Zoological Studies **47**(6): 767-773 (2008)

Zoological Studies

A New Species of *Halicmetus* (Lophiiformes: Ogcocephalidae) from the Western Pacific, with Comments on Congeners

Hsuan-Ching Ho[1,2,*], Hiromitsu Endo[3], and Kazunobu Sakamaki[4]

[1]*Institute of Marine Biology, National Taiwan Ocean University, 2 Peining Rd., Keelung 202, Taiwan*

[2]*Biodiversity Research Center, Academia Sinica, 128, Sec. 2, Academia Rd., Taipei 115, Taiwan*

[3]*Laboratory of Marine Biology, Faculty of Science, Kochi University, 2-5-1Akebono-cho, Kochi 780-8520, Japan*
E-mail:endoh@kochi-u.ac.jp

[4]*Civil Engineering and Eco-technology Consultants Co., Ltd., 2-23-2 Higashi-ikebukuro, Toshima, Tokyo 170-0013, Japan*

(Accepted April 3, 2008)

Hsuan-Ching Ho, Hiromitsu Endo, and Kazunobu Sakamaki (2008) A new species of *Halicmetus* (Lophiiformes: Ogcocephalidae) from the western Pacific, with comments on congeners. *Zoological Studies* **47**(6): 767-773. *Halicmetus nigra* sp. nov. is described on the basis of 32 specimens collected from the western Pacific off Japan, Taiwan, and Australia at depths of 280-1000 m. The new species differs from its congeners in the body surface being uniform gray to black; the rostrum extending anteriorly, slightly overhanging the mouth; a black band on each fin or fins entirely black; and in differences of morphometrics and squamation. Two species also recognized from the western Pacific are *H. reticulatus* and *H.* cf. *ruber*. Morphological data for nominal species in *Halicmetus* are provided for comparison with the new species.
http://zoolstud.sinica.edu.tw/Journals/47.6/767.pdf

Key words: Ogcocephalidae, Batfish, Taxonomy, New species, *Halicmetus nigra*.

The ogcocephalid genus *Halicmetus* Alcock, 1891 is a small benthic fish (< 10 cm in total length). It was previously comprised of 2 nominal species: *H. ruber* Alcock, 1891 collected from the Andaman Sea and *H. reticulatus* Smith and Radcliffe, 1912 from the Philippines (Bradbury 2003). *Halicmetus ruber* is characterized by the absence of a dorsal fin (unique among batfishes) and no color pattern on its disk. *Halicmetus reticulatus* is characterized by having 2 or 3 dorsal fin rays and a reticular color pattern on its disk. However, Brauer (1906) recorded seven specimens with a small dorsal fin purportedly of *H. ruber* from the Andaman Sea (see "Discussion" below). Furthermore, Smith and Radcliffe (1912) mentioned specimens of *H. ruber* collected by the research vessel *Albatross* from the western Pacific, which had no dorsal fin ray. Weber (1913) described a subspecies, *H. ruber marmorata*, based on 5 specimens (ZMA 101.893) collected from Indonesia. It was synonymized into *H. ruber* by Bradbury (1967).

On the basis of morphological characteristics of all ogcocephalid genera, Bradbury (1967) concluded that *Halicmetus* is distinguishable from others in the head being markedly depressed, the face flattened (truncated) and distinctly upturned; the presence of bucklers, and small tubercles; 2 gills, gill filaments present only on the 2nd and 3rd gill arches; pectoral pedicles not well attached to the body wall; an interrupted lateral line; and the illicial bone being split into 2 long processes.

Specimens of *Halicmetus* are uncommon in the world. Not until the last 2 decades have more specimens been collected by several different research vessels. In recent expeditions conducted in 2001-2006 for exploring deep-sea areas off Taiwan, 15 specimens were collected from off the northeastern coast that were recognized as a new

*To whom correspondence and reprint requests should be addressed. Tel: 886-2-27899621 ext. 221. Fax: 886-2-27883463.
E-mail:ogcoho@gmail.com

species. Nine specimens of this species were also found in collections of the Australian Museum, Sydney. This new species was initially recognized by the 3rd author in his unpublished graduation thesis in 1988 based on eight specimens collected from off southern Japan. Here we describe this new species collected at widely separated localities of the western Pacific.

Additionally, specimens of *H. reticulatus* and those of another species (*H*. cf. *ruber*), similar to *H. ruber*, are also recognized by us from this area. Morphological data for those specimens of *H. ruber* collected from the Indian Ocean, including 2 syntypes, as well as those from an expended series of *H. reticulatus* and *H*. cf. *ruber* from the western Pacific are compared with the new species.

MATERIALS AND METHODS

Standard length (SL) is used throughout. Abbreviations for institutions follow Leviton et al. (1985) and Leviton and Gibbs (1988), except for the Research Center for Biodiversity, Academia Sinica, Taipei (ASIZP). Terminology for describing the angling apparatus follows Bradbury (1967). Methods and definitions of the characters used in this study are modified from Bradbury (1980 1988) as well as those developed by us. Vertebral counts were made from radiographs and included the hypural plate counted as 1 vertebra. Proportional measurements are rounded to the nearest 0.1 mm.

Morphometrics are expressed as percentages of standard length and are defined as follows: skull length (SKL), distance between the center of the upper lips to the groove between the skull and 1st vertebra; orbital diameter (OD), greatest diameter of the bony orbit; interorbital width (IO), narrowest distance between the lateral frontal bones; mouth width (MW), measured as the greatest overall width; illicial cavity width (ICW), greatest distance of the illicial cavity; post-anus length (PAN), distance from the symphysial spine of the lower jaw to the genital papilla (situated immediately posterior to the anus); preanal length (PAL), distance from the symphysial spine of the lower jaw to the origin of the 1st anal fin ray; disk margin length (DM) (measured on the ventral side), distance from the posterior swelling of the mandible to the posterior base of the subopercular buckler; pectoral fin length (PF), distance between the middle of the base to the distalmost tip of the longest fin ray; anal fin length (AF), distance between the origin of the anal fin to the distalmost tip of the longest fin ray; and caudal fin length (CF), distance between the base of the caudal fin to the distalmost tip. Data for syntypes of *H. ruber* were taken by Dr. S. Yamashita during his visit to ZSI and Dr. M.G. Bradbury provided photographs of the syntypes that assisted us in character evaluation of this species.

Halicmetus nigra sp. nov.

(Figs. 1, 4A, 5A)

(new English name: Black Batfish)

(new Japanese name: Kusumi-aka-fûryû-uo)

Materials examined: *Holotype*: BSKU 44380, 87.3 mm, central Tosa Bay, off Kochi, Shikoku I., Japan, otter trawl, ca. 500 m, R/V *Kotaka-maru*, 21 Dec. 1987.

*Paratype*s: AMS I.29756007, 87.2 mm, FRV Kapala sta. K 89-15-04, 33°38'S,152°0'E-33°40'S, 151°58'E, eastern Broken Bay, bottom trawl, 677-750 m, 4 Aug. 1989; AMS I.30304003, 2 specimens, 53.9-60.6 mm, FRV *Kapala* sta. K 89-17-09, 32°13'S, 153°6'E to 32°11'S, 153°7'E, eastern Cape Hawke , 820-857 m, 17 Aug. 1989; AMS I.20920019, 6 specimens, 46.7-58.9 mm, 11°32'S, 144°10'E, 16-17.6 km NE of Raine I., prawn trawl, 1000 m, 12 Feb. 1979; ASIZP 064601, 7 specimens, 37.0-54.2 mm, Nan-fang-ao, northeastern Taiwan, bottom trawl, 280-320 m, 7 July 2004, coll. H.C. Ho; ASIZP 064603, 2 specimens, 49.5-51.2 mm, same data as for ASIZP 064601; AISZP 064604, 5 specimens, 42.4-52.5 mm, same data as for AISZP 064601; ASIZP 064421, 44.9 mm, *Ocean Researcher I*, sta. CD210, NE Taiwan, otter trawl, 445 m, 31 May 2003; BSKU 4931, 35 mm, fish market, Nagasaki, Kyushu I., Japan, 3 Aug. 1955; BSKU 19682, 41.3 mm, 34°21.3'N, 139°37.3'E, sta. B2-2, bottom trawl, 900-955 m, 18 Feb. 1966; BSKU 19892, 32.7 mm, st. B, 35°55.1'N, 140°00.5'E, bottom trawl, 800-870 m, 1 Dec. 1968; BSKU 20251, 68.3 mm, 35°07.7'N, 139°29.9'E, sta. T7, bottom trawl, 450 m, 30 June 1972; BSKU 26707, 57.2 mm, 30°01.8'N, 128°21.9'E, Okinawa Trough, bottom trawl, 900 m, 3 Feb. 1978; BSKU 43795, 57.8 mm, central Tosa Bay, off Kochi, Shikoku I., Japan, otter trawl, ca. 500 m, R/V *Kotaka-maru*, 20 Apr. 1987; NSMT-P 78285, 65.2 mm, same data as for BSKU 43795.

Diagnosis: A species of *Halicmetus* with

body surface uniformly gray to black; trifid tubercles present everywhere (Fig. 4A, best seen under magnification); peritoneum black; rostrum extending anteriorly, slightly overhanging mouth (Fig. 5A, not observable in specimens of < 40 mm SL); and bucklers on ventral surface of tail relatively low and small; all fins with black band or completely black; skull relatively deeper anteriorly; large orbit (Fig. 7, 8.9-11.6% SL); interorbital space wide (Fig. 8, 6.1-8.1% SL); major bucklers absent from dorsal surface, except for those associated with frontal ridge and lateral line scales; illicial cavity relatively wide (6.8-8.5% SL) and high, forming a triangular opening; anal fin relative long, 14.3-24.0% SL; and with 12-15 (mainly 13 or 14) pectoral fin rays.

Description: Proportional measurements of specimens, expressed as percent SL, and meristic data are given in Table 1 and 2, respectively.

Body depressed; disk subtriangular, broader than long, truncated anteriorly; skull deeper anteriorly when viewed in lateral profile; eye relatively large, directed laterally rather than dorsally; rostrum a bony plate, extending anteriorly,

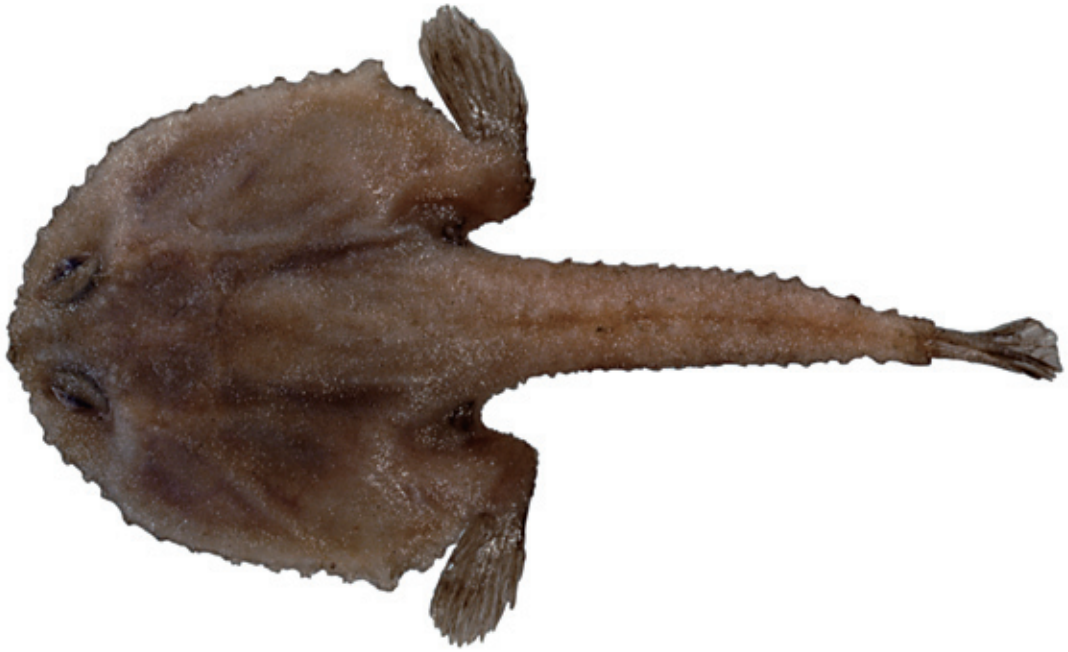

Fig. 1. Holotype of *Halicmetus nigra* sp. nov., BSKU 44380, 87.3 mm, central Tosa Bay, Shikoku I., Japan.

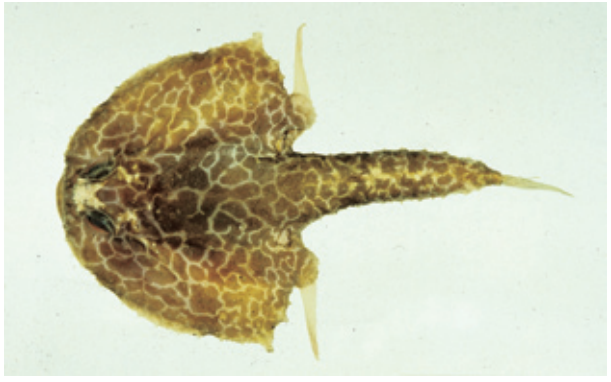

Fig. 2. *Halicmetus reticulatus*, ASIZP 058048, 86 mm SL, NE Taiwan.

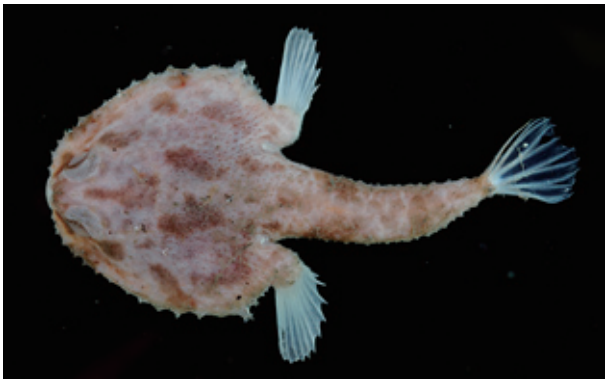

Fig. 3. *Halicmetus* cf. *ruber*, ASIZP 063079, 65 mm SL, NE Taiwan.

slightly overhanging illicial cavity and mouth, except in those specimens of < 40 mm where SL not well extended; illicial cavity situated entirely under rostrum, opening triangular in shape, wider than high; nostrils located on each side of lateroventral margins of illicial cavity; esca a fleshy bulb with a pair of short filaments on dorsal margin. Mouth small, horizontal, slightly curved; lower jaw slightly overhanging upper jaw; teeth villiform, small, in wide band in both jaws; quadrangular tooth patches on vomer and palatines. Fifth ceratobranchials bearing large and elongated tooth plates ("tongue teeth" (sensu Bardbury 1967 1980)) which closely articulate.

Gill filaments present only on 2nd and 3rd gill arches; gill rakers 3 or 4 on 2nd gill arch; gill opening small, at dorsal and inner portion of pectoral lobes. Dermal cirri present, associated with lateral line system on disk margin and tail. Pectoral fins at lateral side of disk; pelvic fins on ventral surface, closer to mouth rather than anus; anal fin on ventromedial surface at mid-length of tail.

Squamation agrees well with description for *Ogcocephalus* in Bradbury (1980), consisting of close-set tubercles and bucklers, their bases slightly overlapping, forming heavy armor. Numerous trifid tubercles, mixed with a few simple, bifurcated tubercles, covering entire body except for eyes, lips, fins, and anus. Bucklers present and usually associated with lateral line system and skeleton; those on dorsal surface of rostrum fused together, forming a flat bony plate; bucklers on dorsal surface of body barely perceptible to touch, except for those associated with lateral line scales; those on frontal ridge relatively low and small, almost imperceptible to touch on posterior area; bucklers on ventral surface slightly larger than co-

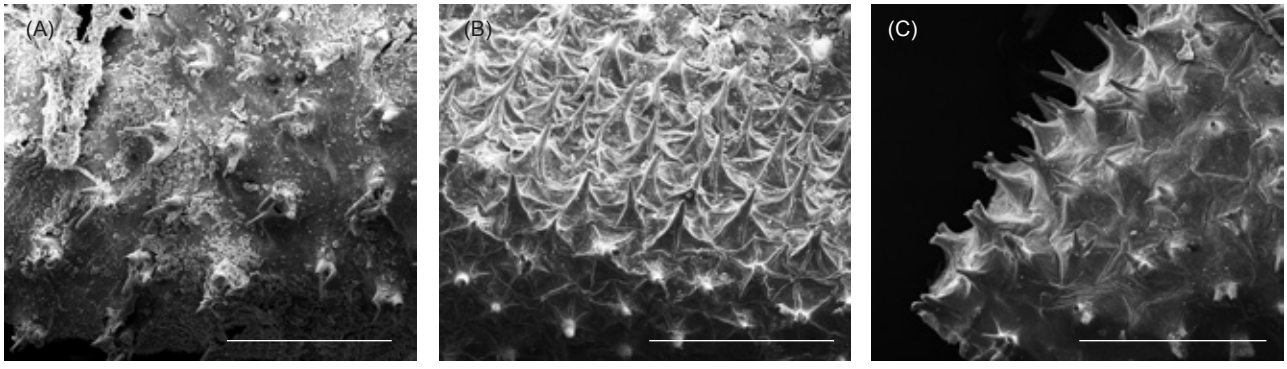

Fig. 4. SEM photograph of dorsal surface skin. (A) *Halicmetus nigra* sp. nov., ASIZP 64601, paratype, 54.2 mm SL. (B) *Halicmetus reticulatus*, ASIZP 58048, 62.4 mm SL. (C) *H.* cf. *ruber*, ASIZP 63079, 65.0 mm SL. Scale bar = 500 μm.

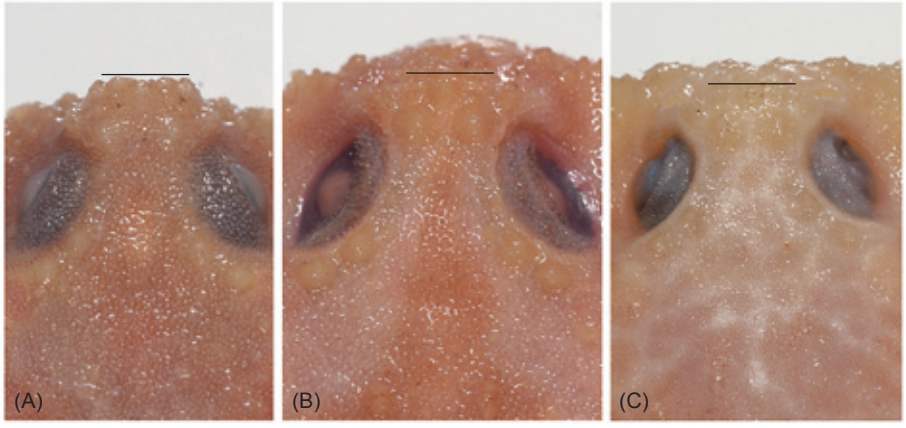

Fig. 5. Dorsal view of rostrum of *Halicmetus* species. (A) *Halicmetus nigra*, BSKU 43795, 57.8 mm SL. (B) *Halicmetus* cf. *ruber*, BSKU 8870, 75.0 mm SL. (C) *Halicmetus reticulatus*, BSKU 43013, 62.0 mm SL. Black bar indicates the anterior tip of rostrum.

occurring tubercles; bucklers on dorsal surface of tail forming 2 rows; those on ventral surface of tail anterior to anal fin small, not enlarged to degree as in congeners.

Lateral line system well developed. Supraorbital series 4 or 5; body series 8 or 9; premaxillary series 0; cheek series 6; preopercular series 2; subopercular series 7; dorsolateral branch of subopercular series 3; ventral series 1; tail series 8-11 (mainly 10 or 11).

Color: Freshly caught specimens with uniformly gray to black dorsal surface, each fin with a wide dark band or entire fin darkly pigmented, ventral surface slightly paler than dorsal, usually gray. In preserved specimens, dorsal surface brown or paler (Fig. 1). Oral cavity pale, with gray on pharynx. Peritoneum black.

Distribution (Fig. 6): *Halicmetus nigra* sp. nov. is known from the western Pacific localities, including southern Japan, Taiwan, and eastern Australia at depths of 280-1000 m.

Etymology: The new species name alludes to the uniform gray to black color of the body, peritoneum, and pharynx.

Remarks: *Halicmetus nigra* sp. nov. is more similar to both *H. ruber* from the Indian Ocean and *H*. cf. *ruber* from the northwestern Pacific than *H. reticulatus* in lacking dorsal fin rays and in having a dark-brown peritoneum. *Halicmetus nigra* differs from *H. ruber* in having uniformly grayish to black coloration (vs. creamy white); rostrum extending anteriorly, slightly overhanging mouth (vs. rostrum short not overhanging mouth), with the exception of those specimens of < 40 mm SL; large orbit (8.9-11.6% vs. 7.5-8.2% SL); wider illicial cavity (6.5-8.5% vs. 4.6-6.3% SL); tubercles on dorsal surface mainly trifid (vs. mainly bifurcated, cf. Fig. 4C); and longer anal fin (14.3-24.0% vs. 9.0-15.5% SL). It differs from *H*. cf. *ruber* in having uniformly grayish to black coloration (vs. brown to black patches on a creamy-white background); rostrum extending anteriorly, slightly overhanging mouth (vs. rostrum short not overhanging mouth), with

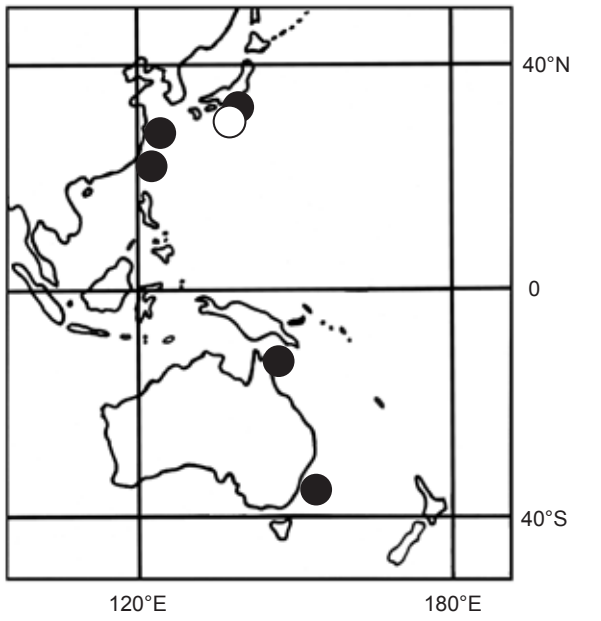

Fig. 6. Distribution of *Halicmetus nigra* sp. nov. The open dot indicates the locality of the holotype. A single symbol may represent more than 1 capture.

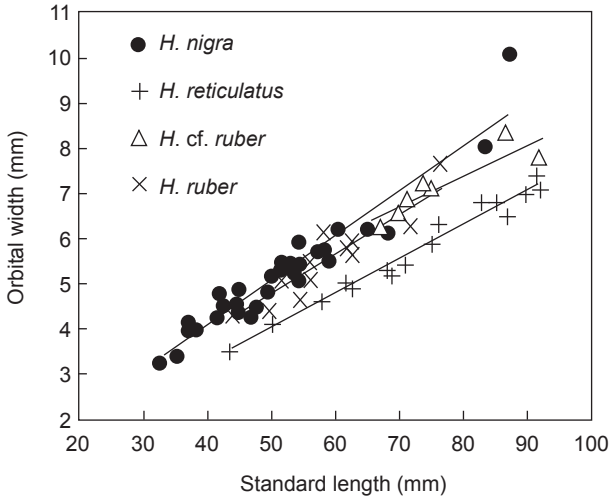

Fig. 7. Comparison of orbital diameter versus standard length for *Halicmetus* species.

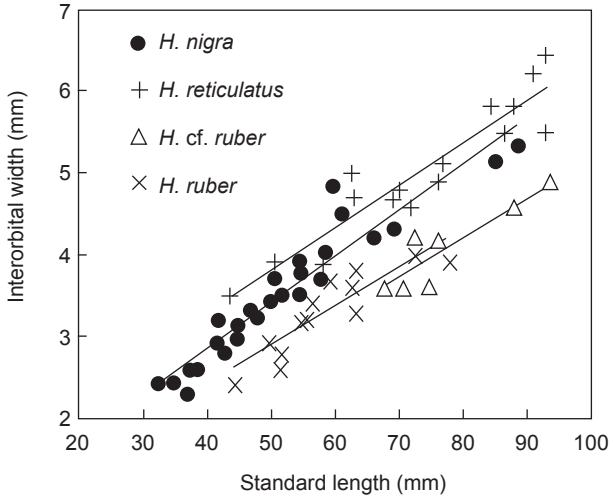

Fig. 8. Comparison of interorbital width versus standard length for *Halicmetus* species.

the exception of those specimens of < 40 mm SL; tubercles on dorsal surface mainly trifid (vs. mainly bifurcated, Fig. 4C); wider interorbital space (6.1-8.1% vs. 4.9-5.9% SL); and wider illicial cavity (6.5-8.5% vs. 4.3-5.7% SL).

DISCUSSION

Of 4 species in the genus *Halicmetus*, *H. reticulatus* is the only member with dorsal fin rays, while *H. nigra* sp. nov., *H. ruber*, and *H*. cf. *ruber* lack dorsal fin rays. Brauer (1902) recorded 7 specimens (4.4-7.6 cm TL) he identified as *H. ruber*, collected off India, and they have 2 or 3 dorsal fin rays. We did not have the opportunity to examine Brauer's specimens; however, all specimens of *H. ruber* collected from the Indian Ocean that we examined lack dorsal fin rays. Most likely, the specimens examined by Brauer that have dorsal fin rays are an undescribed species of *Halicmetus* that were originally misidentified as *H. ruber* (A. Prokofiev, pers. comm. 2007). Weber (1913) described a variation, as a subspecies, *H. ruber* marmorata, from off Indonesia. Bardbury (1967) synonymized it into *H. ruber*. However, its status is still uncertain.

Comments on congeners

Halicmetus reticulatus (Fig. 2) can be distinguished from its congeners by having a reticular pattern on its dorsal surface; tubercles mainly simple on dorsal surface (Fig. 4B); rostrum not extending and overhanging mouth (Fig.

Table 1. Morphometric data of 4 species of *Halicmetus*. Abbreviations of characters are given in text

	Halicmetus nigra sp. nov.		*H*. cf. *ruber*	*H. ruber*	*H. reticulatus*
Distribution	W. Pacific		W. Pacific	Indian Ocean	W. Pacific
	Holotype	All types (*n* = 32)	*n* = 7	*n* = 12	*n* = 15
SL (mm)	87.2	35.0 - 87.2	67.0 - 92.1	49.6 - 71.3	43.5 - 91.7
In % SL		Range (mean)	Range (mean)	Range (mean)	Range (mean)
SKL	30.8	25.4 - 30.8 (27.8)	24.8 - 26.3 (25.7)	21.6 - 28.1 (26.7)	24.4 - 27.8 (26.2)
CR	23.3	19.6 - 23.9 (21.9)	18.5 - 22.3 (20.6)	19.8 - 23.9 (21.6)	18.6 - 21.5 (20.4)
OD	11.6	8.9 - 11.6 (10.1)	8.5 - 9.9 (9.5)	8.8 - 10.5 (9.6)	7.5 - 8.3 (7.9)
IO	6.1	6.1 - 8.1 (6.8)	4.9 - 5.9 (5.4)	5.1 - 6.4 (5.7)	6.0 - 8.1 (7.0)
ICW	7.2	6.5 - 8.5 (7.5)	4.3 - 5.7 (5.2)	4.8 - 6.4 (5.5)	4.6 - 6.3 (5.7)
MW	14.3	11.1 - 16.7 (14.1)	13.0 - 14.6 (13.9)	15.4 - 18.2 (16.6)	14.6 - 17.0 (15.9)
JL	8.5	7.0 - 10.3 (8.2)	7.6 - 8.4 (8.1)	5.6 - 10.1 (8.2)	8.1 - 10.1 (9.0)
DM	46.4	42.1 - 50.4 (45.8)	39.7 - 46.5 (42.6)	42.9 - 47.4 (44.9)	43.7 - 50.8 (47.2)
PAL	56.8	41.4 - 59.3 (54.2)	52.7 - 57.3 (54.6)	50.2 - 54.3 (52.2)	52.5 - 58.9 (55.3)
PAN	75.2	73.2 - 82.2 (76.0)	69.7 - 77.3 (75.0)	72.4 - 76.0 (74.3)	73.1 - 78.7 (76.1)
PF	15.6	15.6 - 26.2 (20.6)	17.0 - 20.7 (18.9)	16.4 - 22.1 (19.4)	17.7 - 22.3 (20.0)
AF	19.3	14.3 - 24.0 (18.0)	12.7 - 17.2 (14.9)	12.7 - 17.0 (15.1)	9.9 - 15.5 (12.9)
CF	23.4	18.4 - 27.6 (22.3)	18.5 - 23.2 (21.2)	20.0 - 24.0 (21.6)	17.8 - 24.7 (21.2)

Table 2. Meristic data of 4 nominal species of *Halicmetus*. Pectoral fin rays were counted on both sides

		Dorsal fin rays				Pectoral fin rays					Anal fin rays	
	n	0	2	3	4	11	12	13	14	15	3	4
H. nigra sp. nov.	32	32					1	31	31	1	1	31
H. ruber	12	12					16	8			9	3
H. cf. *ruber*	7	7					6	8			2	5
H. reticulatus	15		6	7	1	2	26	1	1			15

5C); dorsal fin rays present; a small eye (Fig. 7, 7.5%-8.3% SL); a white peritoneum with black pepper dots and 11-14 (mainly 12) pectoral fin rays.

Thus far, specimens of *H. ruber* examined by us have only been collected from the Indian Ocean. *Halicmetus ruber* can be distinguished from its congeners by the following combination of characters: the absence of dorsal fin rays; a small eye (Fig. 7, 7.5-8.3% SL); a wide interorbital space (Fig. 8, 6.0-8.1% SL); the rostrum not extending and overhanging mouth (Fig. 5B); creamy-white coloration; a light-brown peritoneum; pectoral fins ray 12 or 13 (mainly 12). Most specimens of *H. ruber* examined by us are uniformly creamy white with black pigmentation around the nostrils and pectoral fin tip (not in the 2 syntypes). Fresh specimens are needed to verify the color pattern of this species. According to Dr. S. Yamashita who examined the squamation of 2 syntypes of *H. ruber*, the tubercles are mainly bifurcated, similar to those of *H*. cf. *ruber* (Fig. 4C).

Specimens of *H*. cf. *ruber* (Fig. 3) collected from the West Pacific (Japan to Australia and possibly New Caledonia) are most similar to *H. ruber* from the Indian Ocean. Both nominal species share the same features such as a brown peritoneum, tubercles mainly bifurcated (Fig. 4C), and similar proportions of body features. However, these 2 forms differ in some features: *H*. cf. *ruber* when fresh has reddish patches on a creamy-white background which turn gray to black when preserved (vs. uniformly creamy white in *H. ruber*); a relatively large eye (8.5-9.9% vs. 7.5-8.3% SL); and the illicial cavity relatively low, not forming a triangle (vs. illicial cavity higher and triangular in *H. ruber*). Possibly, preserved specimens of *H. ruber* initially had brown patches that faded over time in preservation, but this point needs confirmation. Thus, we treated specimens collected from the western Pacific as a nominal species, *H*. cf. *ruber*, but it is premature to describe this form as a new species until more specimens become available.

Acknowledgments: The work was supported by grants (NSC92-2311-B-001-034 and NSC94-2621-B-001-013) from the National Science Council of Taiwan to K.T. Shao, Biodiversity Research Center, Academia Sinica, Taiwan. We thank L. R. Parenti and J.T. Williams (USNM), T. Iwamoto, D. Catania, M. Hoang (CAS), M. McGrouther, S. Reader, A. Hay (AMS), A. Prokofiev (IOAN), and G. Shinohara (NSMT) for their help during HCH's visits to their respective institutions. Our thanks also go to O. Okamura (Prof. Emeritus of Kochi Univ., Japan), S. Kishida, and H. Horikawa (Fisheries Research Agency, Japan) for collecting BSKU specimens; S. Yamashita (Nakamra City, Kochi Pref., Japan) for taking data and photographs of the syntypes of *H. ruber* at ZSI; and G. Shinohara (NSMT) for registration of the paratype. We thank T. Munroe (NMFS) for reading and improving our manuscript, and S. Raredon (USNM) provided the radiographs and photograph of type specimens of *H. reticulates* for further identification. Special thank to M. G. Bradbury (Prof. Emeritus, San Francisco State Univ., USA) for her generosity in providing photographs of syntypes of *H. ruber* and valuable suggestions.

REFERENCES

Alcock AW. 1891. Natural history notes from H. M. Indian marine survey steamer `Investigator' Commander R. F. Hoskyn, R. N., commanding. – Series II., No. 1. On the results of deep-sea dredging during the season 1890-91. Ann. Mag. Nat. Hist. Ser. **6, 8:** 16-34, 119-138.

Bradbury MG. 1967. The genera of batfishes. Copeia **1967:** 399-422.

Bradbury MG. 1980. A revision of the fish genus *Ogcocephalus* with descriptions of new species from the western Atlantic Ocean (Ogcocephalidae; Lophiiformes). Proc. CA Acad. Sci. **42:** 229-285.

Bradbury MG. 1988. Rare fishes of the deep-sea genus *Halieutopsis*: a review with descriptions of four new species (Lophiiformes: Ogcocephalidae). Fieldiana Zool. (New. Ser.) **44:** 1-22.

Bradbury MG. 2003. Family Ogcocephalidae Jordan 1895 – batfishes. CA Acad. Sci. Annot. Checklists Fishes **17:** 1-17.

Brauer A. 1906. Die Tiefsee-Fische. I. Systematischer Teil. *In* C Chun. Wissenschaftl. Ergebnisse der deutschen Tiefsee-Expedition "Valdivia," 1898-99. Jena. Tiefsee-Fische **15:** 1-432.

Leviton AE, RH Gibbs Jr. 1988. Standards in herpetology and ichthyology. Standard symbolic codes for institution resource collections in herpetology and ichthyology. Copeia **1988:** 280-282.

Leviton AE, RH Gibbs Jr, E Heal, CE Dawson. 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. Copeia **1985:** 802-832.

Radcliffe L. 1912. New pediculate fishes from the Philippine Islands and contiguous waters. Scientific results of the Philippine cruise of the Fisheries steamer "Albatross," 1907-1910. – No. 16. Proc. US Natl. Mus. **42:** 199-214.

Weber M. 1913. Die Fische der Siboga-Expedition. Siboga-Expeditie. Uitkomsten op zoologisch, botanisch, oceanographisch en geologisch gebied verzameld in Nederlandsch Oost-Indië 1899-1900, ann boord H. M. Siboga onder commando van Luitenant ter zee I^{e}kl. G. F. Tydeman **57:** 1-710.