First Japanese Record of the Haemulid Fish *Pomadasys kaakan* (Perciformes), from Kagoshima Prefecture, Southern Japan

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A single adult specimen of *Pomadasys kaakan* (Cuvier in Cuvier and Valenciennes, 1830), 483.0 mm in standard length, was collected at a depth of 36 m off the Satsuma Peninsula, Kagoshima Prefecture, Japan. Because previous records of the species from Japan had been based on mis-identifications of *P. argenteus* (Forsskål, 1775), the Kagoshima specimen represents the first reliable record of *P. kaakan* from Japan supported by a voucher specimen.

Key Words: Pomadasys kaakan, Pomadasys argenteus, Haemulidae, Japan, distribution, new country record.

Introduction

The haemulid fish genus *Pomadasys* Lacepède, 1802, characterized by two pores and a median pit on the chin (Shen 1993; McKay 2001), is currently represented in the western Pacific by at least seven species (McKay 2001), three of which, *viz.*, *P. argenteus* (Forsskål, 1775), *P. maculatus* (Bloch, 1790), and *P. quadrilineatus* Shen and Lin, 1984, are currently recognized as occurring in Japanese waters (Shimada 2013).

During an ichthyofaunal survey around the mainland of Kagoshima, southern Japan, as a part of the Kagoshima Fish Diversity Project (*e.g.*, Motomura and Matsuura 2010, 2014; Hata *et al.* 2013, 2014; Motomura *et al.* 2013), a single specimen of *Pomadasys* was collected off Kasasa on the west coast of the Satsuma Peninsula facing the East China Sea. The specimen, described here in detail and identified as *P kaakan* (Cuvier in Cuvier and Valenciennes, 1830), represents the first record of this species from Japan.

Materials and Methods

Counts and proportional measurements, expressed as percentages of standard length (SL) and shown in Table 1, follow Hubbs and Lagler (1958) except for counts of the pectoral-fin rays and measurements of the head, snout, and pectoral-fin lengths, orbit diameter, and preorbital width, which follow Satapoomin and Randall (2000). All measurements were made with digital calipers to the nearest 0.1 mm. Curatorial procedures for newly collected specimens, including the comparative material examined during the present study, follow Motomura and Ishikawa (2013). The specimens examined in the present study are deposited at the Kagoshima University Museum, Japan (KAUM) and the Museum Support Center of the National Museum of Natural History, Smithsonian Institution, Suitland, Maryland, USA (USNM).

Pomadasys kaakan

(Cuvier in Cuvier and Valenciennes, 1830) [English name: Javelin Grunt; New standard Japanese name: Kagayaki-mizoisaki] (Figs 1–2; Table 1)

- *Pristipoma kaakan* Cuvier in Cuvier and Valenciennes, 1830: 244 [type locality: Arian River, Coupang (Kupang), Timor, Indonesia; Pondicherry (=Puducherry) and Mahé, India].
- *Pomadasys hasta* (not of Bloch 1790): Okada and Matsubara 1938: 226 (Kaohsiung and Keelung, Taiwan; Okinawa to Red Sea; South Africa); Kumada 1941: 88, unnumbered fig. (Red Sea; Indian Ocean; China Seas; Java Sea); Matsubara 1955: 672 (Kaohsiung and Keelung, Taiwan; Okinawa, Japan); Kyushin *et al.* 1982: 100, fig. 79 (South China Sea).
- Pomadasys kaakan: Gloerfelt-Tarp and Kailola 1984: 198, unnumbered fig. (06°13'15"S, 105°44'E, between Sumatra and Java, Indonesia); McKay 1984: HAEM Pomad 13, unnumbered fig. (Indo-West Pacific from east coast of Africa, Red Sea, Persian Gulf, and Sri Lanka to Queensland, Australia, and Taiwan); Bianchi 1985a: 71, pl. 16, 92 (Pakistan); Bianchi 1985b: 78, pl. 20, 115 (Tanzania); Smith and McKay 1986: 569, unnumbered figs (Inhaca Island, Mozambique; Transkei, South Africa); Majid and Imad

	Japan KAUM–I. 67816	Southeast Asia
Standard length (mm)	483.0	51.3-195.6
Counts		
Dorsal-fin spines	12	12
Dorsal-fin soft rays	14	14
Anal-fin spines	3	3
Anal-fin soft rays	7	7-8
Pectoral-fin rays	17	17
Pelvic-fin spines	1	1
Pelvic-fin soft rays	5	5
Pored lateral-line scales	49	48-50 (48)
Caudal-peduncle scales	20	20
Gill rakers (upper)	6	4-6 (5)
Gill rakers (lower)	12	11-13 (12)
Gill rakers (total)	18	16-19 (17)
Measurements (%SL)		
Greatest body depth	30.8	35.0-40.4 (37.5)
Body width	14.5	12.8–16.5 (15.5)
Head length	32.2	35.6-38.1 (36.6)
Snout length	11.5	10.2–11.7 (11.0)
Orbit diameter	5.0	7.5–11.1 (8.9)
Pupil diameter	2.3	3.8-5.5 (4.7)
Interorbital width	9.2	6.2-8.2 (7.2)
Suborbital depth	7.2	4.7-7.3 (6.6)
Preorbital width	9.2	6.9-8.3 (7.7)
Caudal-peduncle depth	9.0	10.2–11.5 (10.9)
Caudal-peduncle length	22.0	17.8-23.7 (20.2)
Pre-dorsal-fin length	39.0	40.8-43.3 (41.8)
Pre-anal-fin length	67.7	67.7–71.5 (69.8)
Pre-pelvic-fin length	33.6	36.2-40.0 (37.9)
Upper-jaw length	8.5	10.7 - 13.1(11.9)
First dorsal-fin spine length	0.9	3.7-5.3 (4.6)
Second dorsal-fin spine length	4.6	8.1–10.8 (10.0)
Third dorsal-fin spine length	11.2	17.2-22.6(20.2)
Fourth dorsal-fin spine length	14.2	18.2 - 21.3(19.9)
Fifth dorsal-fin spine length	12.3	16.4 - 20.2 (18.0)
Eleventh dorsal-fin spine length	4.3	7.0-8.8 (8.0)
Twelfth dorsal-fin spine length	6.5	9.4 - 12.1(10.5)
Longest dorsal-fin soft ray length	10.9	14.1 - 17.6(16.1)
Spinous dorsal-fin base length	29.2	30.3-35.6 (33.6)
Soft dorsal-fin base length	19.4	161-204(187)
First anal-fin spine length	19	4 4-6 5 (5 5)
Second anal-fin spine length	11.7	18.9-22.0(20.4)
Third anal-fin spine length	9.8	13.6 - 15.5(14.7)
Longest anal-fin soft ray length	11.3	14.8 - 17.5(16.1)
Anal-fin base length	12.4	132 - 148(130)
Caudal-fin length	15.7	$18.6_{-22} 1 (22.0)$
Pectoral_fin length	20.3	$31.2_{33.8}(32.4)$
Longest nectoral-fin ray length	27.5	27.0 - 32.6(32.4)
Pelvic-fin length	18.5	27.0-32.0(30.3) 21.0-26.2(24.5)
Pelvic-fin spine length	11.3	$143_{173}(150)$
i envie-ini opine tengui	11.5	17.3-17.3 (13.9)

Table 1. Counts and measurements, expressed as percentages of standard length (SL), of *Pomadasys kaakan*.

1991: 19, unnumbered figs (Pakistan); Shen 1993: 363, figs 104-3, 104-4 (Kaohsiung, Taiwan); De Bruin *et al.* 1995: 211, pl. 4-29 (Sri Lanka); Sommer *et al.* 1996: 244,

pl. 17-104 (Somalia); Mohsin and Ambak 1996: 358, fig. 589 (Malaysia); Carpenter *et al.* 1997: 178, pl. 10–61 (Persian Gulf); McKay 2001: 2987, unnumbered figs (Indo-West Pacific from Transkei, Red Sea, Persian Gulf, and India to Indonesia, north to China and south to northern Australia from Exmouth Gulf to Moreton Bay); Konishi 2007: 205, unnumbered fig. (Chuja Islands, Korea); Motomura 2009: 155, unnumbered fig. (Andaman Sea); Ambak *et al.* 2010: 141, unnumbered fig. (Malaysia); Valinassab *et al.* 2011: 498, fig. 1 (Hormuzgan Province, Iran); Motomura 2011: 120, unnumbered fig. (off Terengganu, Malaysia).

Pomadasys argenteus (not of Forsskål): Matsunuma 2013: 142, unnumbered fig. (off Chantana Buri, Thailand).

Material examined. KAUM–I. 67816, 483.0 mm SL, off Kouzakiyama, Kataura, Kasasa, Minami-satsuma, Kagoshima, Japan, 31°26′00″N, 130°10′05″E, 19 December 2014, set net, 36 m, N. Teratoko.

Description. Body oblong, compressed, depth 95.9% of head length, deepest at origin of sixth dorsal-fin spine, subsequently gently sloping to caudal-fin base. Snout rather pointed. Lips thick. Mouth subterminal, small; posterior tip of maxilla not reaching anterior margin of orbit. Chin with 2 pores followed by central longitudinal groove. Snout tip located ventral to horizontal line drawn through lower margin of orbit. Eye and pupil round. Nostrils close to each other, slit-like, anterior to orbit. Dermal flap present on posterior margin of anterior nostril. Anus situated just anterior to anal-fin base, posterior to midpoint of body. All dorsal, anal, and pelvic fin-rays branched. Dorsal-fin origin posterior to vertical line drawn through posteriormost point of opercle. Posterior end of dorsal-fin base posterior to that of anal-fin base. Posterior end of spinous dorsal-fin base level with anterior margin of anus. Dorsal fin notched, posterior margin rounded. First dorsal-fin spine very small, 19.8% as long as second spine. Third dorsal-fin spine longer than second. Upper point of pectoral-fin insertion anterior to vertical line drawn through posteriormost point of opercle. Lower point of pectoral-fin insertion level with pelvic-fin origin. Uppermost ray of pectoral fin reduced, its posterior tip reaching vertical line drawn through origin of sixth dorsal-fin spine. Posterior tip of pectoral fin reaching to point between vertical lines drawn through origins of eleventh and twelfth dorsal-fin spines, not reaching to level of anus. Pelvic-fin axillary scale present. Posterior tip of depressed pelvic-fin spine reaching to point between vertical lines drawn through origins of sixth and seventh dorsal-fin spines. First pelvic-fin ray distally filamentous, its posterior tip reaching to point between vertical lines drawn through origins of ninth and tenth dorsal-fin spines when depressed. Anal-fin origin level with origin of fourth dorsal-fin ray. First anal-fin spine very small, 16.4% as long as second spine. Second anal-fin spine longer and stronger than third. Posterior end of anal-fin base level with origin of eleventh dorsal-fin ray. Caudal fin truncate. Lateral line continuous, running parallel with contour of back, straightening along caudal peduncle. Posterior margin of preopercle serrate.



Fig. 1. Fresh specimen of Pomadasys kaakan. KAUM-I. 67816, 483.0 mm SL, Minami-satsuma, Kagoshima Prefecture, Japan.

Angle of preopercle and upper part of subopercle expanded posteriorly. Posterior margin of subopercle not serrate. Ctenoid scales covering body, pectoral-fin base and thoracic region, caudal-fin base, opercular bones, cheek, and head, excepting anterior part of snout, lips, and chin. Scales on top of head extending forward to point between posterior nostrils. Dorsal and anal fins each with low scaly sheath. Teeth in jaws arranged in villiform bands.

Color when fresh (Fig. 1): Body uniformly olive-gold dorsally, silvery laterally and ventrally. Series of indistinct golden vertical bands on dorsolateral surface of body; each band extending from dorsal-fin base to lateral line. Caudal peduncle olive dorsally. Posterior margin of each scale on upper half of body and caudal peduncle bright yellow. Dorsal-fin spines and rays, upper pectoral fin rays, and upper caudal fin rays olive yellow. Lower pectoral fin and pelvic-fin rays translucent. Pelvic-fin spine and anal-fin spines and rays yellow. Caudal fin grayish yellow; lower one-third of fin yellow, bright yellow distally. Dorsal-fin membranes between spines with irregular black spots; membranes between rays with up to three variously distinct black spots. Lips pale pink. Iris white. Pupil bluish-black.

Color of preserved specimen: Body purplish dark brown dorsally, pale yellow laterally and ventrally, with blackish vertical bands on trunk dorsally.

Remarks. Morphological characters of the Japanese specimen closely match those given for *P. kaakan* by McKay (2001), including 20 circumpeduncular scales, 14 dorsal-fin rays, the posterior margin of the opercle not extending beyond the middle of the pectoral fin, the dorsal-fin membranes having with black spots but lacking a large dark blotch on the spinous portion of the dorsal fin, and the absence of distinct dark longitudinal stripes on the lateral surface of the body. Meristic data for the Japanese specimen are within the range of those of comparative specimens of *P. kaakan* from Indonesia, Malaysia, and Thailand (Table

1). Therefore, the Japanese specimen is identified here as *P. kaakan*.

All previous reports of P. kaakan have lacked an extensive range of proportional measurements, and ontogenetic proportional changes have been similarly overlooked. However, analyses of 35 measurements in P. kaakan show that the proportions relative to SL of body depth, head length, orbit and pupil diameters, caudal-peduncle depth, and pre-dorsal fin, pre-pelvic fin, upper jaw, and most spine lengths decrease with growth (Fig. 2A-R). In contrast, interorbital and preorbital widths relative to SL increase with growth (Fig. 2S, T). This species can be distinguished from its congeners known from the western Pacific in having an opercle that does not extend beyond the middle of the pectoral fin, a body coloration pattern with pairs of spots or dull blotches aligned into vertically interrupted bars, 14 dorsal-fin rays, and 20 circumpeduncular scales. Pomadasys kaakan has been often misidentified as P. argenteus, which it closely resembles. The two species can be easily distinguished from other congeners by the opercular posterior margin, which does not extend beyond the midpoint of the pectoral fin insertion, and the absence of a large dark blotch on the spinous portion of the dorsal fin and any distinct dark longitudinal stripes on the lateral body surface (McKay 2001). Pomadasys kaakan differs from P. argenteus in having pairs of spots or dull blotches forming vertical bars on the body in young specimens, these subsequently fading with growth (vs irregular longitudinal streaks in young fish, later replaced by numerous scattered dark spots in adults), in addition to the 20 circumpeduncular scales (vs 21-22; McKay 1984, 2001). Specimens reported by Masuda and Allen (1987) and Chen and Fang (1999) as P. kaakan, but re-identified herein as P. argenteus, had numerous scattered black spots on the lateral body surface. Matsunuma (2013) reported a specimen (KAUM-I. 33218) collected off Chantha Buri, Thailand as P. argenteus, but we now re-identified it as P. kaakan (see



Fig. 2. Relationships of (A) body depth, (B) head length, (C) orbit diameter, (D) pupil diameter, (E) caudal-peduncle depth, (F) pre-dorsal-fin length, (G) pre-pelvic-fin length, (H) upper-jaw length, (I) first dorsal-fin spine length, (J) second dorsal-fin spine length, (K) third dorsal-fin spine length, (L) fourth dorsal-fin spine length, (M) fifth dorsal-fin spine length, (N) eleventh dorsal-fin spine length, (O) twelfth dorsal-fin spine length, (P) first anal-fin spine length, (Q) second anal-fin spine length, (R) third anal-fin spine length, (S) interorbital width, and (T) preorbital width (as % standard length) with standard length in (\star) Japanese and (\bullet) Southeast Asian specimens of *Pomadasys kaakan*.

Comparative material examined).

Fowler (1931) reported two specimens from Naha, Okinawa, Japan (USNM 71911 and 71912) as *P. hasta* (Bloch, 1790), giving the following description: "In some examples the spots on the back and sides tend to form into longitudinal dark streaks, though not entirely continuous as in *Poma-dasys argenteus*." Although this description is reminiscent of *P. kaakan*, our examination of Fowler's specimens (USNM 71911, 208.0 mm SL, USNM 71912, 185.0 mm SL) showed them to be *P. argenteus*. Okada and Matsubara (1938) and

Matsubara (1955) subsequently reported *P. hasta* from Okinawa, but provided no supportive literature citations or voucher specimens. Accordingly, the present Japanese specimen represents the first reliable record of *P. kaakan* from Japan. Another example of *P. kaakan*, reported from Chuja Island, southern Korea, by Konishi (2007) (based on a photograph of a line-caught individual, probably not retained), represents the current northernmost record of *P. kaakan*.

Although Kumada (1941) proposed new Japanese common names "Shimatauro" and "Hoshitauro" for *P. kaakan* and *P. maculatum*, respectively, with fine illustrations, these Japanese names have not been used in recent papers that have treated fishes of the genus *Pomadasys*. In his review of Japanese *Pomadasys*, Shimada (2002, 2013) used "Hoshimizoisaki" as the standard Japanese name for *P. maculatum*. We herein propose a new standard Japanese name "Kagayaki-mizoisaki" for *P. kaakan*, based on the bright golden coloration of the body of the Japanese specimen (KAUM–I. 67816); "kagayaki" means brightness in Japanese. The latter part of the name, "mizoisaki", is the Japanese generic name for the genus *Pomadasys*.

Comparative material examined. Pomadasys argenteus (13 specimens, 79.0-360.0 mm SL): KAUM-I. 1783, 103.6 mm SL, Uchiumi Bay, Sumiyou, Amami-oshima island, Kagoshima; KAUM-I. 12228, 152.2 mm SL, KAUM-I. 49231, 109.5 mm SL, off Kota Kinabalu, Sabah, Malaysia, 06°00'N, 116°07'E; KAUM-I. 17252, 121.9 mm SL, off Kuala Terengganu, Terengganu, Malaysia, 05°22'N, 103°15'E; KAUM-I. 55321, 201.2 mm SL, KAUM-I. 55322, 200.0 mm SL, off Itoman, Okinawa-jima island, Okinawa, Japan, 26°07'N, 127°37'E; KAUM-I. 60821, 208.0 mm SL, KAUM-I. 60822, 227.5 mm SL, Urauchi River, Iriomote-jima island, Taketomi, Okinawa, Japan, 24°22'45"N, 123°46'55"E; KAUM-I. 67817, 280.0 mm SL, off Kouzakiyama, Kataura, Kasasa, Minami-satsuma, Kagoshima, 31°26'00"N, 130°10'05"E, 36m; KAUM-I. 70596, 360.0mm SL, offshore east of Sakinoyama, Kataura, Kasasa, Minamisatsuma, Kagoshima, Japan, 31°25′44″N, 130°11′49″E, 27 m; USNM 71911, 208.0 mm SL, USNM 71912, 185.0 mm SL, USNM 71913, 79.0 mm SL, Naha, Okinawa, Japan.

Pomadasys kaakan (8 specimens, 51.3–195.6 mm SL): KAUM–I.12123, 145.0 mm SL, off Kota Kinabalu, Sabah, Malaysia, 06°00'N, 116°07'E; KAUM–I. 17000, 106.9 mm SL, off Kuala Terengganu, Terengganu, Malaysia, 05°22'N, 103°15'E; KAUM–I. 22236, 143.4 mm SL, off Kunak, Sabah, Malaysia, 04°42'N, 118°17'E; KAUM–I. 33218, 195.6 mm SL, off Chantha Buri Province, Thailand; KAUM–I. 39452, 51.3 mm SL, off Tanjung Sepat, Selangor, Malaysia, 02°39'N, 101°33'E, 33 m; KAUM–I. 52134, 128.2 mm SL, off Jakarta, Jakarta Bay, Java, Indonesia, 05°44'S, 106°48'E; KAUM–I. 59748, 153.2 mm SL, off Phuket, Thailand; KAUM–I. 67501, 98.1 mm SL, Ha Long Bay, Ha Long, Vietnam, 20°55'S, 107°05'E, 10 m.

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