Baseline Macroinvertebrate and Infauna Communities in an Eroding Salt Marsh Prior to Restoration

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Introduction

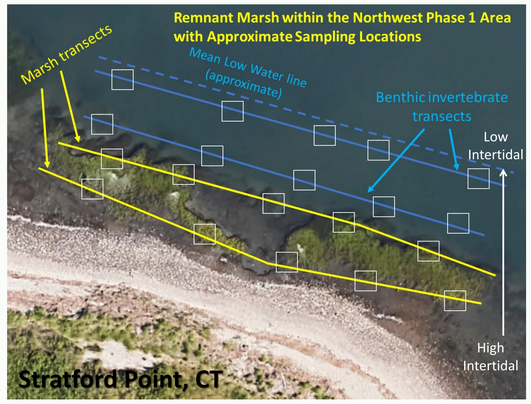
Salt marshes are essential for resilient coastlines, housing a diversity of benthic invertebrates that provide key ecosystem services, such as nutrient cycling. Many invertebrates, such as oysters, can also act as bioindicators for water quality and salt marsh health (Grabowski et al. 2022). Stratford Point, Connecticut has experienced rapid erosion over the past decade. A living shoreline has improved conditions at part of the site, but a marsh remnant that was not part of past restoration efforts at the site is extremely degraded. This study documented the benthic invertebrate community within areas targeted for restoration and protection within the next 2-3 years as a baseline against which to gauge future restoration success.

Objectives:

1. Determine baseline epibenthic macroinvertebrate (> 5 mm in size) community within the eroding marsh
2. Determine baseline epibenthic and infauna macroinvertebrate (> 3 mm in size) community within the unvegetated area seaward of the marsh cliff
3. Determine baseline infauna (<5 mm in size) community within the unvegetated area seaward of the marsh cliff

Methods

July 2022: Sampled 5 randomly selected 0.25 m^2 quadrats along each of 4 transects



Macroinvertebrate Sampling (Quadrats)

- Vegetated area (marsh transects): counted invertebrates visible at the sediment surface
- Unvegetated area (benthic invertebrate transects): dug each quadrat to 10 cm depth, placed sediment into a bucket, sieved through a 3.175-mm mesh gardening sieve, enumerated all invertebrates >3 mm (released in the field)

Infauna Sampling (Cores)

- Subsampled quadrats for infauna <1-mm by taking 3 cores (4.5 cm diameter x 10 cm deep) from within each quadrat in the unvegetated area
- Sieved cores through 1-mm mesh sieve and preserved in 70% ethanol
- Stained invertebrates with Rose Bengal then identified and counted under a dissecting scope

Conclusion & Future Directions

The existing remnant salt marsh has heavily degraded invertebrate communities, especially in the vegetated area. The invertebrate community is typical of a mudflat seaward of the marsh cliff.

- The vegetated area had very low species diversity and invertebrate densities (Fig. 1).
- Unvegetated low and high intertidal zone had similar macroinvertebrate diversity but densities were higher in the high intertidal zone (Fig. 2)
- Unvegetated low and high intertidal zones had similar infauna but densities were higher in the low intertidal zone (Fig. 3)

Following future restoration, it is expected that diversity and density of macroinvertebrates like bivalves, gastropods, and decapods will increase across the currently vegetated and unvegetated areas, especially ribbed mussels (usually present in mature salt marshes). After restoration, annual monitoring will document changes in the invertebrate community over time. This data will be beneficial in measuring the health and habitat quality of the marsh based on what species are returning or what is disappearing (Pétillon et al. 2014).

Results

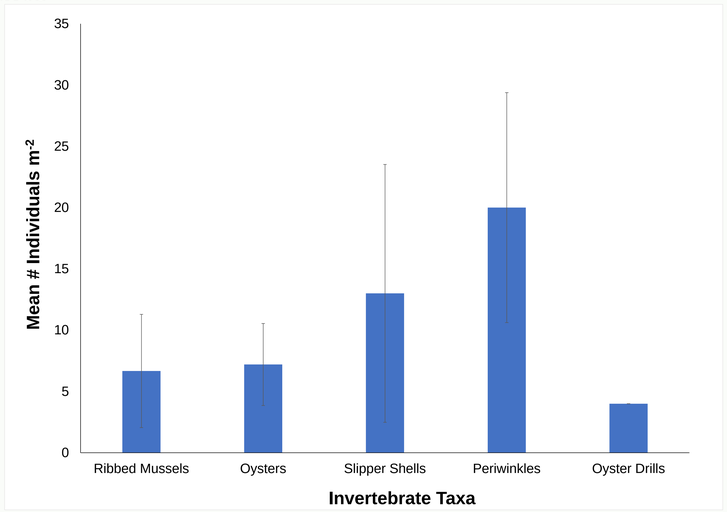


Figure 1. Mean number of epibenthic macroinvertebrates (>5 mm) per m^2 within lower intertidal zone in the vegetated area. Error bars indicate standard deviation. No macroinvertebrates were found in the vegetated high intertidal transect.

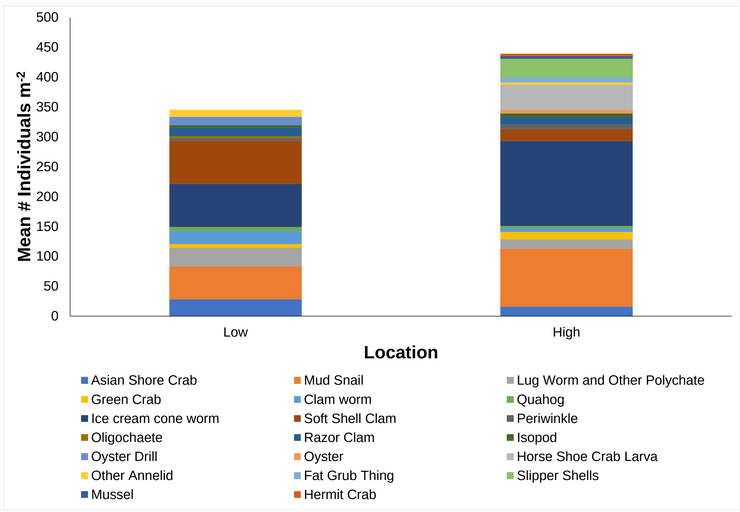


Figure 2. Mean number of macroinvertebrates (>3 mm) per m^2 in unvegetated low and high intertidal zones in the unvegetated area. Both low and high intertidal transects had similar macroinvertebrate diversity and species composition, but densities were higher in the high intertidal transect.

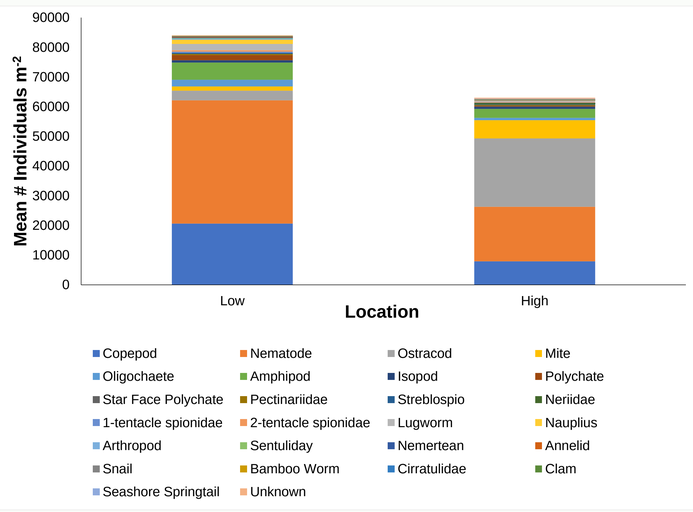


Figure 3. Mean number of infauna (<5 mm) per m^2 in unvegetated low and high intertidal zones in the unvegetated area. Species diversity in the high and low zones were similar. The low intertidal transect had higher infauna density.

Literature Cited

Pétillon J, Potier S, Carpentier A, Garbutt A. 2014. Evaluating the success of managed realignment for the restoration of salt marshes: Lessons form invertebrate communities. Ecological Engineering. 60;70-75.

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