Marine Habitat Mapping for Barbados: Ground-truthing Surveys and Analysis to Support Remote Sensing

Mapeo de Hábitat Marinas en Barbados: Encuestas y Análisis para Apoyar la Teledetección Verificación en el Terreno

La Cartographie des Habitats Marins pour la Barbade: Enquêtes et Analyses à L'appui Télédétection Vérification sur le Terrain

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EXTENDED ABSTRACT

Marine habitat maps are fundamental for the management of marine resources, but are not routinely available in the small island states of the Caribbean, due largely to the cost traditionally associated with production of these maps. Furthermore, existing habitat maps, even within country, are rarely compatible since they have usually been created for different purposes using different habitat schemes, different mapping resolutions and different methods Mumby and Harborne (1999). This makes it very difficult to piece together maps over sufficiently large enough areas to inform national-level marine spatial planning. The application of modern remote sensing technologies, together with a geographical information system (GIS) and strategic ground-truthing now means that marine habitat maps can be produced over larger geographical areas with better accuracy and lower budgets than previously possible. In this study, I describe the application of relatively inexpensive methods to conduct an extensive ground-truthing video survey and analysis to support remote-sensing at an island-wide scale, in order to produce a comprehensive shallow (to a depth of 40 m) marine habitat map for the island of Barbados. A 12-class locally relevant habitat scheme was developed through an iterative process involving key stakeholders and analysis of the underwater video footage. Location of ground-truthing sites was guided by:

i) The use of a draft remotely sensed habitat map allowing sites to be stratified to ensure adequate coverage of all draft habitat classes, and
ii) The need to give comprehensive coverage to all eight coastal zone management areas used by the Government's Coastal Zone Management Unit.

A total of 361 sites were visited and photographed (Figure 1). For the majority of sites, short (30 sec) underwater video clips were taken by a combination of a Seaviewer underwater camera and a GoPro camera operated from a small boat (Figure 2). For a small minority of sites, a handheld camera was operated by a free diver and/or SCUBA diver. Additional information (depth and geographic coordinates) were taken at each site with handheld instruments. Post-processing of the video clips was time consuming, but allowed for an iterative process in assigning habitat classes (Figure 3). Additional attribute data (including substrate type, rugosity, community abundance and dominant community groups were also scored from the video footage for each site, providing an additional rich dataset beyond that required for ground-truthing. The ground-truthing exercise provided the information needed to ensure that the habitat (Figure 4) scheme was appropriate at the island scale, and that the remotely sensed habitat map was accurate and fit for purpose (locally relevant and appropriately scaled for national-level marine spatial planning). The methods used, and lessons learned in this study have broad application to other countries in the region wishing to advance the process of marine spatial planning.

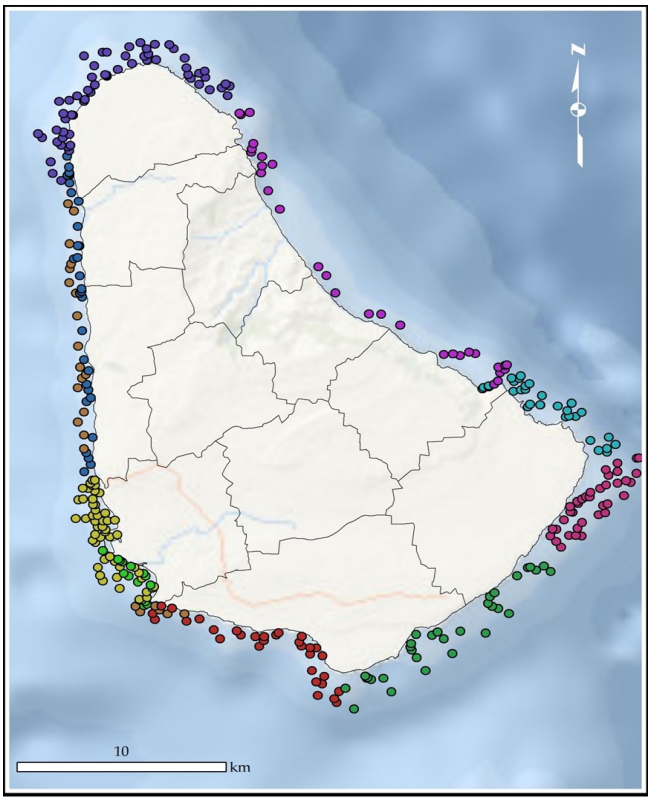

Figure 1. Map of Barbados showing the locations of the 361 sites that were surveyed over 12 days in the ground truthing exercise. Each colour represents a different field day in the ground truthing exercise.

LITERATURE CITED

Mumby, P.J. and A.R. Harborne. 1999. Development of a Systematic Classification Scheme of Marine Habitats to Facilitate Regional Management and Mapping of Caribbean Coral Reefs." *Biological*

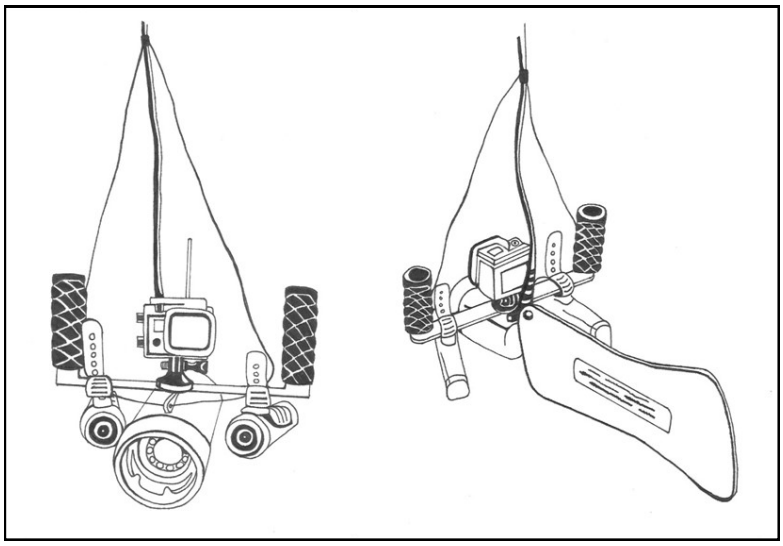

Figure 3. The rig consisted of a GoPro, two underwater flashlights, and the Seaviewer dropcamera (with a tail fin) attached to a GoPro tray. Additional fortification of the rig was added by wrapping the rig with duct tape and a stainless steel wire (Diagrams by Holly Trew)

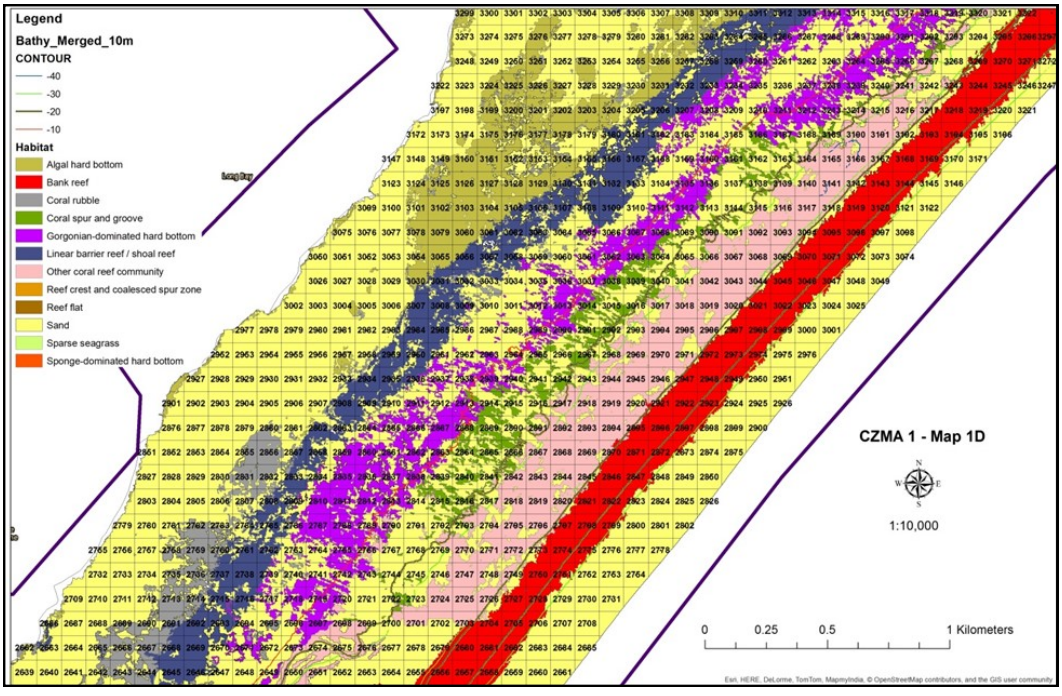

Figure 4. An excerpt from the draft habitat map showing the 100x 100m numbered grid that was overlain to assist in the selection of ground-truthing sites. (K. Baldwin, CZMA 1- Map 1D, Scale 1:10000 2015)