Exploring the Ribbed Mussel-*Spartina* Mutualism Across Distinct Salt Marsh Types In Jamaica Bay, NY

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Introduction: Salt marshes are important habitats:

- They filter contaminants
- Assimilate and remove nitrogen
- Store carbon
- Buffer storm surge

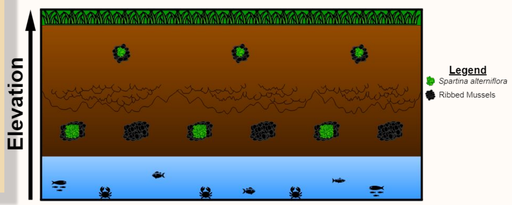
Salt marshes have been disappearing due to nitrogen enriched wastewater and urban runoff (Wigand et al. 2014).

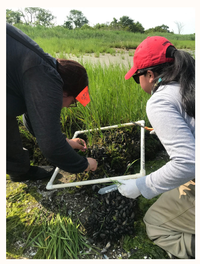
Jamaica Bay is been losing around 33 acres/year (Wigand et al. 2014).

Previous research suggests that there is a mutualistic relationship between ribbed mussels and *Spartina alterniflora*:

- Ribbed mussels provide *Spartina alterniflora* with nitrogen as fertilizer and help stabilize sediments
- *Spartina* provides mussels with shade and protection from desiccation/predators.

The significance of this mutualism in eutrophic environments and in the conservation of salt marshes is unclear.





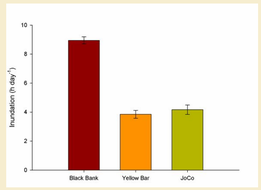
Research Question: What impact does elevation and inundation have on mussel and Spartina abundance?

Hypothesis: We predicted that mussels may be more abundant at sites with low elevation and high *Spartina* biomass.

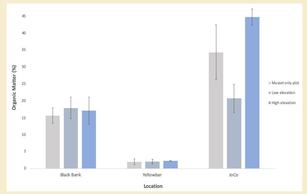
Methods: We performed a field survey at three salt marsh sites in Jamaica Bay , NY.

- At each site we established three plots in high elevation areas, three plots in low elevation areas, and three mussel only plots. We deployed a temperature data logger in each plot.
- We used quadrat sampling to determine *Spartina* and ribbed mussel density and biomass.
- Sediment samples were taken from each plot to determine organic content.
- We calculated a temperature ratio by dividing plot temperature by air temperature

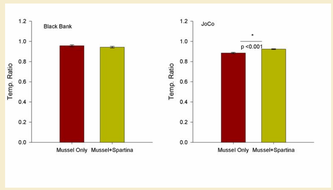
Results:



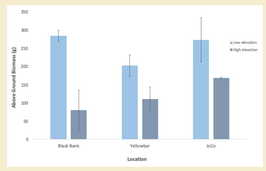
Black Bank was submerged for around 33.3% of the day. Yellow Bar and JoCo were submerged for half that time.



There was significantly more organic matter at JoCo than at Black Bank. Yellow Bar had the least organic matter due to the sand used for its restoration.

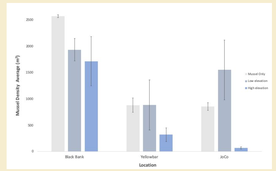


The presence of *Spartina* did not alter the temperature mussels were exposed to during daytime low tides at JoCo or Black Bank marshes.



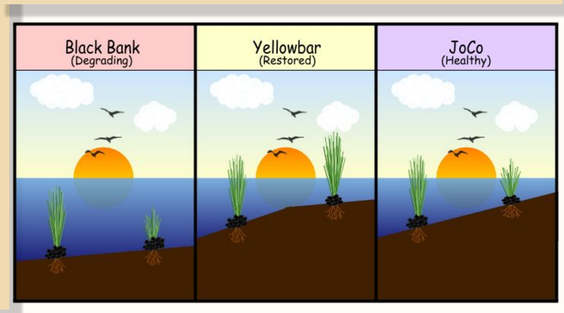
There was a higher biomass at lower elevation and a lower biomass at higher elevation for all of the sampled marshes.

Black Bank had similar mussel densities across plot types while densities differed between elevation plots at Yellow Bar and JoCo marshes. High elevation plots had lower densities.



Discussion: Overall, low elevation plots tended to have a greater biomass than high elevation plots. There was a longer period of inundation and a denser population of mussels at degraded plots compared to healthy or restored plots. *Spartina* abundance did not have a positive correlation with ribbed mussel density at degraded marsh sites.

- *Spartina* abundance did not provide temperature relief, but may trap heat instead.
- Inundation rather than *Spartina* abundance may encourage mussel recruitment.
  - While underwater, mussels are able to feed and are cooled.
  - Greater inundation promotes mussel survival.



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