Florida Trustee Implementation Group

Suwannee and Springs Coast Intertidal Oyster Reef Mapping 2023

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Overview

The Deepwater Horizon Natural Resource Damage Assessment Florida Trustee Implementation Group awarded the Florida Fish & Wildlife Conservation Commission (FWC) funds to map, monitor, and create habitat suitability analyses in order to identify optimal locations for oyster restoration along the Gulf coast of Florida. Six estuaries of interest were selected for habitat analyses: Pensacola Bay, St. Andrew Bay, Suwannee Sound, Withlacoochee River, Crystal River, Tampa Bay, and Charlotte Harbor. This mapping effort was designed to replace older mapping layers and identify any previously unmapped oyster reefs for inclusion in the statewide compilation of live oyster habitat, Oyster Beds in Florida. Maps will also be used to help create regional oyster habitat suitability analyses. Mapping was divided into subtidal or intertidal efforts due to differing methodologies. This report encompasses intertidal oyster habitat mapping of the Suwannee and Springs Coasts (Suwannee Sound, Withlacoochee and Crystal Rivers).

Methods and Results

Potential oyster reefs were digitized in ArcMap 10.8.1 (ESRI; Redlands, CA) with no minimum mapping unit. Imagery basemaps in ArcMap (Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community) and Google Earth Pro 7.3.6 (Google LLC; Mountain View, CA) were used to identify potential oyster reefs and determine delineation boundaries (2019 imagery for Suwannee coast; 2019-2023 imagery for Springs Coast). Once digitized, potential oyster reefs were visually analyzed with consideration of color, shape, texture, and location and classified as ‘moderate-confidence’ or ‘low-confidence’ based on the cartographer’s interpretation of the imagery.

A random subset (~25%) of moderate-confidence reefs and all low-confidence reefs were targeted for ground-truthing. Ground-truthing efforts were conducted by FWC personnel in April and June 2023. Not all sites selected for ground-truthing could be evaluated due to site access, tides, or time constraints. The substrate of each ground-truthed reef was visually inspected or probed with a pole then classified as oyster reef, sand/mud, oyster shell/shell hash, or scattered live oyster. Oyster reefs were classified as areas with a minimum of 30% live oyster coverage (estimated visually); sites with less than 30% cover were classified as scattered live oyster (Baggett et al. 2014). Only live reefs were included in the final map. Results from ground-truthing were then used to reclassify confidence accuracy of all remaining reefs that were digitized but not visited. Only polygons that were confirmed reef or had a high confidence in accuracy after reclassification were included in maps.

Suwannee Sound

Previous mapping efforts in the Suwannee region were conducted by USGS from 1992 – 1993 imagery (USGS 1992) and historical toposheets (Raabe et al. 2004), Suwannee River Water Management District from 2001 imagery (SRWMD 2001a, SRWMD 2001b) and 2010 – 2011 imagery (SRWMD 2011), FWC from 2011 – 2019 imagery (FWC 2019), FWC from 2017 – 2021 imagery (FWC 2021), FWC /University of New Hampshire from 2021 imagery (Grizzle et al. 2023), and Espriella & Lecours from 2021-2022 imagery (Espriella & Lecours 2023). This mapping effort focused on identifying previously unmapped habitat and updating the 2001

SRWMD maps. This map was designed to be complementary to reefs already mapped by FWC (2021) in Suwannee Sound. This new layer replaced those intertidal SRWMD (2001a, 2001b) polygons in Oyster Beds in Florida that were visible in satellite imagery.

Between Horseshoe Beach and Cedar Key, 759 potential reefs were digitized and 403 were targeted for ground-truthing. Of these, 237 potential reefs were visited. Following reclassification based upon information gathered during ground truthing, the final map consisted of 737 oyster reefs for the region (Figure 1). Ground-truthing data determined that 100% of moderate-confidence reefs and 91% of low-confidence reefs were classified correctly (Figure 2, Table 1).

Springs Coast (Withlacoochee & Crystal Rivers)

Previous mapping efforts of oyster habitat along the Springs Coast were conducted by USGS from 1992 – 1993 imagery (USGS 1992), Southwest Florida Water Management District from 2007, 2012, 2016, and 2020 imagery (SWFWMD 2007, 2012, 2016, 2020). This mapping effort focused on identifying previously unmapped habitat and thus was designed to be added to Oyster Beds in Florida as a complementary dataset to SWFWMD (2020).

Between Waccasassa Bay and Homosassa Bay, 467 potential reefs were digitized and 225 were targeted for ground-truthing. Of these, 132 potential reefs were visited. Following reclassification based upon information gathered during ground truthing, the final map consisted of 459 oyster reefs for the region (Figure 3). Ground-truthing data confirmed 98% of moderate-confidence reefs and 93% of low-confidence reefs were classified correctly (Figure 4, Table 2).

Conclusion

In total, 1,196 intertidal oyster reefs were identified through this mapping effort with a mean accuracy of 93.8%. Potential reefs that were determined during ground-truthing to be misclassified were composed of oyster shell/shell hash (2.7%), followed by sand/mud (1.9%), and scattered, live oyster (1.6%). Separating potential reefs into moderate-confidence and low-confidence strata for ground-truthing can focus efforts on areas that have the potential to be reefs yet lack the distinctive visual appearance of oyster reefs, enhancing ground-truthing efficiency and improving overall accuracy of oyster maps.

The following characteristics were notable for the Suwannee Sound and the Springs Coast:

- Newly identified reefs were inshore and predominantly in small tidal creeks of the Gulf of Mexico (Figures 1 and 3). Similar findings were noted by FWC (2021) while mapping intertidal oyster reefs north of Suwannee Sound, near Horseshoe Beach and Deadman Bay.
- Color and texture are the primary distinguishing features of an oyster reef, though scattered oysters, sand, mud, and shell hash can closely resemble a reef signature depending on basemap imagery resolution and contrast (Figures 5 and 6). This emphasizes the need for ground-truthing when mapping using imagery.
- Reefs were frequently colonized by marsh plants, particularly *Spartina alterniflora* (Figure 7) with clusters of oysters interspersed within vegetation. Similar findings were noted by Espriella & Lecours (2023) when using drone imagery to delineate oyster reefs

in Suwannee Sound. Potential reefs with an estimated >50% *S. alterniflora* cover were excluded from maps.

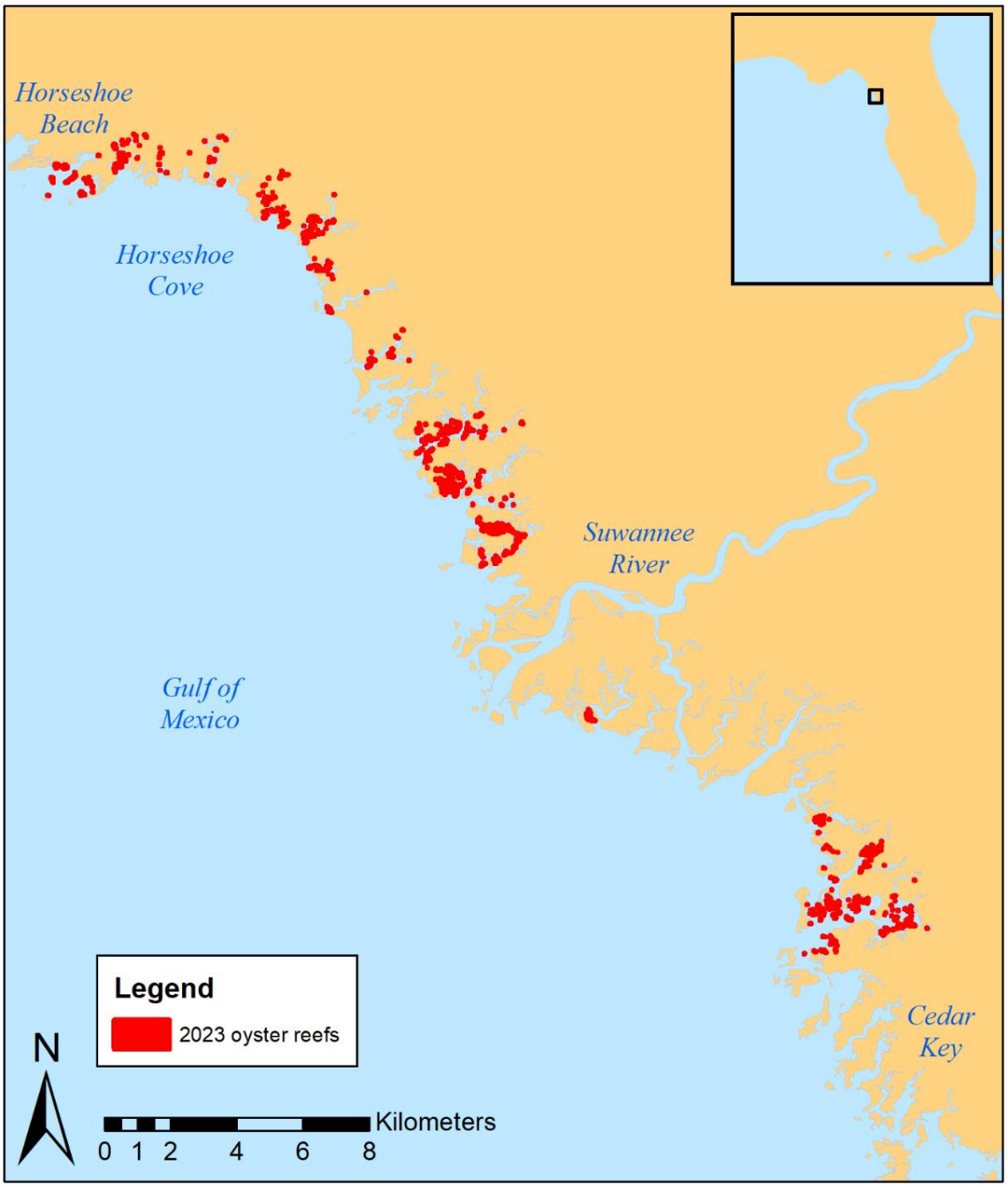

Figure 1. Oyster reefs of the Suwannee region of Florida identified through this mapping effort. Oyster reefs are not represented to scale.

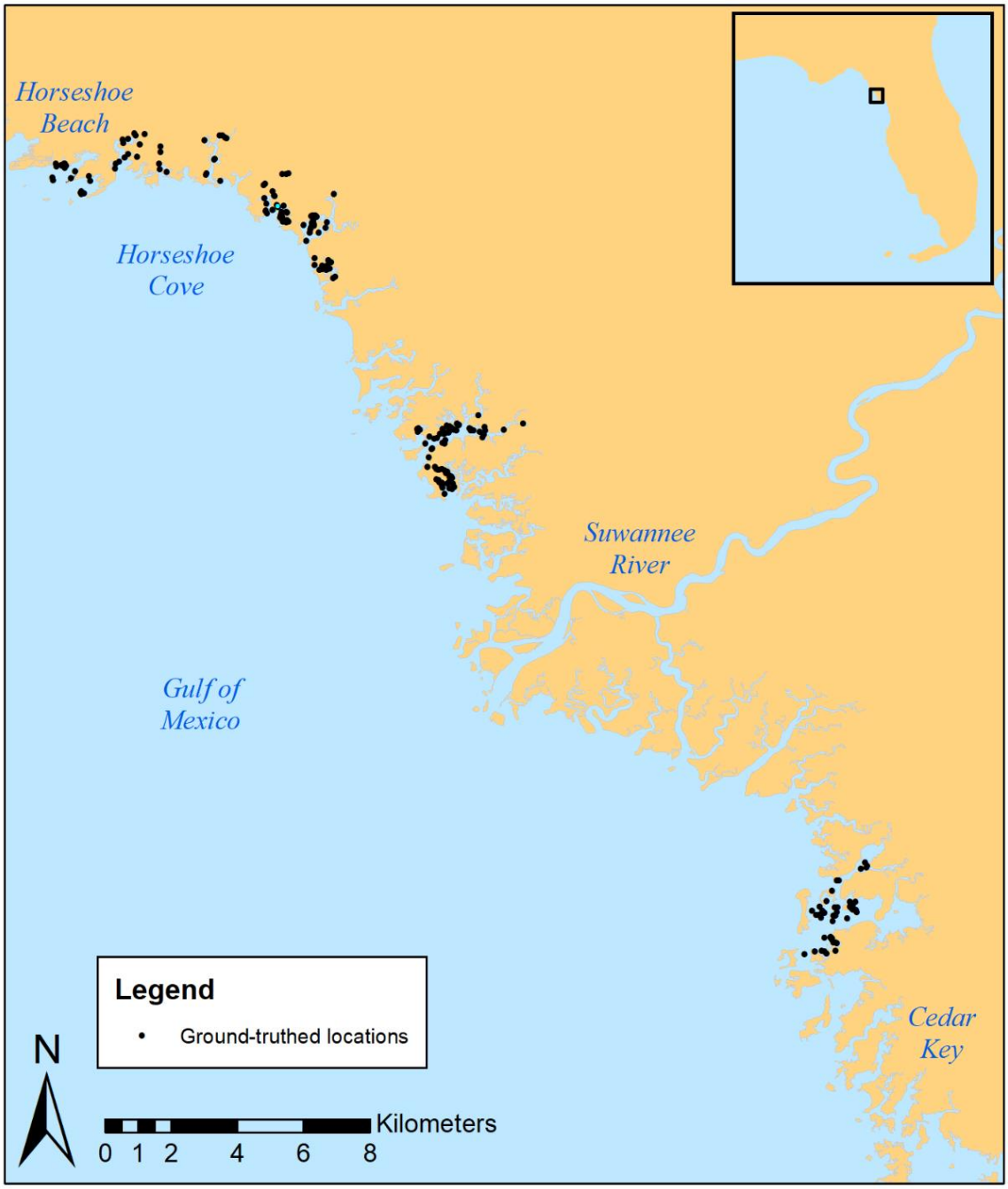

Figure 2. Map of ground-truthed locations in the Suwannee region of Florida.

Table 1. Error matrix of ground-truthing results from field assessments in the Suwannee region of Florida.

Ground-truthed substrate	Moderate-confidence potential reefs	Low-confidence potential reefs	All potential reefs
Oyster reef	62	159	221
Sand/mud	0	6	6
Oyster shell/shell hash	0	5	5
Scattered live oyster, non-reef	0	5	5
Total classified correctly	62	159	221
Total sites	62	175	237
Accuracy	100%	91%	93%

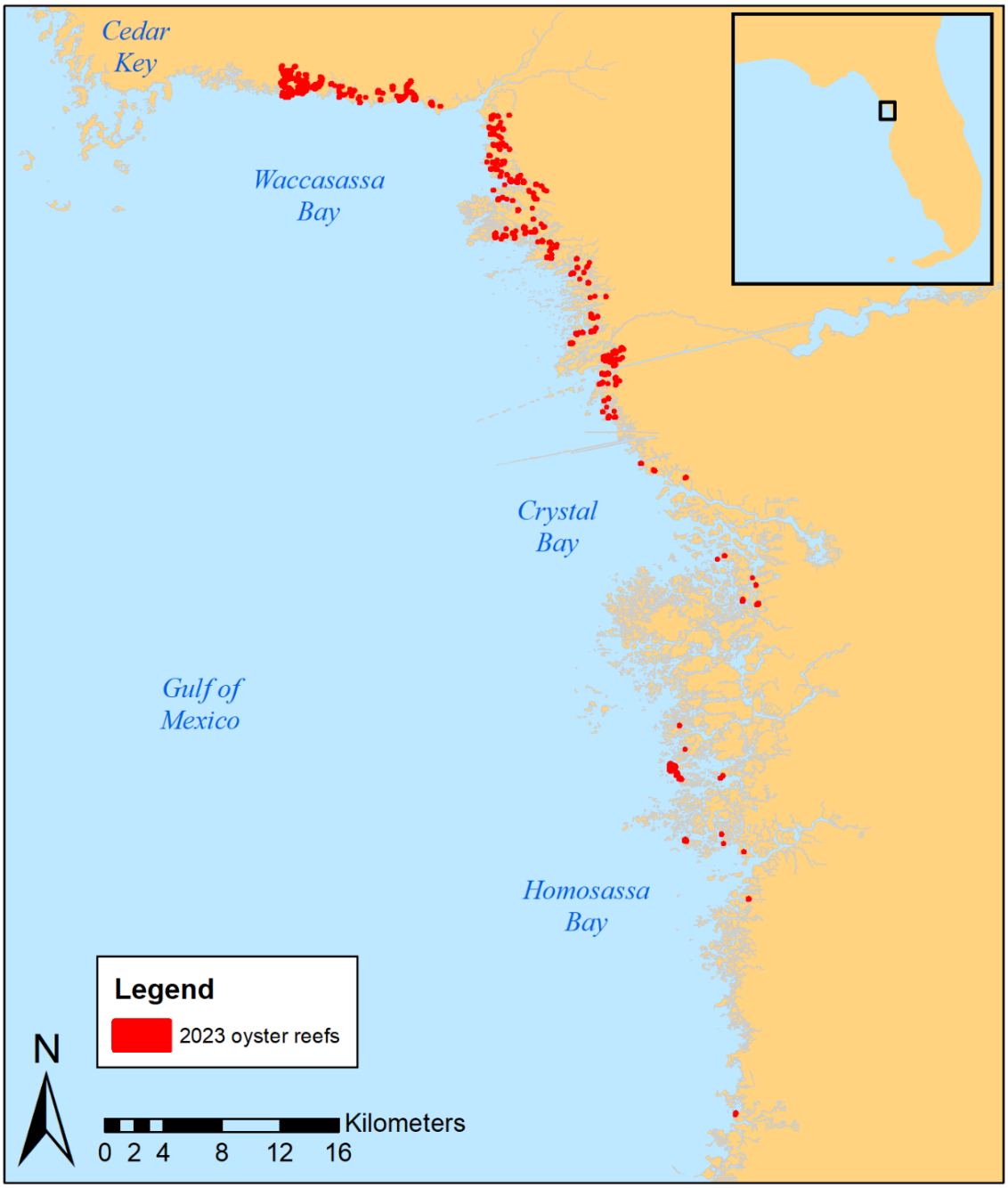

Figure 3. Oyster reefs along the Springs Coast region of Florida identified through this mapping effort. Oyster reefs are not represented to scale.

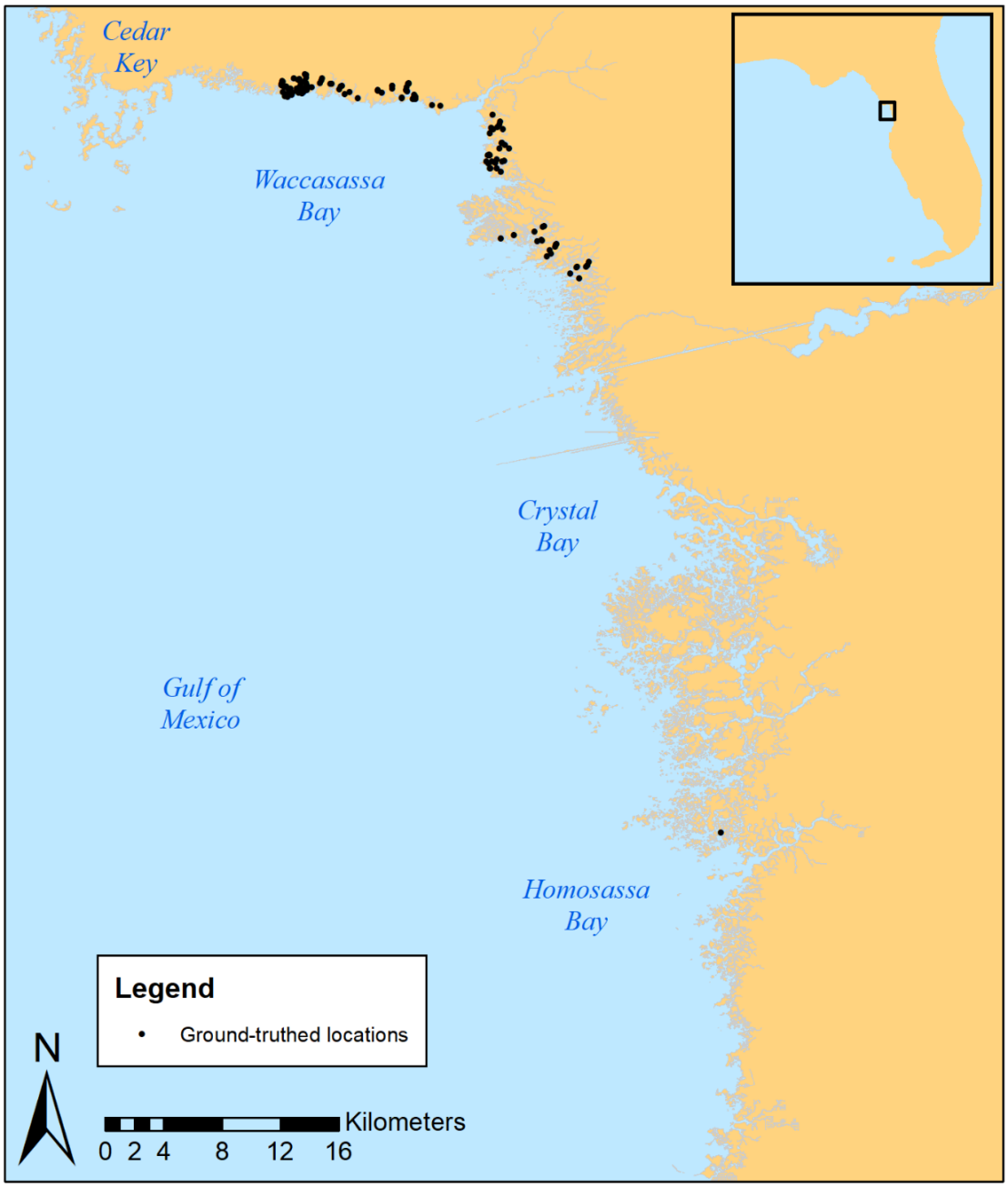

Figure 4. Map of ground-truthed locations along the Springs Coast region of Florida, from Waccasassa Bay to Homosassa Bay.

Table 2. Error matrix of ground-truthing results from field assessments in the Springs Coast region of Florida.

Ground-truthed substrate	Moderate-confidence potential reefs	Low-confidence potential reefs	All potential reefs
Oyster reef	50	75	125
Sand/mud	0	1	1
Oyster shell/shell hash	1	4	5
Scattered live oyster, non-reef	0	1	1
Total classified correctly	50	75	125
Total sites	51	81	132
Accuracy	98%	93%	95%

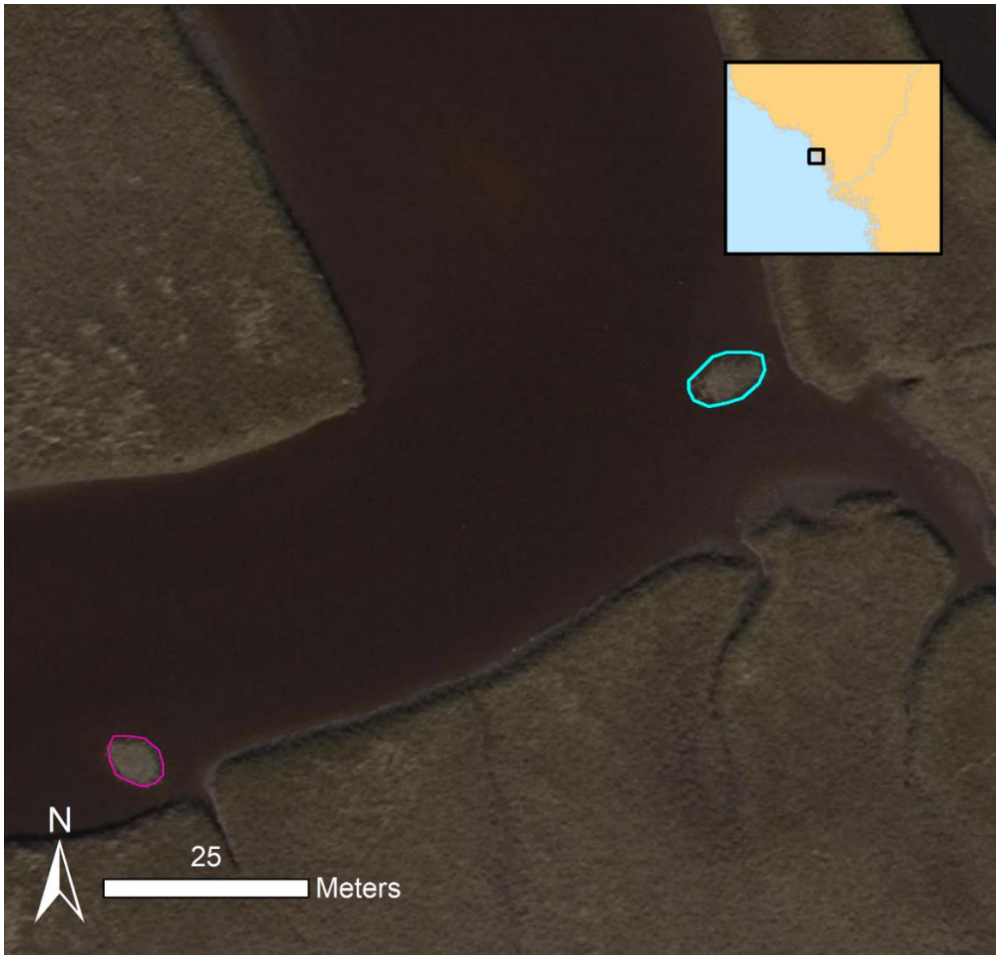

Figure 5. Outline of two low-confidence potential oyster reefs mapped along the Suwannee region of Florida. One was confirmed as oyster reef during ground-truthing (pink outline), while the other was sand/mud (blue outline). The similarity in texture between polygons highlights the importance of ground-truthing when digitizing from aerial imagery.

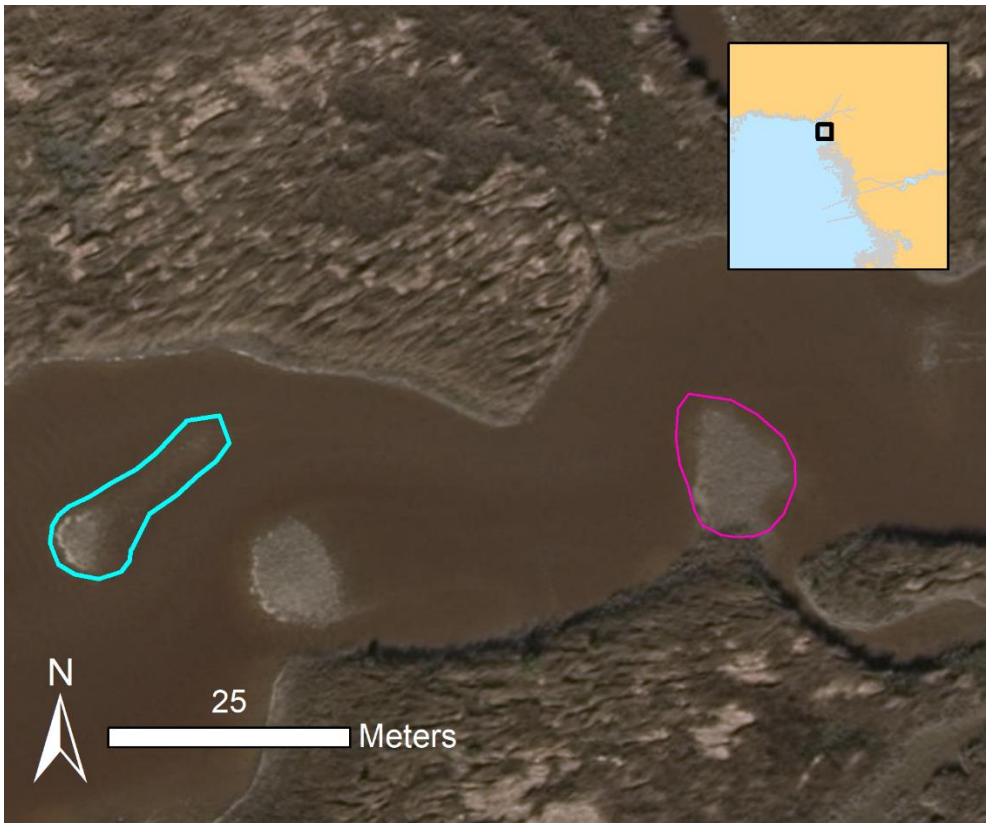

Figure 6. Outline of two low-confidence potential oyster reefs mapped along the Springs Coast region of Florida. One was confirmed as oyster reef during ground-truthing (pink outline) while the other (blue outline) was scattered oysters. The habitat visible between the two polygons is also oyster reef. Reefs are difficult to confidently differentiate from scattered oysters using imagery alone, again emphasizing the importance of ground-truthing, especially low-confidence reefs.

Figure 7. An intertidal, patch oyster reef covered in *Spartina alterniflora*. Clusters of oysters were also found nested within the blades of marsh grass.

Acknowledgements

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