The effect of macrophyte position on macroinvertebrate abundance and species composition in two Vermont lakes

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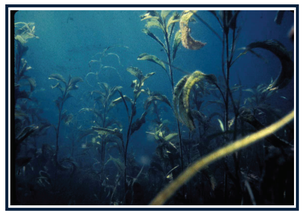
Background

·Macrophytes— submersed, rooted vegetation—play an important role in aquatic ecosystems

·Provide microhabitat for algae and animals by offering complex and varied structure

·Macroinvertebrates live on macrophytes, making them a feeding ground for larger animals

·Macrophytes commonly grow in clumps, with stems of one or more macrophyte species creating a ring around the perimeter of a lake (see diagram below)



Macrophyte Bed

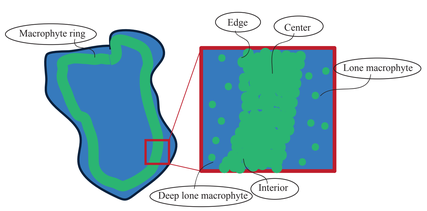
Objective and Hypothesis

·To determine the relationship between macrophyte position within a bed and macroinvertebrate abundance and diversity.

·We hypothesized that the interior macrophytes would have the highest abundance and diversity because these plants would be surrounded by other macrophytes, providing ample structure and diminished predation of macroinvertebrates. By the same reasoning, we expected lone macrophytes to have the lowest abundance and diversity of macroinvertebrates.

Methods

·We sampled in two Vermont Lakes: Beebe and Glen. Beebe is more eutrophic than Glen, meaning that it experiences a higher level of nutrient loading. Glen has a more diverse array of plants than Beebe.



·We collected plants from five locations within the plant bed: center, interior, edge, lone macrophyte, and—in Glen only—deep lone macrophyte.

·Within each location category, we collected six replicates. Replicates were evenly spaced with 2 meters between each sample site.

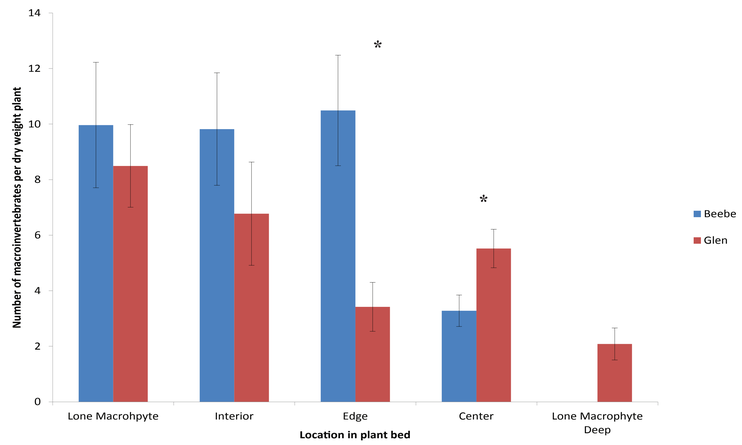
·We collected the macrophytes using a special plant sampler that ensured we did not lose macroinvertebrates in the collection and transport process.

·Once in the lab, we removed and counted all macroinvertebrates within each sample. Each macroinvertebrate will also be identified to taxon.

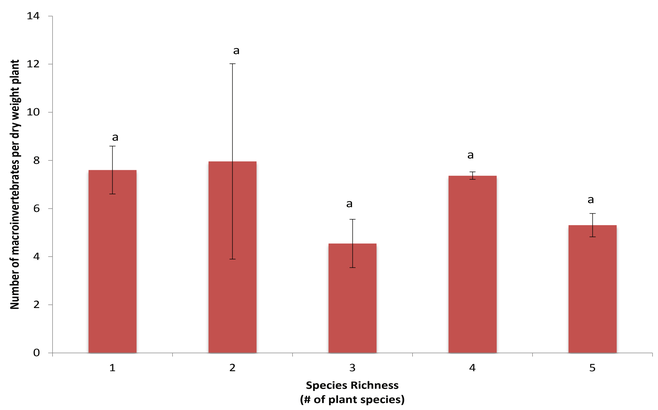
·After macroinvertebrate removal, we dried the macrophytes and weighed them as a proxy to control for plant size. However, the dry weight cannot indicate surface area, an important factor in how macrophytes affect the underwater community.

·Results were analyzed using SPSS.

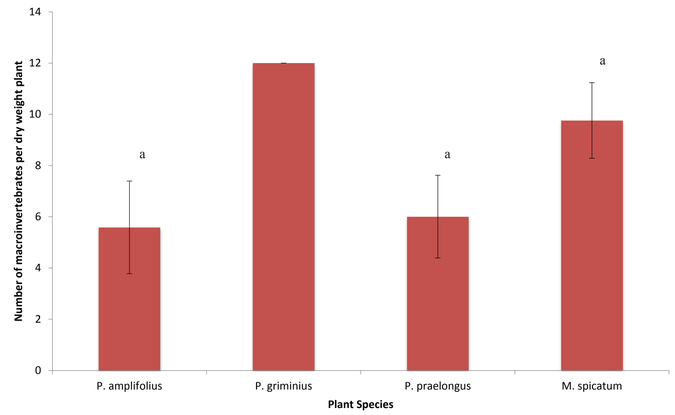
Results



Relationship between location of macrophyte and number of macroinvertebrates found on each sample (by dry weight plant). Deep lone macrophyte samples were only collected in Glen Lake. For Beebe, the number of macroinvertebrates differed significantly based on macrophyte location (ANOVA, p = .035), with the least macroinvertebrates found in the center samples. For Glen, the number of macroinvertebrates differed significantly based on macrophyte location (ANOVA, p = .012), with the most macroinvertebrates on lone macrophytes and the least on deep lone macrophytes. When we combined the data for Beebe and Glen, we again found that macroinvertebrate number varied significantly by sample location (ANOVA, p = .024).



Relationship between species richness and number of macroinvertebrates found on each sample (by dry weight plant). The number of macroinvertebrates did not differ significantly by species richness (ANOVA, p = .418). None of the individual differences were significant.



Relationship between plant species and number of macroinvertebrates found on the each sample (by dry weight plant). Some samples had multiple plant species; only samples with one species are considered in this comparison. We had only one sample with single plant P. griminius, so there is no standard error for that column. The results were not significant (ANOVA, p = .330).

Conclusions

·There is a significant relationship between macrophyte location within a bed and number of macroinvertebrates found on macrophytes.
·These differences are not consistent across lakes, however, meaning that we cannot find a general trend in which one particular macrophyte position has more or less macroinvertebrates.
·Neither species richness nor plant species can account for these differences, because we did not find a significant relationship between either of those variables and macroinvertebrate abundance.
·Other variables like depth, eutrophication, or light access—which were not consistent between lakes—may have accounted for the differences in results.
·Future research can investigate these and other variables in order to determine why macroinvertebrate abundance varies based on macrophyte position.

References

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Bologna, P.A.X. and K.L. Heck. 2002. Impact of habitat edges on density and secondary production of seagrass-associated fauna. *Estuaries*, 25: 1033-1044.

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