千葉県と沖縄県から得られたミナミキントキの記録

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First reliable records of the bullseye *Priacanthus sagittarius* (Teleostei: Priacanthidae) from Chiba and Okinawa prefectures, Japan

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Abstract. Single specimens of the Arrowfin Bigeye *Priacanthus sagittarius* Starnes, 1988 (Teleostei: Priacanthidae), collected off the Pacific coast of Boso Peninsula (Chiba Prefecture) and Ishigaki-jima Island (Yaeyama Islands, Okinawa Prefecture), represent the first confirmed records of the species from those prefectures. Previous records of the species in the Pacific coast of Japanese waters have been limited to west of Kanagawa Prefecture, with records from Okinawa Prefecture being unconfirmed or lacking detailed locality data.

Introduction

Priacanthus sagittarius Starnes, 1988 (Teleostei: Priacanthidae) is widely distributed in the Indo-West Pacific, usually inhabiting rocky reefs (Yamada 1997; Starnes 1999). Although widely recorded from the Pacific coast of Japan west of Kanagawa Prefecture (Hata & Nakae 2021), specimen-based records or those with detailed locality data from Okinawa Prefecture are lacking, and the distribution of the species in the prefecture is poorly known. Recent collections of single specimens (described herein) from the Pacific coast of Boso Peninsula, Chiba Prefecture and Ishigaki-jima Island, Yaeyama Islands, Okinawa Prefecture, represent the first reliable records of the species from those prefectures.

Materials and Methods

Methods for counts and proportional measurements, shown in Table 1, followed Starnes (1988). Standard length, total length, Kuroshio Biological Research Foundation, and National Museum of Nature and Science are abbreviated as SL, TL, KBF, and NSMT, respectively. All measurements were made with calipers to the nearest 0.1 mm. Curatorial procedure for the specimens followed Motomura & Ishikawa (2013). Genomic DNA of the specimens was obtained from the muscle or fin pieces preserved in 99% ethanol. The method of DNA extraction and mitochondrial genome sequencing generally followed Matsunuma et al. (2022), the primer set used was L-708-12S (5′–TTA YAC ATG CAA GTA TCC GC– 3′) and H-1784-16SG (5′–TTC AGC TTT CCC TTG CGG TAC– 3′). The sequences are registered in the DDBJ/EMBL/NCBI database [LC706438 (NSMT-P 143257) and LC706439 (NSMT-P 143549)].

Results and Discussion

***Priacanthus sagittarius* Starnes, 1988**
Standard Japanese name: Minami-kintoki
(Fig. 1; Table 1)

Material examined. NSMT-P 143257, 220.6 mm SL, 270.2 mm TL, off Wada Fishing Port, Wada, Minamiboso City, Chiba Prefecture, Japan (obtained at Wada Fishing Port), 18 Nov. 2021, coll. by H. Hata and M. Nakae; NSMT-P 143549, 296.2 mm SL, 365.0 mm TL, south off Ishigaki-jima Island, Yaeyama Islands, Ryukyu Archipelago, Japan (24°17'N, 124°14'E), 220 m depth, 9 Dec. 2021, coll. by H. Hirasaka.

Description. Body oblong, laterally compressed. Dorsal profile from snout to origin of sixth dorsal-fin spine gently elevated, thereafter gradually lowering to caudal-fin base. Ventral profile of body lowering from lower-jaw tip to pelvic-fin insertion, subsequently parallel to body axis, and elevating from origin of third anal-fin soft ray to caudal-fin base. Eye and iris round. Anterior and posterior nostrils located anterior to orbit, close to each other; anterior nostril oval, vertical dimension longest; posterior nostril slit-like. Pelvic-fin insertion slightly posterior to vertical through posterior margin of

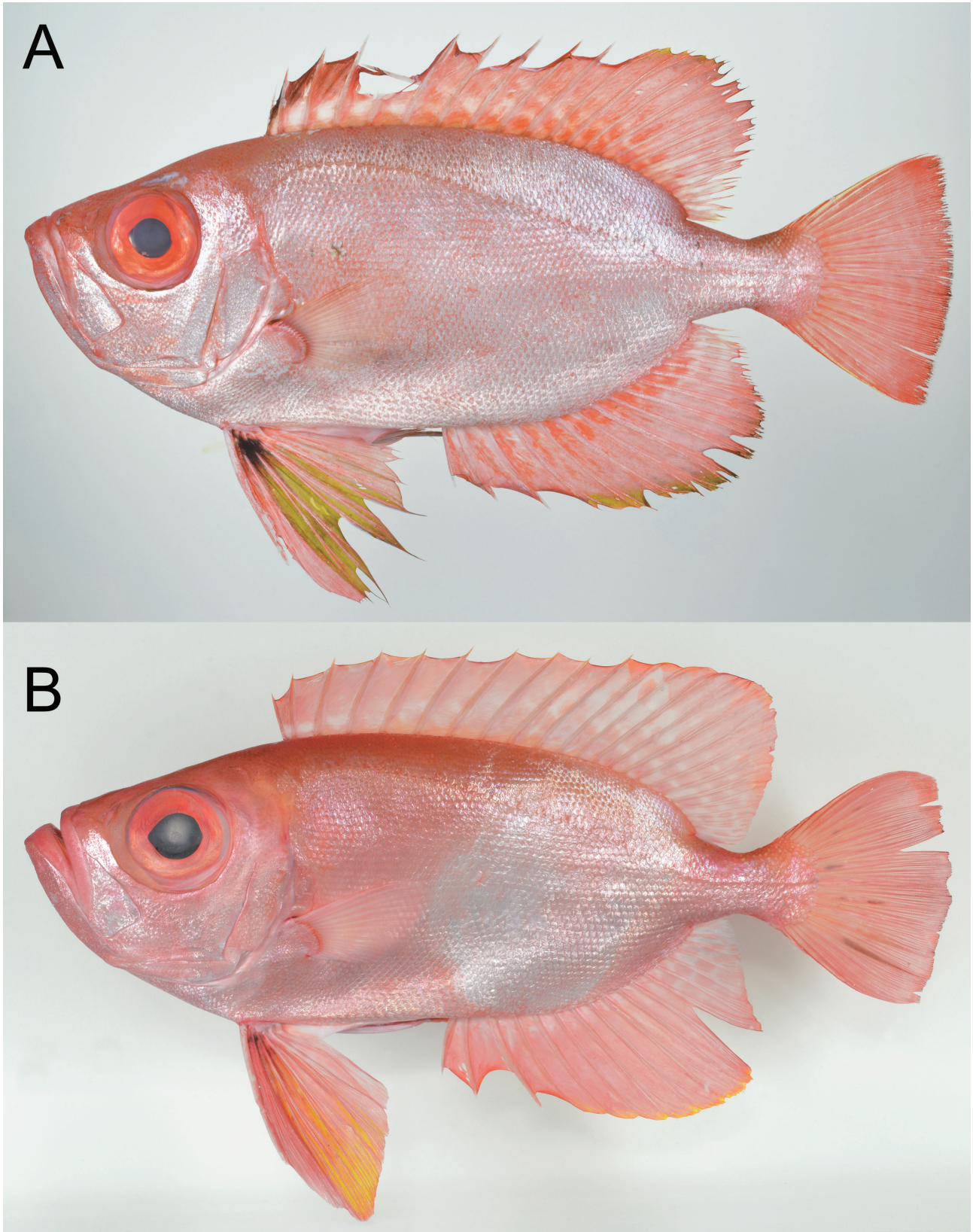

Fig. 1. Fresh specimens of *Priacanthus sagittarius* from (A) off Minamiboso City, Chiba Prefecture, Japan (NSMT-P 143257, 220.6 mm standard length) and (B) near Ishigaki-jima Island, Yaeyama Islands, Ryukyu Archipelago, Japan (NSMT-P 143549, 296.2 mm standard length).
図 1. ミナミキントキ *Priacanthus sagittarius* (A: NSMT-P 143257, 標準体長 220.6 mm, 千葉県南房総市沖 ; B: NSMT-P 143549, 標準体長 296.2 mm, 八重山諸島石垣島近海).

eye. Base of last ray of pelvic fin slightly anterior to uppermost point of pectoral-fin base. Second pelvic-fin ray longest, last ray connected to abdomen by membrane. All pelvic-fin soft rays branched. Outer profile of pelvic fin lowering from fin origin to second fin ray tip, elevated to fifth fin ray tip. Posterior tip of depressed pelvic fin slightly beyond origin of second anal-fin spine. Uppermost point of pectoral-fin base slightly anterior to posterior tip of opercle, below level of lower eye margin. Lowermost point of pectoral-fin base just below second dorsal-fin spine origin. Pectoral fin round, its posterior tip blunt, not reaching to vertical through anal-fin origin. Dorsal, ventral, and posterior margins of pectoral fin almost straight. Dorsal-fin origin just above uppermost point of pectoral-fin base; tenth spine longest spine; fifth soft ray longest ray. Corner of outer margin of soft portion of dorsal fin rounded. All dorsal-fin soft rays branched. Anal-fin origin just below seventh dorsal-fin spine origin. All anal-fin soft rays branched; outer margin of soft portion rounded. Caudal fin truncate; dorsal and ventral margins nearly straight, both pointed posteriorly; posterior margin centrally convex. Anus just anterior to anal-fin origin. Mouth terminal, posterior tip of maxilla barely reaching below anterior margin of pupil. No supramaxilla. Bands of villiform teeth on both jaws, vomer, and palatines. Tooth band on vomer V-shaped, broadly pointed anteriorly. Tongue edentate. Snout tip pointed, above level of iris upper margin. Lower jaw tip pointed, slightly above level of eye center. Posterior edge of preopercle serrated. Lower margin of preopercle and posterior margin of opercle smooth. Short spine on angle of preopercle, its posterior tip not reaching opercular margin. Body covered with small scales. Both lips without scales. Lateral line complete, originating above anterodorsal tip of opercle and rapidly rising to just below third or fourth dorsal-fin spine, subsequently lowering to caudal peduncle, thereafter straight to caudal-fin base.

Color when fresh (Fig. 1)**.** Body uniformly reddish-silver. Dorsum above lateral line red. Pectoral fin transparent, rays reddish. Pelvic fin entirely red, with yellowish central tinge between first soft ray and fourth soft ray. Fin membrane connecting last pelvic-fin ray and body whitish. Black blotches (obscure in NSMT-P 143549) on base of pelvic fin and anteriorly on dorsal fin. Dorsal, anal, and caudal fins light red with obscure white spots. Dorsal fin basally yellowish. Outer margin of soft portion of dorsal fin and ventral margin of anal fin yellow. Posterior margin of caudal fin black. Pupil black, iris bright red.

Distribution. *Priacanthus sagittarius* is distributed in the Indo-West Pacific from Réunion and the Red Sea to Japan and Samoa (Starnes 1988, 1999; Hayashi 2013; Hata & Nakae 2021). Recent invasion of the species into the Mediterranean Sea has also been reported (Alshawy et al. 2019). In Japan, *P. sagittarius* has been reported from Aomori Prefecture (Tsugaru City), Toyama Bay, Izu Islands (Miyake-jima Island), Sagami Bay, Mie Prefecture (Shima City), southern part of Wakayama Prefecture (Shirahama and Minabe towns), Kochi Prefecture (Iburi), Hyuga-nada Sea, mainland of Kagoshima Prefecture, Koshiki-shima Islands (Shimokoshiki-shima Island), Osumi Islands (Tanega-shima Island), Amami Islands (Amami-oshima Island), and Yaeyama Islands (Stern 1988; Hayashi 2013; Hata & Nakae 2021; Murase et al. 2021; Shimose 2021; Wada 2022). It is newly recorded herein from Chiba Prefecture and Ishigaki-jima Island, Yaeyama Islands (Fig. 2).

Remarks. The present specimens are assignable to the genus *Priacanthus* as defined by Starnes (1988), having the following characters: preopercle entirely scaled; dorsal, anal, and caudal fins lacking small dark spots; 9 or 10 scale rows between dorsal-fin origin and lateral line; pelvic fin slightly longer than head; fine serrations on anteroventral margin of lachrymal bone; anal fin with 15 soft rays, dorsal fin with 13 or 14 soft rays; scales in lateral series 62 or 67. Moreover, the specimens were identified as *P. sagittarius* on the basis of the following combination of characters, which closely matched the diagnostic features of *P. sagittarius* given by Starnes (1988, 1999) and Hayashi (2013): single black blotches on fin membrane between first and second or third dorsal-fin spines, and pelvic-fin insertion; pectoral fin transparent, lacking distinct color; dorsal and anal fins light red; total gill rakers on first gill arch 21; truncate caudal fin with convex posterior margin; spine on angle of preopercle short, not reaching opercular margin; tenth dorsal-fin spine length 181.1–208.4% that of second dorsal-fin spine. Moreover, the mitochondrial DNA sequences of both specimens indicated close affinity with 1,084bp of *P. sagittarius* [specimen number / registration number: KBF-I 1070 / LC654219, NSMT-P 140774 / LC706437], registered to the DDBJ/EMBL/NCBI database as eDNA reference data.

As detailed by Hata & Nakae (2021) and summarized in Fig. 2, *P. sagittarius* has been

Table 1. Counts and measurements, expressed as percentages of standard length, of *Priacanthus sagittarius* from Chiba Prefecture and Ishigaki-jima Island.
表 1. 千葉県・石垣島産ミナミキントキ *Priacanthus sagittarius* の計数・計測形質 .

	NSMT-P 143257 Chiba Prefecture	NSMT-P 143549 Ishigaki-jima Island
Standard length (SL; mm)　標準体長	220.6	296.2
Counts　計数形質		
Dorsal-fin spines 背鰭棘数	10	10
Dorsal-fin rays 背鰭軟条数	13	14
Anal-fin spines 臀鰭棘数	3	3
Anal-fin rays 臀鰭軟条数	15	15
Pectoral-fin rays 胸鰭軟条数	18	19
Pelvic-fin spines 腹鰭棘数	1	1
Pelvic-fin rays 腹鰭軟条数	5	5
Scales in lateral series 体側縦列鱗数	67	70
Lateral-line scales 側線鱗数	62	67
Vertical scale rows 体側横列鱗数	46	46
Scales above lateral line 側線上方横列鱗数	9	10
Scale below lateral line 側線下方横列鱗数	41	37
Gill rakers 第1鰓弓上の鰓耙数	5 + 16	5 + 16
Measurements (% of SL) 計測形質		
Body depth 体高	41.1	40.7
Body width 体幅	17.4	14.4
Caudal-peduncle length 尾柄長	14.8	12.7
Caudal-peduncle depth 尾柄高	9.3	8.6
Head length 頭長	33.1	33.9
Head depth 頭高	38.2	38.4
Head width 頭幅	18.5	18.3
Horizontal bony orbit length 眼窩径	14.9	15.3
Bony interorbital width 眼隔域幅	7.8	7.0
Snout length 吻長	9.2	10.1
Mandibular length 下顎長	21.9	21.1
Pectoral-fin length 胸鰭長	19.8	19.7
Pelvic-fin length 腹鰭長	34.7	34.4
1st dorsal-fin spine length 背鰭第1棘長	7.7	7.2
2nd dorsal-fin spine length 背鰭第2棘長	10.1	9.2
3rd dorsal-fin spine length 背鰭第3棘長	11.6	10.8
4th dorsal-fin spine length 背鰭第4棘長	13.5	12.0
5th dorsal-fin spine length 背鰭第5棘長	broken	13.5
6th dorsal-fin spine length 背鰭第6棘長	14.9	14.9
7th dorsal-fin spine length 背鰭第7棘長	15.6	16.1
8th dorsal-fin spine length 背鰭第8棘長	16.1	16.5
9th dorsal-fin spine length 背鰭第9棘長	17.1	17.0
10th dorsal-fin spine length 背鰭第10棘長	18.2	19.1
1st dorsal-fin soft ray length 背鰭第1軟条長	21.2	20.8
2nd dorsal-fin soft ray length 背鰭第2軟条長	21.9	21.5
3rd dorsal-fin soft ray length 背鰭第3軟条長	23.1	24.6
4th dorsal-fin soft ray length 背鰭第4軟条長	22.3	23.6
5th dorsal-fin soft ray length 背鰭第5軟条長	21.1	23.1
1st anal-fin spine length 臀鰭第1棘長	8.7	9.3
2nd anal-fin spine length 臀鰭第2棘長	12.6	12.3
3rd anal-fin spine length 臀鰭第3棘長	15.8	16.1
1st anal-fin soft ray length 臀鰭第1軟条長	19.7	18.6
2nd anal-fin soft ray length 臀鰭第2軟条長	21.4	20.7
3rd anal-fin soft ray length 臀鰭第3軟条長	21.8	22.1
4th anal-fin soft ray length 臀鰭第4軟条長	22.7	23.4
5th anal-fin soft ray length 臀鰭第5軟条長	22.7	24.1
Distance between dorsal-fin origin and uppermost point of pectoral-fin base 背鰭起部から胸鰭基底上端までの距離	25.5	25.6
Distance between dorsal-fin origin and pelvic-fin insertion 背鰭起部から腹鰭基底前端までの距離	39.0	39.5
Distance between dorsal-fin origin and anal-fin origins 背鰭起部から臀鰭起部までの距離	45.6	45.5
Distance between pectoral and pelvic fin insertions 胸鰭基底上端から腹鰭基底前端までの距離	15.9	17.2
Distance between uppermost point of pectoral-fin base and anal-fin origin 胸鰭基底上端から臀鰭起部までの距離	27.0	28.3
Distance between pelvic-fin insertion and anal-fin origin 腹鰭基底前端から臀鰭起部までの距離	29.5	29.7
Dorsal-fin base length 背鰭基底長	57.0	58.5
Anal-fin base length 臀鰭基底長	35.9	35.6
Pectoral-fin base length 胸鰭基底長	6.1	5.9
Pelvic-fin base length 腹鰭基底長	4.8	4.1

recorded off the Pacific coast of southern Japan, from Sagami Bay to the southern coast of Kyushu, and at several coastal localities in the Japan Sea and East China Sea. Therefore, the specimen collected from Boso Peninsula (NSMT-P 143257) represents the first record of the species from Chiba Prefecture. In the Ryukyu Archipelago, previous records of the species had limited collection data, restricted to Tanega-shima Island, Osumi Islands (Kaburagi 2016; Kagoshima City Aquarium Foundation 2018) and Amami-oshima Island, Amami Islands (Fujiyama 2004; Nakae et al. 2018). Although Gushiken (1972), Yokoi (1989), and Etsu (2002) included photographs of *P. sagittarius* in their report on fishes of Okinawa Prefecture, they did not provide detailed locations. In addition, Masuda et al. (1975) stated that the species was common in the Ryukyu Archipelago, showing a color photograph of a fresh specimen of *P. sagittarius* as *Priacanthus* sp., without collection locality of the specimen and distributional range of the species. Although Yamada (1997) and Koeda (2018, 2020) stated that *P. sagittarius* was locally called “iki-gusara” and “kusara-akayu” in the Ryukyu Archipelago, they did not include any detailed records from Okinawa Prefecture. Moreover, Yoshino et al. (1975), Yokoi (1989), and Etsu (2002) noted that local names such as “iki-gusara” were also used generally for priacanthid fishes. Accordingly, distributional records of *P. sagittarius* in Okinawa Prefecture are uncertain, and Hayashi’s (2013) review of Japanese priacanthid fishes, did not include the Ryukyu Archipelago in

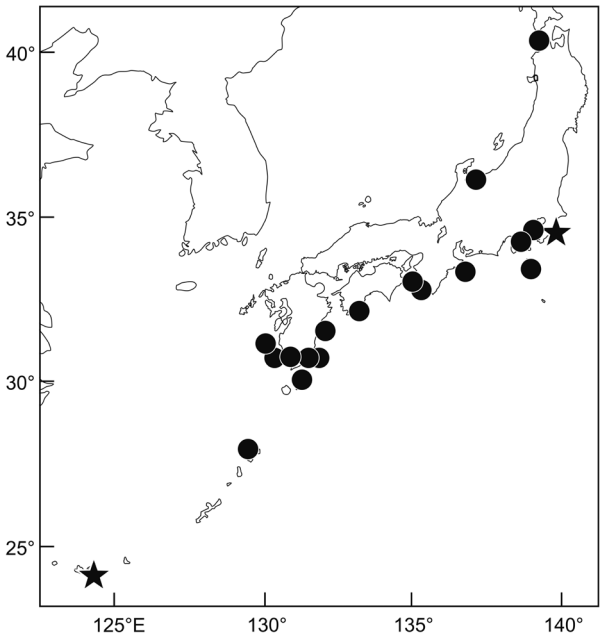

Fig. 2. Distributional records of *Priacanthus sagittarius* in Japanese waters. Stars and circles represent localities of the specimens examined in this study and previous recor ds, respectively.
図2. ミナミキントキ*Priacanthus sagittarius*の日本における分布図 (★と●はそれぞれ本研究によって分布が確認された地域と従来報告のあった地域を示す).

the distributional range of *P. sagittarius*. Including a photograph of the species, probably collected around the Yaeyama Islands, Shimose (2021) stated that *P. sagittarius* was rarely fished in those islands, but a detailed collection locality of the photographed specimen was not given; nor is the latter known to have been retained. Therefore, the present specimen (NSMT-P 143549) collected from Ishigaki-jima Island represents the first reliable specimen-based record of the species in the prefecture. Nevertheless, judging from the records of the species from the Satsunan Islands (Tanega-shima and Amami-oshima islands, Kagoshima Prefecture) and islands in Okinawa Prefecture, the species is apparently widely distributed in the Ryukyu Archipelago.

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References

Alshawy, F. A., A. Ibrahim, C. Hussein & M. Lahlah, 2019. First record of arrow bulleye, *Priacanthus sagittarius* Starnes, 1988 from the Syrian marine waters (Eastern Mediterranean). FishTaxa, 4: 21–24.

Etsu, H., 2002. Okinawa fish book to search in island words. Okinawa Marine Publishing, Haebaru. [In Japanese]

Fujiyama, M., 2004. Privately printed book: Fishes collected with hook and line from Amami-oshima Island. Self-publishing (Manta Fujiyama), Naze. [In Japanese]

Gushiken, S., 1972. Fishes of the Okinawa Islands. Ryukyu Suisan Kyokai, Naha. [In Japanese]

Hata, H. & M. Nakae, 2021. First specimen-based record of *Priacanthus sagittarius* (Actinopterygii: Teleostei: Priacanthidae) from Shizuoka Prefecture, Japan. Ichthy, Natural History of Fishes of Japan, 8: 37–42. [in Japanese]

Hayashi, M., 2013. Priacanthidae, bigeyes. In: T. Nakabo (ed.), Fishes of Japan with pictorial keys to the species, third edition. Pp. 822–825, 1978–1979. Tokai University Press, Hadano. [In Japanese]

Kaburagi, K., 2016. Angling fishes of Tanega-shima island. Tamashida-sha, Nishinoomote. [In Japanese]

Kagoshima City Aquarium Foundation, 2018. Fishes collected with set nets in Kagoshima and confirmed by Kagoshima City Aquarium. Second edition. Kagoshima City Aquarium Foundation, Kagoshima. [In Japanese]

Koeda, K., 2018. *Priacanshus sagittarius* Starnes, 1988. In: K. Koeda, H. Hata, M. Yamada & H. Motomura (eds.), Field guide to fishes landed at Uchinoura Fishing Port, Kagoshima, Japan. P. 202. The Kagoshima University Museum, Kagoshima. [In Japanese]

Koeda, K., 2020. *Priacanshus sagittarius* Starnes, 1988. In: K. Koeda, H. Hata, M. Yamada & H. Motomura (eds.), Fishes from markets in Osumi Peninsula, Kagoshima, Japan. P. 236. The Kagoshima University Museum, Kagoshima. [In

Japanese]
Masuda, H., C. Araga & T. Yoshino, 1975. Coastal fishes of southern Japan. Tokai Univ. Press, Tokyo. [In Japanese]
Matsunuma M., T. Sado & H. Motomura, 2022. *Cocotropus aurantius*, a new velvetfish (Aploactinidae) from Japan. Ichthyological Research, 69: 60–74.
Motomura, H. & S. Ishikawa, 2013. Fish collection building and procedures manual. English edition. The Kagoshima University Museum, Kagoshima and the Research Institute for Humanity and Nature, Kyoto.
Murase, A., R. Miki & Y. Ogata, 2021. Fish that may be in Kadogawa. In: A. Murase, Y. Ogata, Y. Yamasaki, R. Miki, M. Wada & H. Senou (eds.), Coastal, shelf and deep-sea fishes around Kadogawa Bay, northern part of Miyazaki Prefecture, southern Japan. P. 343. Nobeoka Marine Science Station, Field Science Center, University of Miyazaki, Nobeoka. [In Japanese]
Nakae, M., H. Motomura, K. Hagiwara, H. Senou, K. Koeda, T. Yoshida, S. Tashiro, B. Jeong, H. Hata, Y. Fukui, K. Fujiwara, T. Yamakawa, M. Aizawa, G. Shinohara & K. Matsuura, 2018. An annotated checklist of fishes of Amami-oshima Island, the Ryukyu Islands, Japan. Memoirs of the National Museum of Nature and Science, Tokyo, 52: 205–361.
Shimose, T., 2021. Commercial fishes and shellfishes of Okinawa. Okinawa Times, Naha. [In Japanese]
Starnes, W. C., 1988. Revision, phylogeny and biogeographic comments on the circumtropical marine percoid fish family Priacanthidae. Bulletin of Marine Science, 43: 117–203.
Starnes, W. C., 1999. Priacanthidae, bigeyes. In: K. E. Carpenter & V. H. Niem (eds.), FAO species identification guide for fishery purposes. The living marine resources of the western central Pacific. Vol. 5. Bony fishes part 3 (Menidae to Pomacentridae). Pp. 2590–2601. FAO, Rome.
Wada, H., 2022. Priacanthidae. In: H. Iwatsubo, M. Itou, M. Yamada & H. Motomura (eds.), Field guide to fishes of the East China Sea side of Satsuma Peninsula in Kagoshima, southern Kyushu, Japan. Pp. 27–30. Kagoshima Museum of Aquatic Biodiversity, Kagoshima and the Kagoshima University Museum, Kagoshima. [In Japanese]
Yamada, U., 1997. *Priacanshus sagittarius*. In: O. Okamura & K. Amaoka (eds.), Sea fishes of Japan. P. 287. Yama-kei Publishers, Tokyo. [In Japanese]
Yokoi, K., 1989. Okinawa fish book to search in dialect. Okinawa Publishing, Urasoe. [In Japanese]
Yoshino, T., S. Nishijima & S. Shinohara, 1975. Catalogue of fishes of the Ryukyu Islands. Bulletin of Science & Engineering Division, University of Ryukyus. Mathematics & Natural Sciences, 20: 61–118. [in Japanese]

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要旨. 千葉県南房総市沖および沖縄県石垣島近海において, キントキダイ科魚類の 1 種, ミナミキントキ *Priacanthus sagittarius* Starnes, 1988 が 1 個体ずつ採集された. 本種は日本の太平洋沿岸において神奈川県以西からのみ知られていたほか, 沖縄県における証拠標本に基づく確実な記録がなかったことから, 本報告は標本に基づく本種の千葉県と沖縄県における初めての記録となる.

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