

Chelidoperca tosaensis, a new species of perchlet (Serranidae) from Japan and the Philippines, with geographic range extension of *C. stella* to the northwestern Pacific Ocean

Mizuki Matsunuma¹  · Takeshi Yamakawa¹ · Jeffrey T. Williams²

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Abstract *Chelidoperca tosaensis* is described as a new species based on 84 specimens from Japan and the Philippines taken from depths of 60–302 m. The species can be distinguished from all known congeners by having the following combination of characters: scale rows between lateral line and base of spinous dorsal fin 3; pored lateral-line scales 37–42 (modally 39); scale rows in longitudinal series 39–43 (modally 40); no longitudinal dark stripe or row of dark blotches on body side. The new species is additionally characterized by having a combination of numerous, scattered, yellow spots on dorsal and anal fins with red streak or cluster of reddish spots over bases of about 4–6th dorsal-fin spines; large ocellated red spot with pinkish white border

present on membrane between opercular spines; pelvic fin with middle area yellow with whitish spine, and whitish first, second and fifth soft rays; caudal fin with about three transverse rows of yellow spots centrally and posteriorly, two fan-shaped rows of red blotches on basal third, and a pair of white blotches with a pair of yellow blotches between white blotches on the base. Diagnostic characters of *Chelidoperca stella*, previously known only from its type locality in the Andaman Sea, are updated based on 12 specimens from Taiwan, the Gulf of Tonkin, Vietnam and the Philippines. These specimens represent the first records of the species from the Pacific Ocean.

Keywords Teleostei · Perciformes · Morphology · Taxonomy · Distribution

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✉ Mizuki Matsunuma
k1139853@kadai.jp
Takeshi Yamakawa
yamatake@md.pikara.ne.jp
Jeffrey T. Williams
williamsjt@si.edu

¹ Laboratory of Marine Biology, Faculty of Science, Kochi University, 2-5-1 Akebono, Kochi 780-8520, Japan

² Division of Fishes, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, 4210 Silver Hill Road, Suitland, MD 20746, USA

Introduction

Chelidoperca Boulenger 1895 comprises a group of small, bottom-dwelling Indo-Pacific marine fishes of the family Serranidae. The genus is characterized by having a relatively slender, elongate body; dorsal-fin rays usually X, 10; anal-fin rays usually III, 6; and two flattened strong opercular spines. All nine nominal Indo-West Pacific species are currently recognized as valid (Bineesh et al. 2013; Williams and Carpenter 2015; Matsunuma and Motomura 2016): *Chelidoperca hirundinacea* (Valenciennes in Cuvier and Valenciennes 1831), *Chelidoperca pleurospilus* (Günther 1880), *Chelidoperca investigatoris* (Alcock 1890), *Chelidoperca margaritifera* Weber 1913, *Chelidoperca occipitalis* Kottaus 1973, *Chelidoperca lecromi* Fourmanoir 1982, *Chelidoperca maculicauda* Bineesh and Akhilesh in Bineesh et al. 2013, *Chelidoperca santosi* Williams and Carpenter 2015, and *Chelidoperca stella* Matsunuma and Motomura

2016. The Atlantic *Chelidoperca africanus* Cadenat 1960 has been reassigned to the genus *Serranus* Cuvier 1816 (Heemstra and Anderson 2016).

Eighty-four specimens of an unidentified species of *Chelidoperca* were collected from numerous localities in the northwestern Pacific Ocean, ranging from the Philippines northward to southern Japan. Examination of these specimens revealed that they represent a new species, described herein.

An additional 12 specimens of *Chelidoperca stella*, previously known only from its type locality in the Andaman Sea, were collected from Taiwan, the Gulf of Tonkin, Vietnam and the Philippines. Morphometric data are reported for these specimens, which represent the first records of the species from the Pacific Ocean.

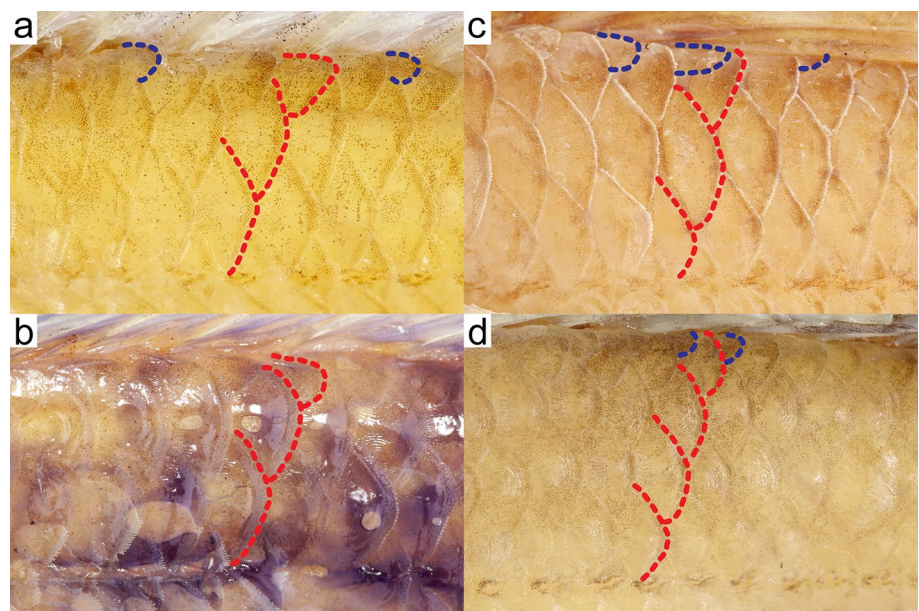
Materials and methods

Methods of taking counts and measurements generally follow Matsunuma and Motomura (2016) and Matsunuma (2016). The last two rays of the dorsal and anal fins are counted as single rays, each pair being associated with a single pterygiophore. We use soft rays to refer to segmented rays, but use unsegmented and segmented ray designations for the caudal fin to differentiate the soft unsegmented procurrent rays from the soft segmented caudal rays. The dorsal-most scale in the transverse row beneath the spinous dorsal-fin base is often between about 50 % and 100 % of the height of lower adjacent scales (the tiny and irregularly spaced scales at the bases of the spines are not counted; Fig. 1). In this paper, we refer to the slightly smaller dorsal-most scale as a full-size scale and count it as one scale

(Fig. 1). In previous studies (Bineesh et al. 2013; Williams and Carpenter 2015; Matsunuma 2016; Matsunuma and Motomura 2016), the variably sized dorsal-most scale in this row has been counted either as a half- or full-size scale depending on its height relative to the next lower adjacent scale. Counting this scale as full size in all species will minimize confusion for this character. Preopercular, interopercular and subopercular serrae (see Matsunuma and Motomura 2016: fig. 1), including a variety of shapes ranging from small spines to indistinct bony protuberances along the distal margins of these bones, are identified as serrae tips. Post-temporal serrae (see Matsunuma and Motomura 2016: fig. 1) include several serrae tips on the exposed posterior bony margin anterior to the first pored lateral-line scale. Counts and measurements are taken on the left side when possible, except for counts of the pectoral-fin rays and head serrae (counted on both sides). Developed gill rakers on the first arch, herein termed “rakers,” include only those with length greater than their base width. Standard length is abbreviated as SL. In the description of *Chelidoperca tosaensis*, data for the holotype are given first, followed by other specimen data (if different) in parentheses.

The formula for the configuration of the supraneural bones, anterior neural spines and anterior dorsal pterygiophores follows Ahlstrom et al. (1976). Osteological characters were examined from X-ray photographs of 11 specimens of *C. tosaensis* (BSKU 52608, 52727, 53312, 54675, 55190, 76443, 76444, 80732, 84452, 121442 and 121443) and six specimens of *Chelidoperca stella* (FAKU 101095). Meristic data were taken only from specimens marked by an asterisk in the lists of examined specimens. Institutional codes follow Sabaj (2016) with the following additions: Faculty of Fisheries, Nagasaki University (FFNU), Nagasaki; Kazuo Hoshino Private

Fig. 1 Dorsal portion of body beneath spinous dorsal fin showing scale rows between the lateral line and base of spinous dorsal fin of *Chelidoperca tosaensis* sp. nov. (a), *C. stella* (b), *C. maculicauda* (c) and *C. hirundinacea* (d). a BSKU 53312, holotype, 82.8 mm SL; b NSMT-P 70495, 68.7 mm SL; c BSKU 95038, 124.1 mm SL; d USNM 306446 (1 of 2 specimens), 114.2 mm SL. Red-outlined scales are included in count of scale rows; blue-outlined small scales are excluded from count



Collection (KHPC), Oita; Kochi Senior High School (SHS), Kochi; National Museum of Nature and Science (NSMT), Tsukuba; The Museum of Natural and Environmental History (SPMN), Shizuoka; Ichthyology Collection, Museum of Natural Sciences, University of the Philippines Visayas (UPVMI), Miagao; Wakayama Prefectural Museum of Natural History (WMNH), Kainan. Photographs of *C. tosaensis* referred to in this study for purposes of distributional records are registered in the Image Database of Fishes in KPM (KPM-NR) and uploaded to the Japanese Internet atlas of fishes, WEB sakana-zukan (<http://zukan.com/fish/>) [see Miyazaki et al. (2014)].

Molecular techniques for DNA extraction and sequencing are those employed at the Smithsonian as described by Carpenter et al. (2017) for genetic analysis of the mitochondrial gene coding for cytochrome *c* oxidase subunit I (COI). Six hundred and fifty-five base-pair fragments from two specimens of the new species [KAUM-I. 86633 (Japan; DDBJ/EMBL/GenBank accession number: MF597717) and USNM 437819 (Philippines; MF597699)], five specimens of *Chelidoperca hirundinacea* (MF597700–597704), 13 specimens of *Chelidoperca santosi* [KP150308 (Williams and Carpenter 2015) and MF597705–597716] and one specimen of *C. stella* (MF597718) were sequenced and compared with the following available sequences (none available for *Chelidoperca lecromi*, *Chelidoperca margaritifera* and *Chelidoperca pleurospilus*) from congeners available in the Barcode of Life Database (BOLD; <http://www.boldsystems.org>; accessed 22 June 2017) and from DDBJ/EMBL/GenBank accession numbers: *C. hirundinacea*: JQ681448 and JQ681449 (registered as *C. pleurospilus*), JQ681476 (*Chelidoperca* sp.); *Chelidoperca investigatoris*: JX185305, JX185307, JX185310, JX185312, KP009557–009559; *Chelidoperca maculicauda* (registered as *Chelidoperca* sp.; see Bineesh et al. 2013): JX185308, JX185309, JX262929; and *Chelidoperca occipitalis*: JX185304, JX185306, JX185311, JX185313 [details of sequences used in this study are shown in Electronic

Supplemental Material (ESM) Table S1]. Sequence divergence in relation to other known species of *Chelidoperca* and the full BOLD database of COI sequences was determined by comparing the COI sequences from our two successfully sequenced specimens using tools available on the BOLD database to assist with taxonomic comparisons (including BLAST-Basic Local Alignment Search Tool). Our sequences were compared with all COI sequences in the BOLD database (public and private) to assess sequence similarity/divergence.

Chelidoperca tosaensis sp. nov.

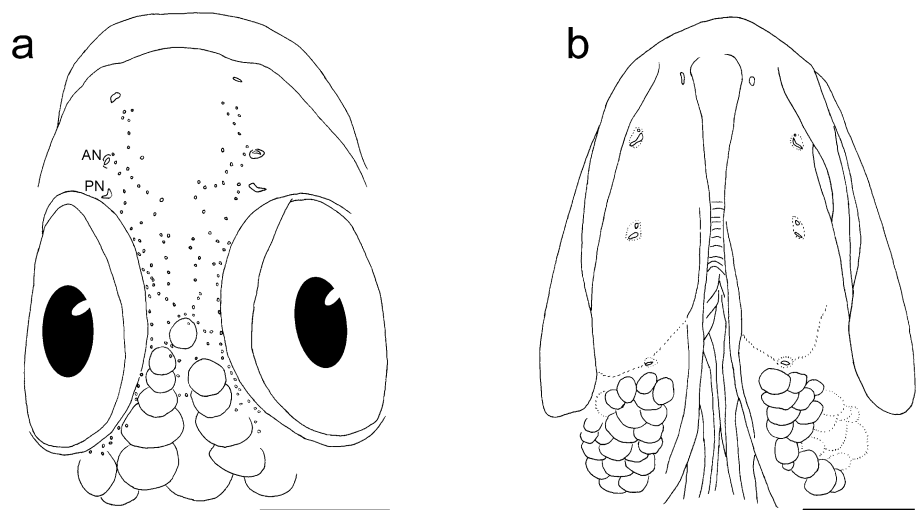
(New Japanese name: Tosa-himekodai; new English name: Red-spot Perchlet) (Figs 1a, 2, 3, 4, 5, 6, 7, 8, 11; Tables 1, 2, 3)

Chelidoperca margaritifera (not Weber): Konishi 2011: 66, unnumbered fig. [off Amami-oshima Island, Ryukyu Islands, Japan; figured photograph also appeared in WEB sakana-zukan (<http://zukan.com/fish/leaf16957>)].

Holotype. BSKU 53312, 82.8 mm SL, off Tosa Bay, Kochi Prefecture (obtained at Mimase Fishing Port), bottom trawl, 21 Jan. 2001.

Paratypes. 75 specimens, 29.3–92.8 mm SL: **JAPAN: Shizuoka Prefecture:** MSM-09-194, 76.9 mm SL, off Awa-shima Island, Numazu, Suruga Bay, 20–80 m, H. Kobayashi, line-fishing, 15 Sept. 2009; MSM-09-195, 84.5 mm SL, collected with MSM-09-194, K. Yamada; MSM-17-43, 87.1 mm SL, Suruga Bay, 50 m, S. Mizuno, line-fishing, 25 May 2016; SPMN-PI 40431, 86.6 mm SL, Suruga Bay, 50 m, S. Mizuno, line-fishing, 8 Dec. 2015; SPMN-PI 42124, 83.5 mm SL, collected with MSM-09-194, Y. Itou. **Wakayama Prefecture:** WMNH 2010 PIS-208, 66.3 mm SL, off Shirasaki, Kii Channel, 60 m, M. Nishiyama, bottom trawl, 11 June 2010. **Kochi Prefecture (Tosa Bay):**

Fig. 2 Dorsal (a) and ventral (b) views of head of *Chelidoperca tosaensis* sp. nov., BSKU 53312, paratype, 82.8 mm SL, showing conditions of scales and sensory pores. AN and PN indicate anterior and posterior nasal pores, respectively. Bars indicate 5 mm



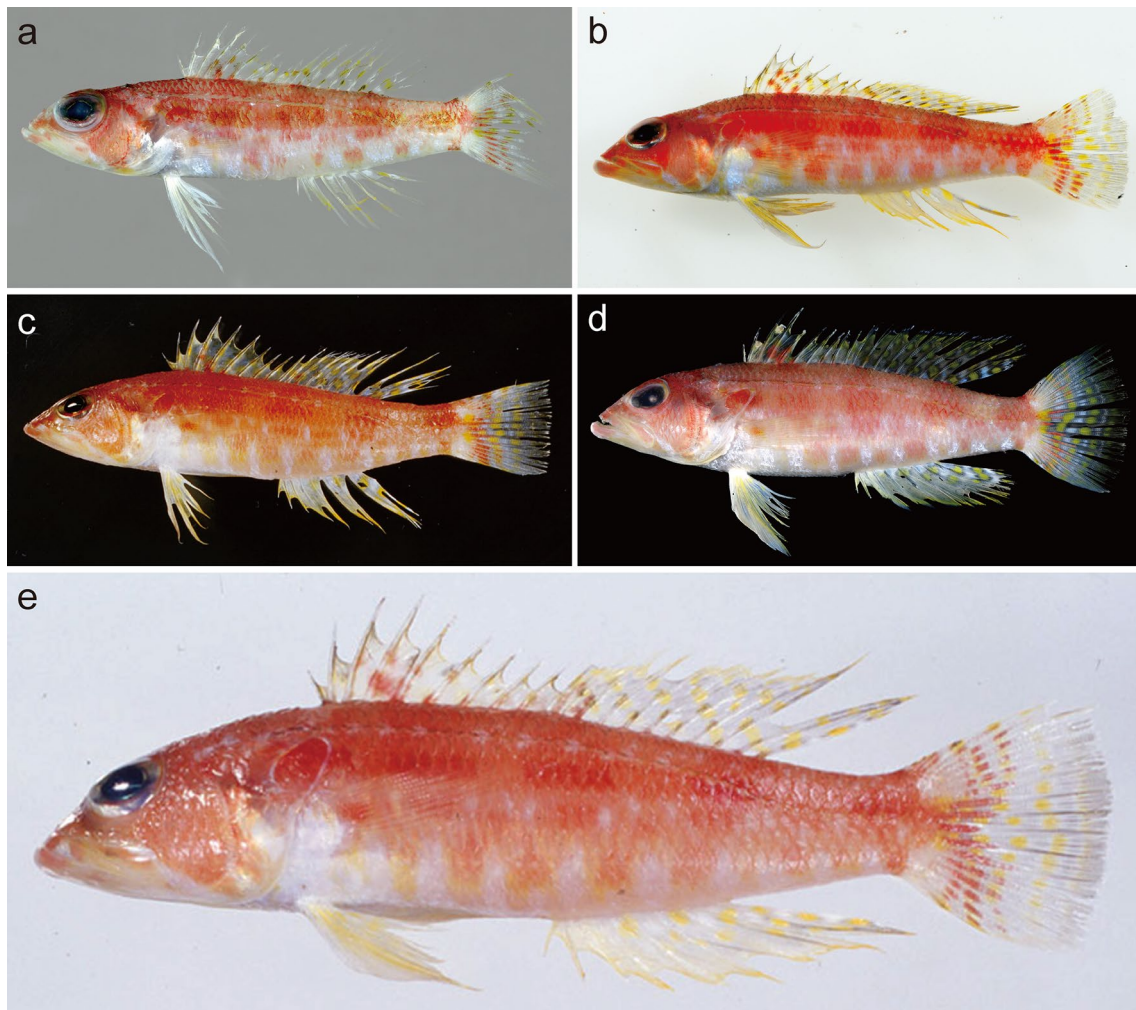


Fig. 3 Fresh specimens of *Chelidoperca tosaensis* sp. nov. **a** KAUM-I. 150001, paratype, 47.3 mm SL, East China Sea (photo: KAUM); **b** WMNH 2010 PIS-208, paratype, 66.3 mm SL, Wakayama Prefecture, Japan (photo: Y. Kaji); **c** BSKU 52608, paratype,

75.3 mm SL, Kochi Prefecture, Japan; **d** KAUM-I. 150000, paratype, 92.8 mm SL, East China Sea (photo: KAUM); **e** BSKU 53312, holotype, 82.8 mm SL, Kochi Prefecture, Japan

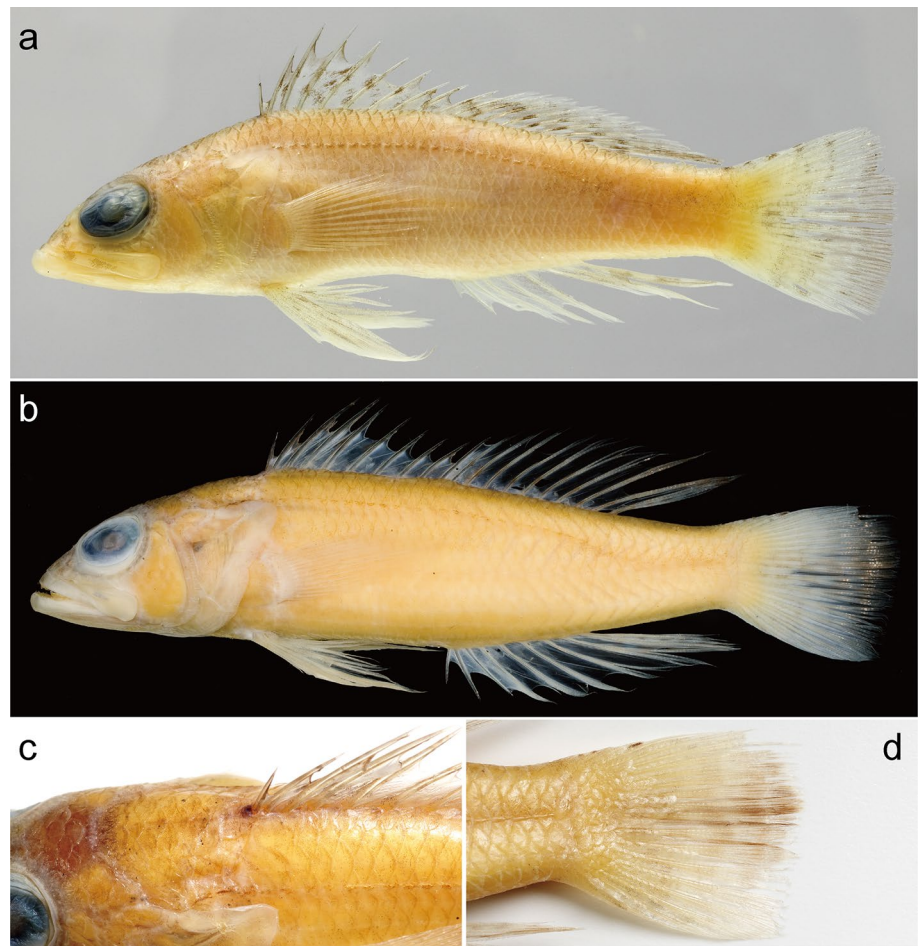
BSKU 52608, 75.3 mm SL, obtained at Mimase Fishing Port, bottom trawl, 28 Nov. 2000; BSKU 52727, 81.7 mm SL, obtained at Mimase Fishing Port, bottom trawl, 1 Dec. 2000; BSKU 54604, 29.3 mm SL, 90 m, RV *Toyohata-maru*, 4 Apr. 1995; BSKU 54675, 56.2 mm SL, 125 m, RV *Kotaka-maru*, 14 Mar. 1998; BSKU 55190, 81.9 mm SL, obtained at Mimase Fishing Port, bottom trawl, 18 Oct. 1997; BSKU 76443, 74.8 mm SL, BSKU 76444, 80.3 mm SL, obtained at Mimase Fishing Port, bottom trawl, 23 Nov. 2001; BSKU 80731, 90.9 mm SL, BSKU 80732, 84.4 mm SL, obtained at Kochi City Central Fish Market, 28 Nov. 1992; NSMT-P 129211 (formerly KSHS 590), 76.3 mm SL, obtained at Mimase Fishing Port, bottom trawl, 28 Apr. 1961; NSMT-P 129212 (formerly KSHS 17989), 76.4 mm SL, obtained at Mimase Fishing Port, bottom trawl, 8 Feb. 1979; NSMT-P 129213 (formerly KSHS 18017), 78.8 mm

SL, obtained at Mimase Fishing Port, bottom trawl, 8 Mar. 1978; NSMT-P 129214 (formerly KSHS 18058), 61.6 mm SL, obtained at Mimase Fishing Port, bottom trawl, 24 Mar. 1979; NSMT-P 129215 (formerly KSHS 18063), 61.0 mm SL, NSMT-P 129216 (formerly KSHS 18064), 62.4 mm SL, obtained at Mimase Fishing Port, bottom trawl, 23 Mar. 1979; NSMT-P 129217 (formerly KSHS 18469), 73.2 mm SL, NSMT-P 129218 (formerly KSHS 18470), 73.1 mm SL, NSMT-P 129219 (formerly KSHS 18471), 60.6 mm SL, obtained at Mimase Fishing Port, bottom trawl, 3 Apr. 1980; NSMT-P 129220 (formerly KSHS 18505), 75.8 mm SL, NSMT-P 129221 (formerly KSHS 18506), 76.0 mm SL, NSMT-P 129222 (formerly KSHS 18507), 70.8 mm SL, obtained at Mimase Fishing Port, bottom trawl, 5 Apr. 1980; UPVMI 2214 (formerly BSKU 84452), 71.5 mm SL, 125 m, RV *Kotaka-maru*, 14 Mar. 1998. **Yamaguchi**

Fig. 4 Live specimens of *Chelidoperca tosaensis* sp. nov. **a** uncatalogued specimen, Suruga Bay, Shizuoka Prefecture, Japan (photo: S. Mizuno); **b** WMNH 2010 PIS-208, paratype, 66.3 mm SL, Wakayama Prefecture, Japan (photo: Y. Kaji)



Fig. 5 Preserved specimens of *Chelidoperca tosaensis* sp. nov. **a** WMNH 2010 PIS-208, paratype, 66.3 mm SL, Wakayama Prefecture, Japan; **b–d** BSKU 53312, holotype, 82.8 mm SL, Kochi Prefecture, Japan



Prefecture: NSMT-P 129227 (formerly SNFR 15882), 79.8 mm SL, off Mishima Island, 34°52'30"–53'57"N,

131°01'11"–04'55"E, 87–115 m, RV *Tanshu-maru*, 25 July 1998. **Oita Prefecture:** BSKU 121439 (formerly one of

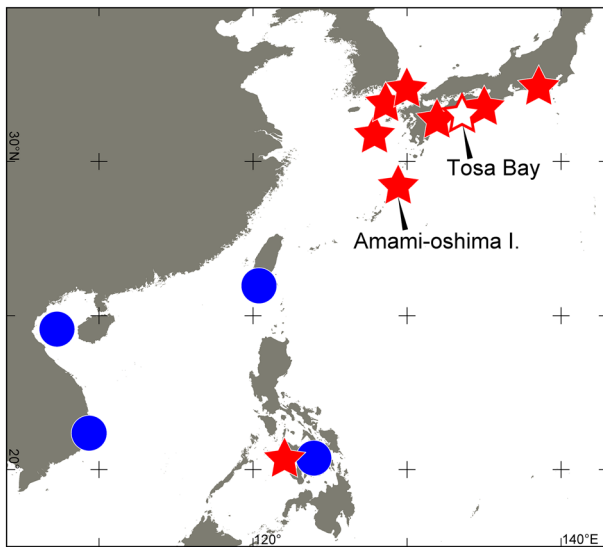


Fig. 6 Distributional map of *Chelidoperca tosaensis* sp. nov. (stars) and *C. stella* (circles) in the northwestern Pacific Ocean. Open star indicates type locality of *C. tosaensis*, Tosa Bay, Kochi Prefecture, Japan. Record of *C. tosaensis* from Amami-oshima Island, Japan, are based on photographs and literature

KHPC 3590), 52.6 mm SL, BSKU 121440 (formerly one of KHPC 3590), 72.9 mm SL, off Fuka-shima Island (obtained at Kamae Fishing Port), K. Hoshino, bottom trawl, 4 Sept. 2000; BSKU 121441 (formerly KHPC 5268), 72.7 mm SL, off Fuka-shima Island (obtained at Kamae Fishing Port), K. Hoshino, bottom trawl, 24 Sept. 2002; BSKU 121442 (formerly KHPC 4592), 79.9 mm SL, off Fuka-shima Island (obtained at Kamae Fishing Port), K. Hoshino, bottom trawl, 19 Sept. 2001; BSKU 121443 (formerly KHPC 5620), 77.7 mm SL, off Senzaki, Saeki (obtained at Kamae Fishing Port), K. Hoshino, bottom trawl, 16 July 2003; BSKU 121444 (formerly KHPC 5838), 70.7 mm SL, off Senzaki, Saeki (obtained at Kamae Fishing Port), K. Hoshino, bottom trawl, 29 July 2005; BSKU 121445 (formerly KHPC 5914), 73.3 mm SL, off Senzaki, Saeki (obtained at Kamae Fishing Port), K. Hoshino, bottom trawl, 16 July 2003; USNM 440339 (formerly KHPC 3427), 5 specimens, 55.9–80.7 mm SL, off Fuka-shima Island (obtained at Kamae Fishing Port), K. Hoshino, bottom trawl, 5 July 2000. **Nagasaki Prefecture:** FAKU 58108, 74.9 mm SL, FAKU 58109, 79.5 mm SL, FAKU 58110, 63.6 mm SL, FAKU 58111, 59.1 mm SL, FAKU 58112, 61.3 mm SL, FAKU 58113, 73.6 mm SL, FAKU 58114, 76.7 mm SL, FAKU 58115, 68.5 mm SL, FAKU 58117, 73.5 mm SL, FAKU 58118, 76.5 mm SL, FAKU 58119, 63.4 mm SL, FAKU 58120, 84.5 mm SL, FAKU 58121, 63.9 mm SL, FAKU 58122, 56.1 mm SL, FAKU 58123, 59.0 mm SL, FAKU 58124, 61.2 mm SL, FAKU 58125, 55.9 mm SL, FAKU 58126, 58.4 mm SL, FAKU 58127, 58.7 mm SL, southwest of Tsushima Islands, RV *Tanshu-maru*, 16 July 1990; NSMT-P 69277,

2 specimens, 44.3–45.5 mm SL, off Tsushima Islands, 34°15'16"N, 129°09'14"E, M. Mitsunashi, RV *Toyoshio-maru*, 302 m, 7 Sept. 2003. **Japan Sea:** FAKU 82646, 65.2 mm SL, Japan Sea (no further data); NSMT-P 129223 (formerly SNFR 11190), 79.1 mm SL, 34°52'45"–54'17"N, 131°01'52"–05'39"E, 80–108 m, RV *Tanshu-maru*, 16 July 1992; NSMT-P 129224 (formerly SNFR 15117), 80.7 mm SL, 34°31'01"–33'30"N, 130°31'44"–34'27"E, 123 m, RV *Tanshu-maru*, 11 July 1996; NSMT-P 129225 (formerly SNFR 15753), 4 specimens, 61.3–67.6 mm SL, 34°26'33"–28'49"N, 130°06'55"–09'59"E, 115 m, RV *Tanshu-maru*, 23 July 1996; NSMT-P 129226 (formerly SNFR 15872), 2 specimens, 74.7–75.6 mm SL, 34°00'55"–57'56"N, 131°00'25"–03'10"E, 102–118 m, RV *Tanshu-maru*, 25 July 1998. **East China Sea:** KAUM-I. 86633, 61.9 mm SL, 31°53'00"N, 128°08'43"E, 148–201 m, bottom trawl, 18 June 2014; KAUM-I. 150000, 92.8 mm SL, KAUM-I. 150001, 47.3 mm SL, 31°54'57"N, 128°09'31"E, 152 m, bottom trawl, 11 Dec. 2016. **PHILIPPINES:** USNM 437819, 69.5 mm SL, off Guimaras and Panay islands (obtained at Iloilo City fish market), tissue sample PHIL-209, J. Williams et al., 3 Sept. 2015.

Non-type specimens: Eight specimens, 53+ – 83.3 mm SL (all from Japan): *FAKU 58116 (head deformed), 53+ mm SL, southwest of Tsushima Island, Nagasaki Prefecture, RV *Tanshu-maru*, 16 July 1990; KHPC 3438, 78.4 mm SL, off Fuka-shima Island (obtained at Kamae Fishing Port), Oita Prefecture, K. Hoshino, bottom trawl, 5 July 2000; SNFR 14188, 83.3 mm SL, East China Sea, 31°54'57"–54'58"N, 128°09'48"–11'46"E, 152 m, RV *Kumamoto-maru*, 19 May 2008; SNFR 15195, 5 specimens, 64.1–81.6 mm SL, southwestern Japan Sea, 35°04'22"–06'58"N, 131°00'25"–03'10"E, 130 m, RV *Tanshu-maru*, 13 July 1994.

Diagnosis. A species of *Chelidoperca* distinguished from other members of the genus by the following combination of characters: pectoral-fin rays 14–16 (modally 15); pored lateral-line scales 37–42 (39); scale rows in longitudinal series 39–43 (40); scale rows between lateral line and base of sixth dorsal-fin spine 3 (Fig. 1a); preopercular serrae 15–40, interopercular serrae 3–19; subopercular serrae 5–20; interorbital scales reaching to or extending slightly beyond mid-orbit level but not extending beyond anterior margin of orbit (Fig. 2a); scales on ventral surface of lower jaw restricted to angular, no scales on dentary (Fig. 2b); relatively long dorsal- and anal-fin soft rays, penultimate dorsal-fin soft ray 15.9–25.7 (21.1) % of SL, longest dorsal-fin soft ray 16.4–25.7 (21.4) % of SL, penultimate anal-fin soft ray 18.2–26.4 (22.0) % of SL and longest anal-fin soft ray 18.2–26.4 (22.0) % of SL; dorsal-fin with numerous small yellow spots scattered over fin in irregularly diagonal rows, several small to large red blotches forming reddish diagonal streak from middle of 3rd or 4th spine to base of 5th or 6th

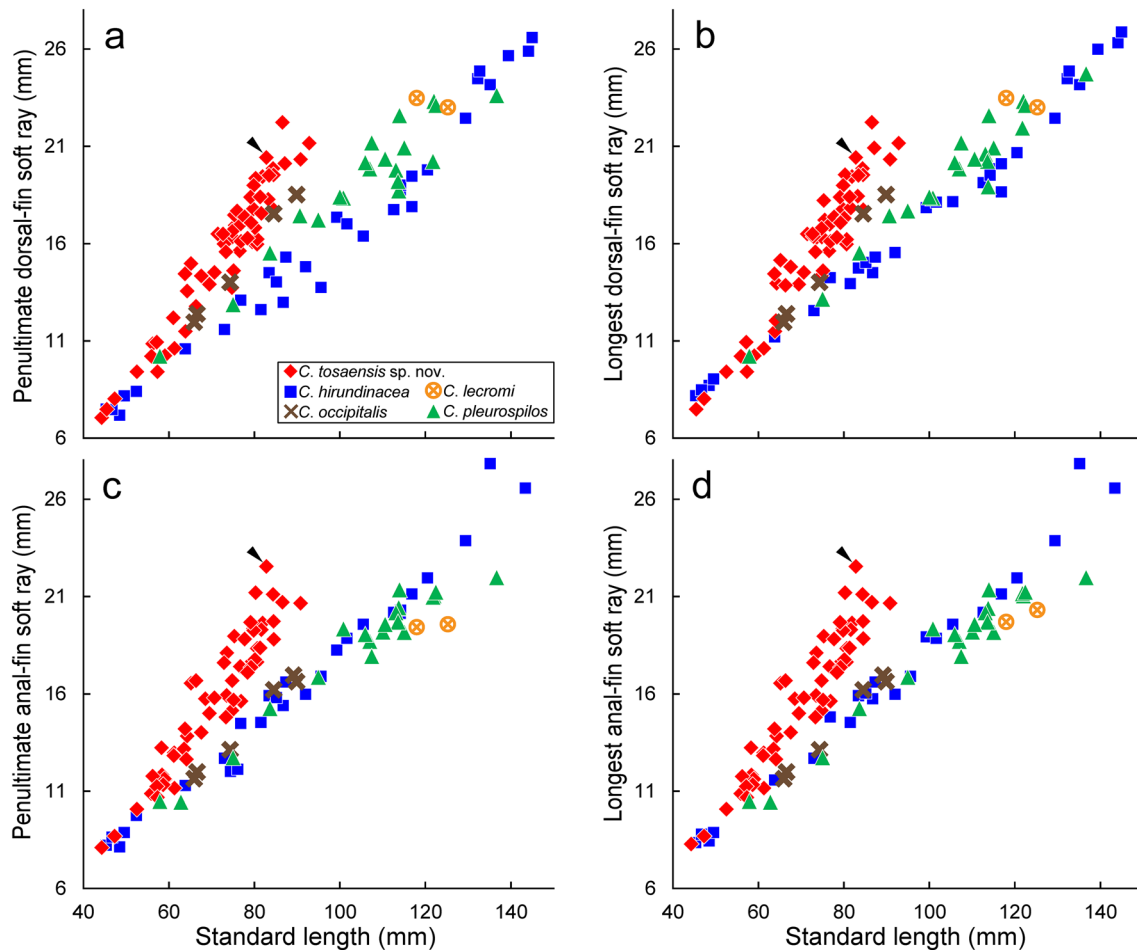


Fig. 7 Relationships of penultimate soft dorsal-fin ray (a); longest soft dorsal-fin ray (b); penultimate anal-fin soft ray (c); and longest soft anal-fin ray (d) to standard length (mm) in *Chelidoperca hirun-*

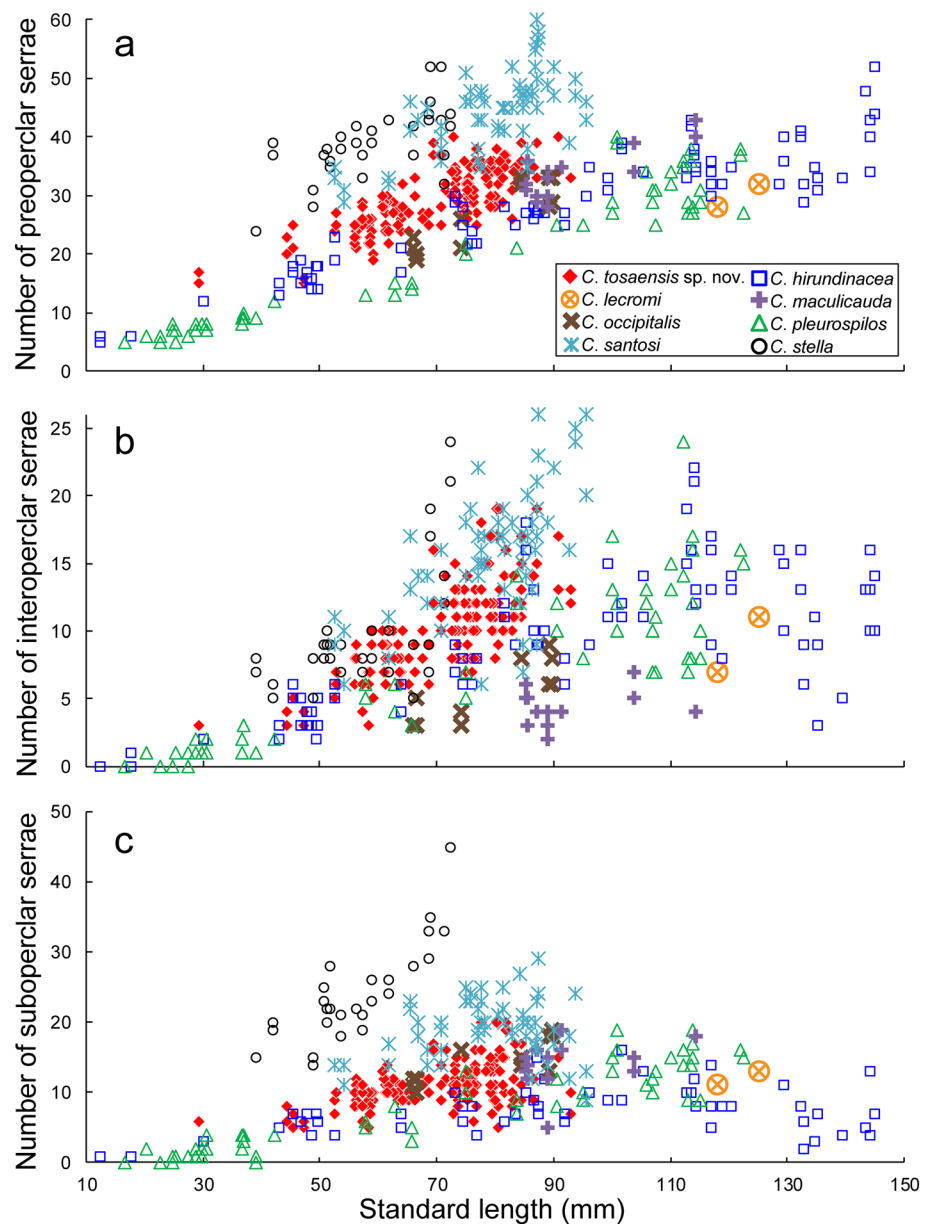
dinacea (squares); *C. lecromi* (circles with cross); *C. occipitalis* (crosses); *C. pleurospilus* (triangles); and *C. tosaensis* sp. nov. (diamonds). Arrowheads indicate holotype of *C. tosaensis*

spine; anal fin with small yellow spots scattered basally and centrally over posterior half of fin (Fig. 3); caudal fin with about 3 irregular columns of small yellow spots alternating with columns of whitish spots on central and distal portions of fin, about 2 narrow columns of red spots on interradial membranes of basal portion of lower lobe of fin, and a pair of large poorly defined white blotches on fin base with a pair of small yellow blotches between them; large ocellated red spot located on opercular membrane; side of body with longitudinal row of about 4 dark red elongate blotches.

Description. Morphometric and meristic values are summarized in Tables 1, 2, 3. Pelvic-fin rays I, 5. Body fusiform, slightly elongated; snout pointed, dorsal profile of snout forming angle of about 40° to horizontal axis of head and body; caudal peduncle relatively long (Figs 3, 4, 5). Orbit large, its dorsal margin included in dorsal contour of head. Mouth large, slightly oblique; posterior margin of maxilla extending beyond a vertical through mid-orbit, but not reaching a vertical through posterior margin of orbit;

maxilla expanded posteriorly, with low lateral ridge along dorsal margin; lower jaw slightly protruding beyond upper jaw when mouth closed. Upper jaw with band of about 7 rows (in anterior portion) of small, sharp-tipped conical teeth, tooth band becoming narrow posteriorly, outermost row of teeth enlarged, anteriorly projecting antrorse canines; lower jaw with band of about 4 rows (in anterior portion) of small, sharp-tipped conical teeth, innermost and outermost rows of teeth enlarged canines, band of small teeth narrowing posteriorly to 1 or 2 rows; vomer with V-shaped band of about 5 rows of small conical teeth, with several large canines in posterior row directed posteriorly; palatine with relatively long band of 4 rows of small, sharp-tipped conical teeth. Anterior nostrils situated at middle of snout, with small rounded flap rising from posterior rim; posterior nostril with elliptical opening at anterior border of orbit. Posterior margins of preopercle, interopercle and subopercle finely serrated, serrae on preopercle 26 (31 on right side) (15–40), interopercle 11 (10) (3–19) and subopercle 8 (10)

Fig. 8 Relationships of numbers of preopercular serrae (a); interopercular serrae (b); and subopercular serrae (c) (counted in both sides) to standard length (mm) in *Chelidoperca hirundinacea* (squares); *C. lecromi* (circles with cross); *C. maculicauda* (plus signs); *C. occipitalis* (crosses); *C. pleurospilus* (triangles); *C. santosi* (asterisks); *C. stella* (circles); and *C. tosaensis* sp. nov. (diamonds)



(5–20); number of serrae increasing with growth. Opercle with 2 flat, prominent spines, upper spine slightly longer than lower; angle of upper and lower spines about 40°. Post-temporal with 2 (3 on right side) (2–7) serrae tips at beginning of lateral line, number of serrae increasing with growth.

Body covered with ctenoid scales; lateral line slightly arched over pectoral fin before gradually descending, terminating at caudal-fin base (rarely with one pored lateral-line scale on caudal fin). Uppermost row of body scales along dorsal-fin base always about half size of adjacent lower body scales. Caudal-fin base covered with ctenoid scales (slightly elongate cycloid scales in posterior portion), extending onto fin over about basal two-thirds length of fin. Pectoral fin with ctenoid basal scales, small elongate cycloid scales extending

onto fin ventrally. Basal scales absent on dorsal fin, but membranes between 1st and 3rd soft rays covered with row of elongate poorly developed ctenoid or cycloid scales (easily lost). Anal fin without basal scales, but membrane between 2nd and 3rd spines covered with a row of elongate cycloid scales. Pelvic-fin base and membrane without scales. Head generally covered with ctenoid scales, but snout and maxilla naked; scales on ventral surface of lower jaw present on angular, dentary naked; interopercle, subopercle and opercle with ctenoid scales (based on paratype), dorsal portion of opercle with several cycloid scales; interorbital scales mostly cycloid, reaching or slightly extending beyond mid-orbit level, but not extending to anterior margin of orbit. A pair of interorbital canals with numerous small pores along

Table 1 Frequency distributions of selected counts recorded from specimens of *Chelidoperca tosaensis* sp. nov. and *C. stella* from the Pacific Ocean

	Dorsal-fin rays			Anal-fin rays				Pectoral-fin rays (one/other sides)											
	X, 9	X, 10		II, 7	III, 6		III, 7	14/15	15/15	15/16		15/16							
<i>C. tosaensis</i>	1	83 ^H		1	82 ^H		1	5	69 ^H	5		3							
<i>C. stella</i>		12			12			1	10			1							
	SR above LL			SR below LL				SR between LL and 6th DSB			Circumpeduncular SR								
	3	4	5	8	9	10	11	12	3			17	18	19					
<i>C. tosaensis</i>	18	39	1			24 ^H	37	1	84 ^H			8	47 ^H						
<i>C. stella</i>	1	2		1		3			12			3		1					
	Pre-dorsal-fin SR				Cheek SR				Upper GR ^a				Lower GR ^a						
	6	7	8	9	4	5	6	7	4	5	6	7	9	10	11	12	13	14	15
<i>C. tosaensis</i>	8	26	14	2	1	11	7	1	15	56	11 ^H		1	11	31 ^H	28	9	1	
<i>C. stella</i>		1	1		1						9	3			2	3	5	1	1
	Upper developed GR			Lower developed GR			Total GR ^a												
	1	2	3	6	7	8	14	15	16	17	18	19	20	—	23				
<i>C. tosaensis</i>	1	80 ^H	1	6	71 ^H	5	2	15	28	25 ^H	18	1							
<i>C. stella</i>		12		1	11					1	3	6	1						

DSB spinous dorsal-fin base; GR gill rakers; LL lateral line; SR scale rows

^HIncludes holotype of *C. tosaensis*

^aIncluding all rudiments

outer margin of interorbital region, canals diverging outward anteriorly and reaching to a point between anterior and posterior nasal pores; small pores of interorbital canal forming about 4 rows (about 2 rows on each side; Fig. 2a). Lower jaw with 1 pore anteriorly on each side of dentary symphysis), followed on each side by 2 pore positions along dentary sensory canal, each position with 2 (sometimes 1) minute pore openings, and a fourth slit-like or rounded pore at angular–dentary junction (Fig. 2b).

Dorsal-fin origin above pectoral-fin base, 4th spine longest, 9th (or rarely 10th) spine shortest; all soft rays branched, subequal in length, 9th (or sometimes 8th, rarely 7th) longest. Anal-fin origin below base of 1st dorsal-fin soft ray, 3rd spine longest; all soft rays branched, 5th (or rarely 4th) ray longest. Posterior tip of dorsal and anal fins slightly extending beyond a vertical through caudal-fin base when fins adpressed. Pectoral fin with uppermost 2 rays unbranched, remaining rays branched, 9th (or 8th) longest, its posterior tip reaching a vertical through anal-fin origin. Pelvic-fin origin below pectoral-fin base; spine entirely covered with skin; all soft rays branched, 2nd longest, elongate, slightly expanded distally, its tip reaching anus when adpressed. Caudal fin truncate, but posterior margin slightly rounded; upper lobe with pointed tip, slightly longer than lower lobe; upper lobe with 6–8 unbranched unsegmented procurrent

rays, 2 or 3 unbranched segmented rays and 8 branched segmented rays; lower lobe with 4–7 unbranched unsegmented procurrent rays, 2–4 unbranched segmented rays and 7 branched segmented rays; 19–22 segmented rays in total.

Formula for configuration of supraneural bones, anterior neural spines and anterior dorsal pterygiophores 0/0/0 + 2/1 + 1/1; vertebrae 10 + 14.

Fresh coloration. Based on color photographs of the following specimens, including holotype when fresh or alive (Figs 3, 4): BSKU 52608, BSKU 53312, KAUM–I. 86633, KAUM–I. 150000, KAUM–I. 150001, KHPC 3438, MSM-17-43, SPMN-PI 40431, SNFR 14188, USNM 437819 and WMNH 2010 PIS-208. Head and body reddish pink, becoming whitish ventrally; 5 irregular, broad slightly darker pinkish red bands extend from dorsal profile to about midbody, each band with contrasting dark red, longitudinally rectangular blotch (height of about one scale) at or slightly above lateral midline; about 10–12 small white spots along lateral line; row of 8–10 poorly defined white spots midlaterally and 10 vertically elongate bright white blotches alternating with 10 irregular yellowish orange to reddish orange blotches along ventral portion of body from pectoral-fin axil to base of caudal fin. Upper lip reddish at anterior tip flanked by white (sometimes dusky yellow) bar, followed by about two alternating reddish orange and dusky yellow bars distally

Table 2 Frequency distributions of selected counts recorded from specimens of species of *Chelidoperca*

	Pored lateral-line scales													
	33	34	35	36	37	38	39	40	41	42	43	44	45	46
<i>C. tosaensis</i>					4	16 ^H	28	20	7	1				
<i>C. hirundinacea</i>										7	18	8		
<i>C. lecromi</i>												1	1	
<i>C. maculicauda</i>										1	1	4		
<i>C. occipitalis</i>										1	2			
<i>C. pleurospilus</i>								2	2	8	20			
<i>C. santosi</i>										2	14	13	3	2
<i>C. stella</i> (Pacific Ocean)	1	2	3	1										
<i>C. stella</i> (Andaman Sea)		2	1											

	Scale rows in longitudinal series													
	34	35	36	37	38	39	40	41	42	43	44	45	46	47
<i>C. tosaensis</i>						9	25 ^H	23	15	3				
<i>C. hirundinacea</i>											9	18	9	1
<i>C. lecromi</i>											2			
<i>C. maculicauda</i>												3	4	
<i>C. occipitalis</i>										1	3	1		
<i>C. pleurospilus</i>									2	5	17	9	1	1
<i>C. santosi</i>										2	3	21	6	
<i>C. stella</i> (Pacific Ocean)	1	3	2	2	2									
<i>C. stella</i> (Andaman Sea)		1	2	1										

^HIncludes holotype of *C. tosaensis*

on premaxilla; maxilla with triangular red area dorsally and yellow streak extending through length of maxilla ventral to red triangular area; lower jaw with red tip flanked by white bar, then red blotch and yellow from mid jaw to beneath ventral tip of maxilla. Cheek pinkish red with posteroventrally directed diagonal white stripe from posterior border of maxilla toward pelvic-fin base; opercle pinkish red above with white ventrally, large ocellated red spot with pinkish white border present between opercular spines. Dorsal-fin membrane translucent dusky whitish with numerous small yellow spots scattered over fin in irregularly diagonal rows, several small to large red blotches forming reddish diagonal streak from middle of 3rd or 4th spine to base of 5th or 6th spine; soft dorsal fin with narrow whitish distal margin. Anal fin dusky white, with narrow yellow distal margin and about 10 (4–12) small yellow spots with 1st spot at about base of middle rays followed by 1 or 2 rows of yellow spots with 2 or 3 yellow spots along latter two rays from base to about three-quarters length of rays. Number of yellow spots on dorsal and anal fins increasing with growth. Pectoral fin translucent or with pale yellowish tint, small yellowish orange to red blotch basally on middle rays. Pelvic fin with bright white anterior and posterior streaks surrounding yellow area over middle rays, base of fin white. Caudal fin dusky with 3–5 small red or yellowish red spots along dorsal margin and

small yellow spots on rays arranged in about 3 irregular columns of small yellow spots alternating with columns of whitish spots on central and distal portions of fin, about 2 narrow columns of red spots on interradiial membranes of basal portion of lower lobe of fin, a pair of large poorly defined white blotches on fin base with a pair of small yellow blotches between them, dusky band along distal margin.

Preserved coloration. Based on all examined specimens (Fig. 5). Head and body tan, scales on nape and along dorsal quarter of body with dark distal margins; dusky yellow blotches on upper jaw retained as bands of melanophores. Red and yellow markings on fins retained as dark markings but obscured in long-term preserved specimens, including holotype (Fig. 5b). Small dark blotch on base of 1st dorsal-fin spine (Fig. 5c); 3 (or 4) small dark spots along dorsal margin of caudal fin (Fig. 5a) almost always retained.

Etymology. The specific name *tosaensis* is derived from the name of the type locality of the species, Tosa Bay, Kochi Prefecture, Japan. The English common name, Red-spot Perchlet, refers to the distinctive ocellated red spot located on the opercular membrane.

Distribution. The species is currently recorded from Japan, including the northern East China Sea, southern Japan Sea and the Pacific coast of central and southern Japan, and the Philippines (around Guimaras and Panay

Table 3 Morphometrics expressed as percentages of standard length, recorded from specimens of *Chelidoperca tosaensis* sp. nov.

	HT BSKU 53312	PT <i>n</i> = 75	NT <i>n</i> = 8	Means*
Standard length (mm)	82.8	29.3–92.8	53+–83.3	
Body depth	24.0	22.8–27.1	24.2–27.1	24.9
Body depth at anal-fin origin	23.9	21.0–25.2	22.1–24.9	23.3
Body width	19.5	17.4–21.8	19.7–20.9	19.5
Head length	37.6	35.2–40.1	36.0–38.3	37.6
Head width	13.5	12.4–15.0	12.6–14.2	13.7
Snout length	8.7	6.9–9.1	7.6–8.9	8.2
Orbit diameter	11.2	10.4–13.6	10.5–12.0	11.4
Interorbital width	3.3	2.3–3.3	2.6–3.0	2.9
Internasal width	6.1	5.4–6.7	5.8–6.5	6.1
Upper-jaw length	17.7	16.3–19.0	17.1–18.2	17.8
Lower-jaw length	19.1	17.4–20.3	17.9–19.5	18.8
Maxillary depth	4.7	4.0–5.8	4.2–4.9	4.7
Postorbital length	19.4	17.6–20.6	17.4–19.5	19.1
Suborbital depth	2.1	0.9–2.5	1.6–2.5	1.8
Inter-opercular-spine width	6.0	4.8–6.7	5.3–5.9	5.7
Pre-dorsal-fin length	36.6	33.6–39.7	34.3–37.8	36.0
Pre-anal-fin length	61.0	58.7–67.2	58.4–64.0	62.0
Pre-pelvic-fin length	32.6	30.5–35.9	31.9–36.6	33.2
1st dorsal-fin spine length	7.1	5.5–8.2	5.6–6.7	6.4
2nd dorsal-fin spine length	11.5	8.5–14.1	9.4–11.1	10.7
3rd dorsal-fin spine length	15.5	12.6–17.1	12.8–15.5	14.8
4th dorsal-fin spine length	16.1	14.0–17.8	14.2–16.1	15.9
5th dorsal-fin spine length	14.4	12.9–17.1	13.4–15.8	14.9
6th dorsal-fin spine length	12.9	11.3–14.9	12.2–13.5	13.2
7th dorsal-fin spine length	11.0	9.5–12.8	10.2–11.6	11.1
8th dorsal-fin spine length	9.6	7.7–11.5	8.2–10.0	9.5
9th dorsal-fin spine length	9.5	7.3–11.1	8.0–9.2	9.1
10th dorsal-fin spine length	10.0	8.4–11.5	8.9–9.7	9.6
1st D soft ray length	13.4	13.0–15.7	12.8–14.7	14.0
5th D soft ray length	18.2	15.4–19.8	16.6–17.9	17.6
Penultimate D soft ray length	24.6	15.9–25.7	19.4–22.6	21.1
Longest D soft ray length	24.6	16.4–25.7	18.8–22.6	21.4
1st anal-fin spine length	6.1	4.0–6.8	3.8–5.0	5.2
2nd anal-fin spine length	9.2	6.8–9.2	7.2–8.5	8.0
3rd anal-fin spine length	10.6	9.2–11.8	8.9–10.7	10.1
1st A soft ray length	—	13.3–16.7	14.3–17.0	15.0
3rd A soft ray length	—	16.7–20.2	17.2–18.8	18.1
Penultimate A soft ray length	27.2	18.2–26.4	19.7–22.6	22.0
Longest A soft ray length	27.2	18.2–26.4	19.7–22.6	22.0
Pectoral-fin length	27.2	24.3–29.1	24.8–27.5	26.5
Pelvic-fin spine length	13.0	11.3–19.4	11.5–13.2	13.5
Longest P2 soft ray length	27.6	23.6–30.8	24.8–28.7	27.7
Caudal-fin length	—	24.8–28.9	25.6–26.7	26.8
Middle caudal-fin length	25.7	23.7–28.9	24.7–26.7	25.9
Caudal-peduncle depth	12.1	11.5–13.5	11.8–12.4	12.2
Caudal-peduncle length	20.4	18.4–23.3	20.3–22.4	21.0
Upper caudal-peduncle length	18.8	17.3–21.7	17.7–20.7	19.3
Dorsal-fin base length	50.9	44.1–53.2	46.9–51.2	49.4

Table 3 (continued)

	HT BSKU 53312	PT <i>n</i> = 75	NT <i>n</i> = 8	Means*
Anal-fin base length	19.6	15.3–20.3	16.5–20.1	18.0
Pectoral-fin base length	6.8	6.0–7.4	6.4–6.9	6.8

A anal fin; D dorsal fin; HT holotype; NT non-type specimens; P2 pelvic fin; PT paratypes

*Means for all

islands) in depths of 60–302 m (Fig. 6). A photograph of a hook-and-line captured individual of *Chelidoperca* from off Amami-oshima Island in the Ryukyu Islands, Japan, at 210 m provided by a sport fisherman via WEB sakana-zukan was identified here as *C. tosaensis*. The photograph of the Amami-oshima specimen was also figured by Konishi (2011) as *Chelidoperca margaritifera*. An adult specimen (KPM-NR 91866) was photographed from Suruga Bay, Shizuoka Prefecture, on the Pacific coast of central Japan at 11 m depth and is also identified here as *C. tosaensis*.

Comparisons. Meristic character differences are: *Chelidoperca tosaensis* has 3 scale rows between the lateral line and the middle of the spinous dorsal-fin base (Fig. 1a), whereas there are 4 scale rows in *Chelidoperca hirundinacea*, *Chelidoperca lecromi*, and *Chelidoperca pleurospilus* (Fig. 1d); and 3 scale rows in *Chelidoperca investigatoris*, *Chelidoperca maculicauda*, *C. margaritifera*, *Chelidoperca occipitalis*, *Chelidoperca santosi* and *Chelidoperca stella* (Figs. 1b and c). *Chelidoperca tosaensis* has 37–42 (modally 39) pored lateral-line scales [vs. 33–36 (usually 34 or 35) in *C. stella*, 40–43 (43) in *C. pleurospilus*; and 42 or more in *C. hirundinacea*, *C. investigatoris*, *C. lecromi*, *C. maculicauda*, *C. margaritifera*, *C. occipitalis* and *C. santosi*] and scale rows in the longitudinal series [39–43 (40) vs. 34–38 (35 or 36) in *C. stella*, 42–47 (45) in *C. pleurospilus*, 43–45 (44) in *C. occipitalis* and 44 or more in *C. hirundinacea*, *C. lecromi* and *C. maculicauda*] (Bineesh et al. 2014; this study) (Table 2). *Chelidoperca tosaensis* has pectoral-fin rays 14–16 (modally 15), while *C. hirundinacea* has 15–17 (modally 16), although one specimen (OMNH 13827) of *C. hirundinacea* abnormally possesses 14 and 16 pectoral-fin rays in the left and right sides, respectively. *Chelidoperca tosaensis* has modally fewer upper gill rakers, including all rudiments 4–6 (modally 5) [vs. 6–8 (modally 7) in *C. maculicauda*]; fewer developed gill rakers 6–8 (modally 7) [vs. 7–9 (modally 8) in *C. hirundinacea* and *C. pleurospilus*; 9 or 10 in *C. maculicauda*; and 8 or 9 (modally 8) in *C. occipitalis*]; and total gill rakers, including all rudiments 14–19 (modally 16) [vs. 20–22 (modally 20) in *C. maculicauda*] (this study).

Morphometric character differences: *C. tosaensis* has relatively long dorsal- and anal-fin soft rays. *Chelidoperca tosaensis* differs from its congeners, except for *C. margaritifera*, *C. maculicauda*, *C. investigatoris* and *C. santosi*, in having a slightly longer penultimate dorsal-fin soft ray

15.9–25.7 % (mean 21.1 %) of SL [vs. 14.4–18.7 % (16.7 %) of SL in *C. hirundinacea*; 13.7–19.8 % (18.1 %) of SL in *C. pleurospilus*]; longest dorsal-fin soft ray 16.4–25.7 % (21.4 %) of SL [vs. 16.0–18.7 % (17.7 %) of SL in *C. hirundinacea*; 16.6–19.8 % (18.5 %) of SL in *C. pleurospilus*]; penultimate anal-fin soft ray 18.2–26.4 % (22.0 %) of SL [vs. 15.9–23.2 % (18.7 %) of SL in *C. hirundinacea*; 15.6–16.5 % (16.1 %) of SL in *C. lecromi*; 17.7–19.2 % (18.3 %) of SL in *C. occipitalis*; and 16.6–19.9 % (17.6 %) of SL in *C. pleurospilus*]; and longest anal-fin soft ray 18.2–26.4 (22.0) % of SL [vs. 17.4–23.4 (19.2) % of SL in *C. hirundinacea*; 16.2–16.7 (16.5) % of SL in *C. lecromi*; 17.7–19.2 (18.3) % of SL in *C. occipitalis*; and 16.6–19.2 (17.6) % of SL in *C. pleurospilus*] (Fig. 7). *Chelidoperca tosaensis* differs from *C. maculicauda* and *C. occipitalis* in having relatively shorter postorbital length 17.4–20.6 % (mean 19.1 %) of SL [vs. 22.6–23.6 % (23.2) % of SL in *C. maculicauda* and 22.3–23.6 % (23.0) % of SL in *C. occipitalis*]. *Chelidoperca tosaensis* is not known to exceed 93 mm SL (large adults of *C. hirundinacea*, *C. lecromi* and *C. pleurospilus* reach an SL exceeding 93 mm).

The number of serrae on some bones of the head has been regarded as diagnostic characters for some species of *Chelidoperca* [see Akazaki (1972), Matsunuma (2016) and Matsunuma and Motomura (2016)]. Although the number of serrae on preopercle, interopercle and subopercle tends to increase with growth and broadly overlap at similar sizes for most species (Fig. 8), *C. tosaensis* differs from *C. stella* in having relatively fewer preopercular serrae 15–40 (mean 29.5) at 29.3–92.8 mm-SL [vs. 25–52 (38.9) in 39.0–72.3 mm-SL *C. stella*] and subopercular serrae 5–20 (11.1) [vs. 14–45 (24.9) in *C. stella*].

Head squamation is useful for distinguishing some of the species of *Chelidoperca*, as stated by Akazaki (1972), Matsunuma (2016) and Matsunuma and Motomura (2016). In *C. tosaensis*, the anteriormost interorbital scales almost reach, or extend slightly beyond, the level of the mid-orbit (Fig. 2a), but in *C. hirundinacea*, *C. investigatoris* and *C. maculicauda* they extend far beyond the level of the mid-orbit, reaching the level of the anterior margin of the orbit (Akazaki 1972; Bineesh et al. 2014; fig. 3; Matsunuma 2016; fig. 3A; this study), and in *C. lecromi* they reach the posterior nasal pores (Fourmanoir 1982; this study). *Chelidoperca tosaensis* has lower jaw scales on the ventral surface of the angular, but lacks scales on the dentary at all sizes (Fig. 2b),

whereas at least some scales are usually present posteriorly on the dentary in *C. hirundinacea*, *C. pleurospilus*, *C. santosi*, *C. maculicauda*, *C. margaritifera* and *C. stella* (Williams and Carpenter 2015; Matsunuma and Motomura 2016; fig. 3; Matsunuma 2016; fig. 3B; this study).

In coloration, *C. tosaensis* can be distinguished from *C. investigatoris*, *C. occipitalis* and *C. pleurospilus* by having no longitudinal stripe or dashed line of black blotches midlaterally along the body, which are present in the latter species (Bineesh et al. 2014; Matsunuma 2016; this study). The combination of markings on the head, body and fins of *C. tosaensis* is unique among the species of *Chelidoperca*. *Chelidoperca tosaensis* also differs from *C. hirundinacea* and *C. maculicauda* by having an almost truncate upper caudal-fin lobe, elongate and pointed in *C. hirundinacea* and rounded in *C. maculicauda* (Bineesh et al. 2013; Matsunuma 2016; this study). *Chelidoperca maculicauda* and *C. santosi* also differ in having broad red bands (Bineesh et al. 2013; Williams and Carpenter 2015) on the body compared to the irregular pinkish red bands with red rectangular blotches midlaterally on *C. tosaensis*.

Identifications of *C. margaritifera* and *C. santosi*. *Chelidoperca margaritifera* was originally described by Weber (1913) based solely on the holotype from the Ceram Sea between Misool Island and New Guinea. This area is currently in the region of the Bird's Head Peninsula Marine reserve, an area known for its high level of endemism (Allen and Erdmann 2009). Fowler (1928) and Weber and de Beaufort (1931) referred to the original description of the species. Akazaki (1972), subsequently, reviewed the species of *Chelidoperca* in Japan and identified two specimens from off Tanega-shima Island, Kagoshima Prefecture, southern Japan as *C. margaritifera*. Katayama (1984) and Senou (2013) followed Akazaki (1972) and included *C. margaritifera* among Japanese serranid fishes. Although some of Akazaki's (1972) specimens of *Chelidoperca* are now deposited at the Maizuru Fisheries Research Station, Kyoto University (FAKU), the two specimens of *C. margaritifera* listed by Akazaki (1972) were not found in the FAKU collection and are apparently missing. The species subsequently was recorded from Vietnam (Orsi 1974), the Philippines (Fourmanoir 1985), the Andaman Sea (Satapoomin 2011) and New Caledonia (Fricke et al. 2011), but only in their checklists. Yamakawa (1985) identified his specimens as *C. margaritifera* and described them based on three specimens from the Okinawa Trough in the East China Sea. Yamada and Horikawa (1999) identified a single specimen from the East China Sea as *C. margaritifera* and provided a color photograph of the fresh specimen for the first time. Yamada et al. (2007) also recorded the species from the East China Sea and described the fresh coloration. No other records of *C. margaritifera* with specimen descriptions have previously been reported. All extralimital specimens previously

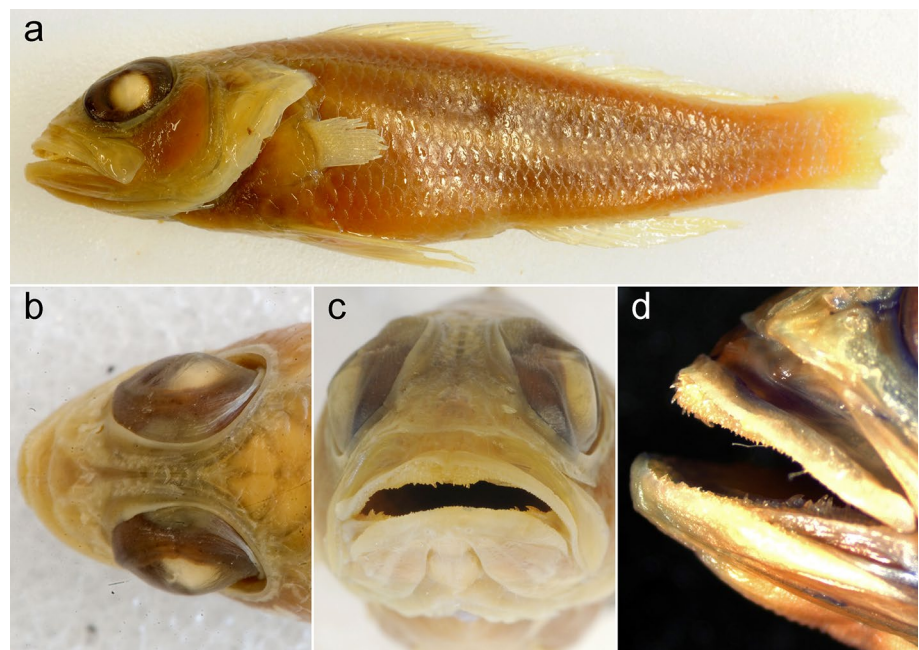
identified as *C. margaritifera* that we have examined have proven to be referable to *C. tosaensis*, *C. santosi* or *C. stella*. This is not surprising as these three species had not been described when the earlier studies were published, so there were no other names available for these specimens when they were misidentified. We have not examined any specimens of *Chelidoperca* that share the diagnostic characters possessed by the holotype of *C. margaritifera*, and no additional specimens of *Chelidoperca* have been collected from the Misool region that might provide evidence for character variation. Although we have not been able to examine all of the specimens previously identified as *C. margaritifera*, to avoid confusion we tentatively consider all of these extralimital records to be misidentifications until confirmed identifications are made or additional *C. margaritifera* are collected from the Misool region.

Williams and Carpenter (2015) described *Chelidoperca santosi* based on the holotype and two paratypes from the Philippines. Matsunuma (2017) also recorded and figured *C. santosi* from Panay Island in the Philippines. Williams and Carpenter (2015) stated that *C. margaritifera* differs from *C. santosi* in having a yellow stripe and small white spots below the stripe on the body side, whereas such markings are absent in the latter when fresh or preserved. Their color description of *C. margaritifera* was based on Weber (1913). The color description of the species provided by Weber (1913) was based solely on the relatively freshly preserved holotype and only known specimen and some colors had probably faded before Weber's examination. Photographs of the preserved holotype of *C. margaritifera* (ZMA 101029, 51.3 mm SL) indicate that it possesses a pale stripe along the ventrolateral portion of the body from the posterior tip of the opercle to the caudal peduncle, but the rows of white spots above and below the stripe, originally described by Weber (1913), are no longer evident. Specimens of *C. santosi* lack this stripe in both fresh and preserved conditions (Williams and Carpenter 2015). The second author's examination of the holotype of *C. margaritifera*, in combination with examination of high-resolution images provided to the authors by Ronald de Ruiter and Mao-Ying Lee, resulted in recognition of several additional characters that differ between *C. margaritifera* and *C. santosi*. *Chelidoperca santosi* is diagnosed as having two pairs of small dark spots anteriorly on the snout and a pair of small dark spots on the chin [see Williams and Carpenter (2015: fig. 1); Fig. 9a, b], with the melanophores of these dark spots retained on preserved specimens, whereas these melanophores are absent on the holotype of *C. margaritifera*, although other melanophores are present on the body (Fig. 10a–c). *Chelidoperca santosi* also differs from *C. margaritifera* in having more posttemporal serrae 3–12 [usually 5–7 (rarely 3; the smallest 39.5 mm SL specimen has 2–4, but is not included in range)] on each side [the holotype of *C. margaritifera* (51.3 mm SL) with 2 serrae on

Fig. 9 Fresh specimens of *Chelidoperca santosi* from East China Sea, KAUM-I. 81604, 77.0 mm SL, showing overall body (a), dorsal view of head (b) and lateral view of teeth on both jaws (c). Photos: KAUM



Fig. 10 Holotype of *Chelidoperca margaritifera* from New Guinea, ZMA 101029, 51.3 mm SL, showing overall body (a), dorsal view of head (b) and anterior and lateral views of teeth on both jaws (c–d). Photos: R. de Ruiter (a, c) and M-Y Lee (b)



each side] and in having an outer row of anteriorly directed, antrorse canine teeth in the upper jaw and an outer row of dorsally directed enlarged canines in the lower jaw (Fig. 9c) [no outer row of canines in either jaw of *C. margaritifera*, but there are several mesially directed enlarged canines posteriorly in the lower jaw. (Fig. 10c, d)]. The existence of

enlarged canines in the jaws is useful as a diagnostic character for the species of *Chelidoperca*. *Chelidoperca hirundinacea* lacks an outer row of enlarged canines in either jaw similar to *C. margaritifera*, and has several rows of small interorbital scales extending to posterior nostrils (scales

extend in a single row almost to anterior margin of orbit, Fig 10b, c, on *C. margaritifera*).

Based on these morphological differences between *C. margaritifera* and *C. santosi*, the photographs of the East China Sea specimens recorded by Yamada and Horikawa (1999) and Yamada et al. (2007) as *C. margaritifera* are consistent with *C. santosi*, as the specimens possess the diagnostic features of *C. santosi*. An additional 29 non-type specimens listed as comparative material from several localities from the northwestern Pacific Ocean, including specimens from the East China Sea and the Philippines, previously identified by Matsunuma and Motomura (2016) and Matsunuma (2016) as *C. margaritifera*, are all consistent with *C. santosi*. Among them, three specimens from the East China Sea (KAUM-I. 81603, 81604 and 81683; Fig. 9) are also identical with *C. santosi* based on COI sequence data. Therefore, the above-mentioned previous records of *C. margaritifera* from Japanese waters are referable to *C. santosi*. Akazaki's (1972) specimens of *C. margaritifera* are not available for this study and a definitive identification of the specimens is not possible based on his brief description. As no confirmed specimens of *margaritifera* have been captured from Japanese waters, Akazaki's specimens are almost certainly misidentifications and his records should be disregarded until his specimens can be examined to determine their correct identification. Additional specimens of *C. margaritifera* from the Bird's Head Peninsula region are needed before the species can be more thoroughly redescribed.

Chelidoperca tosaensis can be distinguished from *C. margaritifera* and *C. santosi* by several morphometric and meristic characters as well as by coloration. *Chelidoperca tosaensis* can be distinguished from the holotype of *C. margaritifera* (51.3 mm SL) by having relatively narrower interorbital width 2.3–3.3 (mean 2.9) % of SL (vs. 3.9 % of SL in the latter) and fewer interopercle and subopercle serrae 3–10 and 5–12, respectively, in 50–60 mm-SL specimens [vs. 14 (10 on right side) and 16, respectively]. Although there is overlap, *C. tosaensis* has modally fewer pored lateral-line scales 37–42 (modally 39; see Table 1), compared to the holotype of *C. margaritifera* with 42 pored lateral-line scales. *Chelidoperca tosaensis* and *C. santosi* have similar dentition, but differ by having relatively fewer pored lateral-line scales 37–42 (modally 39) [vs. 42–46 (modally 44) in the latter]; circumpeduncular scale rows 17–20 (18) [vs. 19–22 (modally 20)]; preopercular serrae 15–40 (modally 30 for specimens over 60 mm SL) [vs. 29–60 (modally 45 for specimens over 60 mm SL)]; no dark spot on the snout and chin (vs. 2 pairs of dark spots on the snout and a pair of spots on the chin); and the dorsal-fin soft-rayed portion dusky whitish with numerous yellow spots (vs. pale yellow with a longitudinal row of translucent spots dorsally) (Williams and Carpenter 2015; this study; Figs 3, 9; Table 2).

Chelidoperca sp. 2 described by Sainsbury et al. (1985) from the Timor Sea is primarily distinguished from *C. tosaensis* by having 45–57 pored lateral-line scales (vs. 37–42 in the latter) and a broad yellow longitudinal band along the body side (vs. absent). *Chelidoperca* sp. 1 recorded by Gloerfelt-Tarp and Kailola (1984) from off Indonesia and northwestern Australia is also readily distinguished from *C. tosaensis* by having 46 or 47 pored lateral-line scales (vs. 37–42 in the latter) and 2 or 3 rows of dark olive streaks along the dorsal fin (vs. absent). *Chelidoperca* sp. 1 and *Chelidoperca* sp. 2 described by Sainsbury et al. (1985) and Gloerfelt-Tarp and Kailola (1984), respectively, from off northwestern Australia are most similar to *C. stella* in having 35 or 36 pored lateral-line scales [see “Remarks” for *C. stella* and Matsunuma and Motomura (2016)].

Morphological changes with growth. The numbers of serrae on the head tend to increase with growth in *C. tosaensis*, although the number of serrae on each bone is highly variable (see Fig. 8). The smallest examined specimen (BSKU 54604, 29.3 mm SL) of *C. tosaensis* possesses 15 preopercular serrae, 3 interopercular serrae, 6 subopercular

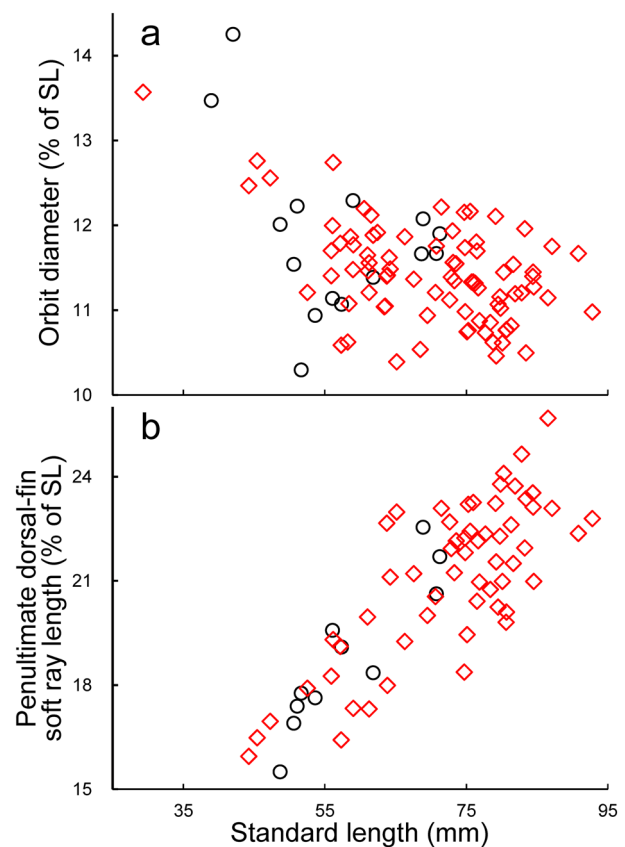


Fig. 11 Relationships of orbit diameter (a) and penultimate soft dorsal-fin ray length (b) (all as % of standard length) to standard length (mm) in *Chelidoperca stella* (circles) and *C. tosaensis* sp. nov. (diamonds), showing ontogenetic changes

serrae and 2 posttemporal serrae, whereas there are 33, 12, 10 and 5, respectively, in the largest examined specimen (KAUM-I. 150000, 92.8 mm SL). In morphometric measurements, relative lengths (% of SL) of orbit diameter, maxilla depth and pelvic-fin spine tend to decrease with growth (Fig. 11a), whereas suborbital depth, lengths of penultimate dorsal- and anal-fin soft rays, and lengths of longest dorsal- and anal-fin soft rays all increase with growth (Fig. 11b) in *C. tosaensis*. Similar trends were also recognized in the examined specimens of *C. stella*. No other significant relationships were recognized between the other morphometric characters and standard length in *C. tosaensis*. Small specimens less than about 50 mm SL of *C. tosaensis* differ from large specimens in having a faint dusky yellowish stripe with about four red blotches formed where the stripe crosses the irregular body bands extending along mid-body from the posterior tip of the opercle to the caudal-fin base (usually retained in preserved specimens) (Fig. 3a), whereas this stripe is broken into dark red rectangular blotches in larger specimens (Fig. 3b–e).

Molecular analysis results. A comparison of the COI sequences from the Philippine and Japanese specimens against the BOLD database using the BLAST technique revealed that these two sequences are nearly identical, diverging from each

other by about 0.3 %. The next most similar sequences are a group of three specimens (private dataset in BOLD) from Vanuatu that are not identified to species, but are likely *C. lecroimi* based on the locality, and these diverge from *C. tosaensis* by almost 10 % sequence divergence. The next most similar group is slightly more than 10 % divergent and is identified as *C. hirundinacea* [26 nearly identical samples ranging from China and the Philippines to northwestern Australia; most are private and five specimens (USNM 437778, 437790, 437792, 437794, 437834) from the Philippines are confirmed to be this species by the third author]. Other species of *Chelidoperca* that are shown to be more than 10 % divergent from *C. tosaensis* based on the BOLD analysis (BLAST against all public and private sequences in BOLD with GenBank sequences included) include *C. hirundinacea*, *C. investigatoris*, *C. maculicauda*, *C. occipitalis*, *C. santosi* and *C. stella*.

Chelidoperca stella Matsunuma and Motomura 2016

(Figs 1b, 6, 8, 11, 12; Tables 1, 2, 4)

Chelidoperca stella Matsunuma and Motomura 2016: 388, figs 1–7 (type locality: off Thailand, Andaman Sea).

Fig. 12 Fresh specimens of *Chelidoperca stella* from the Pacific Ocean. **a** KAUM-I. 69436, 42.0 mm SL, Panay Island, Philippines (photo: KAUM); **b** NSMT-P 70495, 68.7 mm SL, Nha Trang, Vietnam (photo: K. Shibukawa)

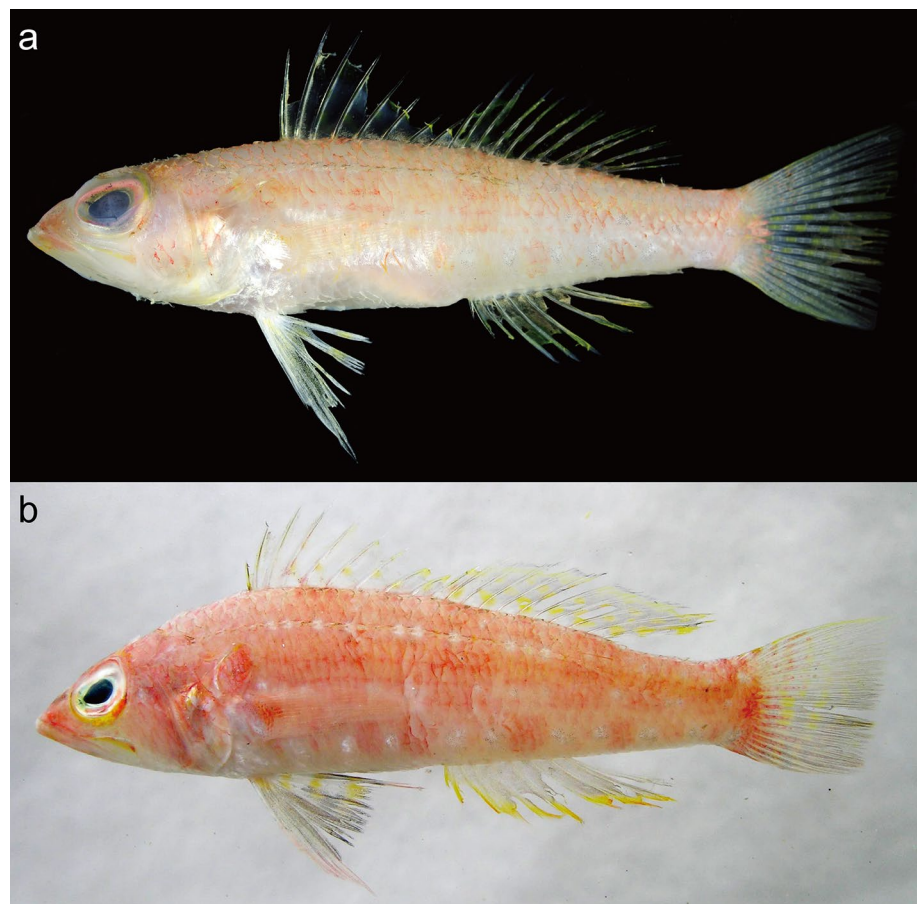


Table 4 Morphometrics expressed as percentages of standard length, recorded from specimens of *Chelidoperca stella*

	Present specimens <i>n</i> = 12	Type series* <i>n</i> = 5	Means
Locality	Pacific Ocean	Andaman Sea	
Standard length (mm)	39.0–72.3	51.7–61.8	
Body depth	22.3–25.6	23.8–26.4	24.8
Body depth at anal-fin origin	21.5–23.6	22.4–24.5	22.9
Body width	14.3–19.6	17.6–19.3	17.5
Head length	35.6–39.8	35.7–37.6	37.4
Head width	12.4–13.7	12.2–13.2	12.9
Snout length	7.3–8.7	7.4–8.3	7.9
Orbit diameter	10.6–14.2	10.3–11.4	11.7
Interorbital width	2.7–3.6	3.1–3.7	3.2
Internasal width	5.5–6.2	5.2–6.0	5.8
Upper-jaw length	17.2–19.3	17.4–18.1	18.4
Lower-jaw length	18.4–20.2	17.8–19.2	19.3
Maxillary depth	4.9–5.6	4.9–5.2	5.2
Postorbital length	18.0–20.2	18.1–20.2	19.1
Suborbital depth	1.1–1.9	0.6–1.7	1.3
Inter-opercular-spine width	4.6–5.9	4.9–6.1	5.5
Pre-dorsal-fin length	34.0–39.2	35.6–36.0	36.3
Pre-anal-fin length	59.6–63.5	59.8–64.8	62.0
Pre-pelvic-fin length	32.4–35.7	30.4–36.5	33.9
1st dorsal-fin spine length	5.7–8.3	6.0	6.6
2nd dorsal-fin spine length	10.6–13.9	9.3–11.9	11.6
3rd dorsal-fin spine length	13.6–18.5	13.0–16.2	15.6
4th dorsal-fin spine length	15.3–18.0	15.9–16.9	16.6
5th dorsal-fin spine length	13.8–16.5	13.3–15.7	15.1
6th dorsal-fin spine length	11.0–14.7	11.8–14.2	13.1
7th dorsal-fin spine length	9.4–12.4	9.9–12.0	11.1
8th dorsal-fin spine length	7.8–10.1	8.6–9.0	9.0
9th dorsal-fin spine length	7.4–8.9	7.7–9.0	8.2
10th dorsal-fin spine length	9.1–10.5	7.5–9.3	9.3
1st D soft ray length	14.1–17.1	14.8–15.6	15.5
5th D soft ray length	15.4–17.7	15.0–16.0	16.2
Penultimate D soft ray length	15.5–24.2	17.6–19.6	19.6
Longest D soft ray length	16.6–24.2	17.8–19.6	19.7
1st anal-fin spine length	3.5–5.2	3.3–4.1	4.2
2nd anal-fin spine length	6.5–8.2	6.4–7.1	7.2
3rd anal-fin spine length	9.7–11.5	9.8–10.2	10.4
1st A soft ray length	14.3–16.1	13.8–15.7	14.9
3rd A soft ray length	15.8–18.4	14.8–16.2	16.3
Penultimate A soft ray length	15.2–23.1	17.4–18.7	18.9
Longest A soft ray length	16.4–23.1	17.4–18.7	19.2
Pectoral-fin length	26.0–27.6	26.2–26.7	26.9
Pelvic-fin spine length	13.6–16.4	14.1–14.6	14.6
Longest P2 soft ray length	25.6–32.2	27.1–28.7	28.5
Caudal-fin length	26.5–28.3	25.6–29.2	27.4
Middle caudal-fin length	23.9–26.3	23.1–25.3	24.8
Caudal-peduncle depth	11.3–13.2	11.0–12.1	12.0
Caudal-peduncle length	21.9–24.1	22.2–24.0	23.0
Upper caudal-peduncle length	20.0–22.7	19.4–21.2	20.9
Dorsal-fin base length	46.0–51.0	45.0–49.8	48.0

Table 4 (continued)

	Present specimens <i>n</i> = 12	Type series* <i>n</i> = 5	Means
Anal-fin base length	14.1–17.4	15.3–16.9	15.8
Pectoral-fin base length	6.1–6.9	6.1–6.8	6.5

A anal fin, *D* dorsal fin, *P2* pelvic fin

*Matsunuma and Motomura (2016)

Means for all

Material examined. Twelve specimens, 39.0–72.3 mm SL: **TAIWAN:** NMMB-P 22749, 2 specimens, 66.0–72.3 mm SL, off Kaohsiung, H.-C. Ho, 11 Feb. 2015. **GULF OF TONKIN:** FAKU 101095, 6 specimens, 39.0–71.3 mm SL, 31 May–6 Aug 1957; NSMT-P 63938, 48.7 mm SL, Sanya Bay, south coast of Hainan Island, China, 24 Nov. 1997. **VIETNAM:** NSMT-P 70495, 68.7 mm SL, Nha Trang, 7 Oct. 2004. **PHILIPPINES:** KAUM-I. 69436, 42.0 mm SL, off Iloilo, Panay Island (obtained at Miagao Market, Iloilo), 24 Feb. 2015; NSMT-P 110259, 59.0 mm SL, Philippines (no further locality), 24 Mar. 1975.

Diagnosis. A species of *Chelidoperca* distinguished from other members of the genus by the following combination of characters: pectoral-fin rays 15 or 16 (modally 15); pored lateral-line scales 33–36 (34 or 35); scale rows in longitudinal series 34–38 (34 or 35); scale rows between lateral line and sixth dorsal-fin spine base 3; preopercular serrae 24–52; interopercular serrae 5–24; subopercular serrae 14–45; interorbital scales slightly extending anteriorly, almost reaching or slightly beyond level of mid-orbit; scales on ventral surface of lower jaw covering the angular; relatively wide interorbital region, its width 2.7–3.7 (mean 3.2) % of SL; length of longest anal-fin soft ray moderate, 16.4–21.6 (18.5) of % SL; 2 longitudinal rows of white blotches, containing numerous melanophores, along trunk; pelvic fin white with several yellow spots or bands; no longitudinal dark stripe of blotches laterally on body sides.

Remarks. Morphometric and meristic values for the new records are listed in Tables 1, 2 and 4. Other meristic and osteological characters for these specimens are as follows: pelvic-fin rays I, 5; formula for configuration of supraneural bones, anterior neural spines and anterior dorsal pterygiophores 0/0/0 + 2/1 + 1/1/1 (0/0/0 + 2/1 + 1/1 + 1/1 in one of six examined specimens); vertebrae 10 + 14 (11 + 13 in one of six examined specimens). The present specimens from the northwestern Pacific Ocean (Fig. 6) were identified as *C. stella* by having the diagnostic characters of the species described in the original description. As the species was previously known only from its type locality in the Andaman Sea, eastern Indian Ocean, the present specimens represent the first records for the species from the Pacific

Ocean. Matsunuma and Motomura (2016) stated that *Chelidoperca* sp. 1 briefly described by Sainsbury et al. (1985) from off northwestern Australia in the southeastern Indian Ocean may be identical to *C. stella*. A photograph of *Chelidoperca* sp. 2 recorded by Gloerfelt-Tarp and Kailola (1984) from off northwestern Australia is the same as that of Sainsbury et al.'s (1985) *Chelidoperca* sp. 1. *Chelidoperca stella* is probably widely distributed in the eastern Indian and western Pacific oceans.

The present specimens from the northwestern Pacific Ocean slightly differ from the Andaman Sea specimens in having relatively larger orbit diameter (11.5–14.2 % of SL in the former vs. 10.3–11.4 % of SL in the latter) and darker pelvic fins. Such differences are tentatively regarded herein as geographic variation within the species. Specimens from a geographic distributional gap between the presently known distributional ranges (the Arafura and Timor seas and the southern South China Sea) may provide overlapping values between geographically disjunct known populations.

Newly recognized diagnostic characters. The diagnostic characters of *C. stella* stated in the original description are enhanced by these additional specimens. Excellent photographs of specimens from Vietnam and the Philippines clearly show the fresh coloration of the species. The Vietnamese specimen (NSMT-P 70495, 68.7 mm SL; Fig. 12b) has about three very narrow red stripes midlaterally from just above and beneath the pectoral fin reaching posteriorly to about the caudal peduncle; it also has two longitudinal rows of poorly defined small white blotches along the ventral portion of the trunk. The upper row is located along the mid-body from the upper portion of the pectoral-fin base to the middle of the caudal-fin base. The lower row is located along the ventral portion of the trunk from the abdomen to the lower portion of the caudal-fin base. The white blotches on the trunk contain numerous minute melanophores (retained in the preserved specimens). In a small specimen from the Philippines (KAUM-I. 69436, 42.0 mm SL; Fig. 12a), most of the body scales are missing, but it has about three very narrow red stripes midlaterally from just above and beneath the pectoral fin reaching posteriorly to about the caudal peduncle. Although *C. stella* was originally diagnosed as having the pelvic fin with several small yellow spots on the basis of a photograph of the fresh paratype (Matsunuma and

Motomura 2016: fig. 4), the photographs of the additional fresh specimens reveal that the species possess 2 or 3 short yellow bands alternating with similar sized whitish bands on the pelvic fin, rather than yellow spots (Fig. 12).

Comparative material examined. *Chelidoperca hirundinacea* (57 specimens, including 2 syntypes, 17.6–145.0 mm SL): **JAPAN: Shizuoka Prefecture:** SPMN-PI 40109, 113.6 mm SL, off Yaizu; SPMN-PI 41879, 116.9 mm SL, Lake Hamana; SPMN-PI 42122, 135.2 mm SL, Suruga Bay, off Awa-shima Island, Numazu. **Aichi Prefecture:** FAKU 132267, 145.0 mm SL, off Isshiki; FAKU 136519, 144.1 mm SL, Mikawa Bay. **Wakayama Prefecture:** OMNH 15475, 83.4 mm SL, OMNH 15478, 120.5 mm SL, north of Tomoga-shima Island; OMNH 13826, 132.3 mm SL, OMNH 13827, 129.4 mm SL, OMNH 13828, 114.3 mm SL, off Arita. **Kochi Prefecture (Tosa Bay):** BSKU 54603, 17.6 mm SL; *BSKU 75108, 98.9 mm SL; BSKU 78672, 47.7 mm SL; *BSKU 78227, 133.5 mm SL; *BSKU 89706, 128.9 mm SL; *BSKU 90605, 127.5 mm SL; *BSKU 90913, 128.7 mm SL; *BSKU 92710, 130.1 mm SL; *BSKU 94228, 71.9 mm SL; *BSKU 94297, 117.1 mm SL; *BSKU 95038, 124.1 mm SL; *BSKU 95470, 112.9 mm SL; KAUM-I. 81742, 49.6 mm SL; KAUM-I. 81743, 45.3 mm SL; KAUM-I. 81744, 43.1 mm SL; KAUM-I. 81756, 52.4 mm SL. **Kyoto Prefecture:** FAKU 131856, 114.1 mm SL, off Kyoga-misaki; FAKU 132439, 105.5 mm SL, off Ine; FAKU 135373, 99.3 mm SL, off Kammuri-jima Island, Wakasa Bay. **Nagasaki Prefecture:** FAKU 134652, 112.6 mm SL, northeast of Tsushima Islands; *FFNU P-881, 2 specimens, 30.2–49.4 mm SL, off Fukue-jima Island; *FFNU P-1210, 3 specimens, 96.2–128.7 mm SL. **Japan Sea:** SNFR 15879, 5 specimens, 46.7–86.7 mm SL. **TAIWAN:** NSMT-P 115036, 139.5 mm SL, off Pingtung. **PAPUA NEW GUINEA:** ASIZP 73871, 76.9 mm SL, off Lae. Other 15 specimens were listed in Matsunuma and Motomura (2016). *Chelidoperca lecromi* (2 specimens, including the holotype, 111.8–125.3 mm SL): listed in Matsunuma and Motomura (2016). *Chelidoperca maculicauda* (8 specimens, 85.3–114.2 mm): listed in Matsunuma (2016). *Chelidoperca margaritifera*: ZMA 101029, holotype, 51.3 mm SL, between Misool and New Guinea islands, Indonesia (some measurements and meristics only taken). *Chelidoperca occipitalis* (6 specimens, 65.9–89.9 mm SL): listed in Matsunuma (2016). *Chelidoperca pleurospilus* (48 specimens, 16.5–128.2 mm SL): **JAPAN: Shizuoka Prefecture** MSM-10-584, 113.9 mm SL, Suruga Bay. **Kochi Prefecture (Tosa Bay):** BSKU 30185, 36.9 mm SL; *BSKU 36114, 128.2 mm SL; *BSKU 36148, 122.7 mm SL; *BSKU 39625, 100.0 mm SL; *BSKU 39646, 85.8 mm SL; *BSKU 40023, 107.5 mm SL; *BSKU 40024, 95.3 mm SL; BSKU 41921, 42.3 mm SL; BSKU 43439, 16.5 mm SL; *BSKU 51438, 113.0 mm SL; *BSKU 53315, 116.9 mm SL; *BSKU 62639, 113.2 mm SL; *BSKU 62640, 128.2 mm

SL; BSKU 64448, 36.7 mm SL; BSKU 64449, 39.0 mm SL; *BSKU 68295, 116.0 mm SL; *BSKU 68644, 128.0 mm SL; *BSKU 80094, 86.7 mm SL; *BSKU 80098, 92.5 mm SL; BSKU 120632, 29.8 mm SL; BSKU 120634, 27.6 mm SL; BSKU 120636, 22.8 mm SL; BSKU 120637, 30.7 mm SL; BSKU 120638, 20.4 mm SL; BSKU 120640, 25.3 mm SL; BSKU 120641, 24.8 mm SL; BSKU 120642, 28.7 mm SL. **Kagoshima Prefecture:** FAKU 26194, 112.4 mm SL, off Tanega-shima Island, Kagoshima Prefecture, Japan. **Okinawa Prefecture:** URM 31205, 100.9 mm SL. **EAST CHINA SEA:** FAKU 81431, 122.0 mm SL; FAKU 85502, 107.0 mm SL. **NO DATA:** FAKU 24478, 65.8 mm SL; FAKU 76583, 115.1 mm SL. Other 13 specimens were listed in Matsunuma and Motomura (2016). *Chelidoperca santosi* (35 specimens, 52.6–95.5 mm SL): **JAPAN: Kochi Prefecture:** BSKU 69837, 92.7 mm SL, BSKU 92585, 54.0 mm SL, FAKU 136360, 85.6 mm SL, Tosa Bay. **Oita Prefecture:** KHPC 6018, 61.7 mm SL, off Senzaki, Saeki. **EAST CHINA SEA:** BSKU 27428, 77.1 mm SL, BSKU 27429, 66.9 mm SL, Okinawa Trough; KAUM-I. 35776, 89.0 mm SL; KAUM-I. 81603, 87.1 mm SL; KAUM-I. 81604, 77.0 mm SL; KAUM-I. 81684, 95.5 mm SL; KAUM-I. 81685, 93.7 mm SL; KAUM-I. 87048, 83.0 mm SL; KAUM-I. 88497, 77.7 mm SL; SNFR 1645, 84.8 mm SL; SNFR 12277, 81.4 mm SL; SNFR 14074, 85.2 mm SL; SNFR 12295, 70.8 mm SL; SNFR 16454, 90.2 mm SL; SNFR 16455, 70.7 mm SL; URM-P 35684, 80.4 mm SL. **TAIWAN:** NMMB-P 21104, 68.5 mm SL, off Donggang, Pingtung; NMMB-P 22803, 52.6 mm SL, off Kaohsiung; URM-P 23108, 86.4 mm SL, off Tainan. **SOUTH CHINA SEA:** BSKU 17276, 84.7 mm SL, BSKU 17277, 75.0 mm SL, ca. 300 km north of Natuna Islands. **PHILIPPINES:** PNM 15190, holotype, 69 mm SL, vicinity of Palawan; UPVMI 1169, 84.3 mm SL, UPVMI 1170, 87.3 mm SL, UPVMI 1171, 87.0 mm SL, UPVMI 1172, 86.8 mm SL, UPVMI 1173, 78.1 mm SL, UPVMI 1174, 77.6 mm SL, UPVMI 1175, 75.7 mm SL, UPVMI 1176, 65.4 mm SL, off Antique, Panay Island; USNM 427531, paratype, 81.6 mm SL, off Mindanao, Bohol Sea.

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