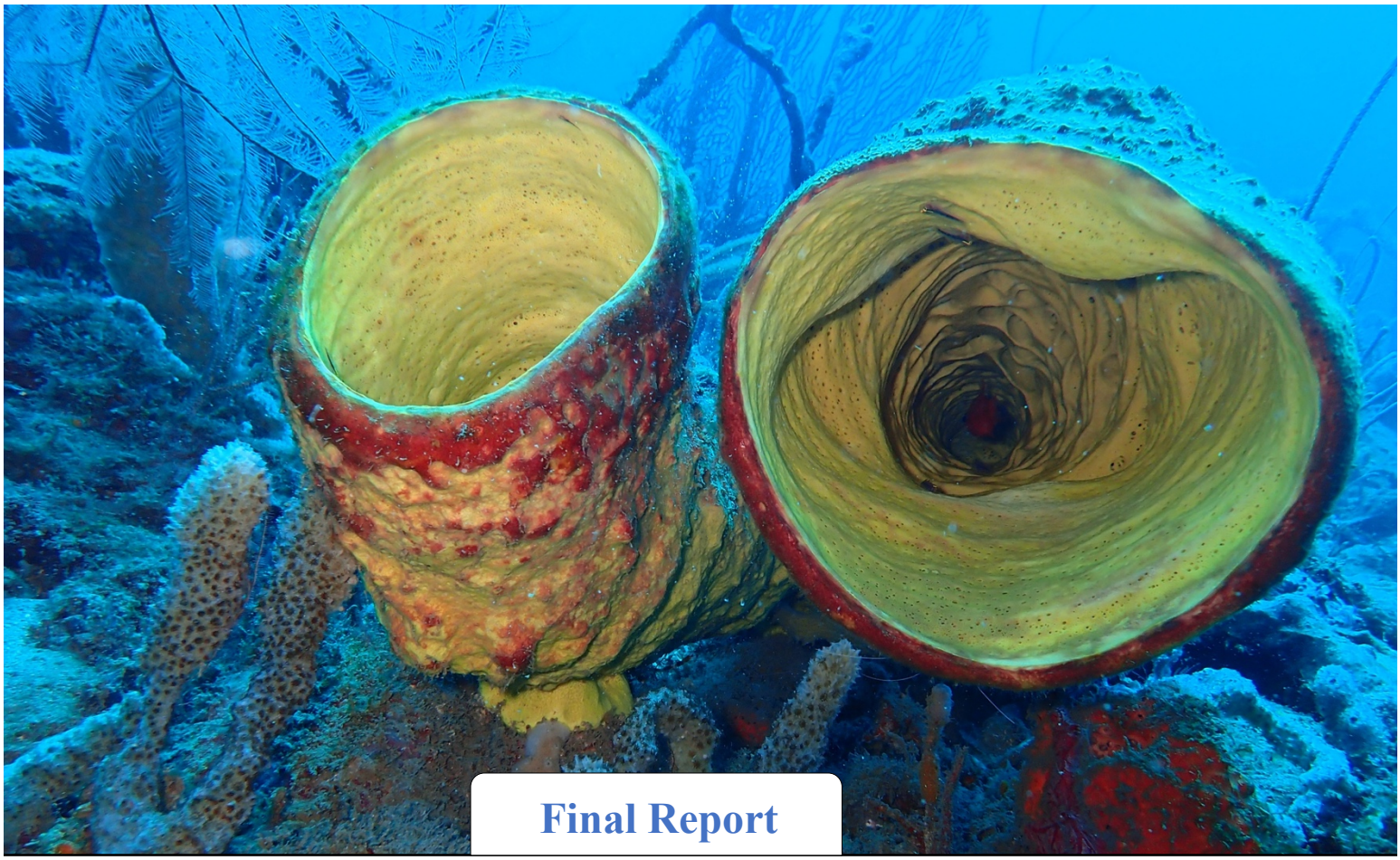
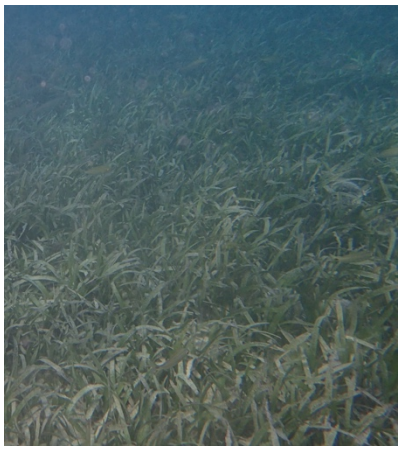
BENTHIC HABITAT MAPPING

A Baseline Assessment of Habitat Types within the proposed Gouyave MPA



Final Report

JANUARY 2018

KFW

Caribbean Community Climate Change Centre

GRENCODA

GMPA Grenada Marine Protected Areas

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EXECUTIVE SUMMARY

This study was commissioned by the Grenada Community Development Agency (GRENCODA) as part of a larger project aimed at establishing a marine protected area in the coastal area off the parishes of St. John's and St. Mark's on the West Coast of Grenada. More specifically, this study was designed to identify the location and extend of the various benthic habitat types within the coastal waters extending from Grand Roy in the south to La Source in the north and seaward to a depth of 25m.

Six benthic habitat categories were developed for the classification of the area. The area was then mapped using a series of investigation sites distributed 200m apart to determine the habitat type at various location. A composite habitat map was then compiled using the information gathered at each of the investigation sites.

The study showed that all six major habitat types exist within the study area. The area was dominated by 5 major coral reef systems along with extensive areas of dense and sparse seagrass habitat. There were two significant areas of hardground with gorgonians in shallow areas close to the shore. There are large areas of sandy habitat along with two smaller areas of silt adjacent to the mouth of the two rivers that empties into the study area.

One noteworthy observation was the fact that a number of investigation sites where sparse seagrass with algae was discovered, the dominant seagrass species was *H. stipulacea* an invasive species from the Indian Ocean first observed in Grenada in 2002. This is significant as this species have been shown to have negative impact to native flora and fauna in its invaded range.

Now that the location and extent of the various habitat types have been identified, the next step is to conduct a comprehensive scientific study of the various habitat to identify the species present within each habitat along with their abundance and overall health.

BACKGROUND

The German Ministry for Economic Cooperation and Development (BMZ) is supporting the Caribbean Community (CARICOM) through a €12.9 million Coastal Protection for Climate Change Adaptation in the Small Island States in the Caribbean project over the next 5 years. The Project seeks to pursue the implementation of local adaptation measures for the sustainable improvement of coastal ecosystems relevant for climate change adaptation in Grenada, Jamaica, Saint Lucia, and St. Vincent and the Grenadines.

Grenada Community Development Agency (GRENCODA) was able to secure the project "Community-based Coastal Ecosystem Management for Climate Adaptation in Selected Areas of Grenada" which plans to enhance ecosystem services provided by coral reefs to reduce the effect of climate change on vulnerable coastal communities on Grenada's west coast by:

a. Fostering the creation of an effectively managed MPA on Grenada's West Coast

b. Increased Public awareness of, and Community Resilience to the adverse impact of climate change

This project meshes well with Grenada's strategic objective to improve the country's adaptation to climate change as illustrated in the country's participation in the Caribbean Challenge Initiative (CCI) and pledged to protect at least 20% of its near-shore marine and coastal environment by 2020.

The primary objective of this study to identify the location and extent of the various benthic habitat types within the coastal waters extending from White Gate in the South to La Source in the North and extending seaward to the 25m depth contour. The benthic habitat map that would form the primary output of this study would help to direct the process of establishing a marine protected area off the parishes of St. John's and St. Mark's along the West Coast of Grenada. More specifically, the study would identify the various habitat within the proposed boundaries of the MPA, thereby ensuring that all major habitat types and represented along with adequate replicates of each habitat type.

METHODOLOGY

Study Area

The Fisheries Division has decided to use ecosystem connectivity as one of the main parameters for deciding on the boundaries of all future MPAs. More specifically, the boundaries of an MPA be determined to afford protection of the entire coral reef ecosystems. Based on Preliminary surveys conducted by the Fisheries Division, and request from the fishing community, the study area for this benthic habitat mapping exercise would extend from Palmiste in the south up to La Resource in the north (i.e. straddling the parishes of St. John's and St. Mark's). During the preliminary scoping visit by the Grenada Coral Reef Foundation (GCRF) Field Team it was determined that the southern boundary should be moved further south to Grand Roy to include a coral reef system that was identified. The study focused on the ecosystems/habitat types that lay in water from the surf zone down to a depth of 25m. Given the steep bathymetry of the west coast, the study area constituted a relatively narrow band along the coast.

Investigation Sites

In order to determine the various habitat types within the study area, a series of investigation sites (IS)were laid out in a grid pattern approximately 200m apart across the extent of the study sites with the aid of Google Earth™ (see figure 1 below).

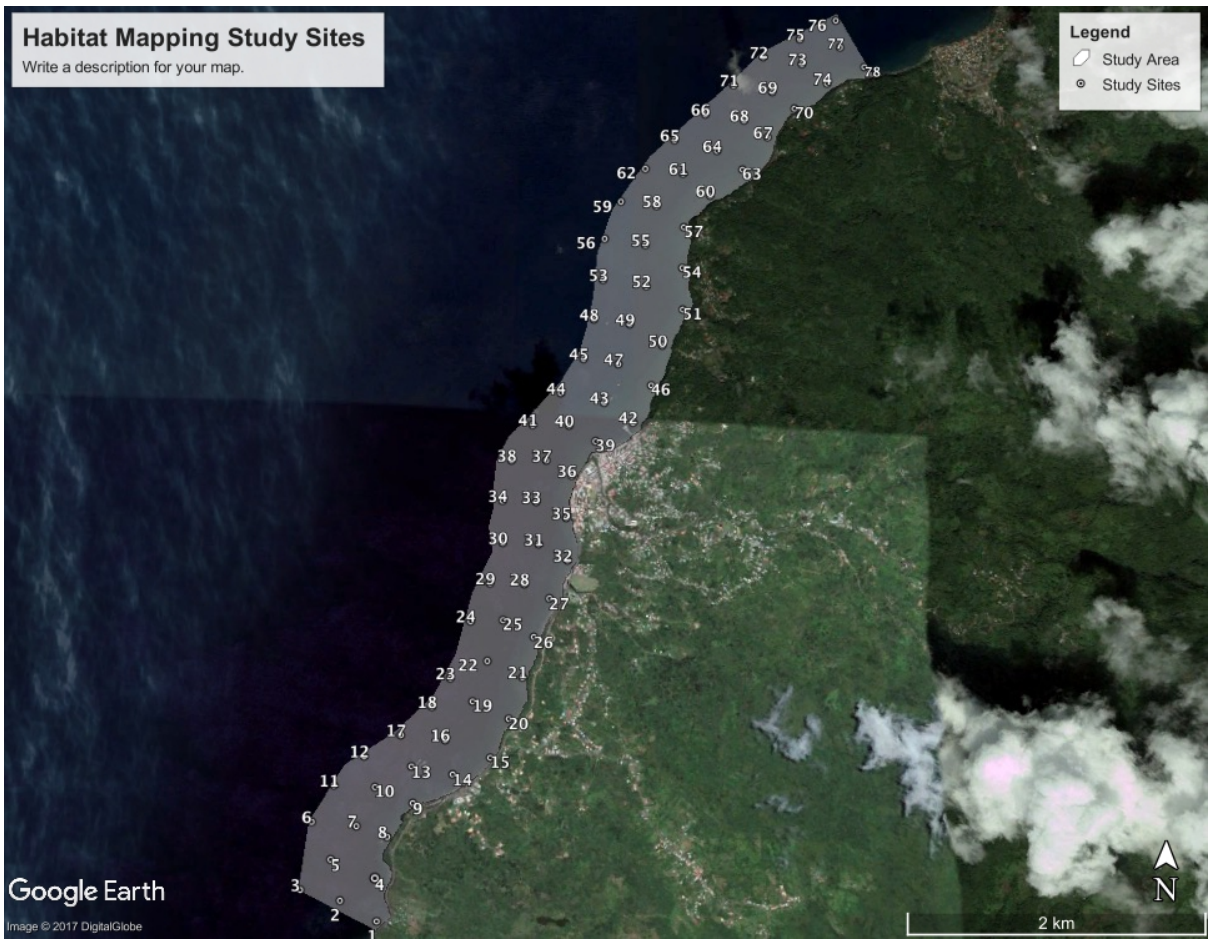


***Figure 1*:** Map showing the location of the Investigation sites (IS) within the study area for the habitat map.

Field Survey

The survey team traveled to the GPS coordinate for each investigation site with the aid of a handheld Garmin GPSMAP 78SC Unit. Once at the GPS location, a surface marker buoy (SMB) attached to 28m of line with 3kg of weight was dropped to identify the site. The SMB served two purposes; firstly, it facilitated easy relocation of the IS and secondly, it served as a decent and ascent line for the in-water survey team. A Garmin GPSMAP 741Xxs GPS Sounder Unit with a transducer was utilized to determine the depth of the water at the investigation site. Once it was determined that the IS was within the 25m depth limit, the in-water survey team equipped in SCUBA Gear utilized the SMB line as a decent guide. In the areas where the IS was deeper than the 25m survey limit, the habitat type was assigned based on the traditional ecological knowledge of the two local fishers onboard. Upon reaching the bottom, the survey team with the aid of a 20m transect tape surveyed a 5m circle around the weighted line. In-situ data on the habitat type along with actual depth and any relevant information (e.g. marine organism or structures) was recorded on a printed under water data sheet (see Annex 2 for a copy of the data sheet) along with photos and videos of the substrate type. The Garmin GPSMAP 741xs GPS Sounder Unit with the transducer was utilized to refine the boundaries of the substrate types that has a distinctive 3-dimensional structure (i.e. coral reef systems and gorgonian on boulders) by running transects along the systems and recording the GPS coordinates at the transition points.

Map Development

After the field surveys, all the data for each of the IS was combined to form polygons representing the different habitat types. The boundaries for the coral reef complexes and boulders were drawn based on the sounding data from the GPS. Given the dynamic nature of seagrass, it was determined that solid lines would be the most appropriate representation for the boundaries between habitat types. The boundaries between the less structurally distinct habitat types were drawn by equally dividing the space between two IS point with different habitats.

HABITAT TYPES

Prior to the field survey, a series of habitat types were established based on a modification of description for the most commonly encountered marine habitat types on the West Coast of the island (TNC, 2017). The habitat type is based on the dominant feature within the benthic community. More specifically, the classification on a habitat is based on the percentage of the substrate that is covered by a specific organism (i.e. seagrass, coral, gorgonian, algae). In instances where the substratum is void of living organisms, the substratum itself is characterized (e.g. slit or sand). The section that follows provides a more comprehensive description of each of the habitat types along with photos depicting the various habitats encountered during the field surveys for this study.

Coral Reef

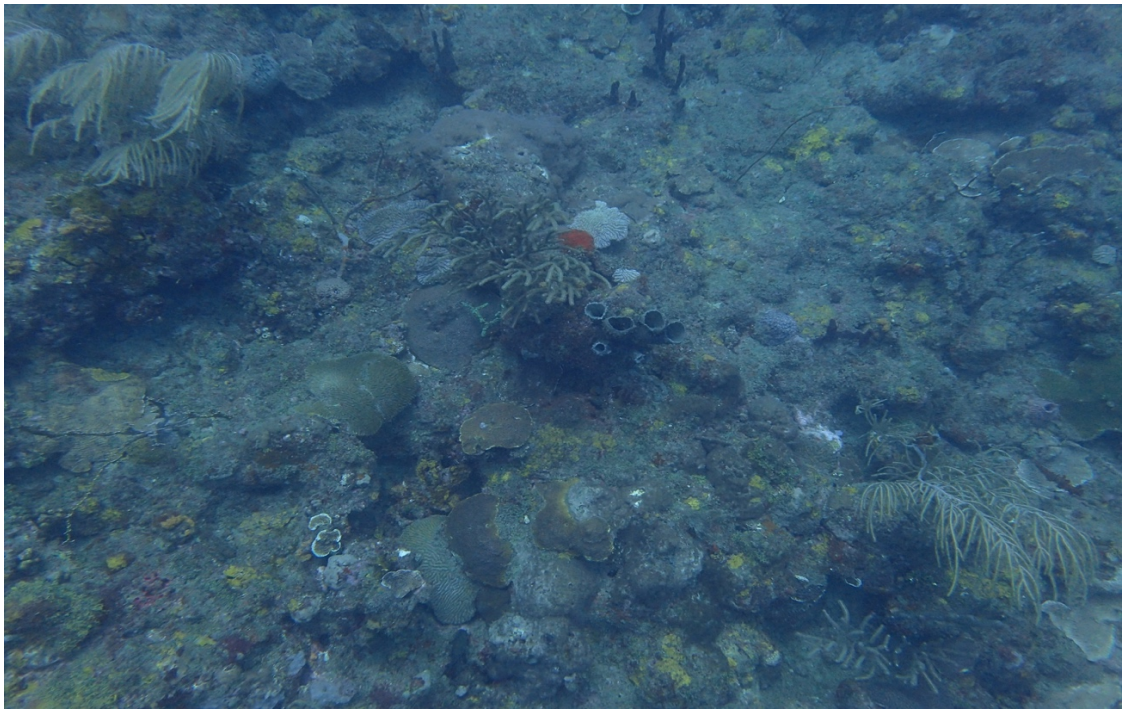


Figure 2: Photo taken during field surveys depicting a typical coral reef habitat

Coral Reef systems consist of a rugose calcium carbonate framework form from scleractian corals. Depending on the dominant coral species within the reef complex, the substrate may have veneer of live hard coral. Live coral cover is generally patchy but generally >10% overall with *Montastraea*, *Orbicella*, *Porities*, *Diploria*, *Colphylia* and *Dendrogyra* being the most commonly encountered coral species.

Hardground with Gorgonians

Figure 3: Photo graph taken during the field survey depicting Hardground with Gorgonians

This substrate type is characterized by a hard reef framework, scoured hardground or boulders covered by predominately (i.e. >60%) by gorgonians. The rest of the substrate is covered by macroalgae and sponges, while live coral cover is typically very low (<10%).

Sparse Seagrass with Algae

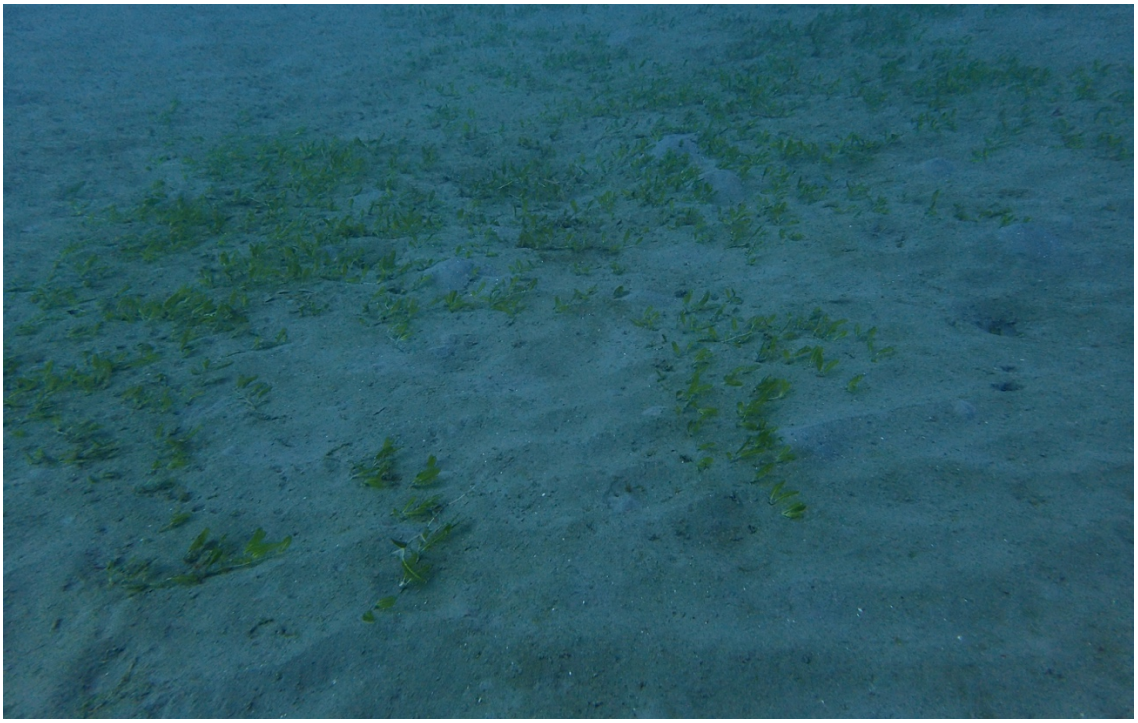


Figure 4: Photo taken during the field survey depicting sparse seagrass with algae habitat

This habitat type is characterized by a primary substrate of sand or silt with <30% of the area with a sparse seagrass or macroalgae meadow. The seagrass community consist of *Thallasia testudinum, Syringodium filiforme* or *Halophila stipulacea* interspersed with various fleshy macroalgae species along with cyanobacteria mats.

Dense Seagrass

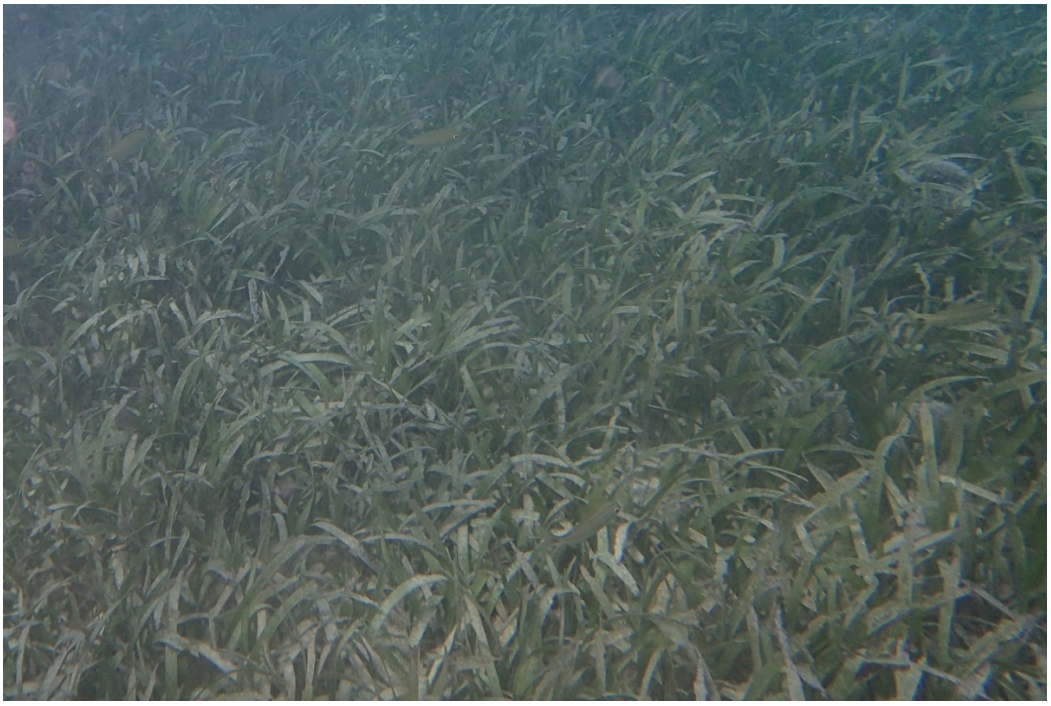


Figure 5: Photo taken during the field survey depicting Dense Seagrass habitat

The habitat type is characterized by a primary substrate of sand with >60% of the substrate covered in a dense meadow of seagrass interspersed with macroalgae. The seagrass community is dominated by *Thallassia testudinum* but other seagrasses (i.e. *Syringodium filiforme* or *Halophila stipulacea*) may contribute significantly to the overall seagrass cover.

Sand

Figure 6: Photo taken during field survey depicting typical Sand habitat

Unconsolidated sediment with grain size ranging from 0.05mm to 2mm that has a seagrass or macroalgal cover <10%. A handful of sand released into the water column would immediately fall to the bottom with minimal alteration to water clarity/visibility. The sand may be covered with a thick mat of cyanobacteria.

Silt

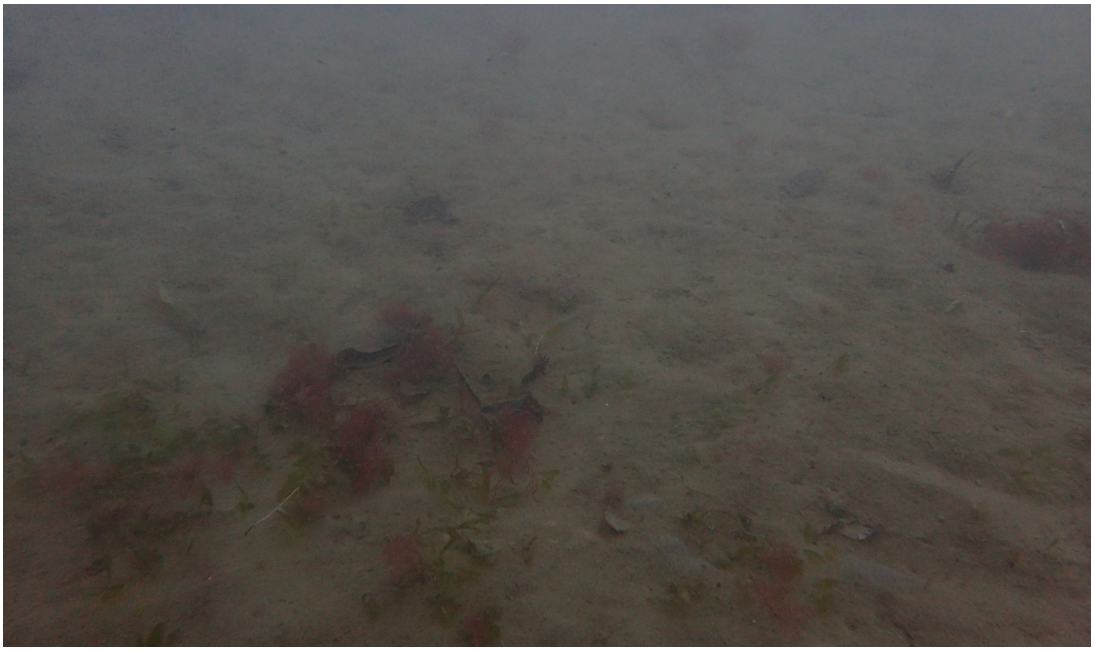
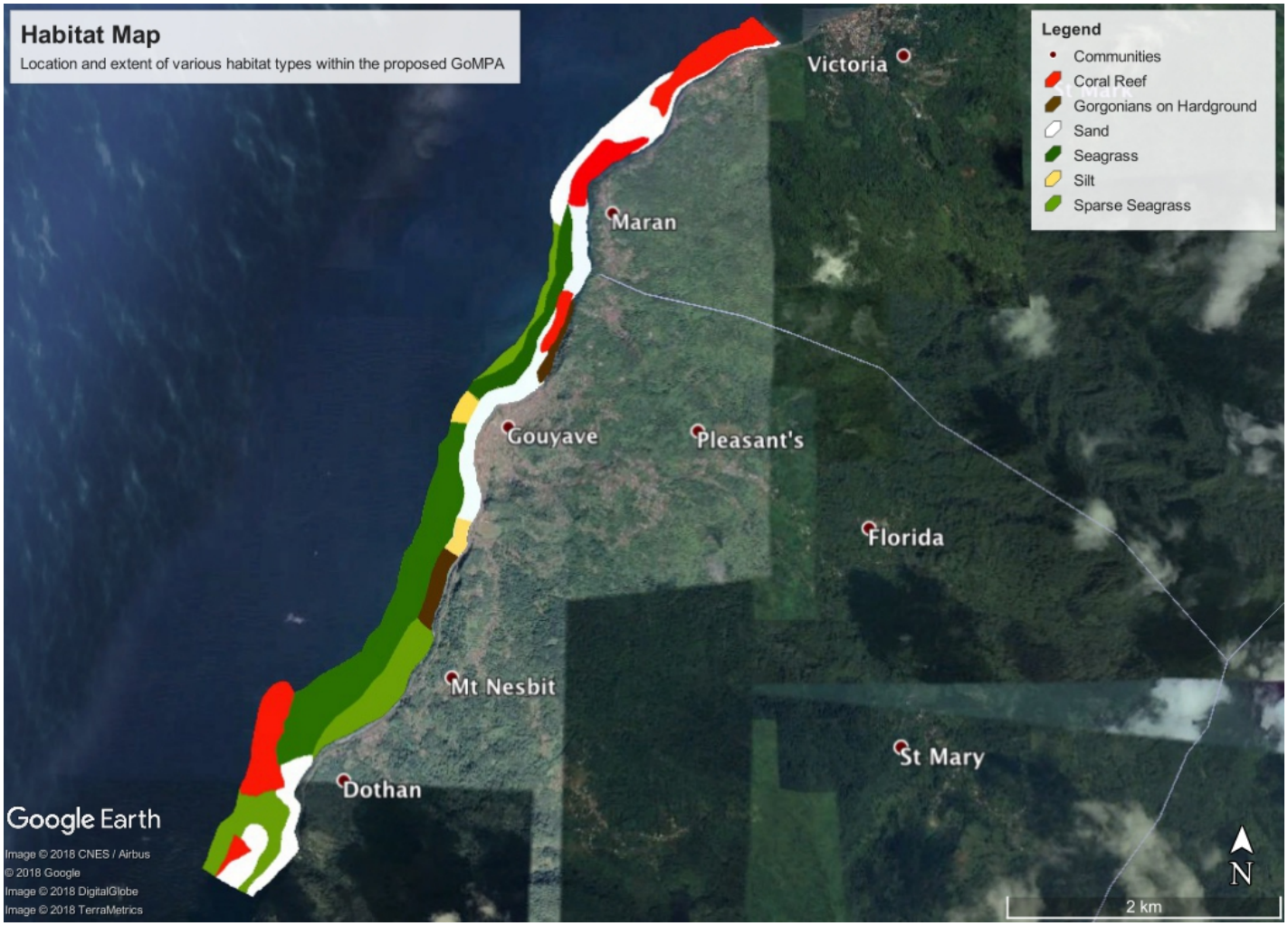


Figure 7: Photo taken during field surveys depicting silt habitat

Unconsolidated sediment with grain size <0.05mm in diameter that has a seagrass or macroalgal cover <10%. A handful of sand released into the water column would remain in suspension of a prolonged period of time; thereby, altering water clarity/visibility.

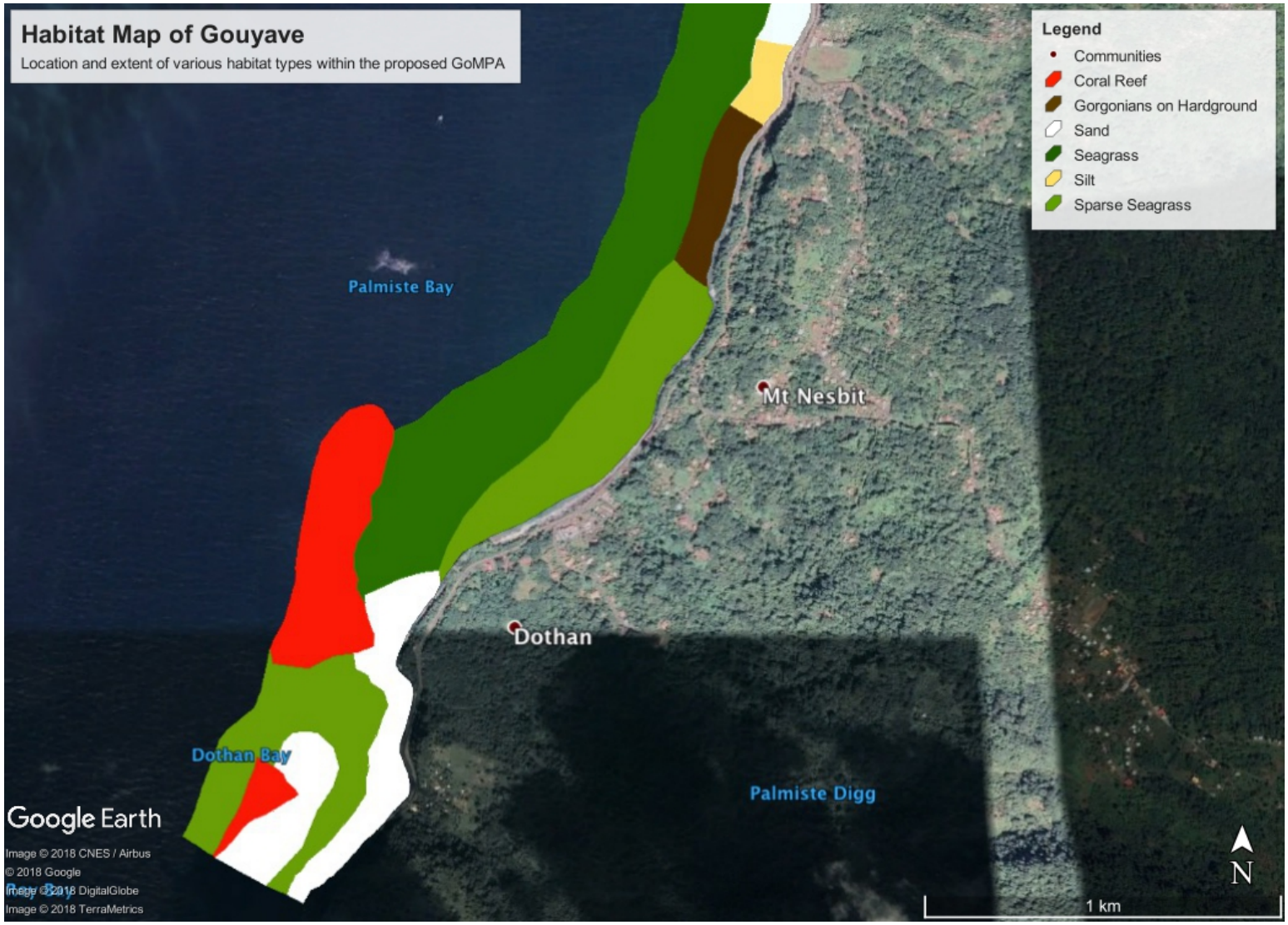
HABITAT MAP

Entire Area



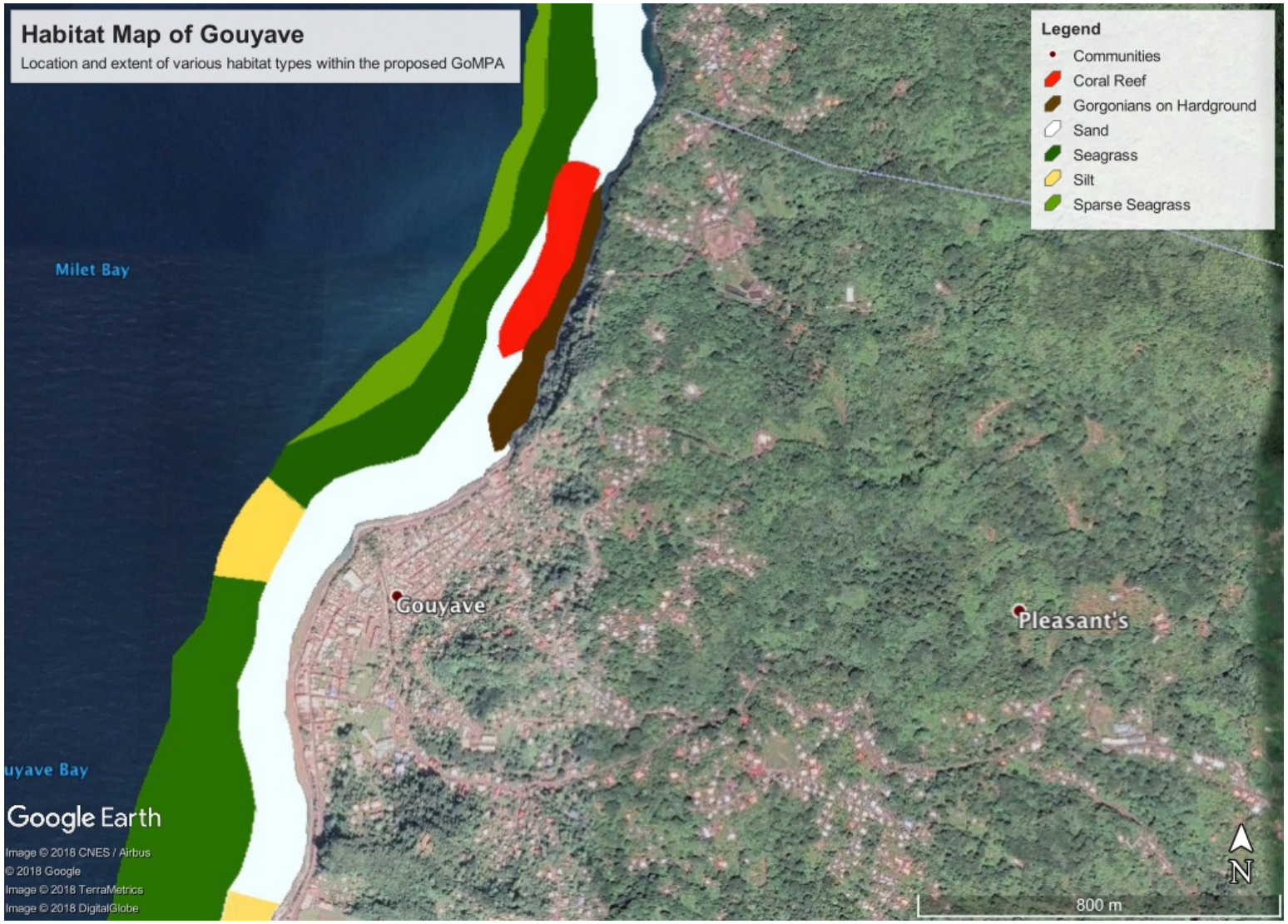
Map 1: Map depicting the various habitats within the entire study area.

White Gate/Palmiste



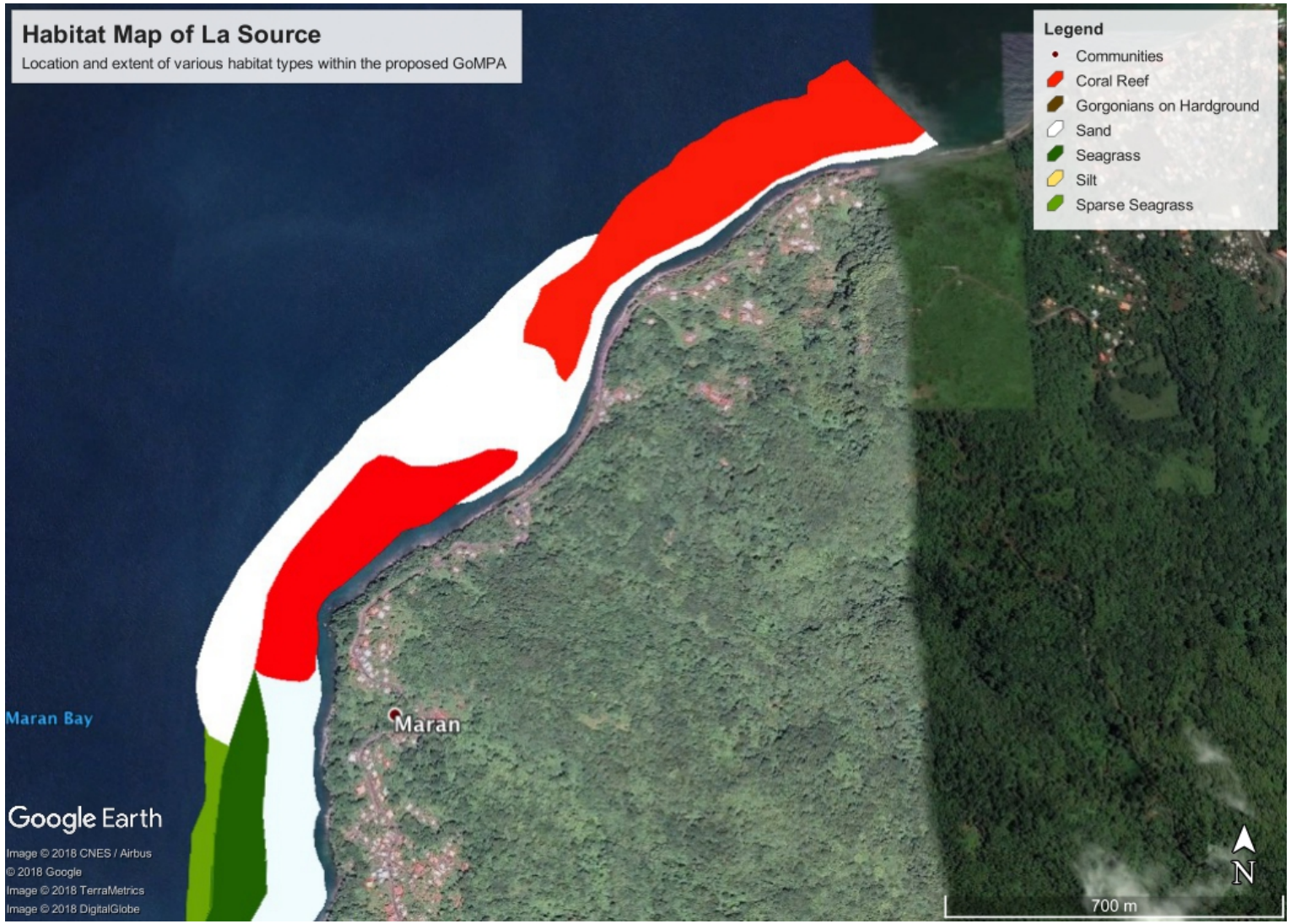
***Map 2*:** Map depicting the habitats within the segment of coastline along the White Gate/Palmiste area.

Gouyave



Map 3: Map depicting the habitats within the segment of coastline along the Gouyave area.

Maran/La Source



Map 4: Map depicting the habitats within the segment of coastline along the Marian/La Source area.

DISCUSSION

Primary Findings

All of the major habitat types are present within the study area; therefore, there is habitat available for the vast majority of coastal marine organisms. Dense Seagrass is the dominant living habitat type within the areas followed by Sparse Seagrass with Algae, Coral Reef and Gorgonian on hardground. The area has at least two distinct areas of each habitat type which is good for replication of habitats that would be protected within the boundaries of the proposed MPA. The presence of seagrass and five distinct coral reef systems in close proximity to each other at varying depths would facilitate the typical interplay between these two habitat that are important to the ontogenetic movement of ecologically and economically important marine species (e.g. fish, crustaceans and mollusks). The effective protection of these systems would provide a significant opportunity to halt and/or reverse the degradation of these habitats and associated species.

It is important to note that this study is a snap shot assessment of the current distribution of the various habitat types. Some of the habitat types (i.e. seagrass & sand) may undergo seasonal changes based on the prevailing conditions (i.e. salinity, turbidity or waves regime) at varying times of the year. This is especially relevant given the fact that dense seagrass comprises a significant proportion of the area within the proposed GoMPA at the moment. Seagrass are a very dynamic habitat type that can undergo significant changes in cover within a relatively short time span. More specifically, if the prevailing conditions are favorable (e.g. good visibility & stable substrate), areas that are now sparse seagrass can undergo a rapid growth spurt and transitions to an area populated with dense seagrass. Similarly, if the conditions are not favorable (e.g. high sedimentation) the dense seagrass area could dieback and transition to a sparse seagrass or sand area.

Halophila stipulacea was the dominant seagrass species at a number of Investigation sites where sparse seagrass with algae was identified. *H. stipulacea* is an invasive species of seagrass that was first concussively identified in Grenadian waters in 2002 (Ruiz & Ballantine, 2004). The species is believed to have been introduced into the Caribbean from the Mediterranean and spread about the region via pleasure yachts (Ruiz & Ballantine, 2004). Studies have shown that *H. stipulacea* has the potential to displace native seagrass and form large single species meadows (Willette & Ambrose, 2012). The presence of this invasive seagrass is an issue that warrant further research as there might me a species transition occurring that could hive significant repercussion for species (e.g. conch, turtles, urchins, etc.) that are associated with or depend on native seagrass species.

Next Steps

This study has identified the location and extent of the various habitat types within the area, the next step should be to conduct a comprehensive study of the various living habitat types (e.g. Seagrass, Coral Reef & Gorgonian). Such a study should focus on providing an inventory of the various species present along with their abundance and current health. These two studies combined would provide a scientifically robust starting point of making decisions with regard to the location of the boundaries of the proposed GoMPA. They would also assist significantly in the zoning of the MPA as they would identify areas that are appropriate for the various zoned activities based on the presence and health of the habitat in the area.

REFERENCES

Ruiz, H. and Ballantine, D.L. (2004). Occurrence of the seagrass Halophila stipulacea in the tropical west Atlantic. Bulletin of Marine Science 75,131–135.

The Nature Conservancy (2017). Summary Report for the Satellite Mapping of Benthic Habitats and Bathymetry for Grenada, Caribbean. BMU ICI ECMMAN 21p.

Willette, D.A. and Ambrose, D.F. (2012). Effects of the invasive seagrass *Halophila stipulacea* on the native seagrass, Syringodium filiforme, and associated fish and epibiota communities in the Eastern Caribbean. Aquatic Botany 103, 74–82.

ANNEX 1

Copy of Field Data Sheet

Date: _____

Habitat Categories: Coral Reef; Seagrass; Gorgonian; Hardground-Tuff; Rubble; Sand; Silt

Site #	Lat.	Long.	Depth	Habitat Type	Comments
1	12° 8'14.38"N	61°44'40.07"W			
2	12° 8'18.85"N	61°44'49.05"W			
3	12° 8'21.17"N	61°44'58.64"W			
4	12° 8'24.16"N	61°44'40.80"W			
5	12° 8'28.25"N	61°44'51.56"W			
6	12° 8'36.88"N	61°44'56.35"W			
7	12° 8'36.05"N	61°44'45.59"W			
8	12° 8'33.71"N	61°44'38.11"W			
9	12° 8'41.64"N	61°44'32.14"W			
10	12° 8'45.15"N	61°44'41.39"W			
11	12° 8'45.41"N	61°44'51.26"W			
12	12° 8'52.28"N	61°44'44.15"W			
13	12° 8'50.07"N	61°44'32.72"W			
14	12° 8'48.41"N	61°44'22.74"W			
15	12° 8'52.50"N	61°44'13.74"W			
16	12° 8'56.33"N	61°44'24.74"W			
17	12° 8'57.34"N	61°44'35.47"W			
18	12° 9'4.04"N	61°44'28.12"W			
19	12° 9'5.43"N	61°44'18.33"W			
20	12° 9'1.59"N	61°44'9.47"W			
21	12° 9'11.32"N	61°44'6.40"W			
22	12° 9'14.93"N	61°44'14.97"W			
23	12° 9'10.77"N	61°44'23.81"W			
24	12° 9'24.24"N	61°44'19.20"W			
25	12° 9'24.61"N	61°44'11.35"W			
26	12° 9'20.80"N	61°44'3.81"W			
27	12° 9'29.88"N	61°44'0.21"W			
28	12° 9'33.16"N	61°44'6.36"W			
29	12° 9'33.23"N	61°44'14.69"W			