

Brief communication on the Crown-of-thorns Seastar (*Acanthaster* spp.) densities in the municipalities of San Francisco, Liloan and Pintuyan, Southern Leyte, Philippines

Authors:

Chantel Elston¹, Thomas Dallison²

¹ Project Scientist, Coral Cay Conservation, Napantao Dive Resort, 6613, San Francisco, Southern Leyte, Philippines. Email: lrcp@coralcay.org

² Corresponding author: Head of Science, Coral Cay Conservation, The Kiln, Grange Road, Tongham, Surrey, GU10 1DJ, United Kingdom. Email: headofscience@coralcay.org

October 2019

Introduction

A rapid assessment was initiated in 2019 by the Southern Leyte State University (SLSU) to assess the potential for a crown-of-thorns Seastar (COTS) (*Acanthaster* spp.) outbreak in Sogod Bay, Southern Leyte. The aim was to identify and to quantify the extent of a COTS outbreak in selected municipalities of Sogod Bay. The outbreak threshold was defined as 25-30 COTS/ha (which equates to 0.25 COTS/100m²) (Napala *per comms.* 2019). Coral Cay Conservation (CCC) were invited by the honourable Ma'am Eva of the Provincial Environment and Natural Resources Management Office (PENRMO) to assist with this assessment. CCC have undertaken ecological-based coral assessments in Southern Leyte since 2002 to support current conservation efforts in the protection of regional marine resources. The previous data collected forms the baseline data to which current observations can be compared to in order to characterize outbreaks that are occurring across the reef systems. The aim of this report is, therefore, to provide data on the densities of COTS in the municipalities of Liloan and San Francisco, Sogod Bay to assist with this assessment.

Acanthaster spp. hold a vast reproductive potential which is particularly relevant to large population fluctuations and possible ecological outbreaks. The male and female spp must be within proximity and spawn simultaneously to increase chances of success, further identifying

that a 15m distance would result in a 30-50% chance of successful fertilization. Post-spawning and successful fertilisation, the larval stage of COTS is typically 11 days but can decrease or increase from 9 to 42 days depending on environmental conditions, predominantly driven by phytoplankton abundance.

COTS are a highly successful predator of Scleractinian corals with individual size and life phase being a key factor in prey-preference and feeding rates. Once the CoTS larvae have settled on benthic substratum, showing preference for coralline algae and consolidated rubble (actively avoiding predatory corals) ([Lucas 1975]), juveniles (0.5 – 10mm diameter) will consume exclusively coralline algae for the first 6 months. From the 6-month period, juveniles will switch diet and predate Scleractinian corals ([Yamaguchi, 1973]). After approximately 20-months, coral-feeding juveniles and sub-adults are <15cm in diameter and demonstrate less cryptic behavior as they become more diurnally active (Zann *et al.*, 1987). Coral-feeding adults (200 – 350mm diameter) present the highest predation rates and fecundity in relation to other life phases with most observed aggregations on reefs composed of adults. The feeding rate of adults ranges from 150 to 250cm² whilst demonstrating a prey-preference to *Acropora* spp. and *Montipora* spp. colonies. These voracious feeding rates, alongside large aggregations and outbreaks often results in the death of an entire colony leading to devastating

ecological impacts to reef systems on both short- and long- term timescales.

These key life-history traits highlight the importance of incorporating higher resolution protocols that consider feeding rates, growth and size metrics during density assays. It is also important to develop baseline densities and metrics for focus areas that enable the temporal assessment of COTS densities and life histories that will enable greater resolution when determining outbreaks.

Materials and Methods

The densities of crown-of-thorns Seastar (COTS) were estimated in the municipalities of Liloan and San Francisco in Sogod Bay, Southern Leyte with data collected in 2019 using Reef Check methodology. At each site, six to eight 100m transects were laid along the substrate parallel to the shoreline at depths of 6 and 12m. Each transect was segmented into four 20m sections, separated by a 5m gap, where no data were collected. Each transect was separated by 100m at each site. Two SCUBA divers recorded the numbers of COTS 2.5m either side of the transect line whilst swimming in a U-shaped pattern. A total of 400m² was thus surveyed for each transect. GPS coordinates were taken for all sampling efforts.

Results and Recommendations

A total of 8 sites were surveyed by CCC in 2019, and the number of COTS counted ranged from 0 – 25, equating to densities of 0 – 1.44 COTS/100m² (Table 1). Five out of the eight sites were over the outbreak threshold of 0.25 COTS/100m² (Fig. 1). However, densities in the CCC surveyed sites were much lower compared to densities recorded by SLSU (which ranged from 1.80 – 50.00 COTS/100m²) (Table 1). We therefore recommend that further monitoring efforts are deployed in areas that present densities above the threshold level (0.25 100m²). Following further monitoring, and once criteria for an Outbreak are satisfied, efforts should be placed into areas with the highest recorded densities (municipalities of Malitbog, Libagon, Padre Burgos and Limasawa), and if any resources are

available subsequent to that, extraction efforts can be concentrated in the municipalities of San Francisco and Liloan.

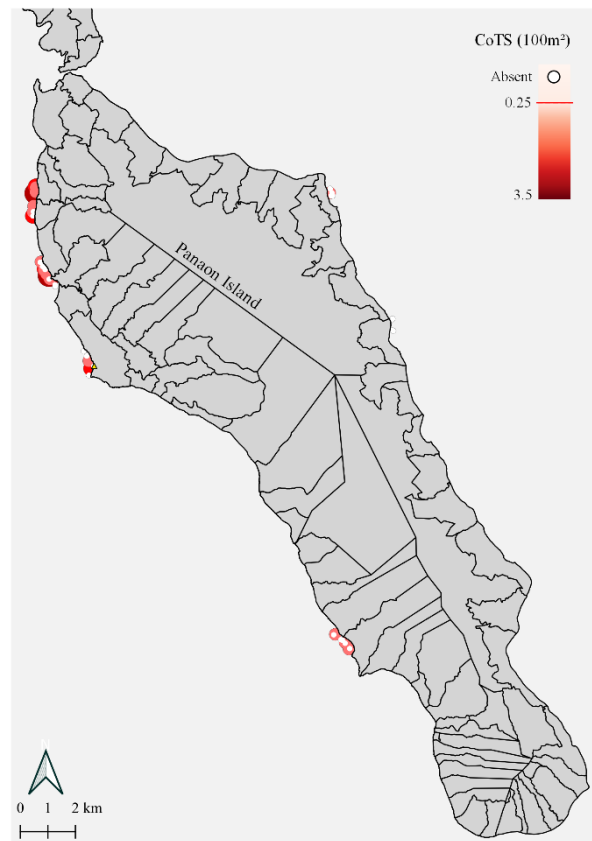


Figure 1. Spatial distribution of *Acanthaster* spp. (Crown of Thorns Seastar) density throughout Sogod Bay following spatial assessments in 2019. The Outbreak threshold is defined as 0.25 100m²⁻¹.

References

- Lucas, J.S. 1975. Environmental influences on the early development of *Acanthaster planci* (L.). In Crown-of-Thorns Starfish Seminar Proceedings, Brisbane. Canberra, Australia: Australian Government Publishing Service, 109–121.
- Yamaguchi, M. 1973. Early life histories of coral reef asteroids, with special reference to *Acanthaster planci* (L.). In Biology and Geology of Coral Reefs (Vol. 2: Biology), O.A. Jones & R. Endean (eds). New York: Academic Press, 369–387.
- Zann, L., Brodie, J., Berryman, C. & Naqasima, M. 1987. Recruitment, ecology, growth and behavior of juvenile *Acanthaster planci* (L.) (Echinodermata: Asteroidea). *Bulletin of Marine Science* **41**, 561–575.

Table 1: Densities of the crown-of-thorns Seastar (COTS) in Sogod Bay. Results include those reported by the SLSU and by CCC through survey efforts in 2019.

SLSU Results - externally sourced								
Municipality	Barangay	Category	Area (m ²)	COTS collected (N)	Status	COTS density (COTS/100m ²)	Outbreak density (COTS/100m ²)	
Libagon	Pangi	MPA	400	15	Outbreak	3.75	0.25	
Liloan	Calian	Non-MPA	250	53	Outbreak	21.20		
Limasawa	San Agustin	MPA	500	21	Outbreak	4.20		
	Magallanes	Non-MPA	500	9	Non Outbreak	1.80		
Malitbog	Abgao	Non-MPA	600	130	Outbreak	21.67		
	Abgao	Non-MPA	1000	956	Outbreak	95.60		
	Cantamuac	Non-MPA	300	150	Outbreak	50.00		
	Bcabulanunan	Non-MPA	500	232	Outbreak	46.40		
	Iba	Non-MPA	500	40	Outbreak	8.00		
	Juangon	MPA	600	76	Outbreak	12.67		
	Sabang	Non-MPA	500	244	Outbreak	48.80		
	Timba	MPA	500	195	Outbreak	39.00		
Padre Burgos	Bunga	Non-MPA	400	22	Outbreak	5.50		
CCC 2019 results								
Municipality	Barangay	Category	Samples (N)	Area (m ²)	COTS recorded (N)	Status	COTS density (COTS/100m ²)	Outbreak Density (COTS/100m ²)
Liloan	Bahay Cagbungalon	MPA	24	2400	0	Non Outbreak	0.00	0.25
		Non-MPA	24	2400	10	Outbreak	0.42	
	Catig	MPA	24	2400	1	Non Outbreak	0.04	
	Gudan	Non-MPA	16	1600	23	Outbreak	1.44	
San Francisco	Anislagon	Non-MPA	32	3200	9	Outbreak	0.28	0.25
	Napantao	MPA/MPA	24	2400	10	Outbreak	0.42	
	Santa Paz Norte	Non-MPA/MPA	32	3200	25	Outbreak	0.78	
Pintuvan	Manglit	Non-MPA/MPA	32	3200	3	Non Outbreak	0.09	