Controlling population outbreaks of Crown of Thorns *Acanthaster planci* in Mauritius

MITERNIQUE Céline* research@reefconservation.mu (presenting author); BOUVELLE Emeline* ebouvelle@reefconservation.mu; YOUNG Kathy* admin@reefconservation.mu (*Reef Conservation, Les Flammants Branch Road, Pereybere, Mauritius)

**Topics/Submission Themes:** Marine Biodiversity and Threatened Marine Species

**Background**

Marine invasive species and the explosion of a species population can have detrimental effects on a threatened area as well as unaffected areas due to the connectivity of marine ecosystems through currents and tides. This is the case of the crown-of-thorns (COTs), *Acanthaster planci*, a large, multi-armed coral eating starfish. It has become one of the most well-known biological threats to coral reefs, building its notoriety not on its beauty or commercial value but on its capacity to decimate extensive areas of coral. An outbreak of COTs population is when the feeding rate of COTs exceeds the growth, recruitment and recovery rate of the coral. Population outbreaks of this species represent the most severe biological disturbance experienced by coral reefs across the Indo Pacific, from the coast of South Africa to the Gulf of California”.

It was estimated that only about 20% of the coral reefs around Mauritius is structurally functional. Sustained and ongoing declines in live coral cover due to man-made and natural disturbances are causing accelerating degradation of coral reefs. Importantly, it is feared that the combined effect of outbreaks and other disturbances (bleaching, ocean acidification, sediment pollution) along with the intensification of the climatic variabilities, could further accelerate the demise of coral in Mauritius.

In 2017, Reef Conservation conducted a study whose overall goal was to apply innovative population control techniques to avoid outbreaks at the scale experienced by other Indo Pacific countries. One of the first observations of COTs in Mauritius was realized by the Mauritian Underwater Group (MUG) in 1971 under the "Starfish Project". More recently since 2014, alarming reports from various users of the sea around Mauritius has raised attention about outbreaks of COTs at numerous sites, some of which include offshore islands that are popular recreational sites. It is imperative to understand the extent and patterns of COTs outbreaks reported in Mauritius and to implement appropriate and effective population control methods.

Another objective of this study was to create a network of observers consisting mainly of diving centres. They were sensitised and trained in the identification and on the effects of these organisms on the coral reef. With the help of citizen science, sites requiring population control could be identified.

**Method**

In order to identify the pilot sites many meetings and training sessions on the impact and identification of COTs were organized with different stakeholders such as diving centres, boat houses and individual divers. A data sheet was designed so all stakeholders could record their observations. Field truth dives were organized to validate the data collected by diving centres.

There are some considerations to be taken into account when selecting a pilot site for trials on a wild and an ordinarily natural population of animals, these considerations include:

The number of individuals found on the site, i.e. are the numbers beyond the normal population curve which is 1-2 COTs seen in 15 min of diving. The precautionary principle of
ethical field work should be applied at all times. It would not be considered ethical to carry out field trials on what would otherwise be considered a normal population density. This could result in ecological imbalance in the system and exacerbate other potential issues.

Pilot sites for population control of COTs were chosen where individual numbers exceeded 9 in a 15 min swim or dive.

The population control methods were tested incorporating the latest methods, injecting white vinegar at several spots on the body adjacent to the arms of the COT. Injections were carried out using a special syringe designed by Reef Conservation for the purpose. Injection sessions were performed only during the day. Each COTs received 2 injections of 10ml or a total of 20ml of vinegar. Each dose of vinegar was injected at the base of a COT arm (The arms chosen for injection should be located as far as possible from each other).

48 hours after the injection session, a visual inspection and a count of the number of individuals on the controlled site was carried out in order to evaluate the effectiveness of the control.

Results

Analysis of returned the data sheets from the different stakeholders indicated 5 sites in the north showing the number of COTs observed, to be within the range considered to be at a level relevant for intervention. These sites lie on the southern edge of Coin De Mire, a small, unpopulated offshore island that is a nature reserve. The specific sites identified are well known dive sites known as Charpentier and Confetti Bay.

The population of COTs at 5 dive sites were controlled during 12 field diving sessions, with a total of 130 Acanthaster planci injected with vinegar. With our observations as well as those of the observer’s network it is recommended that future surveys and projects pertaining to COTs be undertaken during the summer months with prevailing higher sea temperatures and calmer seas. Population levels for monitored dive sites were observed to increase as the seasons changed from winter to summer months.

Divers network a dozen diving centres took part in the COTs population data collection and was able to contribute to strengthening the knowledge on the situation of the COTS population in Mauritius.

Conclusion

To ensure full feedback on data sheets, further sensitisation sessions with the diving centres should be undertaken and the importance of all results including zero results should be emphasised. Most importantly a mechanism is now in place for monitoring and controlling COTs in Mauritius through stakeholder engagement. There is now an established pathway for reporting COTs outbreaks and a standard methodology for controlling outbreaks. In the event of an outbreak in the short term, Reef Conservation will have to respond to any requests for support from the dive centres.

Following the results obtained during this first control test, it was important to work with the various governmental institutions on the establishment of a national protocol for the control of these organisms.

In 2018 the issue of a national protocol was raised by members of the Coral Reef Network, this document is under development. Monitoring should be continued as the COTS population is not well studied in Mauritius, more data is needed regarding the distribution of the
organisms and their configuration, as well as the status of coral biodiversity and health of infested sites and the potential recovery of these sites.