

Report on the specimens of the family Butidae (Teleostei: Gobiiformes) in the Department of Zoology, the University Museum, the University of Tokyo

Hirozumi Kobayashi^{1*}, Keita Koeda^{2,3}, Masahiro Aizawa², Kazuo Sakamoto^{2,4}, Rei Ueshima⁵

¹Tropical Biosphere Research Center, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 903-0213, Japan

²The University Museum, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

³Faculty of Science, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 902-0213, Japan

⁴Fish Information Center and Museum, 6-6 Toyosu, Koto-ku, Tokyo 135-0061, Japan

⁵Department of Biological Sciences, Graduate School of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

*Corresponding author: E-mail: acheilognathus5884@gmail.com

Abstract

During a detailed investigation of the collection of Butidae (Teleostei: Gobiiformes) deposited in the Department of Zoology, The University Museum, The University of Tokyo (ZUMT), 47 specimens in four genera of seven species with an unidentified species, including some bearing the Japanese name of *Butis butis* (Hamilton, 1822) and *Bostrychus sinensis* La Cèpède, 1801, were found. No types are known for this family in ZUMT collection. We also confirmed the first reported *Bo. sinensis* specimen in Japan by Kuroiwa (1927), which was later transferred to Field Museum of Natural History, Chicago (FMNH).

Introduction

The family Butidae (Gobiiformes) includes about 10 genera and 46 species inhabiting the inland water of Indo-Pacific and Western Africa (Nelson et al. 2016), and is characterized by unfused pelvic fins, developed cephalic canal pores, position of mandibular telson position, and procurrent cartilages (Hoese and Gill 1993; Akihito et al. 2013). Three species, *Butis amboinensis* (Bleeker, 1854), *Bostrychus sinensis* La Cèpède, 1801, and *Ophiocara ophicephalus* (Valenciennes in Cuvier & Valenciennes, 1837), were recorded from Japan, and most of them recorded only from the Ryukyu Archipelago (Akihito et al. 2013).

In the Department of Zoology, The University Museum, The University of Tokyo (abbreviated as ZUMT), several butid specimens are historically important in Japanese ichthyology such as the first Japanese record of species, specimens bearing standard Japanese name. However, details of these specimens have not demonstrated.

In this study, we listed the butid gudgeon specimens in the ZUMT with an updated taxonomic status and identified the specimens used to propose Japanese names for *Bu. butis* (Hamilton, 1822) and *Bo. sinensis*. We also noted the current deposition of *Bo. sinensis* that was first discovered from Japan.

Materials and Methods

Specimens of Butidae in ZUMT were identified using following reference and unpublished data by HK: *Butis*: Kottelat et al. (1993); *Bostrychus*: Hoese and Kottelat (2005); *Ophiocara*: Keith and Mennesson (2021); *Oxyeleotris*: Koumans (1953). The synonymy and notation of valid names were assigned following Kottelat (2013).

Contents included in the list following registration numbers as follows: specimen counts (if plural specimens included in the lot), sex (if possible to identify from the shape of urogenital papilla); standard length (in mm), collection locality, collection date, collector. Collection data of the specimens are omitted if it matches the immediately following specimen. The collection year and collector for some specimens was estimated by following Koeda et al. (2022). Catalog numbers after ZUMT 62000 are newly given during this study.

Although, some of the ZUMT specimens collected by Dr. Abe had not been formally cataloged into the ZUMT collection (and the data of some specimens not retained), such specimens which can recognize by having underbar with the number on the accompanying label, are listed herein with the number ZUMT ABE XXXX, due to the possibility of future discovery of Dr. Abe's remaining catalog books with collection data. ZUMT-ABE 2700–6000 are recognized as which collected from Palau in 1936–1937 (Koeda et al. 2022).

Collection of Butidae in ZUMT

At least 48 specimens in 4 genera, 7 species, were found in the ZUMT fish collection. No types are known for this family in the collection. Some specimens were considered as undescribed species (see remarks). One specimen of *Bo. sinensis* (ZUMT 8850: the first Japanese specimen of the species) was transferred to another museum (see remarks). Three specimens of *Bo. sinensis* (ZUMT 58296 and ZUMT 60037, from Iriomote-jima I.; and ZUMT 60653 from Ishigaki-jima I., Japan) and a specimen of *Op. ophicephalus* (ZUMT 58053 from Iriomote-jima I., Japan) were not found during the present investigation.

Butidae ノコギリハゼ科

Butis Bleeker, 1856 ノコギリハゼ属

Butis butis (Hamilton, 1822) ノコギリハゼ

Remarks: The Japanese name of this species “Nokogiri-haze (ノコギリハゼ)” was proposed by Tomiyama (1936) based on three specimens (60–100 mm in total length) collected from the Philippines. Although the specimens were collected before 1936, they included both *Bu. butis* and *Bu. amboinensis*. The author pointed out that “*Butis amboinensis* has no accessory scales” and illustrated *Bu. butis* based on a large specimen (about 100 mm in total length), with small accessory scales at the base of the trunk scales. Therefore, we identified two candidates, ZUMT 11141 and ZUMT 31009, sharing these characteristics as bearing the Japanese name.

[Palau]

ZUMT 37815: female, 60.2, during Oct. 1936 to Mar. 1937, T. Abe.

[Philippines]

ZUMT 11141: male, 79.5, possibly 1920's, Umejiro Yamamura (山村樸次郎).

ZUMT 31009: male, 81.4, 1926, U. Yamamura.

ZUMT 42097: female, 49.1, 1936–1937, Yaeko Yamamura (山村八重子) [Jan. 1938, Umejiro Yamamura (山村樸次郎) in ZUMT specimen ledger].

Remarks: Although only the name of U. Yamamura was written on the ZUMT specimen ledger, he did not visit the Philippines after he returned to Japan in 1926. The specimens should be collected by Y. Yamamura (daughter of U. Yamamura) who visited and collected many specimens from the Philippines during 1936–1937 (Koeda et al. 2022), and donated them to ZUMT by U. Yamamura in 1938.

[West Pacific]

ZUMT 31709: male, 85.6, locality details unknown [Nan-yo (南洋) in ZUMT specimen ledger], before 1936.

Remarks: “Nan-yo (南洋)” in this period in ZUMT means West Pacific including Micronesian Islands to Southeast Asia and excluding Korea, China, and Taiwan.

[Locality unknown]

ZUMT 63385: male, 96.7, localities and dates unknown.

Remarks: This specimen contained in unlabeled lot with *Eleotris acanthopoma* Bleeker, 1853, and a Gobiidae gen. sp. with iron tags. Former tag of ZUMT 63385 is “2263”.

Butis amboinensis (Bleeker, 1854) ヤエヤマノコギリハゼ

[Palau]

ZUMT 37814: male, 56.3, during Oct. 1936 to Mar. 1937, T. Abe.

[Philippines]

ZUMT 31010: male, 50.0; ZUMT 31011: male, 45.8, 1926, coll. U. Yamamura.

ZUMT 42090–42096, ZUMT 42098–42100, ZUMT 42105: 12, 6 males and 6 females, 33.7–59.9, 1936–1937, Yaeko Yamamura.

Remarks: For the collection date and collector name, see remarks of *Butis butis*.

Bostrychus La Cepède, 1801 ジャノメハゼ属

Bostrychus sinensis La Cepède, 1801 ジャノメハゼ

Fig. 1a, b

Remarks: Following Chinese specimens in the ZUMT collection were observed by Tomiyama (1936) and he proposed a standard Japanese name of the species “Zyanome-haze (ジャノメハゼ)” (Akihito et al. 2013). A single specimen (ZUMT 8850), the first Japanese record of *Bo. sinensis*, collected by Hisashi Kuroiwa (黒岩 恒) from Ishigaki-jima Island in Japan, was not

found in the present investigation. However, it was discovered that the specimen was initially transferred to Carnegie Museum, Pittsburgh, USA (CM 8318: Jordan and Tanaka 1972), and finally deposited in the Field Museum of Natural History, Chicago, USA (FMNH 59175, 116.8 mm SL: Fig. 1b). Mr. Kuroiwa proposed another Japanese name “Iwasaki-haze (イワサキハゼ)” for the species (Kuroiwa 1927), but this name has never been used in other studies.

[China]

ZUMT 18009: 118.2, Shanghai Market (上海市場), Tamiji Kawamura (川村多實二).

ZUMT 21219: 178.0; ZUMT 21220: 113.5, Shanghai, Kurami Narita (成田蔵巳).

Remarks: ZUMT 18009 was transferred from the Otsu Hydrobiological Station, Kyoto University, Japan (recently called as Center for Ecological Research, Kyoto University) by Denzaburo Miyadi (宮地傳三郎). Although no information of the sample collection date was noted in the ZUMT specimen ledger, two specimens, possibly as an original lot (FAKU-P 258), were collected from the same locality on 10 Dec. 1915 by T. Kawamura (川村多實二), and stored in Kyoto University Museum (HK, personal observation).

ZUMT 30142: 140.1; ZUMT 30143: 132.1, Hainan Island, Guangdong Province, Qing dynasty (清国, 広東省, 海南島), Oct. 1906, Ichigoro Katsude (勝出市五郎).

[Japan]

ZUMT 58009: 79.9, Nakama-gawa River (仲間川), Iriomote-jima I., Yaeyama Islands, Ryukyu Archipelago, 7 July 1988, H. Senou and M. Aizawa

ZUMT 58293: 87.1; ZUMT 58294: 91.2; ZUMT 58295: 111.0; ZUMT 58297: 52.7, Yonada-gawa River (与那田川), Iriomote-jima I., Yaeyama Islands, Ryukyu Archipelago, 13 July 1988, H. Senou and M. Aizawa

ZUMT 60035: 103.0; ZUMT 60038: 93.9; ZUMT 60039: 115.1, Yonada-gawa River, 17 Aug. 1989.

ZUMT 60125: 33.2; ZUMT 60126: 41.1, Yonada-gawa River, 18 Aug. 1989.

Ophiocara Gill, 1863 ホシマダラハゼ属

Ophiocara ophicephalus (Valenciennes, 1837) ホシマダラハゼ

Remarks: We treated specimens with “silver dotted pattern” in Keith and Mennesson (2021) as *O. ophicephalus*.

[Palau]

ZUMT 37767: female, 148.8, Palau, during Oct. 1936 to Mar. 1937, T. Abe.

ZUMT-ABE 3091: juvenile, 52.9, 1936–1937, T. Abe.

[Philippines]

ZUMT 48524: 97.3, Basilan, 1926, U. Yamamura.

ZUMT 11112: male, 146.6, Philippines, possibly 1920's, U. Yamamura.

[Japan]

ZUMT 58052: female, 174.0, Nakama-gawa River, Iriomote-jima I., Yaeyama Islands, Ryukyu Archipelago, 9 Jul. 1988, H. Senou and M. Aizawa.

ZUMT 60727: male, 169.0, Sukuji-gawa River (底地川), Ishigaki-jima I., Yaeyama Islands, Ryukyu Archipelago, 29 Aug. 1989.

Ophiocara* cf. *ophicephalus

Fig. 1c

Remarks: Following specimens may be an undescribed species. This species is distinguished from *Op. ophicephalus* by the color pattern and arrangement of the ctenoid scale (currently under study by HK).

[Philippines]

ZUMT 55323: male, 205.0, Manila, Luzon I., Philippines, Aug. 1922, Yata Haneda (羽根田弥太).

[Palau]

ZUMT-ABE 3129: male, 221.2; ZUMT-ABE 3130: female, 220.5, 1936–1937, T. Abe.

Ophiocara* cf. *cantoris

Fig. 1d

[Singapore]

ZUMT 40749: 92.2, Singapore, 12 Mar. 1910, Isao Iijima (飯島 魁) and Kumakichi Aoki (青木熊吉).

Remarks: The observed specimen shared the trunk melanophore patterns with *Op. cantoris* (Günther, 1861) figured in Keith and Mennesson (2021). However, the number of predorsal scales of the specimen was fewer than that of *Op. cantoris* (21 vs. 25–27 in *Op. cantoris*; Keith and Mennesson 2021).

***Ophiocara* sp.**

[?South Africa]

ZUMT 55238: juvenile, 36.2; ZUMT 55239: juvenile, 39.2, questionably from South Africa (paper tag written as “Nyara rpo.?”).

Remarks: “Nyara” may be local place in Eastern Cape region in South Africa. However, this species was collected together with *Stenogobius* sp. and *Hypseleotris cyprinoides*, which usually inhabit waters in the Western Pacific Region. Identification of the specimens is pending due to the poor condition and uncertain locality of them.

Oxyeleotris Bleeker, 1874
Oxyeleotris urophthalmus (Bleeker, 1851)

Fig. 1e

[Singapore]

ZUMT 40748: 96.8, possibly female, Singapore, 12 Mar. 1910, coll. I. Iijima and K. Aoki.

Remarks: *Oxyeleotris urophthalmus* resembles *Bo. sinensis* and *Odonteleotris macrodon* (Bleeker, 1853) in having a large number of lateral cycloid scales and elongated body. However, this species can be clearly distinguished from former by not having vomerine teeth (vs. with vomerine teeth in *Bo. sinensis*: Larson, 2008) and from the latter by having single interorbital canal pore (vs. divided in *Od. macrodon*: personal observation of HK)

Acknowledgements

We are grateful to S. Kunimatsu (Kyoto University) for providing information and a photograph of specimens in FMNH; K. Maeda (Okinawa Institute of Science and Technology Graduate University) for providing literatures and valuable comments for the identification of the genus *Butis*; M. Sato (formerly in Kyoto Univ. Museum) for access to the collection of FAKU; H. Hata (National Museum of Nature and Science), I. Abe, S. Fujiwara, A. Iinuma, M. Saito, A. Takahashi (Tokyo University of Marine Science and Technology), M. Fukatani, S. Ito (University of Tokyo), and H. Ogata (ZUMT) for curatorial assistance. The present study was supported in part by JSPS KAKENHI 19J22686 for HK, 21K06313 JP and the Sasakawa Scientific Research Grant from The Japan Science Society (2021-4064) for KK.

References

- Akihito, Sakamoto, K., Ikeda, Y. and Aizawa, M. 2013. Gobioidae. Pp. 1347–1608, 2109–2211. In: Nakabo, T. (ed) Fishes of Japan with pictorial keys to the species, third edition. Tokai University Press, Hadano. (In Japanese)
- Hoese, D. F. and Gill, A. 1993. Phylogenetic relationships of eleotridid fishes (Perciformes: Gobioidae). *Bulletin of Marine Science*, 52 (1): 415–440.
- Hoese, D. F. and Kottelat, M. 2005. *Bostrychus microphthalmus*, a new microphthalmic cavefish from Sulawesi (Teleostei: Gobiidae). *Ichthyological Exploration of Freshwaters*, 16 (2): 183–191.
- Jordan, D. S. and Tanaka, S. 1927. The fresh-water fishes of the Riukiu Islands, Japan. *Annals of the Carnegie Museum*, 17 (2): 259–278, pls. 22–23.
- Keith, P. and Mennesson, M. 2021. Review of *Ophiocara* (Teleostei: Butidae) from Indo-Pacific Islands. *Cybium*, 45 (2): 89–108.
- Koeda, K., Hata, H., Aizawa, M., Sakamoto, K. and Ueshima, R. 2022. History of the fish collection of the Department of Zoology, The University Museum, The University of Tokyo. *The University Museum, The University of Tokyo Material Reports*, 129: 1–24. (In Japanese)

- Kottelat, M. 2013. The fishes of the inland waters of Southeast Asia: a catalogue and core bibliography of the fishes known to occur in freshwaters, mangroves and estuaries. *The Raffles Bulletin of Zoology, Supplement*, 27: 1–663.
- Kottelat, M., Whitten, T., Kartikasari, S. N. and Wirjoatmodjo, S. 1993. Freshwater fishes of Western Indonesia and Sulawesi. Periplus Editions, Hong Kong. 344 pp.
- Koumans, F. P. 1953. Gobioidae. *The fishes of the Indo-Australian archipelago*, 10: 1–423.
- Kuroiwa, H. 1927. Catalogue of Fresh Water Fishes Collected in Liukiu Curve, 1912–1925. *Zoological Magazine*, 39: 355–368. (In Japanese)
- Nelson, J. S., Grande, T. C. and Wilson, M. V. 2016. *Fishes of the World*, 5th Edition. John Wiley & Sons, New York. 752 pp.
- Tomiyama, I. 1936. Gobiidae of Japan. *Japanese Journal of Zoology*, 7: 37–112.



Figure 1. Specimens of Butidae deposited in the Department of Zoology, The University Museum, The University of Tokyo (ZUMT). (a, b) *Bostrychus sinensis* [a: ZUMT 21219, 178.0 mm standard length (SL); Shanghai Market, China; b: FMNH 59175 (former ZUMT 8850) 116.8 mm SL, Ishigaki-jima Island, Japan]; (c) *Ophiocara* cf. *ophicephalus* [ZUMT-ABE 3129, male, 221.2 mm SL; Palau]; (d) *Ophiocara* cf. *cantoris* [ZUMT 40479, 92.2 mm SL, Singapore]; (e) *Oxyeleotris urophthalmus* [ZUMT 40748, 96.8 mm SL, Singapore].