Australian Government
Department of the Environment, Water, Heritage and the Arts

Marine and Tropical Sciences Research Facility Milestone Report, February 2010

Program 1: **Status and trends of species and ecosystems in the Great Barrier Reef**

Project 1.1.2: **Condition and trend of the Great Barrier Reef ecosystem: Indicators, thresholds of potential concern, and ecological influence of the Great Barrier Reef Zoning Plan on mid and outer shelf reefs**

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Summary

Waves of outbreaks of the destructive crown-of-thorns starfish (COTS) (*Acanthaster planci*) are thought to start on reefs north of Cairns and then spread south to the reefs of the central Great Barrier Reef. COTS early warning surveys are designed to detect substantial increases in starfish numbers that might precede a new wave of outbreaks. Surveys of 37 reefs between Cairns and Lizard Island in December 2009 detected one or more *A. planci* on 5 of 14 reefs surveyed at 14-15°S; on 4 of 10 reefs at 15-16°S; and on none of 13 reefs at 16-17°S. This was a slight increase in the proportion of reefs with starfish present in the region 15-16°S and a slight decrease in the region 14-15°S. The densities of starfish on all reefs were well below outbreak levels; the highest number recorded at one reef was eight starfish, observed at Lizard Island reef.

While the increases in starfish densities were small, the numbers of reefs with starfish present increased in the region 15-16°S in 2008-2009 and 2009-2010 (see Figure 3, this report), suggesting that continued vigilance would be advisable.

Project Results

Crown-of-thorns starfish early warning surveys

The three waves of outbreaks of crown-of-thorns starfish *Acanthaster planci* that have passed through the central Great Barrier Reef (GBR) started somewhere north of Cairns and progressed southwards. Brodie *et al.* (2005)[1] specifically identified the region between Cape Grafton and Cape Tribulation (16-17°S) as the 'initiation region', linking this to hydrodynamics and water quality in this area. Note that reefs were surveyed by manta tow and the probability of recording starfish when using manta tow is less than 10% of that when searching on Scuba (Fernandes 1991)[2]. This means that, while a record of a single starfish

[1] Brodie, J., Fabricius, K. E., De'ath, G. and Okaji, K. (2005) Are increased nutrient inputs responsible for more outbreaks of crown-of-thorns starfish? An appraisal of the evidence. *Marine Pollution Bulletin* 51: 266-278.

[2] Fernandes, L. (1991) Development of a more robust method for determining the status of individual reefs with respect to outbreaks of crown-of-thorns starfish (*Acanthaster planci*). Report to the Great Barrier Reef Marine Park Authority, Townsville (47 pp.).

on a reef is hard to interpret, an observation of 8 individuals on a reef implies that substantial numbers are present. As was the case a year ago, surveys of reefs between Lizard Island and Cairns (Figure 1) did not observe any reefs with outbreak densities of starfish (although eight starfish were seen at Lizard Island reef: this represents a density of 0.09 starfish per tow, compared with the outbreak density threshold of 0.22 per tow for an *Incipient* outbreak and 1.0 for an *Active* outbreak). While the numbers of starfish seen at each reef was low (usually single individuals: Figure 2), the number of reefs where at least one starfish was observed increased in the north in 2008-2009, notably in the region 15°-16°S (Figure 3) and has continued to increase over the past year. This area is to the north of the initiation zone identified by Brodie *et al.* (2005).

The objective of the early warning surveys is to give advance warning of increases in starfish numbers that might precede and initiate a new wave of outbreaks, and so allow tourism operators, particularly in the Cairns region, to prepare for outbreaks at their sites. Primary outbreaks of *A. planci* have never been reliably identified on the GBR, so the critical starfish densities are unknown. While the evidence for a substantial recent increase in starfish densities is limited, the proportion of reefs with low densities of starfish increased in the region 15-16° S in 2008-2009 and 2009-2010 (Figure 3), suggesting that continued vigilance would be advisable.

This component of Project 1.1.2 has been completed and the other components are on track.

Communications during this milestone reporting period

The Australian Institute of Marine Science Long-term Monitoring Program was inadvertently drawn into the climate change debate following a cold-call from Jamie Walker of *The Australian*, with subsequent media coverage and commentary on Mediawatch. See a summary at: http://www.abc.net.au/mediawatch/transcripts/s2813774.htm

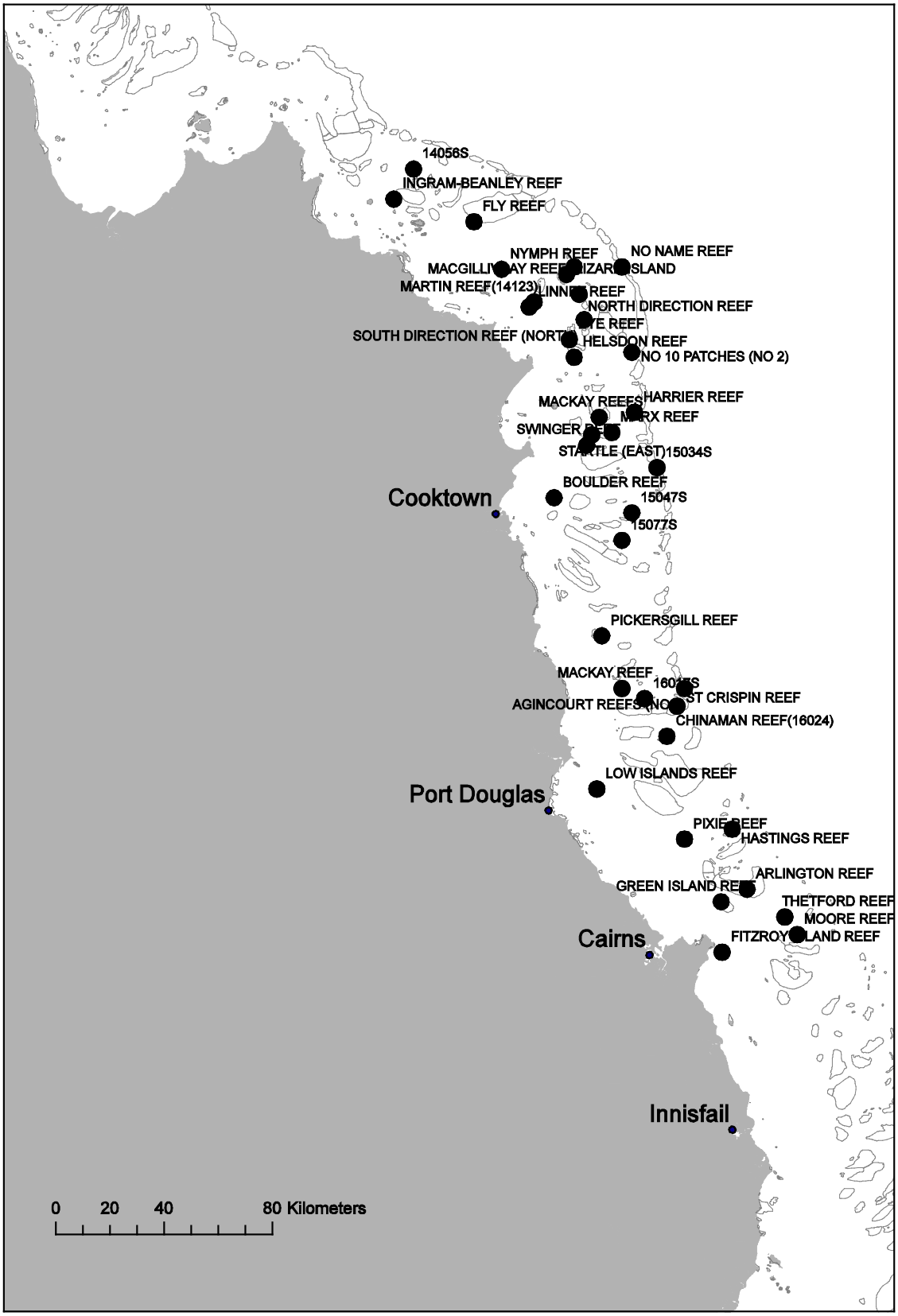

Figure 1: Map of the Great Barrier Reef region showing reefs that were surveyed by manta-tow for *Acanthaster planci* in December 2009.

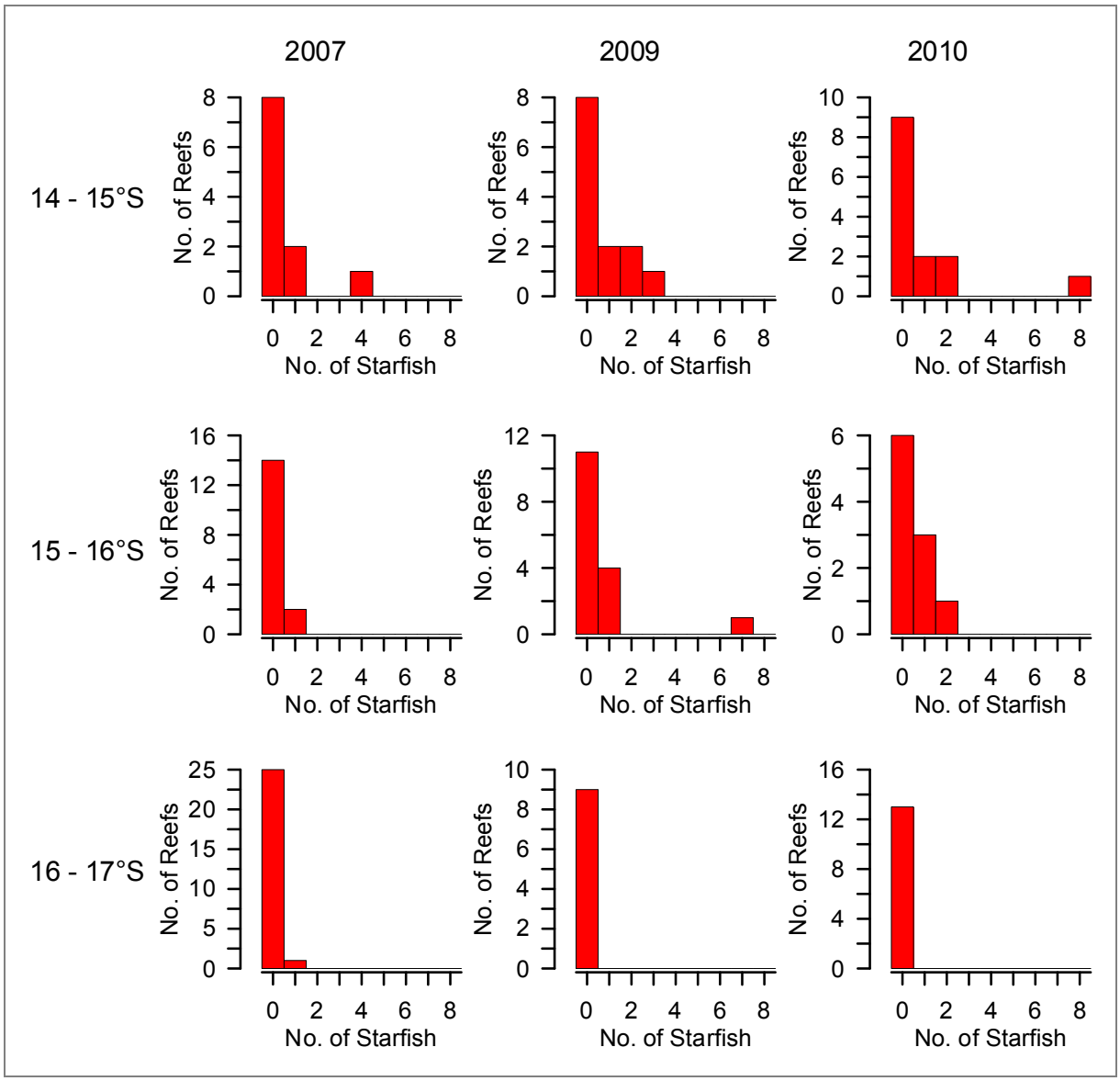

Figure 2: Frequency of numbers of *Acanthaster planci* recorded on reefs by latitude (top to bottom) and by year (left to right). Either no starfish, or just a single individual, was recorded at the majority of reefs at all latitudes. Note the variable scales on Y-axes, reflecting the numbers of reefs that were surveyed in each region.

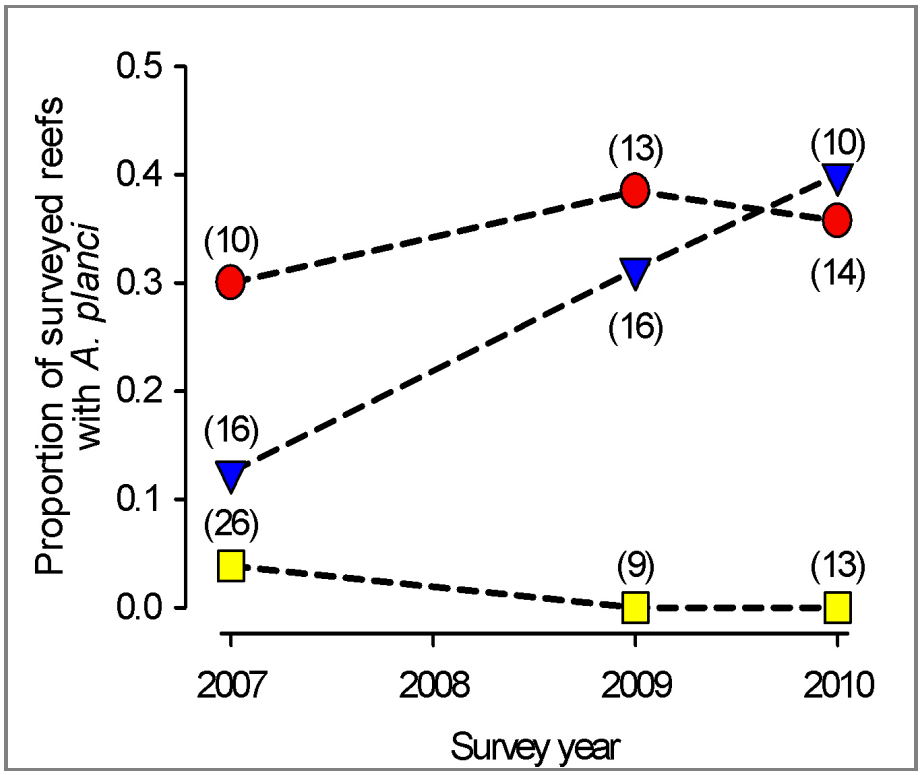

Figure 3: Proportion of reefs surveyed by manta tow which had *Acanthaster planci* present in the 2007 and 2009 and 2010 survey years. Red circles represent reefs 14-15°S; blue triangles represent reefs 15-16°S; yellow squares represent reefs 16-17°S (the putative initiation zone for outbreaks); figures in parentheses are the numbers of reefs.