

Does Bark Texture have an Influence on Tree-Based Lichen Biodiversity on Long Island?

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Abstract:

By collecting a variety of lichen species from a variety of different trees, our group, Jacticose, posed the following question: Does bark texture have an influence on tree-based lichen biodiversity on Long Island? Due to time, access, and sequencing limit restraints, we took a convenience sample of different trees and lichen patches through a biased selection process. We collected lichen samples from three local areas from smooth and rough barked trees using chisels and tweezers. We then organized the samples between rough and smooth bark, and transferred them from paper bags to tubes of ethanol in order to preserve each sample. Across our 20 samples, we confidently matched 12 species of lichen to already existing species in the National Center for Biotechnology Information (NCBI) DNA sequence databases. Our rather unique samples largely located on rough barked trees suggested an answer to our research question.

Introduction:

Prior to our sampling process, we knew that...

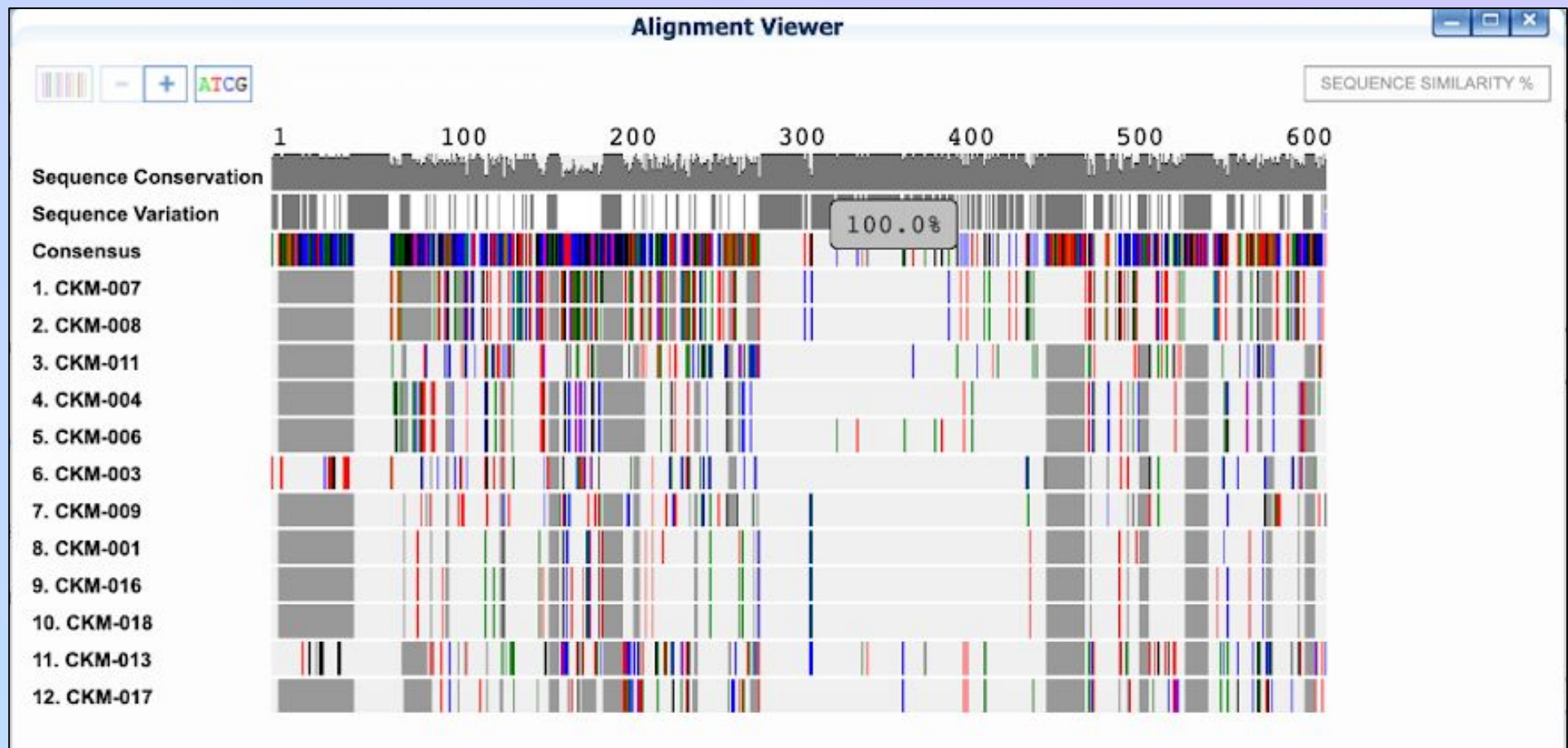
- The symbiotic relationship between a fungi and and algae is what makes up a lichen.
- Lichens tend to appear on natural surfaces that can provide ample space.
- Each species of lichen have slightly different shapes, colors. and textures.
- Given that there are 3,600 discovered species of lichen in North America, there is reason to believe that more still have yet to be identified!



Collection tools
(shown above)

Results:

Figure 3:



The MUSCLE function shows the similarities and differences between the samples' sequences. The colored lines signify differences in the base pairs between the samples while the gray areas indicate the same sequence of base pairs.

Figure 4:

Sample ID#	Lichen Taxonomic Identity	Type of Bark
CKM-001	<i>Punctelia guanchica</i>	Rough
CKM-004	<i>Lepraria finkii</i>	Rough
CKM-013	<i>Phaeophyscia ciliata</i>	Rough
CKM-018	<i>Punctelia rudecta</i>	Rough
CKM-003	<i>Lecanora pulverulenta</i>	Smooth
CKM-006	<i>Lepraria finkii</i>	Smooth
CKM-007	<i>Naganishia globosa</i>	Smooth
CKM-008	<i>Naganishia globosa</i>	Smooth
CKM-009	<i>Myelochroa aurulenta</i>	Smooth
CKM-011	<i>Biatora printzenii</i>	Smooth
CKM-016	<i>Punctelia rudecta</i>	Smooth
CKM-017	<i>Physcia stellaris</i>	Smooth

References:

Allen J, Lendemer, J. 2021. Urban Lichens: A Field Guide for Northeastern North America. Yale University Press. 158 pages.

Armstrong R.A.1990. Dispersal, establishment and survival of soredia and fragments of the lichen, *Hypogymnia physodes* (L.) Nyl. Volume 114 (Issue 2): 239-245. Free Access. 26 May 2023.

FS USDA government.U.S. Forest Service. About Lichens. Washington DC. Available from <https://www.fs.usda.gov/wildflowers/beauty/lichens/about.shtml#:~:text=There%20are%20approximately%203%2C600%20species.and%20all%20over%20the%20world.>

Method & Materials:

We sought to collect an equal amount of lichens from rough and smooth bark from the Friends Academy campus, Shu Swamp, and Bailey's Arboretum. We then proceeded to extract & amplify the DNA samples.

The steps for DNA extraction are as follows:

1. Add **lysis solution** to samples to break cell membrane
2. **Incubation** to help lyse cell through breaking down celluloid materials
3. **Centrifuge** to separate supernatant and pellet where we take only the component that contains DNA after
4. Add **silica** to purify DNA components of the supernatant
5. Repeat steps of **incubation and centrifuge** to extract DNA

We then proceeded to amplify the DNA through PCR

1. Add **PCR reagents**
2. Add **source DNA & primers** to amplify **ITS region**
3. Amplify in **thermal cycler**

Our next step was then to perform electrophoresis to separate the DNA fragments by size

→ This showed us the DNA structure of each sample that we are able to confirm our results with.

Discussion:

- We sorted the samples by which type of tree it came from: rough or smooth
- Four successful identifications from rough trees and eight from smooth trees.
 - Each sample that was collected from a rough tree had a unique identity; This is compels us to believe that rough barked trees host a more biodiverse group of lichen species.
 - There was an overlap in the species we identified from the smooth trees
- Our sample size was too small to make a conclusion about the biodiversity of each type of tree.
- There are several variables that were not controlled for in our sampling including the varying tree species and the lack of random selection when sampling.

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