Phytoplankton Abundance and Diversity through a tidal sequence and a transect of the Charleston Harbor
Erica J. Butler & Cassi A. Karish
College of Charleston, Charleston, SC

Abstract
This independent research project was done to further understand and explore phytoplankton concentrations and diversity throughout Charleston Harbor. During this study, concentration and diversity were measured through a tidal cycle on both sides of the harbor as well as on a transect through the harbor. In the chlorophyll graph from both sides of Charleston Harbor an inverse relationship was present until time 4 when high tide started to approach and both sides showed a decrease in chlorophyll. In the chlorophyll graph from the transect of the Charleston Harbor point three had an increase in concentration during times of low tide (Pinckney & Dustan, 1990). The study concluded that the most chlorophyll a was found on the incoming flow from the Cooper River Bridge (Pinckney & Dustan, 1990). Other research done analyzed the patchiness of plankton as you exit the Charleston harbor, finding that due to incoming flow from three different rivers in the area plankton are found in different concentrations along the water's path of flow. These two studies helped us to choose sampling spots and predict the data we expect to collect.

Introduction
The topic of our independent research project is to measure phytoplankton diversity and abundance in different areas of the harbor. One study done on this subject involved looking for chlorophyll-a concentration during tides when a front was coming (Pinckney & Dustan, 1990). The study concluded that the most chlorophyll a was found on the incoming flow from the Cooper River Bridge (Pinckney & Dustan, 1990). Other research done analyzed the patchiness of plankton as you exit the Charleston harbor, finding that due to incoming flow from three different rivers in the area plankton are found in different concentrations along the water's path of flow. These two studies helped us to choose sampling spots and predict the data we expect to collect.

Materials/Methods:
Sampled 5 liters of water through a phytoplankton net (size) into sampling jars in 6 locations (refer to points on map) between 7:30 am and 1:30 pm. Obtained surface water for Chlorophyll analysis and obtained temperature and salinity from CTD data.
Obtained surface water for Chlorophyll analysis, temperature, and salinity from CTD data.
Obtained diversity using species guide and 4 samples per time under a microscope at 40x magnification.

Chlorophyll Concentration Over a Tidal Sequence

In this graph the predicted inverse relationship is shown until time 4 (11:30am) where both graphs decrease. This could be because high tide is approaching allowing low nutrient ocean water to enter both sampling areas.

Questions:
1) Where will Phytoplankton be most abundant in a tidal sequence on each side of the Charleston Harbor?
2) Where will Phytoplankton be most abundant on the transect of the Charleston Harbor?
3) Where will Phytoplankton be most diverse in species number in a tidal sequence on each side of the Charleston Harbor?
4) Where will Phytoplankton be most diverse in species number through a transect of the Charleston Harbor?

Chlorophyll Concentration for Transect

In this graph the predicted high abundance near the mouth of the Charleston Harbor is shown, with a decrease as locations reach farther out into low nutrient ocean water.

Phytoplankton Abundance

We hypothesize that phytoplankton will be most abundant on the side of Charleston Harbor where there is incoming flow.

Phytoplankton Abundance through a tidal sequence and a transect of the Charleston Harbor

In this graph the predicted high abundance near the mouth of the Charleston Harbor is shown, with a decrease as locations reach farther out into low nutrient ocean water.

Phytoplankton Abundance through a tidal sequence and a transect of the Charleston Harbor

We hypothesize that phytoplankton will be most abundant at the mouth of the Charleston Harbor.

Phytoplankton Abundance through a tidal sequence and a transect of the Charleston Harbor

We hypothesize that phytoplankton will be most diverse on the side of the Charleston Harbor where there is incoming flow.

Materials/Methods:
Sampled 5 liters of water through a phytoplankton net (size) into sampling jars in 6 locations (refer to points on map) between 7:30 am and 1:30 pm. Obtained surface water for Chlorophyll analysis and obtained temperature and salinity from CTD data.
Obtained surface water for Chlorophyll analysis, temperature, and salinity from CTD data.
Obtained diversity using species guide and 4 samples per time under a microscope at 40x magnification.

Bibliography

Acknowledgements
We would like to thank Dr. Sudhik Sambu and Aidan Dempsey for their help in obtaining correct methods and data. We would like the staff of NOAA to use their online phytoplankton ID guides.

Photos from NOAA phytoplankton ID guides, part of the Marine Biotoxins Program.