Coral Health in the Solitary Islands Marine Park

In early 2012 Coffs Harbour's Solitary Islands Underwater Research Group (SURG) Inc. received $34,164 from the NSW Government through the NSW Environmental Trust to conduct research into the health of coral communities in the Solitary Islands Marine Park.

The project has reached the halfway point and to date reefs adjacent to 7 islands have been surveyed several times, with the Summer 2014 round of surveys underway. A total of 28 sites at these locations have been investigated, with 44 SURG members participating in coral health surveys spending 960 person-hours on or under the sea.

Approximately 4,500 individual coral colonies have been assessed using the CoralWatch protocol developed by the University of Queensland (http://www.coralwatch.org). Coral health, as indicated by the incidence of bleaching in the coral community, in response to changing sea temperature, can be readily observed and monitored by well-trained citizen scientists using this protocol.

During a coral bleaching event, often due to high water temperatures during summer, the coral expels the symbiotic algae (dinoflagellates) out from its tissue, leading to an observed paling in colour. As the sea temperatures cool during winter, corals that have not starved as a result of losing their algae, may overcome a bleaching event and recover the algae. However, even if they do survive, their reproductive capacity is reduced, which may lead to shifts in reef associated communities that are generally dominated by corals.

Past studies in the marine park by scientists from the National Marine Science Centre (Southern Cross University) and SURG volunteers, have ascertained that several families of hard corals are more susceptible to bleaching, and it is these families of corals the current investigation has centred on. Six families of hard and soft corals have been assessed and whilst frequencies of these vary between islands, corals from the Acroporidae, Dendrophyllidae, Faviidae and Pocilloporidae families comprised the most common corals of those surveyed (18%, 21%, 24% and 26% respectively).

Various growth forms of corals have also been recorded with Boulder (Encrusting), Branching, Plate and Soft Corals having frequencies of 37%, 38%, 21% and 4% respectively. However, cover of these growth forms vary between islands. For example, at North Solitary Island there is a clear dominance of Boulder (Encrusting) and Branching forms, whilst at North West Solitary all hard coral growth forms (Boulder, Branching and Plate) are well represented. Interestingly, islands closer to shore have a higher cover of soft corals.

There has been no evidence of widespread bleaching events in the Solitary Islands Marine Park during the study to date and all common coral families are generally in good condition.

The data also provide important information on the natural and seasonal variation in coral pigmentation during a period of normal seawater temperatures. Generally, coral pigmentation tends to be more variable within individual colonies during summer. A greater variation in coral hue was found in summer surveys compared to cooler winter surveys. These differences found during

normal seawater temperatures throughout the year are a general response to lower light conditions experienced during winter compared to summer months.

As a general observation, when data for all corals, regardless of growth form or family, are examined, then corals are more stressed (less healthy) during the summer survey periods. A value of 2 or 3 indicates moderate stress, whilst 4 – 5 indicate high stress (as measured by the density of dinoflagellates in their tissues). The following data from North Solitary Island illustrates this point. In the absence of high water temperatures during the study to date, these 'stress' values may be due to higher light intensities during summer survey periods affecting areas of a colony exposed to direct sunlight, compared to areas of the same colony which are generally shaded.

Coral Health	Summer 2012	Summer 2013	Winter 2013
0	16%	24%	33%
1	37%	37%	40%
2	20%	18%	19%
3	16%	13%	6%
4	10%	7%	2%
5	1%	2%	0%

Three further survey periods will be completed during summer and winter 2014, and summer 2015. It is anticipated a further 5,000 individual colonies will be assessed by the end of the study.

A partially bleached encrusting Poriitid coral at North Solitary Island, showing its normal brownish hue and areas bleached white due to loss of its symbiotic algae.