

The Effect of Human Interference on the Biodiversity of Terrestrial Spiders In Western Suffolk County of Long Island

Aiden Ciesluk and Dean Festa
West Islip High School

Abstract

The different species of spiders that live on Long Island can have both positive and negative effects on the environment. Twenty-five spiders were caught with pitfall traps and after taking microscopic pictures of them, legs were removed and the Cold Spring Harbor lab procedure for DNA extraction, PCR, and gel electrophoresis were followed. Then the successful samples were sent to a lab for Sanger Sequencing. After getting the results back, DNA Subway and GenBank were used to analyze the sequence results. Out of twenty samples tested, five samples had successful DNA sequences. It was found that using half of a spider's body rather than only one leg was more successful. All of the spiders that had positive results are commonly found throughout Suffolk County. Human foot traffic did not seem to have an effect on where spiders live as we found spiders in different environments, therefore human foot traffic does not affect spider biodiversity.

Introduction

- There are currently about forty species of spiders that have been barcoded on Long Island, but more are being discovered every day along with different invasive species (Barrett & Hebert, 2005).
- Some of these unknown species can be dangerous to humans as they could be venomous or poisonous, but many could also be beneficial because some venom can help with medical conditions ("Deseret News", 2018). Other spiders could also have a positive effect on the ecosystem, like controlling insect populations (Paetzold, Lee & Post, 2008) therefore their biodiversity needs to be preserved.
- This research aimed to trap spiders in different areas of foot traffic to determine the human effect on spider biodiversity. It was hypothesized that foot traffic from humans will have an effect on the amount of spider biodiversity. It was hypothesized that locations with minimal foot traffic would result in the greatest diversity of spiders.

Methods

Sample Collection and Documentation

DNA Barcoding:
DNA Extraction
PCR of CO1 Gene
Gel Electrophoresis

Sanger Sequencing and DNA Subway Analysis



Figure 1: Pitfall trap placement



Figure 3: After collecting spiders, DNA was extracted.

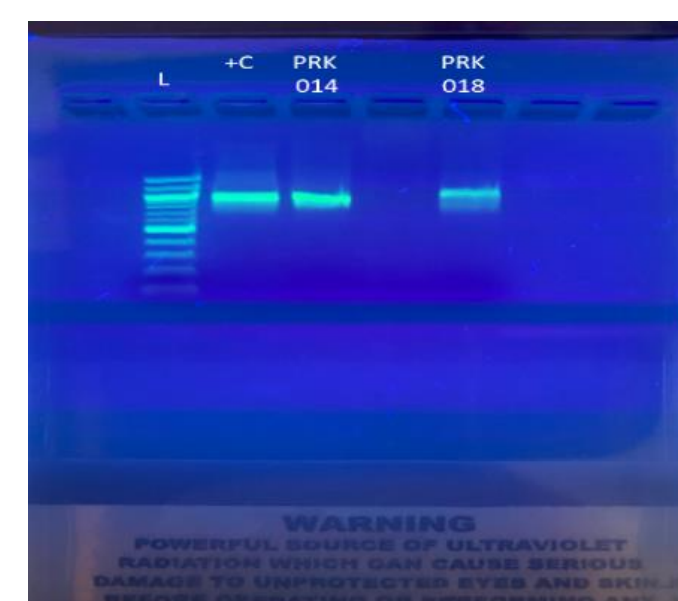


Figure 4: After PCR we used gel electrophoresis to see if DNA extraction was successful.

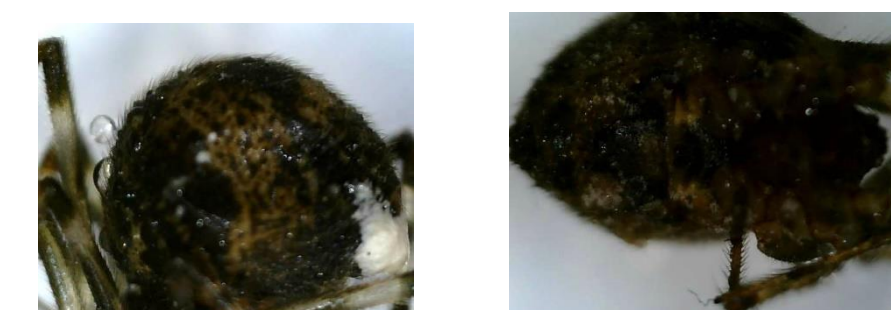


Figure 2: Spiders collected included PRK-018 (left) and PRK-014 (right)

Results

Table: Metadata and sequence results for PRK

Sample ID	Longitude	Latitude	Elevation (m)	Date Collected	Terrain	Litter	Human Traffic	Bird Nest nearby	Spider Webs	Bit Score	e-Value	Mismatches	Species ID
PRK-001	-73.305427	40.704896	6	19-Nov	Developed	None	Common	None	None	Low Quality Sequence			
PRK-006	-73.305427	40.704896	6	4-Nov	Cement	None	Occasionally	2	1	722	0	1	<i>Leptyphantes leprosus</i>
PRK-012	-73.280204	40.720997	n/a	20-Nov	Developed	None	Occasionally	None	Many	933	0	0	<i>Parasteatoda tepidariorum</i>
PRK-014	-73.280204	40.720997	n/a	20-Nov	Developed	None	Occasionally	None	Many	1088	0	0	<i>Parasteatoda tepidariorum</i>
PRK-018	-73.280204	40.720997	n/a	20-Nov	Developed	None	Occasionally	None	Many	910	0	0	<i>Parasteatoda tepidariorum</i>

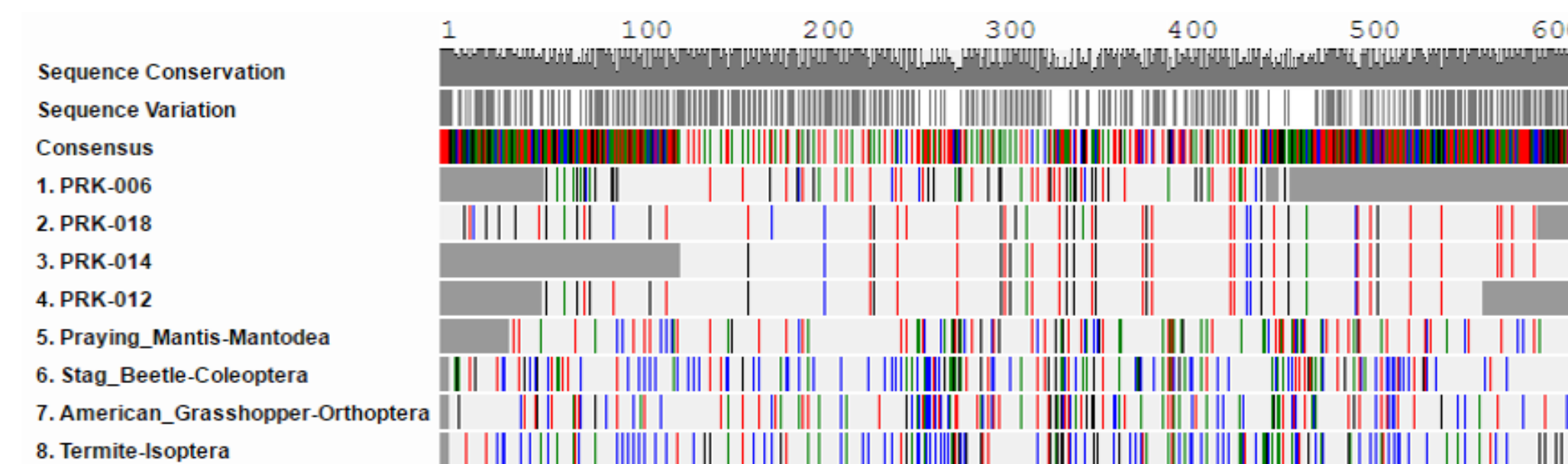


Figure 5: Barcode of the samples sequenced compared to control samples, showing areas of conservation. PRK-012, PRK-014, and PRK-018 all have similar barcodes because they are the same species while PRK-006 is quite different as it belongs to a different genus.

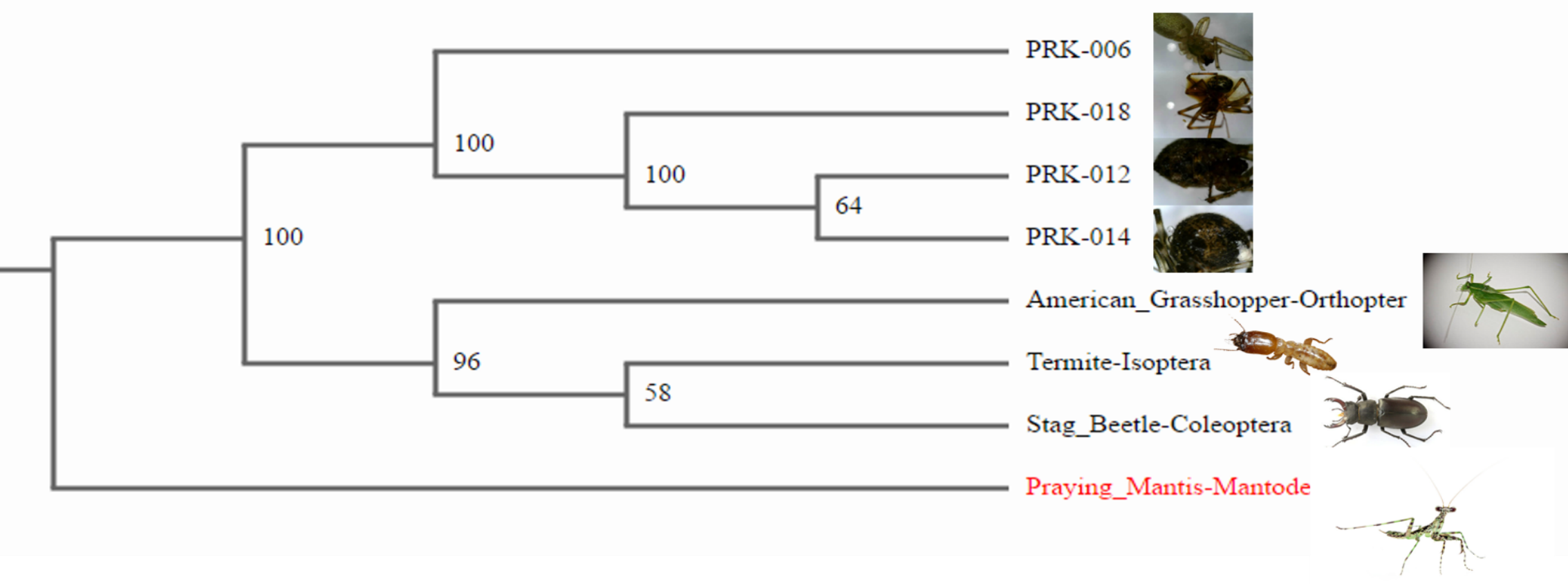


Figure 6: Phylogenetic tree showing comparison between samples collected and control samples

Discussion and Conclusions

- After catching all of the spiders, the DNA was extracted and sent to a lab for Sanger Sequencing. After getting the results back, the spiders were identified by comparing their DNA sequences to others that were already published in GenBank.
- Almost all the spiders that were sequenced were collected in areas of occasional human foot traffic, so the hypothesis about the foot traffic affecting biodiversity was not able to be answered.
- When the spiders were collected it was getting close to winter and it was getting colder so certain spiders could have thrived more in the cold and therefore have been more abundant which decreases the biodiversity.
- Different collection sites could have different environmental features, such as a natural beach might have more of a certain species of spiders rather than the spiders found at a man made beach. This could be future research.

References

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