Mushroom corals overcome live burial through pulsed inflation

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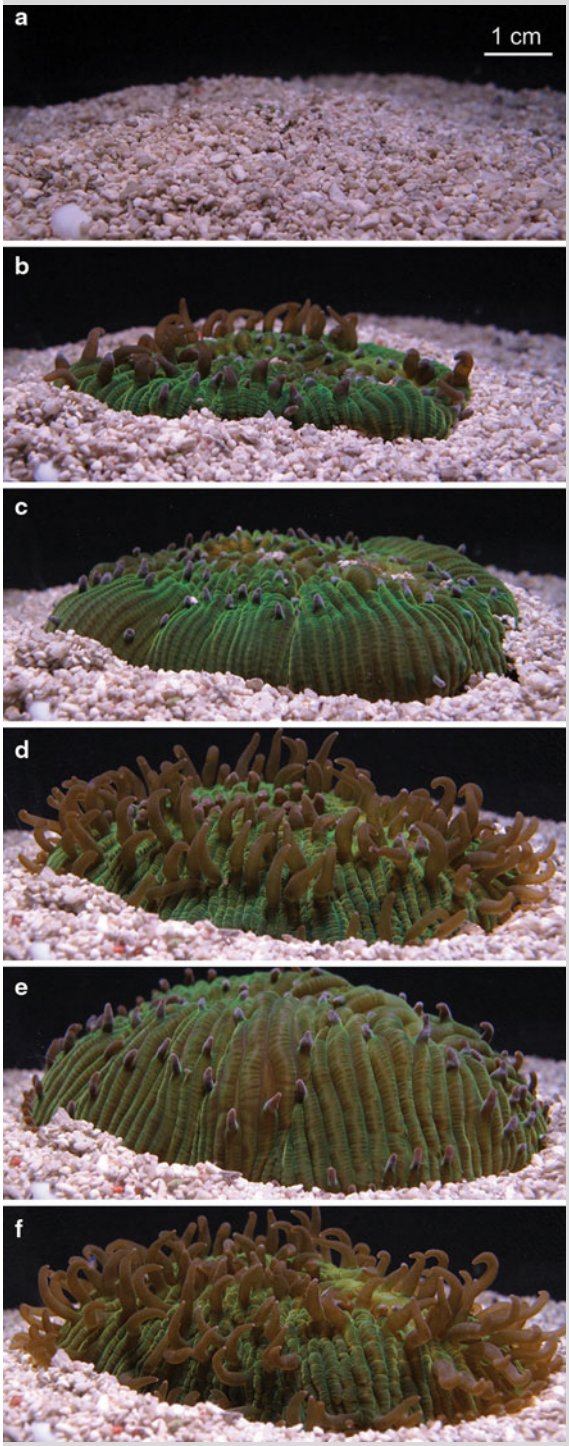

Fig. 1 Still shots from time-lapse video (20 h) showing cycles of tissue inflation and deflation in a *Herpolitha limax* specimen after being completely covered by sediment: **a** t = 0:00 h, **b** t = 5:30 h, **c** t = 6:00 h, **d** t = 14:15 h, **e** t = 17:15 h, **f** t = 20:00 h

Sedimentation represents a major stressor for scleractinian corals. Although many coral species exhibit the capacity of active sediment rejection (Stafford-Smith and Ormond 1992), only few are capable of freeing themselves after becoming completely buried. Fungiid corals appear to be an exception, as they can remove sediments through substantial polyp inflation (up to five times their normal size) in addition to mucus entanglement and ciliary action (Schuhmacher 1977). Using time-lapse photography (speeding up time 300×), we observed that this inflation occurs in rhythmic pulses (Fig. 1), allowing corals to completely exhume themselves after becoming covered in sand.

Specimens of *Lobactis scutaria* (Lamarck, 1801) and *Herpolitha limax* (Esper, 1797) from Heron Island (Great Barrier Reef) were placed in aquaria, covered with coarse sand (0.5–1 mm), and photographed every 10 s over a 10–20 h period (videos available as ESM and at: http://www.coraltimelapse.com/reefsite). Pulses occurred at intervals ranging from 10 to 20 min with each pulse characterized by (1) a gradual inflation phase of 1–3 min, (2) a rapid inflation phase (<10–15 s), and (3) a slower deflation phase of 3–5 min. Tentacles retracted during inflation, whereas they extended during deflation and waved from side-to-side in between pulses due to peristaltic waves of tissues on septal ridges. The extent of inflation in each pulse increased over time (15–25 cycles) until the coral was completely freed from sediment particles.

The combination of rhythmic pulses and peristaltic waves (during deflation) appears to represent an effective sediment shedding mechanism that allows these fungiids to excavate themselves within hours. Due to the relatively long time intervals at which fungiid specimens were examined in previous sediment rejection experiments, such periodicity and details of the shedding mechanism were not observed earlier (Marshall and Orr 1931; Schuhmacher 1977). Time-lapse photography is a well-established technique in microbial and botanical research and provides an effective tool to study behavioural responses in reef organisms.

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