Report on the specimens of Setarchidae (Teleostei: Scorpaenoidei) deposited in the Department of Zoology, The University Museum, The University of Tokyo

Hidetoshi Wada[1*)], Keita Koeda[2,3)], Masahiro Aizawa[2)], Kazuo Sakamoto[2,4)], Rei Ueshima[2,5)]

[1)]Kanagawa Prefectural Museum of Natural History, 499 Iryuda, Odawara, Kanagawa 250-0031, Japan
[2)]The University Museum, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan
[3]Faculty of Science, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 902-0213, Japan
[4)]Fish Information Center and Museum, 6-6 Toyosu, Koto-ku, Tokyo 135-0061, Japan
[5)]Department of Biological Sciences, Graduate School of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

*Corresponding author: h-wada@nh.kanagawa-museum.jp; gd120300@gmail.com

Abstract

The collection of Setarchidae (Teleostei: Scorpaenoidei) held in the Department of Zoology, The University Museum, The University of Tokyo (ZUMT) includes 30 specimens representing three genera and five species, most of which were collected from 1924 to 1936, but does not include type specimens of nominal species in the family. About two-third of the specimens were donated from the Mitsui Institute of Marine Biology (previously at Shimoda City, Shizuoka Prefecture, Japan). The distributions of the five species in Japanese waters in the early 20th century, as judged from these specimens, were not significantly different from the current distributions. A single specimen of *Lythrichthys longimanus* (Alcock, 1894) from the Enshu-nada Sea, Shizuoka Prefecture represents the first record of this species from the Enshu-nada Sea.

Introduction

The circumglobal deepwater scorpionfish family Setarchidae Matsubara, 1943 (Teleostei: Scorpaenoidei) is one of the most widely distributed scorpionfish family including four valid genera and twelve valid species (Wada et al. 2020, 2021; Romanov et al. 2021; Wada and Motomura 2022), ranging from tropical to temperate waters of the Indo-Pacific and Atlantic deep-seas about 150–2400 m depth (Eschmeyer and Collette 1966; Poss 1999; Nakabo and Kai 2013). This family is characterized by the following characters: cranium thin, cavernous, bones weakly ossified; suborbital stay uniformly broad or gradually becoming wider posteriorly, without spines; no fleshy appendages on head or body; small slit present behind fourth gill arch; lateral line continuous, covered by thin membranous scales; cycloid scales on head and body; total vertebrae 24; and pyloric caecum 4 or 5 (Eschmeyer and Collette 1966; Ishida 1994; Motomura and Struthers 2015; Wada et al. 2021).

During the management of the fish collection in the Department of Zoology, The University Museum, The University of Tokyo (ZUMT), 30 specimens were identified by the first author as belonging to the family Setarchidae. They are listed below with distributional notes.

Materials and Methods

Identifications of the setarchid specimens in ZUMT were confirmed by the first author, with reference to Wada et al. (2020, 2021), Romanov et al. (2021), and Wada and Motomura (2022). Standard lengths (SL) were measured for all specimens, which are arranged herein in alphabetical order by species. Collector's name and affiliation are given where known (from ZUMT specimen catalog or tag), with Japanese language equivalents in parentheses. The collection year and collector for some specimens was estimated by following Koeda et al. (2022). The following list includes ZUMT number, SL, number of specimens in parentheses when two or more, type (abbreviated when non-type), collection locality, collection depth, collection date, collecting method, collector or donator and affiliation, and remarks when applicable. Catalog numbers after ZUMT 62000 are newly given during this study.

Collection of Setarchidae in ZUMT

Three genera and five species of the family Setarchidae are represented by 30 specimens held in ZUMT, there being no type specimens of any nominal species. Most of specimens were collected from 1924 to 1936, many representing Kanagawa to Kochi prefectures in the Pacific coast of Japan. No local names were used for any of these specimens. Probably these species were new face in these collection localities of the specimens at that time because deepwater bottom trawl, most common method to catch these species, was newly developed and not a traditionally in Japan at that time (Faculty of Fisheries, Nagasaki University 1973; Kataoka 1999). Currently, the five species are still having no determinate local names (Ichthyological Society of Japan 1981; Fujiwara 2015). The 19 of 30 specimens were donated from Mitsui Institute of Marine Biology (MIMB; previously at Shimoda City, Shizuoka Prefecture, Japan), and most of them collected from Suruga Bay, Shizuoka Prefecture, Japan. These specimens were donated to ZUMT around 1941 when MIMB closes. The distribution of these species in Japan in the early 20th century, as judged from these specimens, was not significantly different from the current distributions (Nakabo and Kai 2013; Wada et al. 2020, 2021). The current common species *Lythrichthys cypho* (Fowler, 1938), *L. eulabes* Jordan & Starks, 1914, and *Setarches guentheri* Johnson, 1862 were also commonly collected in the early 20th century (Wada et al. 2020, 2021; this study). *Ectreposebastes imus* Garman, 1899 and *L. longimanus*, which are still rare, were also rarely collected at that time (Amaoka 1984; Wada et al. 2021; this study).

Setarchidae シロカサゴ科
Ectreposebastes Garman, 1899 クロカサゴ属
Ectreposebastes imus Garman, 1899 クロカサゴ

ZUMT 62446: 65.1 mm SL; **ZUMT 62447**: 62.3 mm SL, probably off Shizuoka Pref., Japan21 Oct. 1940, R/V Dainichi-maru (大日丸), donated from MIMB. The label reads as follows: DAINITI-MARU: 2599~2600; 21/10 /2600.

Remarks: The date on the label of this specimen is written in the accession of Emperor Jinmu (the same for ZUMT 62448).

ZUMT 63454: 118.2 mm SL, northeast of Suriname (07°49'N, 54°14'W), 676 m depth, 1 Dec. 1980, otter trawl, M. Aizawa, collected at the survey to develop new fishery resources by the Japan Marine Fishery Resource Research Center (JAMARC) during 1 June 1979 to 31 March 1983 (Uyeno et al. 1983).

Lythrichthys Jordan & Starks, 1904　アカカサゴ属
Lythrichthys cypho (Fowler, 1938)　アズキカサゴ

ZUMT 62430: 47.7 mm SL; **ZUMT 62431**: 43.6 mm SL; **ZUMT 62432**: 37.8 mm SL; **ZUMT 62433**: 40.2 mm SL; **ZUMT 62434**: 29.8 mm SL, Suruga Bay, off Heda, Numazu City, Shizuoka Pref., Japan, Dec. 1936, donated from MIMB.

ZUMT 62448: 36.3 mm SL, Sagami Bay (details unknown), ca. 400 m depth, 20 Mar 1941, 4 m beam trawl (1270 m length), donated from MIMB. The label reads as follows: SAGAMI SEA: Aguro Bay. D= ca. 400 m: 4m. B. Trawl 1270 m: 20/3.2601.

Lythrichthys eulabes Jordan & Starks, 1904　アカカサゴ

ZUMT 15517: 78.6 mm SL, coast of Kanagawa Pref., Japan, 1924, S. Miyashiro (East Kanagawa Technical Senior High School) [宮代周輔 (東神奈川工業学校)].

ZUMT 18977: 94.4 mm SL, Tosa Bay, off Kochi City, Kochi Pref., Japan, 7 Feb. 1929, T. Kamohara (Kochi Senior High School) [蒲原稔治 (高知高等学校)].

ZUMT 22592: 112.9 mm SL; **ZUMT 22593**: 106.3 mm SL, Tosa Bay, Kannoura (currently Toyo Town), Kochi Pref., Japan, 3 Apr. 1929, T. Kamohara.

ZUMT 24248: 102.9 mm SL; **ZUMT 24260**: 106.3 mm SL, Tosa Bay, off Mimase, Kochi, Kochi Pref., Japan, 15 Jan. 1932, T. Kamohara.

ZUMT 26398: 120.0 mm SL, Sagami Bay, off Iwa, Manazuru, Ashigarashimo, Kanagawa Pref., Japan, 1925, set net (大謀網), T. Fujita (a student at Fishery School) [藤田　正 (水産講習所生徒)].

ZUMT 33519: 32.7 mm SL, Suruga Bay, off Shizuura (currently Shishihama, Numazu City), Shizuoka Pref., Japan, May 1935, N. Kuroda (黒田長礼; details explained in Koeda et al. 2022).

Lythrichthys longimanus (Alcock, 1894)　スミクイアカカサゴ

ZUMT 33974: 125.7 mm SL, Enshu-nada Sea, off Hamamatsu, Shizuoka Pref., Japan, N. Ishiuchi (Hamamatsu Normal School) [石内直太郎 (浜松師範学校)].

Remarks: *Lythrichthys longimanus* is widely distributed in eastern Indian to western Pacific oceans (Wada et al. 2021). In Japanese waters, this species has been widely recorded from Kanagawa to Kochi prefectures in the Pacific coast, and Kagoshima to Okinawa

prefectures in the East China Sea coast on the basis of reliably identified specimens, but the distributional gap remained at the Enshu-nada Sea in the Pacific coast of Japan (Wada et al. 2021). Thus, the present specimen represents the first record of the species from this area.

Setarches Johnson, 1862　シロカサゴ属
Setarches guentheri Johnson, 1862　シロカサゴ

ZUMT 24308: 85.3 mm SL, Tosa Bay, off Mimase, Kochi, Kochi Pref., Japan, 5 Dec. 1931, T. Kamohara.

ZUMT 62435: 88.0 mm SL; **ZUMT 62436**: 78.2 mm SL; **ZUMT 62437**: 49.3 mm SL; **ZUMT 62438**: 52.2 mm SL; **ZUMT 62439**: 51.0 mm SL; **ZUMT 62440**: 47.1 mm SL; **ZUMT 62441**: 50.1 mm SL; **ZUMT 62442**: 50.4 mm SL; **ZUMT 62443**: 53.1 mm SL; **ZUMT 62444**: 45.0 mm SL, Suruga Bay, off Heda, Numazu City, Shizuoka Pref., Japan, Dec. 1936, donated from MIMB.

ZUMT 62445: 175.6 mm SL, Suruga Bay, off Heda, Numazu City, Shizuoka Pref., Japan, donated from MIMB.

Acknowledgements

We are deeply grateful to the late Y. Tominaga for his dedication and efforts to the ZUMT collection. We are also grateful to 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. G. S. Hardy (Ngunguru, New Zealand) kindly improved the English in the manuscript. The present study was supported in part by Grant-in-Aid from the Japan Society for the Promotion of Science for JSPS Fellows (PD:21J01755) to the first author, and JSPS KAKENHI 21K06313 JP and the Sasakawa Scientific Research Grant from The Japan Science Society (2021-4064) to the second author.

References

Amaoka, K. 1984. *Ectreposebastes imus.* P. 317, pl. 283. In: Masuda, H., Amaoka, K., Araga, C., Uyeno, T. and Yoshino, T. (eds) The fishes of the Japanese archipelago. Tokai University Press, Tokyo.

Eschmeyer, W. N. and Collette, B. B. 1966. The scorpionfish subfamily Setarchinae, including the genus *Ectreposebastes*. Bulletin of Marine Science, 16: 349–375.

Faculty of Fisheries, Nagasaki University. 1973. Fishes of southern & western Japan, edited by T. A. Glover during 1912 to 1933. Vol. 1 (group 1~7). Faculty of Fisheries, Nagasaki University, Nagasaki. 429 pp., 176 pls.

Fujiwara, M. 2015. Minor marine products super minor marine products picture book [Oishii maina gyokai zukan]. Mynavi Corporation, Tokyo. 319 pp. (In Japanese)

Ichthyological Society of Japan. 1981. Dictionary of the Japanese fish names and their foreign equivalents. Sanseido, Tokyo. vii + 843 pp. (In Japanese)

Ishida, M. 1994. Phylogeny of the suborder Scorpaenoidei (Pisces: Scorpaeniformes). Bulletin of the Nansei National Fisheries Research Institute, 27: 1–112.

Kataoka, C. 1999. Modern history of fresh fish distribution and fish market in Nagasaki. Bulletin of the Faculty of Fisheries, Nagasaki University, 80: 1–33.

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)

Motomura, H. and Struthers, C. D. 2015. Setarchidae. Pp. 1083–1085. In: Roberts, C. D. and Stewart, A. L. and Struthers, C. D. (eds) The Fishes of New Zealand. Vol. 3. Te Papa Press, Wellington.

Nakabo, T. and Kai, Y. 2013. Scorpaenidae, scorpionfishes. Pp. 683–705, 1939–1946. In: Nakabo, T. (ed) Fishes of Japan with pictorial keys to the species, third edition. Tokai University Press, Hadano. (In Japanese)

Poss, S. G. 1999. Scorpaenidae. Pp. 2291–2352. In: Carpenter, K. E. and Niem, V. H. (eds) FAO species identification guide for fishery purposes. The living marine resources of the western central Pacific. Vol. 4. Bony fishes part 2 (Mugilidae to Carangidae). FAO, Rome.

Romanov, E. V., Cherel, Y. and Marsac, F. 2021. New record of *Ectreposebastes niger* (Fourmanoir, 1971) (Setarchidae, Scorpaeniformes): a rare bathypelagic fish from La Pérouse Seamount, Western Indian Ocean, and distribution of *Ectreposebastes* Garman, 1899 in the Indian Ocean. Zoosystema, 43: 283–296.

Uyeno, T., Matsuura, K. and Fujii, E. 1983. Fishes trawled off Suriname and French Guiana. Japan Marine Fishery Resource Research Center, Tokyo. 519 pp.

Wada, H., Kai, Y. and Motomura, H. 2020. Redescription of the circumglobal deepwater scorpionfish *Setarches guentheri* (Setarchidae). Ichthyological Research. DOI: 10.1007/s10228-020-00762-6

Wada, H., Kai, Y. and Motomura, H. 2021. Revision of the resurrected deepwater scorpionfish genus *Lythrichthys* Jordan and Starks 1904 (Setarchidae), with descriptions of two new species. Ichthyological Research. DOI: 10.1007/s10228-020-00793-z

Wada, H. and Motomura, H. 2022. Two new species of the deepwater scorpionfish genus *Lioscorpius* (Setarchidae) from the southwestern Pacific Ocean. Ichthyological Research. DOI: 10.1007/s10228-022-00860-7

Fig. 1. Preserved specimen of *Lythrichthys longimanus* from Enshu-nada Sea, Shizuoka Pref., Japan (ZUMT 33974, 125.7 mm SL)