Crab Diversity in Two Habitats of Randall's Island

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Introduction

- We performed a study to determine crab diversity in two habitats of Randall's Island, a salt marsh and the Harlem River.
- Crabs are Crustaceans, which are a subgroup of the phylum Arthropoda. Other Crustaceans include lobsters, shrimp, barnacles, and many more (Willford 2024).
- Most crabs are scavengers, meaning they eat dead plants or animals. They will eat just about anything that they can find ("Crab" 2024).
- There are approximately 4,500 species of crabs that have adapted to diverse environments including oceans, brackish environments like marshes, freshwater environments, and even burrows of sand and mud (Willford 2024).
- We wondered if there would be differences in the crab species of the two habitats, and we expected to find Blue Crabs in the salt marsh and river, and Fiddler Crabs in the mud.
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Materials and Methods

- Crabs were collected along the shoreline using a seine net, preserved in ethanol, and frozen until processing.
- In the lab, tissues were broken down in a lysis solution, mixed with silica resin, washed, and then separated from silica resin to obtain DNA.
- We then PCRed the DNA to amplify it.
- Finally, the PCR products were loaded into gel electrophoresis trays at 130 V for 30 min, and observed the bands under ultraviolet light.

Results

Table 1:

Location	ID	Species Name	Bit Score	e	Mismatches
Site 1 (Salt Marsh)	KMR-001	*Callinectes sapidus*	1076	0.0	0
Site 1	KMR-002	*Callinectes sapidus*	1158	0.0	1
Site 2 (Muddy area 1)	KMR-003	*Callinectes sapidus*	1168	0.0	0
Site 2	KMR-004	*Callinectes sapidus*	1143	0.0	1
Site 2	KMR-005	NO DATA	NO DATA	NO DATA	NO DATA
Site 3 (Salt Marsh)	KMR-006	*Pagurus longicarpus*	670	0.0	0
Site 4 (Salt Marsh)	KMR-007	*Minuca pugnax*	999	0.0	1
Site 4	KMR-008	*Minuca pugnax*	977	0.0	1
Site 4	KMR-009	*Callinectes sapidus*	1153	0.0	0
Site 5 Harlem River	KMR-010	*Minuca pugnax*	1035	0.0	3
Site 6 (Muddy area 2)	KMR-011	*Minuca pugnax*	981	0.0	1
Site 6	KMR-012	*Minuca pugnax*	1177	0.0	0
Site 6	KMR-013	*Minuca pugnax*	1105	0.0	1
Site 6	KMR-014	*Minuca pugnax*	1051	0.0	3

Table 1 displays the predicted species of each crab sample, as well as the bit score, e, and the number of mismatches. We were interested in the topic of water quality data for each site but were unable to receive data.

Callinectes sapidus

Minuca pugnax

Figure 1:

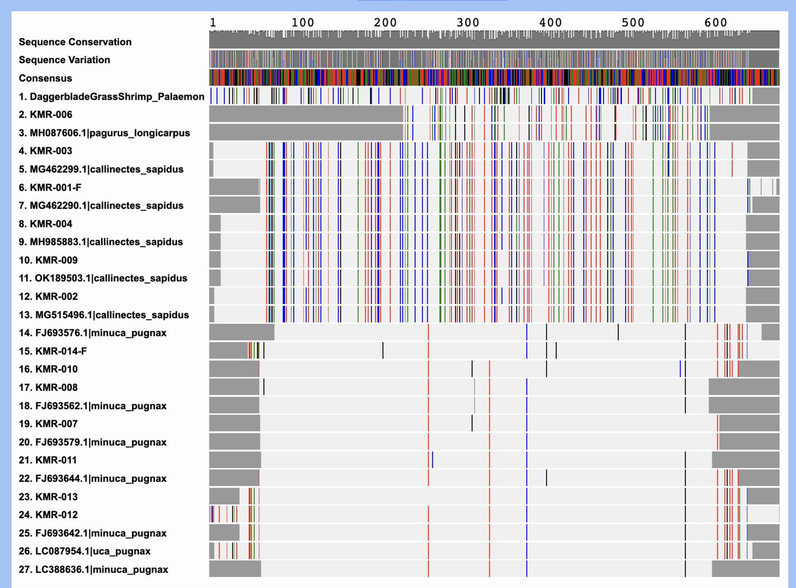

Figure 1 displays the MUSCLE alignment of the samples. This shows how there are many base pair differences among these three species because they are not that closely related.

Discussion

- We were able to find 14 crab samples in total across 6 different sites.
- The 3 species we found were blue crab, fiddler crab and hermit crab.
- Habitat preferences:
  - Blue crab - Warm environment
  - Fiddler crab - Muddy and river areas
  - Hermit crab - Only found once. Suggests they are less common or have more habitat restrictions.
- Different factors that can influence crab diversity:
  - With climate change rising water temperatures, Blue Crabs may become even more abundant in New York waters, shifting ecosystem dynamics
  - Failure to find European green crab species. Possibly because of small sample size.
- Sample KMR-005 failed to bring us DNA despite two attempts. May have occurred because of improper preservation, contamination, or tissue degradation.
- Moving forward, future studies could expand the sampling locations and sites. This would more accurately capture variation in crab populations. The different sampling areas may reflect different levels of salinity or degree of muddiness, which would increase the yield of crab populations sampled. Another potential future study could involve seasonal sampling of the crab populations, as warmer weather may allow the collection of more crabs, such as the Blue Crabs, with each investigative outing.

References

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