Oyster reef and seabed mapping of Copano Bay – CMP Cycle 11 Final Report

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Introduction

This is the final report of our CMP Cycle 11 project to identify and delineate oyster reefs and other bottom features in Copano Bay. This project is being conducted during two successive CMP Cycles, Cycles 11 & 12. During the Cycle 11 we conducted the bulk of the field component of the geophysical mapping. Cycle 12 will be used to process the geophysical data and generate maps and prepare the final report. This project is a cooperative effort between Department of Oceanography, Texas A&M University (TAMU), Department of Marine Sciences Texas A&M University at Galveston (TAMUG), the Institute for Coastal Studies at Texas A&M University at Corpus Christi (TAMUCC), and the Texas Parks and Wildlife Department (TPWD).

Study Site

Copano Bay is a shallow (2-3 m), microtidal estuary in south central Texas (Figures 1 and 2). It is approximately 8 to 10 km wide and up to 26 km long with an area of about 69.5mi^2 (Calnan,1980). It is a secondary bay to Aransas Bay with three main rivers that provide freshwater and sediment inflow to the estuary.

Work Conducted

Geophysical data were collected aboard the R/V *Sammy Ray* (Figure 2) over an eight week period from June 2007 through July 2007 along the survey lines shown in Figure 2. Copano Bay was surveyed using sidescan sonar, CHIRP sub bottom sonar and single beam bathymetry. Grab sediment samples were also collected to correlate sidescan backscatter intensity.

Sidescan Sonar

The sidescan sonar survey was conducted using an Edgetech® 272TD sidescan sonar towfish operating at 100 kHz. Survey line spacing was 150m with a swath width of 100m to provide maximum coverage of the seafloor. Due to the shallow water depths of the Bay the towfish was attached on a PVC catamaran along the starboard side of the research vessel (Figure 4).

Data were acquired digitally using CodaOctopus® Geosurvey software that combines sonar images with navigation data supplied by a Trimble®DGPS receiver. The data was then mosaicked and exported as a georeferenced image (Figure 5).

The high-frequency acoustic signal of the sidescan allows surficial sediments to be mapped based on backscatter intensity. Higher backscatter areas consisting of hard substrates, such as oyster reefs, are depicted as lighter areas on the produced image, while low backscatter soft substrate areas, such as silts and clays, appear as darker areas.

Bathymetry

Single-beam bathymetry was collected using an Odom Hydrotrac operating at a 200 kHz frequency and Hypack® software. Tide corrections were made to the data in Hypack® using the NOAA tidal station (ID #87745 13) located at the main opening of Copano Bay

near the Highway 35 Bridge. The bathymetric map generated from this data is shown in Figure 6.

Grain Size Analysis

Sidescan sonar data were ground truthed using a Ponar style grab sampler. 45 samples were taken at various locations across the Bay and analyzed using a Malvern Mastersizer 2000. This device uses laser diffraction to produce a grain size distribution ranging from .02 um to 200um. The percent gravel, sand, silt and clay were analyzed for each grab sample. Figure 7 is the map generated from this data and will be used to ground truth the sidescan sonar data by correlating the backscatter intensity of the sidescan sonar data image with the sediment grain size.

Chirp Seismic

The Chirp survey was conducted using an Edgetech® 216S Full Spectrum Subbottom chirp seismic sonar towfish and the Triton Elics Delph Seismic® software package. The seismic sonar operates on a range of 2 – 16 kHz to profile sedimentary strata. The Chirp fish was suspended just below the water's surface from a davit on the port side of the stern (Figure 8). Select sample Chirp lines are shown in Figure 9. A Chirp line was collected for each sidescan sonar line and these data will be used both to interpret the sidescan sonar data and to investigate the role subsurface geology plays in the positioning of the reefs.

Results

The Cycle 11 portion of this project was to collect and process the data, detailed reporting of the results, discussion of the data and conclusions will be part of our CMP Cycle 12 project. Shown in the figures are our preliminary results which the CMP Cycle 12 project will be based.

Future work (CMP Cycle 12)

The TAMU-CC group, under the direction of Dr. Simons has conducted considerable effort on ground truthing the oyster reefs by conducting oyster dredge analyses and other biological sampling to document the density of oysters on the mapped reefs. In August, 2008, the TAMUG group went back down to the study site for two weeks and collected a series of vibra cores in the bay to ground truth the Chirp data. Analyses of these cores is still underway.

Figure 1. Map of the Texas coast showing the location of Copano Bay (Calnan, 1980).

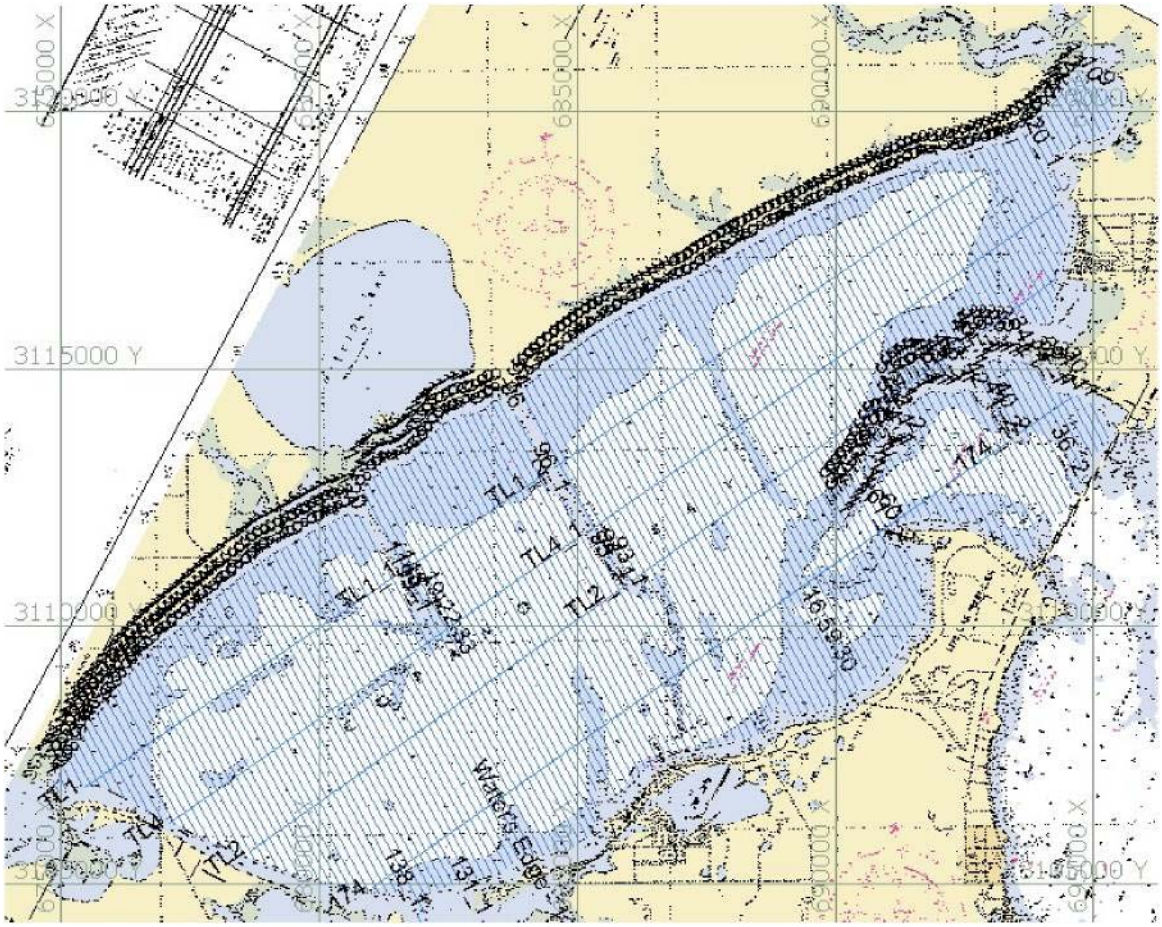


Figure 2. Map of Copano Bay with plot of survey track lines.

Figure 3. Photo of the R/V Sammy Ray, the survey boat used to collect data.

Figure 4. Sidescan sonar being deployed onto catamaran float on starboard side of vessel.

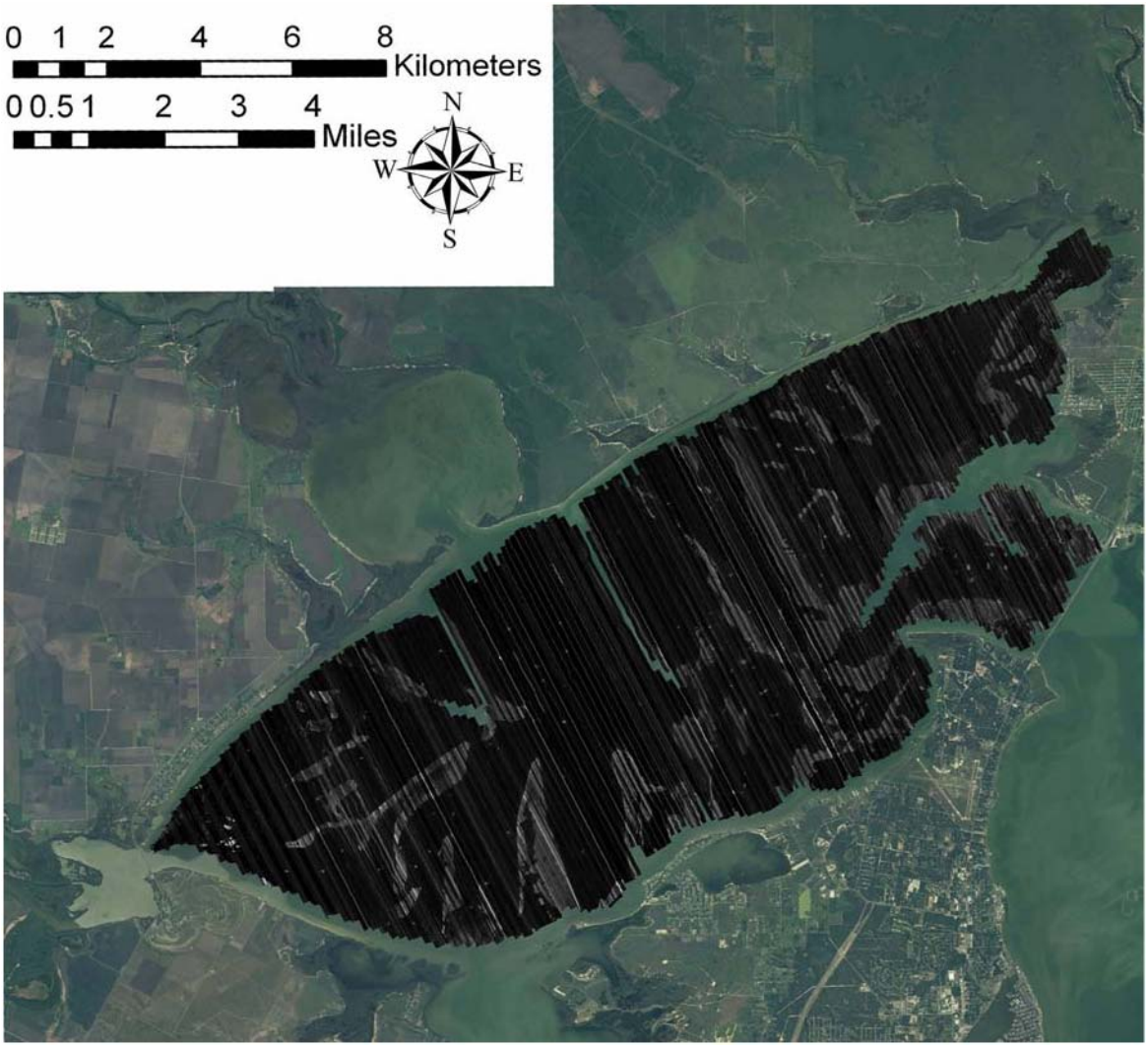


Figure 5. Sidescan sonar mosaic for Copano Bay.

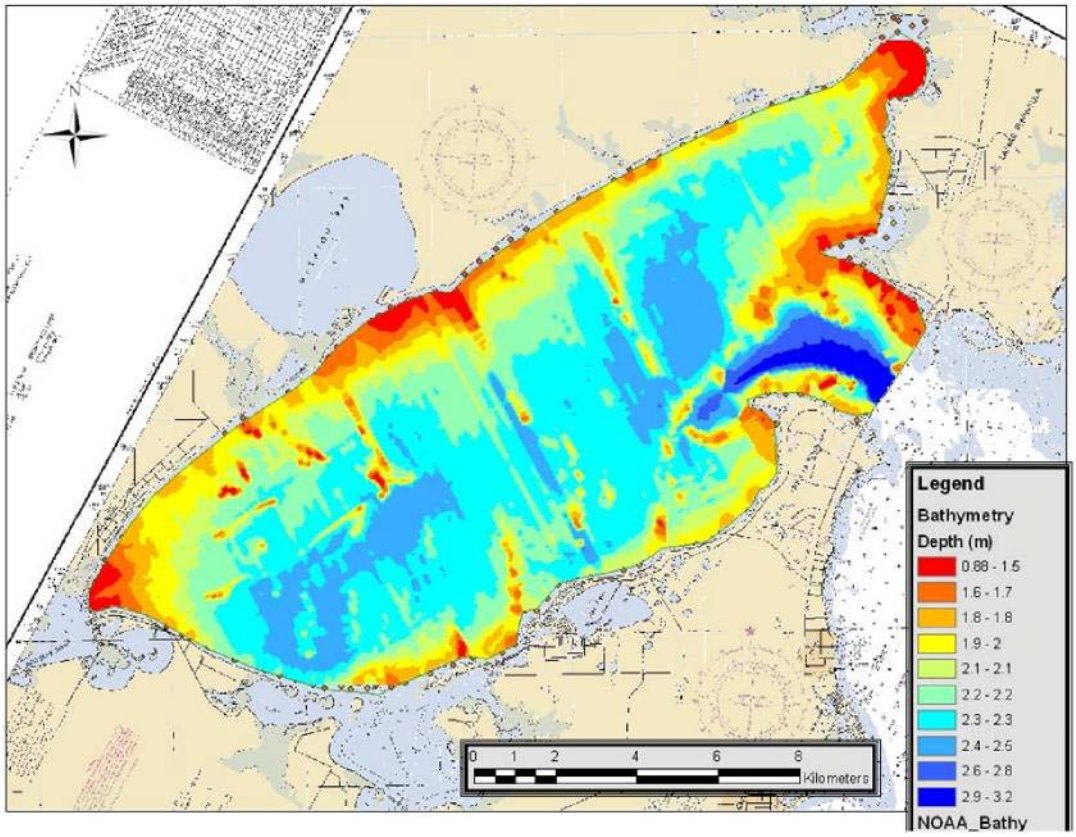


Figure 6. Bathymetric map of Copano Bay

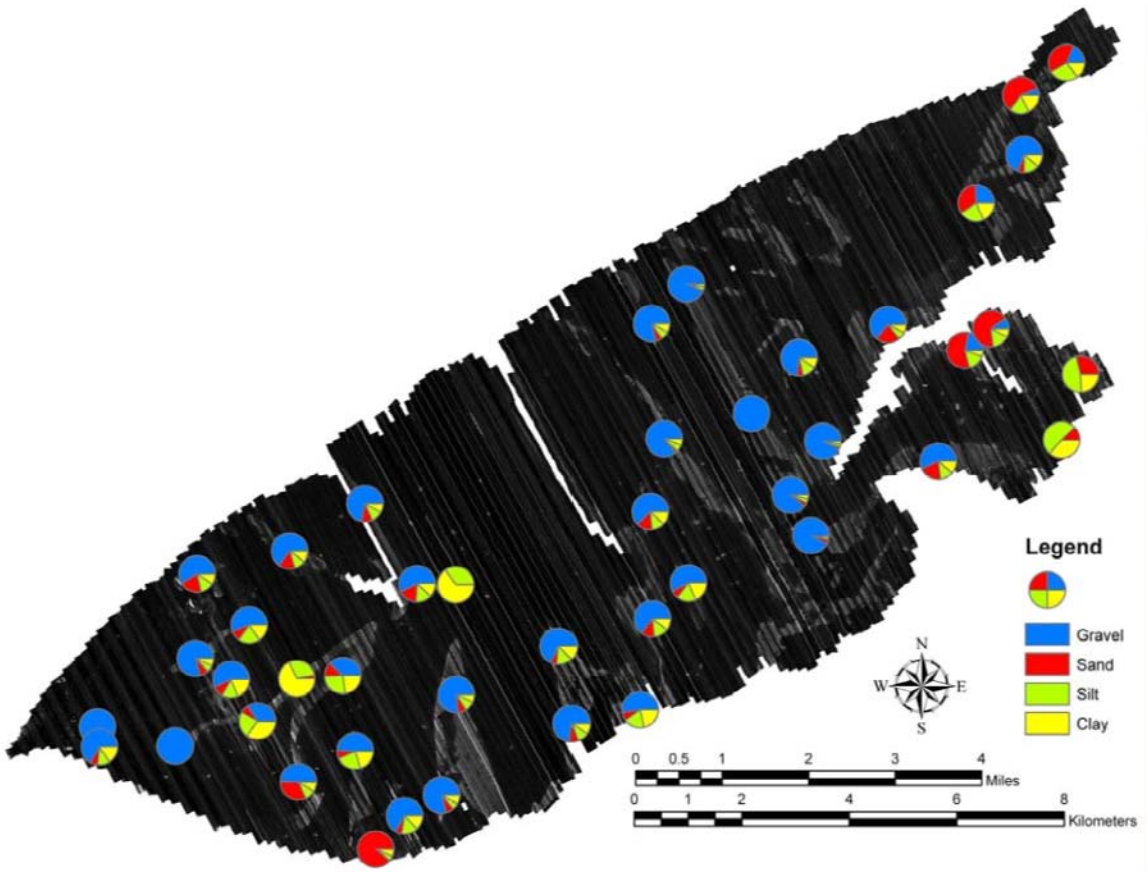


Figure 7. Grab sample grain size data used to correlate sidescan sonar backscatter.

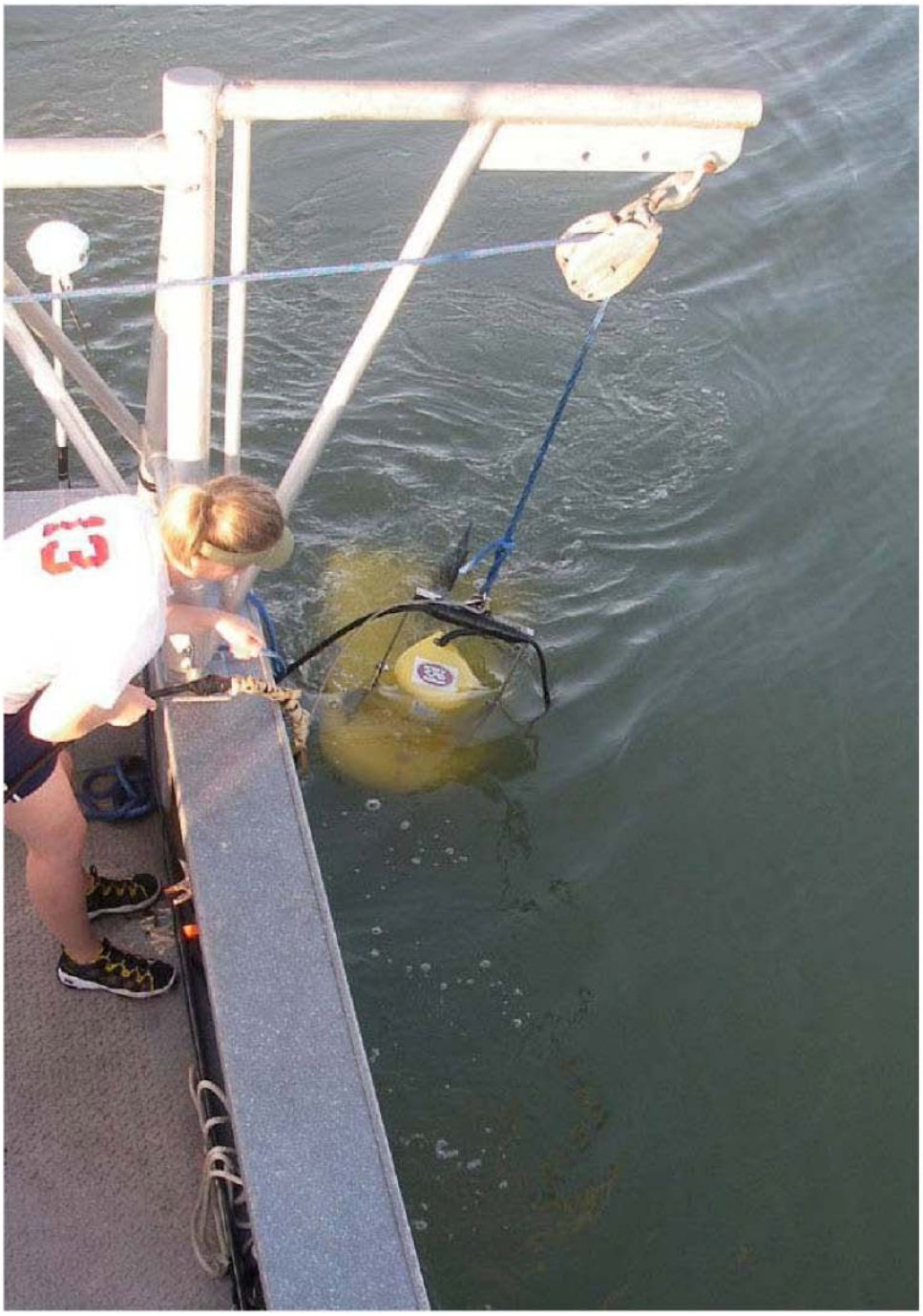
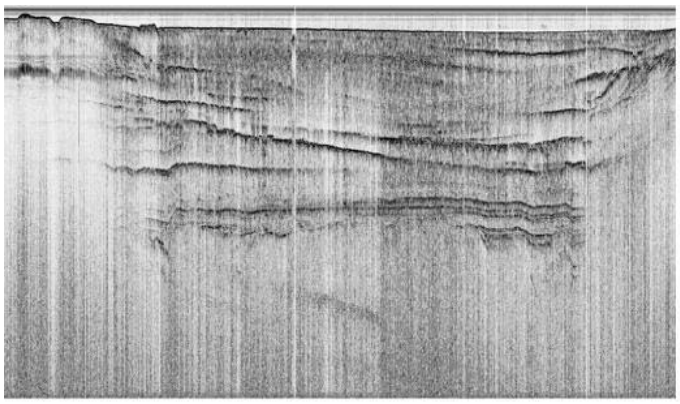
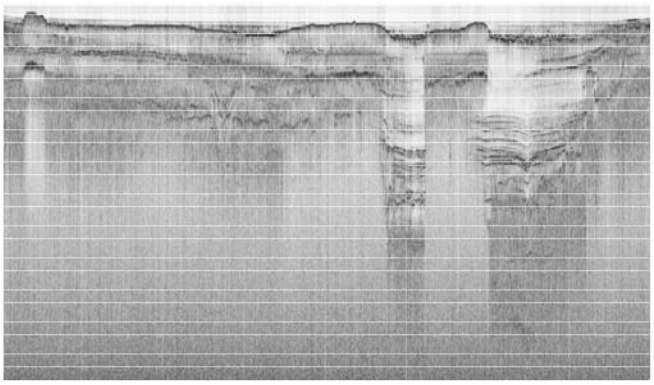


Figure 8. Sub-bottom profiler being deployed from the stern.



Line 42_1

Line 60_3



Line 86

Figure 9. Select Chirp Lines, see Figure 2 for reference