

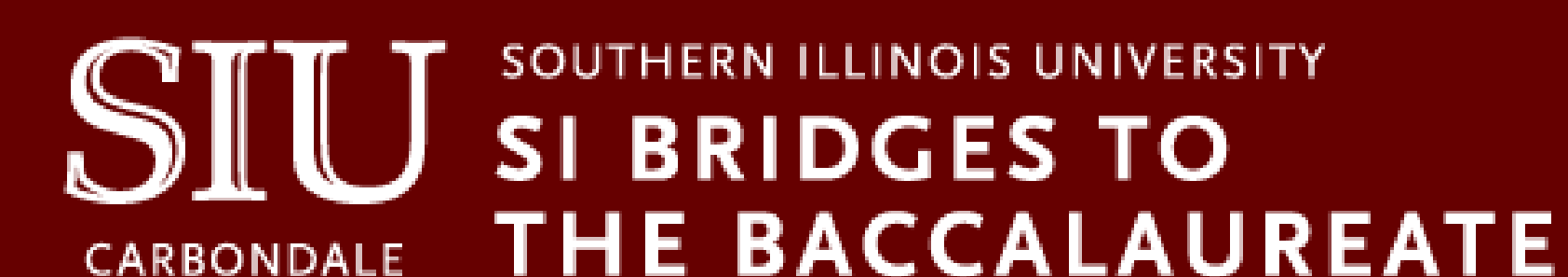
# Effects of Mesophication on the Biodiversity of Epiphytic Bryophytes



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## Introduction

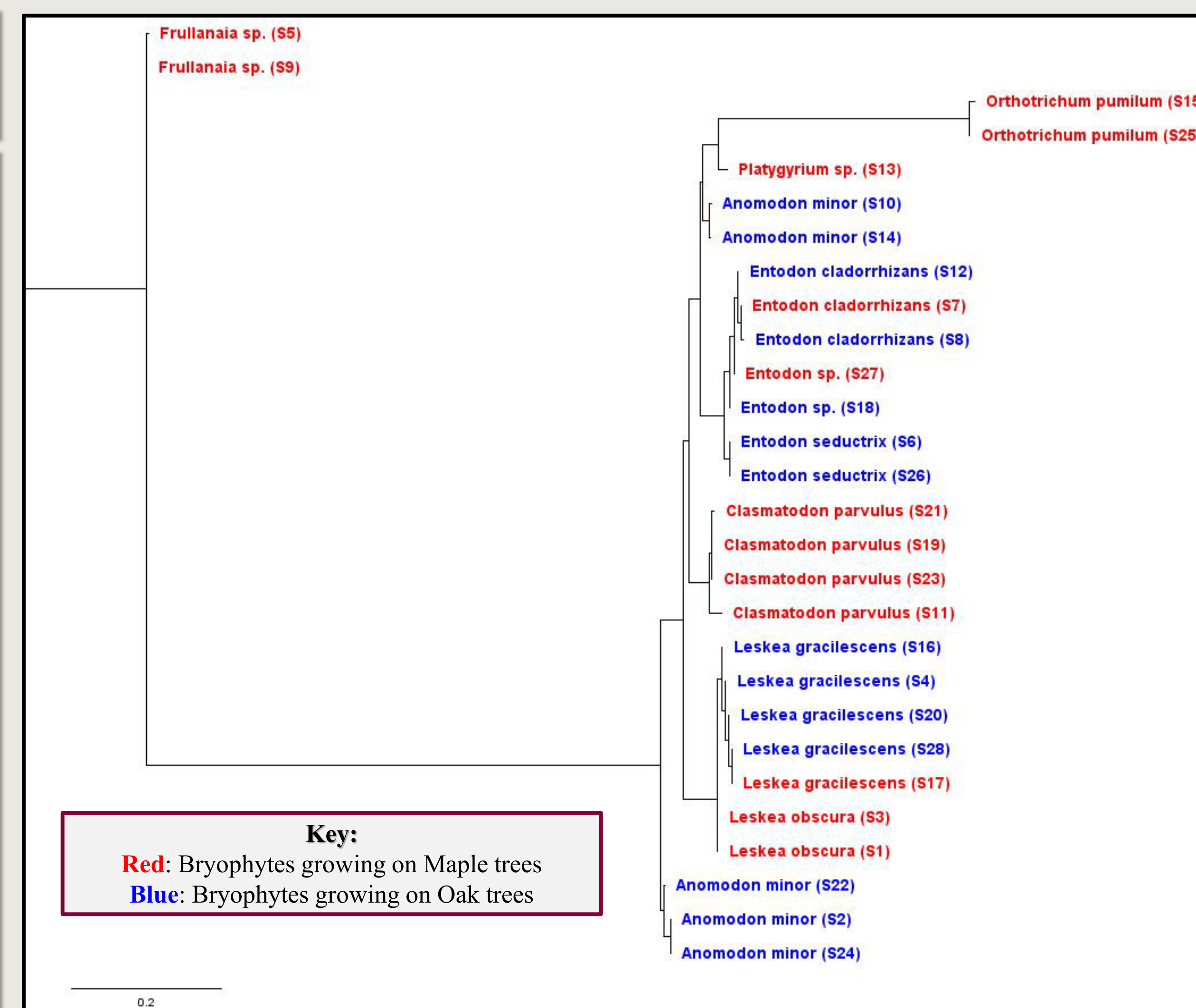
- Bryophyte** is the group name for mosses, liverworts, and hornworts. Bryophytes are small flowerless green plants that do not have roots or vascular tissue and grow on all substrates.
- Epiphyte** is any plant that grows on another plant that is not parasitic for physical support.
- Factors that affect epiphytic growth:** substrate texture, surroundings – light availability, relative humidity, temperature, bark-water capacity, height of bryophytes by location on tree (base, trunk, branch).
- Mesophication** is the process of removing fire from a forest that is fire tolerant. e.g. shift in forest structure from **sun-loving**, fire-tolerant species (**oaks**) to **shade-tolerating**, fire-sensitive species (**maples**).
- Species supported by oaks (animals, epiphytic plants) may not be supported by maples.
- We used DNA barcoding region trnL-F (transfer RNA gene) to identify bryophytes on species level.
- The objective of this study was to determine if the biodiversity of epiphytic bryophytes were impacted by mesophication.**



## Preliminary Results

**Table 1:** Summary of sample collection data for oak and maple trees, and abiotic conditions like temperature, height of bryophyte from base, bark-water capacity and moss growth forms.

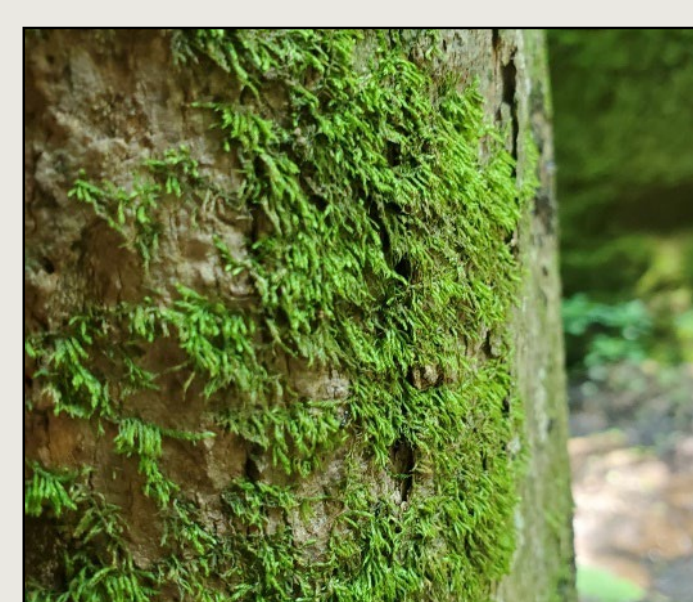
Bryophyte Sample No.	Tree Common Name	Bryophyte - scientific name	Location name	Management	Temp (°C)	Height of bryophyte from base (cm)	Bark-water capacity (%)	Moss Growth Form
1	Silver Maple	<i>Leskea gracilescens</i>	Marion, IL	Unmanaged	18.6	25	60.53	pleurocarp
2	Chestnut Oak	<i>Anomodon minor</i>	Marion, IL	Unmanaged	17.6	15	77	pleurocarp
3	Silver Maple	<i>Leskea obscura</i>	Selmaville, IL	Managed	39	22	60.53	pleurocarp
4	Shingle Oak	<i>Leskea gracilescens</i>	Selmaville, IL	Managed	39	15	-	pleurocarp
5	Silver Maple	<i>Frullanaia sp.</i>	Valier, IL	Managed	23.9	50	60.53	-
6	White Oak	<i>Entodon seductrix</i>	Benton, IL	Managed	18.9	57	58.1	pleurocarp
7	Red Maple	<i>Entodon cladorrhizans</i>	Carterville, IL	Managed	10.6	48	74	pleurocarp
8	Southern Red Oak	<i>Entodon cladorrhizans</i>	Energy, IL	Managed	11.2	20	52.9	pleurocarp
9	Sugar Maple	<i>Frullanaia sp.</i>	Alto Pass, IL	Unmanaged	27.4	22	86	-
10	Red Oak	<i>Anomodon minor</i>	Alto Pass, IL	Unmanaged	20	86	55.7	pleurocarp
11	Red Maple	<i>Clasmatodon parvulus</i>	DeSoto, IL	Unmanaged	21.2	82	74	pleurocarp
12	Red Oak	<i>Entodon cladorrhizans</i>	DeSoto, IL	Unmanaged	17.2	76	55.7	pleurocarp
13	Sugar Maple	<i>Platygyrium sp.</i>	Cobden, IL	Unmanaged	18.8	140	86	pleurocarp
14	Red Oak	<i>Anomodon minor</i>	Cobden, IL	Unmanaged	20.2	160	55.7	pleurocarp
15	Red Maple	<i>Orthotrichum pumilum</i>	Carbondale, IL	Managed	14.8	72	74.4	acrocarp
16	White Oak	<i>Leskea gracilescens</i>	Edwardsville, IL	Managed	22.5	80	58.1	pleurocarp
17	Red Maple	<i>Leskea gracilescens</i>	Carbondale, IL	Managed	17.3	10	74.4	pleurocarp
18	Northern Red Oak	<i>Entodon sp.</i>	Carbondale, IL	Managed	15.6	200	55.7	pleurocarp
19	Maple	<i>Clasmatodon parvulus</i>	Cario, IL	Unmanaged	14.2	34	-	pleurocarp
20	White Oak	<i>Leskea sp.</i>	Cario, IL	Unmanaged	4.1	33	58.1	pleurocarp
21	Red Maple	<i>Clasmatodon parvulus</i>	Marion, IL	Unmanaged	18.8	122	74.4	pleurocarp
22	Black Oak	<i>Anomodon minor</i>	Marion, IL	Unmanaged	17.1	11	54.5	pleurocarp
23	Maple	<i>Clasmatodon parvulus</i>	Murphysboro, IL	Unmanaged	17.7	14	55	pleurocarp
24	Oak	<i>Anomodon minor</i>	Murphysboro, IL	Unmanaged	12.8	10	70	pleurocarp
25	Red Maple	<i>Orthotrichum pumilum</i>	Murphysboro, IL	Managed	24.1	55	74.4	acrocarp
26	Pin Oak	<i>Entodon sp.</i>	Murphysboro, IL	Managed	22.5	14	90	pleurocarp
27	Red Maple	<i>Entodon sp.</i>	Rend Lake, IL	Managed	16.2	60	74.4	pleurocarp
28	White Oak	<i>Leskea sp.</i>	Rend Lake, IL	Managed	14.6	40	58.1	pleurocarp



**Figure 1: Bryophyte Phylogenetic Tree** inferred from analyzing the trnL-F gene sequences. DNA sequences were aligned using MUSCLE method in MEGA 11. The aligned trnL-F sequences were used to construct a maximum likelihood tree based on HKY+F+I+R2 model. To estimate reliability of each node, a bootstrap method was utilized with number of replications of 100. The final tree was annotated by FigTree to highlight taxa.

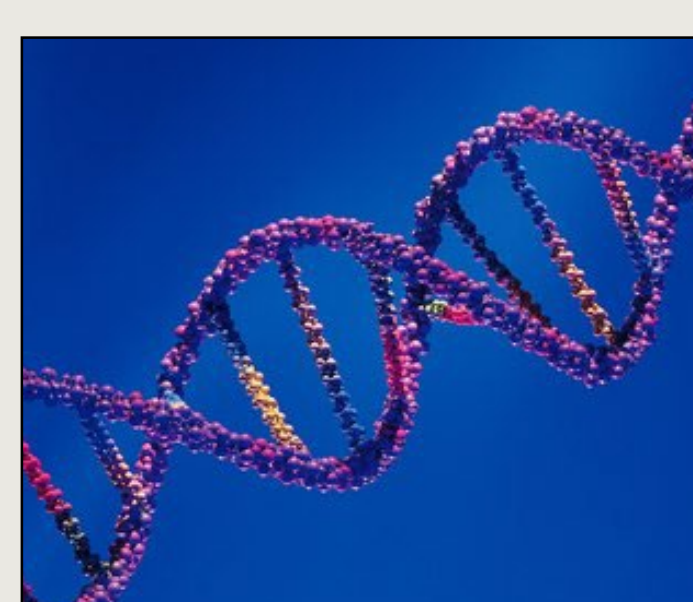
## Methods

### Sample collection



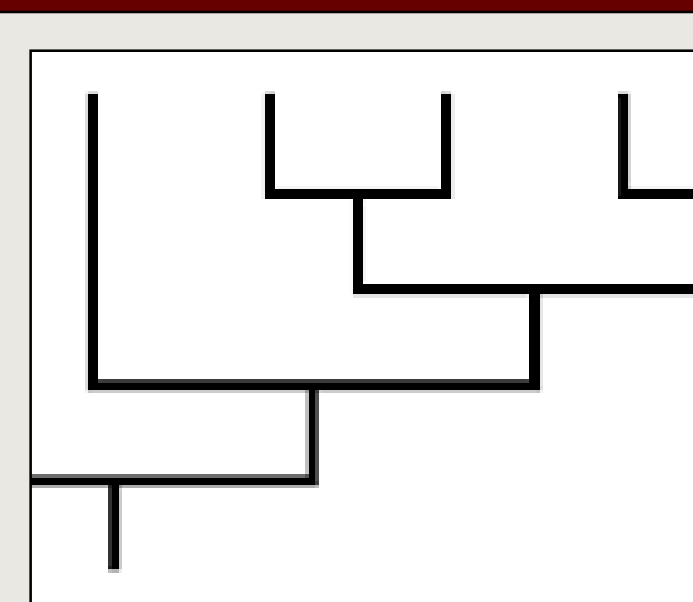
- 28 bryophyte samples were collected
- 14 samples each collected from maple and oak trees, respectively.

### DNA barcoding



- DNA extraction
- Setting up PCR reactions to isolate and amplify the trnL-F gene from all samples
- Sequencing trnL-F gene

### Phylogenetic analysis

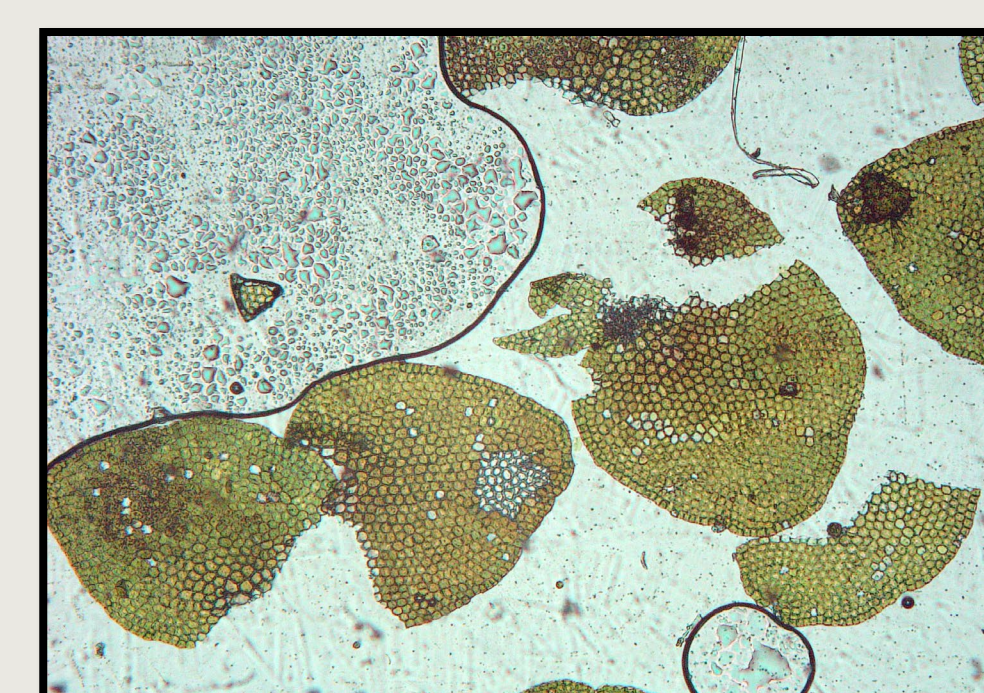


- Tree was constructed using IQtree software.
- Final tree was annotated by FigTree.

## Sample Morphology Identification



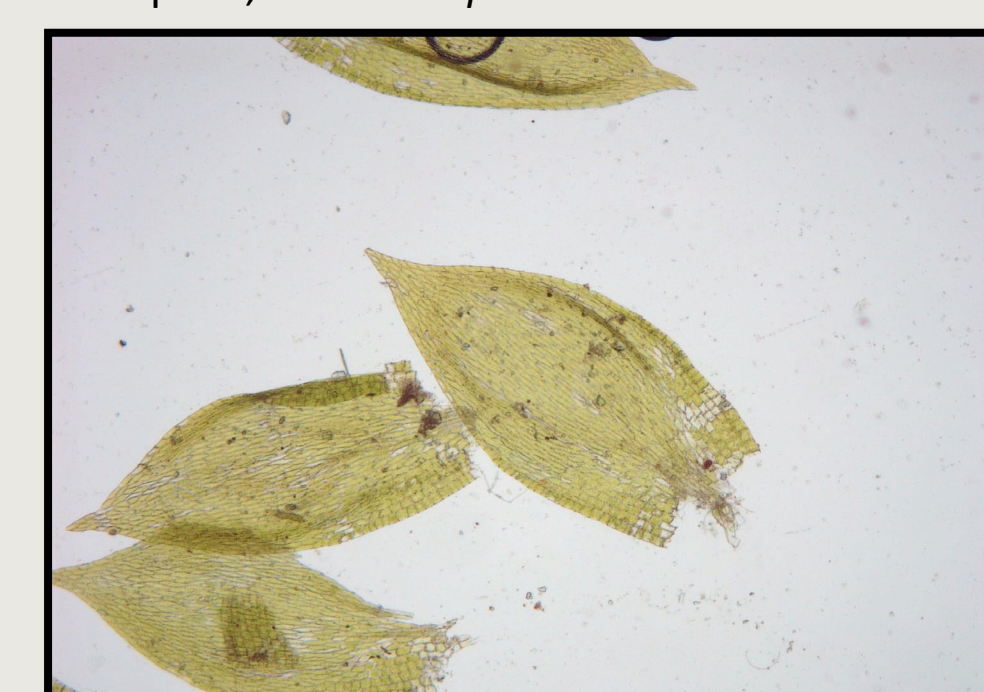
Sample 19, *Clasmatodon parvulus*



Sample 5, *Frullanaia sp.*



Sample 2, *Anomodon minor*



Sample 8, *Entodon cladorrhizans*

## Discussion and Future Directions

- Leskea sp.*, *Entodon sp.*, were found both on **oak and maple trees** and in both **managed and unmanaged areas**.
- Anomodon minor* were found only on **oak trees** in **unmanaged areas**.
- Orthotrichum pumilum* was found only on **maple trees** and in **managed areas**. *Clasmatodon parvulus* was found only on **maple trees** in **unmanaged areas**. *Platygyrium sp.* found only on **maple** in **unmanaged areas**.
- Only one genus of liverwort (*Frullanaia*) was found on **maple trees** in both **managed and unmanaged areas**.
- We observed **greater biodiversity** on maple trees as compared to oak trees.
- Currently, our study does not have enough evidence to show if mesophication influences the biodiversity of epiphytic bryophytes.

Going forward we plan to:

- Increase our sample size by gathering samples from more specific locations
- Revisit samples whose morphological ID did not match their phylogenetic ID

## Acknowledgements

Thanks to SIU, School of Biological Sciences, SI Bridges program and NIH for research opportunity and funding. Special thanks to Drs. Karen Renzaglia and Renee Lopez-Swalls for their guidance in the research project. I would also like to thank Dr. Sagwan-Barkdoll, William Browning and Jewel Green for helping me throughout this project.

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