Eelgrass Habitat Structure and Ecosystem Services

Allison L. Schmidt & Heike K. Lotze

Status, Trends, and Conservation of Eelgrass in Atlantic Canada and the Northeastern United States

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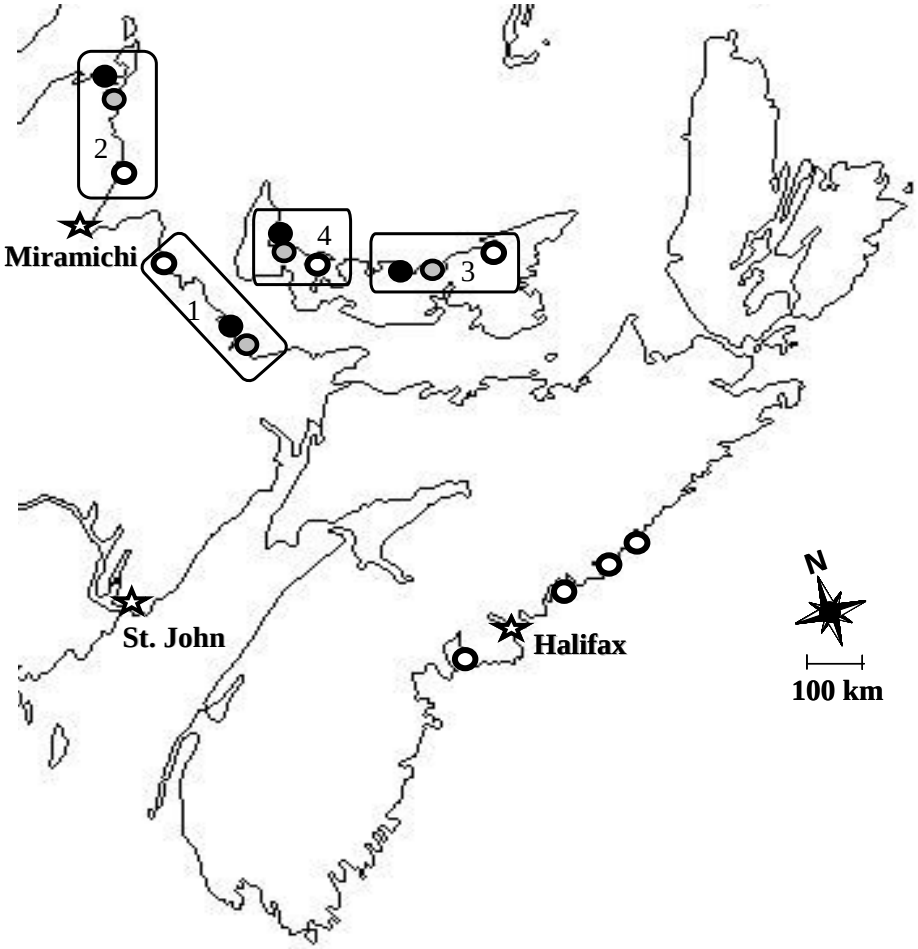
Topics

- Habitat Structure:
  - Shoot Density (m^{-2})
  - Canopy Height (cm)
  - Biomass (g DW m^{-2})
- Regulating Services:
  - Carbon and Nitrogen Tissue Content (%)
  - Storage (g DW m^{-2})
- Supporting Services:
  - Habitat for adults and juveniles of mobile species (# m^{-2})

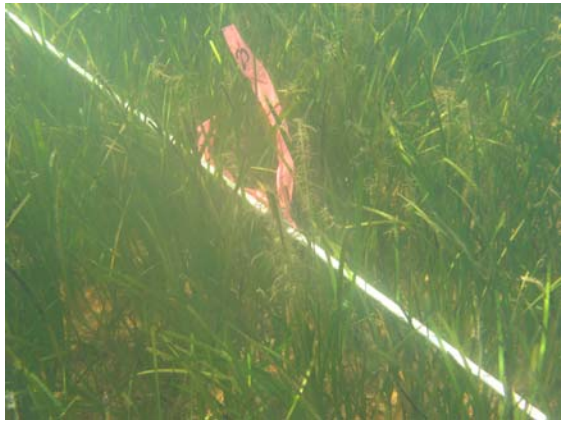
Scales

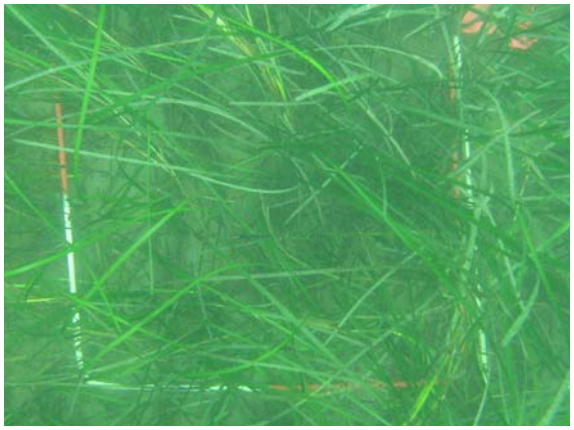
- Local: Seasonal Patterns
- Local: Along a Gradient of Eutrophication
- Regional: Atlantic vs. Gulf of St. Lawrence



Methods

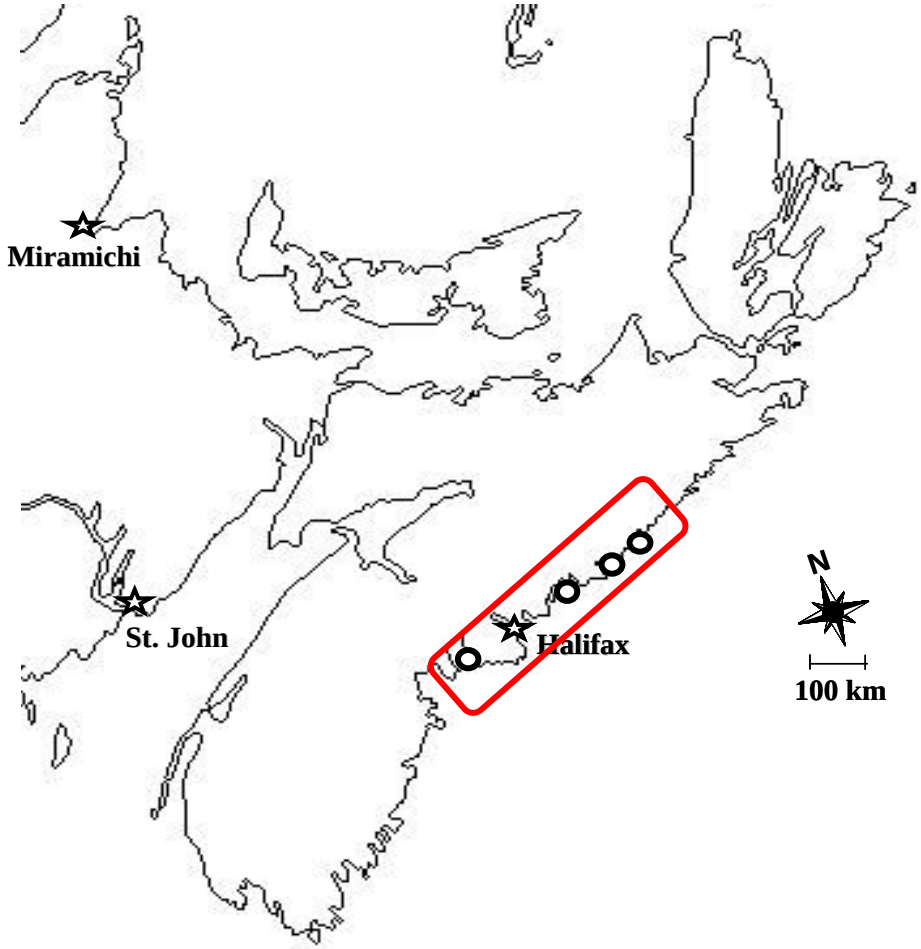
- Transects: visual census of highly mobile fish and inverts
- Quadrats: measured shoot density, canopy height and abundance of mobile fish and inverts
- Cores: Biomass and CN Tissue samples





Local: Seasonal Patterns

- 4 Sites in NS in 2007
- Sampled in early June (SP), mid August (SU) and mid October (FL)

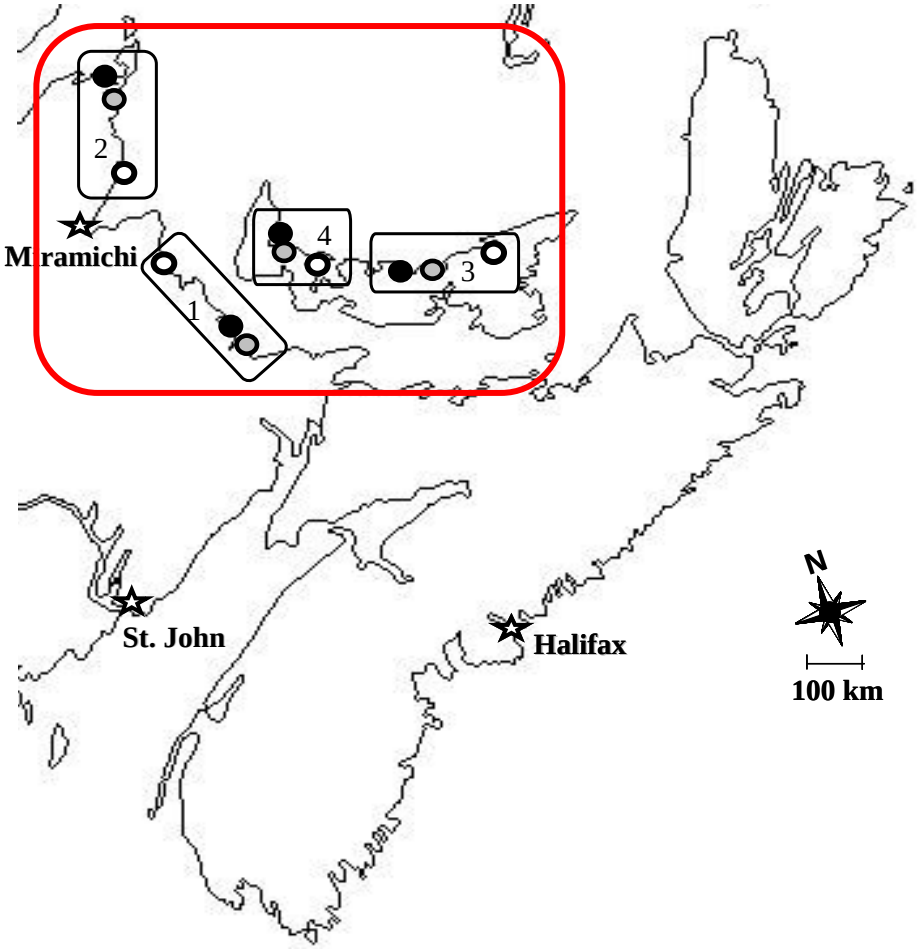


Local: Seasonal – Summary

- Although shoot density and canopy height peaked in SU and FL, respectively, biomass declined over time which was mimicked by C and was exacerbated in N storage due to the seasonality of the N tissue content
- Peaks in highly mobile adult and juvenile Abundance in SP and FL with the lowest values in SU.
- Highest species richness of both adults and juveniles of highly mobile species was in SU whereas for more cryptic fauna the peak was in the spring.
- No difference in cryptic fauna abundance between life stages or seasons.

Local: Eutrophication Gradient

- 4 Blocks with each low (L), medium (M) and high (H) nutrient loading
- 2 Blocks in New Brunswick and 2 in Prince Edward Island
- Sampled once from late July- early August 2007

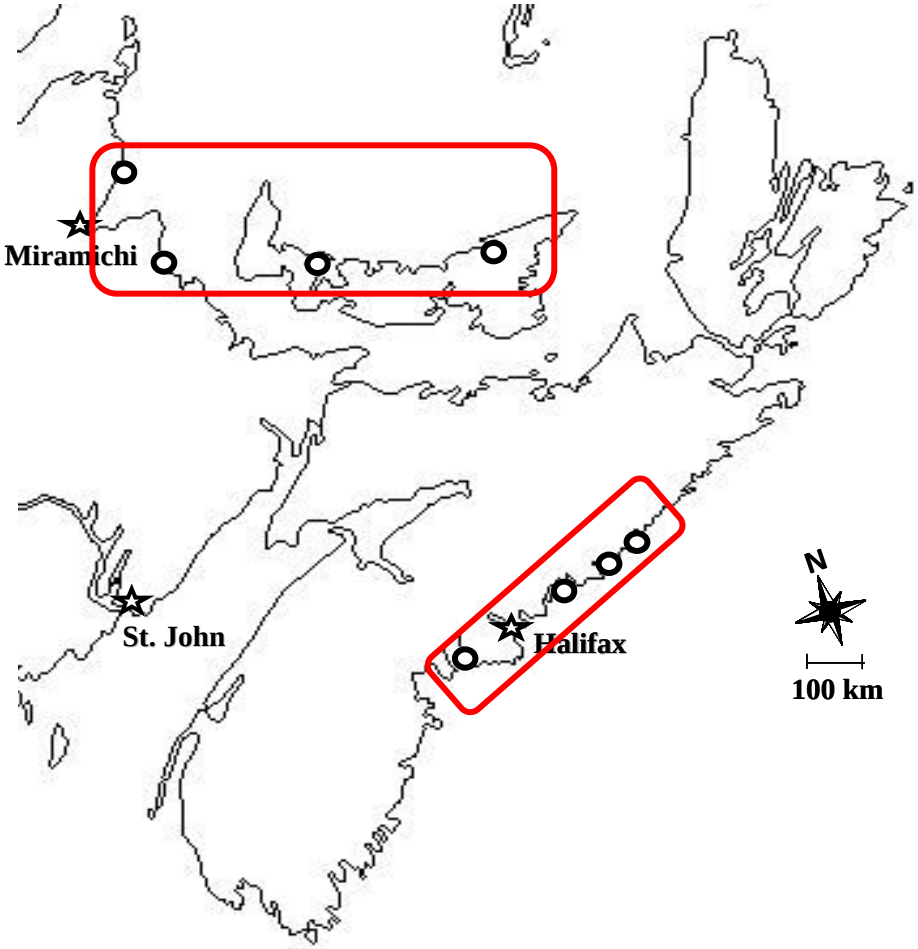


Local: Gradient – Summary

- Significant decline in shoot density and increase in canopy height with eutrophication
- Decline in total biomass along the gradient driven mainly be declines in the below ground component
- Overall decline in mobile species richness from low to high nutrient levels
- Highest richness and abundance of highly mobile adult fauna was in the low sites
- Highly mobile juvenile richness was

Regional: Atlantic vs. Gulf of St. Lawrence

- 4 sites on the Atlantic Coast of NS
- 4 sites in the Gulf of St. Lawrence
- All Low Nutrient Loading



Regional: Atl vs. GSL – Summary

- Shoot density was lower and canopy height greater in the Atlantic
- Order of magnitude greater biomass in the Atlantic
- Tissue C and N were greater in the Atlantic
- Both C and N storage were greater in the Atlantic, mostly in above ground tissue
- Overall mobile species richness was greater in the Gulf
- Abundance and richness of highly mobile & cryptic adult fauna was greater in the Gulf
- Highly mobile juvenile richness was greater in the Atlantic and equal across regions for cryptic fauna

Habitat Structure & Regulating Services: Conclusions

- Seasonal declines in biomass were mainly driven by the below ground compartment which may represent changes in allocation with changing nutrient availability.

- The significant decline in shoot density and total biomass and the concurrent increase in canopy height along a gradient of eutrophication is consistent with previous studies and is likely due to a combination of light limitation, anoxia and increased water column nutrient availability.

- Increased nutrient loading significantly affects the ability of eelgrass beds in the Gulf to act as coastal filters.

- The 6-fold greater carbon and 4-fold greater nitrogen storage capacity of the Atlantic eelgrass beds and currently low impacted state makes them a significant coastal filter.

Supporting Services: Conclusions

- Seasonal patterns in habitat usage by adult and juvenile life stages of mobile fauna are not clearly linked to changes in habitat structure

- The significant declines in overall species richness and decreased abundance and richness of both adult and juvenile life stages of the highly mobile species can be linked to increasing eutrophication.

- The increased abundance of adult and juvenile cryptic species as eutrophication increased was driven by a detritovore, the mud crab *Neopaneus sayi* and the mummichog *Fundulus heteroclitus* a species known to tolerate low oxygen and poor water quality.

- The Gulf of St Lawrence is a more diverse system with respect to mobile fauna. However, Atlantic eelgrass beds housed a more diverse juvenile assemblage indicating that both regions play an important role in maintaining the abundance and diversity of mobile fishes and invertebrates.

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