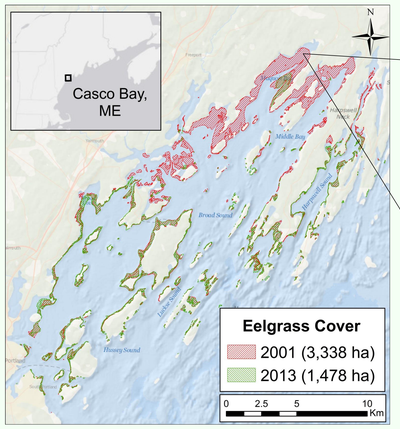
Update on a Continuing Saga: Eelgrass and Green Crabs in Casco Bay, Maine

Hilary A. Neckles[1], Angela D. Brewer[2], John W. Sowles[3], Seth Barker[4], Curtis C. Bohlen[5], Matthew Craig[5], Michael Doan[6], and Sandra Lary[7]

[1]USGS Patuxent Wildlife Research Center, Augusta, ME; [2]ME Department of Environmental Protection, Augusta, ME; [3]North Yarmouth, ME; [4]Boothbay, ME; [5]Casco Bay Estuary Partnership, Portland, ME; [6]Friends of Casco Bay, South Portland, ME; [7]USFWS Gulf of Maine Coastal Program, Falmouth, ME

Recent Loss of Eelgrass in Casco Bay Caused By Green Crabs



Mapping by Seth Barker, produced by:
Maine DMR (2001)
Maine DEP & Casco Bay Est. Partnership (2013)

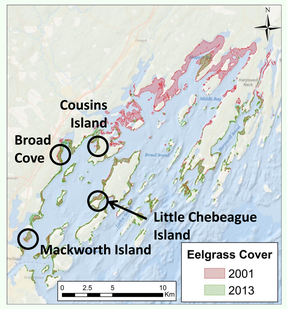
- Eelgrass area declined by 56% between the mapping intervals
- The majority of loss occurred from 2012 to 2013
- Bioturbation by green crabs identified as a leading cause

Questions

1. Are green crabs continuing to destroy eelgrass in Casco Bay?
2. Are effects of green crabs influenced by other environmental factors?

Multi-Scale Approach at Targeted Locations

Study Sites



Eelgrass Measurements

- Large-scale changes since 2013 using low-altitude aerial photos
- High-resolution changes in cover during the peak growth season along fixed transects (1-2 per site) parallel to shore in low intertidal/shallow subtidal
- Permanent quadrats (12) along transects [methods follow SeagrassNet.org]

Green Crab Abundance

- Two traps per transect deployed 24 h every 2 weeks
- Baited with standard quantity of frozen alewives

Environmental Variables

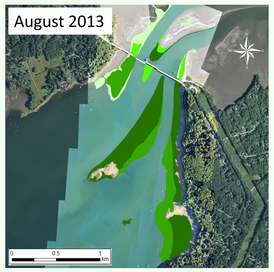
- Light attenuation adjacent to each transect measured from duplicate profiles every 2 weeks
- Triplicate sediment samples collected from each transect for texture and organic analyses

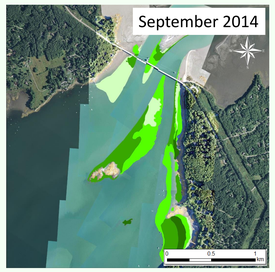
Large-Scale Eelgrass Change: 2013 – 2014

- Percent cover decreased at all sites
- Dramatic loss of area mapped in the highest cover category at CI & MI
- Overall loss of eelgrass area at LCI

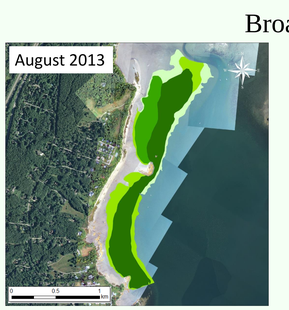
Percent cover
0-10%
10-40%
40-70%
70-100%

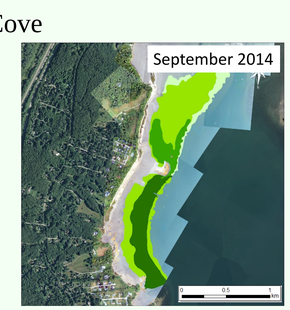
Cousins Island



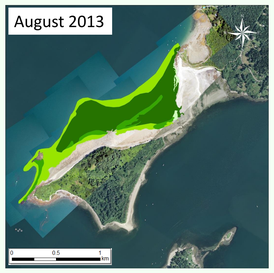


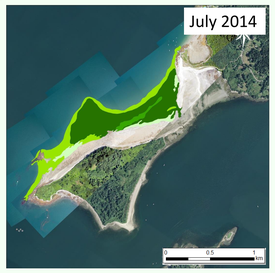
Broad Cove



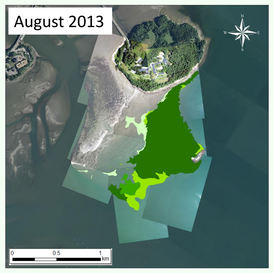


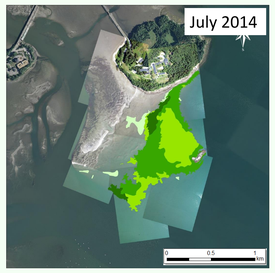
Little Chebeague Island





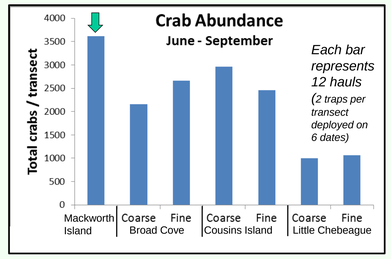
Mackworth Island

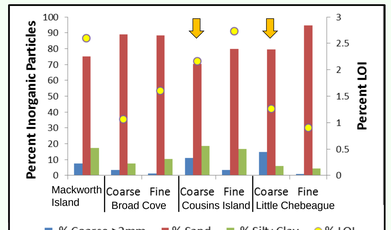




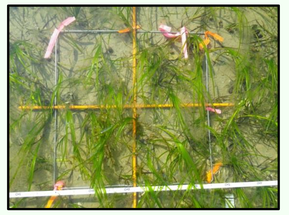
Environmental Variables: June – September, 2014

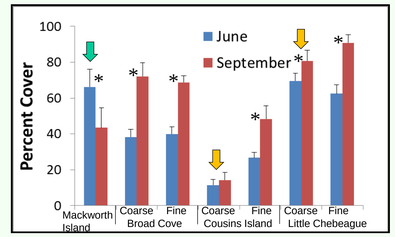
- Highest number of green crabs occurred at Mackworth Isl. transect
- Sediment texture > 10% coarse particles at two sites (Cousins Isl.-Coarse and Little Cheb.-Coarse)
- Seasonal mean attenuation of photosynthetically available radiation (K_d) among sites was 0.46 m^{-1} to 0.59 m^{-1}, resulting in a minimum of about 24% surface irradiance at the canopy depth at mid-tide





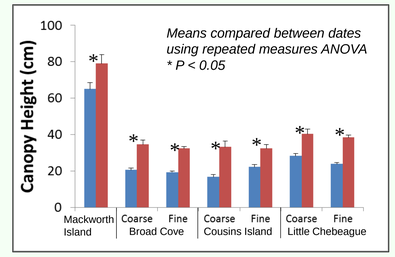
High-Resolution Eelgrass Change: June – September, 2014





From June to September:

- At the transect with the greatest total number of crabs, eelgrass % cover decreased despite increase in canopy height, signifying decrease in shoot density (Mackworth Isl.)
- The smallest seasonal increases in % cover occurred at the two transects with highest fraction of coarse sediments (Cousins Island-coarse, Little Chebeague-coarse)



Conclusions

- Eelgrass loss continued from 2013 to 2014
- Decreases in bed size, patch cover, and shoot density were apparent in different locations
- Changes in shoot % cover corresponded negatively to both crab abundance and the proportion of coarse particles in the sediment
- At measured values, water clarity would not appear to limit shallow eelgrass production
- Results suggest independent or interactive effects of green crabs and sediment texture on eelgrass cover in Casco Bay

Acknowledgments

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