Oyster Integrated Mapping and Monitoring Program

Tampa Bay Oyster Reef Mapping 2020

Florida Fish and Wildlife Conservation Commission

Fish and Wildlife Research Institute

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Report Date: 8 December 2020

Overview

The Oyster Integrated Mapping and Monitoring Program (OIMMP), based at the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute in St. Petersburg, Florida, compiles and contributes to oyster mapping and monitoring information across Florida. Mapping efforts for 2020 focused on unmapped oyster reefs in Tampa Bay, Florida. These maps were designed to accompany the most recently available oyster and seagrass maps produced by the Southwest Florida Water Management District (SWFWMD 2018).

Methods and Results

Oyster reefs not previously mapped by SWFWMD were identified and delineated in ArcMap version 10.7 (ESRI, Redlands CA), with no minimum mapping unit. Imagery used for photointerpretation included ESRI base imagery (NASA Blue Marble: Next Generation and i-cubed Nationwide Prime 1 m resolution imagery) and Google Earth version 7.3.3 satellite and aerial historic imagery (Google Inc., Mountain View CA). Oyster reefs were classified following the 6540 (Oyster Bars) code from the Florida Land Use, Cover and Forms Classification System, originally developed by the Florida Department of Transportation (FDOT 1999).

A total of 207 unmapped potential oyster reefs were identified across Tampa Bay. These potential reefs were divided into "low-confidence" and "moderate-confidence" reefs based upon the confidence in interpretation of the mapper and the clarity of the potential reef in the base imagery. Because this effort sought to identify previously unmapped reefs, many of the potential locations had an ambiguous appearance and required ground truthing. All 69 low-confidence reefs, a random 20% (24) of the moderate-confidence reefs, and 10 negative control sites (locations believed to be sand, seagrass, or muddy bottom) were selected for ground truthing (103 total sites).

Ground-truthing efforts were conducted by OIMMP personnel in August, September, and November of 2020; 96 of the identified 103 ground truthing locations (Fig. 1, Table 1) were evaluated (one moderate-confidence reef and six low-confidence reefs were not visited due to difficulty with site access or weather conditions at the time of ground truthing). Only sites with live, intact oyster reefs qualified for classification as an oyster reef. Sites with scattered shell, scattered patchy oyster clusters, or oysters growing on artificial substrate were not classified as oyster reefs for this effort. Oysters growing on mangrove roots and directly under mangrove canopy are not visible in remote imagery, and therefore were not mapped in this effort.

A positive confirmation of the presence of an oyster reef was mandatory for all low-confidence reefs to be included in the final map. The aerial appearance of reefs that were correctly and incorrectly identified during ground truthing was then used to re-evaluate all moderate-confidence reefs (see below for details on appearance). Only reefs with a high confidence of accuracy were retained in the final map. The final map contained 136 previously unmapped oyster reefs. A compilation of statewide oyster reef maps, including these newly mapped reefs, is available at: https://geodata.myfwc.com/datasets/oyster-beds-in-florida.

Table 1. Error matrix of ground-truthing results for Tampa Bay oyster reef mapping. Gray shading indicates correct classification.

Ground-truthed substrate	Moderate-confidence potential reefs	Low-confidence potential reefs	Negative Control
Oyster reef	17	32	0
Sand/mud	2	23	6
Oyster shell	0	2	0
Scattered oyster clusters	3	1	1
Spartina marsh	0	3	0
Seagrass	1	1	3
Rip rap	0	1	0
Total classified correctly	17	32	10
Total sites	23	63	10
Accuracy (%)	73.9	50.8	100.0

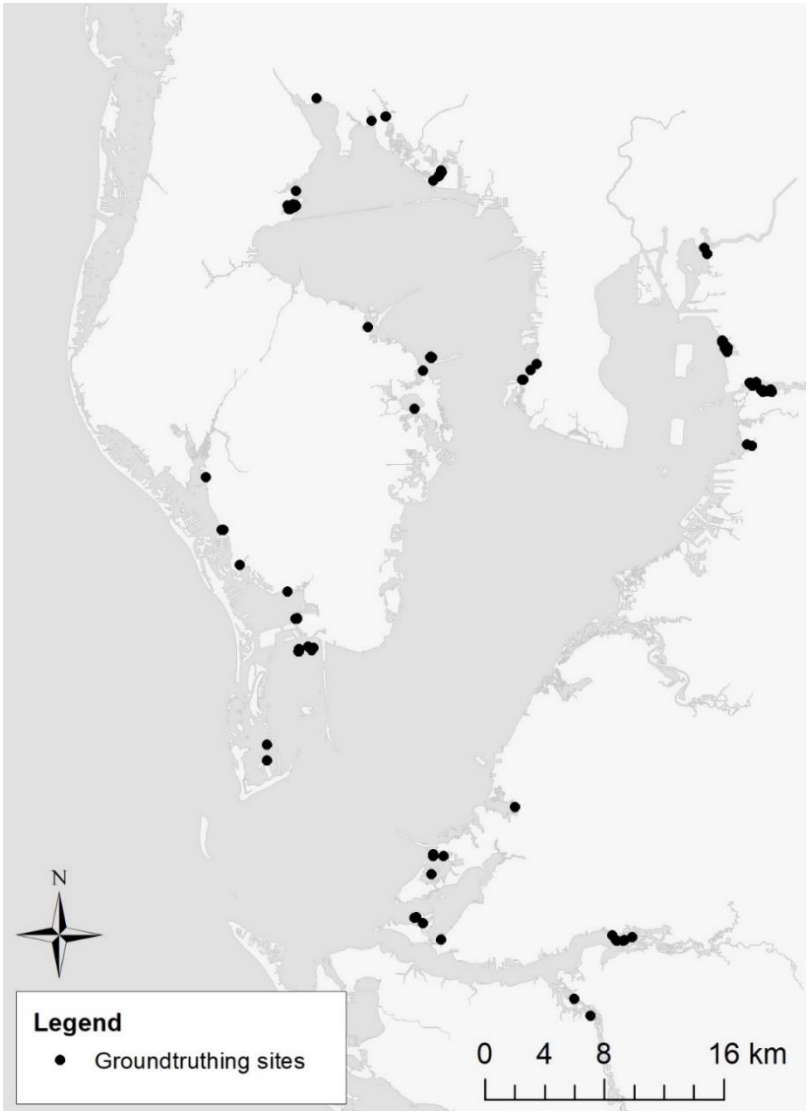

Figure 1. Map of ground-truthed locations in Tampa Bay

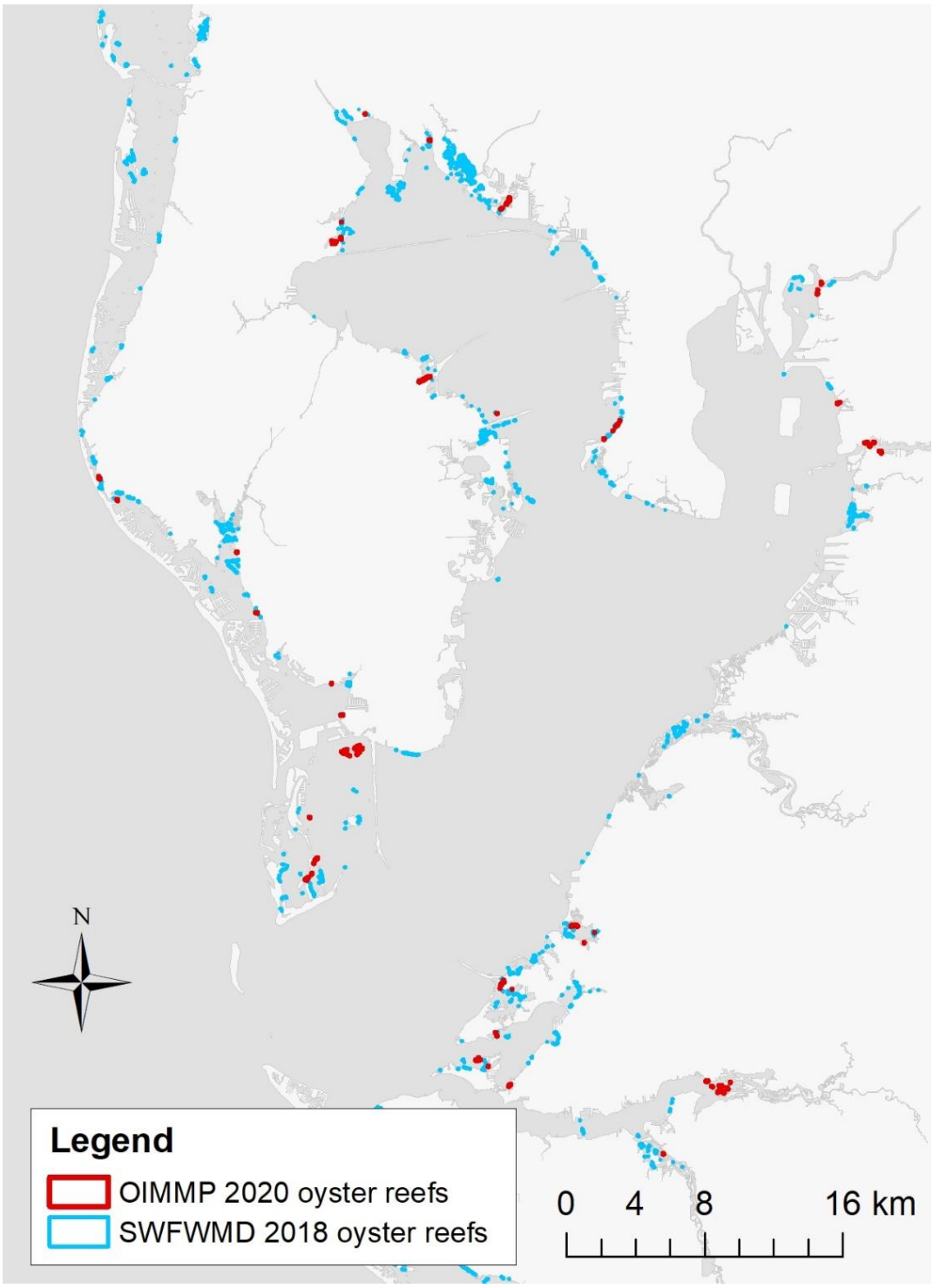

Figure 2. Previously mapped reefs (blue outlines) in Tampa Bay (SWFWMD 2018) and newly mapped reefs (red outlines) added by this project (OIMMP 2020). Outlines indicate reef locations only and are not mapped to scale.

Reefs were identified in available imagery based upon their color, shape, texture, and location. The following characteristics were useful for identification:

- Freestanding reefs were commonly circular or oval-shaped (Fig. 3)
- Lighter-colored shell hash was often visible in the center of the reef, sometimes surrounded by a darker outline on the edges of the reef (presumably due to algae or mud on the margins of the reef) (Fig. 3).
- The textured nature of oyster reefs was often visible in imagery with sufficient resolution (Fig. 4).
- Fringing reefs were oval-shaped or linear along a mangrove fringe (Fig. 5).
- Only wide fringing oyster reefs (those with > 2 m of reef visible beyond the mangrove canopy) could be identified with high confidence (Fig. 5).

Figure 3. Example of lighter-colored shells in the center of an oyster reef surrounded by a dark outline on the edges of the reef.

Figure 4. A low-confidence potential reef (left, in yellow) that was found to be loose shell during ground truthing, and thus omitted from the final map. The rough texture visible in the reef on the right (green outline) was later confirmed to be a live oyster reef.

Figure 5. Due to the difficulty of visually separating narrow fringing oyster reefs from lighter-colored sand and muddy bottom along mangrove shorelines, only wide (> 2 m) fringing reefs could be classified with high confidence. The red-orange point in the image above was found to be muddy bottom, while the green point was confirmed to be a live oyster reef.

Acknowledgements

This mapping was conducted as a component of the Oyster Integrated Mapping and Monitoring Program (OIMMP), which is funded by the Florida Fish and Wildlife Conservation Commission, Florida's Wildlife Legacy Initiative, and the U.S. Fish and Wildlife Service's funding support of Florida's State Wildlife Grants Program (Monitoring and Aquatic Restoration Projects Grant Cycle 2018 F19AF00401). Mapping, ground truthing, and/or writing were conducted by Scott Adams, Savanna Hearne, Ryan P. Moyer, Kara Radabaugh, and Emily Ritz.

References

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SWFWMD (Southwest Florida Water Management District). 2018. Seagrass in 2018. GIS shapefile available from https://data-swfwmd.opendata.arcgis.com/datasets/seagrass-in-2018, accessed June 2020.