Slugs at the Ethical Culture Fieldston School Campus

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Abstract

The goal of collecting slug specimens from around the Fieldston Campus was to determine the biodiversity of slugs in the area. Each of the species that came from different parts of the campus showed the varying habitats on the campus. The DNA of around 20 different slug samples were collected, amplified, and analyzed using polymerase chain reaction (PCR) and gel electrophoresis. The DNA of the different samples was compared using the BLAST search engine, allowing us to determine how many species are present on the campus. The observations taken of the area where the sample was collected were compared to the species the sample belongs to. The DNA extraction method used was the chelex protocol. After both this step was completed, PCR was used to amplify the DNA so that an analysis could be done.

Introduction

- Slugs are terrestrial gastropod Molluscs
  - internal shells used to store minerals
  - live in moist, food abundant areas
  - hermaphrodites
  - lifespan of about 1-5 years
- Description
  - two eyestalks with two tentacles underneath
  - slugs have a mouth under their tentacles which opens to release a radula
  - grow to be up to 10 inches long
  - light brown, yellow, or grey
  - wet, mucus film covering their body, which protects their skin and moistens the surfaces they travel on
  - mucus has anesthetic properties
- Diet
  - flowers, fungi, leaves, decomposing plants, dead animals, feces, and seedlings
  - they eat many times their body weight every day
- Most common slugs in North America is the leopard slug and yellow slug
- All specimens were collected in early fall
  - leaves, sticks, and other decaying organic matter were scattered around

Results

Figure 1: Sample Locations at the Ethical Culture Fieldston School Campus

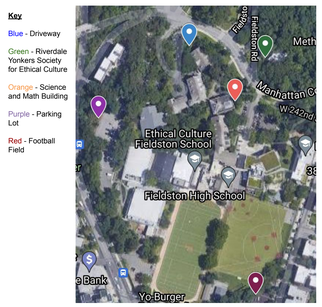

Figure 1. Map of the Fieldston School indicating the locations of each of the collected samples. These locations include behind a building with science and math classrooms, next to a driveway, at the parking lot, around a building across the street called the Riverdale-Yonkers Society for Ethical Culture, and next to the football field.

Table 1: Edited DNA Sequence of the Collected Slugs

Name	Sequence
YRJ-011	CATTATATATAATTTTTGGGGTTTGATGTGGAATAGTAGGGACGGGGCTTTCTCTTTTAA
YRJ-012	AAACGGACGGCCAGTGGTCAACAAATCATAAAGATATTGGGACTCTATATTTAATTTTTG
YRJ-016	GGCCAGTGGTCAACAAATCATAAAGATATTGGAACATTATATATAATTTTGGGGTTTGA
YRJ-017	GGNCGGCCAGTGGTCAACAAATCATAAAGATATTGGGACTCTATATTTAATTTTTGGGAT
YRJ-010-F	(no sequence)
YRJ-010-R	GTATAGTAAGTGCCCCCGCTAAAACAGGTAAAGATAATAAAAGTAAAAACACAGTAACTA
YRJ-013-F	(no sequence)
YRJ-013-R	ANCGGTTAGCAATATCGTAAGAGCTCCAGCTAAGACCGGCAATGAGAGGAGTAAAAGAAA
YRJ-015-F	(no sequence)
YRJ-015-R	ANGTTGATATAGAATAGGATCACCCCCTCCCGCAGGGTCAAAAAACCTTGTATTAAAATT
YRJ-018-F	(no sequence)
YRJ-018-R	(no sequence)

Table 1. This tables shows the DNA sequence for each sample that was collected and successfully sequenced and indicates which samples' sequencing results were not successful.

Figure 3: Muscle

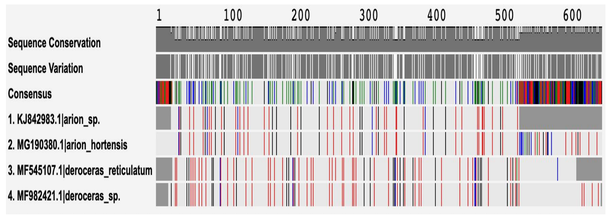

Figure 3. Muscle showing the sequencing for the for different species collected.

Table 2: Slug Sample Initial Observations and Species Identified

Sample	Date Collected	Location	Weather	Species (found using BLAST)
Sample #1 (YRJ-010)	10/22/2020	Parking Lot	Partly sunny, mid 60s°F	*Deroceras reticulatum*
Sample #2 (YRJ-011)	10/22/2020	Parking Lot	Partly sunny, mid 60s°F	*Deroceras sp.*
Sample #3 (YRJ-012)	10/22/2020	Parking Lot	Partly sunny, mid 60s°F	*Arion hortensis*
Sample #4 (YRJ-013)	10/22/2020	Parking Lot	Partly sunny, mid 60s°F	*Arion hortensis*
Sample #5 (YRJ-015)	10/22/2020	Parking Lot	Partly sunny, mid 60s°F	*Deroceras sp.*
Sample #6 (YRJ-016)	10/22/2020	Parking Lot	Partly sunny, mid 60s°F	*Deroceras reticulatum*
Sample #7 (YRJ-017)	10/22/2020	Parking Lot	Partly sunny, mid 60s°F	*Arion sp.*
Sample #8 (YRJ-018)	10/22/2020	Parking Lot	Partly sunny, mid 60s°F	No Sequence

Table 2. There were 8 samples effectively sequenced. This table shows the conditions in which the samples were first collected in and the species they were identified as using the BLAST database.

Figure 4: Slug Species Phylogenetic Tree

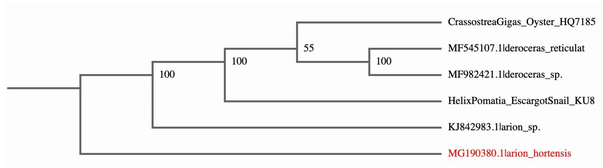

Figure 4. Phylogenetic tree showing the species results from the BLAST search of the sequenced slug samples.

Materials and Methods

- 20 slug samples were collected
  - Found in areas around the Ethical Culture Fieldston School campus
- Chelex protocol was used to extract DNA from the slugs
- DNA from the samples was amplified using PCR
- PCR products were analyzed using gel electrophoresis and 8 samples were sequenced

Discussion

Multiple species of slugs were found at the Ethical Culture Fieldston Campus. There were 4 different species found all in the same location of the parking lot, indicating the diversity of species within one area. The weather also remained similar throughout all specimen collection days, indicating that all species thrive in similar environmental climates. We are able to make connections between the distinct species and interpret their ideal living conditions based on these findings. All of them prefer mild temperatures, little sun, and live in close proximity to each other. These results are important because we can now make a final determination about how biodiverse our school campus is. We are also able to see how changes in the environment may affect the slug population and the specific species that reside there. Our sample size was very small, due to the fact that some samples did not show up as having sufficient DNA on the gels that we ran. Also, some samples did not have enough determined bases in order to identify a slug species. In order to truly make conclusions about the biodiversity of the slugs at the Ethical Culture Fieldston School campus we would need to have more samples. In the future, collecting more samples would be beneficial because it would result in us ending up with more BLAST identifications. Despite this minor setback, we were pleasantly surprised by our results. We did not hypothesize that from our small sample size of only 8 that we would obtain 2 different species. If there are 2 different species in a collection of 8 samples, the Ethical Culture Fieldston School campus may not have a diverse slug population.

References

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