

Spawning Behavior and Social Organization of the Congiopodid Fish *Ablabys taenianotus* at Miyake-jima, Japan

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Literature on reproductive behavior and social organization of scorpaeniform fishes is limited. Most information concerns studies of economically important species of the scorpaenid genus *Sebastes*, with an emphasis on internal fertilization and embryonic development (reviewed by Thresher, 1984). Studies of reproductive behavior of Scorpaeniformes in nature appear to be limited to a few species of pteroin fishes (Fishelson, 1975; Moyer and Zaiser, 1981; Gronell, cited by Thresher, 1984). We know of no field studies of the reproductive behavior of any of the family Congiopodidae.

We observed social behavior courtship and spawning of the congiopodid *Ablabys taenianotus* (Cuvier) at Miyake-jima (34°05'N, 139°30'E), one of the Izu Islands of southern Japan, from September 21 to 28, 1984. Underwater observations, using SCUBA, amounted to 32 man-hours. Dives were made 2–3 times daily to (1) census the study population, (2) determine home range sizes and diurnal activities of individuals in the study population, (3) observe social interactions at different times of day, (4) determine the social organization of the species, and (5) observe spawning behavior.

Results

Habitat. *A. taenianotus* is an extremely cryptic, solitary species that dwells, at Miyake-jima, within dense blankets of algae (*Padina*, *Gelidium*) on a substratum of small rocks, rubble, and sand. Favorite habitats appear to be cul-de-sacs in the rocky reef, where wave and current action is minimal and where large accumulations of wave-torn algae, leaves from terrestrial vegetation, and garbage form a thick cover over the substratum. The fish's resemblance to dead leaves is so striking as to frequently confuse the observer during census observations. *A. taenianotus* further enhances

this camouflage by swaying gently with the surge while feeding, swimming, and courting. Interestingly, when under stress in an aquarium in the total absence of water movement, the fish will begin a surge-like swaying, indicating that to a certain extent, this cryptic movement is under motor control.

Sexual dimorphism and individual recognition. Individuals were easily recognized by the location, shape, size, and number of white spots and blotches on their sides. Sexual size dimorphism was evident. Three adult females, measured underwater, including the single female in our study population, ranged from 135 to 141 mm in total length (TL), and four adult males, also measured underwater, ranged from 86 to 101 mm TL. Sexual dichromatism was conspicuously present in the form of lateral white spots. Females have conspicuous single white spots or blotches both above and below the lateral line on both sides, directly below the 8th–10th dorsal spines. The lower spot is at the level of the upper origin of the pectoral fin. Males have similar spots below the lateral line, but the upper spots are faint or missing on one or both sides. Males have an additional 1–2 small white spots at the upper distal portion of the operculum on both sides. Spots on specimens of both sexes usually disappear after a few days in formalin. The body color of both males and females is a velvety brown, however females darken to become nearly black when in spawning condition.

Social organization. *A. taenianotus* appears to be a diurnal and crepuscular predator, feeding solitarily upon benthic organisms. Repeated censuses at our study site disclosed the presence of one female and three males in an area covering approximately 30 m × 20 m of substratum and ranging in depth from 10 m to 14 m. Home ranges of both males and females appeared to be contiguous, but not overlapping. We have no observations of overlapping feeding ranges. The female continuously occupied a small home range of about 8 m × 10 m, but left it to enter Male A's home range on two consecutive nights just prior to the September new moon to spawn. Male A, the largest male, patrolled a comparatively large area, extending from the edge of Male B's home range to the northeast about 20 m southwestward to the edge of Male C's home range. This long,

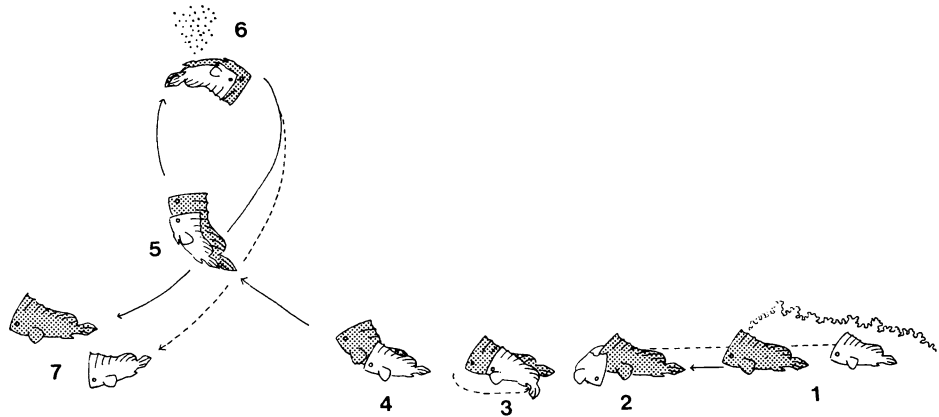


Fig. 1. Motor patterns associated with the spawning of *Ablabys taenianotus*. The dark fish is the female. Solid arrow indicates female movement; dotted arrow shows movement of male. (1) female moves away from algae-covered rocks; (2) male moves up from behind, circling female and brushing her with his dorsal and pectoral fins; (3) male pushes against left side of female; (4) both fish move forward and begin upward rise; (5) slow upward rise; (6) spawning in upside-down position, gametes visible above; (7) descent to substratum.

narrow area was about 12 m in width and bordered the female's feeding grounds on the southeast side. No male-male confrontations were observed, and it is not known whether territorial defense occurs. However, Male A moved slowly from one end of his home range to the other and back throughout the day. The sizes of the home ranges of Males B and C were not determined.

Spawning behavior. The female fed conspicuously in open rubble patches between algae-covered rocks from midday when in spawning condition. Her normally velvety-brown color turned to near black by noon, regardless of background coloration, and by 15:00 h, she was noticeably swollen with eggs. She moved into Male A's home range at about sunset, to a position within 2 m of the spawning site, which was over an area of bare rubble about 60 cm from an algal-covered lava outcropping about 60 cm in height and 2 m in length. Both observed spawnings were at the same location.

Courtship was first noticed exactly six min after sunset on 22 September 1984. The male and female rested under surge-swaying *Gelidium*, about 10 cm apart. Suddenly, the male moved forward, brushing the right side of the female with his long pectoral fins. Periodically, the male circled in front of the female, pushing his body against her and brushing her dorsally with his dorsal fin as

he swayed with the surge (Fig. 1). He then moved to her left side, his head slightly behind hers, and stayed motionless, their bodies in close contact, for more than a minute. At 17:50 h, the female began a slow movement from under the algae across the open rubble. When she was about 20 cm from the male, he swam forward, circled her again, brushed her as she stopped, and swung around to face her. The female started forward and the male joined her on the left side. Side-by-side they began a slow ascent to about 1 m above the substratum, where they began a vertical loop with a radius of about 10 cm. When completely upside-down, about 110 cm above the substratum, they spawned a large, conspicuous cloud of gametes, completed their loop at the same slow speed, and descended to the substratum (Fig. 1). Spawning was at 17:54 h, exactly 15 min after sunset.

A similar spawning was observed the following evening (23 September) at the same location at 18:03 h, 25 min after sunset. Both spawnings were at a depth of 12 m in water temperatures of 25°C. Both Male A and the female were observed simultaneously in their own home ranges at the spawning time over the following five days, and no further spawnings were witnessed.

Spherical, transparent and slightly buoyant eggs, 1.2 mm in diameter and containing a single, small yellow oil globule, were collected from the spawn-

ing of 23 September. No attempt was made to rear the larvae.

There are striking similarities between the spawning behavior of *Ablabys taenianotus* and the pteroine scorpaenid *Dendrochirus zebra* (Moyer and Zaiser, 1981). Both species are solitary benthic carnivores. After a period of feeding cryptically, females of both species move away from shelter and out over rubble. The male circles the female frequently, brushing her with his fins. Spawning takes place several minutes after sunset in rapidly darkening waters. Both species apparently use large conspicuous outcroppings as rendezvous sites (see Moyer, 1980; Moyer and Zaiser, 1981) and females announce readiness to spawn by temporary alterations in color.

Unlike *D. zebra*, which spawns eggs in a protective, unpalatable mucous tube, the eggs of *A. taenianotus* are broadcast unprotected into the water column. Home ranges of both males and females of *D. zebra* broadly overlap, and male-male confrontations are not infrequent. Spawning is promiscuous, but non-random. Home ranges of *A. taenianotus* do not appear to overlap, population density is low, and males seem to practice a strategy of avoidance. No male-male confrontations were observed. From our limited data, it is impossible to tell whether or not spawnings are promiscuous.

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三宅島におけるツマジロオコゼの産卵習性

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ツマジロオコゼは、単独で生活し底生生物を捕食する肉食性魚類である。雌は雄より大きく、体側の白斑に雌雄の相違が見られた。個々の行動圏は同種の他の個体の行動圏と隣接しており重複しない。産卵は日没後の薄暗闇の中で行なわれる。産卵の行なわれる日になると雌の体色は、正午までに黒色に変化し、午後3時までにはその腹部は卵でふくれてくる。日没までに雌は雄の行動圏に移動する。雄は体を曲げて雌の頭部を囲み鰭で雌をこするようにさわり求愛する。その後雌は前進し雄はそれを追う。一緒になった両者は海底から斜上方に泳ぎながら約1m上昇し、更に小さい弧を描いて逆さになり、腹部が真上になった時点で放卵、受精する。産卵は1984年9月22日と23日の両日、三宅島伊ヶ谷水深12mの場所で観察されたが、その後続いての産卵は観察されなかった。この両日は各々新月より3日及び2日前であった。産卵時の水温は25°Cであった。ツマジロオコゼとキリンミノ *Dendrochirus zebra* の産卵習性には多くの類似点が見い出される。

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