Appendix C

Ecology Survey Reports

Sandy Lane Lot 7 Site
Preliminary Marine Assessment



Annabel Cox

Robert Bourne

Report to W.F. Baird and Associates
September 2023

Context

This report was prepared at the request of David Turner of W.F. Baird and Associates Coastal Engineers Ltd. for the 'Sandy Lane Lot 7 project'. The report provides a rapid assessment of the nearshore marine habitats, including their general health status and biodiversity, at the project site (Figure 1). This will contribute to the baseline studies that will inform appropriate engineering designs for potential improvements to the selected shoreline.

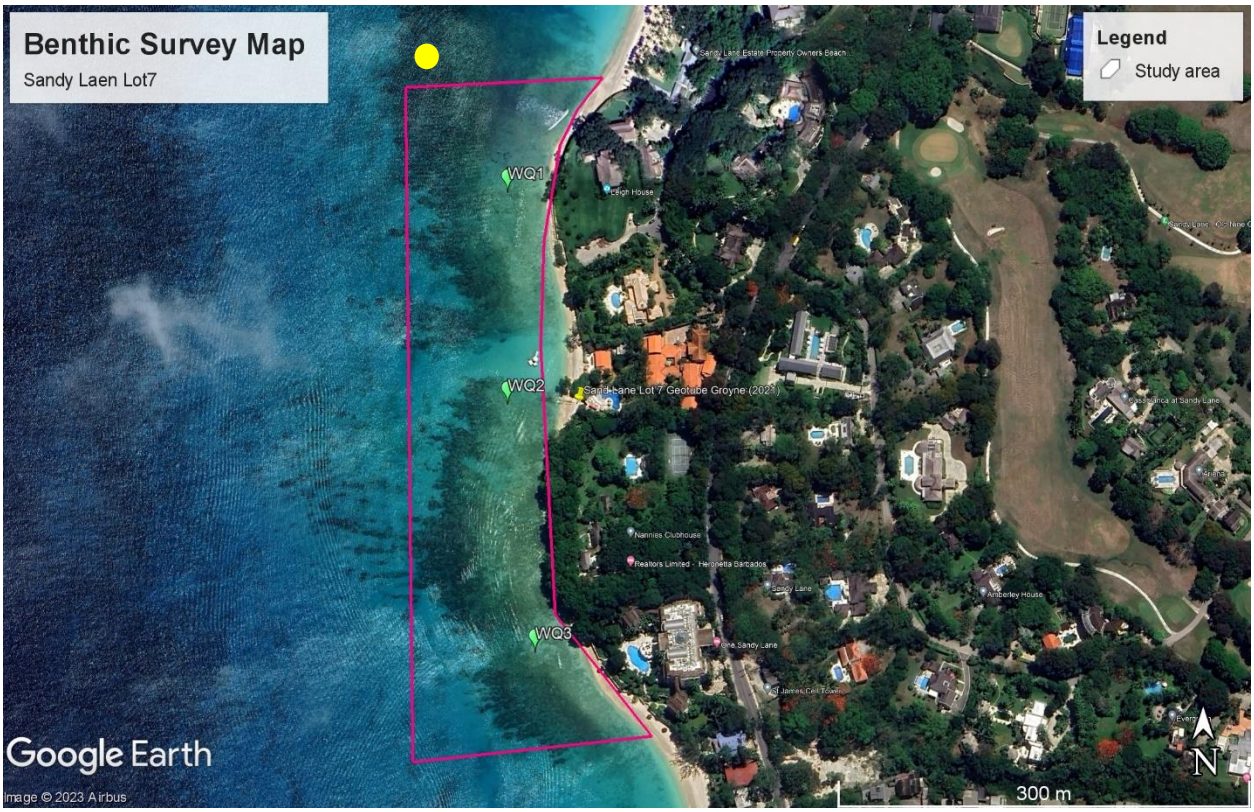


Figure 1. Satellite imagery of Barbados showing the location of the Sandy Lane Lot 7 project site and location of one of the Government's permanent reef monitoring sites (yellow dot).

General Description

The site was visited on August 27, 2023 approximately 3 hours before the high tide. There was an unusual strong onshore breeze causing the water to be choppy and leading to sediment being kicked up in places. There were also small waves breaking on the shallow areas of the reef close to shore. The area surveyed was between 10 – 120 m from shore and the approximate track snorkelled during the underwater survey is shown in Figure 2.

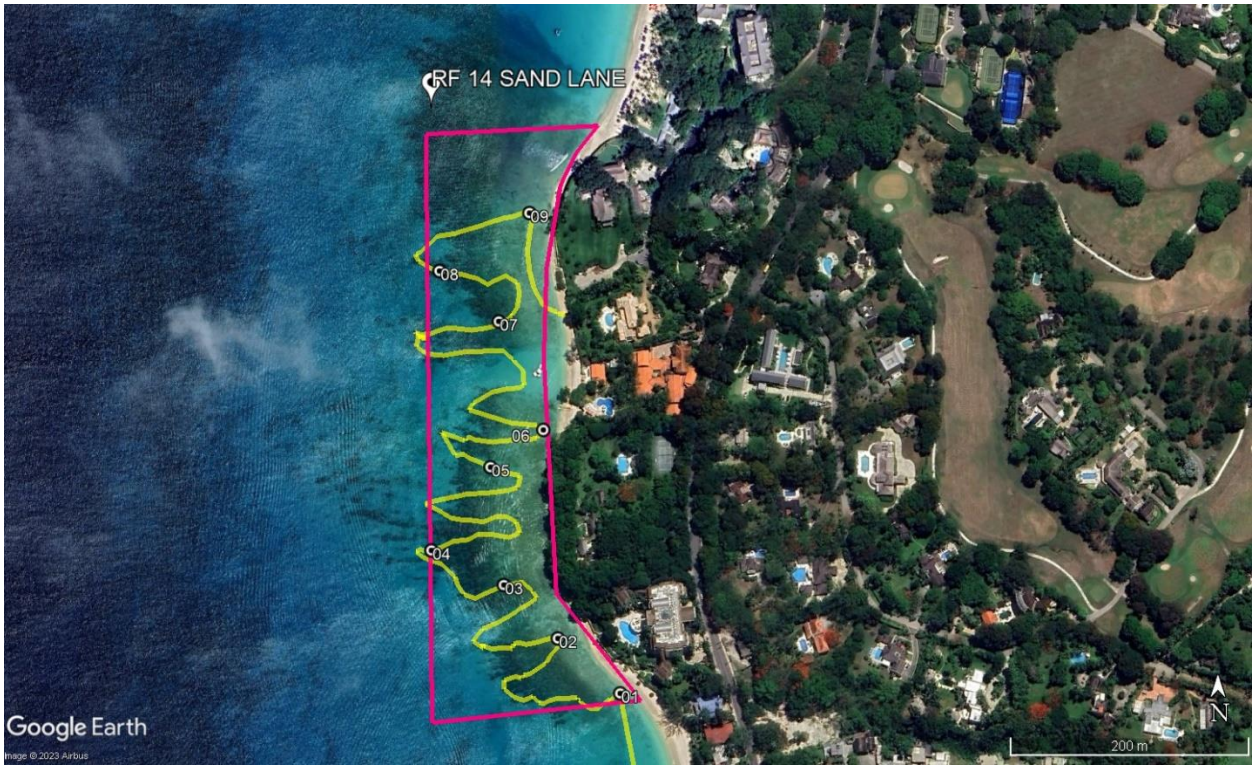


Figure 2. Rapid survey swim track taken over the nearshore reef area showing the approximate location of different reef zones. Points 01, 02, 06, 09 – are on reef flat with algal turf, 03, 05, 07 – shallow reef crest with high rugosity and 04, 08 – in the spur and groove zone.

Shoreline

The shoreline adjacent to the Sandy Lane Lot 7 property consists of a headland with no beach but fronted by large boulders and a walkway to the north. There is an area of relatively narrow beach with signs of hawksbill turtle nesting activity directly in front of the Sandy Lane Lot 7. To the south is a very narrow beach in front of a property wall, a heavily eroded beach with exposed tree roots, and then another narrow beach to the south in front of the property One Sandy Lane (Figure 3).



Figure 3. Shoreline at Sandy Lane Lot 7 site showing (a) headland with no beach but protective boulders and a walkway, (b) narrow sand beach, (c) signs of hawksbill nesting activity, (d) narrow beach in front of property wall, (e) heavily eroded beach with exposed tree roots, (f) narrow beach to the south in front of One Sandy Lane.

Adjacent Reef

The site encompasses two separate fringing reefs with a sand patch separating the two; one large fringing reef to the south and includes most of another large fringing reef to the north (known to the CZMU Barbados Reef Monitoring Programme as Sandy Lane reef # 14). These reefs extend approximately 120 m offshore. The reef is typical of the fringing reefs found along much of the west coast of Barbados, comprising an eroded inshore 'reef flat', a shallow 'reef crest' where the waves generally break, and a deeper 'spur and groove' zone along the outside edge (Figure 4).

The 'reef flat' receives the continuous motion of waves rolling in after breaking on the reef crest, resuspending sand and moving loose coral rubble. Along the shoreline the area is sand strewn with small slabs of coral rubble. The reef flat slightly further offshore comprises a low, relatively flat eroded coral rock platform covered in turf algae (Figure 5). There are occasional colonies of the encrusting knobby brain coral and blade fire coral (Figure 5). To the north of the site, a small colony of elkhorn coral was also found (Figure 5).

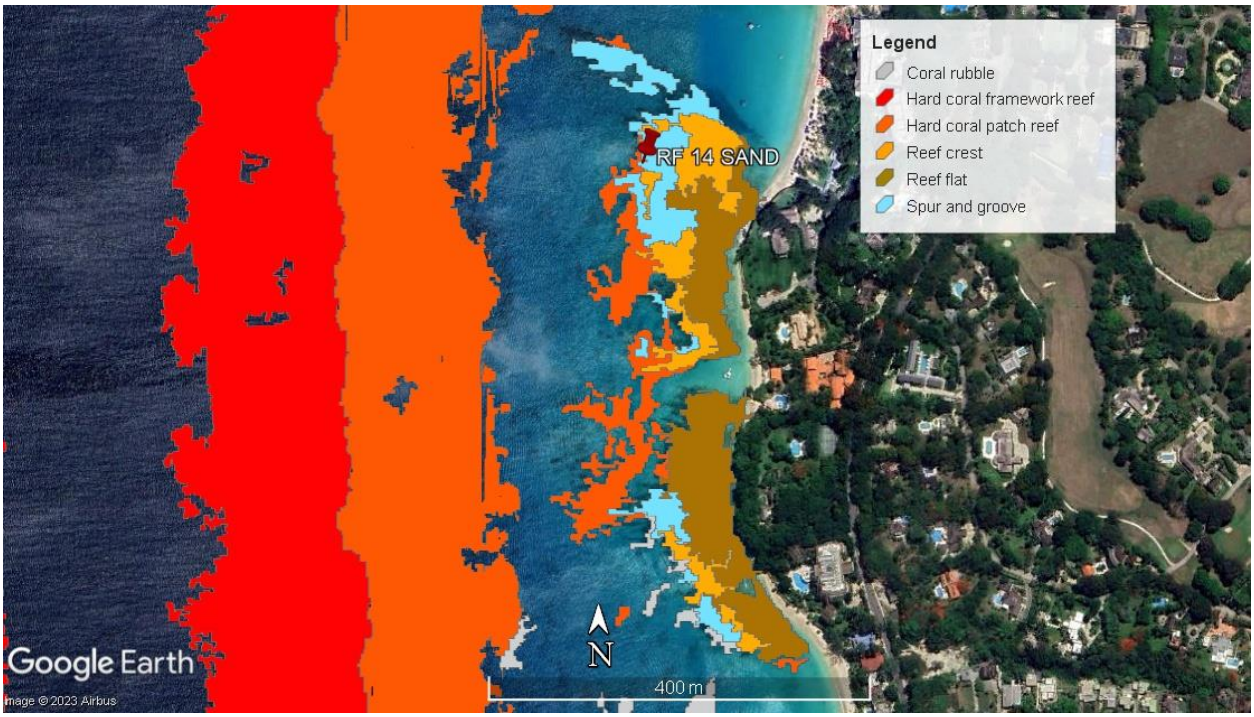


Figure 4. Benthic habitats in the nearshore area within the Sandy Lane Lot 7 site as determined by remote sensing in 2015.

Beyond the reef flat is the reef crest, which is more rugose and supports more live coral and a higher species diversity compared to the reef flat. There are numerous colonies of fire coral (*Millepora complanata*), mountainous star coral (*Orbicella faveolata*), boulder star coral (*Orbicella annularis*), encrusting mustard coral (*Porites astreoides*) and the zoanthid *Palythoa caribaeorum* (Figures 5,6). There are also several colonies of elkhorn coral (*Acropora palmata*) which were reported and mapped in MacLean and Oxenford 2016 (Figures 6,7).

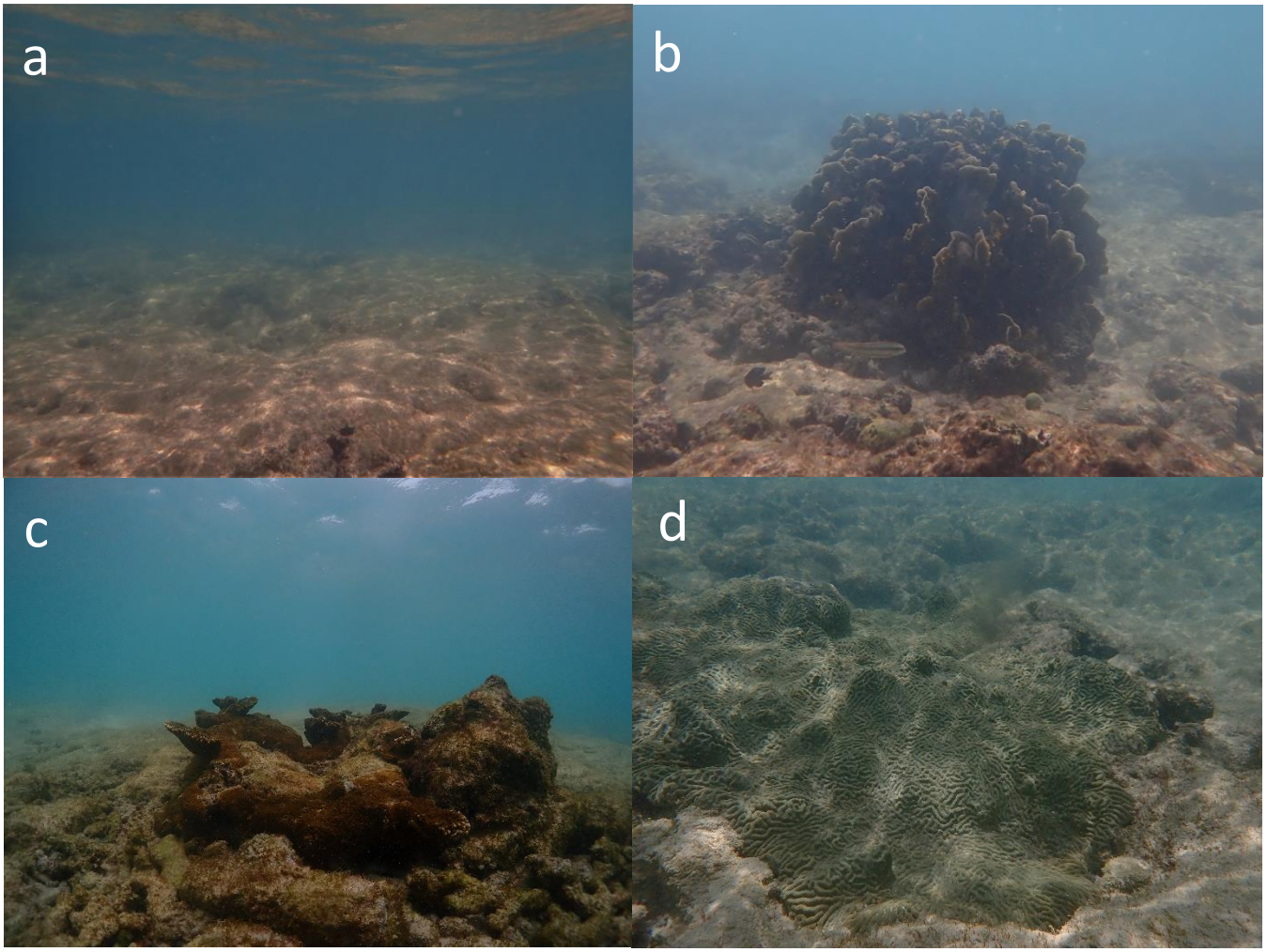


Figure 5. Images of the reef flat in front of the Sandy Lane Lot 7 site showing (a) the typical eroded, low-relief reef framework covered by turf algae and largely devoid of any coral, (b) an example of a colony of blade fire coral (*Millepora complanata*) present on the reef flat, (c) one of the elkhorn coral colonies (*Acropora palmata*), (d) one of the few knobby brain coral colonies (*Diploria clivosa*).

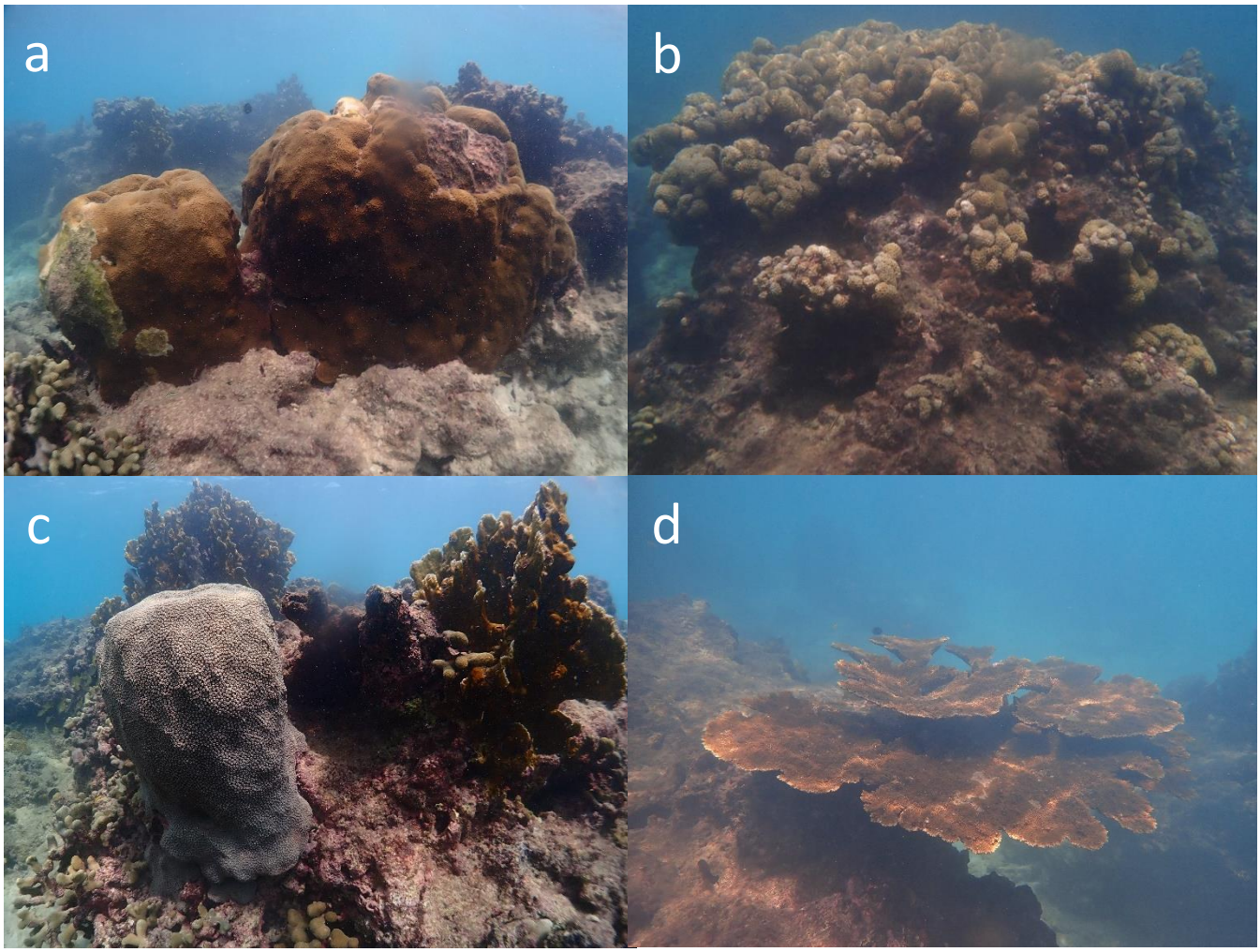


Figure 6. Images of the reef crest in front of the Sandy Lane Lot 7 site showing (a) an example of a colony of mountainous star coral (*Orbicella faveolata*), (b) an area overgrown by the encrusting zooanthid (*Palythoa caribeaorum*), (c) examples of colonies of fire coral (*Millepora complanata*) and boulder star coral (*Orbicella annularis*), (c) one of the elkhorn coral colonies (*Acropora palmata*).



Figure 7. Map of the locations of *Acropora* colonies found between 13th June – August 22nd 2015, within the Sandy Lane Lot 7 site. (Source: MacLean and Oxenford 2016).

The spur and groove zone is located on the offshore margin of the fringing reef and is relatively deep (Figure 8). Coral cover is higher along the tops of the spurs comprising mainly fire coral (*Millepora complanata*) and finger coral (*Porites porites*) (Figure 8). However, overall coral cover is low which is also supported by the reef survey programme that indicated live coral at 7% cover in 2017 on the permanent monitoring site at this reef (Figure 9) (CERMES 2018). There are a number of gorgonians in this area, including sea fans (*Gorgonia ventalina*) (Figure 8), as well as brain corals such as *Diploria strigosa* and larger colonies of the mountainous star coral (*Orbicella faveolata*) and the massive starlet coral (*Siderastrea siderea*) (Figure 8). The coral species diversity is quite high with 12 coral species recorded in the permanent monitoring site here in 2017 (CERMES 2018). This reef is also used by hawksbill turtles as evidenced by an individual spotted on the reef during the survey (Figure 10).

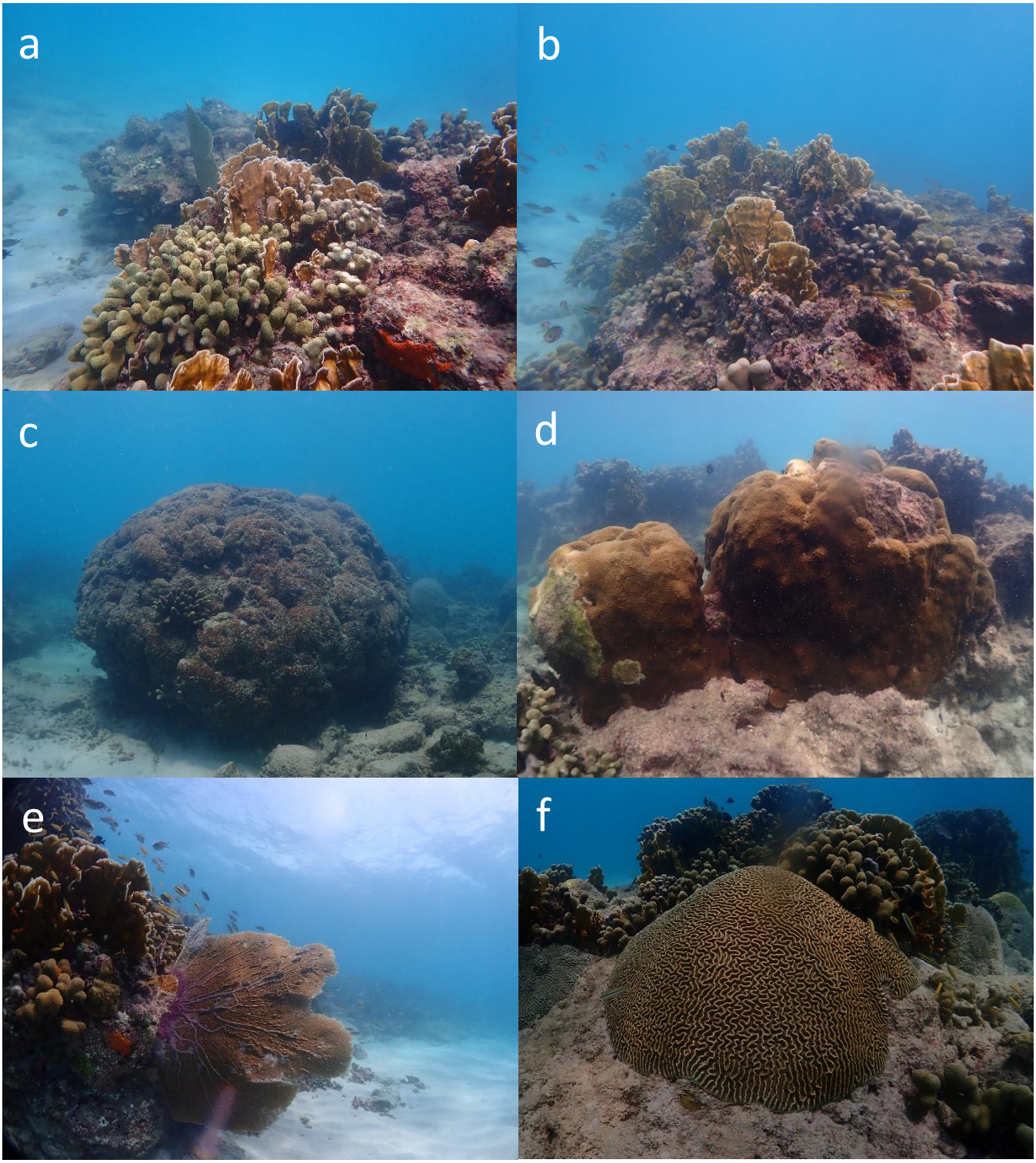


Figure 8. Images of the high diversity, high coral cover spur and groove zone of the Sandy Lane Lot 7 site showing (a) and (b) high coral cover of the reef spur comprising mostly fire coral and finger coral, (c) an example of one of the large colonies of massive starlet coral, (d) an example of one of the larger colonies of boulder star coral, (e) a sea fan, and (f) an example of one of the brain coral colonies present in the spur and groove zone.

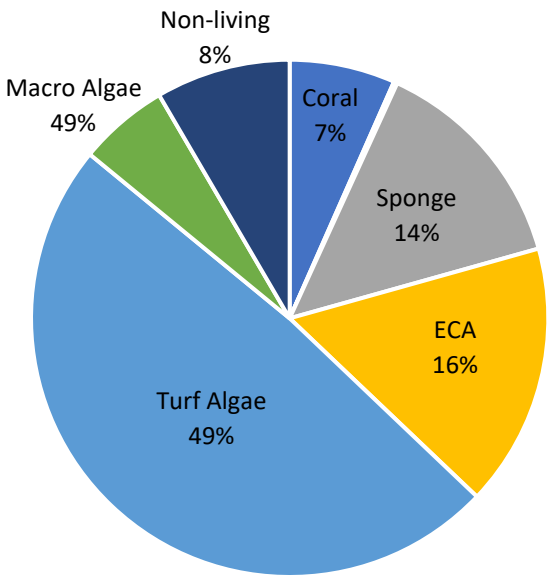


Figure 9. Relative composition by key categories of benthic cover for the Sandy Lane Reef # 14, surveyed in 2017. (Source: CERMES 2018)



Figure 10. Endangered hawksbill turtle swimming in the Sandy Lane Lot 7 reef site.

Concluding Remarks

The nearshore coral reef habitat off Sandy Lane Lot 7 comprises an example of a typical west coast fringing reef comprising the low relief, low coral cover reef flat close to shore, a higher relief reef crest with live coral cover, and a spur and groove zone along the seaward margin with higher coral cover and species diversity. Although there is relatively high coral diversity, overall the reef coral cover is low. However, the hard coral present is in surprisingly good health with very little presence of the stony coral tissue loss disease (SCTLD) that has been spreading across reefs in Barbados since its first reported sighting here in November 2022. There is also very little sign of coral bleaching, despite the high water temperatures that have been affecting the island for several weeks and certainly evident during the survey. This could potentially indicate a degree of resilience in the corals of this and perhaps other fringing reefs along the coast, that could be important to the longer-term survival of corals in Barbados. Other species found included the West Indian sea egg, *Diadema* urchins, Caribbean reef octopus, and rock boring urchins. The fish community mainly consisted of damselfishes and wrasses however, there were large schools of blue tangs, and a number of medium sized parrotfishes, the latter two groups being considered important reef grazers.

References

CERMES 2018. The Barbados Coral Reef Monitoring Programme: Changes in Coral Reef Communities on the West and South Coasts 2007-2017. University of the West Indies, Barbados 81 pp.

Maclean, R. and H. A. Oxenford 2016. Mapping the return of acroporid corals on fringing reefs along the west coast of Barbados. Centre for Resource Management and Environmental Studies, The University of the West Indies, Cave Hill Campus, Barbados. CERMES Technical Report No. 80: 56pp.

Sandy Lane Lot 7 Site

Rapid survey of Sandy Lane Lot 7 site and quantitative assessment of eleven proposed structure footprints



Annabel Cox

Hazel Oxenford

Report to W.F. Baird and Associates

February 2026

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Context

This report was prepared at the request of Cabral Barriteau-Foster of W.F. Baird and Associates Coastal Engineers Ltd. for the 'Sandy Lane Lot 7 site'. The report provides a qualitative rapid survey of the Sandy Lane Lot 7 site and quantitative data on live coral cover within the footprints of the eleven proposed structures at the Sandy Lane Lot 7 site (Figure 1).



Figure 1. Satellite image of the Sandy Lane Lot 7 site showing the proposed locations of eleven coastal protection structures (red): four breakwaters and seven groynes.

Rapid Qualitative Survey

The site was visited on 23rd January 2026 at mid-tide and 15th February 2026 at low tide. There were waves breaking on the shallow areas of the reefs close to shore and against the walkways built around the seafront of the properties with no beach.

Assessment Method

A rapid qualitative survey of the entire Sandy Lane Lot 7 site was completed via snorkel. The area surveyed was between 10 – 250 m from shore and the approximate underwater survey track is shown in Figure 2. During the survey the habitat and marine species present were noted. Species of particular interest were photographed and recorded on an underwater slate. These included: large colonies of boulder star coral (*Orbicella annularis*), a large massive starlet coral colony (*Siderastrea siderea*), a colony of the critically endangered pillar coral (*Dendrogyra cylindrus*), and what appears to be a bleaching resistant colony of elkhorn coral (*Acropora palmata*) (Figure 2, Figure 3). Also of particular interest were several newly dead skeletons of elkhorn coral within the footprint of Breakwater 1 (Figure 2, Figure 3).

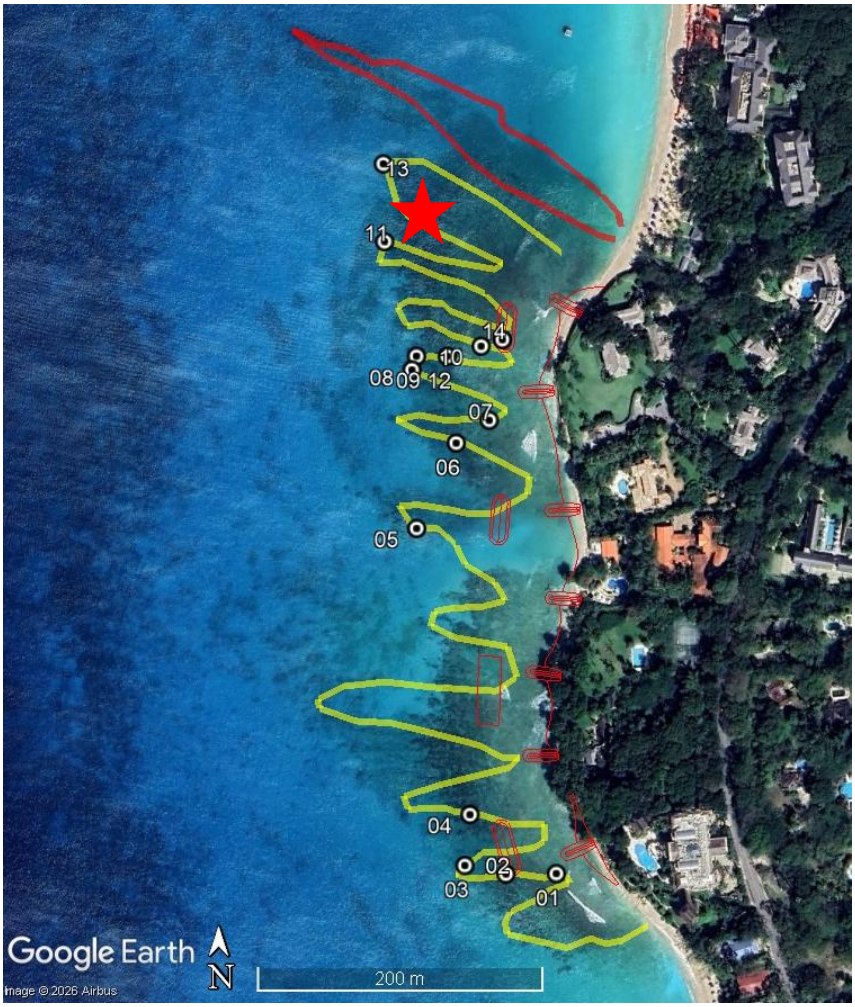


Figure 2. Rapid survey swim track on 23rd January (yellow) and 15th February 2026 (red) taken over the Sandy Lane Lot 7 site showing the approximate location of different reef zones and species of special interest. Points 03, 05 – are in the spur and groove zone, 01, 07, 10 – are on reef flat with turf algae, 02, 04, 06 – shallow reef crest with high rugosity. Species of special interest included colonies of elkhorn coral (08) and pillar coral (13), large colonies of boulder star coral (09, 12) and massive starlet coral (11), and recently dead colonies of elkhorn coral within the footprint of Breakwater 1 (14). Red star shows the location of one of the Government's permanent reef monitoring sites.

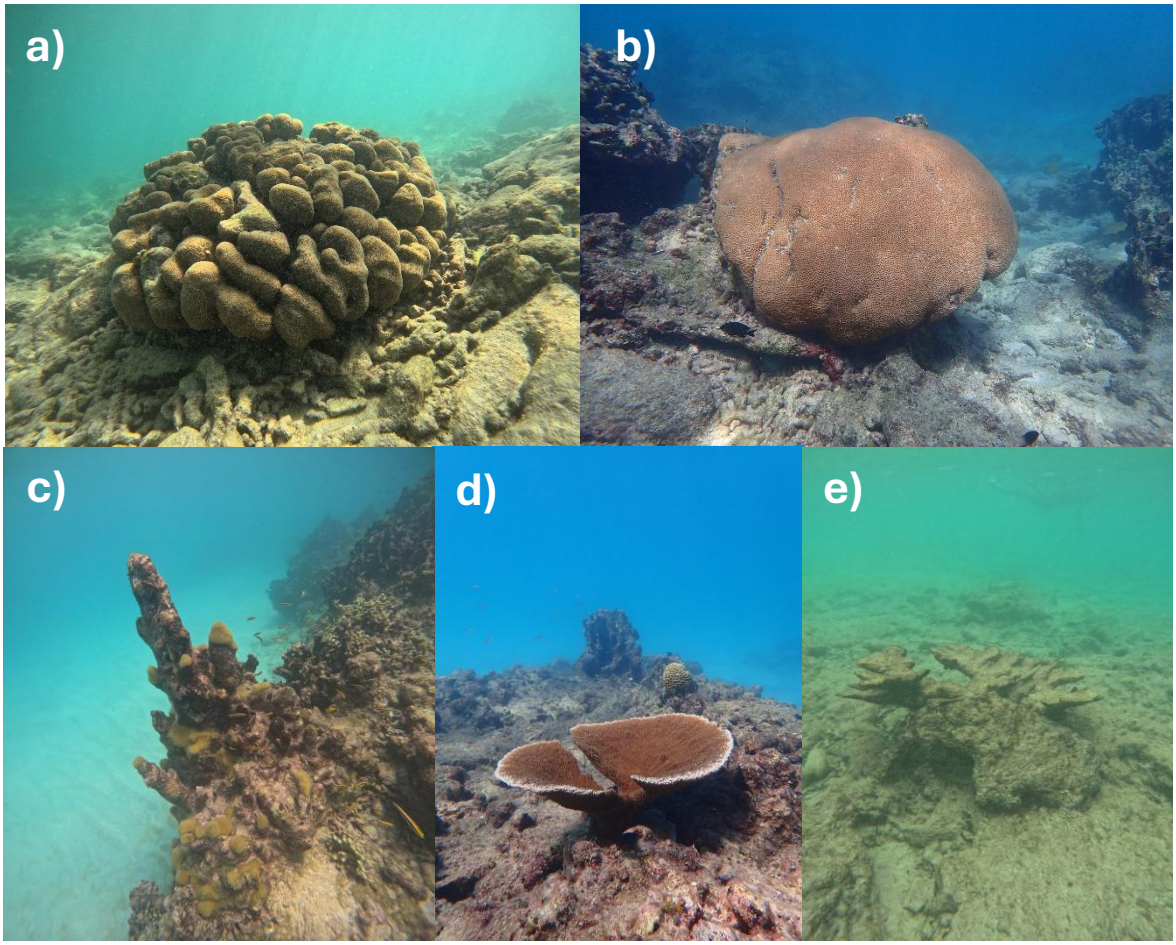


Figure 3. Species of particular note recorded during the rapid qualitative survey included (a) a large boulder star coral colony (*Orbicella annularis*), (b) a large massive starlet coral colony (*Siderastrea siderea*), (c) a colony of the critically endangered pillar coral (*Dendrogyra cylindrus*), (d) what appears to be a bleaching resistant colony of elkhorn coral (*Acropora palmata*), and (e) skeletons of recently dead elkhorn coral (*Acropora palmata*) within the footprint of Breakwater 1.

Shoreline

The shoreline of the Sandy Lane Lot 7 site, from north to south consists of a headland with no beach but fronted by large armour stone boulders (Figure 4a), a very narrow sand beach, only visible at low tide, backed with vertical concrete wall and gabions that have been damaged to expose broken wire with boulders strewn about (Figure 4b), several properties with vertical walls and concrete steps with foundations exposed (Figure 4c,d), a property with no beach and large armour stone boulders, the public access with a heavily eroded beach with exposed tree roots (Figure 4e), and a vertical wall with no beach in front of the One Sandy Lane property (Figure 4f).

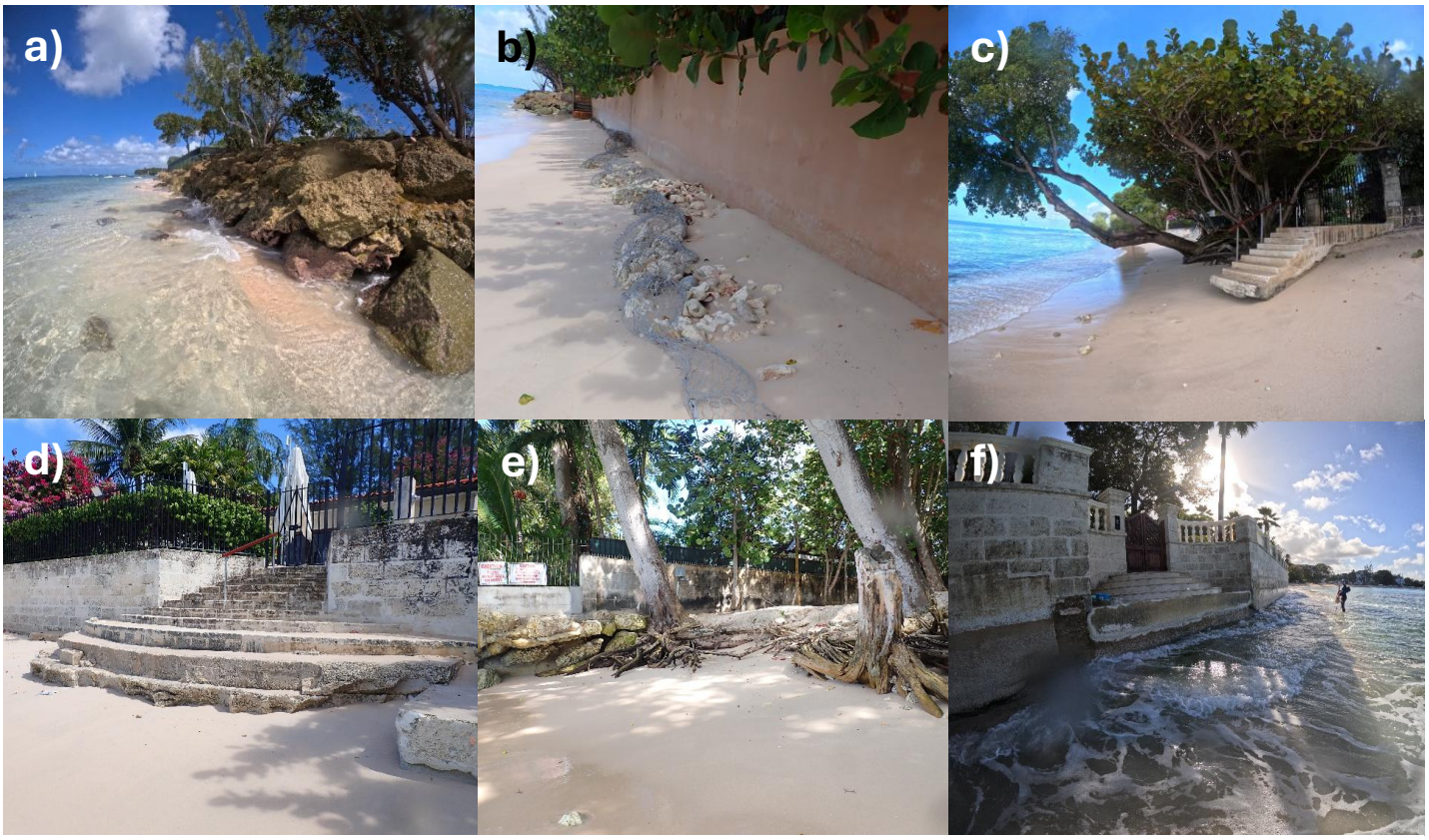


Figure 4. Shoreline at the Sandy Lane Lot 7 site displayed from north to south showing (a) headland with no beach but large armour stone boulders, (b) narrow beach exposed at low tide only, backed by vertical wall with broken gabions and boulders strewn about, (c) and (d) narrow beach in front of several beach front properties with concrete steps with foundations exposed, (e) public access with narrow beach at low tide and exposed tree roots, (f) property wall with no beach in front of One Sandy Lane property.

Adjacent Reefs

The site encompasses two separate fringing reefs with a sand patch separating the two. The reef to the north is known to the CZMU Barbados Reef Monitoring Programme as Sandy Lane reef # 14. These reefs extend approximately 120 m offshore and are typical of the fringing reefs found along much of the west coast of Barbados, comprising an eroded inshore 'reef flat', a shallow 'reef crest' where waves generally break, and a deeper 'spur and groove' zone along the outside edge (Figure 5).

Along the shoreline the area is sand strewn with small slabs of coral rubble (Figure 6a). To the south of the site there was a large amount of rubble as well, presumably from damage caused by Hurricane Beryl in 2024 (Figure 6b).

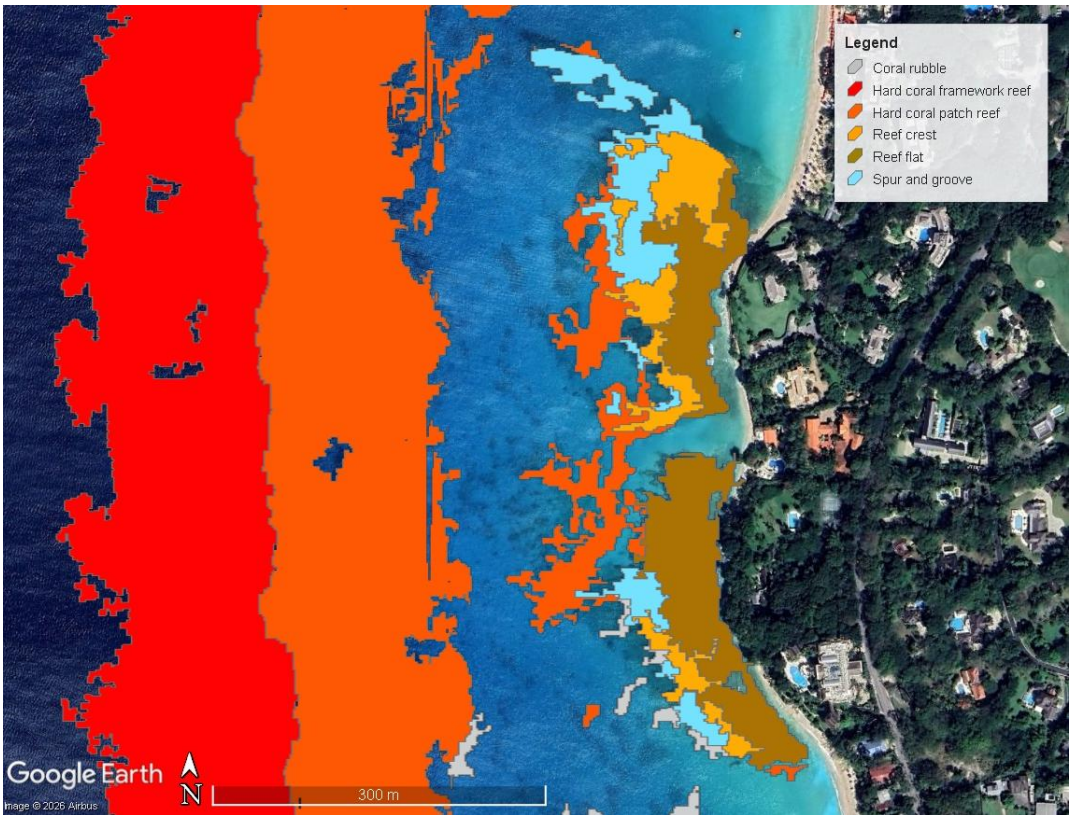


Figure 5. Benthic habitats in the nearshore area within the Sandy Lane Lot 7 site as determined by remote sensing in 2015.

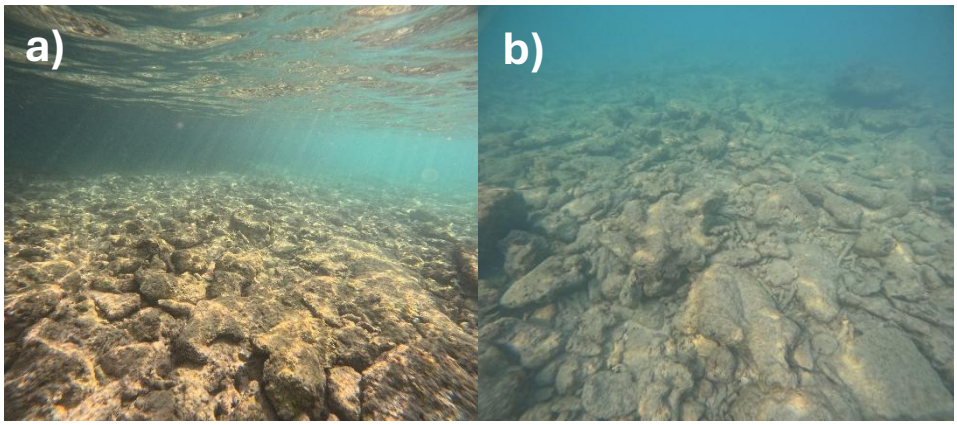


Figure 6. Photos showing large amounts of rubble (a) close to the shoreline, and (b) towards the south end of the site.

The ‘reef flat’ of both the reefs at the Sandy Lane Lot 7 site, slightly further offshore than the rubble zone, comprises a low, relatively flat eroded coral rock platform covered in turf algae. There are occasional colonies of the encrusting knobby brain coral (*Diploria clivosa*) and a population of the rock boring urchin (*Echinometra* sp.) (Figure 7).

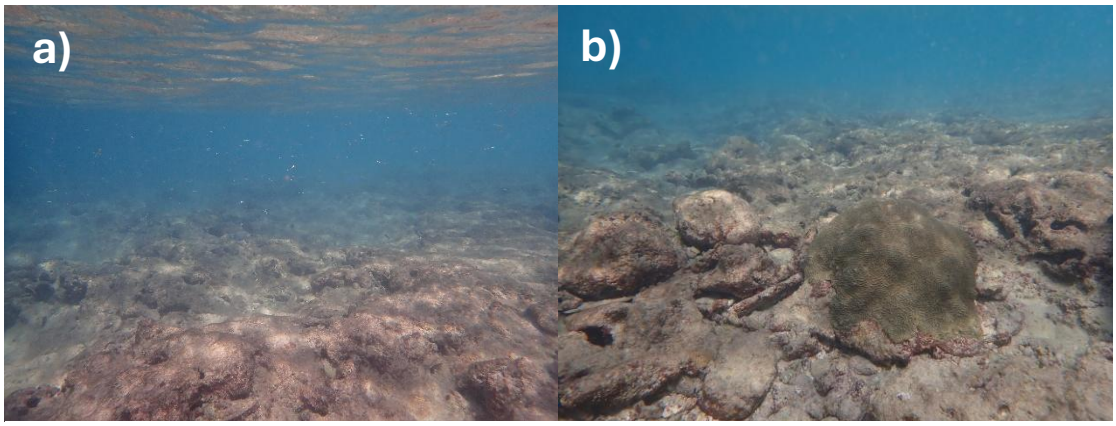


Figure 7. Images of the reef flat on the two reefs in the Sandy Lane Lot 7 site showing (a) the typical eroded, low-relief reef framework covered by turf algae and largely devoid of any coral, and (b) example of one of the few knobby brain coral colonies (*Diploria clivosa*).

Beyond the reef flat is the reef crest, which is more rugose and usually supports more live coral and a higher species diversity compared with the reef flat (Figure 8). However, coral cover was very low due to both the extreme bleaching event and Hurricane Beryl in 2024. There were also several skeletons of dead blade fire coral (*Millepora complanata*) as a result of the 2024 bleaching event. Although there were colonies of mountainous star coral (*Orbicella faveolata*), boulder star coral (*Orbicella annularis*), brain corals (*Diploria clivosa* and *Pseudodiploria strigosa*), these colonies were few and far between, particularly on the southern of the two reefs, and in most cases did not look very healthy. However, there were several mats of the white encrusting zooanthid (*Palythoa caribaeorum*), several large schools of blue tangs and a population of the black sea urchin (*Diadema antillarum*).

Signs of significant recent swell events (including Hurricane Beryl) were evident in the many beach chairs/lounge chairs and umbrella frames strewn about the reef, many overturned coral heads and extensive areas of coral rubble cast across the reef framework (Figure 9).

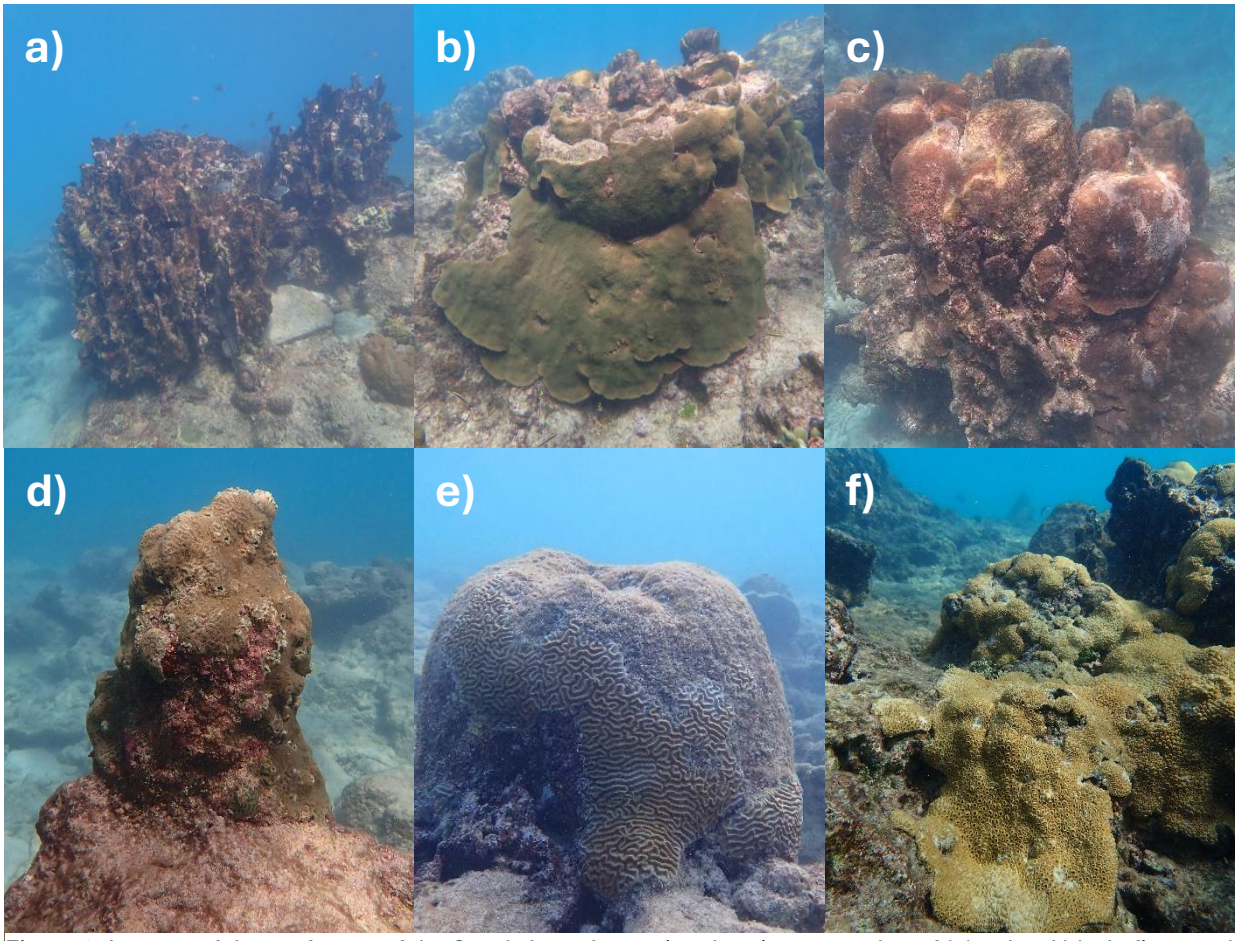


Figure 8. Images of the reef crest of the Sandy Lane Lot 7 site showing examples of (a) a dead blade fire coral (*Millepora complanata*) skeleton, (b) living mountainous star coral (*Orbicella faveolata*) with a damaged top, (c) a live but unhealthy colony of boulder star coral (*Orbicella annularis*), (d) encrusting knobby brain coral (*Diploria clivosa*), (e) a mostly dead colony of symmetrical brain coral (*Pseudodiploria strigosa*), (f) an area overgrown by the encrusting white zooanthid (*Palythoa caribeaorum*).

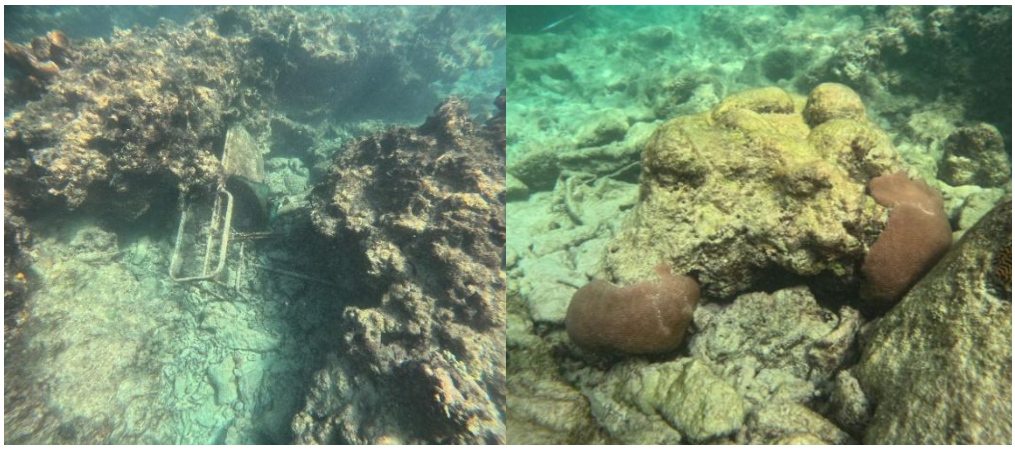


Figure 9. Evidence of significant recent swell events (a) beach chairs strewn about the reef, and (b) overturned coral colonies.

The spur and groove zone is located on the offshore margin of the fringing reef and is relatively deep. Coral cover and species diversity is higher here than on the rest of the reef, however overall coral cover is low. This was already the case in 2022 as reported by the last surveys from the Barbados Reef Monitoring Programme which indicated live coral at 6.2% cover on the permanent monitoring site at this reef (CERMES 2023, Figure 10). Since then, coral cover in Barbados has declined significantly with two mass bleaching events (2023 & 2024) and damage caused by Hurricane Beryl in 2024 (Irvine, Cox and Howell 2025; Clarke 2025). This decline was evident with the spur and groove zone comprising large thickets of finger coral (*Porites porites*) and fire coral skeletons that were either mostly or completely dead. There were also many colonies of brain corals (*Pseudodiploria strigosa*, *Diploria labyrinthiformis*) and massive starlet corals (*Siderastrea siderea*) that were also mostly or completely dead (Figure 11). The few coral colonies that were alive were only partially alive and not healthy (Figure 12). There was also an abundance of newly formed finger coral rubble in the sand grooves and outer reef margin.

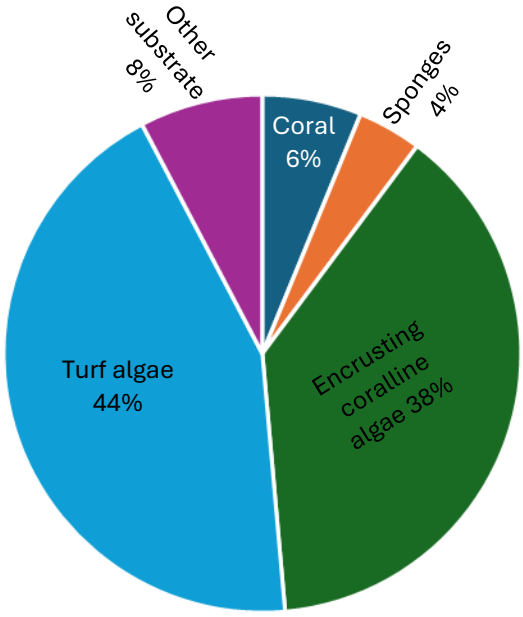


Figure 10. Relative composition by key categories of benthic cover for the Sandy Lane reef #14, surveyed in August 2022 [data source: CERMES 2023].

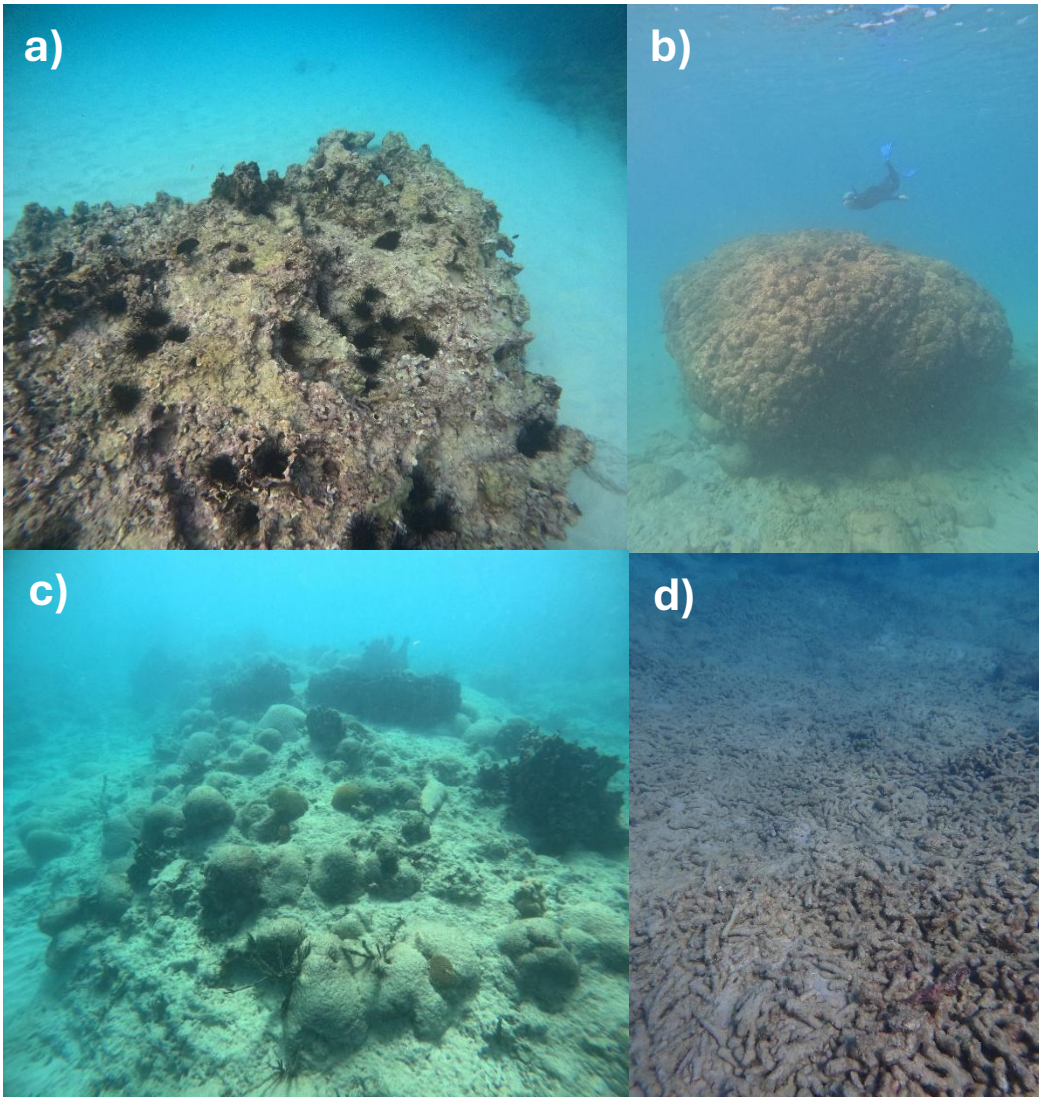


Figure 11. Images of the spur and groove zone of the Sandy Lane Lot 7 site reefs showing examples of (a) dead finger coral skeletons covered with grazing black sea urchins (*Diadema antillarum*), (b) a large dead massive starlet coral (*Siderastrea siderea*) skeleton (showing a diver for scale), (c) several fully or mostly dead brain coral colonies, and (d) large amounts of finger coral (*Porites porites*) rubble.

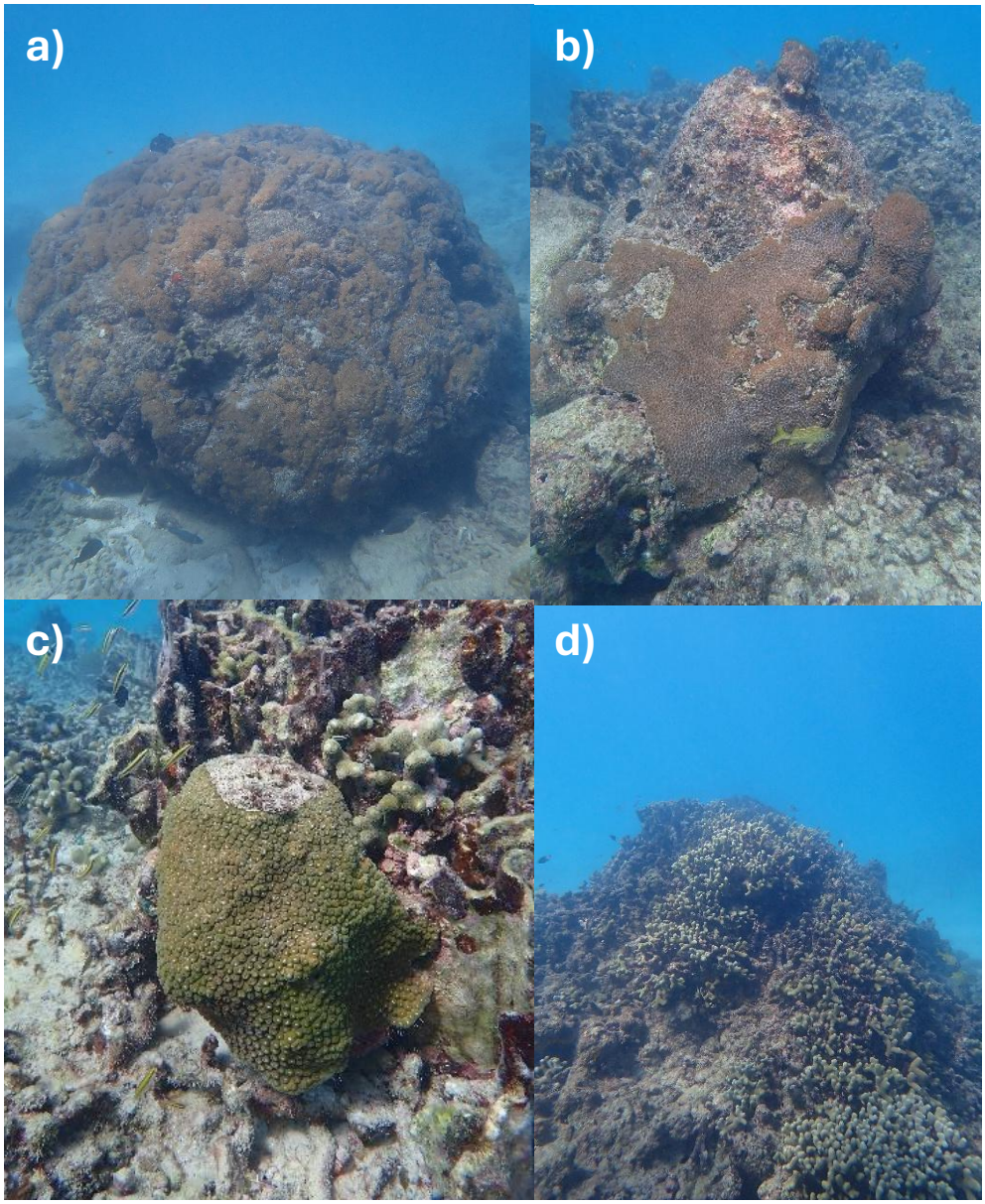


Figure 12. Images of the spur and groove zone of the Sandy Lane Lot 7 site reefs showing examples of partially alive coral colonies of (a) massive starlet coral (*Siderastrea siderea*), (b) mountainous star coral (*Orbicella faveolata*), (c) great star coral (*Montastraea cavernosa*), and (d) finger coral (*Porites porites*).

Despite the low coral cover, the reef is still an important ecosystem for many species. This was evident through the sighting of several motile species during the survey including an endangered hawksbill turtle, large schools of fish such as blue tangs and ocean surgeons, and a large population of the black sea urchin (*Diadema antillarum*) (Figure 13). The black sea urchins, key reef herbivores, are of particular interest as they suffered from a mass die-off in the Caribbean during the 1980s and again in 2022 and have not recovered on most reefs.

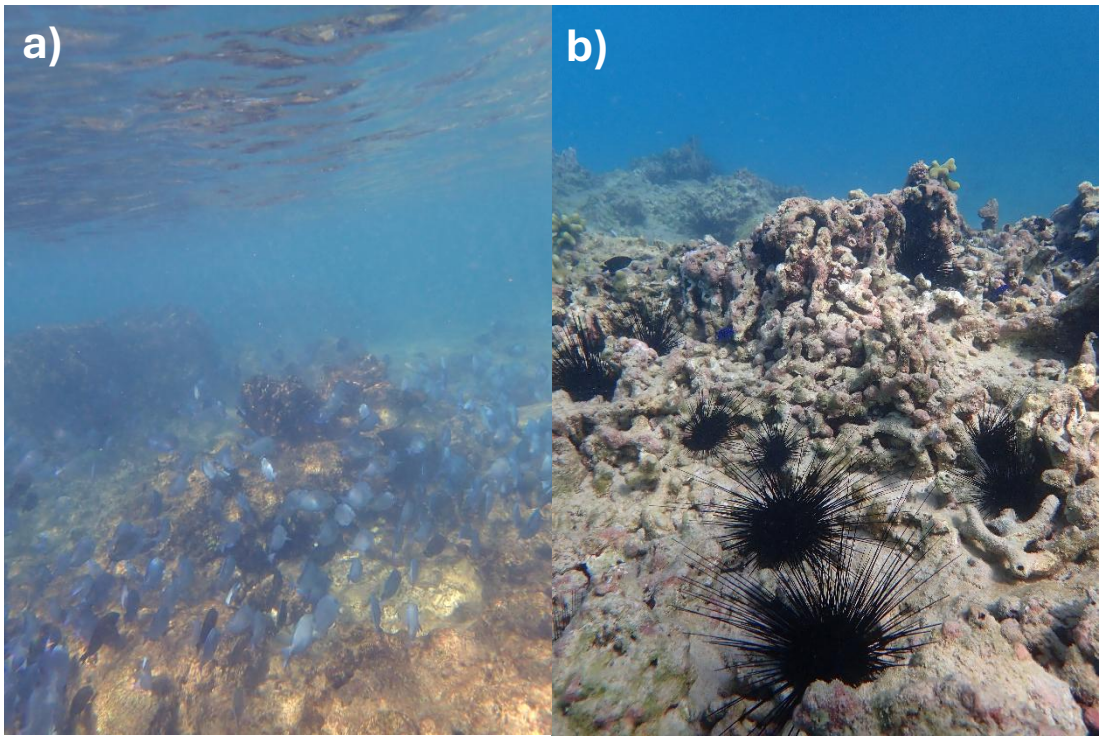


Figure 13. Images showing motile species of special interest observed on the Sandy Lane Lot 7 site reefs (a) a school of blue tangs, and (b) a population of black sea urchins (*Diadema antillarum*).

Quantitative Survey

Proposed Structures

The proposed coastal protection structures requiring quantitative data on live coral cover within their footprints are four breakwaters and seven groynes (Figure 1). The approximate dimensions of these structures are shown in Table 1. The groynes extend perpendicular to the shore in shallow water and the breakwaters are parallel to shore and located approximately 25 – 60 m offshore in 0.5 – 2 m of water (Figure 1).

Table 1. Approximate dimensions of the eleven proposed coastal protection structures at the Sandy Lane Lot 7 site.

Structure	**Dimensions (m)** (length x width)
Breakwater 1	30 x 9
Breakwater 2	30 x 9
Breakwater 3	48 x 15
Breakwater 4	35 x 9

Groyne 1	20 x 3
Groyne 2	20 x 3
Groyne 3	20 x 3
Groyne 4	20 x 3
Groyne 5	20 x 3
Groyne 6	20 x 3
Groyne 7	20 x 3

Assessment Method

The assessment of the breakwater footprints took place on 28th January 2026 at high tide and the assessment of the groyne footprints took place on 15th February 2026 at low tide. The assessments comprised a quantitative survey of the structure footprints. This was done through examination of several photoquadrats taken along transects running the length of each of the structures including the buffer zones (Figure 14). For the breakwaters, two parallel transects were run, while for the groynes only one transect per groyne was run. Quadrats measuring 50 x 50 cm and located every 2 m along the length of the transects within the footprints of the structures were photographed using GoPro Hero 12 cameras and a metal quadrat frame (Figure 15a).

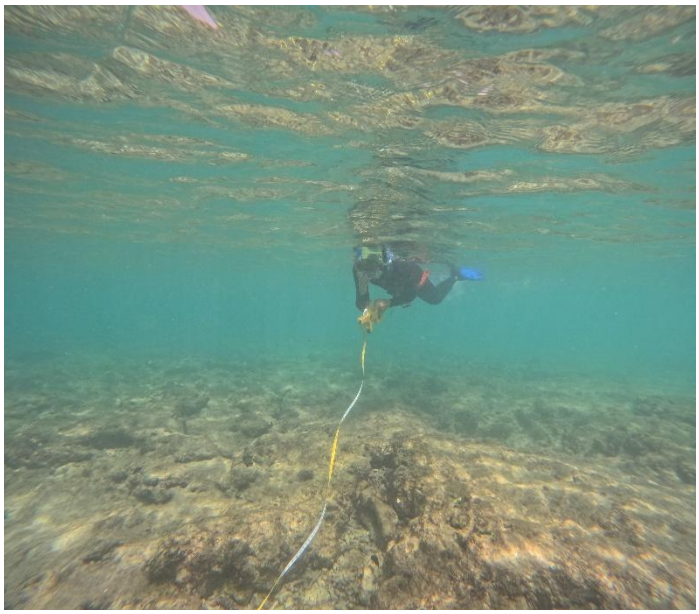


Figure 14. Diver setting up transects in the proposed structure footprints at the Sandy Lane Lot 7 site.

Analysis of the live coral cover (as mean percent benthic cover) was done using the Coral Point Count with Excel extensions (CPCe) software to overlay 50 random points on each of the images (Figure 15c). This produced a total of 7,950 data points for the breakwaters and 3,700 data points

for the groynes. All points landing on live coral (Figure 15b) were recorded by coral species. Percent benthic cover of live coral was then calculated based on the total number of points used. These data are shown in Appendix 1. Presence/absence data were also recorded based on the presence of any live coral within each photoquadrat (see also Appendix 1).

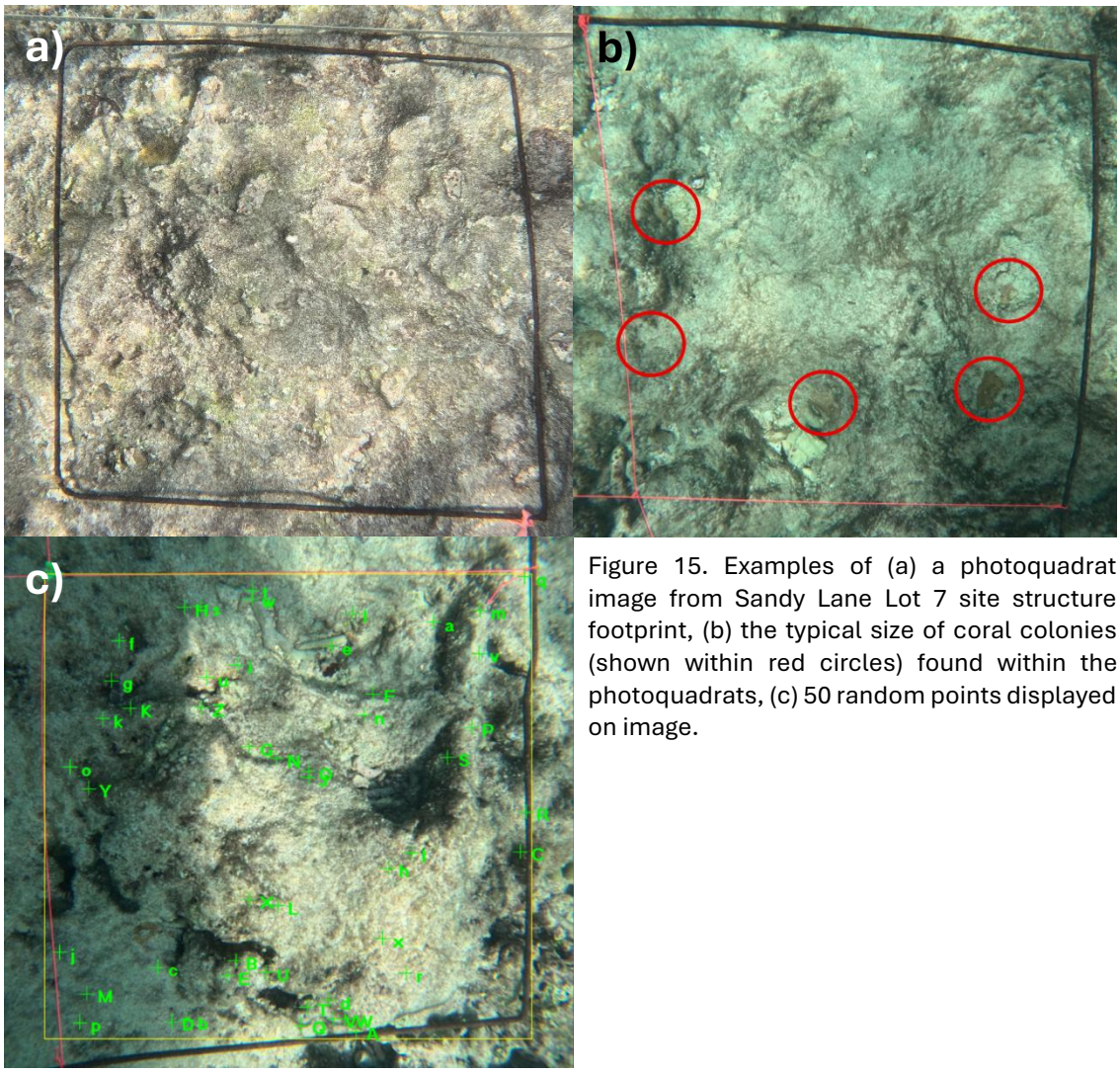


Figure 15. Examples of (a) a photoquadrat image from Sandy Lane Lot 7 site structure footprint, (b) the typical size of coral colonies (shown within red circles) found within the photoquadrats, (c) 50 random points displayed on image.

Quantitative Coral Cover Estimates

The full coral cover data analysed from 233 photoquadrats are provided in Appendix 1 and includes the number of points landing on live coral by species, percent cover of live coral, and coral presence/absence by species. A summary of these data showing mean values per structure is given in Table 2.

Live coral cover was extremely low across all proposed structure footprints ranging from 0.17 – 2.00% of the benthos and comprised mostly new recruits (colonies < 5 cm diameter) (Table 2, Figure 15b). The species diversity within the structure footprints was very low with just three hard coral species being recorded in the quantitative survey across all structures. These were: lesser starlet coral (*Siderastrea radians*), finger coral (*Porites porites*), and knobby brain coral (*Diploria clivosa*). Of these species, lesser starlet coral accounted for 64% of all coral cover recorded, finger coral for 10%, and knobby brain coral for 26%.

Table 2. Summary data showing coral occurrence and mean percent coral cover in the proposed structure footprints at the Sandy Lane Lot 7 site based on photoquadrats taken on 28th January and 15th February 2026.

Structure	No. of Quadrats	Total no. of Coral Points	No. of Coral Colonies	No. of Quadrats with Corals	Mean % Coral Cover
Breakwater 1	37	25	53	26	1.35
Breakwater 2	38	13	33	13	0.68
Breakwater 3	48	12	36	18	0.50
Breakwater 4	36	31	41	19	1.72
Groyne 1	8	4	11	5	1.00
Groyne 2	10	10	34	6	2.00
Groyne 3	10	1	2	2	0.20
Groyne 4	9	2	6	3	0.44
Groyne 5	13	4	5	4	0.62
Groyne 6	12	1	4	2	0.17
Groyne 7	12	2	5	3	0.33
Total	**233**	**105**	**230**	**101**	**0.82**

Summary Observations

The following brief summary is to guide recommendations regarding the potential siting of the proposed structures. Live coral cover was extremely low across all structure footprints and well below the threshold value of 10% coral cover needed to ensure continued accretion of reef framework (Perry et al. 2013). This is not surprising given that the proposed structures are located on the shallow rubble zones and reef flat zones of two highly degraded fringing reefs. The footprints and buffer areas are described here.

- **Breakwaters**: The footprints of these structures are mostly located on the reef flat (Breakwaters 1, 3 and 4). Breakwater 2 was mostly located on bare sand (south end) with the north end going onto the reef flat. Transects conducted within the footprints of these structures showed live coral cover is extremely low ranging from 0.50 – 1.72% of the benthos, with only three coral species being recorded in the 159 quadrats photographed. These species were the lesser starlet coral, finger coral and knobby brain coral, most of which were coral

recruits (< 5 cm diameter). The surrounding benthos is very similar, however, of note was a large colony of massive starlet coral in the buffer zone of Breakwater 4 (Figure 16).

- **Groynes**: The footprints of these structures are mostly on coral rubble and bare sand extending perpendicular from the beach. Beachrock was present in the nearshore area of the footprint of Groyne 5. Not surprisingly, live coral cover is extremely low ranging from 0.17 – 2.00% of the benthos. Only three coral species were recorded (lesser starlet coral, finger coral and knobby brain coral) in the 74 quadrats photographed, most of which were very small coral recruits ((< 5 cm diameter). The surrounding area was very similar with no features of special interest.

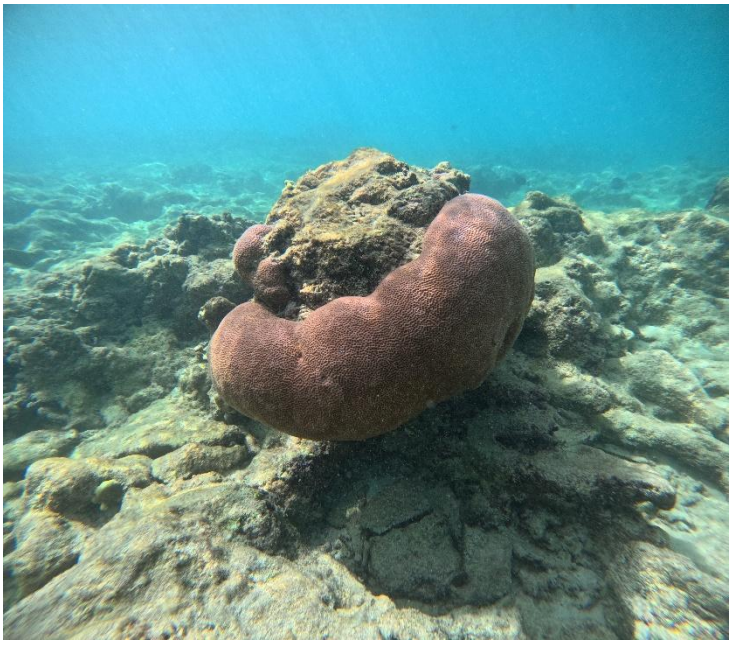


Figure 16. A large colony of massive starlet coral (*Siderastrea siderea*) found in the buffer zone of Breakwater 4.

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Appendix 1.

Data from 233 photoquadrats located in the footprints of eleven proposed coastal protection structures (four breakwaters and seven groynes) at the Sandy Lane Lot 7 site. SRAD – *Siderastrea radians*, PPOR – *Porites porites*, DCLI – *Diploria clivosa*.

Structure Name	Direction	Position	Photographer	Camera	Quadrat #	Photo #	Coral Colony Count	Points on Coral				% Coral Cover
								SRAD	PPOR	DCLI	Total	
Breakwater 1	S – N	Inshore	AC	GoPro	1	347	0				0	0
Breakwater 1	S – N	Inshore	AC	GoPro	2	348	1		1		1	2
Breakwater 1	S – N	Inshore	AC	GoPro	3	349	1				0	0
Breakwater 1	S – N	Inshore	AC	GoPro	4	350	1				0	0
Breakwater 1	S – N	Inshore	AC	GoPro	5	351	1	1			1	2
Breakwater 1	S – N	Inshore	AC	GoPro	6	352	0				0	0
Breakwater 1	S – N	Inshore	AC	GoPro	7	353	3	2			2	4
Breakwater 1	S – N	Inshore	AC	GoPro	8	356	2	1			1	2
Breakwater 1	S – N	Inshore	AC	GoPro	9	357	3				0	0
Breakwater 1	S – N	Inshore	AC	GoPro	10	358	2	1			0	2
Breakwater 1	S – N	Inshore	AC	GoPro	11	359	2	1			1	2
Breakwater 1	S – N	Inshore	AC	GoPro	12	360	1	1			1	2
Breakwater 1	S – N	Inshore	AC	GoPro	13	361	1	1			1	2

Structure Name	Direction	Position	Photographer	Camera	Quadrat #	Photo #	Coral Colony Count	Points on Coral				% Coral Cover
								SRAD	PPOR	DCLI	Total	
Breakwater 1	S – N	Inshore	AC	GoPro	14	362	6	2			2	4
Breakwater 1	S – N	Inshore	AC	GoPro	15	363	3	1			1	2
Breakwater 1	S – N	Inshore	AC	GoPro	16	364	2	1			1	2
Breakwater 1	S – N	Inshore	AC	GoPro	17	366	2	1			1	2
Breakwater 1	S – N	Inshore	AC	GoPro	18	367	4	2			2	4
Breakwater 1	S – N	Inshore	AC	GoPro	19	368	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	1	049	1		1		1	2
Breakwater 1	S – N	Offshore	HO	GoPro	2	050	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	3	051	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	4	052	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	5	053	2				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	6	054	1				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	7	055	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	8	056	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	9	057	1		1		1	2
Breakwater 1	S – N	Offshore	HO	GoPro	10	058	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	11	059	2	2			2	4
Breakwater 1	S – N	Offshore	HO	GoPro	12	060	1	1			1	2
Breakwater 1	S – N	Offshore	HO	GoPro	13	061	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	14	062	0				0	0
Breakwater 1	S – N	Offshore	HO	GoPro	15	063	4	1			1	2
Breakwater 1	S – N	Offshore	HO	GoPro	16	064	1	1			1	2
Breakwater 1	S – N	Offshore	HO	GoPro	17	065	3	1			1	2
Breakwater 1	S – N	Offshore	HO	GoPro	18	066	2	1			1	2
Breakwater 2	S – N	Inshore	AC	GoPro	1	318	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	2	319	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	3	320	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	4	321	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	5	322	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	6	323	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	7	324	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	8	325	0				0	0

Structure Name	Direction	Position	Photographer	Camera	Quadrat #	Photo #	Coral Colony Count	Points on Coral				% Coral Cover
								SRAD	PPOR	DCLI	Total	
Breakwater 2	S – N	Inshore	AC	GoPro	9	326	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	10	327	1				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	11	328	3	1	1		2	4
Breakwater 2	S – N	Inshore	AC	GoPro	12	329	4	1			1	2
Breakwater 2	S – N	Inshore	AC	GoPro	13	330	2	1			1	2
Breakwater 2	S – N	Inshore	AC	GoPro	14	331	4	2			2	4
Breakwater 2	S – N	Inshore	AC	GoPro	15	332	2				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	16	333	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	17	334	0				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	18	335	1				0	0
Breakwater 2	S – N	Inshore	AC	GoPro	19	336	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	1	021	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	2	022	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	3	023	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	4	024	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	5	025	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	6	026	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	7	027	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	8	028	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	9	029	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	10	030	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	11	031	3	1	1		2	4
Breakwater 2	S – N	Offshore	HO	GoPro	12	032	2	1			1	2
Breakwater 2	S – N	Offshore	HO	GoPro	13	033	2	1			1	2
Breakwater 2	S – N	Offshore	HO	GoPro	14	034	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	15	035	3	1			1	2
Breakwater 2	S – N	Offshore	HO	GoPro	16	036	1				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	17	037	0				0	0
Breakwater 2	S – N	Offshore	HO	GoPro	18	038	5	2			2	4
Breakwater 2	S – N	Offshore	HO	GoPro	19	039	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	1	280	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	2	281	1				0	0

Structure Name	Direction	Position	Photographer	Camera	Quadrat #	Photo #	Coral Colony Count	Points on Coral				% Coral Cover
								SRAD	PPOR	DCLI	Total	
Breakwater 3	S – N	Inshore	AC	GoPro	3	282	3				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	4	283	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	5	284	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	6	285	1	1			1	2
Breakwater 3	S – N	Inshore	AC	GoPro	7	286	1	1			1	2
Breakwater 3	S – N	Inshore	AC	GoPro	8	287	1				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	9	288	2			1	1	2
Breakwater 3	S – N	Inshore	AC	GoPro	10	289	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	11	290	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	12	291	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	13	292	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	14	293	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	15	294	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	16	295	1	1			1	2
Breakwater 3	S – N	Inshore	AC	GoPro	17	296	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	18	297	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	19	298	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	20	299	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	21	300	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	22	301	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	23	302	0				0	0
Breakwater 3	S – N	Inshore	AC	GoPro	24	303	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	1	996	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	2	997	3		1		1	2
Breakwater 3	S – N	Offshore	HO	GoPro	3	998	1				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	4	999	5	2			2	4
Breakwater 3	S – N	Offshore	HO	GoPro	5	000	1				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	6	001	6	3			3	6
Breakwater 3	S – N	Offshore	HO	GoPro	7	002	2				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	8	003	4	1			1	2
Breakwater 3	S – N	Offshore	HO	GoPro	9	004	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	10	005	1				0	0

Structure Name	Direction	Position	Photographer	Camera	Quadrat #	Photo #	Coral Colony Count	Points on Coral				% Coral Cover
								SRAD	PPOR	DCLI	Total	
Breakwater 3	S – N	Offshore	HO	GoPro	11	006	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	12	007	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	13	008	1				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	14	009	1				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	15	010	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	16	011	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	17	012	1	1			1	2
Breakwater 3	S – N	Offshore	HO	GoPro	18	013	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	19	014	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	20	015	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	21	016	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	22	017	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	23	018	0				0	0
Breakwater 3	S – N	Offshore	HO	GoPro	24	019	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	1	237	3				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	2	240	1		1		1	2
Breakwater 4	S – N	Inshore	AC	GoPro	3	241	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	4	242	3				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	5	243	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	6	244	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	7	245	1				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	8	246	2				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	9	247	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	10	248	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	11	249	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	12	250	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	13	251	0				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	14	252	1				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	15	253	1	1			1	2
Breakwater 4	S – N	Inshore	AC	GoPro	16	254	5	1	1		2	4
Breakwater 4	S – N	Inshore	AC	GoPro	17	255	3				0	0
Breakwater 4	S – N	Inshore	AC	GoPro	18	256	0				0	0

Structure Name	Direction	Position	Photographer	Camera	Quadrat #	Photo #	Coral Colony Count	Points on Coral				% Coral Cover
								SRAD	PPOR	DCLI	Total	
Breakwater 4	S – N	Offshore	HO	GoPro	1	976	0				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	2	977	2				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	3	978	1				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	4	979	1				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	5	980	8		2		2	4
Breakwater 4	S – N	Offshore	HO	GoPro	6	981	1			25	25	50
Breakwater 4	S – N	Offshore	HO	GoPro	7	982	0				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	8	983	0				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	9	984	0				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	10	985	2				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	11	986	2				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	12	987	1				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	13	988	1				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	14	989	0				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	15	990	0				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	16	991	2				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	17	992	0				0	0
Breakwater 4	S – N	Offshore	HO	GoPro	18	993	0				0	0
Groyne 1	W – E	1	HO	GoPro	1	234	0				0	0
Groyne 1	W – E	1	HO	GoPro	2	235	2	1			1	2
Groyne 1	W – E	1	HO	GoPro	3	236	3				0	0
Groyne 1	W – E	1	HO	GoPro	4	237	4	1			1	2
Groyne 1	W – E	1	HO	GoPro	5	238	1			1	1	2
Groyne 1	W – E	1	HO	GoPro	6	239	0				0	0
Groyne 1	W – E	1	HO	GoPro	7	240	1		1		1	2
Groyne 1	W – E	1	HO	GoPro	8	241	0				0	0
Groyne 2	W – E	1	HO	GoPro	1	222	0				0	0
Groyne 2	W – E	1	HO	GoPro	2	223	0				0	0
Groyne 2	W – E	1	HO	GoPro	3	224	3	1			1	2
Groyne 2	W – E	1	HO	GoPro	4	225	1				0	0
Groyne 2	W – E	1	HO	GoPro	5	226	0				0	0
Groyne 2	W – E	1	HO	GoPro	6	227	11	2			2	4

Structure Name	Direction	Position	Photographer	Camera	Quadrat #	Photo #	Coral Colony Count	Points on Coral				% Coral Cover
								SRAD	PPOR	DCLI	Total	
Groyne 2	W – E	1	HO	GoPro	7	228	10	3			3	6
Groyne 2	W – E	1	HO	GoPro	8	229	7	3			3	6
Groyne 2	W – E	1	HO	GoPro	9	230	2	1			1	2
Groyne 2	W – E	1	HO	GoPro	10	231	0				0	0
Groyne 3	W – E	1	HO	GoPro	1	213	1	1			1	2
Groyne 3	W – E	1	HO	GoPro	2	214(1)	0				0	0
Groyne 3	W – E	1	HO	GoPro	3	214	0				0	0
Groyne 3	W – E	1	HO	GoPro	4	215(1)	1				0	0
Groyne 3	W – E	1	HO	GoPro	5	215	0				0	0
Groyne 3	W – E	1	HO	GoPro	6	216(1)	0				0	0
Groyne 3	W – E	1	HO	GoPro	7	216	0				0	0
Groyne 3	W – E	1	HO	GoPro	8	217(1)	0				0	0
Groyne 3	W – E	1	HO	GoPro	9	217	0				0	0
Groyne 3	W – E	1	HO	GoPro	10	218(1)	0				0	0
Groyne 4	W – E	1	HO	GoPro	1	203	0				0	0
Groyne 4	W – E	1	HO	GoPro	2	204	2				0	0
Groyne 4	W – E	1	HO	GoPro	3	205	0				0	0
Groyne 4	W – E	1	HO	GoPro	4	206	3	1			1	2
Groyne 4	W – E	1	HO	GoPro	5	207	1	1			1	2
Groyne 4	W – E	1	HO	GoPro	6	208	0				0	0
Groyne 4	W – E	1	HO	GoPro	7	209	0				0	0
Groyne 4	W – E	1	HO	GoPro	8	210	0				0	0
Groyne 4	W – E	1	HO	GoPro	9	211	0				0	0
Groyne 5	W – E	1	HO	GoPro	1	187	0				0	0
Groyne 5	W – E	1	HO	GoPro	2	188	0				0	0
Groyne 5	W – E	1	HO	GoPro	3	189	0				0	0
Groyne 5	W – E	1	HO	GoPro	4	190	0				0	0
Groyne 5	W – E	1	HO	GoPro	5	191	1	1			1	2
Groyne 5	W – E	1	HO	GoPro	6	192	1				0	0
Groyne 5	W – E	1	HO	GoPro	7	193	1	1			1	2
Groyne 5	W – E	1	HO	GoPro	8	194	2	2			2	4
Groyne 5	W – E	1	HO	GoPro	9	195	0				0	0

Structure Name	Direction	Position	Photographer	Camera	Quadrat #	Photo #	Coral Colony Count	Points on Coral				% Coral Cover
								SRAD	PPOR	DCLI	Total	
Groyne 5	W – E	1	HO	GoPro	10	196	0				0	0
Groyne 5	W – E	1	HO	GoPro	11	197	0				0	0
Groyne 5	W – E	1	HO	GoPro	12	199	0				0	0
Groyne 5	W – E	1	HO	GoPro	13	200	0				0	0
Groyne 6	W – E	1	HO	GoPro	1	167	0				0	0
Groyne 6	W – E	1	HO	GoPro	2	168	0				0	0
Groyne 6	W – E	1	HO	GoPro	3	169	3	1			1	2
Groyne 6	W – E	1	HO	GoPro	4	170	0				0	0
Groyne 6	W – E	1	HO	GoPro	5	171	0				0	0
Groyne 6	W – E	1	HO	GoPro	6	173	0				0	0
Groyne 6	W – E	1	HO	GoPro	7	174	1				0	0
Groyne 6	W – E	1	HO	GoPro	8	176	0				0	0
Groyne 6	W – E	1	HO	GoPro	9	177	0				0	0
Groyne 6	W – E	1	HO	GoPro	10	178	0				0	0
Groyne 6	W – E	1	HO	GoPro	11	179	0				0	0
Groyne 6	W – E	1	HO	GoPro	12	180	0				0	0
Groyne 7	W – E	1	HO	GoPro	1	149	0				0	0
Groyne 7	W – E	1	HO	GoPro	2	151	0				0	0
Groyne 7	W – E	1	HO	GoPro	3	152	0				0	0
Groyne 7	W – E	1	HO	GoPro	4	153	2	1			1	2
Groyne 7	W – E	1	HO	GoPro	5	155	0				0	0
Groyne 7	W – E	1	HO	GoPro	6	156	0				0	0
Groyne 7	W – E	1	HO	GoPro	7	157	2	1			1	2
Groyne 7	W – E	1	HO	GoPro	8	158	1				0	0
Groyne 7	W – E	1	HO	GoPro	9	160	0				0	0
Groyne 7	W – E	1	HO	GoPro	10	161	0				0	0
Groyne 7	W – E	1	HO	GoPro	11	163	0				0	0
Groyne 7	W – E	1	HO	GoPro	12	165	0				0	0