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Records of Two Diodontid Fishes, *Cyclichthys orbicularis* and *C. spilostylus*, from Japan

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The diodontid fishes, *Cyclichthys orbicularis* (Bloch, 1785) and *C. spilostylus* (Leis et Randall, 1982), are widely distributed in the tropical Indo-West Pacific (Leis, 1986). Sakai et al. (1992) have recently recorded them in a list of fishes from Ishikawa Prefecture, Sea of Japan. Our search for distribution records of the two species has revealed that they occur in several other localities in Japan. Brief notes on specimens of these two species from Japan are given below with comments on color variations in *C. spilostylus*.

Methods and Materials

Methods of measurements and counts follow those of Leis (1977) and Leis and Randall (1982). Half of the examined specimens were reared in the Kanazawa Aquarium. Standard lengths of the reared specimens were measured when they died. Institutional abbreviations follow Leviton et al. (1985) with the addition of IOP (Izu Oceanic Park, Ito).

Cyclichthys orbicularis (6 specimens, 100.4–144.4 mm SL): IOP 1148, east coast of Izu Peninsula (35°02.8′N, 139°08.2′E), Pacific coast of Honshu, 0–20 m, dip net, 5 Feb. 1990; NSMT-P 35173, Akasumi (37°03.0′N, 136°43.9′E), west coast of Noto Peninsula, Sea of Japan, set net, 3 Oct. 1990 (reared for 8 months); NSMT-P 35175 (2 specimens), Iori (37°02.1′N, 137°03′E), eastern north coast of Noto Peninsula, Toyama Bay, Sea of Japan, set net, 22 Dec. 1990 (reared for 1 month); NSMT-P 45067, Ukai (37°24.3′N, 137°00′E), east coast of Noto Peninsula, Iida Bay, Sea of Japan, set net, 17 Dec. 1987 (reared for 10 days); URM-P 4298, Manzamoh, Okinawa I., Ryukyu Islands, 35 m depth, spear, 15 Sept. 1982.

Cyclichthys spilostylus (4 specimens, 134.5–345.5 mm SL): NSMT-P 30137, Toyama Bay, Sea of Japan, set net, mid-December 1988; NSMT-P 41976, Sazanami (37°00.5′N, 137°03′E), east coast of Noto Peninsula, Toyama Bay, Sea of Japan, set net, 20 Nov. 1986 (reared for 2 and a half years); NSMT-P 41977, Iori (37°02.1′N, 137°03′E), east coast of Noto Peninsula, Toyama Bay, Sea of Japan, set net, 22 Dec. 1990 (reared for 1 month); URM-P 11137, Ishigaki-jima I., Yaeyama Group, Okinawa, Ryukyu Islands, bottom long-line, July 1985.

Notes

Among the diodontid fishes found in the waters around Japan, *Chilomycterus reticulatus* (=*Chilomycterus affinis*) may be confused with the two species of *Cyclichthys* discussed above. It resembles them in general appearance and color, but differs in having a small spine on the top of the caudal peduncle (no spines on the caudal peduncle in *Cyclichthys*) and usually 10 caudal rays (usually 9 rays) (Leis, 1986).

Cyclichthys orbicularis differs from *C. spilostylus* in the following characters (Leis, 1986; see also Tables 1 and 2): all spines on the top of head with 3 subdermal roots (some spines with 4 subdermal roots in *C. spilostylus*) and large dark blotches or clusters of spots on the back and sides of the body (black pupil-size spots on the belly and sides of the body associated with the spines in *C. spilostylus*).

Before Sakai et al. (1992) reported *C. orbicularis* from the Sea of Japan, Abe (1987) briefly stated that it occurs in southern Japan but he did not give detailed localities. In addition to the specimens examined here, *C. orbicularis* has been collected along the coast of the Kii Peninsula, Pacific coast of Honshu (pers. comm., H. Ikeda). The specimens from Japan show no significant differences from those collected in the South China Sea (HUMZ 38051, 95.6 mm SL; HUMZ 50083, 117.7 mm SL).

Our specimens of *C. spilostylus* from the Sea of Japan (Fig. 1) have a color pattern on the fins that differs from what has been reported elsewhere (Fig. 2). In specimens from other than the Sea of Japan (Leis and Randall, 1982; Sainsbury et al. 1985; Leis, 1986; material reported here), the fins of this species are light to medium grey, often with a narrow white margin. The pectoral and caudal fins of the specimens from the Sea of Japan have a wide white band separating the dark proximal and distal parts. This

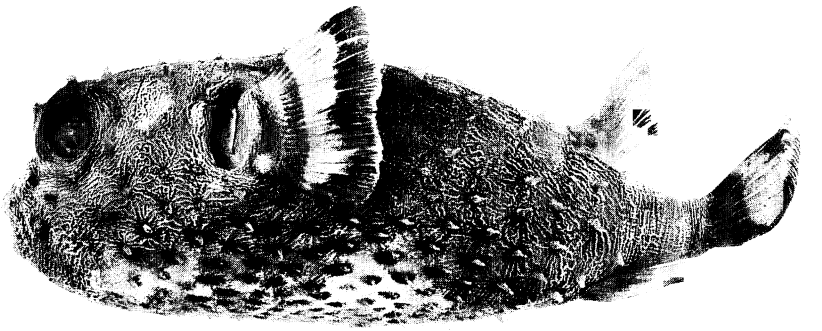

Fig. 1. *Cyclichthys spilostylus.* NSMT-P 41976, 275.0 mm SL, Toyama Bay, Sea of Japan.

color pattern was observed when the specimen (NSMT-P 41976) was reared in an aquarium for two and a half years. When it was alive, the wide white band was transparent and the dark proximal and distal parts were yellow. Because the Sea of Japan specimens were transported from the tropics, they cannot be genetically distinct. Thus, the Sea of Japan fin color pattern suggests that it is either a result of infection to fishes caused by the cold water or an environmentally-induced change. The latter

Table 1. Counts and proportional measurements (expressed as percent of standard length) of *Cyclichthys orbicularis* collected from Japan

	IOP 1148	NSMT-P 35173	NSMT-P 45067	NSMT-P 35175-1	NSMT-P 35175-2	URM-P 4298
Standard length (mm)	100.4	104.0	112.1	129.4	135.7	144.4
Dorsal rays	12	12	12	11	13	12
Anal rays	11	11	11	10	12	11
Pectoral rays	20	20	20	18	21	20
Head length	44.6	46.5	40.1	45.4	45.5	40.2
Snout to anus	87.2	83.4	84.6	77.7	80.5	77.0
Snout to dorsal	82.2	80.3	84.3	76.4	81.1	77.6
Caudal peduncle length	14.0	14.8	14.0	17.0	17.4	18.0
Caudal peduncle depth	6.9	6.2	6.4	6.9	7.0	6.3
Eye diameter	11.4	14.5	8.1	13.3	12.2	18.2
Head width	36.7	38.9	34.3	39.8	37.6	39.1
Body width	45.0	47.3	55.0	50.5	52.0	37.8
Interorbital width	22.5	27.6	23.2	28.9	25.4	15.2
Nostril to mouth	10.0	9.4	8.0	9.6	9.8	11.8
Height of gill opening	11.0	11.1	7.1	10.8	11.3	18.3
Mouth width	14.6	14.6	12.8	14.5	14.5	16.5
Longest dorsal ray	—	19.4	—	—	—	22.2
Longest pectoral ray	—	22.3	17.9	—	17.9	23.5
Longest caudal ray	—	20.8	17.3	—	17.3	27.2
Head spination	1, 2, 2, 2	1, 2, 2, 2	1, 2, 2, 2	1, 0,* 2, 2	1, 2, 2, 2	1, 2, 2, 2
Pre-dorsal spines	8	8	8	8	8	8
Pre-anal spines	12	11	10	10	10	9
Interpectoral spines	4	4	4	4	4	4
Length of longest dorsal spine	6.3	7.2	9.3	5.3	5.7	8.9
Length of frontal spine	5.0	4.5	4.9	4.9	5.5	5.3
Length of longest ventral spine	5.2	6.2	4.9	5.0	5.1	5.2

* Spines abnormally absent.

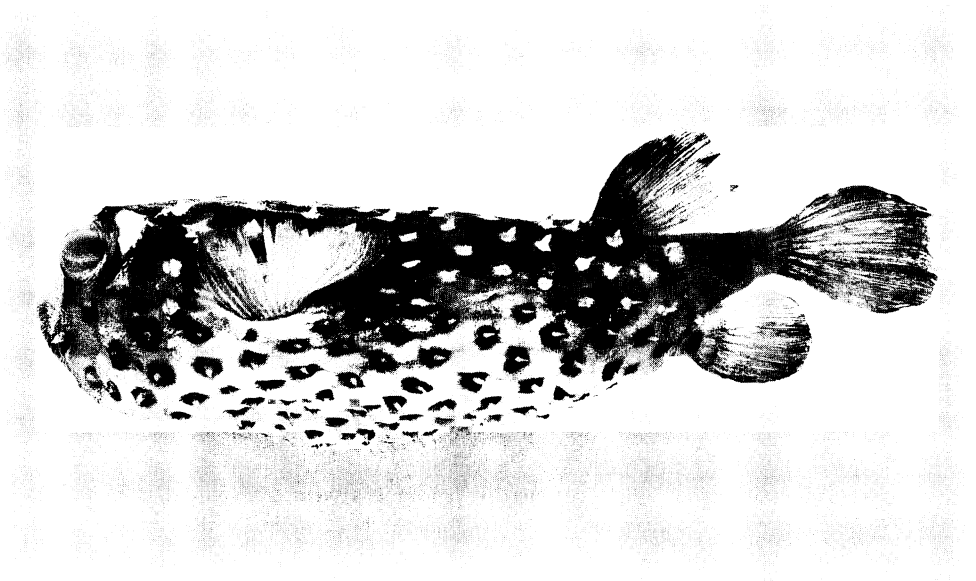

Fig. 2. *Cyclichthys spilostylus.* URM-P 11137, 345.5 mm SL, Ryukyu Islands.

Table 2. Counts and proportional measurements (expressed as percent of standard length) of *Cyclichthys spilostylus* collected from Japan

	NSMT-P 30137	NSMT-P 41977	NSMT-P 41976	URM-P 11137
Standard length (mm)	134.5	137.0	275.0	345.5
Dorsal rays	13	13	10	13
Anal rays	11	10	11	12
Pectoral rays	21	—	21	20
Head length	43.3	45.8	38.8	36.9
Snout to anus	94.7	85.0	78.1	82.6
Snout to dorsal	84.8	87.9	81.3	76.1
Caudal peduncle length	10.9	13.3	13.7	17.8
Caudal peduncle depth	7.7	7.9	8.4	6.9
Eye diameter	9.1	8.9	8.5	12.3
Head width	39.5	35.9	30.4	33.3
Body width	52.6	46.6	38.1	31.1
Interorbital width	22.8	23.0	24.0	20.4
Nostril to mouth	10.4	11.7	11.3	11.1
Height of gill opening	10.4	9.3	10.5	12.0
Mouth width	16.8	16.3	12.5	14.8
Longest dorsal ray	15.9	—	18.3	19.6
Longest pectoral ray	19.9	—	18.8	20.7
Longest caudal ray	—	—	22.5	24.6
Head spination	1, 2, 3, 5, 4	1, 2, 3, 5, 4	1, 2, 3, 5, 4	1, 2, 4, 5, 4
Pre-dorsal spines	11	11	12	12
Pre-anal spines	17	18	17	18
Interpectoral spines	6	6	6	6
Length of longest dorsal spine	4.2	3.8	3.2	2.7
Length of frontal spine	3.4	3.9	2.6	—
Length of longest ventral spine	3.9	1.7	2.9	2.5

case is more likely because one of the specimens, showing this color pattern, was kept for two and a half years in good condition.

One of the authors (KS) has surveyed the fish fauna of the Sea of Japan in all seasons from 1986 to 1992, and found that diodontid fishes are usually collected by set net along the shore in winter one or two days after storms. This observation seems to agree with the hypothesis about the seasonality of diodontid occurrence proposed by Nishimura (1958a–d): The pelagic stage of diodontid fishes is transported by the warm Kuroshio Current and its branch Tsushima Current from the tropics to the Sea of Japan during the summer. The northwest monsoon wind starts to blow in the end of autumn and predominates in winter, and it drives diodontid fishes into schools along the shores and frequently washes them on the beaches along the coasts of the Sea of Japan.

However, our specimens of *C. orbicularis* from the Sea of Japan are too large to have been pelagic. The two specimens (NSMT-P 30137, 41977) of *C. spilostylus* are also relatively large for the pelagic phase, though there is a possibility that they could have been pelagic.

The sizes of these specimens suggest that all of them were living in-shore near the bottom in autumn and were adversely affected by cold water in winter, and not able to swim well. A combination of cold water and storms is probably responsible for the stranding of these near-shore benthic *Cyclichthys* fishes.

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メイタイシガキフグとイガグリフグ（新称）の日本からの記録

松浦啓一・坂井恵一・吉野哲夫

ハリセンボン科のメイタイシガキフグ *Cyclichthys orbicularis* とイガグリフグ（新称）*C. spilostylus* の日本における分布と後者の色彩変異について報告した．この2種はインド・太平洋の熱帯域に広く分布している．両者は日本にも分布するイシガキフグに似るが，尾柄の背面に棘を欠く点で異なる．メイタイシガキフグはイガグリフグから頭部背面の棘に3根をもつこと（イガグリフグでは4根をもつ棘もある），体背面と側面に大きな黒色斑が散在する（イガグリフグでは棘の根元に瞳孔大の黒点がある）ことで区別される．今回の調査でメイタイシガキフグは琉球

列島，紀伊半島，伊豆半島および日本海の能登半島に分布し，イガグリフグは琉球列島と日本海の富山湾に分布することが明らかになった．イガグリフグの日本海の標本は他の海域のものとは尾鰭と胸鰭の色彩が異なり，鰭の中央部の白色帯が先端と根元の暗色部を分けている．これに対して琉球列島やインド・太平洋の熱帯域の標本では尾鰭と胸鰭は一様に淡灰色である．しかし，日本海の標本は鰭の色を除くと他の海域の標本と差を示さなかった．

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