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## **Benthic Habitat Characterization Survey: George Town Harbor Berthing Program**

### **Executive Summary**

CSA Ocean Sciences Inc. (CSA) was contracted by West Indian Marine Group (WIM) and their respective client, the Cayman Islands Government (CIG), to conduct a Benthic Habitat Characterization Survey, which consisted of ecological and geophysical surveys in support of a proposed dredging and land reclamation program for cruise berthing facilities in George Town Harbor—the George Town Harbor berthing program. The direct impact area of the George Town Harbor berthing program is projected to be approximately 32.5 acres (ac) (131,523 m<sup>2</sup>). CSA's Benthic Habitat Characterization Survey, which focused on the direct impact area within the proposed footprint of George Town Harbor berthing program, was conducted to meet the following objectives:

- Delineate seafloor habitats;
- Characterize seafloor habitats;
- Quantify hard and soft corals within the projected direct impact area; and
- Assess potential options to mitigate impacts.

The Benthic Habitat Characterization Survey included ecological and geophysical survey activities that were concurrently conducted within George Town Harbor specific to the berthing program's projected direct impact area. In the ecological survey, scientific divers collected visual, photographic, and *in situ* data for delineating and characterizing seafloor habitats. The geophysical survey was conducted to collect side-scan sonar data to delineate and characterize seafloor substrates based on interpretation of acoustic signatures associated with relative sediment consolidation and topographic relief.

Ground truthing was conducted at 61 locations within the direct impact area of the berthing program and included 43 bounce dive and 17 transect sampling locations. Each location was classified by general substrate type present in the immediate vicinity of the marker buoy anchor and predominant coral-supporting habitat along sampling transects. The three primary substrate classifications were: 1) hard bottom with sand veneer, 2) exposed reef formation, and 3) unconsolidated substrate. Both hard bottom with sand veneer and exposed reef formation habitats supported a biological community with corals; corals were not associated with the areas classified as unconsolidated substrate. The distribution of the coral supporting habitats is generally delineated in **Figure 1** (i.e., yellow and blue dots).

The distribution of the coral supporting habitats as generally delineated in **Figure 1** is corroborated by the 1999 aerial image (**Image 1**) of George Town Harbor showing seafloor habitats offshore of the existing dock area. The hard bottom with sand veneer habitat is predominantly along the shoreward portion of the berthing program's projected direct impact area (**Figure 1**). The exposed reef formation habitat is a relatively continuous parallel to shore feature generally distributed along the seaward edges of the hard bottom with sand veneer habitat (**Image 1**).

The overall coral densities (colonies  $\text{m}^{-2}$ ) were much greater in the exposed reef formation habitat than the hard bottom with sand veneer habitat. The hard coral density for the hard bottom with sand veneer and exposed reef formation habitats ranged from less than 1 to 8 colonies  $\text{m}^{-2}$  and from 7.6 to 15.2 colonies  $\text{m}^{-2}$ , respectively. Similarly the soft coral density for the hard bottom with sand veneer and exposed reef formation habitats ranged from 0 to 4.1 colonies  $\text{m}^{-2}$  and from 0.1 to 5.3 colonies  $\text{m}^{-2}$ , respectively. The densities for the coral-supporting habitats were used in estimating the number of corals that could be potentially impacted within the proposed footprint of George Town Harbor berthing program.

The size of the coral colonies is an important consideration in coral translocation. Typically, hard corals selected for translocation would be at least 10 cm in diameter. The majority of hard corals within the study area were less than 10 cm in diameter and therefore probably less than 5 years old. Since soft corals have much faster growth rates than hard corals specimens, soft corals less than approximately 25 cm may not be considered for translocation. The majority of soft corals within the study area are less than 25 cm in height and probably around 2 to 3 years old. The relative abundance of the various coral size classifications were used to estimate the number of hard and soft corals that could be considered for translocation to mitigate for potential impacts from the George Town Harbor berthing program.

To estimate the amount of coral-supporting habitat directly impacted by the berthing program, the delineated aerial coverage of consolidated substrates based on interpretation of side-scan sonar and visual data (i.e., ground-truth locations) was integrated with the George Town Harbor berthing program direct impact area using ArcMap software (**Figure 1**). The total direct impact area of the berthing program is 32.5 ac (131,523  $\text{m}^2$ ). The total area for coral-supporting habitats (symbolized with purple cross-hatch in **Figure 1**) inside the boundary of the direct impact area is 11.2 ac (45,350  $\text{m}^2$ ). The 11.2 ac of coral-supporting habitat is estimated to comprise approximately 4.3 ac (17,560  $\text{m}^2$ ) of hard bottom with sand veneer habitat and 6.9 ac (27,790  $\text{m}^2$ ) of exposed reef formation habitat.

The coral resources at risk from the direct impact from dredging and land reclamation activities for the cruise berthing facility within George Town Harbor includes an estimated 391,001 hard corals and 61,291 soft corals. These estimates are based on calculations of average densities of hard and soft corals from each coral-supporting habitat. Of the 391,001 hard corals at risk, more than 274,000 are less than 10 cm in diameter and relatively young specimens. Similarly, of the 61,291 at-risk soft corals, more than 44,200 are less than 25 cm in height and relatively young specimens. Subsequently, the estimated number of hard corals (>10 cm in diameter) and soft corals (>25 cm in height) that could be considered for translocation is over 116,800 and over 17,000, respectively.

Possible options to address impacts to coral resources include both in-kind and out-of-kind mitigation. In-kind mitigation is the creation, restoration, or enhancement of a habitat type similar to the habitat that is adversely impacted by an activity. Likewise, out-of-kind mitigation is the creation, restoration, or enhancement of a habitat type different than the habitat that is adversely impacted by an activity. The mitigation options that include coral translocation, coral nurseries, substrate augmentation, and debris removal, reflect our experience and best professional judgment regarding field-tested methods for mitigation of natural resource damages. CSA considers these mitigation options as possibly suitable for application to the George Town Harbor berthing project.

Coral translocation would probably be the primary mitigation option for reducing impacts associated with the berthing project. Coral translocation, if done properly, can significantly reduce the loss of coral tissue and the ecological services provided by corals. CSA began doing coral reattachment during the infancy of this technique and procedural development. Senior marine specialists at CSA have been instrumental in refining reattachment procedures and have field-tested applications for reattachment of coral, soft coral, and large structural sponges as a means of accelerating habitat recovery.

Based on CSA's experience with coral translocation programs, not all at-risk corals are moved from the direct impact location. The percentage of at-risk corals to be translocated usually takes into consideration the larger and older specimens, any endangered species, and less common components of the assemblage. Typically, the final number of at-risk corals selected for translocation is cooperatively decided between regulators and proponents based on a consensus of acceptable level of impact from the proposed activities.

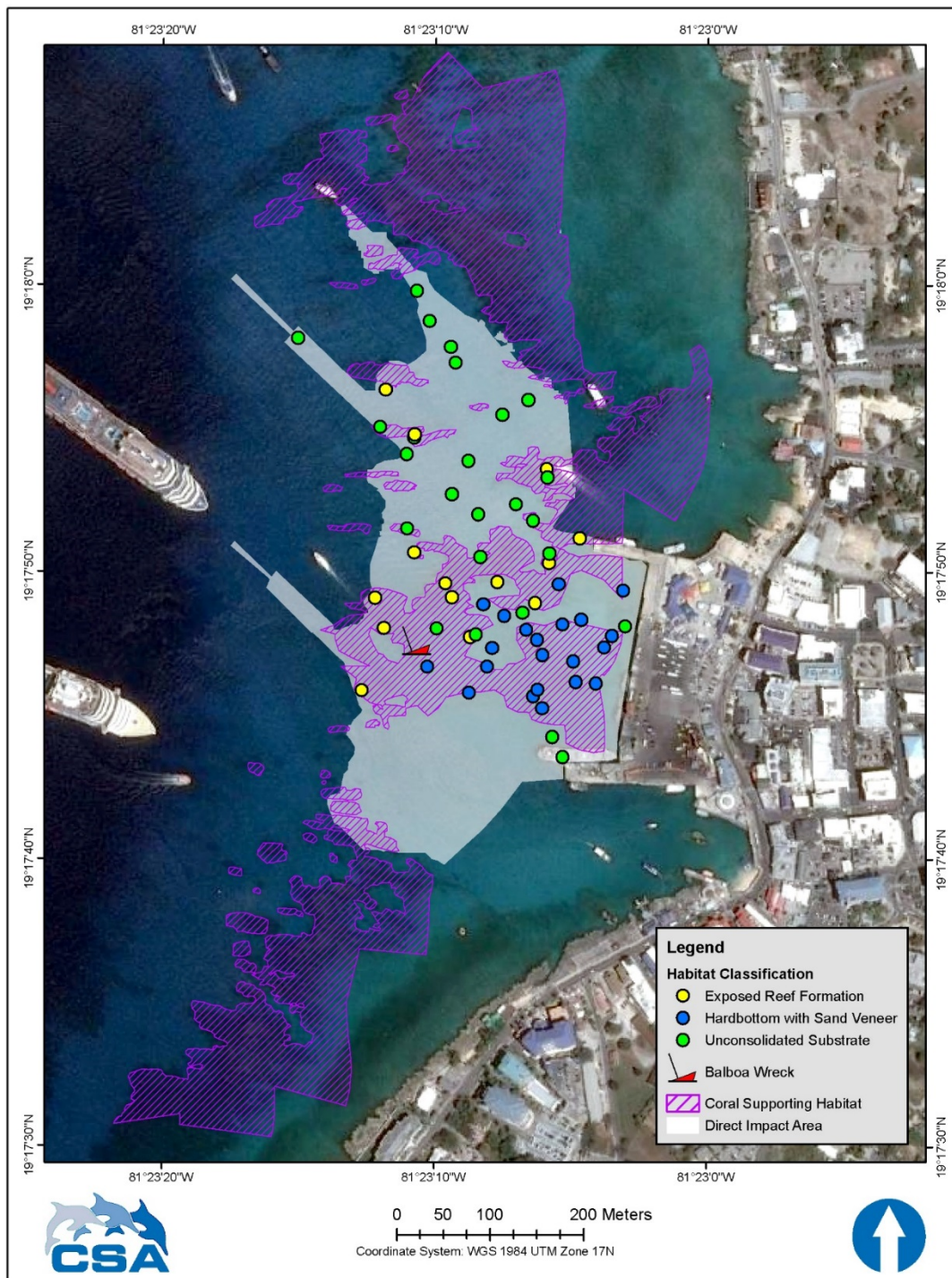


Figure 1. Distribution of coral-supporting habitats within the berthing program's projected direct impact area relative to the interpretation of side-scan sonar data and ground-truth locations.





Image 1. A 1999 aerial image of George Town Harbor showing seafloor habitats offshore of the existing dock area (image was provided by Lands & Survey Department of Cayman Islands Government).