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Records of the spotbase burrfish, *Cylichthys spilostylus* (Tetraodontiformes: Diodontidae), from Okinawa-jima Island, Japan

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Abstract. Five specimens of the Spotbase Burrfish, *Cylichthys spilostylus*, were collected from the waters around Okinawa-jima Island, Ryukyu Archipelago, Japan. The species had only been recorded from Ishigaki-jima Island in the Yaeyama Islands, Tosa Bay in Shikoku, as well as from Toyama Bay and Sadoga-shima Island in the Sea of Japan in Japanese waters. These five specimens represent the first records from the waters of Okinawa-jima Island.

Introduction

The diodontid fish genus *Cylichthys* Kaup, 1855 contains three species: *C. hardenbergi* de Beaufort, 1939, *C. orbicularis* (Bloch, 1785) "Meita-ishigaki-fugu", and *C. spilostylus* (Leis & Randall, 1982) "Igakuri-fugu", and the latter two species are known from Japan (Matsuura et al. 1993; Leis 2001; Aizawa & Doiuchi 2013). The species of genus *Cylichthys* are characterized by all spines being fixed in an erect position, all spines shorter than the eye diameter, spines in the pectoral-fin axil not particularly long, no spines wholly on the caudal peduncle, caudal-fin rays normally nine, and no spots on the fins (Leis 2001).

A single specimen of *C. spilostylus* collected from off Okinawa-jima Island at a depth of 70 m was landed at Nago Fish Market. In addition, four specimens collected from around Okinawa-jima Island, were found in museum collections of the Okinawa Churashima Foundation. This species had previously been recorded in Japanese waters from Ishigaki-jima Island in the Yaeyama Islands, Tosa Bay in Shikoku, Toyama Bay and Sadoga-shima Island in the Sea of Japan (Aizawa & Doiuchi 2013). The specimens examined in the present study are here described as the first records of *C. spilostylus* from the waters of Okinawa-jima Island.

Counts and measurements follow Leis (1977) and Leis & Randall (1982). Measurements were made to the nearest 0.1 mm with calipers. Standard length is abbreviated as SL. The morphological description is based on the five specimens collected from Okinawa-jima Island. The coloration is described on

the basis of a color photograph of URM-P 47600, which was purchased at Nago Fish Market by the first author. The examined materials are deposited in the Okinawa Churashima Foundation (OCF and URM-P; formerly Department of Marine Sciences, University of the Ryukyus).

Species account

Cylichthys spilostylus (Leis & Randall, 1982)

Standard Japanese name: Igaguri-fugu (Fig. 1)

Materials examined. OCF-P 2547, 298.7 mm SL, waters around Okinawa-jima Island, 16 November 1985, landed at Unten Fishing Port; OCF-P 2548, 353.0 mm SL, waters around Okinawa-jima Island, 16 July 1985, landed at Nago Fishing Port; OCF-P 20130109-2, 243.6 mm SL, waters around Okinawa-jima Island, probably landed at Unten Fishing Port; URM-P 20348, 292.0 mm SL, waters around Okinawa-jima Island, 29 December 1988, landed at Nago Fishing Port; URM-P 47600, 412.0 mm SL, west off of Motobu Peninsula (26°41'N, 127°51'E), Okinawa-jima Island, Okinawa Prefecture, Japan, 70 m depth, 2 May 2014, landed at Nago Fishing Port, purchased by K. Koeda.

Description. Counts and measurements are given in Appendix 1. Body capable of great inflation. Spines short and straight, none noticeably elongate; all spine shafts much shorter than their shortest subdermal base. Spines triangular in cross section near base, becoming round to somewhat laterally compressed near tips. All spines fixed in upright position. Body spines with 3 subdermal bases; spines on top of head with 3 or 4 (usually 4) bases; frontal spine with 3 bases. Spine rows often irregular and difficult to count. Single medial frontal spine located between nostrils and in advance of all spines. No spines wholly on caudal peduncle, although inner subdermal bases of posterior spines surrounding dorsal fin extending onto caudal peduncle. Subdermal bases of 4 (occasionally 3) spines form anterior edge of depression surrounding gill opening.

Nasal organ forms a hollow tentacle with 2

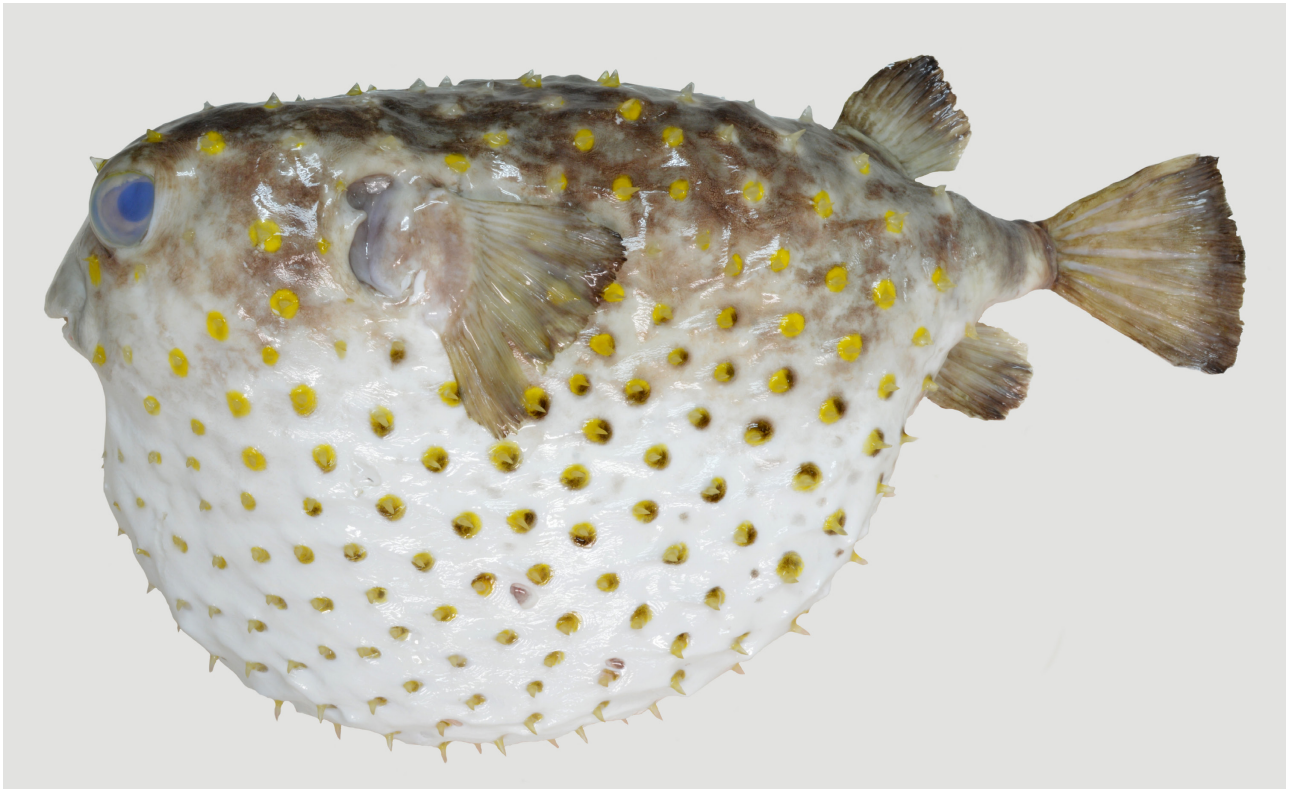


Fig. 1. *Cyclichthys spilostylus* (URM-P 47600, 412.0 mm SL), west off of Motobu Peninsula, Okinawa-jima Island, Okinawa Prefecture, Japan, 70 m depth, 2 May 2014, landed at Nago Fishing Port.

図1. イガグリフグ *Cyclichthys spilostylus* (URM-P 47600, 標準体長412.0 mm), 沖縄島本部半島沖で漁獲, 水深70 m, 名護漁港で水揚げ.

opposed openings near tip. Nasal tentacles located in interorbit at level of frontal spine. Dental plates thick and strong.

Dorsal, anal, and caudal fins rounded; middle rays longest. Pectoral fin slightly emarginated with upper and lower rays longer than middle rays. Dorsal and anal fins of approximately same size and shape.

Dorsal ground color medium grey to brown, fading gradually to white ventrally. Each spine covered with a small yellow spot smaller than pupil; these yellow spots disappearing in preserved specimen. Posterior half of spots on posteroventral side usually dark brown. Lateral, ventral, and some of dorsal spines yellowish and translucent. All fins yellowish light grey with dark grey distal margin without spots.

Distribution. The species is currently known from South Africa, the Red Sea, the south coast of Arabian Peninsula in the eastern Indian Ocean, and the following localities in the Pacific Ocean: Australia; New Guinea; Vietnam; the Philippines; Hong Kong; and Ishigaki-jima Island, Okinawa-jima Island, Tosa Bay, Toyama Bay, and Sadoga-shima Island in Japan (Leis & Randall 1982; Matsuura et al. 1993; McCosker & Humann 1996; Leis 2001; Nakae

& Machida 2007; Aizawa & Doiuchi 2013; Tran 2013; Doi et al. 2014; this study).

Remarks. Characters of the present five specimens were well consistent with those of the holotype and paratypes of *C. spilostylus*, described by Leis & Randall (1982), with the exception of some measurements, e.g. caudal peduncle length (15.6–18.4% SL in present specimens vs. 11.1–15.9% SL in type specimens), height of gill opening (11.7–14.7% SL vs. 7.8–11.2% SL). The differences in measurements may reflect size differences between the materials as the specimens in the present study are larger than the holotype and paratypes (243.6–412.0 mm SL, mean 319.9 mm SL vs. 145–281 mm SL, 217.9 mm SL).

Matsuura et al. (1993) suggested that *C. spilostylus* of the Sea of Japan had a different color pattern on the caudal and pectoral fins from other localities including Ishigaki-jima Island: specimens of the Toyama Bay have a wide white band separating the dark proximal and distal parts of both fins, but the fins of this species in other localities are light to medium grey, often with a narrow white margin. However, a specimen reported by Nakae & Machida (2007) from Tosa Bay had intermediate

coloration of the two color patterns. Additionally, Doi et al. (2014) reported *C. spilostylus* from Sadoga-shima Island in the Sea of Japan, and the specimen had a light grey fins without dark parts which the coloration pattern similar to that of specimens in the east Indian and Pacific oceans. Therefore, Doi et al. (2014) suggested that differences in fin coloration are due to intraspecific variation. The specimens collected from the waters around Okinawa-jima island in the present study also had dark gray distal margins on the caudal and pectoral fins, but no dark gray areas on the bases of the fins. This means that the Okinawan specimens also had intermediate coloration of the two color patterns shown by Matsuura et al. (1993), and this result supports the suggestion of Doi et al. (2014).

Three diodontid species of genus *Cylichthys* have been recognized as valid: *C. hardenbergi*, *C. orbicularis*, and *C. spilostylus*. *Cylichthys spilostylus* is clearly distinguished from the other 2 congeners by all spines being immovable (vs. movable spine near the corner of the mouth in *C. orbicularis*), 3 spines over the eye (vs. 2 spines in *C. hardenbergi*), 1 frontal spine between the nostrils (vs. 2 frontal spines in *C. hardenbergi*), 5 or 6 spines dorsally between the pectoral-fin base (vs. 4 spines in *C. orbicularis*), 11–13 spines anterior to the dorsal-fin base (vs. 8 or 9 in *C. orbicularis*), and black spots present at the base of the spines laterally and ventrally (vs. few black spots present at the base of the spines dorsally and dorsolaterally in *C. hardenbergi*; black spots in the clusters dorsally and dorsolaterally in *C. orbicularis*). Leis (2001) indicated that the fins of *C. spilostylus* have no dusky distal margin, and included this character as one of the keys to distinguish this species from *C. hardenbergi*. However, several studies and our result suggest that the fin coloration of *C. spilostylus* has intraspecific variations (Nakae & Machida 2007; Doi et al. 2014).

Cylichthys spilostylus was originally described by Leis & Randall (1982) on the basis of the specimens from the Gulf of Aqaba in the Red Sea, Cebu in the Philippines, and the Taya Islands in the South China Sea. Matsuura et al. (1993) first reported this species from Japanese waters with the description of 3 specimens collected from Toyama Bay and a single specimen from Ishigaki-jima Island. After that, Nakae and Machida (2007) and Doi et al. (2014) each reported single specimens of this species from Tosa Bay and Sadoga-shima Island, respectively, and the latter record is the northernmost record of the species. The specimens collected in this study represent the first records of *C. spilostylus*

from the waters around Okinawa-jima Island.

The specimen collected from Ishigaki-jima Island (URM-P 11137, 345.5 mm SL) in the Yaeyama Islands and reported on by Matsuura et al. (1993) was the largest voucher specimen of *C. spilostylus*, and other voucher specimens ranged from 130 to 280 mm SL (Leis & Randall 1982; Matsuura et al. 1993; Nakae & Machida 2007; Tran 2013; Doi et al. 2014). However, most specimens collected from the waters around Okinawa-jima Island in this study are larger than those of other localities. The largest specimen (URM-P 47600, 412.0 mm SL) examined in this study represents the largest known specimen of the species.

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沖縄島周辺海域から得られたハリセンボン科 イガグリフグ *Cylichthys spilostylus*

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要旨. 沖縄島周辺海域においてイガグリフグ *Cylichthys spilostylus* が 5 個体採集された。本邦における本種の採集例は、石垣島、土佐湾、富山湾、および佐渡島に限られ、沖縄島からの記録はない。本研究で得られた標本は、沖縄島周辺海域からの初めての記録となるため、その詳細を記録した。

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Appendix 1. Counts and measurements of *Cyclichthys spilostylus* collected from Okinawa-jima Island. Percentages of standard length given in parentheses.

附録 1. 沖縄島で採集されたイガグリフグの計数・計測形質. 括弧内は各計測値の標準体長比を示す.

	OCF-P 2547	OCF-P 2548	OCF-P 20130109-2	URM-P 20348	URM-P 47600
Standard length 標準体長	298.7	353.0	243.6	292.0	412.0
Dorsal-fin rays 背鰭鰭条数	12	12	12	12	12
Anal-fin rays 臀鰭鰭条数	11	10	10	11	11
Pectoral-fin rays 胸鰭鰭条数	21	22	22	22	21
Caudal-fin rays 尾鰭鰭条数	7	7	7	7	7
Head supination 頭部棘配列	1, 2, 3, 5, 4	1, 2, 3, 4, 4	1, 2, 4, 5, 4	1, 2, 3, 5, 4	1, 2, 4, 5, 4
Pre-dorsal spines 背鰭前棘数	13	12	12	11	12
Pre-anal spines 臀鰭前棘数	19	19	19	20	19
Interpectoral spines (D) 胸間棘数 (背側)	6	6	6	6	6
Interpectoral spines (V) 胸間棘数 (腹側)	21	19	20	20	19
Internostrils spines 鼻孔間棘数	1	1	1	1	1
Total spines 総棘数	367	317	374	324	338
Head length 頭長	110.9 (37.1)	128.4 (36.4)	87.7 (36.0)	111.5 (38.2)	142.2 (34.5)
Pre-anus length 肛門前長	252.1(84.4)	277.3 (78.6)	200.3 (82.2)	227.5 (77.9)	318.3 (77.3)
Pre-dorsal-fin length 背鰭前長	243.4 (81.5)	277 (78.5)	193.0 (79.2)	238.7 (81.7)	320.3 (77.7)
Caudal peduncle length 尾柄長	48.8 (16.3)	55.2 (15.6)	38.4 (15.8)	52.2 (17.9)	75.9 (18.4)
Caudal peduncle depth 尾柄高	20.2 (6.8)	26.5 (7.5)	18.8 (7.7)	20.5 (7.0)	30.8 (7.5)
Eye diameter 眼径	24.7 (8.3)	25.3 (7.2)	21.5 (8.8)	25.8 (8.8)	29.4 (7.1)
Head width 頭幅	98.0 (32.8)	114.9 (32.5)	78.4 (32.2)	107.0 (36.6)	119.8 (29.1)
Body width 体幅	113.9 (38.1)	127.6 (36.1)	85.6 (35.1)	122.9 (42.1)	130.7 (31.7)
Interorbital width 両眼間隔	53.9 (18.0)	74.9 (21.2)	47.8 (19.6)	64.1 (22.0)	74.5 (18.1)
Nostril to mouth length 鼻孔から口までの長さ	29.6 (9.9)	36.9 (10.5)	24.5 (10.1)	30.9 (10.6)	42.7 (10.4)
Gill opening height 鰓孔長	38.8 (13.0)	44.3 (12.5)	29.6 (12.2)	42.8 (14.7)	48.2 (11.7)
Mouth width 口幅	45.7 (15.3)	48.1 (13.6)	35.7 (14.7)	45.6 (15.6)	65.5 (15.9)
Longest dorsal-fin ray length 背鰭最長鰭条長	54 (18.1)	68.1 (19.3)	43.4 (17.8)	55.8 (19.1)	72.5 (17.6)
Longest pectoral-fin ray length 胸鰭最長鰭条長	59.1 (19.8)	56.9 (16.1)	43.6 (17.9)	61.6 (21.1)	63.5 (15.4)
Longest caudal-fin ray length 尾鰭最長鰭条長	68.2 (22.8)	78.4 (22.2)	58.7 (24.1)	74.5 (25.5)	87.5 (21.2)
Longest dorsal spine length 背部最長棘長	9.0 (3.0)	7.9 (2.2)	7.4 (3.0)	8.3 (2.8)	9.0 (2.2)
Frontal spine length 額棘長	6.0 (2.0)	5.9 (1.7)	5.3 (2.2)	5.9 (2.0)	6.4 (1.6)
Longest ventral spine length 腹部最長棘長	8.5 (2.8)	7.9 (2.2)	7.1 (2.9)	8.3 (2.8)	9.0 (2.2)