Zooplankton Biodiversity and Density in Cape Cod

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Introduction

- Zooplankton act as primary consumers, serving as a key indicator species of an ecosystems food chain health. They feed primarily on phytoplankton.
- Due to sunlight requirements, phytoplankton occupy the euphotic zone (near the surface) where zooplankton can be found.
- Water temperature and chlorophyll a concentrations can affect the the availability of zooplankton species.
- Important characteristics studied on Zooplankton samples are both the density and biodiversity. The greater the density and biodiversity, the greater the ecosystem's food chain health .
- Being able to understand the factors and trends in those factors that affect zooplankton populations are vital to determining ecosystem health.

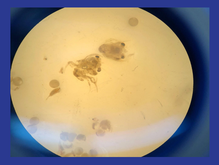
Objectives

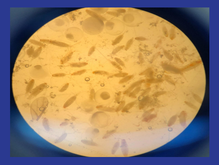
- How does the density and biodiversity differ in each of the three stations?
- How does the chlorophyll density and temperature effect these results?

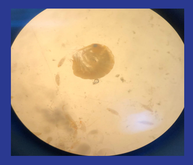
Methods

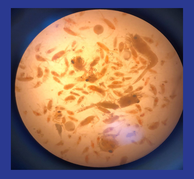
- Zooplankton samples were collected at three different locations around Vineyards sound and two different stations in Buzzards Bay.
- Station 1: Vineyards Sound (41.1° N, 70.9° W), Station 2: Buzzard Bay 1(41.4° N, 71.1° W), Station 3: Buzzards Bay 2 (41.5° N, 70.9°W)
- Collection Times: Vineyards Sound (2:55- 3:25), Buzzards Bay 1 (9:44- 10:14), Buzzards Bay 2 (14:06- 14:36)
- Samples were collected using neuston net with a mesh size of 333 microns. The neuston net was towed on the port side of the *SSV Cramer* for a total of thirty minutes.
- Each Station placed the neuston net in the water column so that half of the net was hovering above the surface, and the other half was submerged in the water column.
- After thirty minutes, the neuston net was removed from the water and the weighted jar attached to the end of the net was removed so that samples could be observed in petri dishes through microscopes.

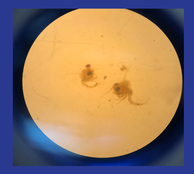
Results


Crab Larvae


Copepods, Fish eggs


Gammarid


Copepods


Zoea

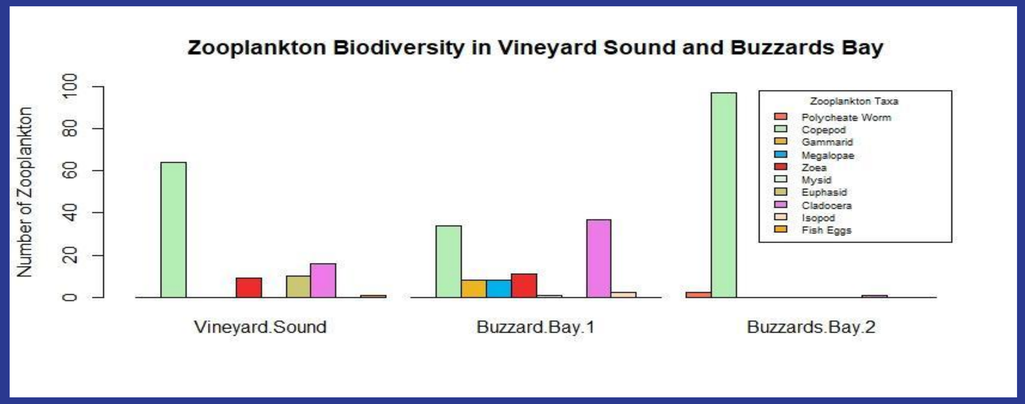
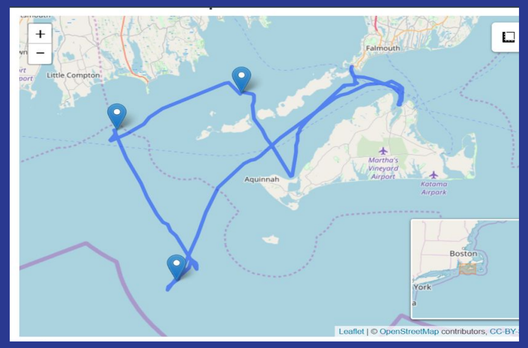


Figure 1: The comparison of Biodiversity collected from all sample sites in the Cape Cod region According to the Shannon Wiener Index; The sample acquired rom Buzzards Bay's first station had the highest biodiversity at a value of 0.652.



Stations 1-3 ; Vineyard Sound, Buzzards Bay 1, and Buzzards Bay 2

Station	Temperature (C°)	Sample Collection Time	Total biomass (ml)	Shannon Index	Chlorophyll a (mg/L)
Vineyards Sound	14.8°	02:55-03:25	106	0.465	0.505
Buzzards Bay 1	16°	09:44-10:14	278	0.651	0.258
Buzzards Bay 2	17.7°	14:06-14:36	65	6.68E-02	0.611

Table 1: The comparison of Biodensity collected from all sample sites in the Cape Cod region
The lower of Zooplankton Biomass density value, the higher the chlorophyll a density. This correlated when comparing predator and prey ecosystems.


Gammarid Amphipod


Zoea


Polychaete worm


Fish Larvae


Isopod

Conclusion

- Chlorophyll a concentrations and Zooplankton densities are capable of demonstrating a direct correlation with each other. Buzzards Bay 1; displayed an abundance of Zooplankton while the Chlorophyll a concentration is the lowest of each station sample. This trend is apparent in the other stations. The lower the zooplankton biomass, the higher the concentration of chlorophyll a. This is due to the consumption of Phytoplankton by Zooplankton.
- The first two stations illustrate a direct correlation between temperature and zooplankton biomass. As the temperature increases throughout the day, so does the biomass of zooplankton. Buzzards Bay 2, did not share this correlation. This could be due to zooplanktons diurnal vertical migration. As light intensity increases throughout the day, Zooplankton retreat lower in the water column, and as light approaches they redirect back to the surface.
- Overall Buzzards Bay 1 contains the highest biodiversity and density. This may be due to the start of the morning, where the sunlight is attracting phytoplankton species as well as zooplankton. Initially Buzzards Bay 2 decreased in zooplankton biomass which was surprising, but this can be explained by diurnal vertical migration. It is important to note that the stations contained the highest concentration of copepods. This is a good indicator the Cape Cod region is a great area for copepods to thrive.

Acknowledgments

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References

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