Specimens of the families Emmelichthyidae and Lobotidae (Actinopterygii: Teleostei) deposited in the Department of Zoology, The University Museum, The University of Tokyo

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Abstract

A list of specimens of the families Emmelichthyidae and Lobotidae deposited in the Department of Zoology, The University Museum, The University of Tokyo is provided. Forty-six specimens of three emmelichthyid species, including three paratypes of *Emmelichthys struhsakeri* Heemstra & Randall, 1977, and eight specimens of a single lobotid species, *Lobotes surinamensis* (Bloch, 1790), were confirmed. However, no specimens were found of the genus *Datonioides*, which is sometimes included together with *Lobotes* within the family Lobotidae.

Introduction

The rovers, included within the family Emmelichthyidae, comprise three genera and about 18 species (Heemstra and Randall 1977; Kotlyar 1982; Parin 1991; Randall and Rivaton 1992; Miyahara and Okamura 1998; Fricke et al. 2014), most of which are often found near the sea bottom in 100 to 400 m depth (Heemstra and Randall 1977; Carpenter 2001a; Hatooka and Hagiwara 2013). Some emmelichthyid species, such as *Erythrocles schlegelii* (Richardson, 1846), are abundantly landed in tropical areas and are important as food fishes (Koeda 2018a, 2019a, 2020a; Shimose 2021). As indicated by Heemstra and Randall (1977), the phylogenetic position of the family is still uncertain, Betuncur-R et al. (2017) regarding it as “Order-level incertae sedis”.

The family Lobotidae (tripletails) is monotypic, including only the genus *Lobotes* Cuvier, 1829 (Kottelat 2013; Betuncur-R et al. 2017), and is characterized by a compressed body, mouth roof without teeth, and soft portions of the dorsal and anal fins rounded and extending beyond the caudal-fin base. Tripletail species are distributed circumglobally, attaining 1 m in total length, and are highly evaluated as food and sport fishes (Heemstra 1995; Carpenter 2001b, 2002, 2016; Koeda 2018b, 2019b, 2020b). Juveniles, which mimic leaves, are often associated with floating objects (Breder Jr. 1949; Sasaki 1997; Kato 2014).

The phylogenetic position of the genus *Lobotes* is somewhat fluid, due to frequent inclusion in a single family with *Datnioides* Bleeker, 1853 (e.g., Rainboth 1996; Carpenter 2001b; Nagao Natural Environment Foundation 2021), the species of which (so-called tigerperches or tigerfishes) inhabit freshwater/brackish regions in South and Southeast Asia (Roberts and Kottelat 1994; Pisces Publishers 2004). Species of *Lobotes* can be distinguished from *Datnioides* by their plain dark colored body (vs. distinct dark bars on the body in *Datnioides*) and the second anal-fin spine not enlarged (vs. enlarged, distinctly longer than third anal-fin spine) (Carpenter 2001b; Nagao Natural Environment Foundation 2021). Recently, Betuncur-R et al. (2017) included the genus in the monotypic family Datniodidae, which together with Lobotidae and Hapalogenyidae comprised the Lobotiformes. Subsequently, Gill and Leis (2019) included Datniodidae and Hapalogenyidae within Lobotidae, which they assigned to Acanthuriformes, together with numerous families, such as Acanthuridae, Chaetodontidae, Antigonidae, and Leiognathidae. The species-level taxonomy of *Lobotes* is also confused, the genus being generally thought to comprise two species, *Lobotes pacifica* Gilbert, 1898 (endemic to the eastern Pacific) and *Lobotes surinamensis* (Bloch, 1790) (a cosmopolitan species, except in the eastern Pacific) (Kottelat 2013). However, differences between the two species remain unclear, and the possibility of cryptic species has been suggested (Mundy 2005; Kharin et al. 2009; Kottelat 2013). Since they constitute an important source for future taxonomic studies, a list of specimens of Emmelichthyidae and Lobotidae deposited in the Department of Zoology, The University Museum, The University of Tokyo is provided.

Materials and Methods

Specimens of Emmelichthyidae and Lobotidae in the Department of Zoology, The University Museum, The University of Tokyo (abbreviated as ZUMT) were identified during the present study, following Heemstra and Randall (1977), Carpenter (2001a), and Hatooka and Hagiwara (2013), and Carpenter (2001b) and Hatooka (2013), respectively. Parentheses following registration numbers include specimen numbers (if plural specimens were included in the lot), standard length, collection locality, collection date, and collector, plus type status (if applicable). Collection data of specimens are omitted if the same as that for the previous specimen. The collection year and collector for some specimens were estimated following Koeda et al. (2022).

The ZUMT specimens listed herein were primarily stored in Room 406 (specimen storage room), with additional specimens in Room 407 (including types and S. Tanaka specimens), in the museum building. Most were stored in shelved containers, although some larger specimens were stored in a glass tank (labelled “Emmelichthyidae”) in the same room, with the glass lid sealed with a silicon adhesive (as of Apr. 2022). Although some of the ZUMT specimens, collected by Dr. Tokiharu Abe had not been registered into the ZUMT collection, with the collection data of most missing, they are listed herein together with their ZUMT ABE number (number with underbar written on the specimen label), in the hope that Dr Abe’s catalog books with collection data will be rediscovered in the future. Additionally, specimens with catalogue numbers ZUMT ABE 2700 to 6000 were collected from Palau by Dr. Abe between 1936 and 1937 (Koeda et al. 2022).

Results

Examples of three emmelichthyid species, comprising 46 specimens, and eight specimens of *Lobotes surinamensis* were confirmed in the ZUMT collection. The existence of three paratypes of *Emmelichthys struhsakeri* in the collection was also confirmed. However, no ZUMT specimens or ZUMT ledger registrations of examples of the genus *Datnioides* were found. A list of ZUMT specimens of the family Hapalogenyidae was published by Hata et al. (2022).

Species accounts

Family Emmelichthyidae　ハチビキ科

Emmelichthys karnellai Heemstra & Randall, 1977　トゲナシチビキ

JAPAN

ZUMT 19377 (185.9 mm; Hachijo-jima Island, Izu Islands, Japan; coll. by Y. Oshizu)

Remarks: This species has been recorded previously in Japanese waters, only from Ryukyu Archipelago and "Omurodashi Bank" (submarine volcano located ca. 20 km southeast of Izu-oshima Island, Izu Islands) (Heemstra and Randall 1977; Yoshino and Kon 2000; Hatooka and Hagiwara 2013; Akaike et al. 2021). The present ZUMT specimen, collected from Hachijo-jima Island (ca. 170 km south of Izu-oshima Island), represents the first record of the species from that locality.

Emmelichthys struhsakeri Heemstra & Randall, 1977　ロウソクチビキ

JAPAN

ZUMT 19375 (170.6 mm), ZUMT 19376 (176.5 mm), ZUMT 19458 (219.7 mm), ZUMT 19459 (216.9 mm), ZUMT 19460 (201.4 mm), ZUMT 40190 (186.3 mm), ZUMT 40191 (160.4 mm), ZUMT 40192 (171.0 mm), ZUMT 40193 (154.8 mm), ZUMT 40194 (178.3 mm), ZUMT 40195 (162.6 mm), ZUMT 40196 (188.5 mm), ZUMT 40197 (172.5 mm), ZUMT 40198 (168.9 mm), ZUMT 40199 (165.8 mm), ZUMT 40200 (166.0 mm), ZUMT 40201 (179.3 mm), ZUMT 40202 (169.9 mm), ZUMT 40203 (164.6 mm), ZUMT 40204 (184.9 mm), ZUMT 40205 (170.6 mm), ZUMT 40206 (164.5 mm), ZUMT 40207 (175.7 mm; Hachijo-jima Island, Izu Islands, Japan; coll. by Y. Oshizu)

ZUMT 44121 (161.6 mm; Hachijo-jima Island, Izu Islands, Sept. 1922; coll. by M. Uchiyama)

ZUMT 54056 (paratype of *E. struhsakeri*; formerly registered as ZUMT ABE 16710, 122.5 mm), ZUMT 54057 (paratype of *E. struhsakeri*; formerly registered as ZUMT ABE 16712, 132.4 mm; off Manazuru Town, Kanagawa Pref.)

HAWAIIAN ISLANDS

ZUMT 53889 [paratype of *E. struhsakeri*; 122.5 mm; Penguin Bank, approx. 15 km east of Moloka'i, Hawaiian Islands (21°09'08"N, 157°27'05"W); 183 m depth; 6 Nov. 1968; trawl; coll. by RV *Townsend Cromwell*]

Erythrocles schlegelii (Richardson, 1846)　ハチビキ

JAPAN

ZUMT 2929 (395.1 mm; Nagasaki Prefecture; Jan. 1911)

ZUMT 13519 (191.2 mm), ZUMT 13520 (176.4 mm; obtained at Tokyo Market, Tokyo Met.), ZUMT 15098 [329.0 mm; probably Okinawa-jima Island, Ryukyu Archipelago; coll. by S. Sakaguchi (Okinawa Prefectural Daiichi Junior High School)]

ZUMT 21733 (258.4 mm; Wakayama Pref.; 22 Jan. 1906)

ZUMT 49900 (219.1 mm; Fukue, Goto City (Fukue-jima Island, Goto Islands); 10 June 1953; coll. by I. Tomiyama)

ZUMT ABE 16573 (80.8 mm), ZUMT ABE 16711 (121.1 mm; off Manazuru Town, Kanagawa Pref.)

LOCALITY UNKNOWN

ZUMT 40185 (149.5 mm), ZUMT 40186 (194.8 mm), ZUMT 40188 (191.2 mm), ZUMT 40189 (190.3 mm), ZUMT 40208 (190.8 mm), ZUMT 40209 (187.4 mm), ZUMT 63839 (198.2 mm), ZUMT ABE 60-204 (121.3 mm), ZUMT ABE 60-737 (128.0 mm), ZUMT ABE 83-250 (144.7 mm; no data)

Family Lobotidae　マツダイ科

Lobotes surinamensis (Bloch, 1790)　マツダイ

JAPAN

ZUMT 4357 (228.0 mm; off Hamada City, Shimane Pref.; 5 Oct. 1914; coll. by personnel of Shimane Prefectural Fisheries Experimental Station)

ZUMT 12337 (121.0 mm; probably collected from Amami-oshima Island, Amami Islands, Kagoshima Pref.)

ZUMT 21312 (22.8 mm; Kanagawa Pref.; 20 Sept. 1925)

ZUMT 42406 (39.7 mm), ZUMT 42407 (25.8 mm; Shimoda City, Shizuoka Pref.; coll. by M. Kato)

ZUMT ABE 10114 (83.6 mm; Manazuru Town, Kanagawa Pref.; 19 Sept. 1954)

LOCALITY UNKNOWN

ZUMT 64095 (165.5 mm), ZUMT ABE 13239 (542.0 mm; no data)

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References

Akaike, T., Maekawa, T. and Motomura, H. 2021. Reliable records of *Emmelichthys karnellai* Heemstra and Randall, 1977 from Amami-oshima and Okinawa-jima islands, Ryukyu Islands, Japan. Ichthy, Natural History of Fishes of Japan, 13: 36–39. (In Japanese)

Betancur-R., R., Wiley, E. O., Arratia, G., Acero, A., Bailly, N., Miya, M., Lecointre, G. and Ortí, G. 2017. Phylogenetic classification of bony fishes. BMC Evolutionary Biology, 17: 162. DOI 10.1186/s12862-017-0958-3

Breder Jr., C. M. 1949. On the behavior of young *Lobotes surinamensis*. Copeia, 1949 (4): 237–242.

Carpenter, K. E. 2001a. Emmelichthyidae, rovers (rubyfishes). Pp. 2838–2839. 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. 5, body fishes part 3 (Menidae to Pomacentridae). FAO, Rome.

Carpenter, K. E. 2001b. Lobotidae, tripletailes. Pp. 2942–2945. 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. 5, body fishes part 3 (Menidae to Pomacentridae). FAO, Rome.

Carpenter, K. E. 2002. Lobotidae, tripletails. P. 1505. In: Carpenter, K. E. (ed), FAO species identification guide for fishery purposes and American Society of Ichthyologists and Herpetologists Special Publication no. 5. The living marine resources of the western central Atlantic. Vol. 3. Bony fishes part 2 (Opisthognathidae to Molidae), sea turtles and marine mammals. FAO, Rome.

Carpenter, K. E. 2016. Lobotidae, tripletailes. Pp. 2544–2545. In: Carpenter, K. E. and De Angelis, N. (eds) FAO species identification guide for fishery purposes. The living marine resources of the eastern central Atlantic. Volume 4. Bony fishes part 2 (Perciformes to Tetraodontiformes), sea turtles and marine mammals. FAO, Rome.

Fricke, R., Golani, D. and Appelbaum-Golani, B. 2014. *Emmelichthys marisrubri*, a new rover from the southern Red Sea (Teleostei: Emmelichthyidae). Cybium, 38 (2): 83–87.

Gill, A. C. and Leis, J. M. 2019. Phylogenetic position of the fish genera *Lobotes*, *Datnioides* and *Hapalogenys*, with a reappraisal of acanthuriform composition and relationships based on adult and larval morphology. Zootaxa, 4680 (1): 1–81.

Hagiwara, K. and Okabe, K. 2012. *Emmelichthys karnellai* (Perciformes: Emmelichthyidae) collected from the near water of the Izu Islands, Japan. Science Report of Yokosuka City Museum, 59: 29–30. (In Japanese)

Hata, H., Koeda, K. Aizawa, M., Sakamoto, K. and Ueshima, R. 2022. List of the specimens of families Haemulidae and Hapalogenyidae (Actinopterygii: Teleostei) deposited in the Department of Zoology, The University Museum, The University of Tokyo. The University Museum The University of Tokyo Bulletin, 128: 103–120.

Hatooka, K. 2013. Lobotidae, tripletails. Pp. 934, 2005. In: Nakabo, T. (ed) Fishes of Japan with pictorial keys to the species, third edition. Tokai University, Press, Hadano. (In Japanese)

Hatooka, K. and Hagiwara, K. 2013. Emmelichthyidae, rovers. Pp. 911–912, 2000–2001. In: Nakabo, T. (ed) Fishes of Japan with pictorial keys to the species, third edition. Tokai University, Press, Hadano. (In Japanese)

Heemstra, P. C. 1995. Lobotidae, dormilonas. P. 1226. In: Fischer, W., Krupp, F., Schneider, W., Sommer, C., Carpenter, K. and Niem, V. H. (eds), Guía FAO para la identificación para los fines de la pesca. Pacifico centro-oriental. Volumen III. Vertebrados Parte 2. FAO, Rome. (In Spanish)

Heemstra, P. C. and Randall, J. E. 1977. A revision of the Emmelichthyidae (Pisces: Perciformes). Australian Journal of Marine and Freshwater Research, 28 (3): 361–396.

Kato, S. 2014. Marine fishes illustrated, 1000+. Seibundo-shinkosha, Tokyo. 383 pp. (In Japanese)

Kharin, V. E. 2009. About the taxonomic status of rare fish species Surinam tripletail *Lobotes surinamensis* (Lobotidae) and new discovery of this species in Russian waters. Journal of Ichthyology, 49 (1): 32–38.

Koeda, K. 2018a. *Erythrocles schlegelii* (Richardson, 1846). P. 270. In: Koeda, K., Hata, H., Yamada, M. and Motomura, H. (eds) Field guide to fishes landed at Uchinoura Fishing Port, Kagoshima, Japan. The Kagoshima University Museum, Kagoshima. (In Japanese)

Koeda, K. 2018b. *Lobotes surinamensis* (Bloch, 1790). P. 289. In: Koeda, K., Hata, H., Yamada, M. and Motomura, H. (eds) Field guide to fishes landed at Uchinoura Fishing Port, Kagoshima, Japan. The Kagoshima University Museum, Kagoshima. (In Japanese)

Koeda, K. 2019a. Emmelichthyidae. P. 775. In: Koeda, K. and Ho, H.-C. (eds) Fishes of southern Taiwan. National Museum of Marine Biology & Aquarium, Pingtung, Taiwan.

Koeda, K. 2019b. Lobotidae. P. 816. In: Koeda, K. and Ho, H.-C. (eds) Fishes of southern Taiwan. National Museum of Marine Biology & Aquarium, Pingtung, Taiwan.

Koeda, K. 2020a. *Erythrocles schlegelii* (Richardson, 1846). P. 328. In: Koeda, K., Hata, H., Yamada, M. and Motomura, H. (eds) Fishes from markets in Osumi Peninsula, Kagoshima, Japan. The Kagoshima University Museum, Kagoshima. (In Japanese)

Koeda, K. 2020b. *Lobotes surinamensis* (Bloch, 1790). P. 349. In: Koeda, K., Hata, H., Yamada, M. and Motomura, H. (eds) Fishes from markets in Osumi Peninsula, Kagoshima, Japan. The Kagoshima University Museum, Kagoshima. (In Japanese)

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.

Kotlayr, A. N. 1982. A new species of the genus *Emmelichthys* (Emmelichthyidae, Osteichthyes) from the south-western [sic, south-eastern] part of the Pacific Ocean. Bulletin of the Moscow Society of Naturalists Biological Series, 87 (1): 48–52. (In Russian)

Kottelat, M. 2013. The fish of the inland waters of Southewast 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.

Miyahara, H. and Okamura, O. 1998. *Erythrocles microceps*, a new emmelichthyid fish from Kochi, Japan. Ichthyological Research, 45 (1): 85–88.

Mundy, B. C. 2005. Checklist of the fishes of the Hawaiian Archipelago. Bishop Museum Bulletin in Zoology, 6: 1–704.

Nagao Natural Environment Foundation. 2021. Fishes of the Indochinese Mekong. Nagao Natural Environment Foundation, Tokyo. xii+546 pp.

Parin, N. V. 1991. Three new species of the bentho-pelagic fish genus *Plagiogeneion* from the southern Pacific and Indian oceans (Teleostei: Emmelichthyidae). Proceedings of the Biological Society of Washington, 104 (3): 459–467.

Pisces Publishers. 2004. Picture book of aquarium fish & water-plants. Pisces Publishers, Tokyo. 510. (In Japanese)

Rainboth, W. J. 1996. FAO species identification field guide for fishery purposes. Fishes of the Cambodian Mekong. FAO, Rome. 265 pp., 27 pls.

Randall, J. E. and Rivaton, J. 1992. *Erythrocles taeniatus*, a new emmelichthyid fish from New Caledonia. Copeia, 1992 (4): 1028–1032, pl. 1.

Roberts, T. R. and Kottelat, M. 1994. The Indo-Pacific tigerperches, with a new species from the Mekong basin (Pisces: Coiidae). Ichthyological Exploration of Freshwaters, 5 (3): 257–266.

Sasaki, K. 1997. *Lobotes surinamensis*. P. 344. In: Okamura, O. and Amaoka, K. (eds) Sea fishes of Japan. Yama-kei Publishers, Tokyo. (In Japanese)

Shimose, T. 2021. Commercial fishes and shellfishes of Okinawa. Okinawa Times, Naha. 206 pp. (In Japanese)

Yoshino, T. and Kon, T. 2000. First record of an emmelichthyid fish, *Emmelichthys karnellai*, from the western north Pacific (Pisces: Perciformes: Emmelichthyidae). Biogeography, 2: 63–65.