Spider Diversity in Van Cortlandt Park
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Abstract
The purpose of this project was to determine the biodiversity of spiders in Van Cortlandt Park. This objective was completed by scanning a wide variety of areas in the park and collecting spiders with different apparent characteristics. After the spiders were collected, the DNA was extracted. Results were sequenced and then analyzed using bioinformatics to compare results to known species. After sequencing, one species, Cicurina japonica was identified. Cicurina japonica is predominantly found in Japan and Korea, and has been introduced to Europe. It has only been identified in Gloucester County, New Jersey in December of 2018 and is a non-native species, and therefore, may be invasive.

Introduction
- Spiders are members of phylum Arthropoda and class Arachnida
  - They are secondary consumers that feed on other spiders or small insects
  - Most spiders are terrestrial and live on or near land
- The woods, wetlands, and meadows all provide a home to many animals, including many species of spiders
  - Some species of spiders in New York City include the nursery web spider, sac spider, black and yellow garden spider, sheet web weavers, grass spider, American house spider, nocturnal orb weaver spider, jumping spider, crab spider, wolf spider, brown recluse, black widow spider
- Van Cortlandt Park is located in the Bronx, NY, and contains over 1,146 acres of land
  - Spiders were collected from a wide variety of areas in Van Cortlandt Park such as woods, tree trunks, and grassy areas

Materials and Methods
The spiders were collected in Van Cortlandt Park on October 18, 2018
  - 22 samples were collected
  - Spiders were submerged in ethanol
  - DNA was extracted
  - PCR was performed
  - Gel electrophoresis was used to confirm PCR products
  - PCR was sent for sequencing

Figure 1: Sample Locations in Van Cortlandt Park

Figure 2: Spider Images

Figure 3: Trimmed MUSCLE Alignment of Spider Sequences

Table 1: Spider Species Identification
<table>
<thead>
<tr>
<th>Spider ID</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHJ-005</td>
<td>Cicurina japonica</td>
</tr>
<tr>
<td>RHJ-007</td>
<td>Cicurina japonica</td>
</tr>
<tr>
<td>RHJ-006-F</td>
<td>Cicurina japonica</td>
</tr>
</tbody>
</table>

Figure 4: Images of Cicurina japonica from the collection sites (compared to a ruler in centimeters) as well as an image of an adult Cicurina japonica, originating from Japan and Korea.

Discussion
- The purpose of this experiment was to determine the biodiversity of spiders in Van Cortlandt Park through the collection and sequencing of the spiders’ DNA
  - Of the 22 collected samples, the DNA from three was ultimately sequenced
  - The species Cicurina japonica was detected in Van Cortlandt Park
- One error of the experimentation process that inhibited the production of viable results was the testing of the DNA of spider legs
  - The leg of a spider consists predominantly of chitin and therefore did not contain high amounts of DNA available for sequencing
- The results produced from the experiment expand the park’s knowledge of the presence of Cicurina japonica, as well as providing a sighting of the Cicurina japonica species in New York City as a whole
  - The species is native to Korea and Japan, and has only been identified in the U.S. in Gloucester County, NJ, in December 2018.
- In the future, it is necessary that this experimentation be performed again in order to further expand the park’s knowledge of the other species present
  - Next time the experiment is performed it would be beneficial to take DNA from the bodies of the spiders

References
- Spiders are among the most effective predators of plant pests. (n.d.). Retrieved from https://www.terminix.com/blog/education/what-do-spiders-eat/
- We would like to acknowledge Dr. K for her help in the conducting of this experiment, as well as John Butler and Alex Byrne for aiding in the collection of spider samples. We would also like to thank the Urban Barcoding project for allowing us the opportunity to investigate the biodiversity of Van Cortlandt Park.

Acknowledgements

Trees and foliage at Van Cortlandt Park