Species Richness and Interaction of Benthic Marine Macroinvertebrates within the Lower Hudson River Estuary (2016)

Introduction

This project was an observational study to monitor the species richness of macroinvertebrates at 4 sites: 116th, 111th, and 103rd Street on the East River and a control at the Governors Island Oyster Reef. This study of the Lower Harlem River took place from October 2015 to October 2016.

Results from the three stations were compared to determine which station had the most richness. The DEC (2016) has a list of freshwater macroinvertebrates that can be found in New York State. Unfortunately, there are no studies regarding macroinvertebrates in the Lower Hudson River Estuary (LHRE). This project used the jgLCO1490 and the jgHCO2198 primers (revisions of the Folmer Primers) at NYU to identify found organisms, these primers were chosen because they have a better chance at identifying marine invertebrates. The species were then compiled into a list of species and a food web.

The food web gives us an idea of the health of the harbor and the steps we can take next.

Objective/Problem

- How many different marine benthic macroinvertebrates are located within the Lower Hudson River Estuary?
- How do these organisms impact the ecosystem in which they reside?

Background Information

Benthic macroinvertebrates are a focal point of the New York Estuary's biodiversity. Biodiversity is the variety of life. It can be studied on many levels from genetic diversity, to species richness, and it is what defines an ecosystem because what makes a high productivity ecosystem is this biodiversity between flora, fauna, mammals, amphibians, etc. (What is Biodiversity? (2016)). An invertebrate that New York is famous for is the oyster, which filters the water of harmful chemicals and algae (Nigro, 2011). Other invertebrates can do anything from merely providing other organisms with a source of food to filtering out toxins from the water, and many things beyond. (Covich *et al.*, 1999) Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play. Greater species diversity ensures natural sustainability for all life forms.

Benthic Invertebrate Food Web

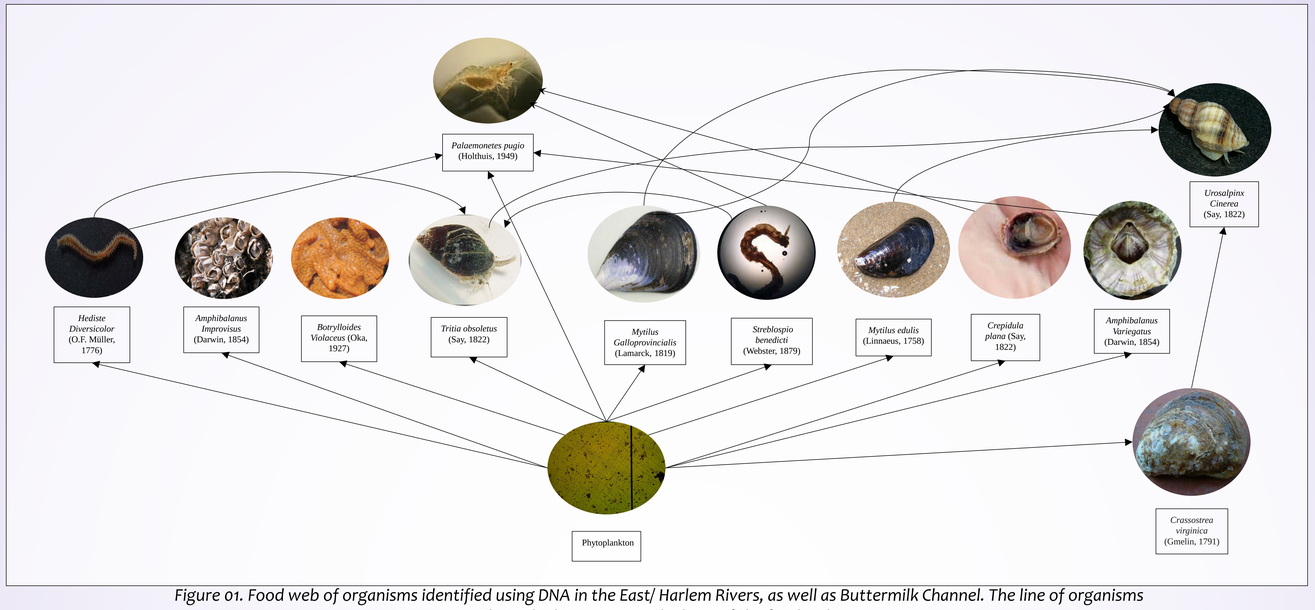

Figure 01. Food web of organisms identified using DNA in the East/ Harlem Rivers, as well as Buttermilk Channel. The line of organisms Phytoplankton serve as the base of the food web.

Figure 02. Sample Sites along East River Esplanade. Site 01. 103rd Street; Site 02. Pier 111; Site 03. 116th Street.

Figure 03. Sample site (control) along Governors Island/ Buttermilk Channel.

Site 1 (116th St)		Site 2 (111th St)		Site 3 (103rd St)		Site 4 (GI Oyster Reef)	
Genus	*specific epithet*	*Genus*	*specific epithet*	*Genus*	*specific epithet*	*Genus*	*specific epithet*
Hediste	*diversicolor*	*Hediste*	*diversicolor*	-	-	*Hediste*	*diversicolor*
Tritia	*obsoleta*	*Streblospio*	*benedicti*	-	-	*Mytilus*	*galloprovincialis*
-	-	*Crepidula*	*plana*	-	-	*Mytilus*	*edulis*
-	-	*Tritia*	*obsoleta*	-	-	*Amphibalanus*	*variegatus*
-	-	*Urosalpinx*	*cinerea*	-	-	*Botrylloides*	*violaceus*
-	-	-	-	-	-	*Amphibalanus*	*improvisus*

Methods

The specimens were collected from 4 locations on the East River, using a benthic grab.

Preliminary taxonomic searches are done for all organisms collected. Then, at NYU the DNA was amplified and then sent to another lab for the retrieval of the DNA streams.

The DNA streams were then put through BLAST, a bioinformatics system, where the DNA is compared to other organisms for the best match.

Analysis

Hediste diversicolor (Ragworm), was the species most present at each site. It is a predatory polychaete, and seems to be an important player in the New York Estuary ecosystem.

The next most commonly found organism was *Tritia obsoleta* (Eastern mud snail). The invading Eastern mud snail has been found in several Pacific locations, but its ecological effects have yet to be evaluated. The mud snails have no natural predators, making it nearly impossible to control the population.

Streblospio benedicti, found at Site 2, was relatively tolerant to elevated levels of sediment organics (Reish 1979). It is a dynamic member of the food web.

Mytilus edulis is a filter feeding bivalve that feeds mostly on phytoplankton and is a close relative to Mytilus galloprovincialis (FIGIS, 2006).

Urosalpinx cinerea (Atlantic oyster drill) preys upon oysters, barnacles and other bivalves, including mussels (Ganaros, 1958).

M. galloprovincialis is able to outcompete and displace native mussels and become the dominant mussel species (Van Erkom Schurink and Griffiths 1993, in Branch and Stephanni 2004).

Amphibalanus reticulatus is a frequent fouler of ships and marine structures worldwide in warm subtropical-tropical waters (Utinomi 1970; Henry and McLaughlin 1975). Finding this wasn't a good sign for the harbor, as they are both invasive and dangerous to the maritime industry.

Amphibalanus improvisus (Bay Barnacle) is characteristic of estuaries and brackish waters.

Conclusion

The hypothesis, that there would be differences between sample sites, was supported by the collected data. While the hypothesis about species richness was not supported, we found more organisms than we originally expected to.

Phase 2 of the project will be determining what kinds of construction materials are best for organisms to grow on in order to begin the restoration process.