

Spawning Behavior of the Bumphead Parrotfish *Bolbometopon muricatum* at Yonge Reef, Great Barrier Reef

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Bolbometopon muricatum are the largest members of the family Scaridae, growing to 150 cm TL and weighing up to 75 kg. They inhabit coral reefs throughout the Indo-West Pacific region, except Hawaii (Munro, 1967; Smith and Smith, 1969; Carcasson, 1977). There is little information about the biology of *B. muricatum*. Johannes (1981) reported that *B. muricatum* around Palau migrated into shallow waters around sunset from their feeding grounds in deeper waters. Spearfishing by natives at night has reduced the numbers of *B. muricatum*. Personal observations around Lizard Island (Great Barrier Reef) have revealed that individuals usually occur as part of schools containing 20 to almost 100 fish which often move into shallow waters while feeding. *B. muricatum* appear to be omnivores; they scrape algae from the reef flat and also consume fist-sized chunks of massive corals (*Platygyra*, *Leptoria*, *Goniastrea*) and the more stubby species of *Acropora*. Palauan fishermen have caught bumphead parrotfish whose stomachs were filled with sea urchins (Johannes, 1981). *B. muricatum* are generally timid and difficult to approach.

I observed *B. muricatum* spawning on the morning of January 15, 1985. The spawning occurred at the mouth of a coral gutter on the northern end of Yonge Reef (approximately 11 nautical miles north-east of Lizard Island, 14° 38'S, 145°28'E). The coral gutter opened into the passage between Yonge Reef and Carter Reef and was swept by currents on the rising and outgoing tides.

The *B. muricatum* were first seen at 0600. They formed a tightly packed school of about 100 individuals, slowly swimming to and fro across the mouth of the coral gutter. Individuals were arranged vertically within the school, from the seafloor (15 m depth) to about 2 m below the water's surface. The *B. muricatum* were approachable on this occasion; I was able to swim to within 2 m of the school and was also encircled by the school for several minutes.

All fish within the school, except one, displayed the usual drab green coloration. The largest individual, who swam at the top of the school, presented a mottled coloration of light green, cream-white, and light brown. This largest individual occasionally chased the smaller members of the school, but did not appear to direct the movements.

Spawning occurred when the largest fish swam slowly out of the school, towards the surface, alongside one of the smaller fish. Both fish ascended simultaneously for 1–2 m along a curved path; the large fish had not forced the smaller fish from the school. Their abdomens were touching (Fig. 1A). About 1 m below the water's surface the two fish turned away from one another and, at the same time, a clearly visible cloud of gametes was released by each fish (Fig. 1B). Both fish then swam slowly downwards and rejoined the school. The spawning occurred at 0735; high tide was at 0540 and it was one day after the moon's last quarter. No further spawnings were seen. The school left the mouth of the coral gutter and swam into the passage that separated the two reefs.

Spawning in *B. muricatum* has not been previously reported. Palauan fishermen told Johannes (1981) that *B. muricatum* aggregated near the inner entrances of channels between reefs on the 8th day of the lunar month. Johannes (1981) predicted that *B. muricatum* in Palau spawned on the 8th or 9th day of the lunar month, after sunset. The bumphead parrotfish that I observed at Yonge Reef spawned in the morning, on the 20th day of the lunar month.

The reproductive behavior of *B. muricatum* is both similar to, and different from, the reproductive behavior of other coral reef scarids. Prior to spawning most scarids migrate to a site on the reef that ensures rapid dispersal of their fertilized eggs. Spawning migrations, and the time of spawning, frequently coincide with tidal changes in water movements (Thresher, 1984). *B. muricatum* spawned on the edge of a channel between reefs on an outgoing tide. The school then swam into the channel. It is possible that more spawning occurred in the strong currents that swept the channel.

The spawning of *B. muricatum* that was observed involved a single male and female. Pair

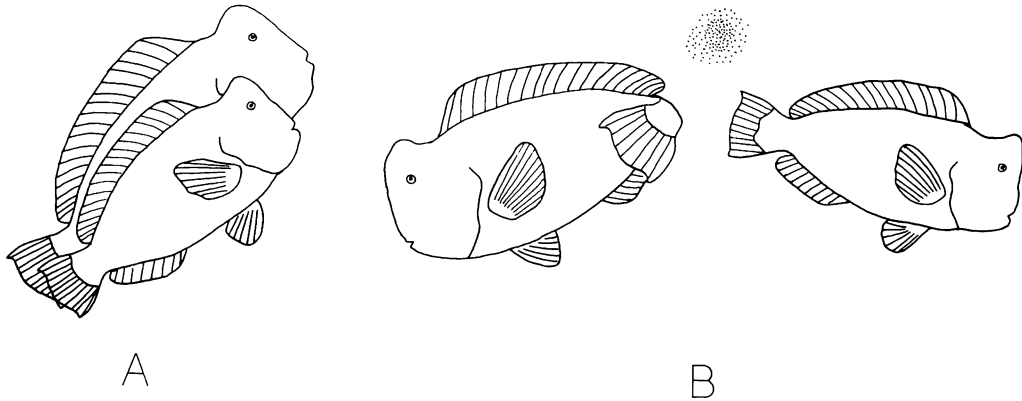


Fig. 1. Two stages in the spawning sequence of *Bolbometopon muricatum*. A, the two fish leave the spawning school and slowly swim towards the surface. B, gametes are released at the peak of the ascent as both fish begin to turn away from one another. The shaded patch above the two fish represents the visible cloud gametes that were released.

spawning in other scarids is preceded by the establishment of temporary spawning territories by males. As females move through the spawning territories they are courted by the male. Spawning involves a rapid dash by a pair towards the surface, gamete release, then a rapid descent (Thresher, 1984). *B. muricatum* also spawned pair-wise but temporary spawning territories were not established by males. Amongst the range of scarid reproductive behaviors reviewed by Thresher (1984) there was no assemblage of individuals equivalent to the "spawning school" of *B. muricatum*. This spawning school was a mobile group of individuals from which a pair spawning took place.

Spawning of *B. muricatum* involved a slow ascent, gamete release, then a slow descent. This is unlike other pelagic spawners who rush upwards, release their gametes, then descend rapidly. It has been hypothesized that the rapid, upward dash facilitates the passage of fertilized eggs away from reef-based predators. At the same time, a rushed spawning is advantageous because it exposes the spawning individuals for a minimum time, thereby reducing the chances of predation (Ehrlich, 1975; Robertson and Hoffman, 1977; Johannes, 1978; Barlow, 1981; Thresher, 1984). The large size of *B. muricatum* probably reduces the range of potential predators. The selection pressure for individuals to rush their spawning

act might thus be minimal. Indeed, Thresher (1984) derived the minimum body sizes at which day and dusk spawning species are freed from the threat of predation; the size for day spawning species was 17 cm SL. Furthermore, Thresher (1984) found a positive correlation between body size and spawning height. None of the *B. muricatum* in the spawning school were smaller than about 60 cm TL. The observed spawning began from the top of the spawning school and gametes were released about 1 m below the surface; this represented a spawning height of about 14 m above the sea floor.

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カンムリブダイの産卵行動

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カンムリブダイの産卵行動をオーストラリアの Yonge Reef で観察した。産卵はリーフの水路入口で行われた。産卵をした個体は約 100 尾の群れの中の雄 1 尾と雌 1 尾であった。この群れは海底（水深 15 m）から水面下 2 m まで、垂直に形成されていて、その一番上に産卵に関与した最大の個体がいた。この個体は他の個体とは色彩が異なり、明るい緑色、乳白色、そして明るい茶色がまだらに体を覆っていた。雄と雌はゆっくりと水面へ向かって上昇し、腹部を接触させて、水面下 1 m で放卵・放精が行われた。この後、雌雄はゆっくりと下降し、群れにもどった。本種と他のブダイ科魚類の産卵行動の相違についても論議した。