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**Mizuki Matsunuma, Sergey
V. Bogorodsky, Ahmad O. Mal, Yukino
Ando & Hiroyuki Motomura**

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Reinstatement of *Minous inermis* and *M. trachycephalus* (Synanceiidae) to the checklist of Red Sea fishes, with comments on *M. monodactylus*

Mizuki Matsunuma¹  · Sergey V. Bogorodsky^{2,3} · Ahmad O. Mal⁴ · Yukino Ando⁵ ·
Hiroyuki Motomura⁵

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Abstract Records of the stingfish genus *Minous* (family Synanceiidae) from the Red Sea are reviewed. Although excluded from the recent checklist of fishes from that region, both *Minous inermis* Alcock 1889 and *Minous trachycephalus* (Bleeker 1855) are reported from the Red Sea, on the basis of two and seven voucher specimens, respectively. On the other hand, the record of *Minous monodactylus* (Bloch and Schneider 1801) from the Red Sea is considered erroneous, the original source of this record having been based on a misidentification of *Minous coccineus* Alcock 1890. Accordingly, only *M. coccineus*, *M. inermis* and *M. trachycephalus* are confirmed from Red Sea waters.

Keywords Synanceiidae · *Minous coccineus* · *Minous inermis* · *Minous monodactylus* · *Minous trachycephalus* · Distribution

Introduction

The genus *Minous* Cuvier in Cuvier and Valenciennes 1829 (family Synanceiidae) includes 12 valid species of small, bottom-dwelling stingfishes from the Indo-Pacific region (Eschmeyer et al. 1979; Amaoka and Kanayama 1981; Mandrytsa 1990, 1993). However, the most recent checklist of Red Sea fishes (Golani and Bogorodsky 2010) included only two species of *Minous*, viz., *Minous coccineus* Alcock 1890 and *Minous monodactylus* (Bloch and Schneider 1801), records of *Minous inermis* Alcock 1889 and *Minous trachycephalus* (Bleeker 1855), previously recognized by Goren and Dor (1994), having been excluded. However, two specimens of *M. inermis* and seven of *M. trachycephalus*, all from the Red Sea, have been located in museum collections or recently collected. These examples represent reliable records of both species from the Red Sea. The validity of Red Sea records of *M. monodactylus* is reviewed.

Materials and methods

Methods of counts and measurements generally followed Eschmeyer et al. (1979), except for the following: body depth—depth taken at pelvic-fin origin; body width—maximum width at pectoral-fin base; anterior and posterior lacrimal spine length—distance between anterior margin of lacrimal and extreme tip of respective spine. Species identification followed Eschmeyer et al. (1979); Amaoka and Kanayama (1981) and Mandrytsa (1990, 1993). Standard length is expressed as SL. Specimens examined in this study are deposited at the Zoological Museum, Hebrew University of Jerusalem (HUI), Jerusalem; King Abdulaziz University Marine Museum (KAUMM), Jeddah; and Senckenberg Research Institute and Natural History Museum (SMF), Frankfurt.

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 Mizuki Matsunuma
k1139853@kada.jp

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

² Senckenberg Research Institute and Natural History Museum Frankfurt, Senckenbergenallee 25, 60325 Frankfurt a. M., Germany

³ Station of Naturalists, Omsk, Russia

⁴ Marine Biology Department, Faculty of Marine Sciences, King Abdulaziz University, Jeddah 21589, Saudi Arabia

⁵ The Kagoshima University Museum, 1-21-30 Korimoto, Kagoshima 890-0065, Japan

The following comparative specimens of *Minous coccineus* were examined (42 specimens): **Eritrea:** HUJ 2452, 73.6 mm SL, Feb. to Apr. 1957; HUJ 2471, two specimens, 73.9–76.7 mm SL, Horigo Bay, Massawa, 3 Apr. 1961. **Saudi Arabia (off Jizan):** KAUMM 44, 12 specimens, 40.0–89.0 mm SL, 58–59 m depth, 29 Feb. 2012; KAUMM 45 (field number: KAU12–739), 87.0 mm SL, 24–26 m depth, 1 Mar. 2012; KAUMM 399 (field number: KAU14–366), 73.9 mm SL, 30–32 m depth, 4 Nov. 2014; KAUMM 421, three specimens, 52.0–75.0 mm SL, 60–67 m depth, 5 Nov. 2014; SMF 34996, 11 specimens, 49.0–93.0 mm SL, 58–59 m depth, 29 Feb. 2012; SMF 34997 (field number: KAU 12–738), 80.0 mm SL, 24–26 m depth, 1 Mar. 2012; SMF 35842 (field number: KAU14–186–188), three specimens, 64.0–71.3 mm SL, 60–65 m depth, 1 Nov. 2014; SMF 35843 (field number: KAU14–502), 90.0 mm SL, 42–45 m depth, 5 Nov. 2014. **Red Sea (no further locality):** HUJ 19136 (field number: E57/654 a + b), four specimens, 48.2–60.9 mm SL, 1957; HUJ 19160 (field number: E57/657d), 66.1 mm SL, 1957; HUJ 19203 (field number: 57/655), 61.0 mm SL, 1957.

Results and discussion

Minous inermis Alcock 1889 (Fig. 1a; Table 1)

Material examined. Two specimens: HUJ 19167 (field number: E57/657b), 63.8 mm SL, off Massawa, Eritrea, 1957; HUJ 19170 (field number: E57/657), 64.9 mm SL, off Massawa, Eritrea, 1957.

Description. Morphometrics and meristics shown in Table 1. Body progressively compressed posteriorly, without scales, except for lateral-line scales (Fig. 1a). Head moderately large, with exposed rough bony surface; lacrimal with relatively long anterior and posterior spines, anterior spine canted anteroventrally, posterior spine much longer than anterior spine, canted backwards; preopercle with five spines, uppermost spine longest. Snout blunt, its length subequal to orbit diameter; mouth moderate, posterior margin of maxilla not reaching a vertical through mid-orbit; both jaws with a band of small, conical teeth, ca. five and three teeth rows at widest portions of upper and lower jaw, respectively; two elongate patches of small conical teeth on vomer; no palatine teeth. Eye moderately large, with ca. 4 cirri on dorsal portion. Dorsal-fin origin well behind orbit; first spine shorter than second spine, bases of spines close together. Anal-fin origin below base of third dorsal-fin soft ray; spines tiny, hidden under skin. Pectoral fin long, fourth ray longest, its tip extending slightly beyond a vertical through base of last anal-fin soft ray; lowermost ray free from membrane, its tip extending beyond a vertical through posterior tip of pelvic fin when depressed. Pelvic fin short, last soft ray attached to abdomen by broad membrane. Caudal fin relatively long, truncate.

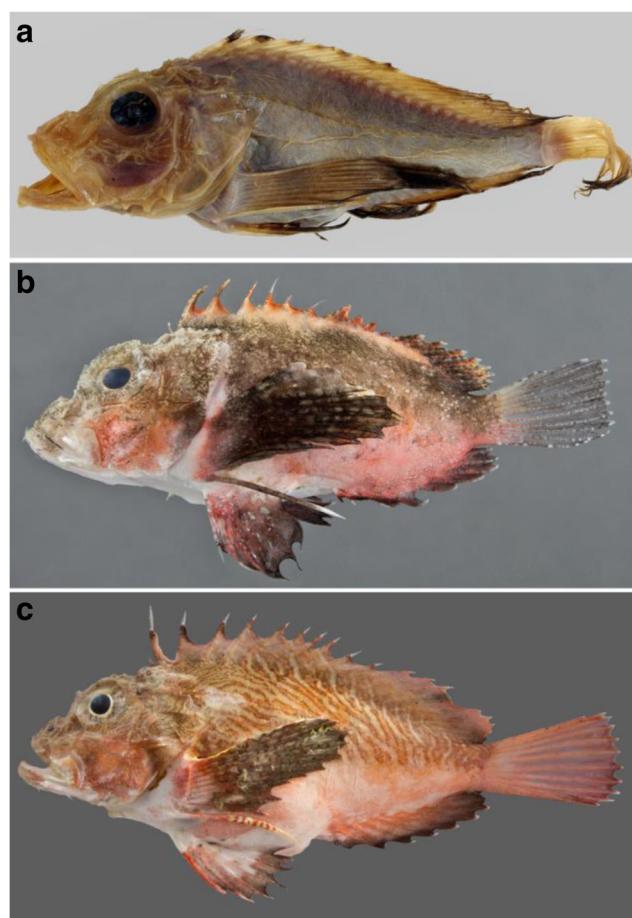


Fig. 1 Three species of *Minous* from the Red Sea. **a** *M. inermis*, preserved specimen, HUJ 19170, 64.9 mm SL, off Massawa, Eritrea; **b** *M. trachycephalus*, fresh specimen, SMF 35844, 38.0 mm SL, off Jizan, Saudi Arabia; **c** *M. coccineus*, fresh specimen, SMF 34997, 80.0 mm SL, off Jizan, Saudi Arabia. Photos by S.V. Bogorodsky (**b, c**)

Preserved coloration. Head and body brown; each fin pale brown with broad dark margin; inner surface of pectoral fin pale brown, without markings.

Distribution. The species is distributed in the northern Indian Ocean from the southern Red Sea and Somalia east to the Andaman Sea (Eschmeyer et al. 1979; this study).

Remarks. The examined specimens were identified as *M. inermis* on the basis of the following characters: first and second dorsal-fin spines close together, the former much shorter than the latter; pectoral fin relatively long (51.1–51.4% SL), tip of free pectoral-fin ray extending beyond a vertical through posterior tip of pelvic fin.

Previously, both specimens had been misidentified as *M. trachycephalus* in Frøiland's (1972) unpublished review of Red Sea scorpionfishes. Although Goren and Dor (1994) included *M. inermis* in their checklist of Red Sea fishes, following Kotthaus (1979), that species was subsequently excluded by Golani and Bogorodsky (2010), who considered Kotthaus's (1979) locality record for *M. inermis* (Bab-el-Mandeb Strait, connecting the Red Sea to the Gulf of Aden), to be separate from

Table 1 Meristic counts and morphometric measurements (expressed as percentages of standard length) of specimens of *Minous inermis* and *M. trachycephalus* from the Red Sea

	<i>M. inermis</i> <i>n</i> = 2	<i>M. trachycephalus</i> <i>n</i> = 7
Dorsal-fin rays	X, 12 or 13	XI, 8–10 (XI, 10)
Anal-fin rays	II, 9 or 11	II, 8 or 9 (II, 8)
Pectoral-fin rays	12	12
Lateral-line tubes	15 or 18	15–17 (17)
Gill rakers (upper + lower limb = total)	3 or 4 + 12 or 14 = 15 or 18	2–4 + 7–9 = 10–12 (2 or 3 + 8 = 10 or 11)
Standard length (mm)	63.8–64.9	25.3–55.0
Body depth	32.7–34.5	32.8–37.8 (36.7)
Body width	25.9–25.9	28.1–29.8 (29.1)
Head length	43.4–44.0	41.7–45.7 (43.0)
Snout length	14.9–14.9	14.4–15.8 (14.9)
Orbit diameter	12.0–14.1	13.1–16.5 (14.1)
Interorbital width at mid-orbit	6.7–7.4	7.7–10.4 (8.7)
Upper-jaw length	17.7–18.8	18.9–19.1 (19.0)
Postorbital length	18.7–19.3	15.6–17.8 (16.5)
Pre-dorsal-fin length	32.9–36.1	32.0–34.7 (32.8)
Pre-anal-fin length	60.7–61.4	59.0–71.3 (66.9)
Pre-pelvic-fin length	37.4–37.9	38.0–43.2 (40.4)
1st dorsal-fin spine length	9.4–9.4	4.6–6.1 (5.4)
2nd dorsal-fin spine length	—	12.0–15.6 (13.5)
3rd dorsal-fin spine length	—	13.6–14.1 (13.8)
4th dorsal-fin spine length	—	13.1–17.0 (14.4)
5th dorsal-fin spine length	—	13.5–18.1 (15.2)
Longest dorsal-fin soft ray length	—	22.4–24.4 (23.9)
1st anal-fin spine length	—	5.5–7.3 (6.8)
2nd anal-fin spine length	—	8.5–9.8 (9.2)
Longest anal-fin soft ray length	—	20.5–23.5 (22.1)
Pectoral-fin ray length	51.1–51.4	33.2–43.8 (40.0)
Pelvic-fin spine length	14.9–18.5	16.3–19.7 (17.5)
Longest pelvic-fin soft ray length	28.2–29.6	24.3–32.4 (30.9)
Caudal-fin length	—	31.0–36.6 (32.7)
Caudal-peduncle length	11.4–11.4	10.3–15.0 (13.1)
Caudal-peduncle depth	9.2–9.8	8.9–11.5 (10.2)
Anterior lacrimal spine length	4.7–5.5	3.4–3.9 (3.6)
Posterior lacrimal spine length	6.0–6.6	5.0–6.2 (5.7)

Modes and means in parenthesis

the Red Sea proper. Accordingly, the present specimens justify the reinstatement of *M. inermis* to the Red Sea fishes checklist.

***Minous trachycephalus* (Bleeker 1855)** (Figs 1b, 2a; Table 1)

Material examined. Seven specimens: **Israel:** HUJ 1633, 55.0 mm SL, Eilat, May 1951; HUJ 14005, 32.6 mm SL, Eilat, 8 Sept. 1986; HUJ 14681 (field number: E65/38), 55.2 mm SL, Eilat, 23 June 1965; HUJ 14682 (E65/88),

52.8 mm SL, Eilat, 14 July 1965. **Eritrea:** HUJ 20655, 25.3 mm SL, Horgigo Bay, 3 Apr. 1961. **Saudi Arabia:** KAUMM 422 (field number: KAU14–574), 35.0 mm SL, off Jizan, 16°34'N, 42°33'E, 30–32 m depth, 4 Nov. 2014; SMF 35844 (field number: KAU 14–556), 38.0 mm SL, off Jizan, 16°45'N, 42°29'E, 28–30 m depth, 5 Nov. 2014.

Description. Morphometrics and meristics shown in Table 1. Body moderately compressed, without scales, except for lateral-line scales (Fig. 1b). Head moderately large, with exposed rough bony surface; lacrimal with relatively short anterior and posterior spines, anterior spine canted

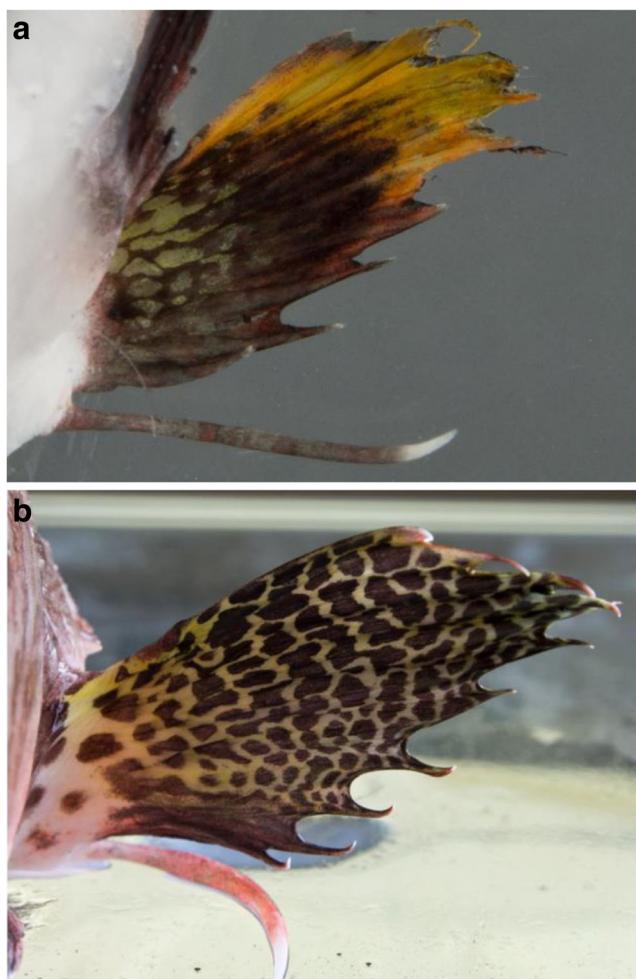


Fig. 2 Pectoral-fin inner surface coloration. **a** *Minous trachycephalus*, SMF 35844, 38.0 mm SL, off Jizan, Saudi Arabia; **b** *M. coccineus*, SMF 34997, 80.0 mm SL, off Jizan, Saudi Arabia

anteroventrally, posterior spine slightly longer than anterior spine, canted backwards; preopercle with five spines, uppermost spine with pointed tip, remaining spines broad, plate-like. Snout blunt, its length subequal to orbit diameter; mouth moderate, posterior margin of maxilla not reaching a vertical through mid-orbit; both jaws with a band of small, conical teeth, ca. five and ca. three teeth rows at widest portions of upper and lower jaw, respectively; two elongate patches of small conical teeth on vomer; no palatine teeth. Eye moderately large, with 4–7 cirri on dorsal portion. Dorsal-fin origin just behind orbit; first spine much shorter than second spine, bases of spines close together. Anal-fin origin below base of last dorsal-fin spine; spines tiny, hidden under skin. Pectoral fin moderately long, fourth ray longest, its tip extending beyond a vertical through anal-fin origin but not reaching base of last anal-fin soft ray; lowermost ray free from membrane, its tip not reaching or extending slightly beyond a vertical through posterior tip of pelvic fin when depressed. Pelvic fin short, last soft ray attached to abdomen by broad membrane. Caudal fin relatively long, truncate.

Fresh coloration. Body brownish dorsally, shading pinkish ventrally; chest and abdomen white ventrally; posterior half of body and base of anal fin with tiny white flecks (Fig. 1b). Jaws anteriorly, snout and head dorsally grayish brown, chin white; cheek reddish pink preceded a triangular white area at angle of jaws. Dorsal fin brownish basally followed by a pale orange zone in spinous and anterior half of soft portions, spinous portion orangish distally, remaining soft-rayed portion grayish with orange rays suffused with dark brown. Anal fin pinkish basally, grayish distally. Outer surface of pectoral fin blackish with irregular faint pale spots distally and small pale gray flecks at base; inner surface mostly brownish with broadly orangish yellow outer margin and pale greenish yellow blotches basally forming hexagonal pattern; free ray gray alternating with pale red bars, tip of ray broadly white (Fig. 2a). Pelvic fin pinkish basally, grayish distally with numerous small white blotches. Caudal fin grayish, scattered with numerous small faint white blotches. Tips of rays in caudal and soft portions of dorsal and anal fins pale gray.

Preserved coloration. Head and body creamy white, darker dorsally, paler ventrally; pectoral fin brownish, yellow markings on inner surface when fresh retained as pale brown markings; other fins whitish, with brownish margin.

Distribution and habitat. The species is distributed in the Red Sea and Gulf of Aden eastwards throughout Sri Lanka to the Philippines and New Caledonia (Eschmeyer et al. 1979; Poss 1999; this study). Specimens collected off Jizan were trawled on open silty sand and mud bottom at a depth of ca. 30 m.

Remarks. The examined specimens were identified as *M. trachycephalus* in having the first and second dorsal-fin spines close together, the former clearly shorter than the latter; dorsal-fin soft rays 8–10; anal-fin spine and soft rays totaling 10 or 11; approximately equal length lacrimal spines; and the inner pectoral-fin surface with numerous pale yellow blotches, forming a hexagonal pattern when fresh (Fig. 2a). The fresh coloration of Red Sea specimens differed slightly from a specimen of *M. trachycephalus* from the Gulf of Thailand [figured in Matsunuma (2003)] in having somewhat darker pelvic and caudal fins.

Goren and Dor's (1994) inclusion of *M. trachycephalus* in their checklist of Red Sea fishes, following Frøiland (1972), was reversed by Golani and Bogorodsky (2010) due to Frøiland's (1972) mistaken identification (see above). Therefore, the present specimens represent the first available specimen-based records of *M. trachycephalus* from the Red Sea.

Comments on records of *M. monodactylus* from the Red Sea

Minous coccineus Alcock 1890 and *M. monodactylus* (Bloch and Schneider 1801) have also been recorded from the Red Sea (Eschmeyer et al. 1979; Golani and Bogorodsky 2010).

The occurrence of the former in the Red Sea was confirmed in this study on the basis of numerous specimens (Fig. 1c). Of them, HUJ 2452, 2471, 19136, 19160 and 19203 had been previously reported by Frøiland (1972) as *Minous superciliosus* Gilchrist and Thompson 1908, that name later being synonymized under *M. coccineus* by Eschmeyer et al. (1979).

Minous monodactylus was first recorded from the Red Sea by Tortonese (1937), based on 13 specimens from Massawa, Eritrea. Subsequent studies, including Eschmeyer et al. (1979) and Golani and Bogorodsky (2010), followed Tortonese (1937), whose description of preserved specimens included: dorsal-fin rays XI, 12; anal-fin rays I, 9; the first dorsal-fin spine about one fourth of the second dorsal-fin spine length; and the inner pectoral-fin surface whitish with numerous, variously shaped and sized brown spots. However, the relationship of first and second dorsal-fin spine length and pectoral-fin inner surface coloration were at variance with true *M. monodactylus*, that species having the first dorsal-fin spine equal to or longer than the second, and the pectoral-fin inner surface devoid of distinctive markings (Eschmeyer et al. 1979). In fact, the description given by Tortonese (1937) for *M. monodactylus* was far more consistent with that of *M. coccineus* (Figs 1c, 2b), which appears to have been misidentified. Although the number of anal-fin rays given by Tortonese (1937) differed from that of *M. coccineus* [total anal-fin rays 10 vs. 11 or 12 in the latter; see Eschmeyer et al. (1979)], the former is regarded as a simple counting error. Therefore, *M. monodactylus* should be excluded from the checklist of Red Sea fishes, the only species of *Minous* validly included being *M. coccineus*, *M. inermis*, and *M. trachycephalus*. Specimens of *Minous coccineus* were collected in areas close to islands and also from areas far from islands on open sand flats from the depths of 24–67 m, whereas two specimens of *M. trachycephalus* were trawled above soft substrata at a depth about 30 m. Habitat and depth of *M. inermis* in the Red Sea are still unknown.

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