Epiphytic macrolichen richness, diversity, and composition in boreal forested swamps, ecotones, and upland forests

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Forested Wetlands

- Forested wetlands are common, but understudied

- Provide many ecosystem services and are important habitats

- Lichens are abundant in forested wetland habitats
Epiphytic Macrolichen

• Composite organism
  = Fungus (or two) + Algae (and/or Cyanobacteria)

• Foliose and fruticose growth forms

• Good environmental indicators
  - Absorb moisture and particles from the air
  - Track pollution
  - Sensitive to their habitat
Lichen Diversity

• High species richness and diversity

• Richness = number of different species

• Diversity = richness + evenness

• High species diversity in ecosystems → higher ecosystem resilience
Rationale

• Wetlands are well studied, high biodiversity compared to non-wetland ecosystems
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• Is biodiversity in forested wetlands higher than non-wetland forests?

• Epiphytic lichens are abundant in forested wetlands

• Could lichens show higher biodiversity in forested wetlands than non-wetland forests?
Hypotheses

**H1** - Macrolichen richness and diversity is highest in forested swamps

**Ha** - Alternatively, ecotones have the highest richness and diversity

**H2** - Macrolichen community composition of forested swamps and upland forests is distinct and overlaps with ecotones
• 5 trees (bF) surveyed for macrolichen on each transect (DBH and height)

• Tree core samples and canopy cover measurements

→ In total, 15 sites, 45 transects, 225 trees surveyed
Forested Swamp

- Closed canopy
- Depressed shrub layer
- Moss ground cover
- Surface water hydrology
Ecotone

- Region of transition between two biological communities

- Can have higher biodiversity due to overlapping habitats
Upland Forest

- Drainage is sufficient so that soils do not become saturated for long periods of time

- No hydrophytic or aquatic processes
Results – Richness

• 22 macrolichen species overall; swamps 21, ecotones 18, uplands 16

• Macrolichen richness was 22% higher in swamps than upland forests
Kruskal-Wallis, $p = 0.004$

- Swamp: 0.82
- Ecotone: 0.019
- Upland: 0.001
Results - Diversity

![Boxplot of Macrolichen Diversity (H) for Swamp, Ecotone, and Upland environments](image)

- **Swamp**: Lower diversity than Ecotone and Upland.
- **Ecotone**: Moderate diversity, higher than Swamp but lower than Upland.
- **Upland**: Highest diversity among the three environments.
Results - Diversity

Kruskal-Wallis, p = 0.062

Macrolichen Diversity (H)

Swamp
Ecotone
Upland
Results - Diversity

Kruskal-Wallis, p = 0.062
**Results - Community Composition**

**NMDS**
- 3 D solution
- Stress = 0.123

**perMANOVA**
- The difference in lichen composition between transects is significant ($p = 0.018$)
Summary

- Macrolichen richness and diversity is highest in forested swamps, and lowest in upland forests

- Ecotones did not show elevated levels of richness and diversity

- Distinct groups formed for macrolichen community composition in swamps and upland forests, composition of both overlapped in ecotones
Species-At-Risk

Boreal felt lichen (*Erioderma pedicellatum*) Globally Endangered, locally Special Concern (NL)

→ 28 found on the trees surveyed, overall 100+ found
Research Implications

• Identified high lichen biodiversity in forested wetlands

• Assist in identifying wetlands of importance

• Contribute fine-scale patterns of lichen diversity

• Monitoring forested wetland condition
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