

The crown-of-thorns starfish (COTS)

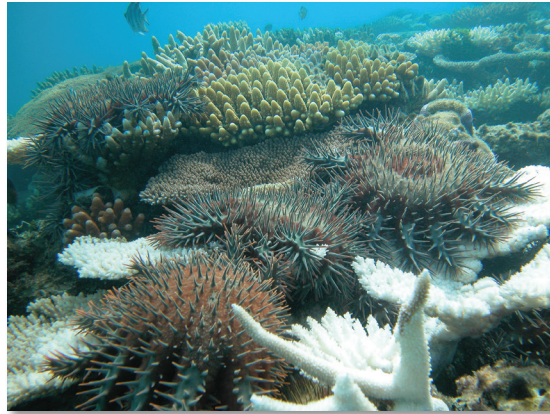
What is the crown-of-thorns starfish?

The crown of thorns starfish (*Acanthaster planci*) (COTS) is a coral-eating starfish that occurs naturally on reefs throughout the Indo-Pacific region. COTS live exclusively on live adult corals.

Why is it a problem?

When conditions are right for COTS to multiply, the starfish can reach plague proportions and devastate the hard coral population on affected reefs. Each starfish can eat up to one square metre of coral per month and as the population increases, they can dramatically reduce coral cover on reefs. COTS outbreaks are responsible for a large decline in coral cover, and coupled with cyclones and bleaching, is seen as key driver in the loss of coral cover (~50%) in the GBR (De'ath et al. 2012). Over the past 50 years, the Great Barrier Reef has experienced three major population outbreaks (Fabricius et al. 2010). Each wave has severely reduced coral cover, especially in the central section of the reef. Since early 2011, a new population of starfish has been observed off Cairns, which is believed to be the beginning of the fourth wave (Brodie & Waterhouse 2012).

The AIMS long-term monitoring program shows that reefs take 10 to 20 years to recover between outbreaks. Reefs affected by other stresses, such as coral bleaching, cyclones or poor water quality, may not get a chance to recover completely. The outbreaks appear to have increased



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in frequency in recent times (since 1950).

What causes COTS outbreaks?

Many reports from around the world suggest that there is a relationship between nutrient enriched coastal waters, and increased survival of juvenile COTS, which can drive very high numbers of adults COTS on coral reefs. During periods of high river flow, water with high sediment and high nutrient loads is washed into the Great Barrier Reef. These nutrients from fertilisers and soil lost from farms and grazing land can cause an increase in microscopic algae (phytoplankton) in the water, providing food for young crown-of-thorns larvae.

We have seen evidence for this. The previous major COTS outbreaks have occurred 3-5 years after wet years in the Burdekin and Wet Tropics rivers. The 1979 and 1994 outbreaks occurred three to five years after the two wettest years on record (Fabricius et al. 2010) and the current build-up of COTS followed large and early floods from the Burdekin and Wet Tropics rivers in January 2008 and 2009 (Brodie



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and Waterhouse 2012). The location of outbreaks – between Cairns and Lizard Island – coincides with the areas where terrestrial run-off floods the shelf after cyclones and monsoonal rain.

The size of the phytoplankton present in coastal waters is linked to COTS larval survival and higher phytoplankton biomass. High nutrients can drive changes in phytoplankton community to larger size plankton. This gives the COTS larvae a higher chance of survival (Brodie et al. 2005; Fabricius et al., 2010) in periods of nutrient enrichment.

What can we do about COTS?

There are few options currently available for managing COTS outbreaks. Methods to reduce adult starfish numbers are labour intensive and expensive and only practical in small areas (Brodie and Waterhouse 2012). Having a system in place that maintains healthy

and resilient reef ecosystems and reducing the amount of nutrients in run-off through better land management is the only solution so far to prevent future large COTS populations from developing.

References

Brodie J. & Waterhouse J. (2012) *A critical review of environmental management of the 'not so Great' Barrier reef*, **Estuarine, Coastal and Shelf Science**.

Brodie JE, Fabricius K, De'ath G, Okaji K (2005) Are increased nutrient inputs responsible for more outbreaks of crown of thorns starfish? an appraisal of the evidence. **Mar Pollut Bull** 51: 266-278

De'ath, G., Fabricius, K. E., Sweatman, H., & Puotinen, M. (2012). *The 27-year decline of coral cover on the Great Barrier Reef and its causes*. **Proceedings of the National Academy of Sciences**, 109(44), 17995-17999.

Fabricius K., Okaji K. & De'ath G. 2010. *Three lines of evidence to link outbreaks of the crown-of-thorns seastar *Acanthaster planci* to the release of larval food limitation*. **Coral Reefs** 29, 593-605.

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