Quantification of the Filtering Activities of Hard Clams (*Mercenaria mercenaria*)

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INTRODUCTION

Excess nitrogen enters ocean waters from various sources, such as sewage treatment plants and lawn fertilizers, causing rapid phytoplankton growth. *M. mercenaria* eat these plankton, thus absorbing some of the excess nutrients (Newell 1992). When these clams are harvested and taken to land, the nitrogen is taken out of the water, reducing eutrophication. (Figure 1).

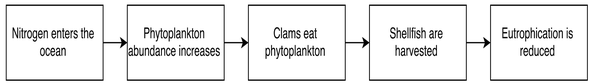

Figure 1. The flow of nitrogen from land to ocean and back to land.

Objectives:

- Quantify ecosystem services that *M. mercenaria* provide
- Obtain an profile of the phytoplankton community, based on species present and abundance

MATERIALS AND METHODS

The feeding physiology of Greenwich hard clams (Figure 2) in the field was determined using a technique called the biodeposition method (Riisgaard 2001), which involved real-time collection of water samples, clam feces, and clam pseudofeces for determination of organic and inorganic matter (Figure 3 a and b).

Plankton community composition at eight stations was determined from samples preserved in lugols solution and enumerated in an Utermohl chamber using light microscopy.

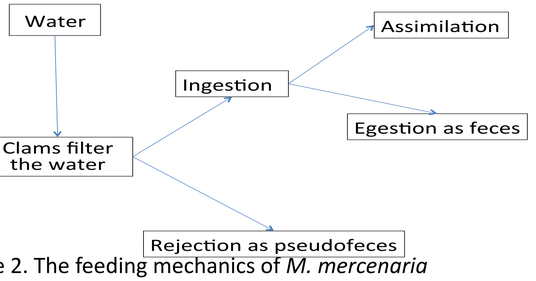

Figure 2. The feeding mechanics of *M. mercenaria*

Figure 3a (top) and 3b (bottom). Experimental set up for the biodeposition experiments.

RESULTS AND DISCUSSION

The relatively high assimilation efficiency (43% in the first experiment and 69% in the second experiment) shows that most of the organic matter ingested was used by the clam. The relatively low proportion of material in the water that was rejected by the clams as pseudofeces (13% and 9%) also supports the notion that most of the particulate matter in the water was high quality food.

Diatom species typically dominated the plankton community at the study sites (Figure 5). Diatoms are the preferred food of *M. mercenaria* especially *Skeletonema* and *Chaetoceros*. *M. mercenaria* do not typically like to eat dinoflagellates and some species can be toxic to them (Kraeuter and Castanga, 2001). Dinoflagellates became more abundant in late July. There did not appear to be a negative effect on the clam's feeding due to this increase, indicating that there was still ample high quality food available in the plankton community.

The biodeposition experiments were only performed at Greenwich Point Park (star in Figure 4), and we were interested in whether this location was representative of Greenwich waters in general. The plankton community was examined at eight locations across Greenwich Harbor, and the assemblages were quite similar at 7 of the 8 stations (Figure 4), including the station closest to the site of our biodeposition experiments.

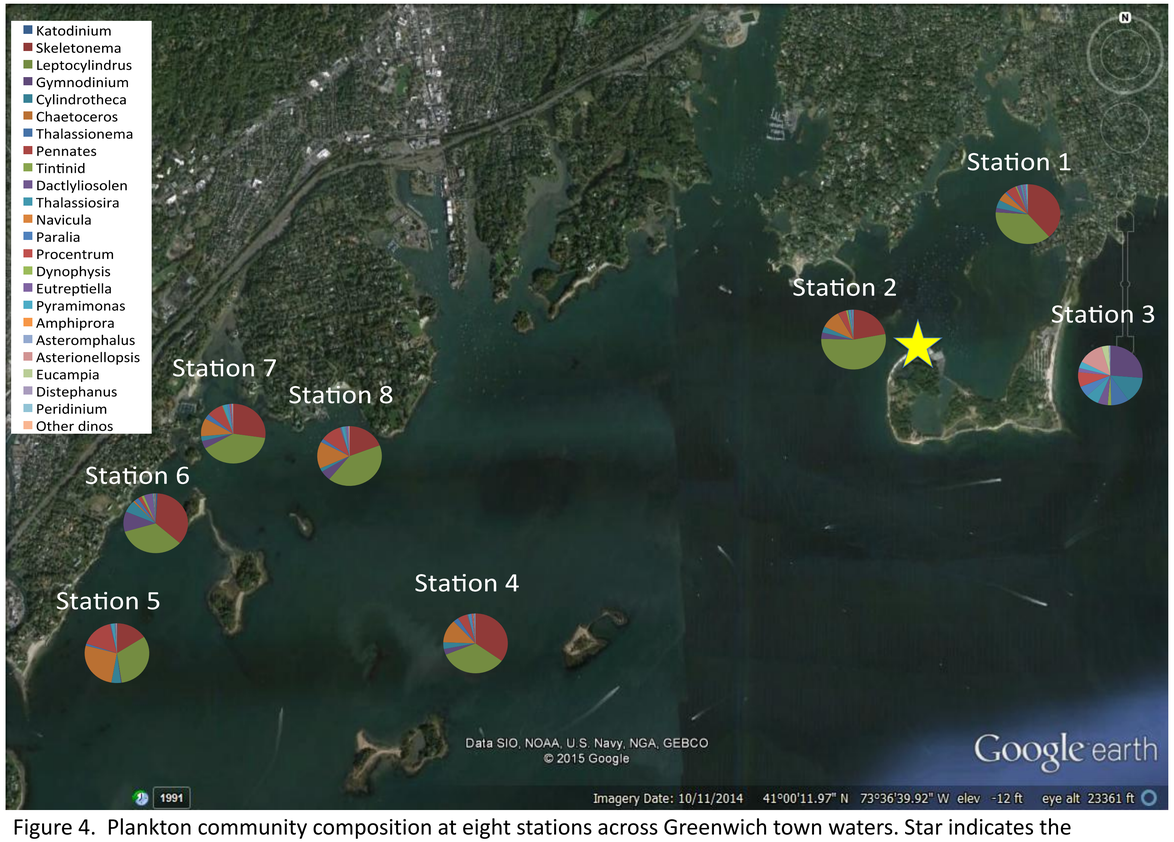

Figure 4. Plankton community composition at eight stations across Greenwich town waters. Star indicates the location of biodeposition experiments.

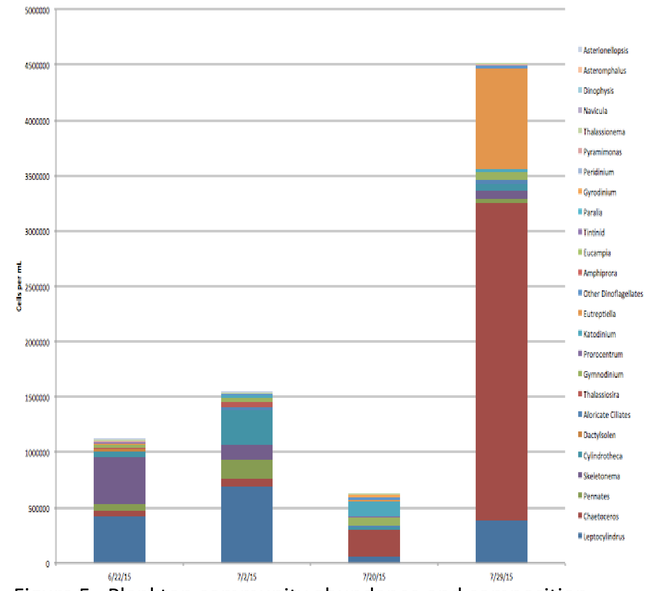

Figure 5. Plankton community abundance and composition during June and July at Greenwich Point.

CONCLUSIONS AND FUTURE WORK

Conclusions

- *M. mercenaria* in Greenwich Harbor are excellent and effective nutrient recyclers
- Greenwich Harbor is a great place to grow clams, based on the abundance of diatoms present in the water

Next Steps

The data reported here on processing of particulate matter by clams will be converted into estimates of nitrogen removal. Nitrogen removal by clams in Connecticut waters can be given a dollar value based on the existing Nitrogen Credit Exchange Program run by CTDEEP. In 2014, nitrogen credits were valued at $5.61 per pound.

REFERENCES

Kraeuter JN, Castagna M. 2001. Biology of the Hard Clam. Amsterdam, The Netherlands: Elsevier Science B.V. 751 *p*.

Newell, RIE. 1992. Ecological Changes in Chesapeake Bay: Are They the Result of Overharvesting the American Oyster, *Crassostrea virginica*?. Understanding the Estuary: Advances in Chesapeake Bay Research 129:536-546.

Riisgard, HU. 2001. On Measurement of the Filtration Rates in Bivalves-the Stony Road to Reliable Data: Review and Interpretation. Marine Ecology Progress Series 211:275-291.

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