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CONTENTS

Original Papers

Records of three anthiadine species, *Plectranthias longimanus*, *P. nanus*, and *P. winniensis*, from Japanese waters, with morphological and genetic comparisons (Perciformes: Serranidae)

Yoshito Kawaji, Hiroshi Senou, Nozomu Muto and Hiroyuki Motomura

First record of *Onigocia grandisquama* (Scorpaeniformes: Platycephalidae) from Japan

Hisashi Imamura and Gento Shinohara

Life history traits of *Mugilogobius* sp. and *M. chulae* on southern Okinawa-jima Island, Japan

Taiga Kunishima and Katsunori Tachihara

Detection of endangered Itasenpara bitterling using simple environmental DNA analysis

Yuji Yamazaki and Masaki Nishio

First Japanese record of *Trachinotus anak* (Perciformes: Carangidae) from Kagoshima Prefecture, Japan

Hidetoshi Wada, Masahide Itou and Hiroyuki Motomura

Distribution of anadromous red-spotted masu salmon *Oncorhynchus masou ishikawae* from 1927 to 1931 evaluated from data published in “River Fishery” by the Fisheries Agency, Ministry of Agriculture and Forestry, Japan

Daisuke Kishi and Tetsuya Tokuhara

Genetic population structure and disturbance among *Coreoperca kawamebari* (Perciformes, Sinipercaidae) populations in Tokushima Prefecture

Takaaki Shimizu, Yoichi Sato and Motohiro Takagi

Notes

New record of *Parascombrops mochizukii* from Suruga Bay; the northernmost record of the species

Naohide Nakayama, Munehiro Takami and Taku Horie

Density and body size of wild chum salmon *Oncorhynchus keta* fry in the lower reaches of a small stream on the Sanriku coast, northern Honshu, Japan

Tsuyoshi Tamate, Ken-ichi Ohmoto, Kei Sasaki and Miwa Yatsuya

A rare serranid fish, *Suttonia coccinea* (Teleostei: Perciformes), from Ishigaki-jima island, Yaeyama Islands, southern Japan

Tomohiro Yoshida, Kiyoshi Hagiwara and Hiroyuki Motomura

Behavioral and morphological comparisons of newly emerged white-spotted char, *Salvelinus leucomaenis*, in two tributaries of the Kame River, southern Hokkaido, Japan

Hiroyuki Yamada, Takashi Enomoto and Satoshi Wada

Review of Japanese records of *Chelidoperca margaritifera* Weber, 1913 (Serranidae); misidentifications of *C. santosi* Williams and Carpenter, 2015 and *C. tosaensis* Matsunuma, Yamakawa and Williams, 2017

Mizuki Matsunuma, Takeshi Yamakawa and Kazuo Hoshino

Spawning of *Gnathopogon caeruleus*, *Carassius buergeri grandoculis*, and Japanese Cyprinus species in a revetmented tributary of the Chounogi River flowing into Lake Biwa, as revealed by DNA identification of field-collected eggs

Kohji Mabuchi, Kazuya Nishida and Makoto A. Yoshida

Records of *Brama orcini* and *Eumegistus illustris* (Bramidae) from the Sea of Japan

Akari Ogino, Fumihito Tashiro and Mizuki Matsunuma

First record of *Scomberoides commersonianus* (Perciformes: Carangidae) from Yamaguchi Prefecture, Japan and a checklist of carangid fishes from Wakasa Bay and adjacent waters

Mizuki Matsunuma, Yoshitaka Uchida and Fumihito Tashiro

Group structure and home range of the cleaner wrasse *Labroides dimidiatus* in Tateyama Bay, Chiba, Japan

Shuta Endo, Sayo Tomatsu and Tomoki Sunobe

Original Papers

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Records of three anthiadine species, *Plectranthias longimanus*, *P. nanus*, and *P. winniensis*, from Japanese waters, with morphological and genetic comparisons (Perciformes: Serranidae)

Yoshito Kawaji, Hiroshi Senou, Nozomu Muto and Hiroyuki Motomura*

Abstract A comparison of 68 specimens of *Plectranthias* (Serranidae: Anthiadae) from Japanese waters with 85 Indo-Pacific specimens, all characterized by the fourth dorsal-fin spine longest, no branched pectoral-fin rays, two antrorse spines on the lower preopercular margin, the lateral line incomplete with fewer than 22 pored scales, and scales absent from the maxilla, revealed the former to include *P. longimanus* (Weber, 1913) [23 specimens, 8.5–28.4 mm standard length (SL)], *P. nanus* Randall, 1980 (38, 10.6–32.3 mm SL), and *P. winniensis* (Tyler, 1966) (7, 24.1–38.6 mm SL). Among the Japanese specimens, *P. longimanus* was similar to *P. nanus* in overall body appearance, but differed from the latter in having modally 12 pectoral-fin rays [vs. 13 in *P. nanus*], 15 gill rakers (vs. 17), 14 pored lateral-line scales (vs. 18), 26 or 27 scale rows in the longitudinal series (vs. 28), 8 scale rows below the lateral line (vs. 9), 3 interopercular spines (vs. spines absent), and 2 or 3 subopercular spines (vs. spines absent), a maximum body depth 34.1% (mean) of SL (vs. 28.6%), and a vertical band absent near the base of the caudal fin (vs. band present in both fresh and preserved specimens). Japanese *P. winniensis* clearly differed from the other two species, having 16 or 17 soft rays in both the dorsal and pectoral fins (vs. fewer than 15 rays in the latter two species), modally 16 pored lateral-line scales (vs. 14 in *P. longimanus*, 18 in *P. nanus*), subopercular spine absent (vs. 1–4 present in *P. longimanus*), and a greenishred body without dark blotches or bands (vs. reddish-brown body, mottled with dark blotches and bands). In addition, analyses of 12S ribosomal RNA and cytochrome c oxidase subunit I gene sequences indicated that the three species were genetically distinct from each other. In Japanese waters, *P. longimanus* has been recorded from the Izu Peninsula and the Izu Islands to the Koshiki Islands, mainland Kagoshima, and the Ryukyu Islands, *P. winniensis* having a similar distribution pattern, i.e., from the Izu Islands south to the Ryukyu Islands. *Plectranthias nanus* has been recorded only from island groups, including the Ogasawara, Ryukyu, and Daito islands.

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First record of *Onigocia grandisquama* (Scorpaeniformes: Platycephalidae) from Japan Hisashi Imamura* and Gento Shinohara

Abstract The platycephalid genus *Onigocia* Jordan and Thompson, 1913, defined by, e.g. pored lateral line scales numbering about 40 or fewer and the infraorbital ridge finely serrated,

presently includes the following nine valid species at present: *Onigocia bimaculata* Knapp, Imamura and Sakashita, 2000, *Onigocia grandisquama* (Regan, 1908), *Onigocia macrocephala* (Weber, 1913), *Onigocia macrolepis* (Bleeker, 1854), *Onigocia oligolepis* (Regan, 1908), *Onigocia lacrimalis* Imamura and Knapp, 2009, *Onigocia pedimacula* (Regan, 1908), *Onigocia sibogae* Imamura, 2011 and *Onigocia spinosa* (Temminck and Schlegel, 1843). Of them, only *O. bimaculata*, *O. macrolepis* and *O. spinosa* have been formally recorded from Japanese waters. However, a single specimen of *Onigocia* [70.6 mm in standard length (SL)] collected from Mugi-oshima Island, Tokushima Prefecture, Japan in 1994, was recently found to be identical with *O. grandisquama*, being characterized by I + VII-11 dorsal-fin rays, 11 anal-fin rays, 12 pectoral-fin rays, 10 caudal-fin rays, 34 pored lateral-line scales, no small spines on the lachrymal ridges, 2 preocular spines, 9 pterotic spines, a single ocular flap not attaining to the posterior margin of the orbit, small papillae absent on the eye, the upper iris lappet short and branched, a notch absent on the suborbital ridge below the eye and interopercular flap, and a head length 48.6% SL. Although the latter has been widely recorded in the Indo-West Pacific, it has not been previously reported from Japanese waters; thus, the specimen represents the first record of *O. grandisquama* from Japan, as well as the northernmost record of the species. The Japanese specimen is described in full and a new Japanese standard name (Nameraonigochi) is proposed for the species.

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Life history traits of *Mugilogobius* sp. and *M. chulae* on southern Okinawa-jima Island, Japan

Taiga Kunishima* and Katsunori Tachihara

Abstract The species of *Mugilogobius* sp. (Japanese name: Izumi-haze) and *M. chulae* are both common species, sympatrically inhabiting the estuaries and tidal flats of Okinawajima Island. Some species of *Mugilogobius* has a urea cycle, and their processing ability is higher, especially in northern distributed species, such as *M. abei* and *Mugilogobius* sp. It is possible to differentiate their life history traits and habitats on the basis of urea processing ability. However, because little is known in detail of their life history and habitat, *Mugilogobius* sp. and *M. chulae* were investigated through monthly sampling conducted on the southern part of the Sashiki Tidal flat and Manko Wetland on Okinawa-jima Island, from January 2012 to January 2013. The spawning seasons of *Mugilogobius* sp. and *M. chulae* are from January to October and April to October, respectively, with peaks in the summer period (April to October), indicating that maturity in both species is closely related to changes in water temperature. A comparison with the spawning season of *M. abei*, a temperate region species, revealed the subtropical species to spawn over a longer period. Estimates of daily age from otolith analyses indicated the possibility of recruitment from other areas, since histological

observations revealed mismatches of gonads and birthmonths between different spawning seasons, as estimated by back-calculations of daily age. The longevity of *Mugilogobius* species was about six months. The study also revealed the growth rate of *Mugilogobius* sp. to be similar to that of *M. chulae*. *Mugilogobius chulae* locally inhabited mangrove habitats, whereas *Mugilogobius* sp. showed wide habitat use and was less susceptible to decreasing habitat than the former. Accordingly, future conservation of *M. chulae* is dependent upon suitable mud habitat associated with mangroves.

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Detection of endangered Itasenpara bitterling using simple environmental DNA analysis

Yuji Yamazaki* and Masaki Nishio

Abstract Environmental DNA (eDNA - genetic material released from an organism into the environment, such as water), which has recently gained attention as a new area of study, has applications in confirming the presence and estimating the biomass of target species, especially endangered fishes, as well as aiding an understanding of the general fish fauna. However, eDNA analysis requires expensive equipment and reagents, and is presently subjected to restrictions on widespread use, especially for environmental education and public awareness. For future conservation studies of the endangered Itasenpara bitterling *Acheilognathus longipinnis*, and subsequent application to other species, a species-specific PCR amplification and simple method of eDNA analysis was developed. Species-specific primer pairs based on nucleotide sequences were designed for the Itasenpara bitterling and closely related species. These enabled Itasenpara bitterling-specific amplification in PCR experiments on DNA samples obtained from fin tissues. Subsequently, species-specific amplification of eDNA samples obtained from a watershed containing Itasenpara bitterling habitat was confirmed using a simple PCR-based experimental method, although the amplification ratio varied, probably due to habitat conditions and bitterling growth stage.

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First Japanese record of *Trachinotus anak* (Perciformes: Carangidae) from Kagoshima Prefecture, Japan

Hidetoshi Wada*, Masahide Itou and Hiroyuki Motomura

Abstract During an ichthyofaunal survey of southwestern Satsuma Peninsula, Kagoshima Prefecture, Japan, a single pompano specimen (748.0 mm standard length, 814.0 mm fork length) was collected by set net at a depth of 20 m on 24 November 2018. The specimen was

subsequently identified as *Trachinotus anak* Ogilby, 1909, having the following combination of characters: dorsal-fin rays VI-I, 18; anal-fin rays II-I, 16; snout profile essentially straight immediately above upper lip; upper lip separated from snout by a continuous deep groove; a narrow band of villiform teeth on lower jaw; teeth on tongue absent; supraoccipital bone thin and blade-like; nasal and lacrimal bones hyperossified; first supraneural bone an inverted “L” shape; first to third ribs hyperossified; no distinct pattern (e.g., blotches or bands) on lateral body surface; and anal-fin lobe yellow, the anterior margin lacking brownish coloration. Because of the superficial similarity of *T. anak* to *T. mookalee* Cuvier, 1832, differentiation between the species sometimes requiring dissection, previous Japanese records of *T. mookalee* were re-examined. *Trachinotus mookalee* was confirmed as occurring in Japanese waters, but is known only from a single specimen from Miyazaki Prefecture, east coast of Kyushu, southern Japan. *Trachinotus anak* was previously known only from Taiwan, northern and eastern Australia, and New Caledonia, the present specimen from Kagoshima representing the first record from Japan and northernmost record for the species. The new standard Japanese name “Yokozunamarukoban” is herein proposed for the species.

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Distribution of anadromous red-spotted masu salmon *Oncorhynchus masou ishikawae* from 1927 to 1931 evaluated from data published in “River Fishery” by the Fisheries Agency, Ministry of Agriculture and Forestry, Japan

Daisuke Kishi* and Tetsuya Tokuhara

Abstract Distribution of the anadromous red-spotted masu salmon, *Oncorhynchus masou ishikawae* in Japan was evaluated from data published in “River Fishery, vol. 1–6” between 1930 and 1934 and in 1937 by the Fisheries Agency, Ministry of Agriculture and Forestry, Japan. Catches of salmon were recorded in 26 rivers from Shizuoka to Yamaguchi Prefecture on Honshu Island and 5 rivers in Tokushima and Kochi Prefectures on Shikoku Island, but no distribution was indicated in rivers in Fukuoka and Oita Prefectures on Kyushu Island between 1927 and 1931. The best-fitted model of Generalized Linear Model indicated that both of latitude and river length had significant positive effects on the presence of salmon. Salmon is possibly distributed only in large rivers, particularly in the southern region. Probability of distribution of salmon as correct classification in 64 rivers and misclassification in 15 rivers including the Shimanto River in southwestern Shikoku Island were calculated from the best-fitted model. Catch of salmon was not recorded in data published by the Fisheries Agency, but that published in 1912 by the local government in Hata, Kochi Prefecture, and our analysis indicated salmon presence in the Shimanto River. Although the Nahari River (the river mouth, 33°25'21"N, 134°0'42"E) in southeastern Shikoku Island had been shown to be the southern limit in data published by the Fisheries Agency, we suggested the Shimanto River (32°55'58"N, 132°59'39"E) the southernmost limit. In this study, we reveal previous

distribution of the anadromous red-spotted masu salmon in 26 rivers in Honshu Island and 6 rivers including the Shimanto River, in Shikoku Island in Japan.

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Genetic population structure and disturbance among *Coreoperca kawamebari* (Perciformes, Sinipercaidae) populations in Tokushima Prefecture

Takaaki Shimizu, Yoichi Sato and Motohiro Takagi*

Abstract Genetic structure and disturbance among populations of the Japanese perch *Coreoperca kawamebari* in Tokushima Prefecture were surveyed by mitochondrial DNA (mtDNA) direct sequence analysis. Two sample series were taken during different sampling periods from three river systems (Kuwano, Fukui, and Tsubaki River systems): (1) 1999, samples from river populations free of any officially sanctioned artificial introduction of seeds; and (2) 2011-14, samples from the Tsubaki River population previously subjected to artificial introduction of seeds from the Kuwano River population. In the 1999 samples, perch in the above three river systems all exhibited the Tokushima clade (comprising haplotypes Hap 1 and Hap 2). Hap 1 was shared by the Fukui and Tsubaki River systems, whereas Hap 2 was endemic to the Kuwano River system. A few cases of an additional haplotype (Hap 10), included in a different clade (Western Setouchi clade), were found in the Fukui River population. In the 2011-14 samples, Hap 2 of the Kuwano River endemic haplotype was shared with Tsubaki River populations, at rates from 25% to 56% among individuals of different year classes, suggesting mtDNA intrusion from the Kuwano River population. Additionally, all individuals in a tributary of the Kuwano River system (a recently discovered habitat of the species), exhibited a haplotype (Hap 11) belonging to the Western Setouchi clade. These findings suggest artificial intraspecific introductions among river populations, resulting in serious irreversible disturbance to the natural perch populations. Further detailed nuclear DNA surveillance should be conducted to clarify the ongoing status of the perch.

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Notes

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New record of *Parascombrops mochizukii* from Suruga Bay; the northernmost record of the species

Naohide Nakayama*, Munehiro Takami and Taku Horie

Abstract A single specimen of the acropomatid fish *Parascombrops mochizukii* Schwarzhans, Prokofiev and Ho, 2017, collected from 346 m in Suruga Bay, west coast of Izu Peninsula, Japan represents the northernmost record of the species, previously known only from the northern South China Sea and off Owase, Mie Prefecture, southern Japan. The Suruga Bay specimen is described, including previously unknown color features. Diagnostic characters separating the species from similar congeners are also discussed.

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Density and body size of wild chum salmon *Oncorhynchus keta* fry in the lower reaches of a small stream on the Sanriku coast, northern Honshu, Japan

Tsuyoshi Tamate*, Ken-ichi Ohmoto, Kei Sasaki and Miwa Yatsuya

Abstract The density and body size of wild chum salmon *Oncorhynchus keta* fry were surveyed in spring each year from 2012–2015 inclusive, immediately above the mouth of the Otobe River, a small stream on the Sanriku coast, northern Honshu Island. In each survey year, fry density peaked in late April or early May, typically exhibiting a sharp decrease afterwards. Mean fork length generally ranged between 42–47 mm, the observed minimum and maximum lengths during the survey being 34 mm and 83 mm, respectively.

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A rare serranid fish, *Suttonia coccinea* (Teleostei: Perciformes), from Ishigaki-jima island, Yaeyama Islands, southern Japan

Tomohiro Yoshida*, Kiyoshi Hagiwara and Hiroyuki Motomura

Abstract A single specimen (43.8 mm standard length) of *Suttonia coccinea* Endo and Kenmotsu, 2013 (Perciformes: Serranidae), previously known only from the holotype from Okino-shima island, Kochi Prefecture, was located in the Yokosuka City Museum collection, having been collected from Ishigaki-jima island, Yaeyama Islands, Japan on 4 July 2000. The specimen represents only the second known record of *S. coccinea*.

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Behavioral and morphological comparisons of newly emerged white-spotted char, *Salvelinus leucomaenis*, in two tributaries of the Kame River, southern Hokkaido, Japan
Hiroyuki Yamada*, Takashi Enomoto and Satoshi Wada

Abstract Many local populations of white-spotted char (*Salvelinus leucomaenis*), a widespread Far East Asian species, persist in above-dam areas, even when erosion control dams prevent continuing upstream movement of individuals. Four morphological characters (dorsal fin height, body depth, caudal peduncle depth, and eye diameter) and two behavioral traits (settlement time and number of foraging actions) of *S. leucomaenis* fry were compared between two tributaries, one above an erosion control dam and the other an unrestricted stream. Dorsal fin height and caudal peduncle depth were smaller, and settlement time during daytime longer in the above-dam fry, which also showed less frequent foraging behavior than unrestricted stream fry during nighttime, suggesting that the former had unsuitable morphology for swimming and a lower wondering tendency. These characteristics may ultimately aid survival of the above-dam population.

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Review of Japanese records of *Chelidoperca margaritifera* Weber, 1913 (Serranidae); misidentifications of *C. santosi* Williams and Carpenter, 2015 and *C. tosaensis* Matsunuma, Yamakawa and Williams, 2017

Mizuki Matsunuma*, Takeshi Yamakawa and Kazuo Hoshino

Abstract Previous Japanese records of *Chelidoperca margaritifera* Weber, 1913 (Perciformes: Serranidae) were reviewed, and all available Japanese specimens previously reported as that species found to be either *C. santosi* Williams and Carpenter, 2015 or *C. tosaensis* Matsunuma, Yamakawa and Williams, 2017. No evidence was found of *C. margaritifera* occurring in Japanese waters, the species instead being known solely from the holotype, collected off New Guinea. *Chelidoperca santosi* is characterized by three scale rows between the lateral line and middle of the spinous dorsal-fin base; two pairs of dark spots on the snout; a pair of dark spots on the lower jaw tip; the interorbital scales just reaching or extending slightly beyond mid-orbit but not reaching level with the posterior nasal pores; scales on the mandibular ventral surface extending anteriorly onto the dentary; and enlarged canine-like teeth on both jaws, thereby being distinguished from all Japanese congeners [*C. hirundinacea* (Valenciennes in Cuvier and Valenciennes, 1831), *C. pleurospilus* (Günther, 1880) and *C. tosaensis*]. The standard Japanese name “Minamihimekodai” should be applied to *C. santosi*. (*Corresponding author: Department of Environmental Management, Faculty of Agriculture, Kindai University, 3327-204 Nakamachi, Nara 631-8505, Japan; e-mail: matsunuma@nara.kindai.ac.jp)

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Spawning of *Gnathopogon caerulescens*, *Carassius buergeri grandoculis*, and Japanese *Cyprinus* species in a revetmented tributary of the Chounogi River flowing into Lake Biwa, as revealed by DNA identification of field-collected eggs

Kohji Mabuchi*, Kazuya Nishida and Makoto A. Yoshida

Abstract A total of 351 eggs from 12 egg populations was collected in June 2018 from a revetmented tributary of the Chounogi River, ca. 2 km upstream from Lake Biwa. Analysis of 95 of these eggs (sampled about equally from all populations) by a 2 or 3-step DNA identification process resulted in 71 being successfully sorted into the following five taxa: *Gnathopogon caerulescens* (25 eggs), *Carassius buergeri grandoculis* (22), triploid *Carassius* (4), and Japanese (8) and Eurasian (12) species of *Cyprinus*. Of these five taxa, *G. caerulescens*, *C. buergeri grandoculis*, and Japanese *Cyprinus* sp. are thought to migrate upstream to spawn, as they are more commonly found in the lake. Notably, 60% of the collected eggs were attached to the substrata provided by riverside trees (the remaining 40% were attached to vegetation hanging into the stream). Unfortunately, these trees were removed during a river renovation procedure conducted just after this study.

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Records of *Brama orcini* and *Eumegistus illustris* (Bramidae) from the Sea of Japan

Akari Ogino, Fumihito Tashiro and Mizuki Matsunuma*

Abstract Two specimens [157.5–269.1 mm standard length (SL)] of Bigtooth Pomfret, *Brama orcini* Cuvier, 1831 (Bramidae), collected from Kyoto Prefecture (Sea of Japan coast), Japan, represent the northernmost record of the species, which had not previously been recorded from the Japan Sea coast. In addition, two examples of Brilliant Pomfret, *Eumegistus illustris* Jordan and Jordan, 1922 (350.0 and 378.0 mm SL), also collected from the Japan Sea coast of Kyoto Prefecture, similarly represent the northernmost records for the species.

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First record of *Scomberoides commersonnianus* (Perciformes: Carangidae) from Yamaguchi Prefecture, Japan and a checklist of carangid fishes from Wakasa Bay and adjacent waters

Mizuki Matsunuma*, Yoshitaka Uchida and Fumihito Tashiro

Abstract A single specimen of *Scomberoides commersonnianus* (Carangidae), previously recorded only from Kagoshima, Miyazaki and Toyama prefectures in Japan, was recently collected off Yamaguchi Prefecture (34°25.3'N, 131°21.0'E), southwestern Japan Sea. The newly collected specimen (FAKU 146095, 401.8 mm SL, 424.8 mm FL), representing the fourth Japanese record of the species, was probably transported by the Tsushima Current, flowing northward off the west coast of Kyushu and the Japan Sea coast of mainland Japan. A checklist of 27 carangid fishes found in Wakasa Bay and adjacent waters, central Japan Sea coast of Japan is also provided.

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Group structure and home range of the cleaner wrasse *Labroides dimidiatus* in Tateyama Bay, Chiba, Japan

Shuta Endo, Sayo Tomatsu and Tomoki Sunobe*

Abstract Group structure and cleaning behavior of the cleaner wrasse *Labroides dimidiatus* were studied in Tateyama Bay, Chiba, Japan. Two males and four females on a rocky reef, and one male and five females on an artificial reef were confirmed as harem groups. The home ranges of the former were extensive and those of the latter relatively narrow. The host species, which were cleaned by *L. dimidiatus*, were widely distributed over the rocky reef, but, restricted to a limited area on the artificial reef, indicating that the home range sizes of the cleaner wrasse may be determined by the distribution of the host species.

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