Spring 2019

Density of Hemigrapsus sanguineus and Carcinus maenas in Kettle Cove, Cape Elizabeth, Maine

Valerie Huston
University of Southern Maine

Teresa Martel
University of Southern Maine

Zimzim Mohamed
University of Southern Maine

Density of *Hemigrapsus sanguineus* and *Carcinus maenas* in Kettle Cove, Cape Elizabeth, Maine

Valerie Huston, Teresa Martel, Zimzim Mohamed, Dr. Rachel Lasley-Rasher
Department of Biology, University of Southern Maine

Introduction

Invasive species are non-native species that cause harm to an ecosystem. The two invasive species that we surveyed include *Hemigrapsus sanguineus*, Asian shore crab and *Carcinus maenas*, European green crab. They are a threat to our lobster industry where they consume juvenile lobsters along with clams, mussels, and take over eelgrass beds. (Lord, 2017).

Questions

- How does the population densities for both species change from September 2018 to October 2018?
- Do densities differ between high tide and low tide?
- Is there a correlation between *Ascophyllum* coverage and density of both species?

Figure 1: *Hemigrapsus sanguineus*, Asian shore crab
© Molly Jacobson

Figure 2: *Carcinus maenas*, European green crab

Methods

- We surveyed the rocky intertidal zone of Kettle Cove, Cape Elizabeth, Maine.
- We haphazardly placed quadrats (1 m²) at our study site and recorded organisms found in the quadrat.
- Salinity and temperature were measured using a refractometer and thermometer, respectively.
- We compared crab densities using *t*-tests in R.

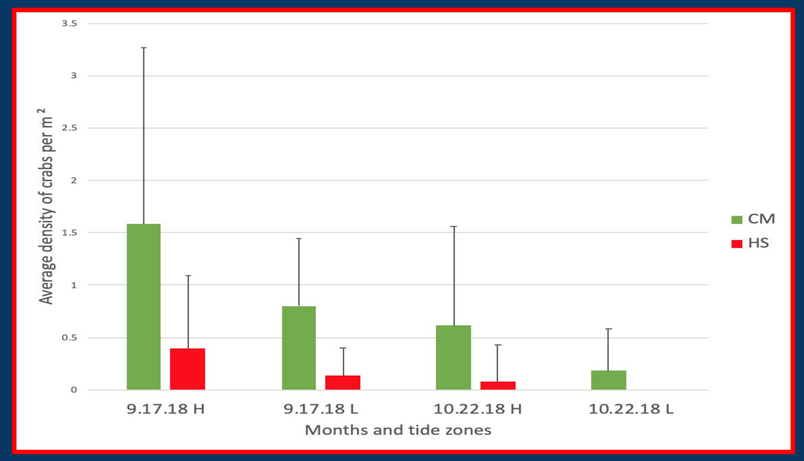

Figure 3: Average density of(HS) Asian shore crabs (*Hemigrapsus sanguineus*) and (CM) European Green crabs (*Carcinus maenas)* per m². In high tide vs low tide zones. During the time periods 9-17-18 vs 10-22-18 in Kettle Cove Cape Elizabeth, Maine and (+) standard deviation.

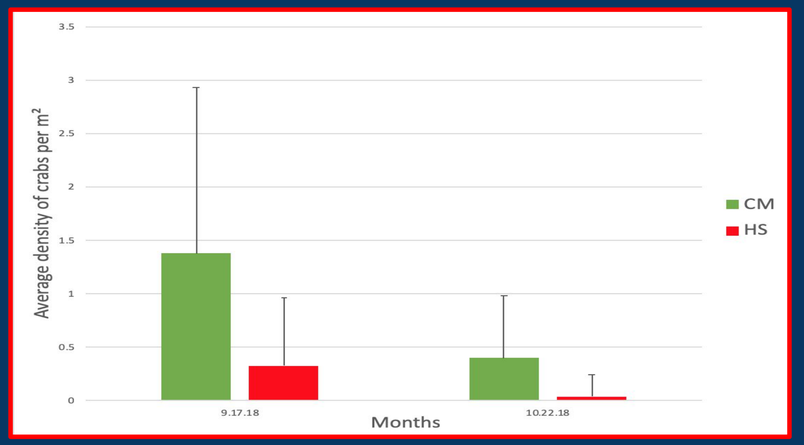

Figure 4: Average density of Asian shore crabs(HS) (*Hemigrapsus sanguineus*) and European Green crab (CM) (*Carcinus maenas*) per m² found in Kettle Cove Cape Elizabeth, Maine on 9-17-18 vs 10-22-18 and (+) standard deviation.

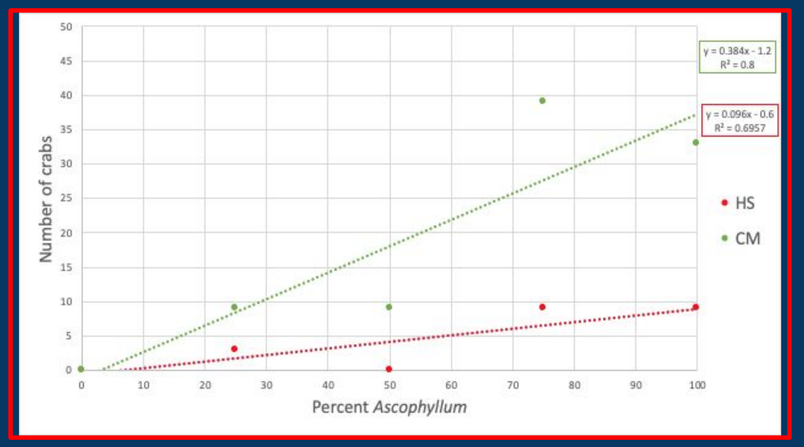

Figure 5: Percent *Ascophyllum* vs number(HS) Asian shore crabs (*Hemigrapsus sanguineus*) and (CM) European Green crab (*Carcinus maenas*) per m² found in both high tide and low tide on the dates 9.17.18 and 10.22.18 at Kettle Cove Cape Elizabeth, Maine.

Date	9.17.2018	10.22.2018
Salinity (ppt)	32	35
Temperature (ºC)	25	9

Table 1: The salinity and temperature on September 17, 2018 and October 22, 2018. Measurements taken after surveying

Results

- Average density of both species decreases from September 17, 2018 to October 22, 2018 significantly (t=4.1, df=80, p=0.002 for CM and t=3.1, df=77, p=0.003 for HS)
- Average density of HS and CM crabs was higher in the high tide zone than in the low tide zone(t=3.1, df=79, p=0.002 for CM and t=2.4, df=80, p=0.02 for HS)
- Average density of both crabs was higher within quadrats that had a higher percent *Ascophyllum* coverage.

Discussion

- The density of both species decreased from September to October most likely due to changes in temperature.
- Surveyors such as (Young et al., 2017) described these species of crabs migrate into deeper waters in the winter months.
- For future surveys, it would be best survey Kettle cove at same time of the year to observe any changes in these populations from year to year. Also focus on salinity and temperature changes and see how this affects the crab populations, and survey subtitle water to see if their migrating or are they gone.

Acknowledgements
Dr. Rachel Lasley-Rasher, Dr. Marissa McMahan, Erica Ferelli, and students of Marine Ecology, Fall 2018.

References

Bloch, C.P., K.D. Curry, and J.C. Jahoda. 2015. Long-term effects of an invasive shore crab on Cape Cod, Massachusetts. Northeastern Naturalist 22: 178–191.
Epifanio, C. E. 2013. Invasion biology of the Asian shore crab *Hemigrapsus sanguineus*: a review. *Journal of Experimental Marine Biology and Ecology* 441: 33–49
Hudson DM, Sexton DJ, Wint D, Capizzano C, Crivello JF. (2018) Physiological and behavioral response of the Asian shore crab, *Hemigrapsus sanguineus*, to salinity: implications for estuarine distribution and invasion. *PeerJ* 6:e5446
Lord, J. P., & Williams, L. M. (2017). Increase in density of genetically diverse invasive Asian (*Hemigrapsus sanguineus*) populations in the Gulf of Maine. *Biological Invasions*, *19*(4): 1153–1168.
Stephenson, E.H., Steneck, R.S., Seeley, R.H., 2009. Possible temperature limits to range expansion on non-native Asian shore crabs in Maine. J. Exp. Mar. Biol. Ecol. 375:21–31.
Young, A., Elliott, J., Incatasciato, J. and Taylor, M. (2017). Seasonal catch, size, color, and assessment of trapping variables for the European green crab Carcinus maenas (Linnaeus, 1758) (Brachyura: Portunoidea: Carcinidae), a nonindigenous species in Massachusetts, USA. *Journal of Crustacean Biology*, 37(5): 556-570.