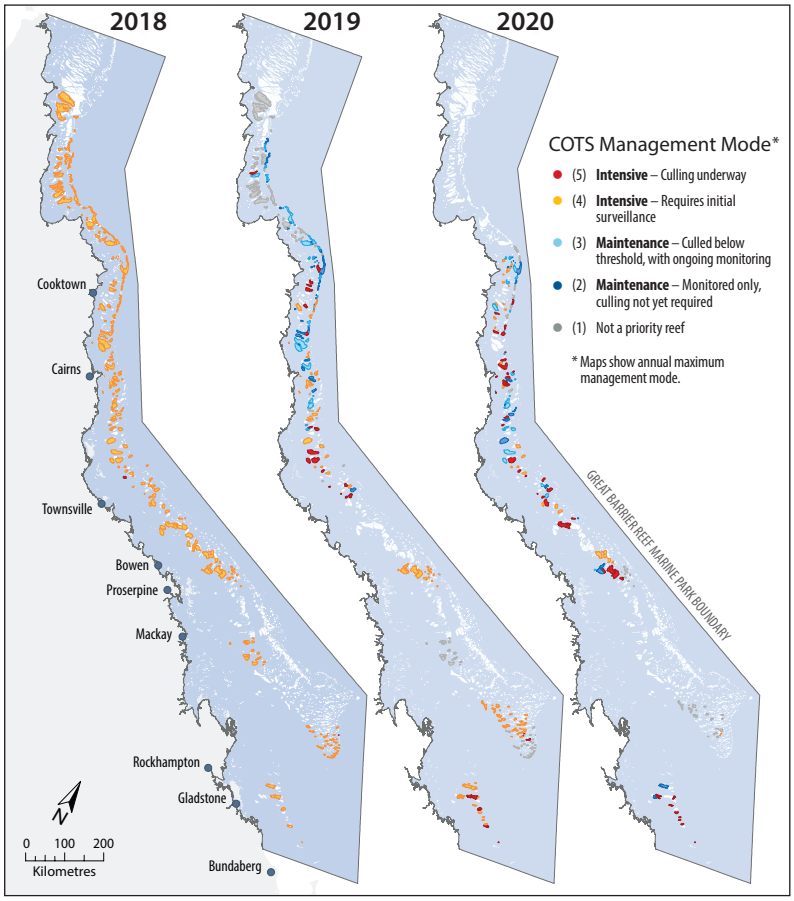
Project 6.1
Innovations in crown-of-thorns starfish control on the Great Barrier Reef

Tropical Water Quality Hub

National Environmental Science Programme

Project Summary

Today management of crown-of-thorns starfish (COTS) outbreaks on the Great Barrier Reef (GBR) is conducted using a strategic and adaptive approach based on Integrated Pest Management (IPM) principles. This IPM approach was developed by NESP TWQ Hub researchers and industry partners using a systems understanding of both the ecology of COTS outbreaks and of the logistics and constraints under which control is conducted. This systems description was used to develop an initial outline of an IPM strategy that would enable the program to achieve its management objectives at each of the relevant management scales on the GBR. Once the IPM strategy was sufficiently defined it was possible to identify the knowledge and technological hurdles that would constrain its successful implementation. Collaborative and strategically-targeted research projects were initiated to address these issues. These projects and on-going analysis of the program's performance and processes enabled continuous improvement in the COTS Control Program. This ensured that not only is the IPM COTS Control Program effective in achieving its management objectives but also, that as its capabilities became clear, the objectives themselves could be refined and expanded to meet the program's emerging potential. The net result of this process is that, under the IPM COTS Control Program, COTS control has been transformed from an ad hoc approach with limited success even at the site scale to a program that is effectively controlling COTS across entire reef perimeters and at hundreds of reefs on the GBR and which has the potential to successfully meet the challenge of future outbreaks.



Changes in reef management modes across the GBR from 2018 to 2020 when the innovative Integrated Pest Management approach was applied

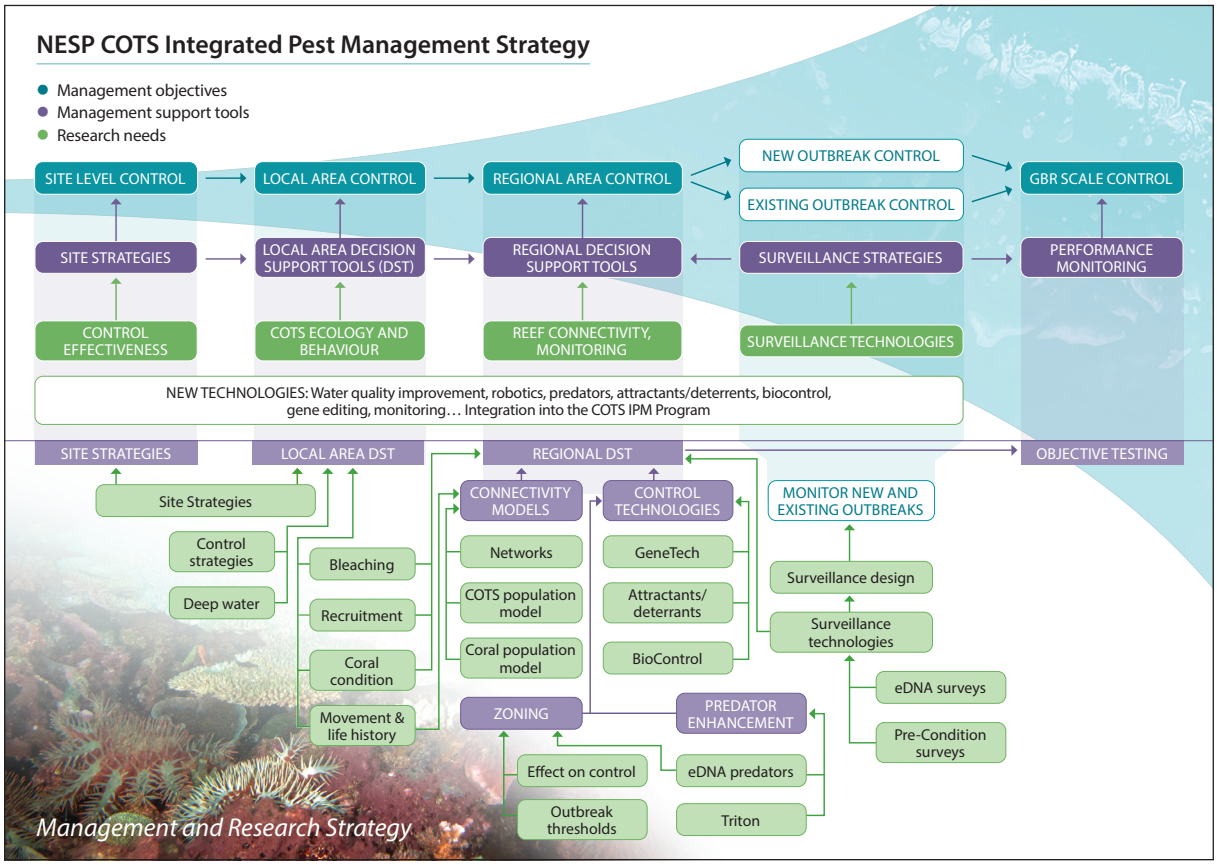


Problem

The Pacific COTS, Acanthaster cf. solaris is native to coral reefs in the Pacific region, including the GBR, and a major predator of hard corals. For reasons that are unclear, COTS populations go through periodic cycles of abundance and can reach densities of hundreds of individuals per hectare. During these periods of high density, COTS can consume most of the hard coral cover at a site. COTS predation has also been identified as a major cause of coral loss at the scale of the GBR contributing as much as 42% of coral loss between 1985 and 2012. This poses long-term risks to overall reef health and resilience. While the management of COTS has been recognized as a pressing issue on the GBR for half a century and has been the focus of significant research and management investment, there has been little progress in developing a successful management response. The NESP TWQ Hub IPM COTS Control Program's research challenge was to remedy that situation.

How Research Addresses Problem

NESP TWQ Hub researchers and industry partners used a systems understanding of COTS outbreaks and of control logistics to develop an IPM control strategy that would achieve the program's objectives. Knowledge and technological hurdles were identified, and collaborative and strategically-targeted research projects were conducted to address these. Continuous assessment of control performance and operations in situ enabled continuous improvement in the Program, ensuring that the Program effectively achieved its management objectives and that these objectives could be expanded to meet the program's new potential on a regional scale.



Management objectives, management support tools, and research needs for the NESP IPM research strategy, established by Westcott et al. (2016).

Key Findings

- The NESP TWQ Hub funded a collaborative, complex and multi-disciplinary research program that has transformed manual COTS control into an effective, adaptive and scalable means of controlling COTS on the GBR.
- Under the IPM COTS Control strategy, the Control Program is now successfully ensuring that COTS densities are kept below the critical densities that allow coral growth to outpace COTS predation, and which reduce COTS reproductive output.
- Under the IPM COTS Control strategy the Control Program is achieving this outcome at the scale of entire reef perimeters and doing so across hundreds of reefs on the GBR.
- These outcomes represent a dramatic improvement in the performance of the COTS Control Program on the GBR. The IPM COTS control program has achieved these outcomes at 88% of sites and 92% of the reefs where control has been conducted. Under the previous approach it took 60% longer to achieve this outcome at site, meaning that more coral was lost before control was successful, and was successful at just 53% of sites and 0% of reefs.

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