

# Reef sites

## Mass stranding of crown-of-thorns starfish



**Fig. 1** Mass stranding of crown-of-thorns starfishes *Acanthaster planci* in Urasoko Bay (24°27'18"N, 124°13'19"E)

(2–10 m depths) in the summer of 2010. There, where *Acropora* corals comprised 20–60 % coverage before the outbreak (Suzuki et al. 2012), all families present were seriously damaged by the COTS, especially Acroporidae, Mussidae, and Pectiniidae (less than 1 % coverage in the winter of 2011). It appears that the COTS then invaded the inner reef and gradually moved into the inner part of the bay by the end of 2011, even though there were few corals there. It was suspected that they starved at that stage, when many COTS were observed moving across the sea floor, presumably in search of corals. The mass stranding might be the result of emaciated and weakened COTS, partly under the influence of currents, aggregating on the lower beach at high tide, and being left high and dry when the tide receded. The stranding may have been exacerbated by shoreward winds that had continued for several days just before the stranding. An already low sea surface temperature (SST) in Urasoko Bay had decreased a further 1.6 °C (from 21.8 to 20.2 °C) in the 3 days before the stranding, but such changes occurs frequently during winter, so in itself, the cooling seems unlikely to have been a direct cause of the mass stranding. Similar stranding of COTS (around the northern beaches of Ishigaki Island) had been reported in local newspapers twice in February and August 2011. Together, these observations possibly provide an answer to the question of what happens to COTS when they have completely depleted their food, at least on reefs within lagoons and around islands. On other reefs with different morphologies and hydrodynamic settings, COTS die and disintegrate on or near the reef, as evidenced by the finding of COTS spicules in near-reef sediments (Walbran et al. 1989).

### References

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In late January 2012, 806 individuals of crown-of-thorns starfish (COTS) *Acanthaster planci* were stranded on a 300 m section of a sandy beach at Urasoko Bay, Ishigaki Island (southern Japan) (Fig. 1). Additional strandings were observed about two times per week in the same point (approximately 1,000 and 300 individuals, respectively). Their average diameter was  $23.35 \pm 3.64$  cm (mean  $\pm$  SD;  $N = 100$ ). These COTS had been observed moving on the sand in shallow water near the beach 4 or 5 days before mass stranding, indicating that they had actively aggregated in the inner part of the bay, not carried there by currents after their death. In Urasoko Bay, adult COTS were common in 2009, and there was an outbreak of juvenile COTS (the diameter was 3–4 cm; the density was more than 1 COTS  $m^{-2}$ ) on the outer reef slope

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