Reef sites

Capacity for regeneration in crown of thorns starfish, *Acanthaster planci*

Fig. 1 **a** *Acanthaster planci* outbreak on the Great Barrier Reef; **b** *A. planci* cut into two equal halves; **c** after 7 weeks, both halves (only one pictured, one arm lost) were almost entirely healed; **d** *A. planci* starting to regenerate new arms after 6 weeks

Population outbreaks of the coral-feeding crown of thorns starfish, *Acanthaster planci* (Fig. 1a), are, with storms, the most significant disturbance on coral reefs in the western Pacific (e.g., De'ath et al. 2012). Controlling outbreaks of *A. planci* is therefore increasingly viewed as a key strategy in reducing coral loss and reef degradation. Initial control efforts in the 1960s involved sectioning starfish and leaving them in situ, but there were subsequent anecdotal reports that *A. planci* could regenerate from small pieces of remnant tissue. Regeneration is a common characteristic amongst echinoderms as a form of asexual reproduction, or following loss of appendages through predation, stress or disease. Regeneration has been recorded in at least 21 species within the Asteroidea (Emson and Wilkie 1980).

The capacity of *A. planci* to regenerate remains controversial. While *A. planci* is not known to undergo asexual reproduction, sectioned animals have been reported to survive for prolonged periods (Sweatman and Butler 1992). We cut four individuals into two equal halves (Fig. 1b), and another four individuals into two sections approximating 2/3 and 1/3. Animals were kept in individual flow-through tanks and photographed over a 7-week period. A total of 100 % mortality was observed in all four 1/3 segments within 3 d. In contrast, 75 % of both halves and 75 % of 2/3 segments survived. At 7 weeks, the wounds appeared to be greatly healed (Fig. 1c) and some of the segments were regenerating new arms (Fig. 1d). These results provide evidence that *A. planci* can regenerate from extensive tissue loss, but survivorship appears to be dependent on maintaining at least part of the central disc. Sectioning *A. planci* as a measure to control populations should be avoided in the absence of further knowledge regarding the survivorship, feeding ability and reproductive capacity of regenerated individuals.

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