



The Differing Biodiversity of Lichens on Coniferous and Deciduous Trees



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Abstract

While lichen can grow on any undisturbed surface, they often grow on trees. We predicted that deciduous trees would have more lichen biodiversity based on information Theodore Roper from Northern Michigan University found in a similar study. To test our hypothesis, we studied the biodiversity of lichen on both coniferous and deciduous trees. 20 lichen samples were collected from Shu Swamp Nature Preserve and Friends Academy. We then extracted and amplified the DNA. Next it was sent for sequencing, and after we received the sequencing data we analyzed and identified the species. Sequencing suggested that lichens on deciduous trees are more biodiverse than those on coniferous trees. Only two out of the eight deciduous samples were the same species, while six out of eight coniferous samples were *Physcia stellaris*, and the other two were *Punctella bolliana*. The remaining four samples did not sequence well, leaving them unidentified. We still question why lichen growing on deciduous trees are more biodiverse than lichen growing on coniferous trees, as we solely focused on determining which had an increased biodiversity rather than why. It is important to note that we did have a relatively small group of samples, so we cannot make a generalized claim regarding lichen biodiversity.

Introduction

Lichens are highly sensitive to environmental conditions in their ecosystems, this is because they receive all of their nutrients from the atmosphere, as they have no roots (National Park Service, 2019). The two primary categories of trees are coniferous, which have needles and cones all year round, and, deciduous trees that drop their leaves in the fall in preparation for the winter. We questioned the difference in biodiversity of lichen on coniferous and deciduous trees. While there wasn't much scientific data on this matter, Theodore Roper performed a similar study to provide an answer to this question. His data states that deciduous trees on average were covered with 15.94% more lichen than coniferous trees, and a mean of 1.46% more biodiversity of lichen on deciduous trees as opposed to coniferous trees. This result inspired our hypothesis, which was that there would be more biodiversity of lichen on deciduous trees than on coniferous trees.

Materials & Methods

To collect our 20 lichen samples we visited Shu Swamp Nature preserve for the deciduous samples, and Friends Academy for the coniferous samples.

- Collected samples
- Photographed and identified specimens
- Extracted DNA using the silica protocol
- Used PCR to amplify the ITS gene
- Checked amplification with gel electrophoresis
- We sent the amplified DNA out for sequencing, and then used DNA Subway to create a DNA barcode.
- The barcode was compared to known sequences to identify each specimen.

Friends Academy

Results

We were able to get DNA sequences from sixteen out of our twenty samples collected, eight coniferous and eight deciduous lichen samples. The four sequences left unidentified were due to poor quality or short sequences. We used Simpson's Diversity Index to calculate the biodiversity for both the coniferous and deciduous samples. The Simpson's Index for the lichen samples from coniferous trees was .375; The Simpson's Index for the deciduous samples was .843.

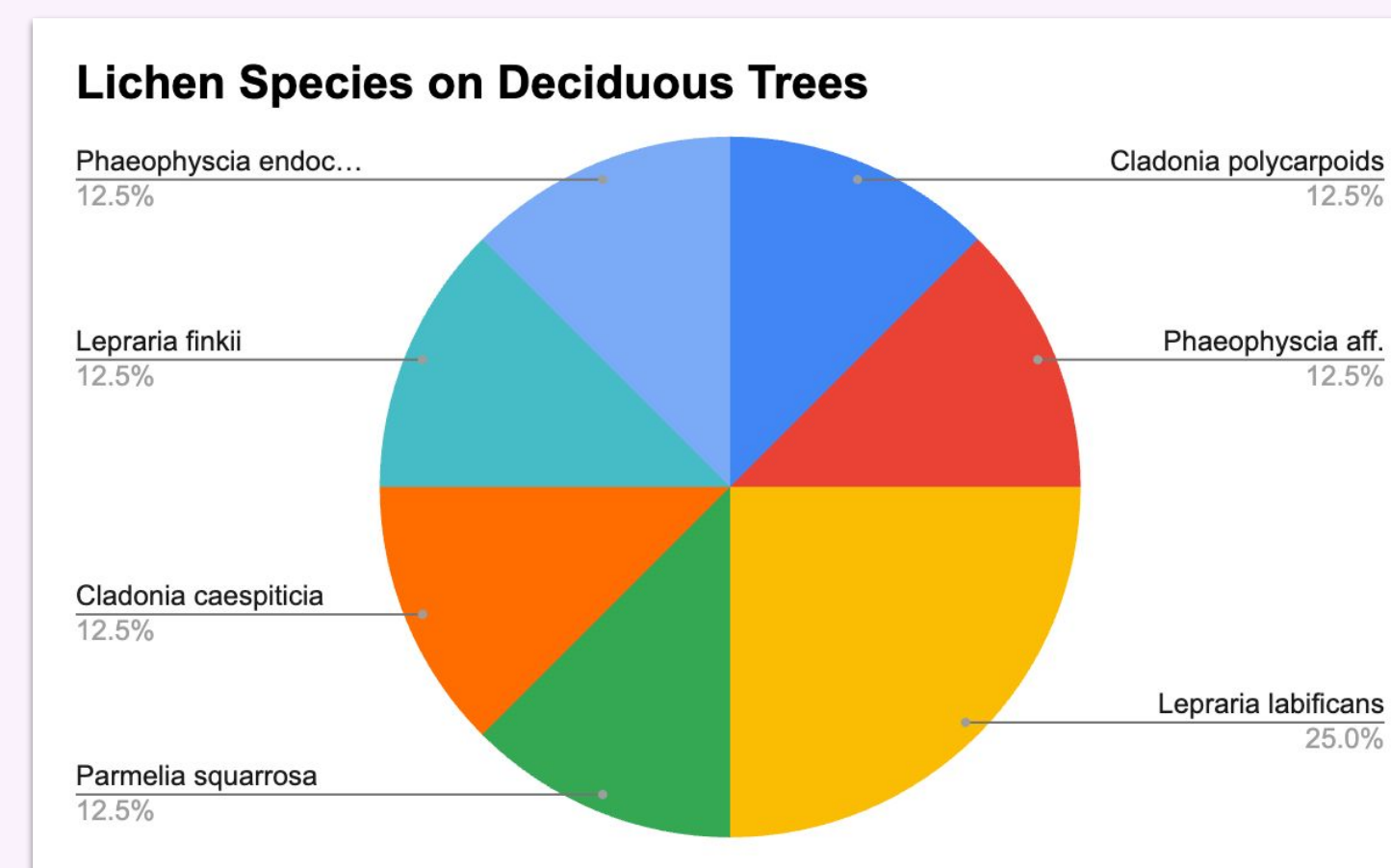


Figure 1: Percentage of each lichen species on deciduous trees

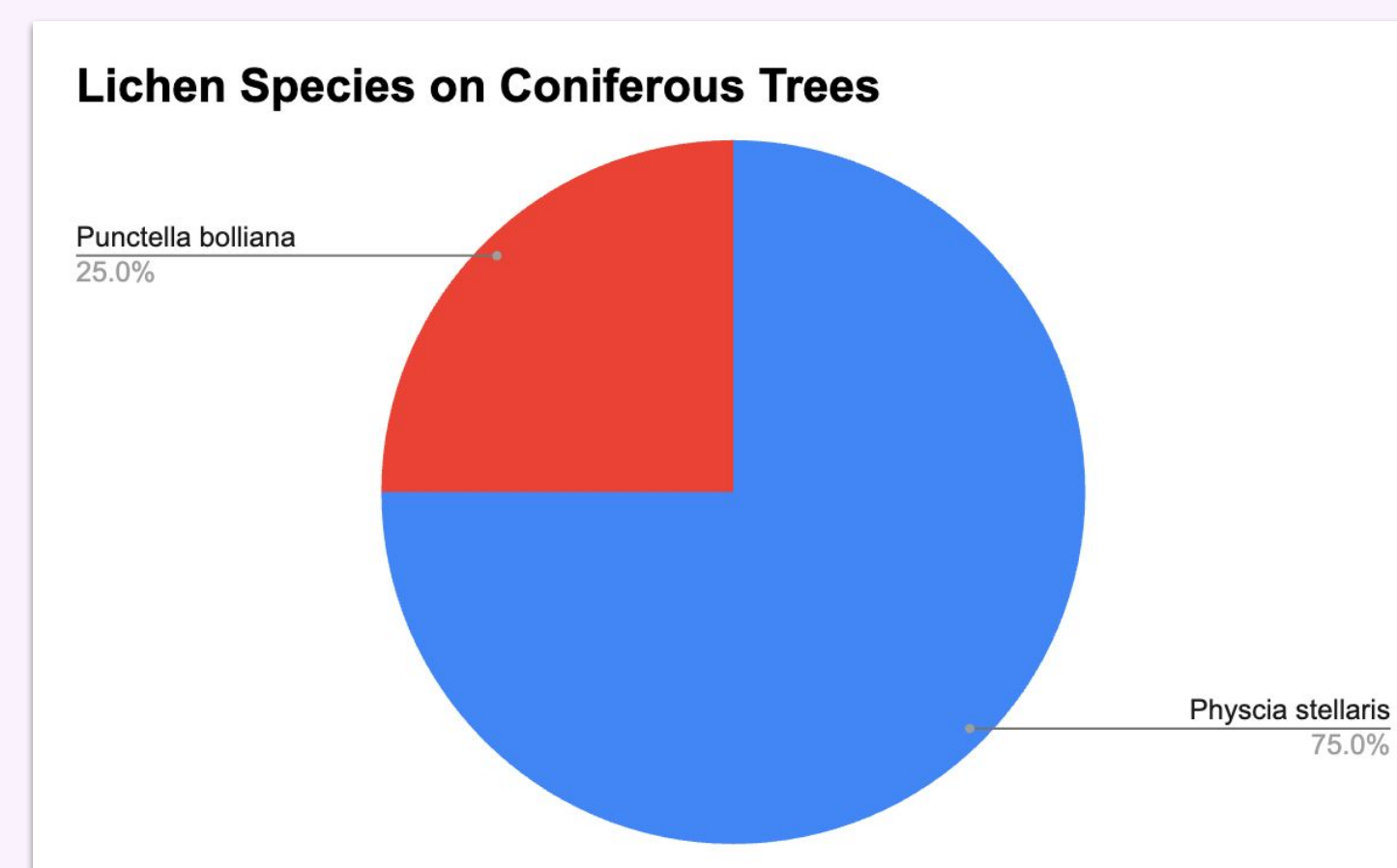


Figure 2: Percentage of each lichen species on coniferous trees

Physcia stellaris



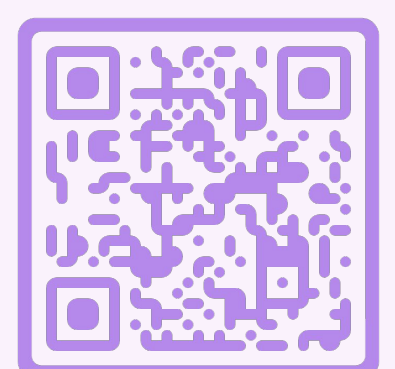
Figure 3: Chart displaying a lichen sample, *Physcia stellaris*, on a coniferous tree and under a microscope

Discussion

Our results convey that the biodiversity of lichen growing on deciduous trees is greater than the biodiversity of lichen growing on coniferous trees. We had a lot of repetition in the coniferous trees, but not a lot in the deciduous trees. For the deciduous trees, we had more of a variety of lichen and we had one repetition. Our intentions were to collect only at Shu Swamp and then we noticed that there were no coniferous trees there so we had to collect coniferous lichen samples at Friends Academy. It makes our data less reliable because there are two different habitats for the trees, with Friends Academy being a drier location than Shu Swamp. During this process, we did have a few errors, for example, we had four inconclusive sequences due to poor quality or length of the sequence. If further studies were undertaken, we suggest exploring various forested areas, rather than just two, and to also collect more samples to account for any unclear sequences.

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Report & References