



DNA detection helps defend Great Barrier Reef from coral-eating starfish

Exciting genetic detection technology under development by the National Environmental Science Program (NESP)'s Tropical Water Quality Hub is one of several ways in which NESP is using novel scientific techniques and developing new strategies for controlling outbreaks of Crown of Thorns Starfish.

Outbreaks of the coral-eating Crown of Thorns Starfish (*Acanthaster spp*) are one of the biggest threats to the health of the Great Barrier Reef, only behind storm damage and mass coral bleaching events in terms of how many square metres of coral they have destroyed.

One of the main challenges in effectively controlling Crown of Thorns Starfish is finding them – the starfish's larvae are tiny and the adults hide below coral outcrops during the day, emerging only at night to feed on coral. Additionally the vast size of the Great Barrier Reef – equal to that of Japan – means finding Crown of Thorns outbreaks requires large amounts of fuel, personnel and time.

Scientists and managers need to be able to prioritise areas to focus their limited resources on how best to control outbreaks.

A promising new technique of detecting and mitigating outbreaks of Crown of Thorns Starfish is 'eDNA' (environmental DNA) technology, first developed at the Australian Institute of Marine Science (AIMS), and now supported by NESP for further application.

Dr Sven Utthicke at AIMS is the principal research scientist who developed the eDNA technology and said it could be used to assist early detection of outbreaks, and associated control efforts.

"All the marine organisms are constantly shedding cells into the water column, we can sample that water and detect the genetic signature of Crown of Thorns in small amounts of water," he said.

“A match means we can tell control crews ‘here are the starfish’. Right now they have to go out and look for them themselves and this can take up a lot of their time.”

In addition to direct control of Crown-of-Thorns starfish, which is currently carried out by trained divers armed with lethal injector guns, additional management strategies are required to reduce starfish numbers. eDNA technology can potentially help out here as well.

Loss of Crown of Thorns Starfish predators is thought to be one of the main causes of outbreaks, and restoring predator populations – especially those who prey on the starfish during its tiny juvenile phase – is a promising avenue to heading off outbreaks.

The eDNA technique is now used to analyze the poo of a variety of fish species to check for Crown of Thorns Starfish genetic material. A match indicates that the fish has preyed on Crown of Thorns, and actions can be taken to protect or further increase its numbers thereby contributing to increased CoTS predation.

A research team lead by Dr Frederieke Kroon from AIMS has just returned from a 10-day fieldtrip to reefs in both Green and Blue Zones off Townsville, to collect poo for eDNA analyses from at least 50 fish species.

Dr Kroon said Crown of Thorns Starfish DNA could be detected in fish poo at least seven days after being eaten by the fish.

“This is a very useful factor because it means we have a bigger window to detect which fish have been eating Crown of Thorns Starfish,” she said.

“When we determine which species are eating Crown of Thorns then management actions can be taken to increase protection of those species.”

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