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Title: Characterization of Laguna Madre Contaminated Sediments

Investigator(s): A. N. S. Ernest¹, Collaborator - P. Bedient²

Institution(s): HSRC/S&SW, ¹ Texas A&M University - Kingsville, ² Rice University

Center Director: D. D. Reible

EPA Project Officer: Dale Manty

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Objectives/Hypothesis

The overall objective of this research was to create an extensive database for the Baffin-Alazan Bay aquatic system for water and sediment quality parameters and to correlate that with the occurrence of the "brown tide blooms" in the area. Surficial sediments were evaluated as a long term accumulator of contaminants, which are probably the main avenue of chronic exposure of the associated ecosystem. The sediments were analyzed for levels of metals and nutrients in the surface sediments. Sampling campaigns were conducted spread over the months of January 1996 to May 1996 to collect the samples for analysis of various parameters. Available data from the previous years for the area was obtained from Texas Natural Resource Conservation Commission (TNRCC). The levels of the parameters were analyzed for variation over time. The primary objective of this study was to provide a coarse characterization of the sediments in the Laguna in terms of morphological and chemical constituents.

Approach

This study was conducted in three phases. Phase I consists of a land use and literature inventory to evaluate point sources for development of a coarse sampling grid. Phase II involved a three-campaign sediment and water column sampling scheme over the coarse grid developed in Phase I. Phase III involved detailed sampling adjacent to a known quantifiable point discharge.

The study area which comprises of Baffin-Alazan Bay and also including Cayo-del-grullo and Laguna Salada is located some 40 miles south of Corpus Christi and about 10 miles south of Kingsville. A grid of sampling stations was identified in the area based on the preliminary site investigations.

Results

High salinities (>40 ppt) have been suggested to favor preferential growth of Brown Tide organism (Stockwell *et al.*, 1993). But the blooms have been observed to be persistent, although lesser in intensity, even when the salinities were much below 40 ppt in the Baffin-Alazan Bay system. This indicates that there has to be a combination of various factors for the persistence of the brown tide blooms. One of the factors contributing may be that due to the small size of the brown tide cells (4-5 :m), it may give them an advantage in the uptake of nutrients during periods when low nutrient levels which may limit larger species and hence its persistence as discussed by Busky and Stockwell, 1993.

High nitrate levels in the water column, rising salinities (>50 ppt), high chlorophyll-a levels, high biomass concentrations were observed during the period of our research study from January 1996 to May 1996. The climatological factors during the study and before included a severe drought in the area. The high nutrient levels, high salinity levels, the climatological conditions and some other factors observed during our research study are very close to the factors that existed just before or at the time of the initiation of the Brown Tide blooms in the early months of 1990. This leads to a speculation if we are going to witness another triggering of the bloom in the area in the near future. A close monitoring of the system needs to be undertaken on a continuous basis to study the dynamics of the system.

Summary of Results

- High sediment phosphorus levels at all sampling stations
- High Nitrogen-Ammonia levels in surficial sediments
- High biomass levels, almost close to the levels recorded during the peak of bloom in 1990.
- Salinity levels showed an increasing trend. After staying at levels below 40 ppt for the last 3-4 years, the salinity levels are up to more than 50 ppt presently.
- A negative correlation between water nitrate levels and biomass levels indicate the possibility of uptake of nitrates in particular or DIN in general, by the brown tide cells for their growth
- The persistence of the brown tide cells may be helped by the regeneration of nutrients from the surficial sediments in the Baffin Bay system, which have been historically considered as sources for regeneration of nitrogen.
- The source of high levels of phosphorus and nitrogen-ammonia levels recorded in the sediments may be from the surface runoff from the agricultural lands in the vicinity of the area.
- The sediment trace metal levels for zinc, cadmium and chromium do not seem to be at levels high enough to have any appreciable toxic effect on the aquatic life, but they need to be monitored closely in future.

Supplemental Keywords

Sediment quality parameter, brown tide blooms, and nutrient loading

Publications and Presentations

Ernest, A., "Characterization of Laguna Madre contaminated sediments", Poster presented at HSRC/MAI Annual Meeting, Atlanta, GA, April, 1995.

Ernest, A., "Characterization of Laguna Madre contaminated sediments", Poster presented at HSRC/MAI Annual Meeting, New Orleans, March, 1995.

Ernest, A., "Characterization of Laguna Madre contaminated sediments", Proceedings of the WERC/HSRC Joint Conference on the Environment, Albuquerque, NM, April 22-24, 1997.

For Further Information

Dr. Danny Reible

E-mail: reible@lsu.edu