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Original Papers

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Fish fauna of Lake Biwa in the 1890s inferred from a fish collection built up by Chiyomatsu Ishikawa

Seigo Kawase, Masanori Nakae and Gento Shinohara*

Abstract The fish collection built up by Chiyomatsu Ishikawa (1860–1935), a Japanese zoologist who investigated the fish fauna of Lake Biwa in the 1890s, was reassessed for the first time in many years, and found to provide an important insight into the fish fauna of the lake at the end of the 1800's. Now held in the National Museum of Nature and Science, Tsukuba, Japan, the collection includes 1,795 specimens (110 lots) collected from 12 sites in Lake Biwa and adjacent areas (i.e., Hikone, Imazu, Kaizu, Kaminyu, Lake Yogo, Maebara (= Maibara), Matsubara, Nagahama, Omi-Hachiman, Seta River, Shiotsu and Zeze). Thirty-three species, including 10 endemic species/subspecies, in 11 families were identified, including the type series of *Pseudogobio zezera* (=*Biwia zezera*). The majority of specimens were included in the following 7 species: *Tanakia lanceolata*, *Acheilognathus tabira tabira*, *Candidia sieboldii*, *Ischikauia steenackeri*, *Sarcocheilichthys variegatus microoculus*, *Tachysurus nudiceps*, and *Plecoglossus altivelis altivelis* (landlocked type). Such species are now seen infrequently along the lake foreshore (except for *P. a. altivelis*), the collection indicating a formerly rich fish fauna before the establishment of artificial influences (e.g., concrete revetments, invasion of alien species such as *Micropterus nigricans* and *Lepomis macrochirus*, and artificial control of water levels by the Seta River Weir). Although the occurrence of *Acheilognathus longipinnis* and *Sarcocheilichthys variegatus variegatus* in Lake Biwa has been unclear for a long time, examples of those species/subspecies in the collection provided evidence of their past distributions in the lake. Importantly, the collection sets a benchmark for any restoration of the past fish fauna of Lake Biwa.

*(*Corresponding author: Lake Biwa Museum, 1091 Oroshimo, Kusatsu, Shiga 525–0001, Japan: e-mail: kawase-seigo@biwahaku.jp)*

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First Pacific record of *Dolopichthys danae* (Ceratioidei; Oneirodidae), collected off Iwate Prefecture, Pacific coast of northern Japan. Japan

Ryo Misawa, Yuto Suzuki and Yoshiaki Kai*

Abstract The ceratoid anglerfish genus *Dolopichthys* Garman, 1899, distributed in the bathypelagic zone of all three major oceans, is characterized by the following combination of characters: females with well-developed sphenotic spines; body relatively long and slender, not globular; pectoral-fin lobe short, shorter than the longest pectoral-fin rays; skin naked and entirely smooth; lower jaw with a well-developed symphysial spine; pterygiophore emerging on the snout from between the frontal bones; caudal peduncle depth less than 20% of standard

length (SL); quadrate spine well developed; frontal bones long and straight; hyomandibula with a double head. The genus includes seven valid species, *Dolopichthys allector* Garman, 1899, *Dolopichthys danae* Regan, 1926, *Dolopichthys longicornis* Parr, 1927, *Dolopichthys jubatus* Regan and Trewavas, 1932, *Dolopichthys pullatus* Regan and Trewavas, 1932, *Dolopichthys dinema* Pietsch, 1972, and *Dolopichthys karsteni* Leipertz and Pietsch, 1987, with only *D. longicornis* being known from Japanese waters to date. A single female specimen (88.6 mm SL) of the rare species *D. danae*, was collected at a bottom depth of 902–917 m off Iwate Pref., Pacific coast of northern Japan, on 12 October 2022. The specimen was distinguished from other congeners by a longer illicium (length 70% SL), dorsal midline of the escal bulb with two darkly pigmented, distally bifurcating papillae, vomer without teeth, and lower jaw with ca. 150 teeth. *Dolopichthys danae* was previously known from six specimens only, all from the North Atlantic (south of 40˚N), the present specimen therefore representing the seventhknown specimen and first record of the species from the Indo-Pacific, including Japanese waters. The new standard Japanese name “Enaga-mimizuku-rakuda-anko” is proposed for the species.

*(*Corresponding author: 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)*

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First Japanese records of *Engyprosopon mozambiquense* and *E. parvipectorale* (Bothidae) from Okinawa Island, Ryukyu Islands

Mizuki Matsunuma and Hiroyuki Motomura*

Abstract Two species of lefteye flounder (Bothidae), *Engyprosopon mozambiquense* Hensley, 2003 and *Engyprosopon parvipectorale* Amaoka and Ho, 2018, are newly recorded from Japan based on five specimens (one male and four females) and a single male specimen, respectively, from Nakagusuku Bay, Okinawa Island, Ryukyu Islands. The two species resemble each other in sharing the following combination of characters: extremely narrow interorbital space; large mouth (posterior margin of ocular side upper jaw extending beyond anterior margin of lower eye); inner margin of gill rakers with serrae; and a pair of dark blotches on caudal fin absent. However, the present male specimen of *E. mozambiquense* differed from male specimens of *E. parvipectorale* from Taiwan and Japan in having a greater interorbital width, 11.5 in head length (vs. 23.1–67.7 in male *E. parvipectorale*), a rostral spine on the ocular side of the snout (vs. absent), and three dark blotches on the ventral surface of the ocular side lower jaw (vs. uniformly black). The present female specimens of *E. mozambiquense* were characterized by having small teeth on both jaws (vs. anterior teeth on the upper jaw, and all teeth on the lower jaw large and canine-like in both male and female *E. parvipectorale*). The two species are also similar to the Japanese endemic congener, *Engyprosopon kushimotoense* Amaoka, Kaga and Misaki, 2008 (known

only from the male holotype from Wakayama Prefecture), and *Engyprosopon longipelvis* Amaoka, 1969 (known from southern Japan) in having gill rakers with serrae and a narrow interorbital space. However, *E. kushimotoense* and *E. longipelvis* differ from the former in having 43 and 37–42 lateral-line scales, respectively (vs. 49–52 in *E. parvipectorale* and 46–52 in *E. mozambiquense*). The new standard Japanese names "Yorime-darumagarei" and "Kiba-yorime-darumagarei" are proposed here for *E. mozambiquense* and *E. parvipectorale*, respectively.

*(*Corresponding author: The Kyoto University Museum, Yoshida-honmachi, Sakyo-ku, Kyoto 606–8317, Japan: e-mail: matsunuma.mizuki.5m@kyoto-u.ac.jp)*

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First Japanese record of the scaleless dragonfish, *Melanostomias nigroaxialis* (Stomiidae: Melanostomiinae)

Kota Obata, Makoto Furusho, Hisashi Imamura and Yoji Narimatsu*

Abstract Five specimens of scaleless dragonfish of the genus *Melanostomias* (Stomiidae: Melanostomiinae) were collected off the Ogasawara Islands, southern Japan and Fukushima Prefecture, Pacific coast of northern Japan. The specimens conformed to *Melanostomias nigroaxialis* Parin and Pokhilskaya, 1978 as follows: tips of the upper and lower jaw teeth bifurcated; chin barbel distally expanded from midpoint, the dorsal and ventral expanded areas membranous and transparent, and including small luminous bodies; a single ovoid body without a terminal filament on terminal part of chin barbel; distinct luminous patch on dorsal surface of head absent; and axis of chin barbel almost entirely black, except terminal part. However, the present specimens had a shorter chin barbel than noted in the original description of *M. nigroaxialis*. Because a plot of barbel lengths (as % of standard length) versus standard length of the present specimens and three specimens examined in the original description indicated that barbel lengths tended to decrease with growth, the difference in barbel length between the two groups of specimens was consistent with intraspecific variation. In addition, the present specimens had different numbers of VAV, AC, IC, VAL and OA photophores compared with the original description of *M. nigroaxialis*, although the ranges were less than the those in many congeneric species, also indicative of intraspecific variation. Consequently, the present specimens were identified as *M. nigroaxialis*, previously known only from the Banda Sea, southern Philippines Sea and northern New Zealand. This is the northernmost record of *M. nigroaxialis*, and first from Japanese waters. The new standard Japanese name "Tomoshibi-kanten-tokagegisu" is proposed for this species.

*(*Corresponding author: Laboratory of Marine Biology and Biodiversity (Systematic Ichthyology), Graduate School of Fisheries Sciences, Hokkaido University, 3–1–1 Minatocho, Hakodate, Hokkaido 041–8611, Japan: email: obata.kota.z1@elms.hokudai.ac.jp)*

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First Japanese record of the ophichthid eel (Actinopterygii: Anguilliformes) *Ophichthus longicorpus*, collected off the Pacific coast of Ibaraki Prefecture, Japan

Makoto Furusho, Eisuke Morikawa, Ryo Misawa and Fumihito Tashiro*

Abstract A single specimen (440 mm in total length) of the genus *Ophichthus* Ahl, 1789 (Anguilliformes: Ophichthidae), captured during a bottom trawl survey at a depth of 351– 353 m off Ibaraki Prefecture, Pacific coast of northern Japan, was identified as *Ophichthus longicorpus* Vo and Ho, 2021, due to the following combination of characters: 29 predorsal and 162 total vertebrae; head length 8.4% of total length; dorsal fin origin situated at 5.0 pectoral fin length (1.2 head length) behind head; pre-dorsal length 19.5% of total length; pectoral fin length 25.6% of head length; pectoral-fin tip slightly pointed; and body without spots and bands. The present specimen represents the second record of the species since its original description, based on Vietnamese specimens, and adds considerable northern and eastern extensions to its known distribution. On the other hand, a number of morphological differences were apparent between the Japanese (n = 1) and Vietnamese (n = 13) specimens, including differences in cephalic sensory pore numbers (1 + 3 = 4 in the supraorbital series and 5 in the mandibular series in the former vs. 1 + 4 = 5 and 6 in the latter), and anus position (somewhat anterior to the middle between the snout tip and tail tip vs. almost in middle). The differences are presently considered to represent intraspecific variations, due to the wide range of morphological variations recorded in other species of *Ophichthus*, although further taxonomic considerations may be in order pending the availability of a greater number of widely-distributed specimens. The new standard Japanese name “Azuki-umihebi” is proposed for the species, referring to its reddish-brown body coloration.

*(*Corresponding author: Laboratory of Marine Biology and Biodiversity (Systematic Ichthyology), Graduate school of Fisheries Science, Hokkaido University, 3–1–1 Minatocho, Hakodate, Hokkaido 041–8611, Japan: e-mail: makoto.furusho.jp@gmail.com)*

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Northernmost record of *Solegnathus* (*Solegnathus*) *lettiensis* (Syngnathidae) from Kamikoshiki-shima Island, Koshiki Islands, Kagoshima Prefecture, Japan

*Daijiro Yuki, Jumpei Nakamura, Tomoaki Saito, Nobuyuki Kashiwagi and Hiroyuki Motomura**

Abstract The pipehorse genus *Solegnathus* Swaison, 1839 is divided into two subgenera, *Solegnathus* Swaison, 1839 (superior trunk ridge discontinuous, with superior tail ridge) and *Runcinatus* Whitley, 1929 (ridges continuous), the former including *Solegnathus* (*Solegnathus*) *hardwickii* (Gray, 1830), *S.* (*S.*) *lettiensis* Bleeker, 1860, *S.* (*S.*) *spinosissimus* (Günther, 1870), and *S.* (*S.*) *robustus* McCulloch, 1911, and the latter, *S.* (*Runcinatus*) *dunckeri* Whitley, 1927. Of these five species, only *S.* (*S.*) *hardwickii* and *S.* (*S.*) *lettiensis*, have been recorded to date from Japanese waters, the latter being known from only two specimens [259.6 mm and 284.6 mm total length (TL)], both reported from the middle of the Okinawa Trough, southern East China Sea in 1978.

However, a single specimen (KAUM–I. 182558, 367.0 mm TL) of *S.* (*S.*) *lettiensis* was found on a beach on Kamikoshiki-shima Island, Koshiki Islands, northern East China Sea, Kagoshima Prefecture, Japan in December 2022, probably a discarded bycatch from a deepwater bottom trawl fishery operating off the island. The specimen was characterized by having the superior trunk ridge discontinuous, with a superior tail ridge; opercular membrane without bony side platelets; body surface mainly tuberculate; length of dorsal-fin base 1.41 in head length; 23 trunk rings; and 74 total rings, and its identification confirmed after comparison with the two previously-collected specimens (above). The former, representing the second Japanese record and northernmost record of *S.* (*S.*) *lettiensis*, is described herein in detail, and the new standard Japanese name "Shinkai-sumitsuki-yoji" proposed for the species.

*(*Corresponding author: The Kagoshima University Museum, 1–21–30 Korimoto, Kagoshima 890–0065, Japan: e-mail: motomura@kaum.kagoshima-u.ac.jp)*

Notes

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First record of *Pseudogobio esocinus* eggs on a shingle beach along the northern coast of the North Basin of Lake Biwa

Kohji Mabuchi and Kazuya Nishida*

Abstract Two egg population samples, G2901 (*n* = 27) and G2902 (*n* = 22), were collected from a shingle beach along the northern coast of the North Basin of Lake Biwa, Japan. Eight eggs were randomly selected from each sample and the mitochondrial 12S rRNA region was partially sequenced (177 bp). All 16 eggs shared a single haplotype and were identified as *Pseudogobio esocinus* based on phylogenetic analysis. To date, eggs of this species found in lake environments (including those of the lakes other than Lake Biwa) have been reported only from a single sandy gravel beach along the eastern coast of the North Basin of Lake Biwa. The present finding is the first record of *P. esocinus* eggs from a shingle beach.

*(*Corresponding author: NIES Lake Biwa Branch Office, National Institute for Environmental Studies, 5–34 Yanagasaki, Otsu, Shiga 520–0022, Japan (e-mail: mabuchi.koji@nies.go.jp)*

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First records of *Abbottina rivularis* from Kyoto, Japan in 38 years

*Atsushi Kogayu, Keigo Kitao, Yugo Miuchi and Keisuke Onuki**

Abstract Fifteen specimens of the Chinese false gudgeon *Abbottina rivularis* were collected from three rivers in the Lake Biwa–Yodo River system, Kyoto Prefecture, Japan for the first time in 38 years. A molecular phylogenetic analysis of mitochondrial cytochrome *b* gene sequences indicated that the specimen haplotypes completely matched two haplotypes

included in the Honshu clade of the Japanese lineage, suggested as indigenous to Japan in a previous study. Further surveys are necessary to reveal the origin and distribution of the species in Kyoto Prefecture, and future conservation requirements, in addition to progressing biogeographic studies in the Kinki region.

*(*Corresponding author: Laboratory of Animal Ecology, Graduate School of Science, Kyoto University, Kitashirakawa-Oiwakecho, Sakyo, Kyoto 606–8502, Japan: e-mail: fwfonk0238@terra.zool.kyoto-u.ac.jp)*

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Record of a river-run specimen of Biwa salmon (*Oncorhynchus masou* subsp.) from a small urban river flowing into the South Basin of Lake Biwa, Japan

Kohji Mabuchi, Kazuya Nishida and Makoto A. Yoshida*

Abstract A fish specimen [ca. 39 cm standard length (SL)] collected on 11 November 2022 in the Azuma River (a small urban river feeding the South Basin of Lake Biwa) was identified as Biwa salmon (*Oncorhynchus masou* subsp.), based on morphology and DNA analysis of the mitochondrial ATPase6 and CO III genes. Although the specimen when collected was in very poor condition, lacking several vertebrae and internal organs (including the gonads), the jaw shape, nuptial color on the body, and white abraded caudal peduncle surface indicated that it was a mature female that had attempted to dig a spawning bed. The river-run specimen represents the first specimen-based record of the subspecies in a river flowing into the South Basin of Lake Biwa, and the southernmost river-run record.

*(*Corresponding author: NIES Lake Biwa Branch Office, National Institute for Environmental Studies, 5–34 Yanagasaki, Otsu, Shiga 520–0022, Japan: e-mail: mabuchi.koji@nies.go.jp)*

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Sneaking behavior of mature male parr directed at pair of Lake-run form Biwa salmon

Masanori Oda and Taiga Yodo*

Abstract Sneaking behavior directed towards a pair of Lake-run form Biwa salmon (ca. 50 cm TL) by a mature male parr (ca. 10cm TL), observed in the Oura River, a small inlet stream of Lake Biwa, central Japan on 25 October 2020, resulted in successful sperm release by the latter. If the parr individual was a Biwa salmon, the observation is important for improved understanding of spawning in the latter, as such sneaking has not been previously recorded with any certainty. On the other hand, if the parr was a stocked Amago salmon individual, it likely represented an unregulated stock, the release of such possibly promoting genetic introgression into the Lake-run form. A third possibility, that the sneaking parr was a native Amago salmon, would support the hypothesis that outbreeding occurs between native Amago salmon and Biwa salmon in the Lake Biwa water system.

*(*Corresponding author: Tottori Prefectural Center for Stock Enhancement, 1166, Ishiwaki*

Yurihama, Tottori 689–0602, Japan: e-mail: malma@sj8.so- net.ne.jp)

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Southernmost records of *Siphonogobius nue* (Gobiidae: Oxudercinae), from Miyazaki Prefecture, eastern Kyushu, southern Japan

Yukiya Ogata, Ryosei Ooe, Yuta Ichii and Atsunobu Murase*

Abstract Four collected gobiid specimens (55.3–87.6 mm in standard length) and a single photographed and released individual, from the coast of Miyazaki Prefecture, Kyushu, southern Japan, were identified as the endemic Japanese species *Siphonogobius* nue Shibukawa and Iwata, 1998, characterized by a simple infraorbital canal extending below the eye, and the oculoscapular canal between pore's A' and L' lacking other pores, except for pore D. The species has been recorded to date from the Pacific coast of Honshu, northeastern Japan (between Fukushima and Shizuoka prefectures), the present specimens representing the southernmost known record of the species. A detailed description and color photograph of the Kyushu specimens is provided.

*(*Corresponding author: Interdisciplinary Graduate School of Agriculture and Engineering, University of Miyazaki, 1–1 Gakuen-kibanadai-nishi, Miyazaki 889–2192, Japan; Nobeoka Marine Science Station, Field Science Center, University of Miyazaki, 376–6 Akamizu, Nobeoka, Miyazaki 889–0517, Japan: e-mail: yukiyalates@gmail.com)*

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***Tomiyamichthys russus* (Gobiidae) from Tanega-shima Island, Osumi Islands, Kagoshima Prefecture, Japan: first record from the Satsunan Islands and northernmost record for the species**

*Masayuki C. Sato and Hiroyuki Motomura**

Abstract A single specimen (95.0 mm standard length) of *Tomiyamichthys russus* (Cantor, 1849), an Indo-Pacific goby associated with alpheid shrimps, was collected from Tanegashima Island, Osumi Islands, Satsunan Islands, Kagoshima Prefecture, Japan. In Japanese waters, the species has previously been recorded only from the Okinawa-jima and Iriomotejima islands (central and southern Ryukyu Islands). Thus, the Tanega-shima specimen, described in detail herein, represents the first record of *T. russus* from the Satsunan Islands (third Japanese record), and northernmost record for the species.

*(*Corresponding author: The Kagoshima University Museum, 1–21–30 Korimoto, Kagoshima 890–0065, Japan: e-mail: motomura@kaum.kagoshima-u.ac.jp)*

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Inheritance of a rare morphotype (Nagaremon-charr) in some hybrids of *Salvelinus leucomaenis* morphotypes collected from the Ane River, Lake Biwa System, Japan

Masataka Hatano, Kazuhiro Sugahara, Yoshitaka Kataoka, Tsuyoshi Yoshioka and Takeshi Kikko*

Abstract Nagaremon-charr, a rare morphotype of *Salvelinus leucomaenis* characterized by wavy parr markings (Nagaremon type) instead of typical parr marks (normal type), inhabit a tributary of the Ane River basin (Lake Biwa system). However, the frequency of the Nagaremon type has decreased from the 1970s. To explain this reduction, mating trials were conducted between the Nagaremon and normal morphotypes. One trial yielded populations that approximated a 1:1 segregation ratio for the two phenotypes, suggesting that the Nagaremon type is a recessive trait and that the parent with a normal phenotype (collected from the tributary) was a heterozygous carrier for the Nagaremon trait. Therefore, conservation of Nagaremon-charr should involve management of the entire tributary,

*(*Corresponding author: Shiga Prefectural Fisheries Experiment Station, 2138–3 Hassakacho, Hikone, Shiga 522–0057, Japan (e-mail : hatano-masataka@pref.shiga.lg.jp)*