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Boreal birds and all you've ever wanted to know about their favorite structural attributes in mixed old-growth forests

Ines Diamant, Maxence Martin, Jacques Ibarzabal, Junior Tremblay, Hubert Morin

Université du Québec à Chicoutimi

Context – Old-growth forests

- High ecological value but endangered by human activities
- Important internal diversity – both in community composition and stand structure
- Shaped by the complex dynamics of natural disturbances (e.g. fire, windthrows, spruce budworm epidemics)

Issues defining "old-growth"

- Heterogeneity of old-growth forests : gradient of changing structure and composition driven by succession
- Can be classified into early, transitional and late old-growth
- Dynamic even after reaching the late old-growth stage

Forest management

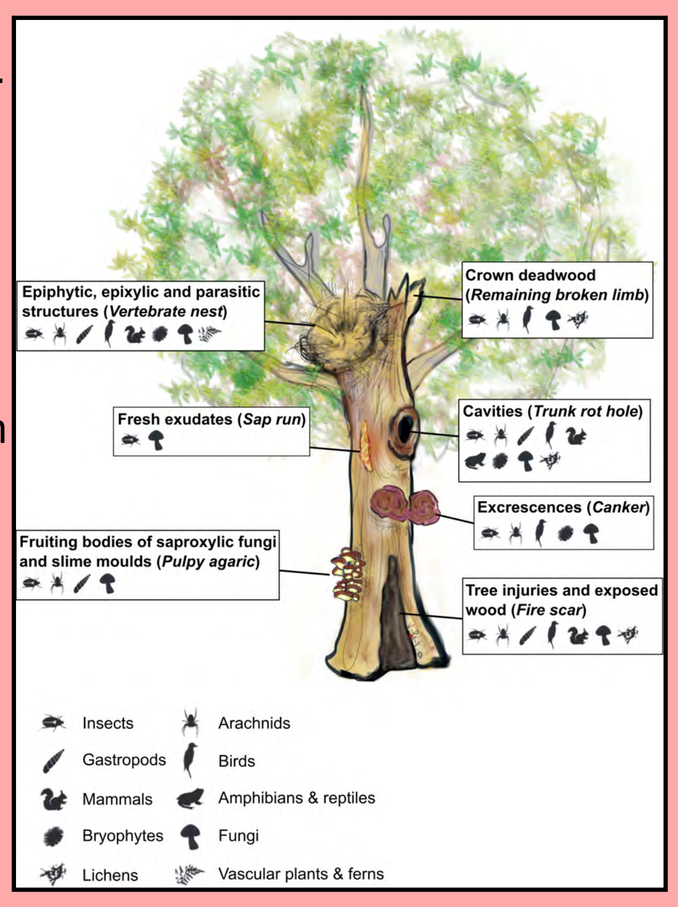
- Extensive use of low-rotation clearcuts (<100 years)
- Scarcity of late old-growth stands
- Fragmented and homogenized landscapes
- Declining bird populations associated with old-growth forests

Habitat & biodiversity

- Specific old-growth attributes (e.g. deadwood, habitat trees) and their dynamics, are part of the boreal forest's internal diversity
- Important structures for wildlife
- Their loss can impact species that depend on them

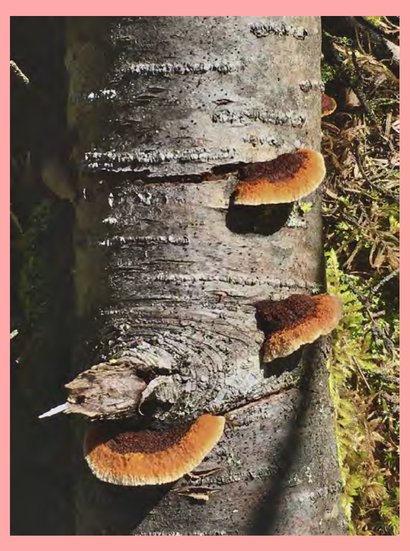
Tree-related microhabitats ("TreMs")

- Promising biodiversity indicator but almost unknown in North America
- Typology of Larrieu et al. (2018) for temperate European forests



Coarse woody debris (CWD)

- Recognized as a key habitat but very variable in volume, size, status (standing or downed) and decay



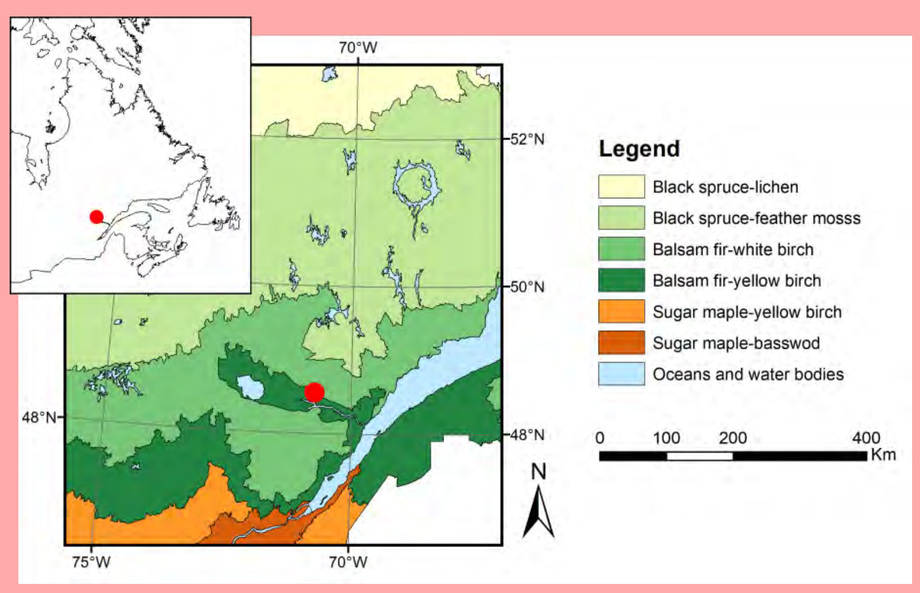
Objectives

> To understand how are structural attributes distributed in early and late old-growth forests

> To determine how are bird communities assembled in boreal mixedwoods in relation to attributes and successional stages

Methods

Study area : Monts-Valin National Park (Qc, Canada)



Forest inventory

- 20 plots in early old-growth forests (burned 90 years ago)
- 20 plots in late old-growth forests (burned > 130 years)
- Standing trees : species, DBH, vigor, TreMs
- Coarse woody debris : species, size, decay

Bird inventory

- Bioacoustic recorders in each plot
- Recording period : between 1 hour before and 2.5 hours after sunrise

Statistical analysis

- Multivariate analyses (PERMANOVA, BIOENV)

Expected results

> Early old-growth forests : higher abundances and richness of TreMs (higher proportions of large diameter trees such as aspen)

> Late old-growth forests : higher abundances of CWD (succession, secondary disturbances)

> Distinct bird community assemblages between the two forest groups

> Higher abundances of certain bird species depending on the structural attributes under study

Association between structural attributes, successional stage and bird assemblages

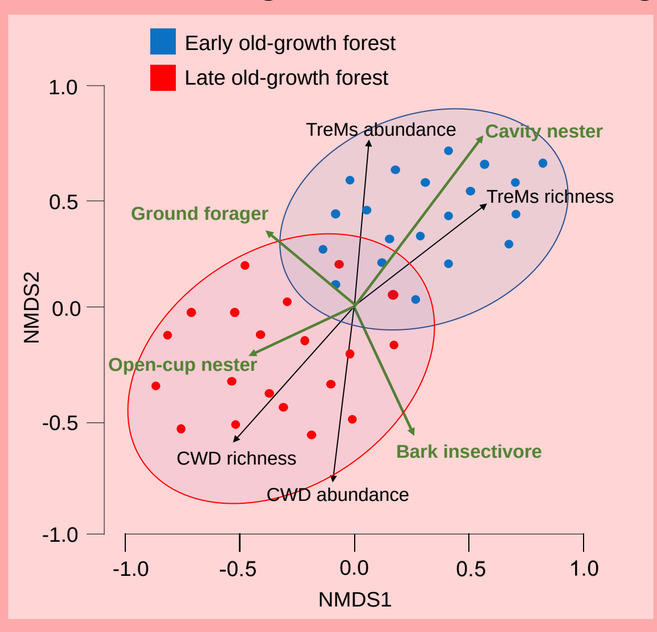


Figure 1. Non-metric multidimensional scaling (nMDS) illustrating the distribution of plots of early old-growth (blue) and late old-growth (red) forests in relation to the abundance of birds (grouped in foraging and nesting guilds) and the abundance and richness of TreMs and CWD in each plot.

References

1. Larrieu L, Paillet Y, Winter S, Bütler R, Kraus D, Krumm F, Lachat T, Michel AK, Regnery B et Vandekerkhove K. 2018. Tree related microhabitats in temperate and Mediterranean European forests: A hierarchical typology for inventory standardization. Ecological Indicators, 84 : 194-207.
2. Martin, M., Fenton, N. J., & Morin, H. (2021). Tree-related microhabitats and deadwood dynamics form a diverse and constantly changing mosaic of habitats in boreal old-growth forests. Ecological Indicators, 128(May), 107813.
3. Martin M, Paillet Y, Larrieu L, Kern CK, Raymond P, Drapeau P, Fenton NJ. In Review. Tree-related microhabitats are promising yet underused tools for biodiversity and nature conservation: a systematic review for international perspectives. Frontiers in Forests and Global Change