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Crown-of-thorns starfish Control program

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Association of Marine Park Tourism Operators

Forum Title:

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RELEVANCE OF WORK

The primary purpose of the AMPTO COTS control program is to protect coral cover at high value tourism sites

- Marine Tourism is worth $5.2 billion and employs over 64,000 people in the GBR catchment
- The impacts from this current outbreak have been reduced, helping to ensure the survival of the tourism industry on the GBR

- Since August 2012, the population of COTS at the majority of tourism sites has been reduced to below outbreak level by:
  - Ensuring that sites remain fished down
  - Controlling larger aggregations of spawning adults further north

RELEVANCE OF WORK

- If hard coral cover stays stable, any associated COTS population can be considered sustainable
- Making precise estimates of coral cover can be expensive and time consuming
- There is not always a baseline measure of coral cover before a COTS outbreak
- Keesing and Lucas (1992) estimated that 10 - 15 COTS per hectare could be sustained in areas of 20 - 50% coral cover. This is doubled to allow for seasonal variation in feeding and that coral cover may be greater than 50% (Lassig & Engelhardt 1995, Engelhardt et al. 1997)
- This information enables COTS abundance to be used as a measure of whether a population is sustainable

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RELEVANCE OF WORK

- COTS abundance is measured by catch per unit effort (CPUE)
- CPUE relies on COTS being seen
- CPUE is dependent on:
    - the type and density of the coral
    - Dive conditions such as visibility and depth
    - Diver experience

- CPUE is better at tracking temporal change at a site than variation between sites
- CPUE on the control program involves time extracting and injecting the COTS. This makes it different to methods of just looking
- A CPUE of 0.1 or greater is considered to be an active COTS outbreak

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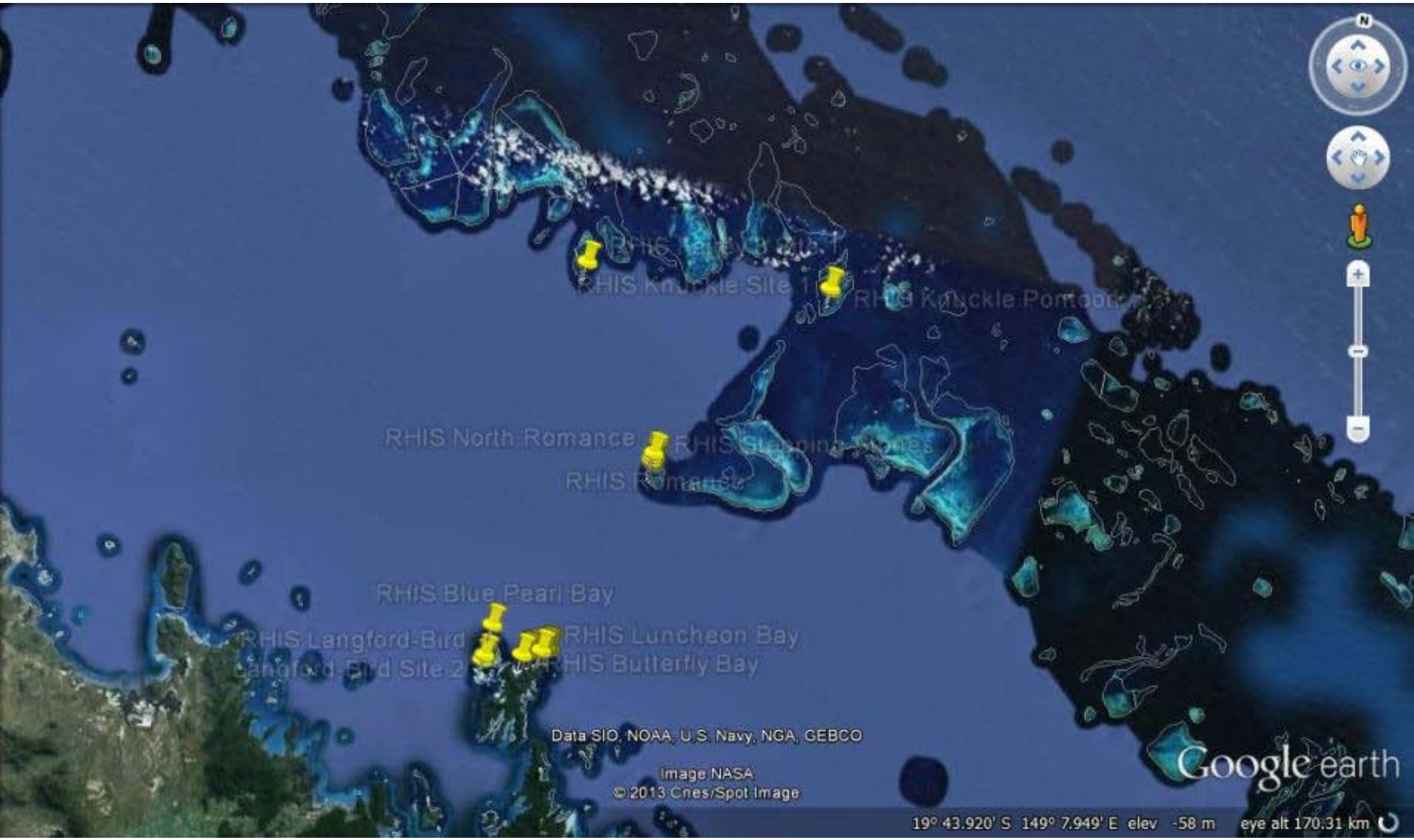
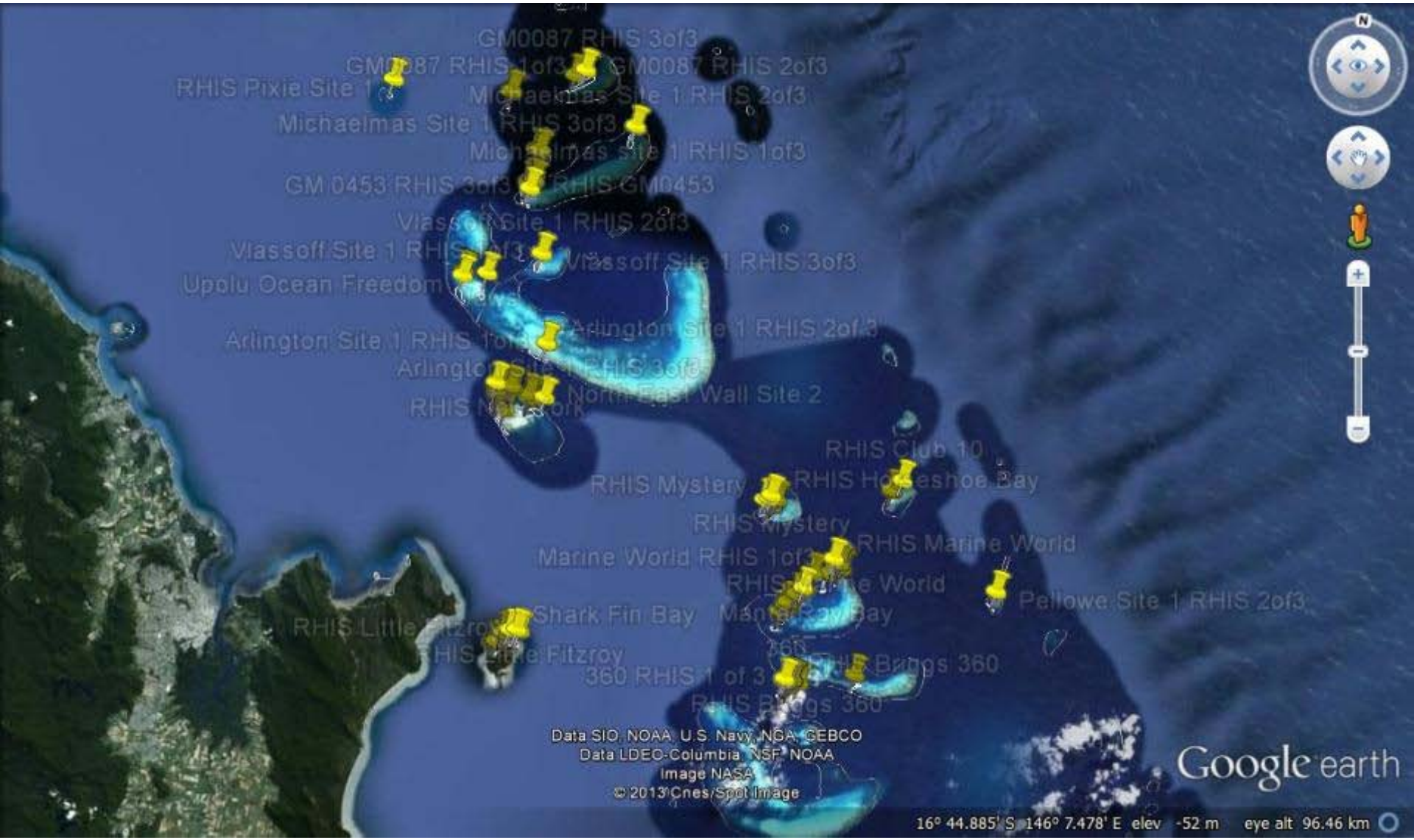
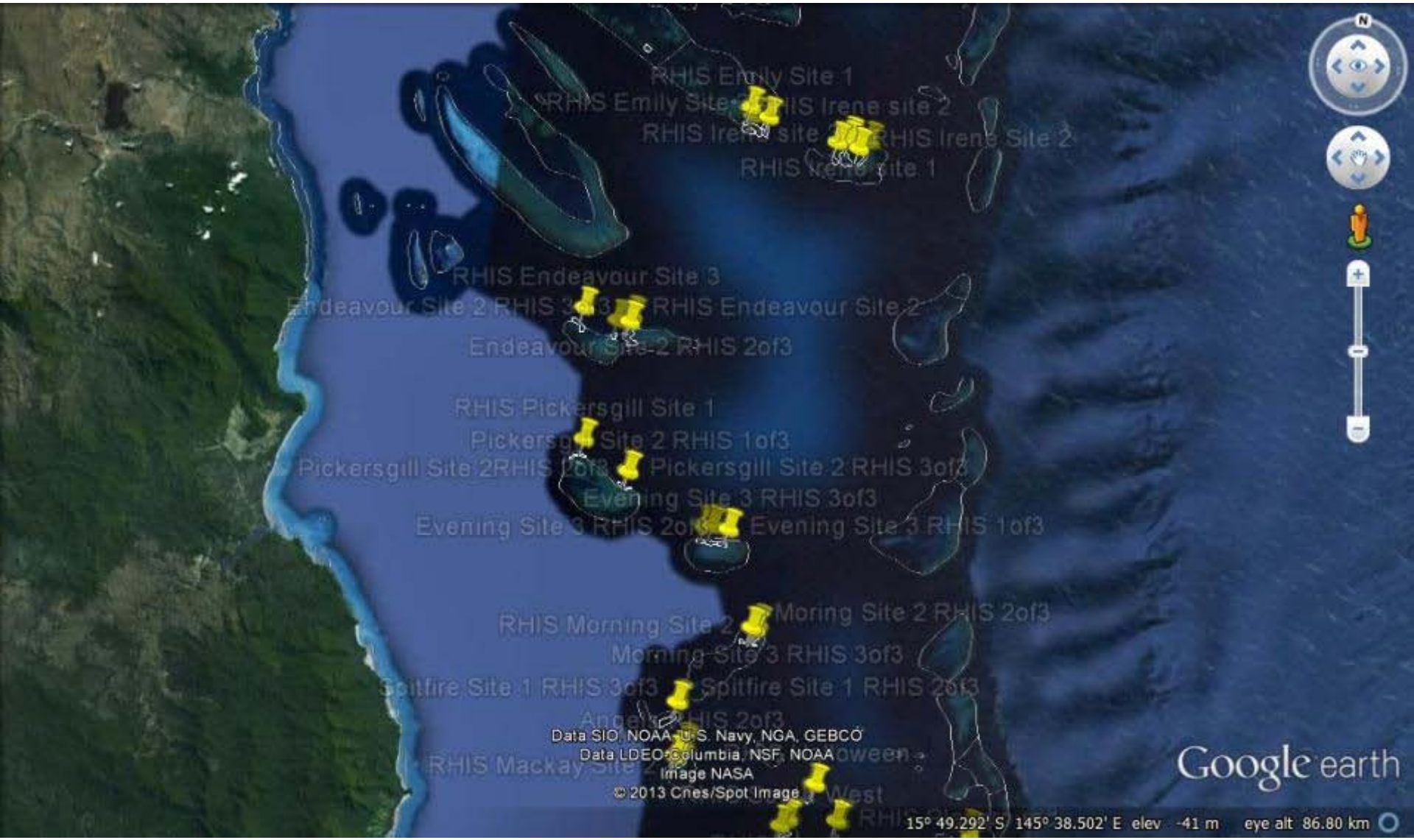
RESULTS

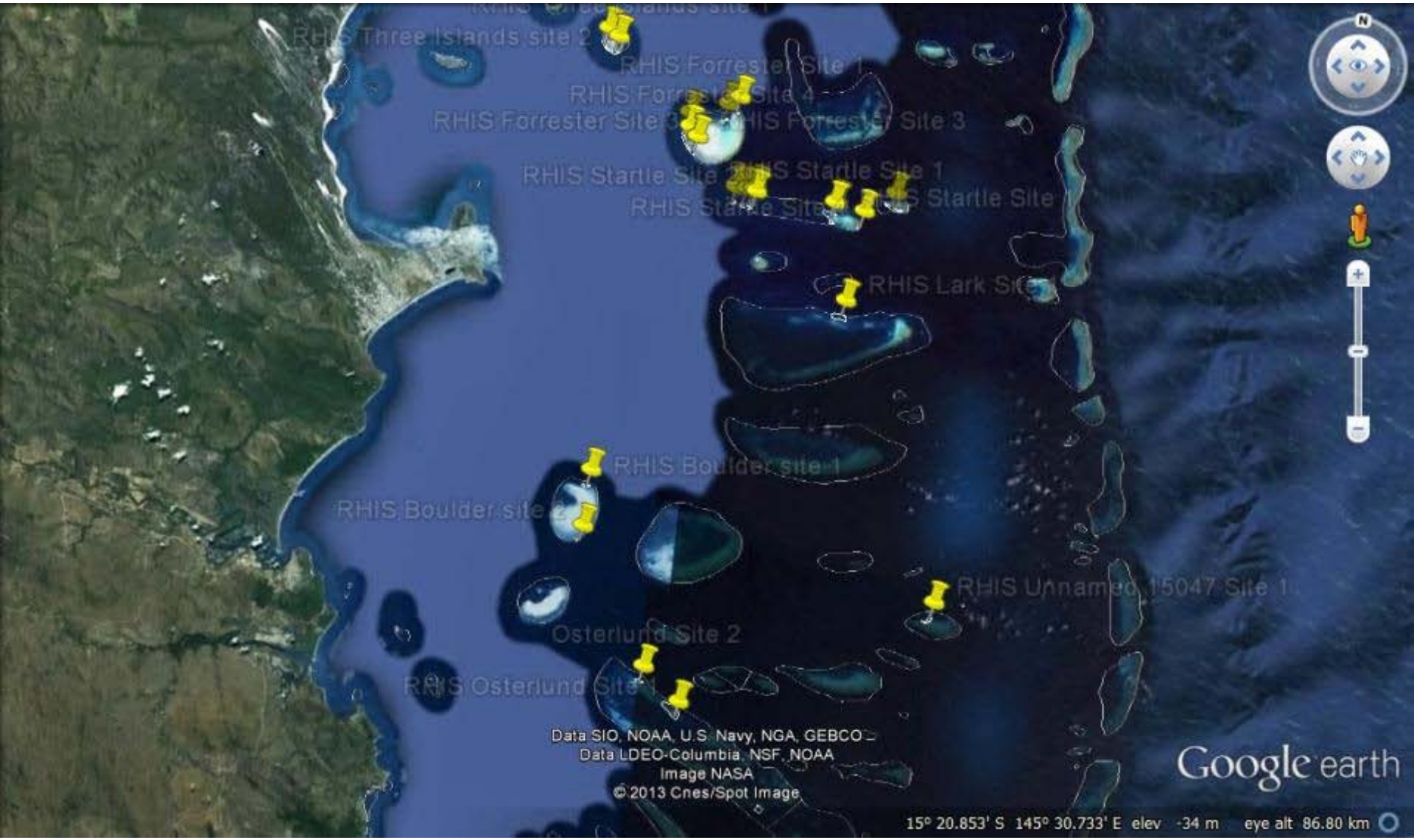
Number of different reefs visited:	**63**
Number of different sites visited:	**190**
Number of voyages	**22**
Number of days at sea:	**220**
Number of control dives and snorkels conducted:	**744**
Total dive time (minutes):	**231,604**
(hours)	**3860:04**
Total number of RHIS:	**696**
COTS killed:	**72643**
Overall average CPUE (total COTS/total dive time):	**0.31**

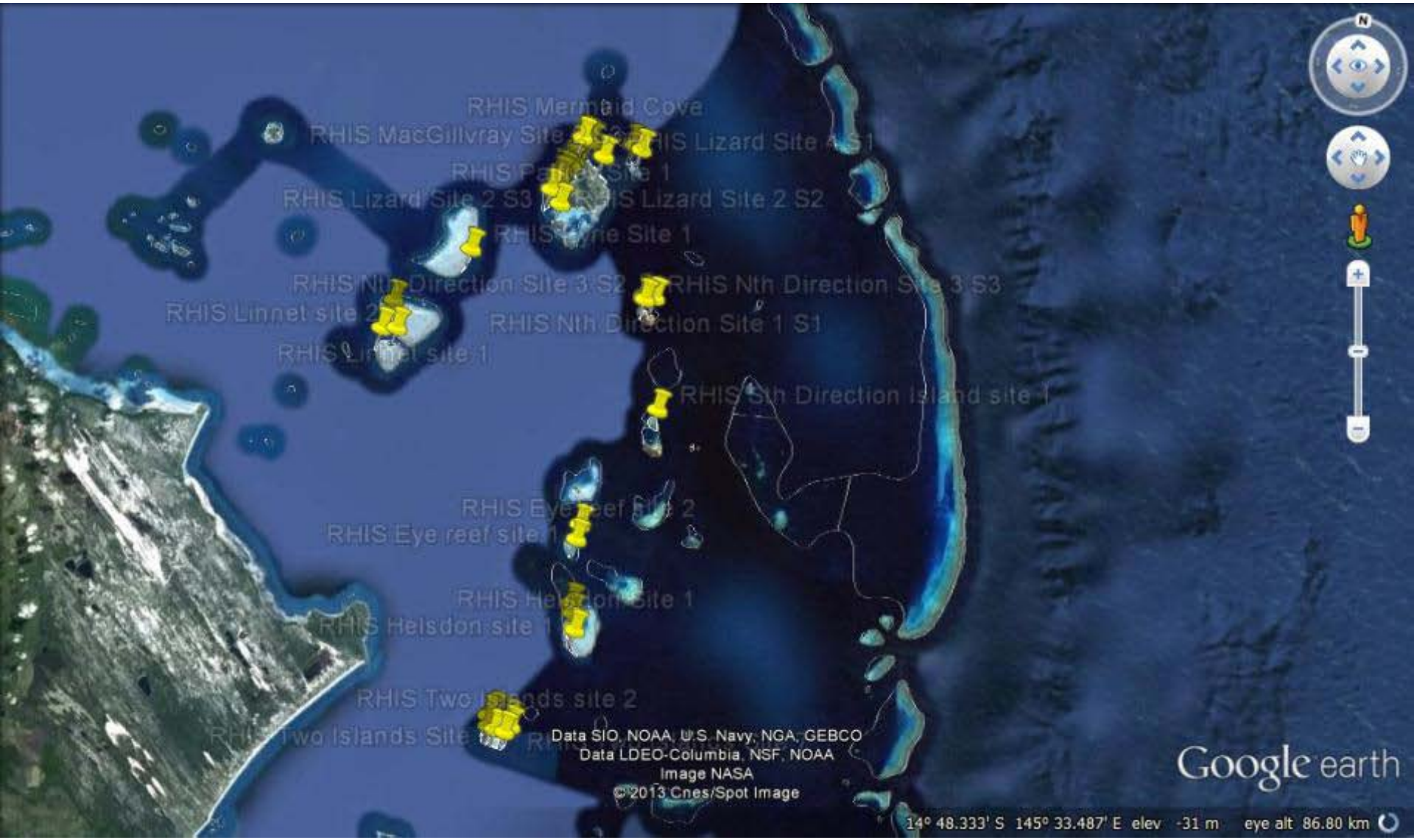

RHIS Knuckle Site 1
RHIS Knuckle Pontoon
RHIS North Romance
RHIS Stepping Stones
RHIS Romance
RHIS Blue Pearl Bay
RHIS Langford-Bird
RHIS Luncheon Bay
RHIS Butterfly Bay
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image NASA
© 2013 Cnes/Spot Image
Google earth
19° 43.920' S 149° 7.949' E elev -58 m eye alt 170.31 km


GM0087 RHIS 3of3
GM0087 RHIS 1of3
GM0087 RHIS 2of3
RHIS Pixie Site 1
Michaelmas Site 1 RHIS 2of3
Michaelmas Site 1 RHIS 3of3
Michaelmas site 1 RHIS 1of3
GM 0453 RHIS 3of3
RHIS GM0453
Vlassoff Site 1 RHIS 2of3
Vlassoff Site 1 RHIS 1of3
Vlassoff Site 1 RHIS 3of3
Upolu Ocean Freedom
Arlington Site 1 RHIS 2of3
Arlington Site 1 RHIS 3of3
North East Wall Site 2
RHIS Club 10
RHIS Mystery
RHIS Horseshoe Bay
RHIS Mystery
Marine World RHIS 1of3
RHIS Marine World
Pellowe Site 1 RHIS 2of3
Shark Fin Bay
RHIS Little Fitzroy
360 RHIS 1 of 3
RHIS Briggs 360
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data LDEO-Columbia, NSF, NOAA
Image NASA
© 2013 Cnes/Spot Image
Google earth
16° 44.885' S 146° 7.478' E elev -52 m eye alt 96.46 km


RHIS Swallow
RHIS Undine site 2
RHIS Gone Again
RHIS St. Crispin Site 3
RHIS Rudder Site 1
RHIS Opal Site 2
RHIS Opal Site 1
RHIS Bashful Bommie
RHIS Tongue Site 1
RHIS Tongue Site 2
RHIS Unnamed 16-027
RHIS NW Channel
RHIS Batt Site 1
RHIS Batt Site 2
RHIS Batt Site 4
Norman GA Pontoon
GM0191 RHIS 2of3
GM0191 RHIS 1of3
GM0191 RHIS 3of3
RHIS 2 GM0419
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data LDEO-Columbia, NSF, NOAA
Image NASA
© 2013 Cnes/Spot Image
Google earth
16° 19.397' S 145° 45.473' E elev -28 m eye alt 86.80 km


RHIS Emily Site 1
RHIS Irene site 2
RHIS Irene Site 2
RHIS Irene Site 1
RHIS Endeavour Site 3
RHIS Endeavour Site 2
Endeavour Site 2 RHIS 2of3
RHIS Pickersgill Site 1
Pickersgill Site 2 RHIS 1of3
Pickersgill Site 2 RHIS 3of3
Evening Site 3 RHIS 3of3
Evening Site 3 RHIS 1of3
RHIS Morning Site 2
Morning Site 2 RHIS 2of3
Morning Site 3 RHIS 3of3
Spitfire Site 1 RHIS 2of3
RHIS Mackay Site 2
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data LDEO-Columbia, NSF, NOAA
Image NASA
© 2013 Cnes/Spot Image
Google earth
15° 49.292' S 145° 38.502' E elev -41 m eye alt 86.80 km


RHIS Three Islands site 2
RHIS Forrester Site 1
RHIS Forrester Site 3
RHIS Startle Site 1
RHIS Lark Site 1
RHIS Boulder site 1
RHIS Boulder site 2
RHIS Unnamed 15047 Site 1
Osterlund Site 2
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data LDEO-Columbia, NSF, NOAA
Image NASA
© 2013 Cnes/Spot Image
Google earth
15° 20.853' S 145° 30.733' E elev -34 m eye alt 86.80 km


RHIS Mermaid Cove
RHIS MacGillvray Site
RHIS Lizard Site 4 S1
RHIS Lizard Site 2 S3
RHIS Lizard Site 2 S2
RHIS Nth Direction Site 3 S2
RHIS Nth Direction Site 3 S3
RHIS Linnet site 2
RHIS Nth Direction Site 1 S1
RHIS Sth Direction Island site 1
RHIS Eye reef site 1
RHIS Helsdon site 1
RHIS Two Islands site 2
RHIS Two Islands Site
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data LDEO-Columbia, NSF, NOAA
Image NASA
© 2013 Cnes/Spot Image
Google earth
14° 48.333' S 145° 33.487' E elev -31 m eye alt 86.80 km

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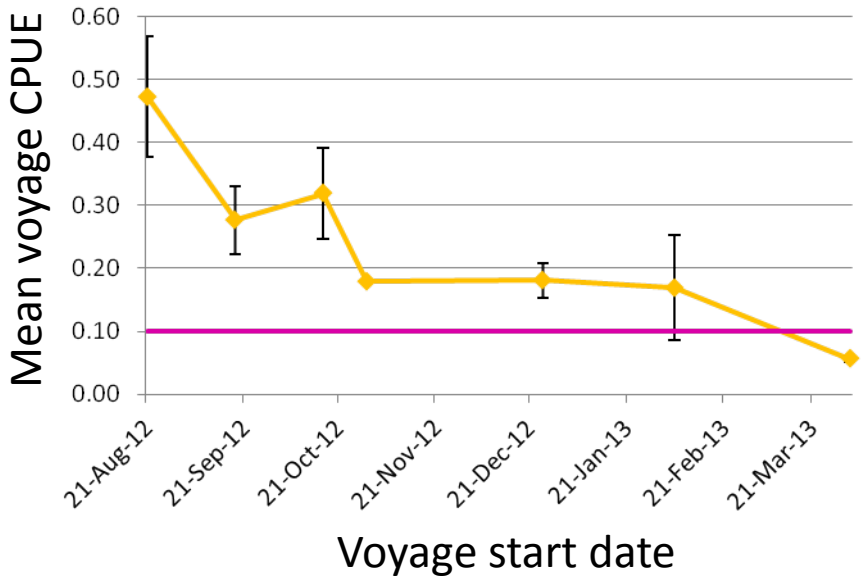
RESULTS

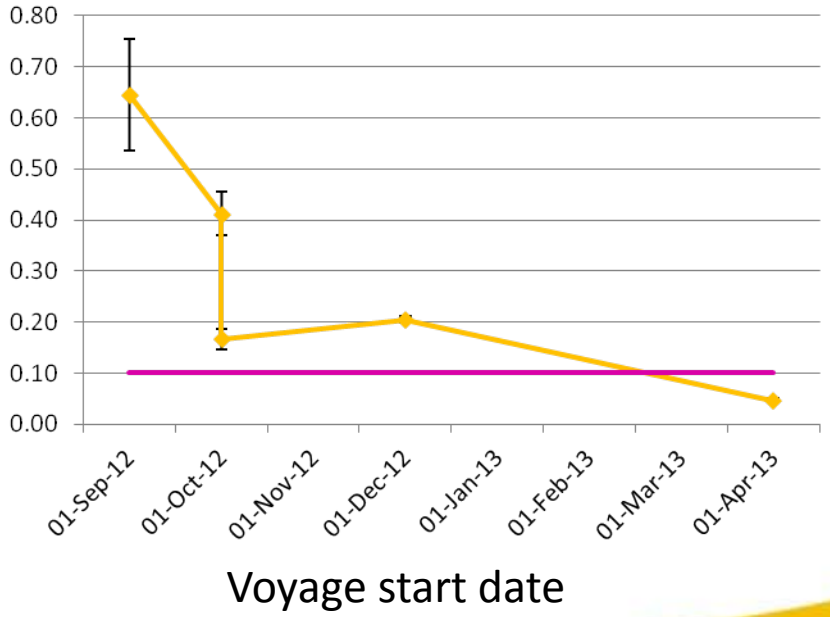
Sites that have been revisited, show significant decrease in CPUE. This is effected by factors such as the proximity to other outbreak sites and coral composition

Green Island, South Wall site



Outbreak level

Reef 16-018a, Playground site



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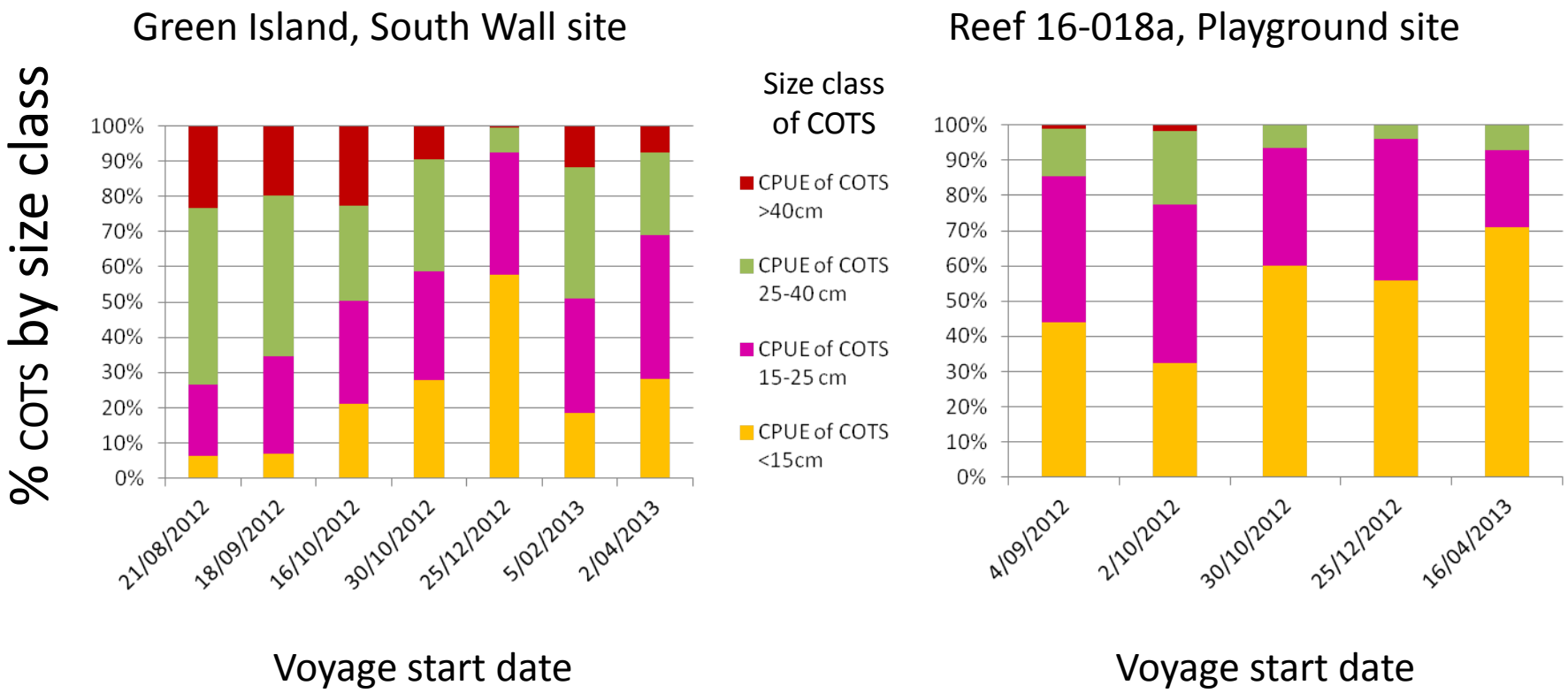
RESULTS

There was also a reduction in size of the COTS that were caught.



APPLICATION OF WORK

"We can't do anything about cyclones, storms, or the coral bleaching caused by high sea temperatures but we may be able to do something about COTS“

Dr Peter Doherty (AIMS.gov.au 2012)

The review and analysis of historical data from previous COTS eradication efforts in the Cairns and Port Douglas areas showed that COTS eradication in specific areas significantly improved the health of the reef in those areas. In fact, coral cover on those protected sites remained high (at near normal levels) while, at the non-protected sites, coral cover was reduced to devastatingly low levels. In some cases, the coral cover became so low, that reef tourism operators had to relocate to other sites to conduct their tourism operations.

FUTURE DIRECTIONS

- AMPTO is committed to protecting Australian marine park tourism operators from the impacts of COTS
- Over the last three years, there has been a $2 million investment by the federal government following a $3.5 million investment by the QLD Government and $2.5 million from industry
- AMPTO hopes to secure future funding to continue the control of COTS both at important tourism sites and at Northern sites that feed secondary outbreaks
- By taking decisive action whilst the current outbreak is in the early stages, the size and scope of the outbreak will be reduced

FUTURE DIRECTIONS

The AMPTO COTS control program has been working with Dr Posada to field test a fatal “one-shot” injection that uses a protein to induce an allergic reaction. The field tests showed a 100% mortality rate

Hypersaline solutions are also being explored as a one-shot treatment, taking advantage of COTS inability to osmoregulate.

It is hoped that a one shot solution will increase the efficiency of control efforts.

THANK YOU

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REFERENCES

AIMS (2012) Spotlight shines on the crown-of-thorns starfish http://www.aims.gov.au/docs/media/latest-releases//asset_publisher/8Kfw/content/id/102688

Engelhardt U, Miller I, Lassig B, Sweatman H and Bass D (1997) Crown-of-thorns starfish (Acanthaster planci) populations in the Great Barrier Reef World Heritage Area: Status report 1995-96

Keesing JK, Lucas JS (1992) Field measurement of feeding and movement rates of the crown-of-thorns starfish Acanthaster planci (L.). J.-Exp.-Mar.-Biol.-EcoL. 156: 89-104

Lassig BR, Engelhardt U (1995) COTS Comms. Reef Research 5(1): 18-23.