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First Records of the Rare Giant Roughy *Hoplostethus grandperrini* (Teleostei: Trachichthyiformes) from Japan

Ryo Misawa[1,8], Yuma Takanashi[2], Yo Su[3], Chih-Wei Chang[4,5,6], and Yoshiaki Kai[7]

[1] *Demersal Fish Resources Division, Fisheries Stock Assessment Center, Fisheries Resources Institute, Japan Fisheries Research and Education Agency, 25-259 Shimomekurakubo, Same, Hachinohe, Aomori 031-0841, Japan*
E-mail: batoideafish@gmail.com
[2] *Laboratory of Marine Biology, Faculty of Science and Technology, Kochi University, 2-5-1 Akebono-cho, Kochi 780-8520, Japan*
[3] *Department of Marine Biotechnology and Resources, National Sun Yat-sen University, Kaohsiung 804-201, Taiwan*
[4] *Marine Ecology and Conservation Research Center, National Academy of Marine Research, Kaohsiung 806-614, Taiwan*
[5] *Department of Oceanography, and Institute of Marine Ecology and Conservation, National Sun Yat-sen University, Kaohsiung 804-201, Taiwan*
[6] *Institute of Marine Biology, National Dong Hwa University, and National Museum of Marine Biology and Aquarium, Pingtung 944-401, Taiwan*
[7] *Maizuru Fisheries Research Station, Field Science Education and Research Center, Kyoto University, Nagahama, Maizuru, Kyoto 625-0086, Japan*
[8] *Corresponding author*

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Two large specimens [310–476 mm standard length (SL)] of the genus *Hoplostethus* Cuvier in Cuvier and Valenciennes, 1829, collected from Iwate and Okinawa prefectures, Japan, were recently discovered and identified as *Hoplostethus grandperrini* Roberts and Gomon, 2012 on the basis of the following characteristics: large body size, exceeding 300 mm SL; abdominal scutes strong; pectoral fins light red; caudal-fin tip without black pigmentation; upper margin of eye almost horizontally level with lateral-line origin; predorsal scales not enlarged; fin spines moderately thickened; pectoral-fin tip not reaching anal-fin origin; anterior part of oral cavity, including underside of tongue, without black pigmentation; 15–17 pectoral-fin rays; 21 predorsal scales; and 13 or 14 abdominal scutes. Furthermore, a molecular phylogenetic analysis of a partial sequence of the mtDNA COI gene from one of the specimens placed it in the same clade as *H. grandperrini* previously recorded from Taiwan, with an uncorrected *p*-distance between both specimens of 0.19%. *Hoplostethus grandperrini* was originally described on the basis of two specimens collected off New Caledonia, with only one additional specimen having been reported (from southern Taiwan). The Japanese specimens are the first records of the species from Japan, the fourth and fifth specimens known, and the Iwate Prefecture specimen the northernmost record of the species.

Key Words: Trachichthyidae, northernmost record, range extension, new Japanese name, COI.

Introduction

The roughy genus *Hoplostethus* Cuvier in Cuvier and Valenciennes, 1829, currently comprising 30 valid species. The genus, including some, like the orange roughy *Hoplostethus atlanticus* Collett, 1889 of commercial importance, is the most diverse group within the family Trachichthyidae, being distributed in deep (mainly continental slope) waters of three oceans (Kotlyar 1996, 2010; Nelson et al. 2016; Su et al. 2022, 2023).

The genus *Hoplostethus* is characterized by 3–8 dorsal-fin spines that are progressively longer posteriorly, scales on the ventral midline of the abdomen usually modified into enlarged thickened scutes, lateral-line scales distinctly enlarged, body height more than 40% standard length (SL), and the anus positioned closer to the anal-fin origin than pelvic-fin base (Kotlyar 1996; Roberts and Gomon 2012; Su et al. 2022, 2023). Five valid species of *Hoplostethus* are currently known from Japanese waters (Yamakawa 1982; Kotlyar 1986; Roberts and Gomon 2012; Hayashi 2013; Su et al. 2022, 2023): *H. crassispinus* Kotlyar, 1980, *H. japonicus* Hilgendorf, 1879, *H. melanopus* (Weber, 1913), *H. robustispinus* Moore and Dodd, 2010, and *H. roseus* Su, Lin, and Ho, 2022. However, some taxonomic issues remain to be addressed, and records of some species should be revised (Su et al. 2022, 2023).

Hoplostethus grandperrini Roberts and Gomon, 2012 was originally described on the basis of two specimens collected off New Caledonia, an additional specimen being recently reported from Taiwanese waters by Su et al. (2023). However, two large specimens of *Hoplostethus* collected in Japanese waters off Iwate and Okinawa prefectures, were also found to represent *H. grandperrini*. Because the specimens represent the first Japanese records of the species, they are described in detail herein, and its new standard Japanese name is proposed. In addition, the DNA barcode sequence [mitochondrial DNA (mtDNA) cytochrome *c* oxidase sub-

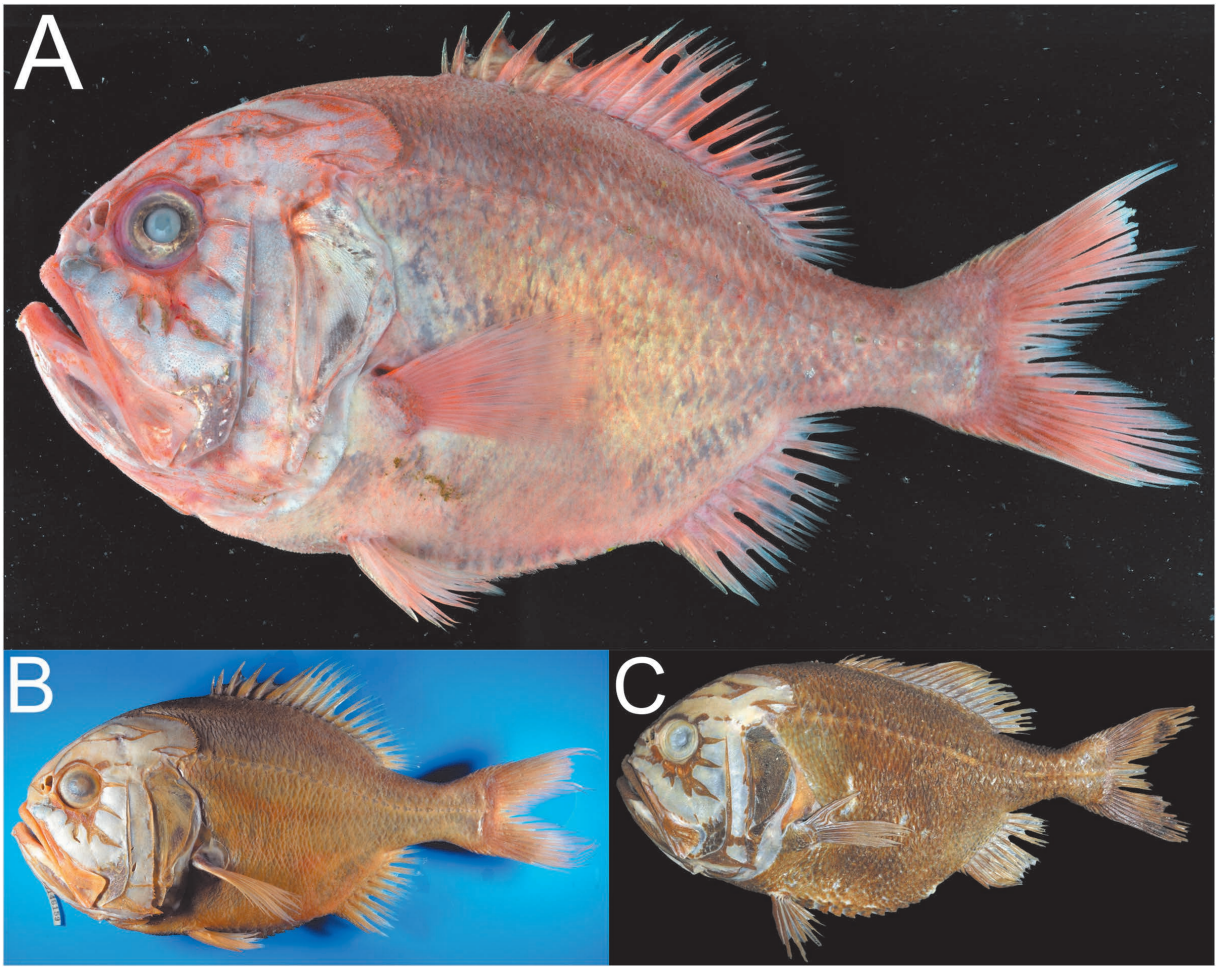

Fig. 1. Fresh (A) and preserved (B, C) specimens of *Hoplostethus grandperrini*. A, B, FAKU 146159, 310 mm SL, Miyako, Iwate, Japan; C, OCF-P 10563, 476 mm SL, Nago, Okinawa, Japan.

unit I (COI)] of the Iwate specimen was determined and compared to other congeners, including *H. grandperrini* reported by Su et al. (2023).

Materials and Methods

Methods for counts and measurements, and the description follow Kotlyar (1996), Roberts and Gomon (2012) and Su et al. (2022, 2023). Standard length and head length are abbreviated as TL and HL, respectively. The Japanese specimens were fixed in 10% formalin, transferred to 50% isopropanol or 70% ethanol, and deposited in the fish collections of the Kyoto University, Kyoto, Japan (FAKU) and Okinawa Churashima Foundation, Okinawa, Japan (OCF). Other comparative materials are deposited in Kochi University, Kochi, Japan (BSKU), FAKU, and the National Museum of Marine Biology and Aquarium, Pingtung, Taiwan (NMMB).

For DNA barcoding of the Iwate specimen, total DNA was extracted from muscle tissue preserved in 99.5% ethanol, using the Wizard Genomic DNA Purification Kit® (Promega) and following the manufacturer's protocols. The partial mtDNA COI gene was amplified using a primer set designed by Folmer et al. (1994) (LCO1490: 5′-GGT CAA CAA ATC ATA AAG ATA TTG G-3′; HCO2198: 5′-TAA ACT TCA GGG TGA CCA AAA AAT CA-3′). The PCR proceeded for 30 cycles, with denaturation at 94°C for 15 sec, annealing at 45°C for 15 sec, and extension at 72°C for 30 sec, using the KAPA2G Robust PCR Kit (KAPA Biosystems). After purification using ExoSAP-IT Express (ThermoFisher Scientific), the PCR products were sequenced on an automated DNA sequencer (ABI Prism 310 Genetic Analyzer; ThermoFisher Scientific) using amplification primers and the BigDye Terminator v1.1 Cycle Sequencing Kit (ThermoFisher Scientific). The 596 base pair (bp) COI sequence determined here has been deposited in the International Nucleotide Sequence Database Collaboration (INSDC) under the accession number LC764606. Following datasets of 39 individuals representing 12 species of *Hoplostehus* given in Su et al. (2022)—*H. atlanticus* (INSDC accession numbers: DQ108109, KX781864), *H. gigas* McCulloch, 1914 (INSDC: DQ108103, DQ108104), *H. japonicus* (INSDC: AP002938, OL675230, OL675231), *H. latus* McCulloch, 1914 [Barcode of Life Data (BOLD) sequence IDs: FOAF767-07, FOAO229-14], *H. mediterraneus* Cuvier, 1829 (BOLD: FMVIC411-08; INSDC: DQ885017, KJ709779), *H. melanopeza* Roberts and Gomon, 2012 (BOLD: FNZ596-06, FNZ621-06), *H. melanopus* (BOLD:

Table 1. Counts and morphometric data of *Hoplostethus grandperrini*.

	This study		Su et al. (2023)	Roberts and Gomon (2012)
	FAKU 146159	OCF-P 10563	NMMB-P 36039	All types ($n = 2$)
Dorsal-fin elements	VI, 13	VI, 13	VI, 13	VI, 13
Pectoral-fin elements (L/R)	17/17	15/16	17/17	17/18
Pelvic-fin elements	I, 6/I, 6	I, 6/I, 6	I, 6/I, 6	I, 6
Anal-fin elements	III, 9	III, 9	III, 9	III, 9
Caudal-fin elements	6 + 2 + 17 + 2 + 6	6 + 2 + 17 + 2 + 6	7 + 1 + 17 + 1 + 7	6 + 2 + 17 + 2 + 6
Gill rakers	6 + 1 + 13 = 20	6 + 1 + 12 = 19	6 + 1 + 13 = 20	6 + 1 + 12–13 = 19 or 20
Pseudobranchial filaments	28	27	30	15 ($n = 1$)
Lateral-line scales	27	28	28	29
Scale rows above lateral line	11	11	13	11–12
Scale rows below lateral line	24	21	23	26–35
Abdominal scutes	13	14	17	13–14
Predorsal scales	21	21	24	21–24
Vertebrae	N/A	11 + 15	11 + 16	11 + 15
SL (mm)	310	476	395	131–455
% SL				
HL	39.8	36.5	37.6	41.4–42.9
Head depth	43.1	38.6	39.5	N/A
Predorsal length	47.8	48.5	46.5	48.1–48.8
Prepectoral length	38.9	40.6	39.8	40.4–40.8
Prepelvic length	44.2	41.2	42.0	42.6–43.8
Preanal length	67.5	71.9	67.6	73.2–76.7
Snout length	9.1	9.8	8.2	9.5–10.5
Eye diameter	10.4	9.3	10.1	9.6–12.5
Interorbital width	14.4	12.7	13.6	13.4–14.1
Upper jaw length	26.3	25.3	25.6	26.3–30.4
Lower jaw length	27.5	25.6	26.8	28.6–31.1
HF1	4.0	3.8	3.2	N/A
HF2	7.8	7.4	6.7	41.0–44.2
Postorbital length	21.7	18.0	18.5	22.0–22.4
P length	25.1	23.3	24.8	25.2–34.0
D–P length	35.7	34.5	32.9	N/A
D–V length	51.7	48.8	48.8	N/A
Body height	52.7	52.1	49.4	53.2–55.6
V length	15.9	17.6	18.5	N/A
V spine length	13.7	11.9	13.9	N/A
P–V length	11.9	14.8	14.3	15.8–18.3
D–A length	54.6	49.5	49.5	N/A
V–A length	32.3	38.4	32.1	35.5–42.4
D length	40.5	35.7	38.2	36.0–38.3
D height	16.4	17.4	18.0	N/A
1st D spine length	4.0	4.4	4.9	2.9–4.7
2nd D spine length	5.7	6.7	7.2	4.1–8.9
Last D spine length	13.1	10.7	12.4	12.1–17.6
A length	18.1	16.0	15.8	15.8–18.3
A height	12.4	13.2	15.0	N/A
3rd A spine length	9.0	7.9	9.7	7.7–13.3
Postanal length	23.0	21.8	23.1	N/A
Postdorsal length	25.4	24.4	27.3	N/A
Caudal peduncle height	12.7	10.4	11.5	12.5–13.0
C length	28.6	27.8	25.4	N/A
Longest GR	7.0	6.3	7.1	N/A
Gill filament at angle	2.3	2.9	2.4	N/A
Longest pseudobranchial filament	5.0	5.1	4.4	N/A

Abbreviations: A, anal fin; C, caudal fin; D, dorsal fin; GR, gill raker; HF, forehead height; HL, head length; P, pectoral fin; SL, standard length; V, pelvic fin.

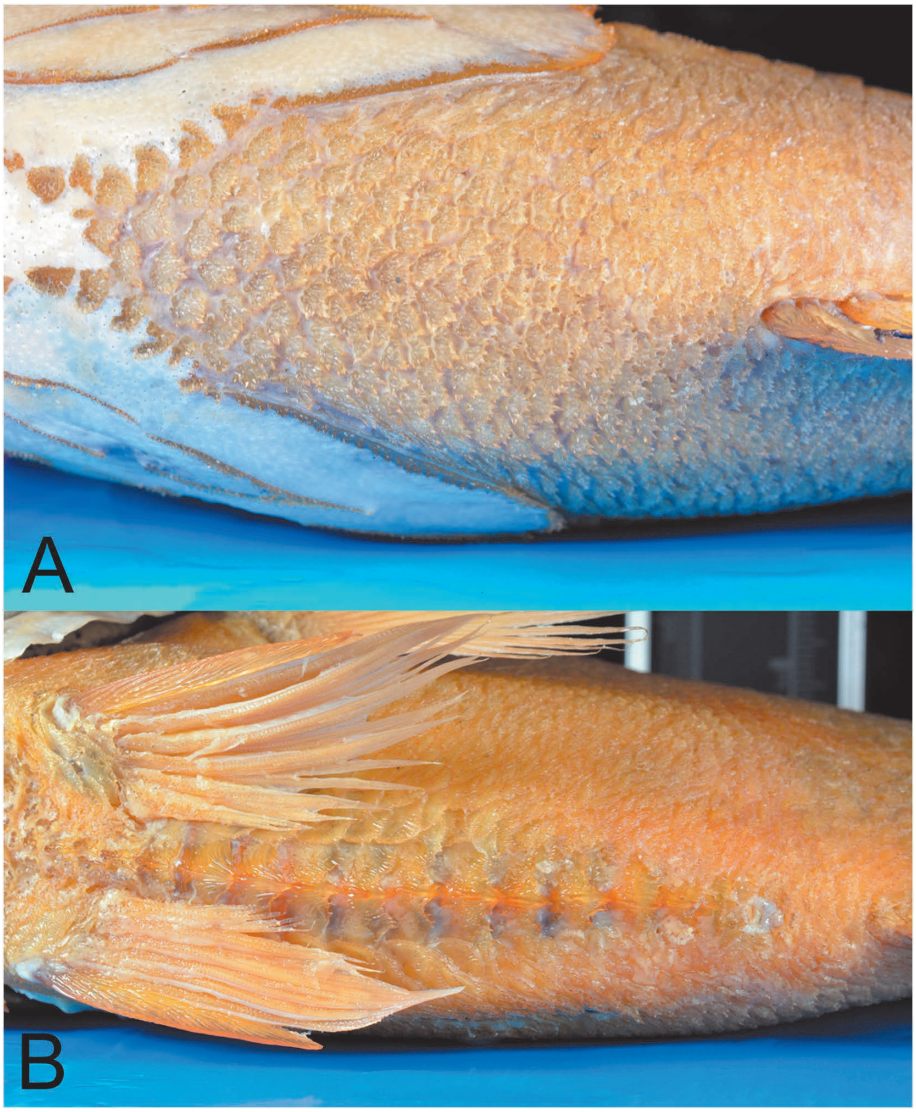

Fig. 2. Dorsal view of predorsal scales (A) and ventral view of abdominal scutes (B) of *Hoplostethus grandperrini*, FAKU 146159, 310 mm SL.

FOAF768-07, FOAF769-07, FOAF770-07, FTWS878-09, FTWS881-09; INSDC KR231806, KR231807, KR231808, KU943268), *H. mento* (Garman, 1899) (INSDC: MF956729, MF956733), *H. ravurictus* Gomon, 2008 (BOLD: FOAN008-11, FOAG288-08), *H. roseus* (INSDC: OL675227, OL675228, OL675232–OL675237), *Hoplostehus* sp. sensu Su et al. (2022) (INSDC: KU943267, OL675229)—were also used, with *Gephyroberyx japonicus* (Döderlein, 1883) as an outgroup (INSDC: OL675238, OL675239). In addition, we used the COI sequence of the specimen of *H. grandperrini* reported by Su et al. (2023) (NMMB-P 36039; INSDC accession number OQ880480). The sequence (OQ880480) was determined by the third author according to the protocol of Su et al. (2022). From the aligned sequences (542 bp), a neighbor-joining (NJ) tree (Saitou and Imanishi 1987) was constructed using MEGA 11 (Tamura et al. 2021). A simple uncorrected *p*-distance model was selected, with branch support measured using nonparametric bootstrapping with 1000 replications. Genetic distances were also determined using the *p*-distance model.

Hoplostethus grandperrini Roberts and Gomon, 2012
[New standard Japanese name: Kondo-hiuchi]
(Figs 1–3; Table 1)

Hoplostethus grandperrini Roberts and Gomon, 2012: 351, fig. 6 (original description, type locality: New Caledonia, Norfolk Ridge, 24°55′8.99″S, 168°20′56.99″E, 600–675 m depth); Su et al. 2023: 88, figs 1, 2, 3A (South China Sea, Taiwan; description).

Specimens examined. FAKU 146159, 310 mm SL, off Miyako, Iwate Prefecture, Japan, bottom trawl, 10 April 2018, coll. Shin-ichi Kondo; OCF-P 10563, 476 mm SL, off Nago (precise locality unknown), Okinawa Prefecture, Japan, 24 August 1996, coll. Minoru Toda.

Description of the Japanese specimens. Morphometrics and meristics given in Table 1.

Dorsal-fin rays VI, 13; pectoral-fin rays 15–17 (left side)/16 or 17 (right side), pelvic-fin rays I, 6/I, 6; anal-fin rays III, 9; Principal caudal-fin rays 21 (2 simple + 17 branched + 2 simple); procurrent caudal-fin rays 6 dorsally and 6 ventrally; gill

rakers on first gill arch 6 + 1 + 12 or 13 = 19 or 20; pseudobranchial filaments 27 or 28; lateral-line scales 27 or 28; scale rows between dorsal fin origin and lateral line 11, between anal-fin origin and lateral line 21–24; abdominal scutes 13 or 14; predorsal scales 21; vertebrae 11 + 15.

Body ovoid, compressed, distinctly longer than deep, depth at dorsal-fin origin 52–53% SL (Fig. 1). Head large, length 37–40% SL, height slightly greater than length, 106–108% HL, with enlarged head canal system with mucous cavities covered by thin membrane; crests of cephalic bones well developed, covered with rather long spinules; profile of nape gently curved to back of head, with slightly concave forehead, and abrupt downturn above maxilla; anterodorsal profile moderately separated from upper orbital rim, forehead height 1 (HF1) 10% and forehead height 2 (HF2) 20% HL. Eye moderately large, diameter 25–26% HL, upper margin almost horizontally level with lateral-line origin; space between eyes wide, interorbital width 35–36% HL. Snout blunt, rather short, length 23–27% SL. Mouth large, oblique, posterior end of maxilla extending just beyond rear margin of eye. Teeth small, villiform, arranged in bands on jaws and palatine; lateral and medial surfaces of premaxilla and dentary densely covered with villiform teeth, those on medial surface rather large and fine, somewhat conical; tip of dentary with ossified knob at symphysis; symphysial notch of premaxilla and knob at symphysis of dentaries without teeth; palatine with narrowly elongated band of villiform teeth; vomer with a small triangular patch of villiform teeth. Preopercular spine thick, short, not reaching pelvic-fin base. Gill rakers on first arch long, strong, somewhat plate-like, with small conical teeth on inner surfaces; central gill raker (between upper and lower limbs) of outer row longest, its length about half eye diameter; those on inner row knob-like; gill filaments at angle of first gill arch short, about half length of longest pseudobranchial filaments. Anus located closer to the anal-fin origin than pelvic-fin base.

Body scales thick, firmly attached; cycloid scales present behind and above pectoral-fin base; remaining area covered with ctenoid scales armored with long ctenii. Most of head naked, including around eye, snout, opercle, interorbital space, upper and lower jaws, isthmus and gular region; cheek posterior to rear tip of maxilla with a patch of ctenoid scales; predorsal scales not enlarged, not forming distinct ridge (Fig. 2A). Lateral-line scales enlarged, without a strong medial spine, about 1.5 times size of other body scales. Ventral midline of abdomen with enlarged robust scales (scutes), each with a single strongly pointed tip, forming low serrated keel (Fig. 2B); additional scales on midline preceding scutes somewhat enlarged.

Dorsal-fin spines progressively longer posteriorly, first and second spines short, third to sixth (last) spines relatively long, posteriormost spine longest, its length 29–33% HL; second, fourth, and posteriormost spines relatively thick and with complex sculpturing, remaining spines slender, sharp, and with striations; first soft ray longer than posteriormost spine, unbranched, remaining rays branched, becoming shorter posteriorly creating a curved fin margin. First and second anal-fin spines short, length of first spine about half that of second, third spine moderately long; all anal-fin spines moderately thick with sculpturing; outer margin of soft anal fin curving posteriorly. Caudal fin distinctly forked, with broad rounded lobes. Pectoral fins of moderate length, 63–64% HL, reaching near posteriormost scute. Pelvic fins rather short, reaching eighth scute, spine robust with complex sculpturing.

Fig. 3. Fresh coloration of oral cavity of *Hoplostethus grandperrini*, FAKU 146159, 310 mm SL.

Coloration. When fresh (Fig. 1A), body largely pinkish-silvery, dorsal surface (above lateral line) pinkish-brown; head generally whitish with partial reddish patches; cephalic bones pinkish-orange, somewhat translucent; fins pinkish to reddish-orange without darker margins; membranes between dorsal-fin spines pale brown, basal region of upper and lower lobes of caudal fin pinkish-brown; anterior part of oral cavity (including palatine and underside of tongue) white, inside line of mandible and posterior part (behind palatine and vomer) of oral and branchial cavities broadly black (Fig. 3). Fresh condition of specimen from Okinawa Prefecture (OCF-P 10563) unknown. After preservation (Fig. 1B, C), reddish color fades uniformly, body and fins becoming yellowish to dark brown; thin membrane on head creamy-white.

Distribution. Known from southern New Caledonia on the Norfolk Ridge and the south-eastern slope of Grande Terre (Roberts and Gomon 2012), southern Taiwan off Pingtung (Su et al. 2023), and Japan off Iwate and Okinawa prefectures (this study). Collection depths off Taiwan and Japan are unknown, but the specimens from southern New Caledonia were collected in 500–675 m depth (Roberts and Gomon 2012).

DNA barcoding. The NJ tree of 12 *Hoplostethus* species

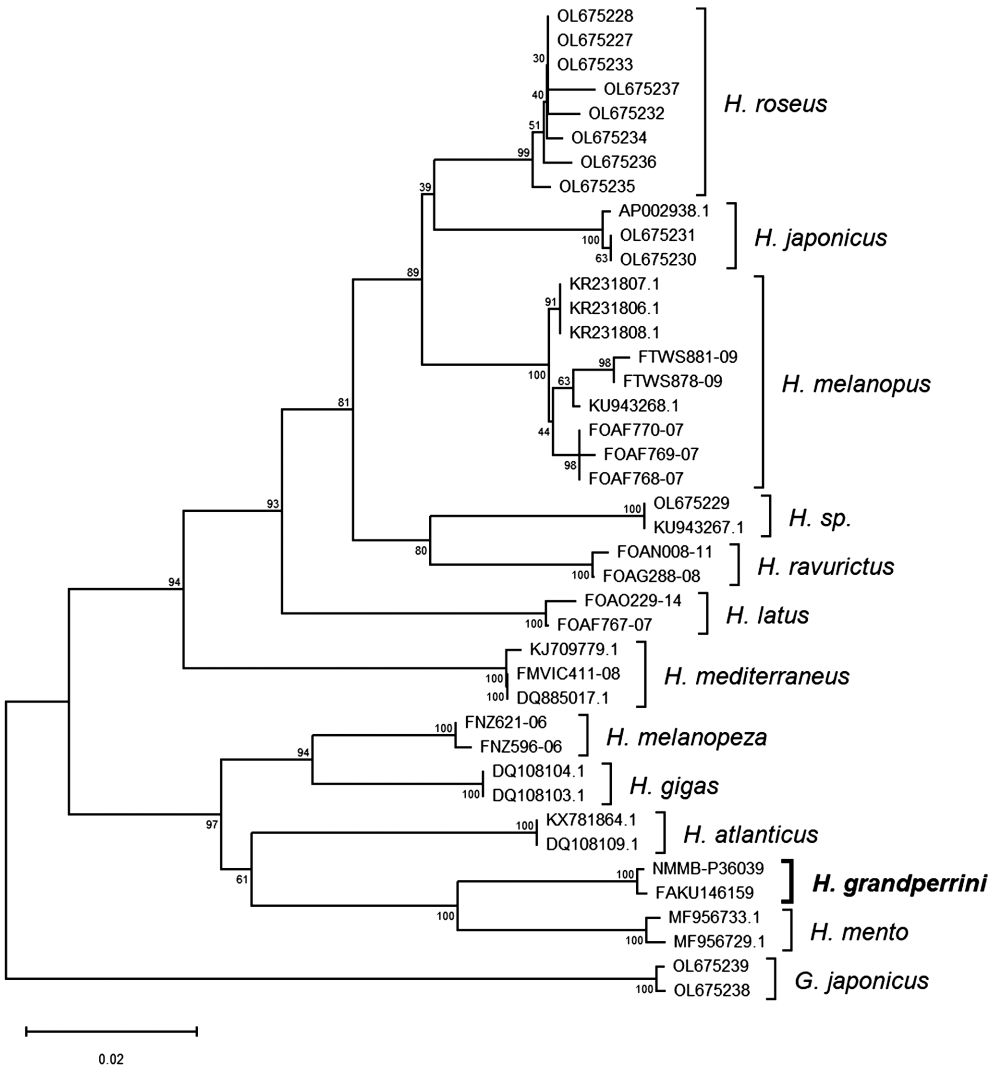

Fig. 4. Neighbor-joining tree based on sequence variations in the mitochondrial DNA COI gene (542 bp). Sample names indicate catalog numbers of specimens (FAKU 146159 and NMMB-P 36039, determined here) or INSDC/BOLD registration numbers. Numbers at branches indicate bootstrap probabilities (> 50%) with 1000 bootstrap replications. Scale bar equals 0.02 of uncorrected *p*-distance.

(ingroup), based on 542 bp of the COI gene, showed each species forming a separate clade supported by high bootstrap probabilities (99–100%) (Fig. 4). The Japanese specimen of *H. grandperrini* (FAKU 146159) clustered with the Taiwanese *H. grandperrini* specimen (NMMB-P 36039), with a sequence divergence between them of 0.19% uncorrected *p*-distance. *Hoplostethus grandperrini* and *H. mento* formed a sister clade, with a sequence divergence between them of 4.43–4.80% uncorrected *p*-distance. In addition, the mean sequence divergences (uncorrected *p*-distance) within and among the species of *Hoplostethus* ranged between 0.00–0.64% and 3.53–14.30%, respectively.

Remarks. The newly-discovered specimens from Iwate (FAKU 146159) and Okinawa (OCF-P 10563) prefectures agree well with the original description (Roberts and Gomon 2012) [and an additional record from Taiwan (Su et al. 2023)] of *H. grandperrini* in having a large body size, exceeding 300 mm SL, a short pectoral fin with the tip not reaching a vertical through the anal fin origin, the upper margin of the eye almost horizontally level with the lateral-line origin, predorsal scales not enlarged and not forming a distinct ridge, ctenoid scales on the body with strong spinules, the anterior part of the oral cavity, including the underside of the tongue, without black pigmentation, 15–17 pectoral-fin rays, 13 or 14 abdominal scutes, and 21 predorsal scales. Most of the counts and proportional measurements, except forehead height 2 (HF2) of the Japanese specimens, were also consistent with the values for *H. grandperrini* given by Roberts and Gomon (2012) and Su et al. (2023). In fact, the forehead height 2 (HF2) shown in Roberts and Gomon (2012), a significantly high value, possibly indicated head depth. The specimen collected off Okinawa Prefecture (OCF-P 10563) had 15/16 pectoral-fin rays, slightly fewer than in other specimens. However, the difference in pectoral-fin ray numbers was continuous among the specimens and was considered here to be within intraspecific variation limits, such a degree of variation within a species of *Hoplostethus* having already been noted (Su et al. 2022). The preserved specimen of *H. grandperrini* (NMMB-P 36039) shown by Su et al. (2023) has black pigmentation

Fig. 5. Fresh specimen of *Hoplostethus grandperrini*, NMMB-P 36039, 395 mm SL, Pingtung, Taiwan. Photo by C.-W. Chang.

on the caudal- and anal-fin tip, which was an artifact while taking photographs of the specimen. The fresh photograph of this specimen shows no black pigmentations (Fig. 5).

The Japanese specimens of *H. grandperrini* were distinguished particularly from other Japanese and Taiwanese species of *Hoplostethus* by the following characteristics (Yamakawa 1982, 1984, 1985; Moore and Dodd 2010; Kotlyar 2011; Roberts and Gomon 2012; Hayashi 2013; Vinu et al. 2017; Su et al. 2022, 2023): abdominal scutes strong (weak in *H. melanopus*); pectoral fins pinkish-orange (darkish in *H. melanopus*); caudal fin tip without black pigmentation (with black pigmentation in *H. japonicus*); upper margin of eye horizontally level with lateral-line origin (below horizontal through lateral-line origin in *H. crassispinus*); predorsal scales not enlarged and not forming distinct ridge [enlarged and forming distinct ridge in *H. crassispinus*, *H. japonicus, H. robustispinus*, *H. roseus*, and *Hoplostethus* sp. sensu Su et al. (2022)]; dorsal- and anal-fin spines moderately thickened (remarkably thickened in *H. robustispinus*); pectoral-fin tip not reaching anal-fin origin [reaching to or beyond anal-fin origin in *H. crassispinus*, *H. japonicus*, *H. roseus*, and *Hoplostethus* sp. sensu Su et al. (2022)]; and gular region naked [covered with scales in *Hoplostethus* sp. sensu Su et al. (2022)]. Furthermore, the NJ tree inferred from the partial sequence of the COI region placed the Japanese specimen in the same clade as *H. grandperrini* from Taiwan, both being genetically distinct from the other 11 species of the genus *Hoplostethus* (Fig. 4).

Hoplostethus grandperrini was originally described by Roberts and Gomon (2012) on the basis of two specimens collected off New Caledonia, with an additional specimen from southern Taiwan later reported by Su et al. (2023). Thus, the Japanese specimens reported here are only the fourth and fifth reported examples of the species, the specimen collected off Iwate Prefecture (FAKU 146159) representing the northernmost record. The new standard Japanese name "Kondo-hiuchi" is proposed here on the basis of FAKU 146159, following the recommendation of the Ichthyological Society of Japan (https://www.fish-isj.jp/iin/standname/guideline/guidelines2020.pdf). "Kondo" is named for Shin-ichi Kondo, who collected the Iwate specimen, "hiuchi" being the common Japanese name for *Hoplostethus*. The specimen from Okinawa Prefecture (OCF-P 10563), measuring 476 mm SL, is the largest known example of the species.

Although Goto et al. (2018) reported a large specimen of *Hoplostethus* (309 mm SL) off Iwate Prefecture as the largest example of *H. crassispinus*, the record was overlooked by Su et al. (2022, 2023). In fact, the specimen reported by Goto et al. (2018) was consistent with *H. grandperrini* (abdominal scutes strong; caudal fin tip without black pigmentation; predorsal scales not enlarged, not forming a distinct ridge; upper margin of eye horizontally level with lateral-line origin; and pectoral-fin tip not reaching anal-fin origin). However, the specimen was not available for this study.

Previously, the standard Japanese name "Maru-hiuchidai" was applied to *H. crassispinus* (type locality: Emperor Seamount Chain) (Yamakawa 1982, 1984, 1985; Shimizu 1997; Hayashi 2013), but when Su et al. (2022) described *H. roseus* (type locality: eastern Taiwan) as a new species, they reassessed the records of Yamakawa (1984) and Shimizu (1997), and found them to be based on misidentified specimens of their new species. Because of the locality and morphological characteristics of specimens, the descriptions by Yamakawa (1984) and Shimizu (1997) are here considered to have been based on Yamakawa (1982), who first proposed the above standard Japanese name. In fact, one of the two specimens (BSKU 29365) from the Kyushu-Palau Ridge reported by

Yamakawa (1982) differed from the original description of *H. crassispinus* by Kotlyar (1980) in that the upper margin of the eye was horizontally level with the lateral-line origin, the gular region naked, and the margin of the caudal-fin base brownish, all characteristics of *H. roseus* (see Su et al. 2022, 2023; this study). Therefore, we conclude that the standard Japanese name "Maru-hiuchidai" should be applied to *H. roseus*. In addition, four specimens of *H. crassispinus* (from the Kyushu-Palau Ridge) were recorded by Kotlyar (1986), and two of *H. robustispinus* (from the East China Sea) by Roberts and Gomon (2012), both species from within Japan's EEZ, but for which no standard Japanese names have been proposed. Therefore, it is necessary to re-examine those records with a view to proposing new standard Japanese names.

Comparative materials examined. *Hoplostethus grandperrini*: NMMB-P 36039, 395 mm SL, Pingtung, Taiwan. *Hoplostethus japonicus*: FAKU 148183, 124 mm SL, FAKU 148185, 121 mm SL, Ibaraki Prefecture, Japan. *Hoplostethus melanopus*: BSKU 17706, 122 mm SL, BSKU 17707, 135 mm SL, South China Sea. *Hoplostethus* cf. *robustispinus*: FAKU 21576, 73 mm SL, FAKU 24458, 71 mm SL, Mie Prefecture, Japan. *Hoplostethus roseus*: BSKU 29365, 129 mm SL, Kyushu-Palau Ridge; BSKU 32578, 177 mm SL, BSKU 34747, 127 mm SL, Okinawa Trough.

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Authors Contributions

Ryo Misawa: Conceptualization; Investigation; Visualization; Writing – original draft. Yuma Takanashi: Conceptualization; Investigation; Resources; Writing – review & editing. Yo Su: Investigation; Resources; Writing – review & editing. Chih-Wei Chang: Resources; Writing – review & editing. Yoshiaki Kai: Conceptualization; Investigation; Resources; Writing – review & editing.

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Declarations

Competing interests. The authors declare no conflicts of interest.

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