige dorsally, pale or grayish white ventrally [ground color of head (excepting occipital region and nape) tinged to yellowish orange in males with nuptial color]; numerous thickened grayish brown or blackish brown chromatophores covering head and body (exclusive of belly, prepelvic region and ventral surface of

head), forming much darker physiognomy than that when alive; yellowish or reddish orange chromatophores scattered on body especially around distal margin of each scale pocket; a dash-like, horizontal series of about 5 black or dark grayish brown blotches along midlateral body (sometimes continuous with each other and forming an irregular midlateral stripe), in addition to a distinct black spot at midbase of caudal fin; iris yellowish orange (vivid in males); first dorsal fin transparent with numerous melanophores and white chromatophores; melanophores on first dorsal fin particularly concentrated around midposterior part of the fin, sometimes forming a vague blackish blotch; white chromatophores of first dorsal fin concentrated at distal half or more of the fin; a yellow longitudinal line through ventral one-fifth or one-sixth of first dorsal fin; second dorsal fin translucent with numearous melanophores and white chromatophores, as well as 1 or 2 longitudinal yellow lines on ventral half of the fin; caudal fin translucent with numerous white chromatophores; anterodorsal margin of caudal fin tinged with yellow; basal part of caudal fin with a rounded dark gray area, followed by a bright white crescent mark posteriorly; anal fin subtranslucent, tinged with dull pink distally in female; anal fin dark yellowish brown with paler rays tinged with yellow in males with nuptial color; pectoral fin translucent, with a large bright white blotch at the basal part; small black spot (smaller than pupil) around bases of some dorsal pectoral-fin rays; pelvic fin blackish with paler rays tinged with orange in males, whereas transparent tinged basally with orange in female.

Color in alcohol. Similar to color when fresh, except for all yellowish and orange colors, white chromatophores on fins and bright white blotch at pectoral base faded.

Sexual dimorphism. Urogenital papilla narrow and pointed in male, whereas broad and rounded in female. Many characteristic color patterns in males noted above are assumed to be nuptial color.

Osteology. Frontals not fused medially; frontal crest not developed; frontals narrow at interorbital region, as wide as parasphenoid at interorbital region; dorsal surface of interorbital and postorbital parts of frontals with a Y-shaped trough-like structure, supporting oculoscapular canal; this canal support continuous to trough-like structure on dorso-lateral part of sphenotic and pterotic; small pointed bump on posterior part of epioccipital; mesethmoid entirely cartilaginous; vomer nearly rounded anteriorly, with a shallow median notch at anterior margin; no vomerine teeth; subtemporal fossa (Birdsong, 1975) well developed; Baudelot's ligament connects anteriorly to basioccipital. Nasal very small, thin, not stained by alizarin red; no infraorbital bones, exclusive of lachrymal; lachrymal narrow, near pear-shape and thin, not stained by alizarin red. Rostral cartilage well developed, large, attached anteriorly to ascending process of premaxilla; ascending process of premaxilla high (higher than articular process), well differentiated from articular process; postmaxillary process of premaxilla well developed; palatine edentate, T-shaped with the ethmoid process moderately developed, well separated from quadrate; ectopterygoid moderately long, extending dorsally to around midpoint of palatine shaft and ventrally to dorsoanterior edge of quadrate; mesopterygoid absent; dorsal lamina of metapterygoid broadly overlapping quadrate, and closed, but not contact with ectopterygoid; symplectic process of preopercle slightly developed, low; small and obtuse spinous projection at posterior margin of preopercle (not projecting beyond skin, and confirmed only in cleared and stained specimen); bony canal support developed on posterior part of preopercle. Basihyal slightly spatulate anteriorly, with straight anterior margin; five branchiostegal rays, with four rays in contact with the anterior ceratohyal and one ray attached to the posterior ceratohyal; second branchiostegal ray wider and longer than third; no transverse bony shelf developed along ventral margin of urohyal. Infrapharyngobranchial 1 absent; interarcual cartilage minute and oviform, well separated from infrapharyngobranchial 2; ossified gill rakers on

outer surface first arch relatively short and spine-like or narrow and blade-like; no accessory spines on gill rakers on outer surface of first arch; inner surface of first gill arch and outer surface of second gill arch lacking bony/cartilaginous gill rakers; inner surface of second gill arch and both inner and outer surfaces of third and fourth gill arches with small, dorsally spinulose ossified gill rakers with 1–2 spines in each. Four pectoral radials; scapula reduced in size, entirely cartilaginous; pectoral radial attached to cleithrum; mid-lateral margin of lateral wing of cleithrum projecting, forming anterolaterally-directed acute process; dorsal postcleithrum absent; short thread-like ventral postcleithrum present. Pelvis articulates with cleithrum via well-developed pelvic intercleithral cartilage; postpelvic process (Akihito and Meguro, 1981) moderately developed. Vertebrae 10+16=26; posteriormost neural spine (on 15th caudal vertebra) broad and blade-like; pleural ribs on third to 10th precaudal vertebrae; epineural ribs on all precaudal vertebrae and anteriormost 3–4 caudal vertebrae, none fused with pleural ribs; anterior dorsal prezygapophyses not developed, except for second to sixth precaudal vertebrae with blunt, anteriorly directed projections; P-V 3/II II I I 0/9; anterior two pterygiophores of second dorsal fin lack middle radials; two anal-fin pterygiophores anterior to first haemal spine; single epurals; hypurals 3+4 fused to urostyle, articulating with hypurals 1+2; parhypural moderately developed, pointed medially; dorsal and ventral procurrent cartilages moderately large, not extending anteriorly to vertical lines through tips of neural and haemal spines of 3rd pleural centrum (PU3), respectively.

Distribution and habitat. Type series of *Phoxacromion kaneharai* was collected from Amami-oshima Island and Okinawa-jima Island of Ryukyu Islands, Japan. Senou *et al.* (2004: 479) noted that this species (as "Gobiidae indet. Gen. and sp. 13") was found solitary under rubbles on sandy and pebble bottoms in protected bays at depths of 2–3 m. Single paratype (KPM-NI 4170) was collected at 20 m depth.

Remarks. Hiroyuki Kanehara (pers. comm.) has found the orange-head form (as shown in Fig. 1A) of *Phoxacromion kaneharai* guarding eggs in Amami-oshima Island, Ryukyu Islands, Japan. Also, one of the specimen pairs was observed with yellowish-orange coloration on the head. He concluded that the orange-head specimens were males in nuptial color. Based on our examination of orange-head specimens (i.e., AMS I. 44870-001, NSMT-P 94892 and 94894, OMNH-P 353749 and YCM-P 44206), all of them were males. The other color variant, paler body with reddish mid-lateral blotches (see Senou *et al.*, 2004: 479), is much less common than the typical color form in the Amami-oshima Island, according to H. Kanehara (pers. comm.). In addition, he once saw a specimen of *P. kaneharai* with a bright reddish color pattern on its body biting another small goby (*Oplopomops* sp.). He inferred that it could be a temporary color pattern exhibited when specimens are excited or agitated (rather than, e.g., ontogenetic variation or sexual dimorphism).

Etymology. The new species is named for H. Kanehara, who provided valuable information and underwater photographs of the species taken in Amami-oshima Island, Amami Group of Ryukyu Islands, Japan.

Comparative materials. *Drombus simulus*: OMNH-P 34782-34786, 5 specimens (3 males, 1 female and 1 young), Okinawa-jima Island, Okinawa Group of Ryukyu Archipelago, Japan, 30 Aug. 2008; NSMT-P 73221, 1 specimen (male), Ambon Island, Indonesia, 1998.

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