

Asian shore crab: a benevolent invader?

Christine R. Blachly and Bradley J. Peterson

Emory University
cblachl@learnlink.emory.edu

Stony Brook University

ABSTRACT

Hemigrapsus sanguineus, the Asian shore crab, was first observed in the United States in 1988, in Townsend Inlet, New Jersey. It was soon found in Long Island Sound and is now well established on the northeast coast of the United States. *H. sanguineus* has been described as exclusively inhabiting rocky areas. However, it has recently been observed in salt marshes on Long Island which also serve as a habitat for *C. maenas*, the green crab.

The objective of this project was to determine if interaction between the two crab species affects mussel consumption by *C. maenas*. The hypothesis was that predation rates of *Geukensia demissa*, the Atlantic ribbed mussel, by *C. maenas* would decrease in the presence of the aggressive *H. sanguineus* as a result of trait-mediated interactions. **Preliminary biomass consumption assays suggest that in high density populations, the presence of *H. sanguineus* decreases mussel consumption by *C. maenas*.** This has positive implications for Long Island salt marshes which are fertilized by the nitrogen-rich pseudofeces produced by *G. demissa*.

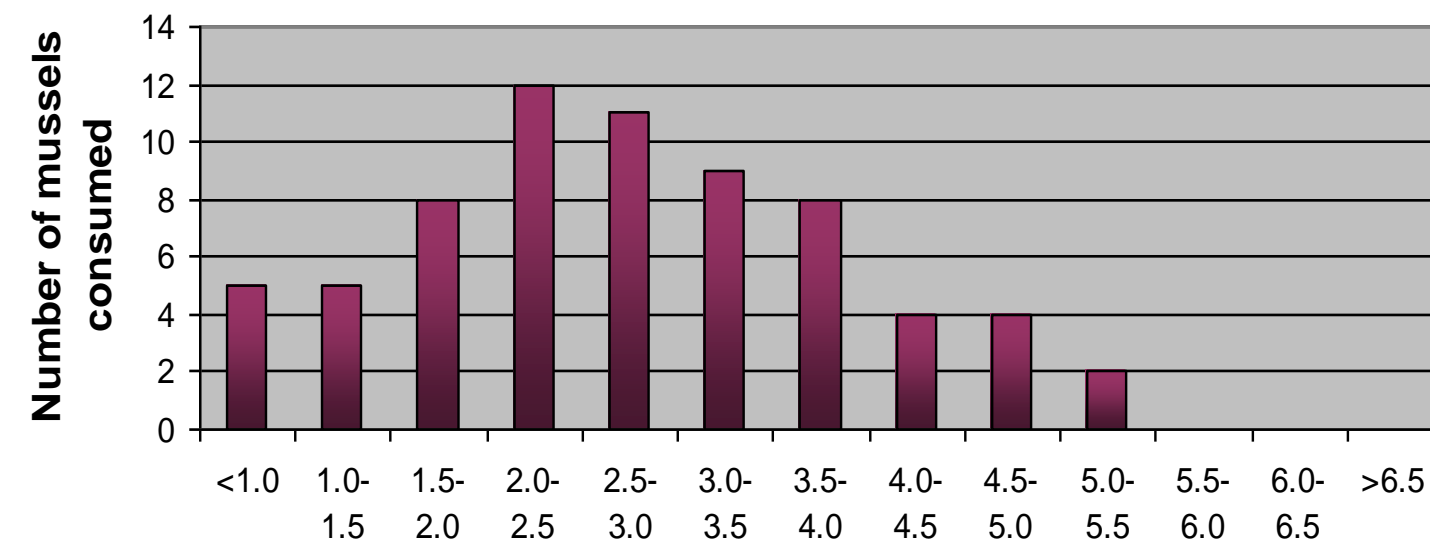
METHODS



- Low density (1 crab/species) and high density (2 crabs/species) environments were created containing:
 - H. sanguineus* only
 - C. maenas* only
 - H. sanguineus* and *C. maenas*

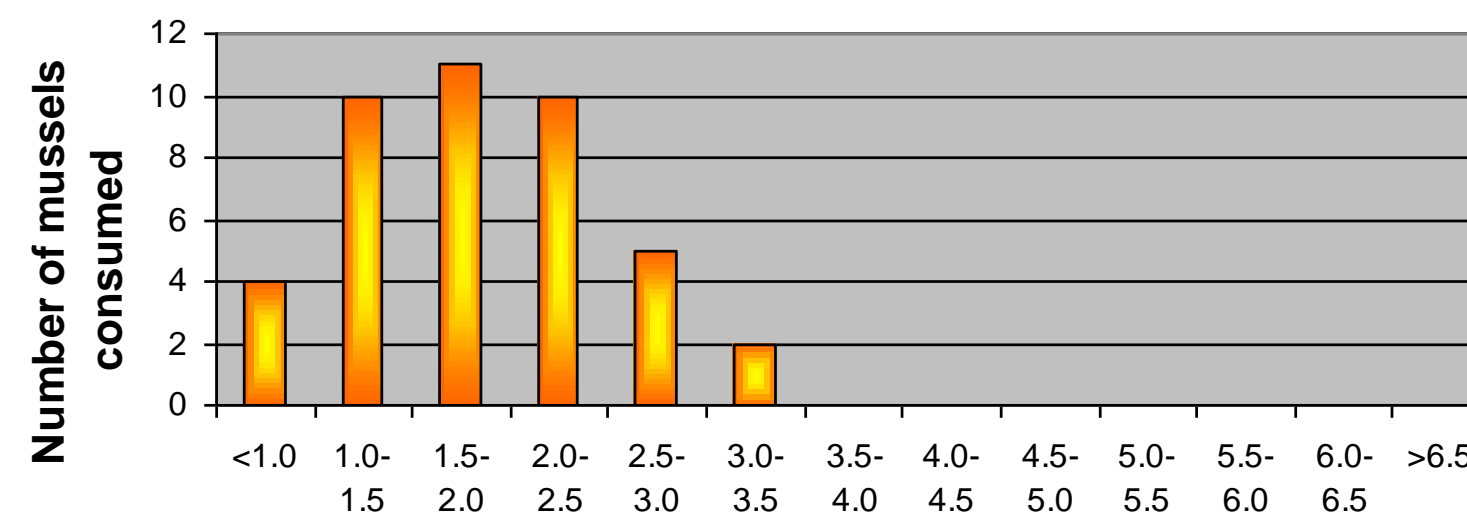
- Crabs were placed in tubs with a known number of ribbed mussels determined by natural size distribution
- Consumption was quantified by comparing the number of mussels remaining after 72 hours with the number of mussels at the start of the experiment.

RESULTS



Mussel size range as measured along the longest axis (cm)

Figure 1. The number of ribbed mussels in given size ranges consumed after 72 hours in all *Carcinus maenas*-only tubs. Consumption size range is <1.0cm to 5.5cm.



Mussel size range as measured along the longest axis (cm)

Figure 2. The number of ribbed mussels in given size ranges consumed after 72 hours in all tubs containing both *Carcinus maenas* and *Hemigrapsus sanguineus*. Consumption size range is <1.0cm to 3.5cm.

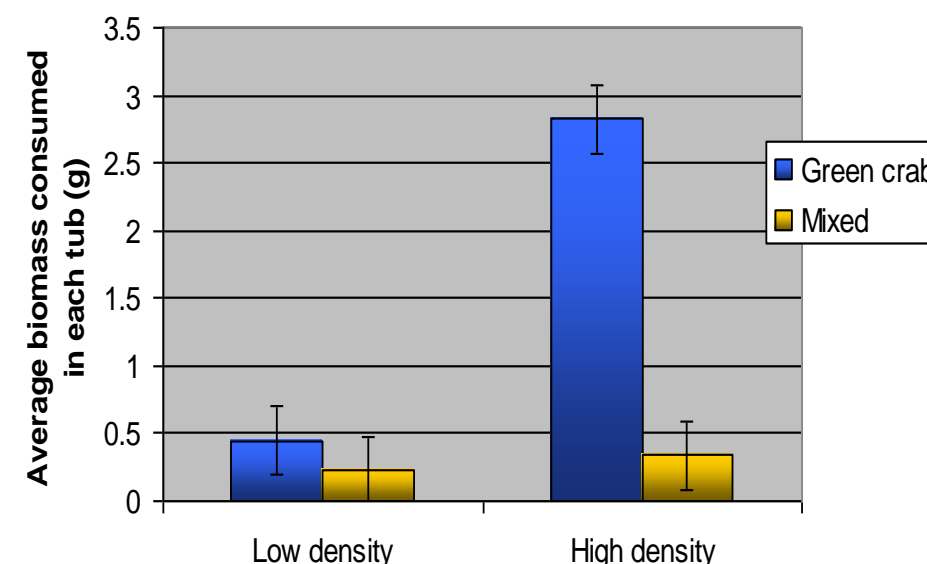


Figure 3. The average biomass consumed in *Carcinus maenas*-only tubs and mixed species tubs at low and high density. There was no difference in consumption at low density. At high density, there was a significant difference ($p < 0.001$ with one-way ANOVA).

DISCUSSION

Figures 1 and 2 compare the number of ribbed mussels consumed in tubs containing only *C. maenas* to the number consumed in tubs containing both crab species. *C. maenas* in single species tubs consumed more mussels than those in mixed species tubs ($n=68$ and $n=42$, respectively). In addition, the mixed species crabs exhibited a smaller maximum size of mussel consumed. Figure 3 compares the consumption at low and high densities separately. These results are given in averages of biomass consumed. At low density, there was no difference in mussel consumption between *C. maenas*-only tubs and mixed species tubs. At high density, mixed species tubs exhibited significantly lower biomass consumption.

CONCLUSIONS

- The presence of *H. sanguineus* at high densities decreases *C. maenas* mussel consumption.
- The aggressive trait of *H. sanguineus* indirectly influences the trophic interaction between *C. maenas* and *G. demissa* by diverting *C. maenas*' energy and away from mussel consumption. Mussel populations may increase, along with biodeposits. While *H. sanguineus* is an invasive species, it may be beneficial to Long Island salt marshes.
- Other factors, such as effect on species diversity or habitat crowding, must be taken into account and viewed holistically to understand the impact of *H. sanguineus* on the northeast coast of the United States.

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