OYSTER REEF ARCHITECTURE

New Hampshire (R. Grizzle et al.)

Towed video

Continuous video imagery acquired along replicate parallel transects spanning the longest axis of each reef and replicate transects perpendicular to them. Each transect should extend 20+ meters in both directions beyond the actual boundary of the reef, yielding a crisscrossing pattern providing complete video coverage of the reef and allowing accurate determination of reef boundaries. Stationary (for 3 to 5 seconds) video imagery can be taken within the overall matrix of transects to yield higher quality stills for further inspection. Concurrently and synchronized with respect to time with the imaging, DGPS output is logged at 0.5 second intervals to provide geo-referencing of all the imagery. The resulting imagery is visually inspected to determine reefs boundaries, relative coverage by oyster shell in different areas, and potentially other characteristics relative to reef condition. If needed, maps are then produced using GIS software. This approach is similar to how single beam sounders are used to produce bathymetric and other seabed maps.

Related References

Grizzle, R.E., Adams, J.R., and L.J. Walters. 2002. Historical changes in intertidal oyster (*Crassostrea virginica*) reefs in a Florida lagoon potentially related to boating activities. Journal of Shellfish Research 21:749-756.

Grizzle, R,E., L.G. Ward, J.R. Adams, S.J. Dijkstra & B. Smith. 2005. Mapping and Characterizing Oyster Reefs Using Acoustic Techniques, Underwater Videography, and Quadrat Counts. Proceedings Volume, Symposium on the Effects of Fishing Activities on Benthic Habitats:Linking Geology, Biology, Socioeconomics, and Management.

Smith, G. F.; D. G. Bruce, E. B. Roach. 2001. Remote Acoustic Habitat Assessment Techniques Used to Characterize the Quality and Extent of Oyster Bottom in the Chesapeake Bay. Marine Geodesy 24(3):171-189.

Wilson, C.A., H.H. Roberts, J. Supan and W. Winans., 1999. The acquisition and interpretation of digital acoustics for characterizing Louisiana's shallow water oyster habitat. Oyster Geophysics Program. 3rd. ICSR Cork, '99 J. Shellfish. Res. 18(2):730-731.

Virginia (P.G. Ross et al.)

Reef Descriptors

Mapped each reef using a Marine Sonics Technology® side-scan sonar system that links a patented PC-based survey system with a 300 kHz towfish to provide high-resolution digital sonar data that permits detailed bathymetry to be coupled with precise navigational positioning. The towfish is towed just above the seafloor and emits narrow focused beams of sound perpendicular to the direction of motion. The pulses are reflected off the seafloor and objects, such as reefs, and the signal strengths of the echoes are recorded. The system enables wide tracts of seafloor to be viewed and mapped. We employed this system during spring 2001 to map the actual size and shape of the experimental reefs and refine the locations of our proposed experimental sites. We also used these maps to evaluate which of the reefs met our design criteria and to allocate samples as indicated above.

Conducted Acoustic Doppler Current Profile (ADCP) surveys around the reefs during flood and ebbs on both spring and neap tidal cycles using a towed ADCP unit to produce current vector maps. Operating in bottom tracking mode, the ADCP measured current velocity underway from a moving boat. Vertical profiles of current data were measured with vertical resolution of 25 cm or smaller.

We collected samples of reef material from randomly selected representative quadrate samples (described above) and measured the surface area of individual particles to compare between reef sites. Ten shells from each sample were haphazardly selected. Digital images of these particles were then processed using Image Pro Plus image analysis software and one-sided surface area was estimated (mm^2). Data from samples was pooled to compare particle size between reef sites. During 2004 we attempted to capture several larger scale reef attributes: seabed depth around reefs, reef crest depths and % slope of reef mounds. Seabed and reef crest bathymetry (10 and six soundings per reef, respectively; Figure 9) were measured using a transom-mounted Garmin depth sounder (150 watts, 200 mHz). Depth calibrations were made using a graduated piece of pvc and related to sounder readings. Depths were standardized to mean lower low water (MLLW) based on the time of data collection and published tide predictions at nearby stations. Percent slope was measured as ***rise/run*100***, with a resolution of one meter. Measurements were made near the crest, on the flank and near the base of four different locations on each reef (i.e. 12 measurements per reef).

Related References

Luckenbach, M. W. and P. G. Ross, 2003. An Experimental Evaluation of the Effects of Scale on Oyster Reef Restoration: Final Report Submitted VA Sea Grant Consortium (120 pp).

Landscape Descriptors

These can include: (1) surface rugosity (chain method; random point heights); (2) relief (absolute height of reef top relative to sediment); (3) shell depth (measure directly excavation), (4) reef size/fragmentation; and (5) total area (i.e. footprint of reef, % cover of that area report in m^2) using surveying equipment for intertidal by walking perimeter and other indirect methods for subtidal such as side-scan sonar or towed-video. Reef elevation, depth of reef and adjacent waters, tidal regime (diurnal or semidiurnal), and related landscape (creek size, depth, nearby habitats) issues.

Related References

Grizzle, R.E., Adams, J.R., and L.J. Walters. 2002. Historical changes in intertidal oyster (*Crassostrea virginica*) reefs in a Florida lagoon potentially related to boating activities. Journal of Shellfish Research 21:749-756.

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