Distribution of Phytoplankton throughout Charleston Harbor

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Introduction

Charleston Harbor is unique due to the fact that it is an estuary influenced by the freshwater of the Ashley River and Cooper River. In estuaries, phytoplankton growth is fueled by rapid nutrient regeneration in these warm, shallow and well-mixed estuarine systems (Wissel 2005). When measuring phytoplankton in this area, it is important to note that there is a gradual reduction in phytoplankton abundance towards the mouth of the estuary (Gharib, 2006). When observing the regulation of phytoplankton in an estuary, nutrients appear to be less important than flow and salinity (Chan and Hamilton, 2001). There also seems to be a relationship between the phytoplankton levels and freshwater inputs, circulation, and bathymetry (Roman, 2005). Other factors playing key roles in high abundance of phytoplankton include appropriate water temperature, salinity, sufficient DSi, as well as a quick recovery of nutrients (Wang et. al 2006).

Questions

•How do chlorophyll concentrations differ at different depths of the water column?

•How does salinity relate to the abundance of phytoplankton at different depths?

Methods

•Water samples were taken from Charleston Harbor at ten different locations (**Map 1**).

•A surface sample, and a deep water sample of 10m were taken at each point.

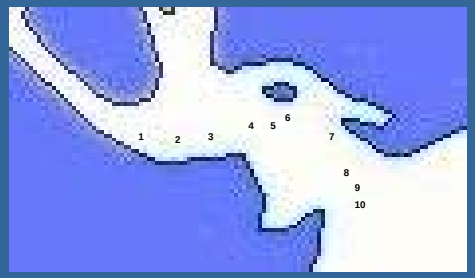
•These samples were tested for:

- •Salinity, using a refractometer
- •Chlorophyll a, using a fluorometer.

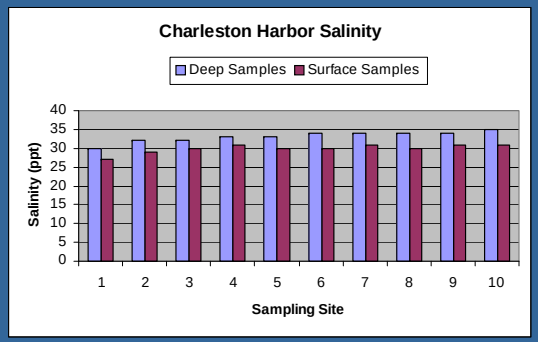
•CTD data was taken at six points throughout Charleston Harbor (**Map 2**).

•This data gave the following measurements throughout the water column:

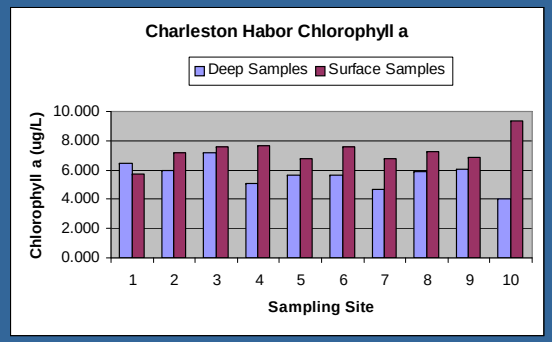
- •Temperature, Salinity, Fluorescence, and Density



Map 1: 2/28/2007, 15:00-17:00, from Charleston Harbor. Samples were taken during the flood (High Tide = 17:43). Weather: Partly Cloudy.



Graph 1

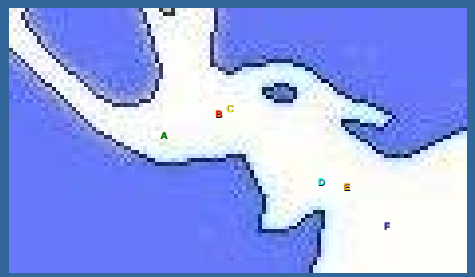


Graph 2

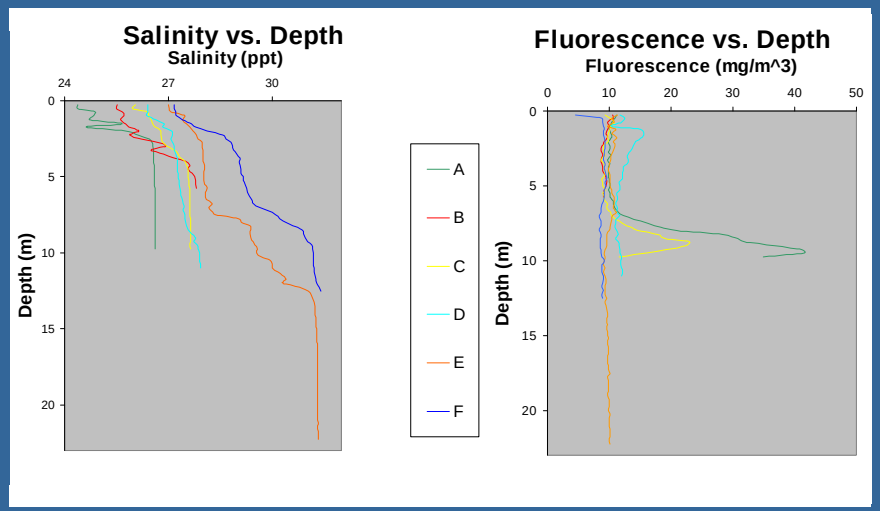
Conclusions: As expected, we see an increase in salinity moving across the harbor as we leave the estuarine zone (Sites 1-4) and move towards the coastal zone (Site 8 and beyond). The deeper samples had a higher salinity than their surface salinity at all ten sites [Graph 1]. Chlorophyll a samples differed for surface and deep samples. Surface chlorophyll is slightly higher closer to the ocean. Chlorophyll a at deep samples was lower for all sites except for Site 1. Overall, there was no correlation between chlorophyll a at deep samples as we moved towards the ocean to saltier conditions.

There is an increasing salinity at both surface and deep samples moving towards coast.

At the surface, this increased salinity positively correlates with greater amounts of chlorophyll a, but we found no correlation between salinity and deep chlorophyll a samples.



Map 2: 3/14/2007, 15:00-17:00, from Charleston Harbor. CTD samples were taken during the flood (High tide = 16:37). Weather: Partly Cloudy.



Conclusions: CTD data shows that salinity increases as you move from freshwater (Site A) towards the saltier ocean (Site F). CTD data also shows that fluorescence is higher in lower salinity sites (Sites A & B). We saw a rise in fluorescence in deep, low-salinity waters. This is possibly due to an abundance of incoming nutrients from freshwater flow.

Salinity increases as you move away from the freshwater sources.

At 7-9 m of depth, sites with low salinity levels had the highest fluorescence levels, indicating that nutrients could play a large role in phytoplankton abundance at deeper depths, while salinity plays a larger role in phytoplankton abundance at shallow depths.

Literature Cited

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Acknowledgments

We would like to thank Dr. Gorka Sancho and Adair Dempsey for their help in the laboratory. Also, we are thankful to those who assisted us in collecting samples on our oceanographic cruises.