Acentrogobius limarius (Gobiidae) from the Ryukyu Islands, Japan: First Northern Hemisphere Records

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(Received 9 July 2020; Accepted 4 September 2020)

A single specimen (31.7 mm in standard length) and an underwater photograph of *Acentrogobius limarius* Allen, Erdmann, and Hadiaty, 2015 (recently described from Batanta Island, West Papua, Indonesia) from Amami-oshima and Iriomote-jima islands, Ryukyu Islands, Japan, respectively, represent the first Northern Hemisphere records of the species, the former being the northernmost record. A full description of the specimen is given and the new standard Japanese name “Hokosaki-kirara-haze” proposed for the species.

Key Words: Teleostei, distribution, range extension, Amami Islands, Yaeyama Islands.

Introduction

The genus *Acentrogobius* Bleeker, 1874 typically inhabits coastal bays, mangrove streams, and estuaries (Allen *et al.* 2015). Although currently a relatively large group of similar-appearing species, the definition of the genus is unclear (Larson and Lim 2005). In addition, species level taxonomic problems have been reported (Allen 2015), including some unidentified species (*e.g.*, Akihito *et al.* 2013).

During a recent ichthyofaunal survey of the Amami Islands, Japan, a single unidentified specimen of *Acentrogobius* was collected (Hagiwara 2018, 2019). It was subsequently identified here as *Acentrogobius limarius* Allen, Erdmann, and Hadiaty, 2015, as was an underwater specimen photographed at Iriomote-jima island, Japan, but not collected. The species was originally described from eight specimens collected from Batanta island, West Papua, Indonesia, with the only other known record being several specimens collected in Milne Bay, Papua New Guinea in 2019 (M. Erdmann pers. comm.). Accordingly, the Japanese records are the first of *A. limarius* from the Northern Hemisphere. The Amami Islands specimen is fully described below.

Materials and Methods

Counts and measurements followed Allen *et al.* (2015). Measurements were made to the nearest 0.01 mm, except for standard length (nearest 0.1 mm), with needle-point calipers under a dissecting microscope. Standard length is abbreviated as SL. Cephalic sensory-canal pore terminology follows

Akihito *et al.* (2013), the canals being observed using versatile staining with Cyanine Blue (Saruwatari *et al.* 1997). Osteological elements were examined from radiographs. The distributional map was prepared using GMT 5.3.1, with data from GSHHG (Wessel and Smith 1996). The specimen used in this study is deposited at YCM: Yokosuka City Museum, Yokosuka, Japan.

Acentrogobius limarius Allen, Erdmann, and Hadiaty, 2015
[English name: Batanta Mud Goby;
new standard Japanese name: Hokosaki-kirara-haze]
(Figs 1–3)

Acentrogobius limarius Allen *et al.*, 2015: 35, figs 1–3 (original description; type locality: Batanta island, Raja Ampat Islands, West Papua, Indonesia).

Acentrogobius sp. 2 (not *sensu* Akihito *et al.* 2013): Hagiwara 2018: 331, unnumbered fig. (brief description; Amami-oshima island, Ryukyu Islands, Japan: based on YCM-P 45483); Hagiwara 2019: 335, unnumbered fig. (same fig. as Hagiwara 2018).

Material examined. YCM-P 45483, female, 31.7 mm SL, Atetsu, Amami-oshima island, Amami Islands, Ryukyu Islands, Japan, 10 m depth (muddy bottom), 11 December 2013, hand net, K. Hagiwara.

Description. Dorsal-fin rays VI+I, 10; anal-fin rays I, 10; pectoral-fin rays 19; pelvic-fin rays I, 5; segmented caudal-fin rays 17; branched caudal-fin rays 13; longitudinal scale series 28; transverse scales 8; pre-dorsal-fin scale rows 7; pre-pelvic-fin scale rows 5; circumpeduncular scales 9; gill rakers on first branchial arch 1+7 (counted on right side);

Fig. 1. Photographs of *Acentrogobius limarius* from: A–C, Atetsu, Amami-oshima island, Amami Islands, Ryukyu Islands, Japan (YCM-P 45483, 31.7 mm SL); D, Amitori Bay, Iriomote-jima island, Yaeyama Islands, Ryukyu Islands, Japan (specimen not collected). A, Fresh coloration; B, preserved coloration; C, radiograph; D, underwater photograph taken at 8 m depth (Photo: K. Yano).

vertebrae 25. The following morphometrics are expressed as percentage of SL: head length 28.8; head width 14.6; head depth 17.0; body depth at pelvic-fin origin 19.1, at anal-fin origin 16.1; caudal-peduncle length 18.1, depth 10.9; snout length 5.9; eye diameter 10.8; cheek depth 6.2; upper-jaw length 10.8; pre-1st dorsal-fin length 35.2; pre-2nd dorsal-fin length 54.7; pre-anal-fin length 53.8; pre-pelvic-fin

length 28.2; base of dorsal fins 48.7; 1st spine length on 1st dorsal fin 12.3; 2nd dorsal-fin spine length 15.1 (tip broken after measurement); 3rd dorsal-fin spine length 13.3; 1st spine length on 2nd dorsal fin 12.7; longest dorsal-fin soft ray length (10th) 18.1; anal-fin spine length 7.1; longest anal-fin soft ray length (10th) 17.4; pectoral-fin length 24.3; pelvic-fin length 23.8; pelvic-fin spine 7.1; and caudal-fin

length 33.5.

Body slender, compressed, width much less than depth (Fig. 1A, B). Anus situated just before anal-fin origin. Head somewhat small, slightly depressed anteriorly, its height greater than width. Snout short, rounded, its length much less than eye diameter. Anterior and posterior nostrils close to each other, both located before vertical through anterior margin of eye, anterior nostril located anteroventrally below posterior nostril; membranous tube on each nostril, that on anterior nostril much longer than on posterior nostril. Eye somewhat large. Interorbital region very narrow, flattened. Mouth terminal. Lower jaw longer than upper jaw, its posterior tip reaching to vertical through anterior margin of pupil. Chin relatively smooth, without mental frenum. Both jaws with several rows of densely arranged conical teeth, outer row teeth larger than those of inner row; 3 and 2 enlarged, recurved canine-like teeth on each side of upper-jaw symphysis and midway along lower jaw, respectively. Gill opening slightly narrowed, anteroventral point below middle of opercle (vertically level with preopercle), gill membranes attached anteriorly to isthmus. Preopercular and opercular margins rounded, upper end of latter horizontally level with middle of eye.

Head sensory canal pores well developed, comprising snout pore (B'), single anterior (C) and posterior (D) interorbital pores, four postorbital (E, F, G, and H') and preopercular (M', N, and O') pores; and 2 posterior oculoscapular pores (K' and L'); head sensory papillae in transverse pattern on cheek; a single row of transverse papillae on chin; papillae rows (papillae behind eye could not be observed because of abrasion) and sensory pores on head as shown in Fig. 2.

Body covered with weak ctenoid scales. Head, including nape, pectoral-fin base, cheek (lower portion damaged), opercle, and pre-dorsal- and pre-pelvic-fin regions completely covered with cycloid scales; anterior margin of pre-dorsal-fin scales just behind posterior interorbital pore; pre-pelvic-fin scales reaching to anteroventral point of gill opening; cheek with 2 rows of 3 scales each, those on lower row much larger than on upper row; opercle with 6 scales, lowermost scale largest of all cycloid scales (Fig. 2). Snout, suborbital region, and jaws naked.

First dorsal fin triangular, 2nd spine longest, all spines lacking filamentous tips (but see Remarks); dorsal-fin origin located slightly posterior to vertical through pectoral-fin base; all spines thin, flexible. Second dorsal and anal fins long, origin of latter under that of former, posteriormost rays of both fins longest, tips reaching to caudal-fin base. Pectoral fin somewhat long, pointed, middle rays longest, tips reaching to below 2nd dorsal-fin origin. Pelvic fins completely connected by membrane, with well-developed frenum; pelvic-fin origin located just below ventral end of pectoral-fin base. Caudal fin lanceolate, its length slightly greater than head length.

Coloration. *Fresh coloration* (based on Fig. 1A). Body ground color light brown dorsally, grayish-white ventrally. Snout dark brown. Cheek with 2 dark orange stripes, upper stripe horizontally level with lower eye margin, slightly indistinct lower stripe on lower margin of cheek, both with

Fig. 2. Sketches of head region of *Acentrogobius limarius* based on YCM-P 45483, 31.7 mm SL, showing cephalic sensory pores and papillae. A, Dorsal view; B, lateral view; C, ventral view. AN and PN indicate anterior and posterior nostrils, respectively. Bar indicates 1 mm. Arrowheads indicate the anteroventral end of gill opening.

posterior tips curved upward. Opercle with dark orange smudges. Upper part of head and body scattered with small dark orange spots. About 4 or 5 small indistinct blackish-brown spots on dorsal and ventral edges of body (origins of 2nd dorsal and anal fins to caudal peduncle). Four large squarish blackish-brown spots on lateral midline, each of similar size to pupil, enclosing 2 small spots; most anterior spot located just below middle of 1st dorsal fin, 2nd and 3rd spots below 1st to 2nd and 8th to 10th soft ray bases of 2nd dorsal fin, respectively; last spot on caudal-fin base. Dorsal fins and upper half of caudal fin with small (same size as small body spots) dark orange spots. Pectoral, pelvic, and anal fins translucent white, with many black melanophores.

Coloration when preserved (based on Fig. 1B). Body brownish-white. Snout dark brown. Cheek with 2 dark brown stripes, lower stripe indistinct. Opercle with dark brown smudges. Small, formerly dark orange spots on upper

Fig. 3. Distributional records of *Acentrogobius limarius*. Stars and circles indicate newly recorded and other localities, respectively. Closed and open symbols indicate records based on collected specimens and underwater photograph, respectively. Arrowhead indicates type locality. Papua New Guinean record was based on three specimens collected by G. Allen and M. Erdmann (unpublished).

part of body, dorsal fins, and upper half of caudal fin dark brown. Four large squarish blackish-brown spots on lateral midline clearly apparent, but slightly paler than when fresh.

Distribution. Currently recorded only from Amami-oshima and Iriomote-jima islands in the Ryukyu Islands, Japan (this study), as well as Batanta island, Indonesia (Allen *et al.* 2015) and Milne Bay, Papua New Guinea (specimens deposited in Western Australian Museum fish collection; M. Erdmann pers. comm.) (Fig. 3).

Remarks. The Japanese specimen agreed very closely with the diagnosis of *Acentrogobius limarius* provided by Allen *et al.* (2015), although the numbers of transverse and pre-dorsal scales (diagnostic characters of *A. limarius*) differ slightly (*viz.*, 8 and 7, respectively, in the Japanese specimen *vs.* 9 and 8–9, respectively). Such differences are very minor and regarded here as intraspecific variations.

Although the taxonomy of species of *Acentrogobius* is still incomplete, *A. limarius* clearly differs from other congeners in having a completely scaled cheek and opercle, and unique pattern of head sensory papillae (*viz.*, transverse pattern on the cheek and single transverse row on the chin) (Allen *et al.* 2015; this study). Eleven species of *Acentrogobius*, including two unidentified species (given only standard Japanese names), have been recorded from Japanese waters to date (Akihito *et al.* 2013). *Acentrogobius limarius* is not likely to be mis-identified as a different Japanese congener due to its lanceolate caudal fin and coloration. Only *Acentrogobius*

viganensis Steindachner, 1893 shares a similar caudal-fin shape with *A. limarius*, although the latter is easily distinguished by the lack of a black spot on the upper end of the opercle and a black strip just behind the eye (Akihito *et al.* 2013; this study).

An underwater photograph taken at Iriomote-jima island, Ryukyu Islands, Japan (Fig. 1D) was identified as *A. limarius*, having a lanceolate caudal fin, long filamentous tip on the 3rd dorsal-fin spine (an occasional character, possibly appeared only in males), and the above-described coloration (Allen *et al.* 2015; this study). The 2nd dorsal-fin spine also bore a long filamentous tip in the photographed individual, such a feature not having been described by Allen *et al.* (2015). However, as those authors pointed out, a long filamentous tip on the 3rd dorsal-fin spine was somewhat variable, which is likely to be applicable to the other spines. Hence, the condition depicted by the underwater photograph probably represents intraspecific variation in *A. limarius*. Similar intraspecific variation has been known in *Acentrogobius suluensis* (Herre, 1927) (Akihito *et al.* 2013).

Acentrogobius limarius has previously been recorded only from the original description (from Batanta island, West Papua, Indonesia) and unpublished specimens from Milne Bay, Papua New Guinea; the present specimen and underwater photograph (Fig. 1) being the first Northern Hemisphere records of the species, that from Amami-oshima island being the northernmost (Fig. 3). The species inhabits relatively deeper (8–26 m) muddy bottoms than other congeners [a habitat which is frequently overlooked and poorly collected (Allen 2015; Allen *et al.* 2015)], and is likely to occur between Japan and Indonesia. The new standard Japanese name “Hokosaki-kirara-haze” is proposed for *A. limarius* (based on YCM-P 45483). “Hokosaki” means ‘tip of halberd’ in Japanese, in reference to the lanceolate caudal fin of the species, and “kirara-haze” being the common Japanese name for the genus *Acentrogobius*.

Acknowledgments

We are very grateful to K. Yano (Diving Service Yano, Iriomote-jima Island) for providing an underwater photograph; M. Erdmann (Conservation International Indonesia Marine Program) for reading the manuscript and giving valuable comments; T. Hashimoto (Kagoshima University) for assistance in taking x-rays, and G. Hardy (Ngunguru, New Zealand) for reading the manuscript and providing help with English. This study was supported in part by a Grant-in-Aid from the Japan Society for the Promotion of Science for JSPS Fellows (DC1: 19J21103); JSPS KAKENHI Grant Numbers JP23580259, JP26450265, and JP20H03311; the JSPS Core-to-Core Program: B Asia-Africa Science Platforms; the “Biological Properties of Biodiversity Hotspots in Japan” project of the National Museum of Nature and Science, Tsukuba, Japan; and “Establishment of Global Research and Education Network in the Amami Islands” project of Kagoshima University, adopted by the Ministry of Education, Culture, Sports, Science and Technology, Japan.

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