How's That "Temp" Down Below?

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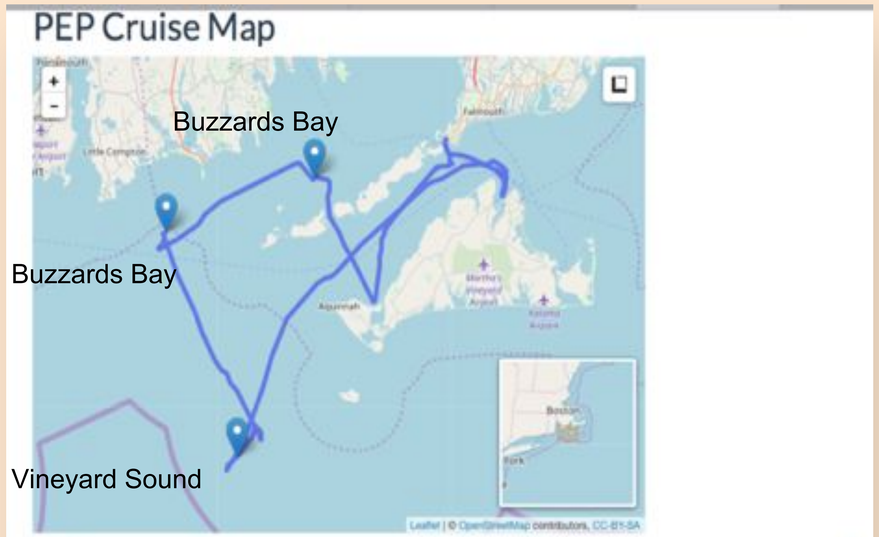
Background

★ Temperature and Salinity are two factors that can work together to influence the density in a body of water. The change in density limits the movement of the water vertically. Temperature can lead to fluid Expansion by way of heat. Thus allowing more salt molecules to accumulate in the water molecules, and thus making ocean water denser. Evaporation, rain, and runoff also adds freshwater making it less salty. Hence, denser material sinks and less dense material rises. This continual exchange leads to convection currents (less denser water sinks pulling cooler water creating circular pattern or currents).

★ The three sample locations asses inland waters and open ocean waters. Vineyard Sound the first sampling location, is considered open ocean and tends to have higher salinity and colder temperatures due to it being further away from shore. On the contrary, the Buzzards Bay locations are more inland and closer to shore. Waters here tend to be lower in salinity and higher in temperature.



station	lon	lat
002	-70.98733	41.19200
003	-71.09333	41.42500
004	-70.87000	41.48167

Objectives

- Observe trends in temperature and salinity over three sample locations
- Explain how temperature/salinity is related to density in the water

➔ **What our data is going to do/prove:** Determine how temperature and salinity affect currents in the Vineyard Sound region.

Methodology

A CTD or conductivity, temperature, and depth instrument was deployed at three different locations. The first being considered open ocean in Vineyard Sound (st. 002) and the other two being more inland (Buzzards Bay 1 (St.003) and Buzzards Bay 2 (st.004)). The instrument gave us readings for temperature, salinity, and depth per second. Graphs were created in R and compared to see location differences.

Results

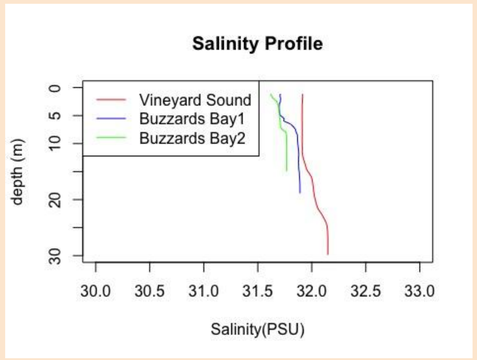


Figure 1.1 Salinity Trends
Vineyard Sound is further away from the shore and has less freshwater runoff. Salinity is thus higher in the ocean open where less precipitation and runoff are present.

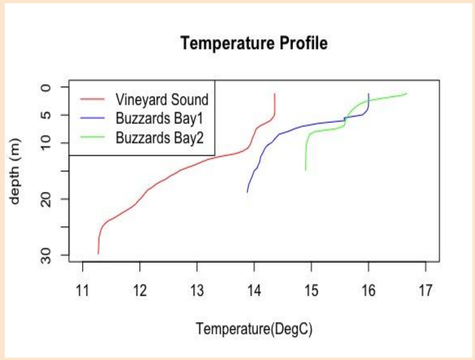


Figure 1.2 Temperature Trends
The Buzzards Bay area is warmer due to continual exposure to sunlight which receives more heat from inland. The structures inland help block winds that would normally cool down the water. The Vineyard Sound area is colder due to its distance from the land, colder winds decrease the water temperature, and in winter season that does not allow the water to completely warm up.

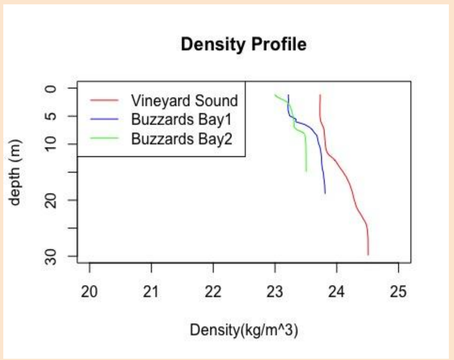
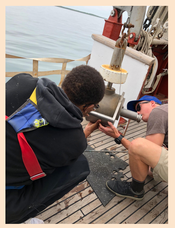


Figure 1.3 Density Trends
The mixed layer at 002 is seen at about 1 meters which is a lot deeper than two inland locations of Buzzards Bay 1 and 2. Rhey show a mixed layer at about a depth of 10 meters.



Conclusion

Varying densities from the three different locations show the general trend that at higher depths temperature and salinity increase, but there are factors that create exceptions, such as runoff of freshwater and precipitation. We see that these inland areas tend to have lower salinity level because they are closer to freshwater run-off and are more susceptible to precipitation. We also see that inland areas have higher temperatures because land tends to block cool winds and lock in heat. The open ocean areas show the opposite trend. Water tends to have a higher salinity at surface depths and tend to be a lot cooler. Our data only accounts for a small portion of Vineyard sound and Buzzards Bay. We are looking at the samples from one season rather than from a whole collection of data over a long period of time. Collecting data from a longer period of time, 2-3 data samples per day, more large-scale comparison of regions closer inland to those further out in the water would help us reflect more accurate conditions.