Assessment of deep-water habitat for COTS in the GBR

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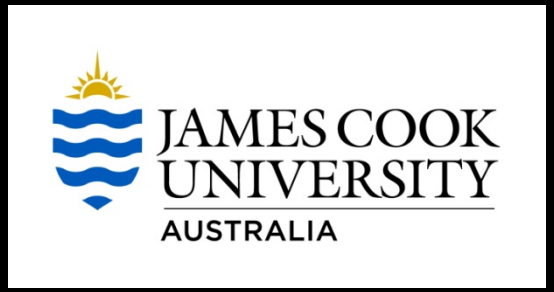


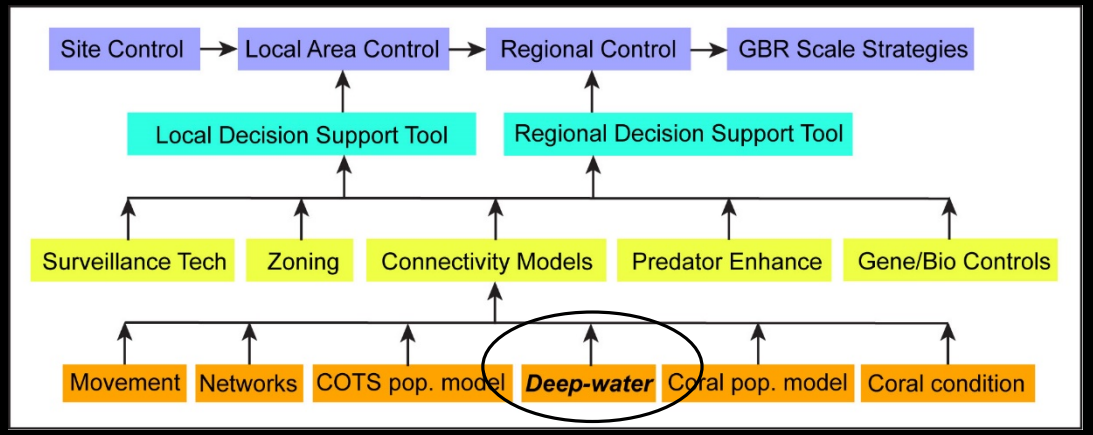
Decision Support Tool

Aims:

Integrate all the available source bathymetry data used in the latest gbr100 grid and to generate a much higher-resolution gbr30 grid (~30 m pixel spacing) over the GBR shelf area.

Use the gbr30 grid to generate spatial datasets and descriptive statistics of the 22 ‘super spreader’ and tourism reefs, to understand the extent of potential deep-water habitat.

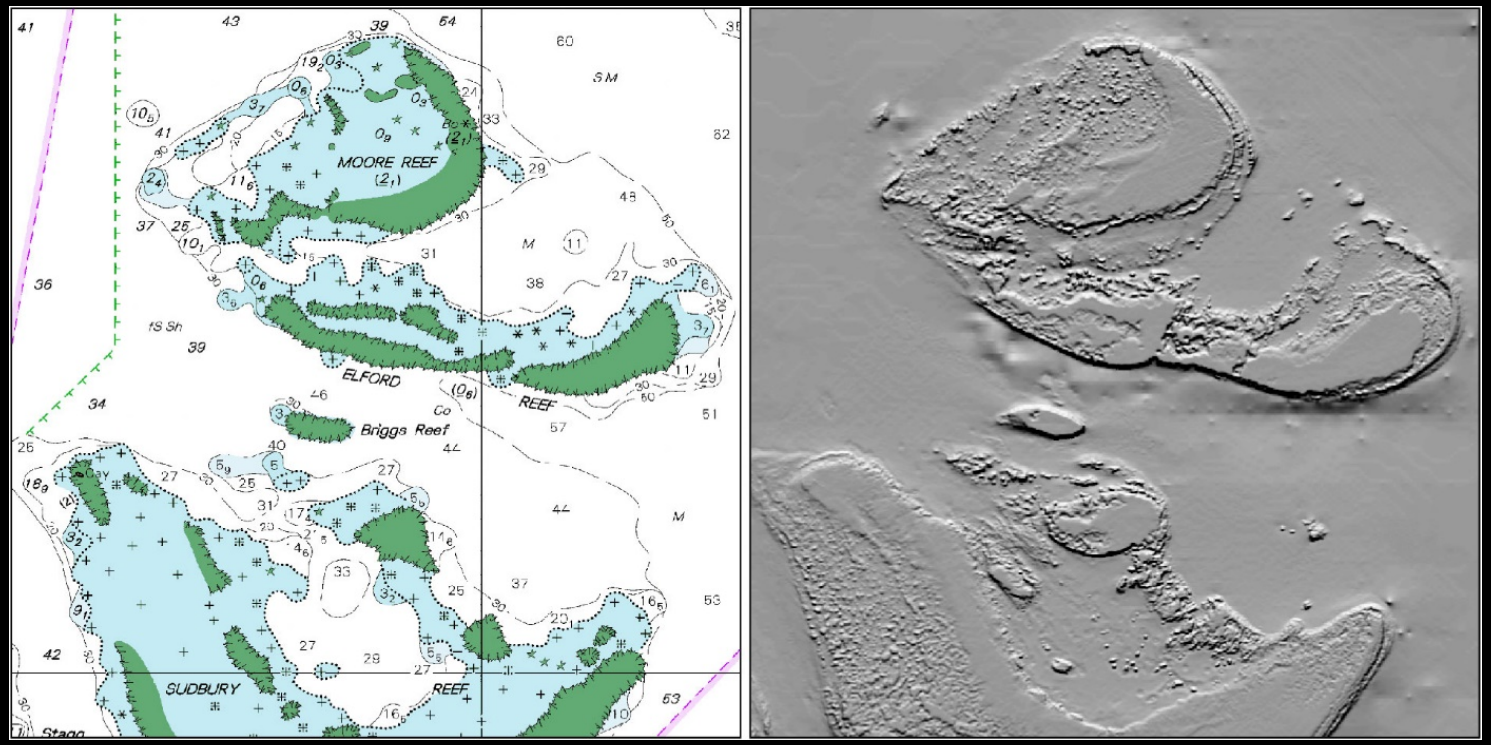
Conduct an assessment of the potential for submerged banks or deeper reefs to act as deep-water habitat for COTS, and the implications of this for the design of the control program.



Media release 19 January 2018

gbr30 data available at: http://pid.geoscience.gov.au/dataset/115066

Compare Aus chart v gbr30



‘super spreader’ + tourism reefs

	Reef Name (ID)	Characteristics
1	St Crispin Reef (16-019)	Tourism
2	Undine Reef (16-020)	Super spreader
3	Rudder Reef (16-023)	Super spreader
4	Chinaman Reef (16-024)	Super spreader
5	Opal Reef (16-025)	Tourism
6	Tongue Reef (16-026)	Tourism, Super spreader
7	Batt Reef (16-029)	Super spreader
8	Low Isles (16-028)	Tourism
9	Norman Reef (16-030)	Tourism
10	Saxon Reef (16-032)	Tourism
11	Hastings Reef (16-057)	Tourism, Super spreader
12	Michaelmas Reef (16-060)	Tourism, Super spreader
13	Green Island Reef (16-049)	Tourism, Super spreader
14	Arlington Reef (16-064)	Super spreader
15	Flynn Reef (16-065)	Tourism
16	Milln Reef (16-060)	Tourism
17	Thetford Reef (16-068)	Tourism, Super spreader
18	Moore Reef (16-071)	Tourism
19	Briggs Reef (16-074)	Tourism
20	Fitzroy Island Reefs (16-054)	Tourism
21	Elford Reef (16-073)	Super spreader
22	Rib Reef (18-032)	Current outbreak

Benthic Terrain Modeler

Benthic Position Index:

BPI is a measure of where a referenced location is relative to the locations surrounding it.

Positive cell values within BPI are features higher than surrounding area e.g. ridges and pinnacles.

Negative cell values within BPI are features lower than surrounding area e.g. valleys and depressions.

Near zero values within BPI are features that are flat or constant gradient e.g. plains or slopes.

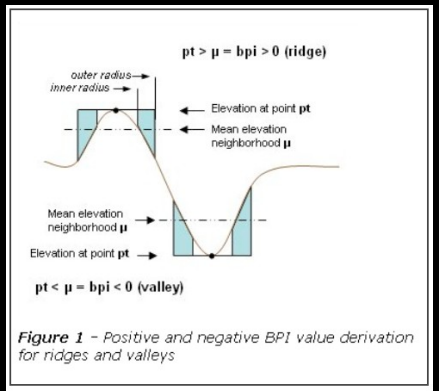


Figure 1 - Positive and negative BPI value derivation for ridges and valleys

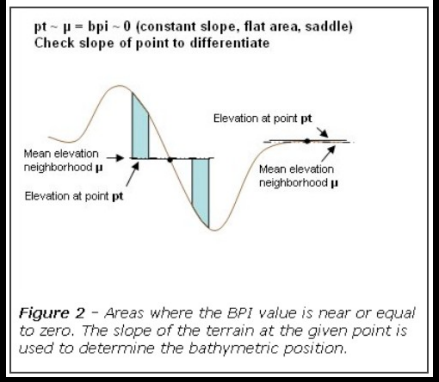
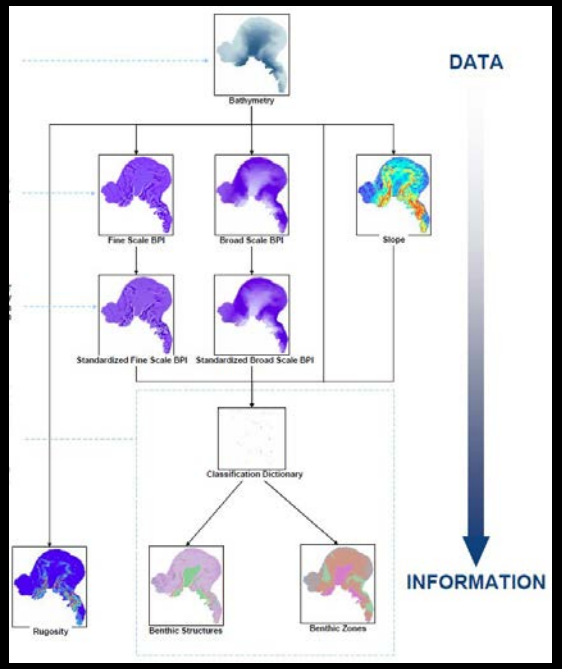


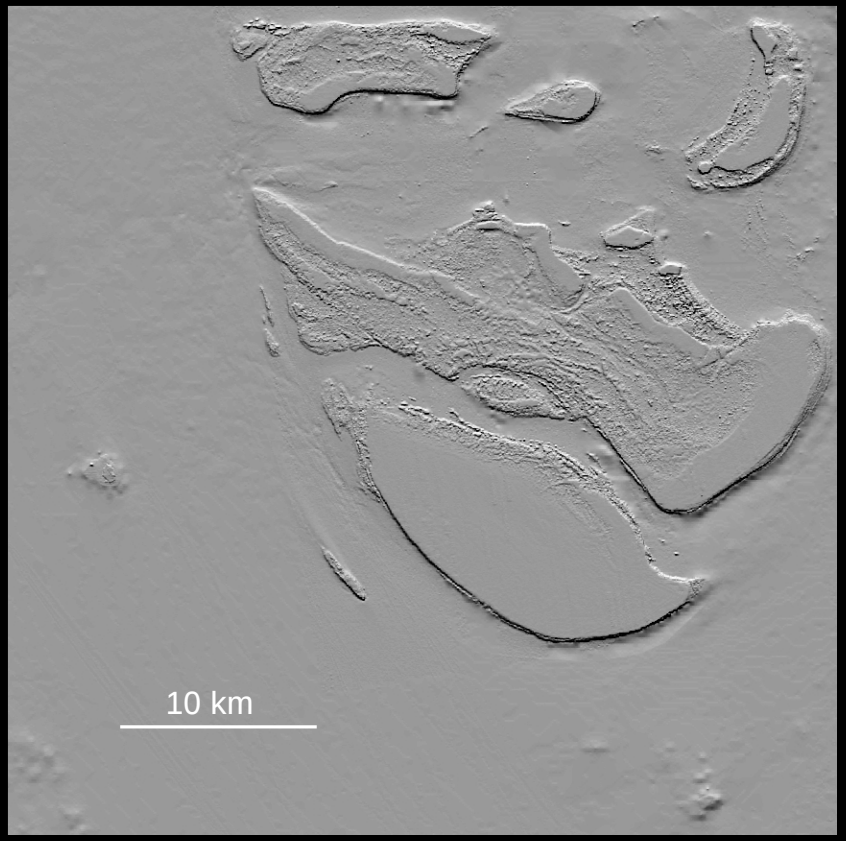
Figure 2 - Areas where the BPI value is near or equal to zero. The slope of the terrain at the given point is used to determine the bathymetric position.



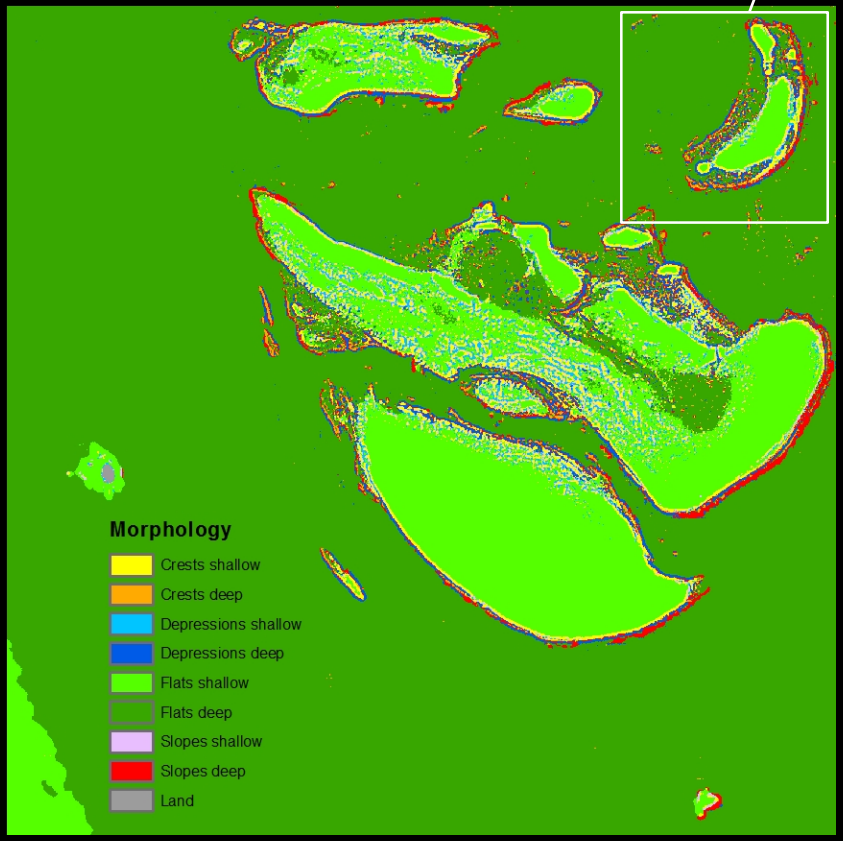
Class	Zone	BroadBPI Lower	BroadBPI Upper	FineBPI Lower	FineBPI Upper	Slope Lower	Slope Upper	Depth Lower	Depth Upper
1	Crests shallow	50						-15	1
2	Crests deep	50							-15
3	Depressions shallow		-50					-15	1
4	Depressions deep		-50						-15
5	Flats shallow	-50	50				3	-15	1
6	Flats deep	-50	50				3		-15
7	Slopes shallow	-50	50			3		-15	1
8	Slopes deep	-50	50			3			-15
9	Land							1	

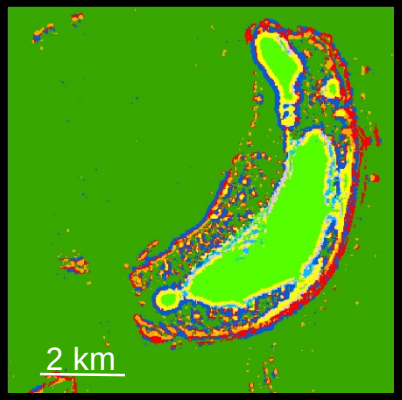
BTM example

gbr30 hillshade



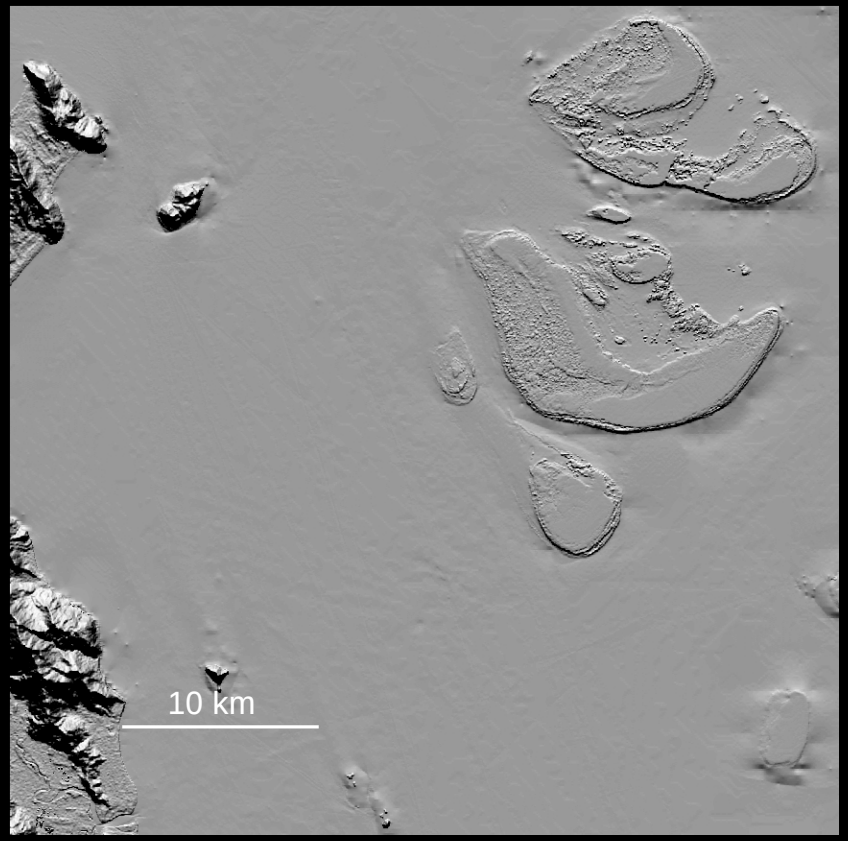
BTM output



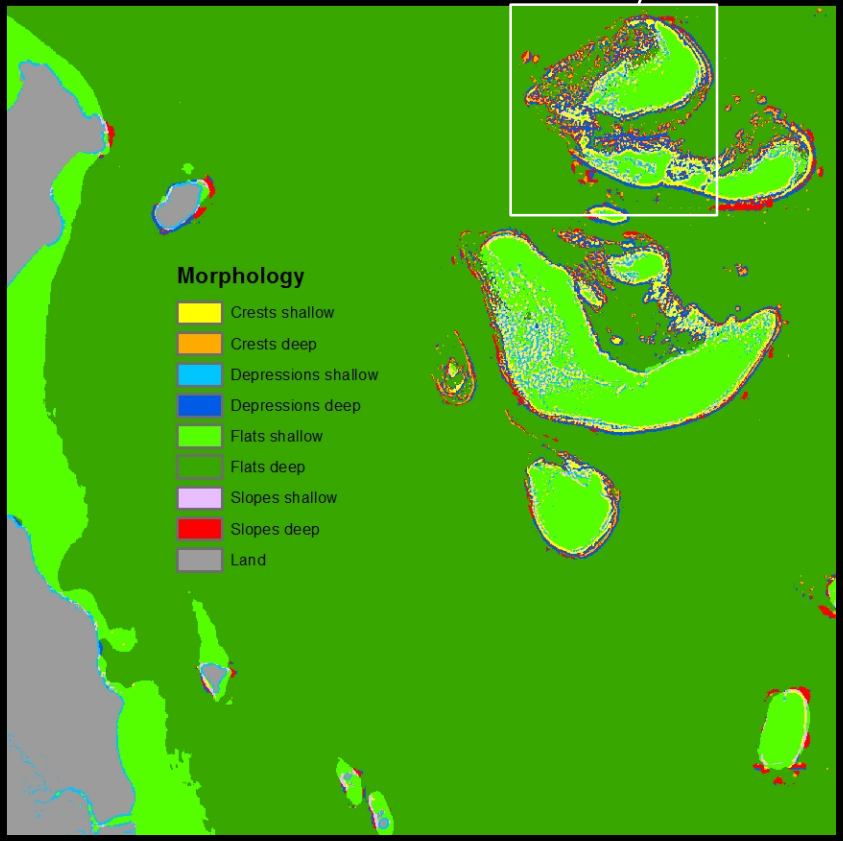


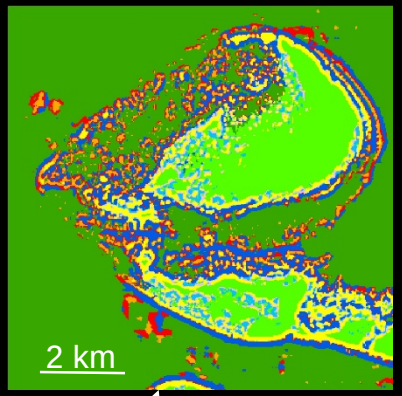
BTM example

gbr30 hillshade

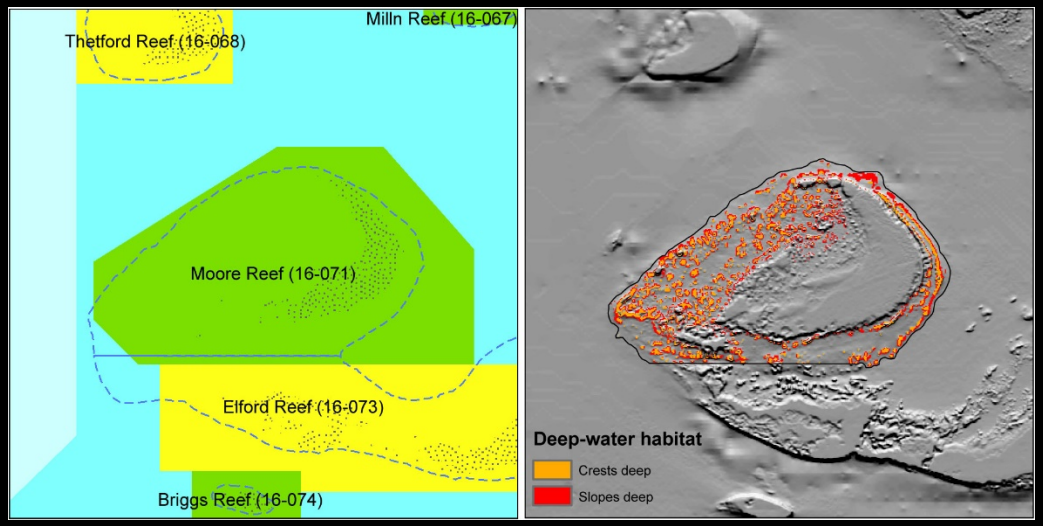


BTM output

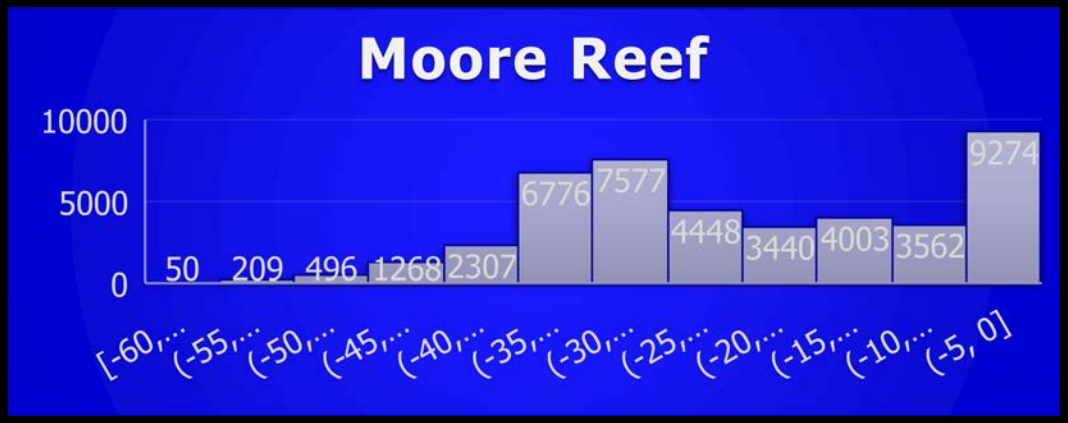




Example Moore Reef 16-071



	Full reef	Reef 0-15 m	Reef 15-59 m	Deep-water habitat
Total No. pixels	43409	16880	26529	8109
Min depth (m)	-0.08	-0.08	-15.00	
Max depth (m)	-59.96	-14.99	-59.96	
Mean depth (m)	-20.02	-5.97	-28.87	
Proportion %	100.00	38.89	61.11	30.57
Area (km²)	46.33	18.02	28.31	8.65



Deep-water banks

Summary:

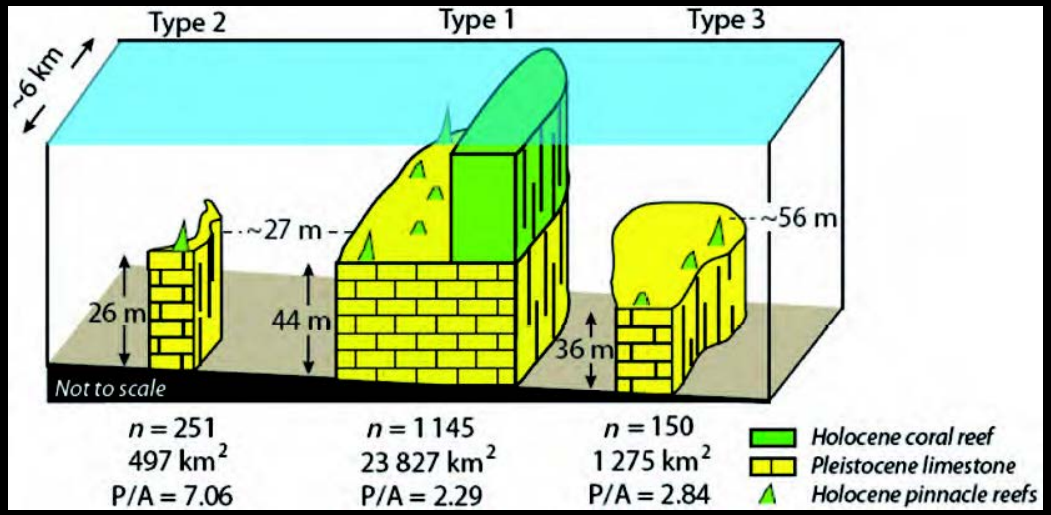
All Type 1 banks (Harris et al. 2013) excl Low Isles and Fitzroy Is Reef

Banks (full depth) mean area - 51 km^2
- Tongue Reef largest area - 257 km^2
- Briggs Reef smallest area - 2 km^2

NSS reefs (<15 m) mean % area - 48%
- Batt Reef largest % area - 85%
- Milln Reef smallest % area - 7%

Deep-water (>15 m) mean % area - 52%
- Milln Reef largest % area - 93%
- Norman Reef largest % area - 83%

<u>Deep-water % area > NSS reefs % area</u>



Harris, P. T., Bridge, T. C. L., Beaman, R. J., Webster, J. M., Nichol, S., & Brooke, B. (2013). Submerged banks in the Great Barrier Reef, Australia, greatly increase available coral reef habitat. ICES Journal of Marine Science, 70(2), 284-293

Deep-water coral habitat

Summary:

Potential deep-water (>15 m) habitat (crests+slopes) excl Low Isles and Fitzroy Is Reef

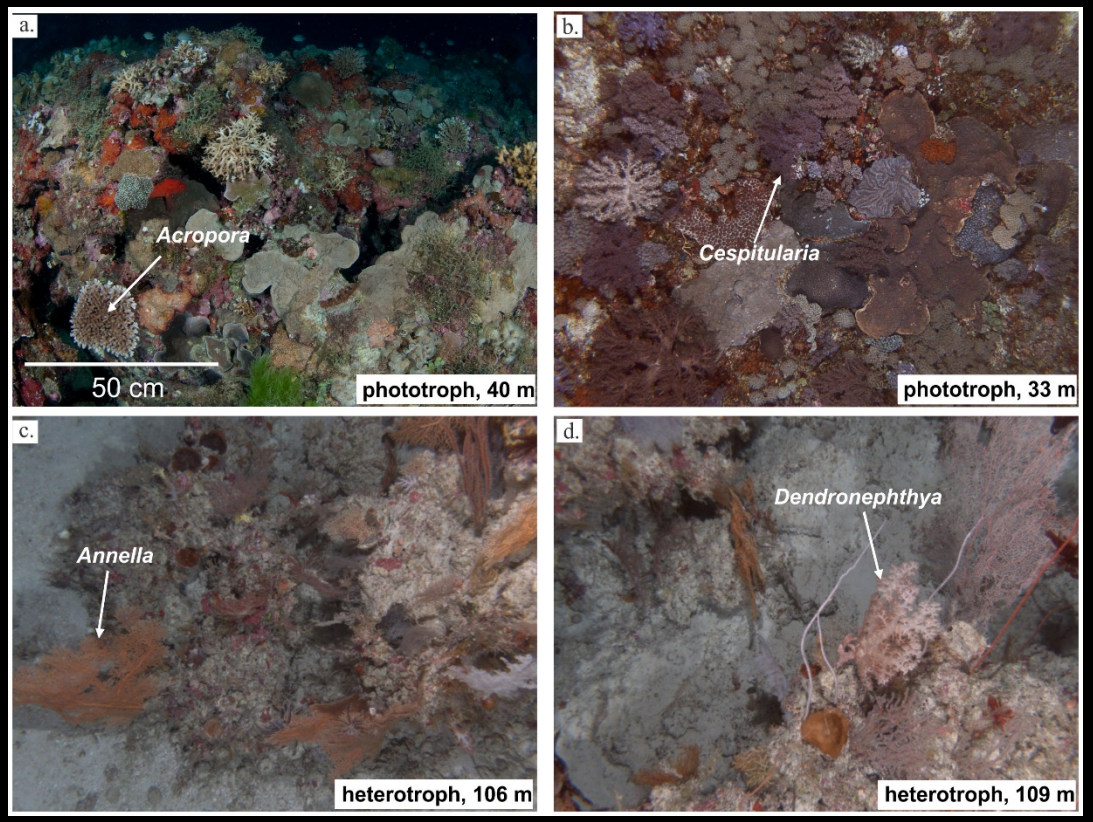
Deep-water habitat mean area - 6 km^2

Deep-water habitat % area - 33%

- Tongue Reef largest area - 24 km^2
- Briggs Reef smallest area - 0.3 km^2
- Chinaman Reef large % area - 51%
- Rib Reef large % area - 50%

<u>Deep-water habitat is third of % area</u>

Requires extensive ground truthing to generate predictive habitat maps



Bridge, T., Beaman, R., Done, T., & Webster, J. (2012). Predicting the location and spatial extent of submerged coral reef habitat in the Great Barrier Reef World Heritage Area, Australia. PLOS ONE, 7(10), e48203

Assessment of COTS risk

- ‘Deep-water’ is relative to the surveys conducted mainly by divers and snorkelers.
- COTS outbreaks are restricted mainly to zones of highest coral cover ~15 m.
- Few reports of adult COTS outbreaks found deeper than zones of highest coral cover.
- No evidence of COTS migration across inter-reefal muddy sand areas.
- Deep-water recruitment hypothesis is discounted. 1000s juveniles found in shallows.

1. Assessment is that there is a low risk of adult COTS outbreaks in deep-water habitats below the zone of highest coral cover.
2. Assessment is that there is a low risk of larval COTS to be found in deep-water habitats on emergent reefs below the zone of highest coral cover.

<u>The recommendation is that COTS control efforts should continue in the relatively shallow waters of emergent reefs, and to not expend resources searching for COTS outbreaks in deeper waters significantly below the zone of highest coral cover.</u>