BayMap: Mapping the geological, biological and archaeological resources of Narragansett Bay, RI

Shumchenia, E.J. and J.W. King
University of Rhode Island Graduate School of Oceanography, Narragansett, RI 02882

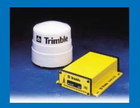
Aerial photography (courtesy of Giancarlo Cicchetti, US EPA) showing our survey boat during a side scan sonar survey, July 2006.

Narragansett Bay and the south-shore coastal lagoons in Rhode Island lack a comprehensive inventory of their geology, habitats, biological communities, and archaeology. For the last two years, the Rhode Island Sea Grant funded BayMap Project has been underway, addressing these needs. The research is based on methods of seafloor imagery that integrate multibeam and sidescan sonar imagery with other surveys (e.g., underwater video, sediment profile camera images) and sampling methods (for ground-truthing biological communities and sediment types) to produce a comprehensive, three-dimensional image of seafloor habitat, contamination sites, and other human-derived disturbances (e.g., fish trawls, dredge sites, and wrecks).

Mapping Gear

Pontoon boat with moonpool and A-frame

Garmin echo-sounder and Trimble GPS for navigation



Ground-truthing methods

Underwater video camera sled; Screenshot of horseshoe crab captured from video; The sled emerging from an eelgrass bed

Benthic fauna counts with a Smith-McIntyre grab; juvenile bivalves caught in the sieve

Current Hypotheses

1. Acoustic signatures of underwater habitats are distinctly different, and can be used to differentiate between seagrass, algae, shellfish, and other habitats.

2. Disturbance (dredging/fishing gear) creates an opportunity for recolonization and increased biodiversity on a broad scale.

3. Differences in biological community can be predicted by depth, slope, and sediment type.

4. Availability of Essential Fish Habitat (such as submerged aquatic vegetation) is an effective indicator of declining or improving benthic habitat conditions.

5. Changes in land use have measurable effects on benthic marine resources.

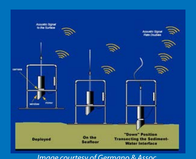
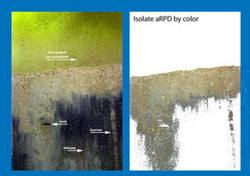
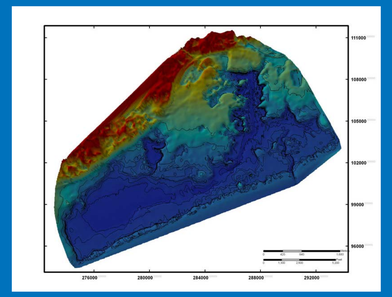


Image courtesy of Germano & Assoc.



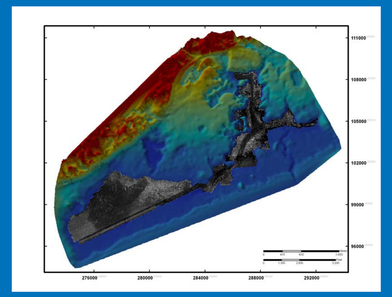
Sediment profile images (SPI) provide both ground-truthing information and an index of Benthic Habitat Quality (BHQ) (Nilsson & Rosenberg, 1997)

Year One: Ninigret Pond: a south-shore coastal lagoon



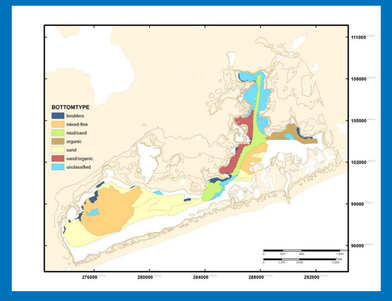
Seamless digital terrain model of Ninigret Pond and surrounding area.

To the northwest is the Charlestown morraine; to the southeast, East Beach and Block Island Sound.



Side scan sonar mosaic of Ninigret Pond, 0.15m (6-inch) pixel resolution.

Processed with Chesapeake Tech. SonarWebPRO

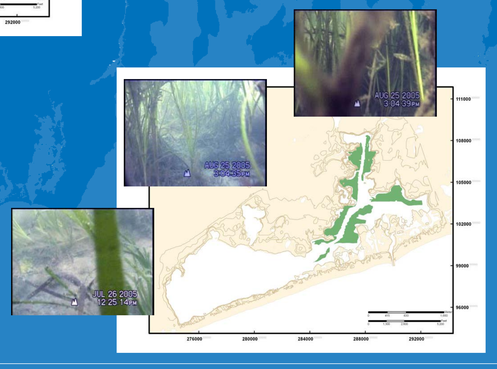


Geologic bottom types of Ninigret Pond.

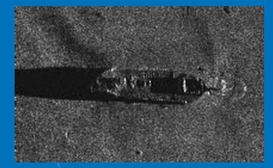
As interpreted from sidescan sonar acoustic signatures and ground-truthing.

Eelgrass coverage map for Ninigret Pond, 2004.

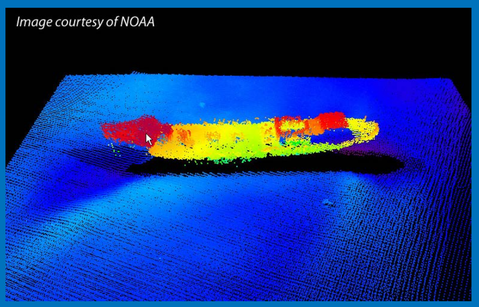
Underwater video surveys map the density and health of eelgrass beds.



Applications



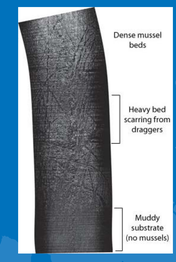
An unknown wreck off Prudence Island as mapped by the Coast Guard Survey vessel *Rude* in 2003, (multibeam, right) and by our team in 2006 (sidescan sonar, top).



Characterizing pea crab infestation in mussels

May be affected by:
- temperature
- salinity
- current velocity
- bottom dissolved oxygen
- intertidal vs. submerged

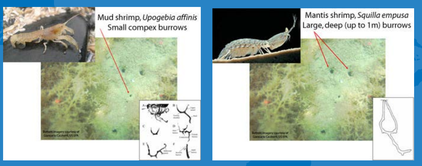
Pinnotheres maculatus



Mapping mussel beds with side scan sonar (west passage of Narragansett Bay, January 2006)

Eelgrass decline in Ninigret Pond

Are burrowing shrimp preventing eelgrass from making a comeback?



The BayMap/MapCoast Partnership

- Develop soil and sediment mapping standards and protocols to produce accurate and useful maps.
- Build multiple interpretations of the soil and sediment data to service the coastal resource management community.
- Ensure that the soil, sediment, and bathymetric data collected will be made available to all users.

Data featured on this poster and more information about both projects can be found at:

www.mapcoast.org