# Exploratory Mussel Survey in a New England Salt Marsh

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**Why Salt Marshes?**

This project is a 6+ year study o**f 8 salt marshes** on the coast of Massachusetts. Salt Marshes are vital ecosystems that protect against storm surge, house habitat for many species, act as carbon sinks, and resist fooding. This Salt Marsh study seeks to understand, model and visualize the physical & biological integrity and health of salt marshes. This study utilizes several forms of monitoring:

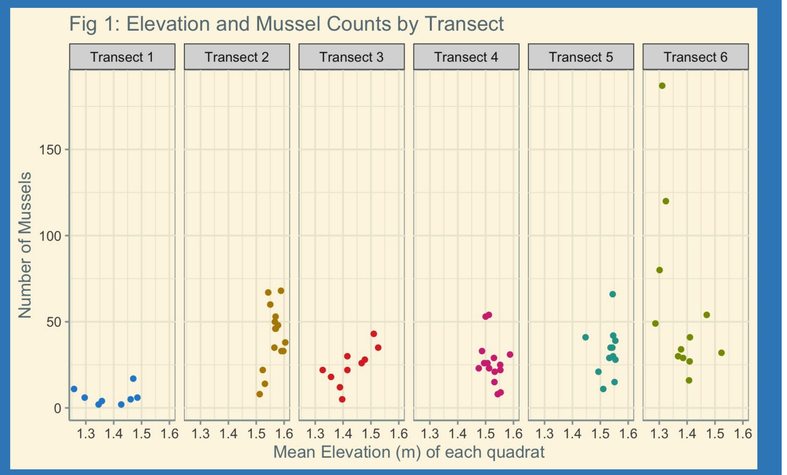
- Unaccompanied Aircraft Systems (UAS) flights with images taken in RGB, red edge, near infrared (NIR), short-wave infrared, and LIDAR
- Water logger deployment including 3 full-season loggers and 41 logger arrays placed for 3 week increments at a site
- Vegetation Transect Sampling
- Mussel Count Quadrat Sampling

**Why Mussels?**

The Atlantic Ribbed Mussel (*Geukensia demissa)* is a common marsh fauna. Mussels are filter feeders, meaning they **process large amounts of water** and deposit feces and pseudofeces, **adding sediment to their surroundings**. Crotty et al, explored the extent of mussels' faunal engineering capability in a multi-year creekhead mussel manipulation experiment in southeastern US salt marshes. Crotty et al, found that mussels **can add substantial elevation** to their surroundings. We were inspired to investigate the presence and location of ribbed mussels in our own salt marshes.

**Goals:** Assess relationship between mussels, elevation and tidal inundation at Wellfleet Bay, a Mass Audubon site.

**Site Selection**: Wellfleet Bay features substantial vegetative die-back and exposed substrate on the marsh platform to facilitate accurate mussel count, without dense vegetation blocking mussel sighting.



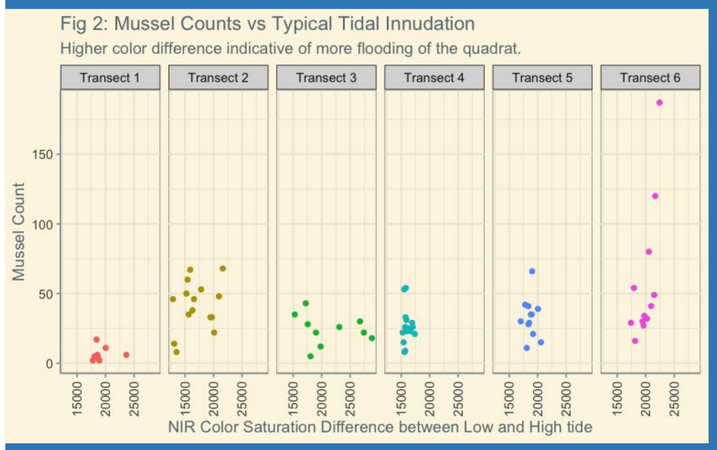
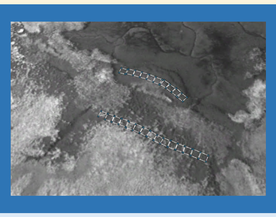




Fig 3: Transects low tide



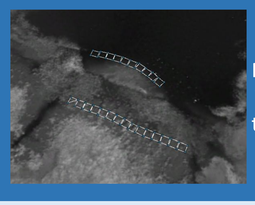


Fig 4: Transects high tide

Important Collaboraters: Joshua Ward, Ryan Wicks, Charles Schweik, and Kate Fickas-Naleway

Citation: Crotty, S.M., Pinton, D., Canestrelli, A. *et al.* Faunal engineering stimulates landscape-scale accretion in southeastern US salt marshes. *Nat Commun* 14, 881 (2023)

**Methods**

- 1m²‧quadrat placed along 6 transects, approximately paralleling the bank of the channel
- Trimble Real Time Kinematic (RTK), took the precise coordinates and elevation of the 4 corners of the quadrat
- Counted the mussels in each quadrat
- Overlaid the LiDAR layer with the plotted quadrats, found the mean elevation (above sea level) of each quadrat
- Compared mussel counts to mean elevation of each quadrat (fig 1)
- Overlaid two near-infrared orthomosaics, a mean high tide & low tide of 7/21/22, to compare the extent of tidal flooding (fig 3 & 4)
- Compared the difference in color saturation between the high and low tide for each quadrat, larger numbers indicating more flooding
- Analyzed mussel counts compared to color saturation difference (fig 2)

**Conclusion**

This exploratory study did not demonstrate an obvious relationship between mussel density and elevation or tidal inundation. Some transects, such as three and five, showed a positive relationship between mussel density and elevation, however the trend was not widespread nor consistent enough to warrant conclusions about a link between mussel density and elevation. A larger experiment, such as the type conducted by the Crotty et al, paper, might provide more insight into these potential relationships. **This exploratory study is an example of a new application of the UAS Salt Marsh project's vast collection of drone imagery and orthomosaics.** This exploratory study combined LiDAR and near infrared orthomosaic with original field work. Remote sensing datasets have powerful capabilities for future researchers to gain deeper insights into tidal marshes.