

Notes on the Spawning Behavior of the Wrasse, *Cirrhilabrus temminckii*

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(Received October 8, 1974)

The labrid genus, *Cirrhilabrus* Temminck and Schlegel, is represented by nine nominal species occurring from Africa and the Red Sea east to Hawaii and north to Japan (de Beaufort, 1940; Shultz, 1960; Springer and Randall, 1974). Breder and Rosen (1966) make no mention of the spawning and reproductive behavior of any species of the genus in their book of fish reproduction and we have found little reference to it elsewhere.

At approximately 4:45 PM, Aug. 24, 1974, we observed the spawning of the wrasse, *Cirrhilabrus temminckii* Bleeker, in 7 m waters in Igaya Bay, Miyake Island, Japan (34°05'N, 139°30'E). The substrate at the spawning site consisted of small, algae covered rocks over sand, with extensive outcroppings of coral within five meters of the site. Reproductive activity was centered around a relatively large boulder near the center of the site. The water temperature was 25°C.

We were attracted to the spawning site by the conspicuous signaling behavior of the male. His entire body appeared to be a deep iridescent blue, except for the anal fin, caudal fin, and the soft dorsal fin, all of which were light, shiny iridescent blue and the pelvic fins which were white. He circled rapidly in a counterclockwise direction from a point about 1.5 m upwards to about 3 m above the substrate. His caudal fin flashed in rapid movement, its shiny iridescence visible horizontally for perhaps 15 m. Ten or more drably colored *C. temminckii* aggregated around the boulder at heights varying from a few centimeters to 1 m above the substrate. The rapid looping display seemed to attract their attention and the entire aggregate gradually moved nearer to the male. On four occasions, a single member of the aggregate, but not always the same one, rose higher than the others. Each time, the male rushed to a point very close to the approaching individual, perhaps even touching it with his side or abdomen. Then, both fish dashed in a sharp upward angle from the boulder to a point more than 3 m above the substrate, suddenly reversing direction and

returning to their original position. On one occasion, a clearly visible cloud of reproductive materials was snapped out at the apex of the upward dash. Once, a drably colored individual left the male and swam downward toward the other members of the aggregate. He chased after it, his bright iridescent caudal fin churning rapidly, as it had in the looping signal display.

Although spawning has been observed only on the above occasion, we have frequently seen variations of the courtship display. These always consisted of a single brightly colored male with an aggregate of drably colored individuals. The male constantly moved around throughout the group, feeding and occasionally enticing. His body color, at depths of from 7~14 m, appeared lavender, and his caudal fin, anal fin, and soft rays of the dorsal fin were always an iridescent light blue, visible from a great distance, but less brilliant than during spawning. In one frequently observed individual, the soft rays of the dorsal fin moved rapidly at all times, even as he fed, as if to flash his presence to all in the aggregate. Caudal and anal fins were not extended and did not move. Feeding males in other aggregates did not flash their soft dorsal or any other fin. In all cases, the long and narrow pelvic fins were extended downward, white, and clearly visible.

Enticement began with the entire body turning a deep iridescent blue, but less brilliant than in the spawning individual. The caudal, anal, and soft dorsal fins remained very light and iridescent. Enticement was usually accompanied by extremely rapid movement of the soft dorsal, caudal, and possibly the anal fin. However, in some individuals, only the caudal fin was flashed, with the soft dorsal folded against the body. Often, the male initially chased a drably colored fish as if to attract its attention; later going into the looping display described above. The long pelvic fins were extended throughout all phases of courtship.

Courtship displays have been observed at depths of from 7~14 m, in water temperatures from 21°C~28°C, morning and afternoon, and at all phases of the moon. Our earliest courtship observation was on May 13, 1974 and the latest on Aug. 25, 1974.

Discussion

The upward spawning rush, followed by the snapping downward motion as gametes are released, appears very similar to spawning behavior of various wrasses of the genera *Thalassoma* Swainson (Breder and Rosen, 1966; Feddern, 1965; Hobson, 1965; Moyer, 1974; Randall and Randall, 1963), *Stethojulis* Günther (Shepard and Meyer, personal observation), *Halichores* (Randall and Randall, 1963), and *Coris* (personal observation). Further similarities are apparent between the reproductive behavior of *C. temminckii* and the paired spawning activity of *Thalassoma bifasciatum*. *T. bifasciatum* males participating in paired spawning are invariably bright phase individuals. As in *C. temminckii*, paired spawning is initiated from a prominent point of visual reference, e.g., an outcropping of elkhorn coral (Reinboth, 1973). Males exhibit a spiralling upward movement, with a quivering motion of the caudal fin, immediately prior to the spawning dash.

Group spawning has not been observed in *C. temminckii*, but does occur in *Stethojulis* (Shepard and Meyer, personal observation) and is common in *Thalassoma* (Feddern, 1965; Randall and Randall, 1963). Randall (personal communication) suggests that many wrasse genera exhibit both paired and group spawning, although one form or the other may predominate to the extent of seeming to be the sole method of reproduction if field observations have been limited or incomplete. The possibility must be considered that observations made under different ecological conditions or in other geographical areas would reveal group spawning in this species.

In *C. temminckii* two basic color phases are observed: a "drab" phase and a developed or "bright" phase. The latter is rare, occurring only in a single large individual in a given aggregate. The drab phase is the common form, being observed in individuals of all sizes. *C. temminckii* seems to exhibit "developed dichromatism", as described by Choat (1969); the colors of the bright phase *C. temminckii* represent an intensification of the drab coloration. On the other hand full dichromatism which shows a distinctly unique pattern is found in *Thalassoma bifasciatum* (see Stoll, 1955). The intensity of the bright phase seems to vary according to the activity of the

individual observed. A feeding individual is less brilliant than an enticing individual, which in turn is less brilliant than a spawning fish. However, the bright phase specimen is easily distinguished from the drab members of the aggregate at all times.

Although systematic collection and gonadal examination were not conducted, we assume that the bright phase *C. temminckii* is a dominant, sexually active male and the drab individuals are immatures, females, and possibly sexually inactive males. Such a trend has been reported in other labrids exhibiting either full or developed dichromatism (Choat, 1969; Reinboth, 1973).

A close look at drab members in *C. temminckii* aggregates shows interesting variations in color and morphology. The largest individuals often have lost the white spot on the snout and some have lavender coloring along the lateral line. In a few, the soft dorsal and caudal fins are turning blue. In many large specimens, the pelvic fins are somewhat elongated and backs are slightly humped, but not nearly as marked as in bright individuals. Large specimens of this type equal bright individuals in size. The role of these transitional specimens is of special interest. The presence of a single bright phase individual in each group, and the morphological and color variations of the drab individuals described above, may suggest a social sex reversal similar to that of *Labroides dimidiatus* (Valenciennes) (Robertson, 1972). A struggle for dominance, perhaps related to sex reversal, may have been the motivation for aggressive behavior observed on Sept. 15, 1974. A transitional *C. temminckii*, with lavender lateral line coloring and blue soft dorsal and caudal fins, was observed aggressively pursuing a similarly colored individual. The chase continued for perhaps 15 seconds, in and around the aggregate of 10~12 fish. Suddenly, the pursued fish turned on its aggressor and instantly the two fish locked jaws. They held this pose, completely motionless for about 6~7 sec., then turned abruptly in opposite directions and resumed feeding.

However, the possibility of a social hierarchy among the male members of a *C. temminckii* aggregate cannot be discounted. In *Thalassoma bifasciatum*, a single dominant male commands a given spawning site, suppressing the sexual activity of the lower ranking males in the surrounding area

(Reinboth, 1973). It is possible that the transition of a drab male *C. temminckii* to the bright phase, and thus his sexual activity, is controlled by the presence of a bright individual in an aggregate. Further studies of the behavior and reproductive physiology of this species, particularly the sexual identities of the color phases, are needed.

Acknowledgments

We wish to thank Kathy Meyer, Marjie Carroll, and Joanna Reid of our station for sharing their field notes with us, and Mr. Torao Sato, Tokyo University, for helping us find pertinent literature. Mr. A. Nakazono, Kyushu University, and Dr. John E. Randall, Bernice P. Bishop Museum, Hawaii, are especially thanked for providing useful literature and for review of the manuscript.

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イトヒキベラの生殖行動

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三宅島で8月にイトヒキベラの生殖行動が観察された。雄の体色は虹色に輝く深青青色で、垂直鰭の大部分は明るい青色である。底近くに群るくすんだ色をした個体群の上で、逆時計廻りに速いスピードで回転する。くすんだ体色の個体が群を離れて上昇すると、雄はその個体に素早く近寄り、2個体は底から3m位上までダッシュする。それから突然向きを変えてそれぞれの元の位置に戻る。上昇した頂点で、生殖物質を放出するのが1度観察された。

この例の他に5月中旬以降に courtship display がしばしば観察されたが、常に輝いた体色の雄1個体とくすんだ色の他の個体群によって構成されていた。

イトヒキベラの生殖行動を他のベラ類のそれと比較して論じた。

(100-12, 東京都三宅村阿古 富賀農園 田中達男記念生物実験所)