Spawning in *Trochus maculatus*: field observations from Bolinao, Pangasinan (Philippines)

Fig. 1 Spawning male *Trochus maculatus* (arrow; gametes), perched on dead giant clam shell. Scale bar 1 cm

The maculated top shell *Trochus maculatus* inhabits the lower to sublittoral zones in Indo- and South Pacific reefs, feeding on green and red algae and benthic diatoms. As *T. maculatus* is economically important, e.g., its meat for food and its shell potentially in button making, Thailand has developed culture methods for this species (Chunhabundit et al. 2001). Hatchery rearing of *T. maculatus* shows spawning during the new and early full moons (Chunhabundit and Thapanand 1993). Literature on natural spawning of *T. maculatus* is nil.

On April 11, 2012, 29 *T. maculatus* individuals were observed releasing gametes at 0900–1045 hours and 1100–1220 hours, 3 days after full moon, within the Bolinao Marine Laboratory's giant clam ocean nursery (northwestern Lingayen Gulf). Depth was ~2 m, substrata sand–coral, and water temperature ~29.5 °C within summer's ambient range. Current was moderately strong; the tide was high and still rising. The top shells aggregated and perched on *Tridacna gigas* shells (Fig. 1a, b). Males first released a stream of sperm (Fig. 1a, b), then 3 females, ~1 m away, released eggs ~5 min after sperm release.

Aggregation and perching are likely spawning behaviors as top shells returned to crevices later. The average basal diameter of spawned individuals was 3.3 ± 0.2 cm. Spawning of 36 *T. maculatus* individuals was again observed in the nursery in a smaller area on February 11, 2013, a day after new moon. The top shells spawned from 1430 to 1500 hours. In 2 h, 5 females released eggs. Water temperature was 28 °C, and again, the tide was rising. Observations were opportunistic, coincident with nursery monitoring, hence, no comparison has been made between rising and ebb tides. Our observations reveal *T. maculatus* spawning naturally during daytime, at more than one period in the year. The environmental cue for spawning may be a rising tide, 1–3 days after a new or full moon.

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