



Earthworms were collected from various areas near the Bridle Path in Central Park to determine the degree of biodiversity, and this data was used to analyze overall trends. The samples were collected, their DNA extracted using the Chelex method, amplified by PCR, and sequenced. We examined how local microenvironments impact the biodiversity of worm species found in Central Park. We hypothesized that there would be more samples found in shady areas. Our hypothesis was not supported as more worm biodiversity was found in sunnier areas.

Introduction

- The term worm is applied to a variety of distantly related invertebrates that typically have slender, long bodies ("Worm," n.d.).
- Earthworms, specifically, "stimulate microbial activity, mix and aggregate soil, increase infiltration, improve water-holding capacity, and provide channels for root growth" (Edwards, n.d.).
- Earthworms live anywhere near soil ("Worm," n.d.).
- In North America, earthworms are an invasive species. The earthworms currently found in North America were introduced from Europe and Asia (Davis, 2003).
- Earthworms are the most abundant soil invertebrates (Edwards, n.d.)
- Worms can be found in a variety of habitats, as different species can live both in water and on land.
- Earthworms are hermaphrodites, so they have both male and female reproductive organs, but reproduction almost always occurs between two worms ("Earthworms," n.d.).
- We hypothesized that there would be more samples found in shady areas. Our hypothesis was not supported as more worm biodiversity was found in sunnier areas.



Bridle Path in Central Park

Earthworm Biodiversity in Central Park Serena Kesha,¹ Courtney Clarke,¹ Caroline Cole,¹ and Annie Kloimwieder¹ ¹Marymount School of New York



Figure 1. Location of Sample and Collection Area. On the left is a map of Central Park where the samples were collected from areas near the Bridle Path. On the right is a picture of one area near the side of the Bridle Path where some samples were collected, with a 1-foot ruler placed for scale.

Latin Name	Common Name	Number Found in Shady Habitat	Number Found in Sunny Habitat
Lumbricus castaneus	Chestnut worm	1	0
Eisenia andrei	Eisenia andrei	0	4
Lumbricus terrestris	Common earthworm	1	2

Table 1. Worm Species Identified in Central Park. Worms were collected from various areas in Central Park near the Bridle Path. The species were identified through DNA sequencing and BLAST analysis for eight of 28 samples.

Materials and Methods

- 28 worm samples
- DNA isolation by chelex
- Invertebrate program used for PCR
- amplification with the invertebrate COI primers • Gel electrophoresis was used to separate the
- DNA by size in order to confirm that the PCR was successful
- Samples were sequenced by Azenta and analyzed using BLAST.

Discussion

• Out of the 30 samples that were collected • 8 were successfully amplified

• 3 different species of earthworms

• Distribution of worms

 \circ 80% of the worms collected were found in sunny areas \circ 20% were found in shady areas

• This was unexpected as "continuous sunlight exposure for more than 3h was found lethal to worms".

• Two of the three species were epigeic species, living on the surface of the soil

• These worms could have been on the surface for less than 3 hours before they were collected.

• We found that the majority of the total samples collected were found in sunny areas.

• We may have preferentially collected from sunny areas, rather than shady areas. Due to the time of the year the samples were collected, the cool fall weather could also have been a factor contributing to the results of our collection as well.

• In the future

• collect samples from various depths of soil • gather data on soil pollution levels and soil quality

References

Davis, C. W. (2003, July 20). An invasion of hungrier, bigger worms. The New York Times. Retrieved October 26. https://www.nytimes.com/2003/07/20/nyregion/environment-an-invasion-of-hungrier-bigger-worms.html

Edwards, C. A. (n.d.). *Earthworms* | NRCS Soils, Natural Resources Conservation Service . Retrieved October

ttps://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/health/biology/?cid=nrcs142p2_053863.

Encyclopædia Britannica, inc. (n.d.). Worm. Encyclopædia Britannica. Retrieved October 21, 2021, from https://kids.britannica.com/scholars/article/worm/77503

Flatow, I., & Groffman, P. (2007, March 23). The trouble with earthworms. NPR. Retrieved October 26, 2021 from https://www.npr.org/templates/story/story.php?storyId=9105956

Misra RB, Lal K, Faroog M, Hans RK. Effect of solar UV radiation on earthworm (Metaphire posthuma). Ecotoxicol Environ Saf. 2005 Nov;62(3):391-6. doi: 10.1016/j.ecoenv.2004.11.008. PMID: 16216633. Oligochaeta." BioKIDS.

http://www.biokids.umich.edu/critters/Oligochaeta/#:~:text=What%20kind%20of%20habitat%20do,moist%20s oil%20conditions%20to%20survive

Park history. Central Park Conservancy. (n.d.). Retrieved October 29, 2021, from https://www.centralparknyc.org/park-history

Ramirez, K. S., Leff, J. W., Wall, D. H., & Fierer, N. (n.d.). Soil communities of Central Park. New York City: A biodiversity melting pot. NASA/ADS. Retrieved October 27, 2021, from https://ui.adsabs.harvard.edu/abs/2013AGUFMGC53A1021R/exportcitation.

Sain-Baird, J. (2017, April 25). How central park keeps New York City healthy. Central Park Conservancy. Retrieved October 29, 2021, from https://www.centralparknyc.org/articles/park-city-healthy.

Jniversity of Nebraska Lincoln. (n.d.). Asian jumping worm. Nebraska Invasive Species Program. Retrieved November 4, 2021, from https://neinvasives.com/species/insects/asian-jumping-worm.

JPenn. (n.d.). Earthworms. Penn Arts and Sciences. Retrieved October 28, 2021, from https://www.sas.upenn.edu/~rlenet/Earthworms.html

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