A Disappearing Act? Eelgrass (*Zostera marina*) Decline in Kejimkujik National Park

Aimée Pelletier[1]; Kristina Benoit[1]; Chris McCarthy[2]; Bill Freedman[3]

[1]School for Resource and Environmental Studies, Dalhousie University[1]; Kejimkujik National Park and National Historic Site[2]; Department of Biology, Dalhousie University[3]

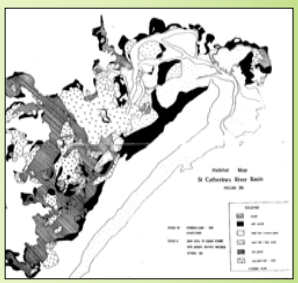
Research Outline

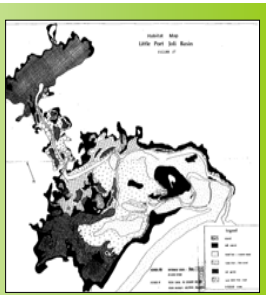
- Long-term monitoring of eelgrass (*Zostera marina*) extent and condition at the Kejimkujik Seaside was initiated in 2007 as part of a larger coastal ecological integrity monitoring program.
- Water quality monitoring was initiated in 2008 to assess whether water quality might be a contributing factor to eelgrass decline.
- A European green crab (*Carcinus maenas*) mark-release-recapture study was carried out in 2008 to assess population size, demographic characteristics (carapace width, sex ratio) and distribution.
- A pilot removal of green crabs from a restricted area of the lagoon was carried out in 2008 to assess feasibility of large scale removal.

Study Site: Kejimkujik Seaside

- The Kejimkujik Seaside is a 22 km^2 coastal property of Kejimkujik National Park and National Historic Site of Canada.
- Contains two coastal lagoons:
  - St. Catherine's River Lagoon (141.8 ha or 5.1 % of total park area)
  - Little Port Joli Lagoon (124.7 ha or 4.5 % of total park area)

Historic Baseline: 1987





- The extent of eelgrass coverage was first mapped in 1987 by Brylinsky *et al.*

Methods

Mapping

- Searched both lagoons from canoe for remaining eelgrass beds
- Mapped perimeter of remaining eelgrass bed in Basin Lake by snorkelling bed edge with GPS unit on "track" setting

Condition Monitoring

- Established permanent transects perpendicular to shore for monitoring:
  - Distance from permanent post to inner bed edge
  - Distance from permanent post to deep bed edge
  - Percent Cover
  - Canopy Height
  - Epiphyte Cover
  - Bed Patchiness
- Piloted the SeagrassNet monitoring protocol

Water Quality Monitoring

- Bi-monthly assessment of several parameters from June-September
  - Nutrients: Nitrate, Phosphate, Ammonia, Silicate
  - Chlorophyll *a*
  - CDOM (Coloured Dissolved Organic Matter)
  - TPM (Total Particulate Matter)
  - Water Chemistry: pH, Salinity, DO

Green Crab Monitoring

- Population Estimate: Mark-Release-Recapture
  - Two trap sizes
  - Visible implant elastomer
- Density surveys: Swim transects and beach seining
- Pilot removal from portion of lagoon

Results

Eelgrass Extent

- Eelgrass coverage has declined by 64 ha (88%) since 1987. An 8.94 ha bed fringes a tidally restricted portion of Little Port Joli Lagoon.
- Anecdotal evidence supported by examination of aerial photos from 1990, 1994, 2000 and 2007 suggest maximum loss occurred between 1994 2000.
- Reasons for loss are unknown.

Eelgrass Condition

- Epiphyte coverage minimal except some shoots partially covered or knitted together with the invasive golden star tunicate (*Botryllus schlosseri*).
- Large proportion of whole dislodged plants with signs of green crab damage (shredded or neatly clipped sheaths).
- A large precipitation event followed by protracted hot weather caused rapid senescence and stagnation of the bed in mid-July 2008—a full month earlier than in 2007.
- SeagrassNet methods too intensive for the sensitive bed (very fine sediment substrate). Eelgrass bed should likely be monitored from boat to minimize disturbance.

Water Quality

- Water quality is strongly influenced by large precipitation events which increase CDOM concentrations due to large freshwater inputs from surrounding wetlands.
- Water quality is considered good, but lagoon waters are moderately enriched with respect to nearby open ocean waters, likely due to restricted tidal flushing.

Green Crab Population

- Two trap sizes used together capture full size crab size range.
- Low number of recaptures in Mark-Release-Recapture study (<10%) indicates large population size (~ 50,000).
- Males more frequently captured than females in traps.

Next Steps

- Large-scale green crab removals are being considered for 2009.

Acknowledgements

- GIS analysis of eelgrass coverage was conducted by Sally O'Grady, Kejimkujik National Park
- The following provided technical support and field assistance: Cullen Lab (Oceanography Department, Dalhousie University), Parks Canada, Anna-Sarah Eyrich, Marla Bojarski, Brian Starzomski, and Beatrice Amstutz.
- This research was made possible by the generous support of the following funding sources:

Canada · Dalhousie University Inspiring Minds · NSERC CRSNG