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Eleutheronema rhadinum (Perciformes,
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journal or publication title	Biogeography
volume	9
page range	7-11
year	2007
URL	http://hdl.handle.net/10232/22398

Second Japanese Record of a Threadfin, *Eleutheronema rhadinum* (Perciformes, Polynemidae), with Distributional Implications

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Abstract. A single specimen (420.4 mm in standard length) of an East Asian endemic threadfin (Perciformes: Polynemidae), *Eleutheronema rhadinum* (Jordan and Evermann), was collected in a small set net at a depth of 27 m off Kasasa (East China Sea), Kagoshima, southern Japan, on 28 October 2006. The specimen represents the second confirmed record for the species from Japanese waters (the first record being of a single specimen from Aomori, northern Japan). Distributional implications for Japanese *E. rhadinum* are noted.

Key words: Polynemidae; *Eleutheronema rhadinum*; distribution; Japan; Kuroshio Current.

Introduction

The threadfin, *Eleutheronema rhadinum* (Perciformes: Polynemidae), originally described as *Polydactylus rhadinus* by Jordan and Evermann (1902) from Taiwan Province, China (Motomura, 2004a), has usually been treated as a junior synonym of *E. tetradactylum* (Shaw, 1804) (*e. g.* Weber and de Beaufort, 1922; Kagwade, 1970; Motomura *et al.*, 2001). Recently, however, Motomura *et al.* (2002) recognized *P. rhadinus* as a valid species of *Eleutheronema* Bleeker, 1862 and redescribed it in detail along with designation of a neotype, and a discussion of intraspecific variations and morphological changes with growth. Intraspecific variations in lateral line squamation on the caudal-fin membrane in *E. rhadinum* were discussed by Motomura (2003).

Motomura *et al.* (2001) reported a single large specimen (739.0 mm standard length) of *E.*

tetradactylum from off the mouth of Azuma River, Fukaura, Aomori, northern Japan as the first record of the species from Japanese waters. Subsequently, Motomura *et al.* (2002) re-identified the Aomori specimen as *E. rhadinum*, showing that *E. tetradactylum* does not occur in East Asia where it is replaced by the endemic *E. rhadinum*. *Eleutheronema rhadinum* has currently been recorded on the basis of collected specimens from northern Vietnam (Motomura, 2003; one specimen), China, including Taiwan Province (Motomura *et al.*, 2002; 19 specimens), and Japan (Motomura *et al.*, 2001; as *E. tetradactylum*, one specimen).

During an ichthyological survey of inshore waters of Kagoshima, southern Kyushu Island, Japan, with the support of the Kasasa Fishery Cooperative Society, Kagoshima, we collected a single specimen of *Eleutheronema* (420.4 mm standard length) in a small set net at a depth of 27 m off Kasasa, Minami-satsuma, Kagoshima. The specimen was identified as *E. rhadinum* on the basis of meristics, morphometrics, lower-jaw morphology and coloration, and rep-

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resents the second reliable record for the species from Japan.

Counts and measurements followed Motomura *et al.* (2002). Pectoral-fin ray counts included only those interconnected by a membrane, the lower free rays being considered separately; counts of pectoral filaments begin with the anterior element. Standard, fork and total lengths are expressed as SL, FL and TL, respectively. The specimen is deposited at the Kagoshima University Museum, Japan (KAUM). Comparative material examined are listed in Motomura *et al.* (2002) and Motomura (2003) — *E. rhadinum*: 20 specimens (including neotype of *Polydactylus rhadinus* Jordan and Evermann), 82–739 mm SL, northern Japan, China (including Taiwan Province), and northern Vietnam; *E. tetradactylum*: 113 specimens (including neotype of *Polynemus tetradactylus* Shaw), 48–375 mm SL, Persian Gulf to Papua New Guinea and northern Australia; *E. tridactylum*: 34 specimens (including holotype of *Polynemus tridactylus* Bleeker), 60–255 mm SL, Thailand to Indonesia.

Eleutheronema rhadinum (Jordan and Evermann)

[Japanese name: Minami-konoshiro]

(Figs 1–3)

Polydactylus rhadinus Jordan and Evermann, 1902: 351, fig. 20 (type locality: Linkou, Taipei, Taiwan Province, China, based on a neotype designated by Motomura *et al.*, 2002).

Eleutheronema tetradactylum (not of Shaw); Shen S-C, 1984: 98, pl. 98, figs 361-1a, b (Taiwan Province of China); Senou, 2000: 968 (East China Sea); Motomura *et al.*, 2001: 41, fig. 1 (Aomori Prefecture, northern Japan).

Eleutheronema rhadinum; Motomura *et al.*, 2002: 50, figs 2, 3, 7, 9, 11 (Japan and China including Taiwan Province); Senou, 2002: 968 (Japan); Motomura, 2003: 33, fig. 1 (Long Chau Bay, northern Vietnam).

Material examined. KAUM-I. 956, 420.4 mm SL (455.0 mm FL, 546.0 mm TL), east of Sakinoyama,

Kasasa, Minami-satsuma, Kagoshima, southern part of Kyushu, southern Japan, 31°25.44'N, 130°11.49'E, 27 m depth, small set net, 28 Oct. 2006, collected by Y. Nakao and M. Ito.

Description. First dorsal fin with 8 spines; second dorsal fin with 1 spine and 15 soft rays; anal fin with 3 spines and 15 soft rays; pectoral fin with 18 rays (exclusive of filaments); pectoral filaments 4 on each side of body; pelvic fin with 1 spine and 5 soft rays; pored lateral-line scales 95; scale rows above lateral line 13, below 18; gill rakers on upper limb 5, lower limb 6. Head length 26.7% of SL; body depth at first dorsal-fin origin 24.4; body depth at second dorsal-fin origin 27.6; body width at pectoral-fin base 14.3; snout length 4.0; eye diameter 4.3; orbit diameter 5.1; interorbital width 6.0; postorbital length 18.7; upper-jaw length 14.5; depth at posterior margin of maxilla 2.7; length of tooth plate 7.6; pre first dorsal-fin length 31.9; pre-second dorsal-fin length 58.3; pre anal-fin length 59.0; pelvic-fin origin to anal-fin origin 38.3; pelvic-fin origin to anal-fin origin 23.8; second dorsal-fin base length 15.4; anal-fin base length 18.7; longest pectoral-fin ray (2nd) length 19.7; longest pectoral-filament (4th) length 18.0; pectoral-fin base including pectoral-filaments base 6.8; longest pelvic-fin soft ray (1st) length 11.3; longest first dorsal-fin spine (3rd) length 15.2; second dorsal-fin spine length 7.0; longest second dorsal-fin soft ray (2nd) length 18.2; longest anal-fin spine (3rd) length 6.3; longest anal-fin soft ray (1st) length 14.9; caudal-peduncle length 24.8; caudal-peduncle depth 11.0; upper caudal-fin lobe length 33.8; lower caudal-fin lobe length 30.7.

Body oblong, compressed; body depth 4.1 in SL. Maxilla covered with scales; posterior margin of maxilla extending well beyond a vertical through posterior margin of adipose eyelid; width of tooth band on upper and lower jaws greater than space (on symphysis) separating tooth bands on opposing premaxillae; anterior parts of lower jaw with small teeth extending onto lateral surface, adjacent portion of lip absent; upper-jaw lip absent, small teeth extending onto lateral surface; teeth villiform in broad bands on vomer, palatines and ectopterygoids; vomer with



Fig. 1. Fresh specimen of *Eleutheronema rhadinum*. KAUM-I. 956, 420.4 mm standard length, east of Sakinoyama, Kasasa, Minami-satsuma, Kagoshima, Kyushu, southern Japan.

Fig. 2. Head of *Eleutheronema rhadinum*, showing anterior two-thirds of lower jaw with small teeth extending onto lateral surface, adjacent portion of lip absent. KAUM-I. 956, 420.4 mm standard length.

deciduous tooth plates on both sides. Preopercular margin serrated. Base of second spine in first dorsal fin slightly more robust than other spines. Posterior tip of pectoral fin not reaching a vertical through posterior tip of depressed pelvic fin; pectoral-fin insertion well below midline of body; all pectoral fin rays unbranched. Fourth pectoral filament longest, extending beyond a vertical through pelvic-fin insertion, but not reaching to pectoral-fin tip; third filament extending beyond a vertical through pelvic-fin origin; first filament shortest, first and second filaments not reaching a vertical through pelvic-fin origin. Upper and lower caudal fin lobes not filamentous. Lateral line extending from upper gill opening to caudal-fin; lateral line bifurcating on middle of caudal fin; the upper branch simple, not reaching to posterior margin of caudal fin; the lower branch secondarily bifurcating, both secondary branches reaching to posterior margin of lower caudal-fin lobe. Swimbladder absent.

Fresh coloration (Fig. 1). Body grayish-silver dorsally, pale yellowish-silver ventrally; lateral surface of abdomen shining greenish-yellow; ventral surface of head and trunk white. Adipose eyelid transparent; tooth band on upper and lower jaws pinkish white. First dorsal fin dense black distally; second dorsal fin grayish. Pectoral fins dense black; pectoral filaments white. Pelvic fins whitish, with scattered melanophores anteriorly. Anal fin pale gray; anterior parts of base and distal margin of the

fin whitish. Caudal fin grayish with black narrow margin.

Remarks. The present specimen was identified as belonging to the genus *Eleutheronema*, owing to having the following characters given as diagnosis of the genus by Motomura *et al.* (2002): pectoral-fin insertion well below midline of body; eye diameter greater than snout length; anterior parts of lower jaw with small teeth extending onto lateral surface, adjacent portion of lip absent (Fig. 2); width of tooth band on upper and lower jaws greater than space (on symphysis) separating tooth bands on opposing premaxillae; 3 or 4 pectoral filaments, longest filament shorter than distance between snout tip and first dorsal-fin origin; pectoral-fin base length (including base of pectoral filaments) less than upper-jaw length; upper and lower caudal-fin lobes not filamentous; and swimbladder absent.

The Indo-West Pacific genus *Eleutheronema* was revised by Motomura *et al.* (2002), who recognized three valid species: *E. rhadinum*, *E. tetradactylum* and *E. tridactylum* (Bleeker, 1845). Comparisons among the three species of *Eleutheronema* were given by Motomura *et al.* (2002) in detail. The present specimen, from Kagoshima, had the following characters: 18 pectoral-fin rays; 4 pectoral filaments; 15 second dorsal-fin soft rays; 95 pored lateral-line scales; 13 scale rows above lateral line, 18 below; 5 upper series gill rakers, 6 lower, 11 total; vomer with deciduous tooth plates on both sides; and pectoral-fin



Fig. 3. Distributional records of *Eleutheronema rhadinum* in Japan. Star and circle represent localities of the specimens examined in this study and reported by Motomura *et al.* (2001), respectively.

membranes black. These characters agreed closely with those of the neotype and non-type specimens of *E. rhadinum* redescribed by Motomura *et al.* (2002). Morphometrics for the present specimen (see Description) were also very close to the range of values of *E. rhadinum* given in Motomura *et al.* (2001: table 1, Japanese specimen), Motomura *et al.* (2002: table 1, Chinese and Japanese specimens, including the neotype) and Motomura (2003: table 1, Vietnamese specimen).

In Japanese waters, *E. rhadinum* (as *E. tetradactylum*) has to date been reported only from Aomori, northern part of Honshu Island, northern Japan (Motomura *et al.*, 2001, 2002; Fig. 3). Accordingly, the present specimen (KAUM-I. 956, 420.4 mm SL) represents the second confirmed record for the species from Japan (based on collected specimens).

Eleutheronema rhadinum is an important commercial fish in China, including Taiwan, its annual catch ranging from 1,140 to 16,041 *t* between 1970 and 1999 (Motomura, 2004b: table 3). Although it is abundant around Taiwan (H. Motomura, *pers. obs.*,

at Taipei Fish Market, May 2005), the paucity of specimens from Japan (no specimens having been reported from the Ryukyu Islands, adjacent to Taiwanese waters) suggests that the Japanese specimens of *E. rhadinum* were most likely accidentally transported from around Taiwan or China by the Kuroshio Current, normally flowing well west of the Ryukyu Islands. It is highly unlikely that the species reproduces around Japan.

Nine specimens (KAUM-I. 967–974, 1003, 150.0–175.0 mm SL) of a carangid fish, *Atule mate* (Cuvier *in* Cuvier and Valenciennes, 1833), which is mainly distributed in Indo-Pacific tropical waters (Smith-Vaniz, 1999) and formerly known from only three specimens from Japanese waters (Suzuki, 1962; Yoshino and Yoshigou, 2003; Miyahara *et al.*, 2006), were also collected at the same place and time (October 2006) as the present specimen of *E. rhadinum*. These unusual records of *A. mate* and *E. rhadinum* from inshore Japanese waters indicate that the Kuroshio Current, conveying tropical continental shelf fishes, probably flowed more strongly and closer to the shore in October 2006 than usual.

Acknowledgments

We greatly appreciate Yusaku Nakao (Kasasa Fishery Cooperative Society, Kagoshima, Japan) for opportunities to examine the present specimen of *Eleutheronema rhadinum*, and Nami Kita (KAUM) and Junko Omori (Kagoshima Aquarium) for their curatorial assistance. The first author thanks Yuko Motomura (Kagoshima, Japan) for her assistance and Graham S. Hardy (Ngunguru, New Zealand), who read the initial manuscript and offered helpful comments. This study was supported in part by Grant-in-Aids for Scientific Research (A) by the Japan Society for the Promotion of Science, Tokyo, Japan (19208019) and for Young Scientists (B) by the Ministry of Education, Science, Sports and Culture, Japan (19770067).

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(Accepted November 10, 2006)