Caterpillar recruitment in response to tree diversity in an experimental forest

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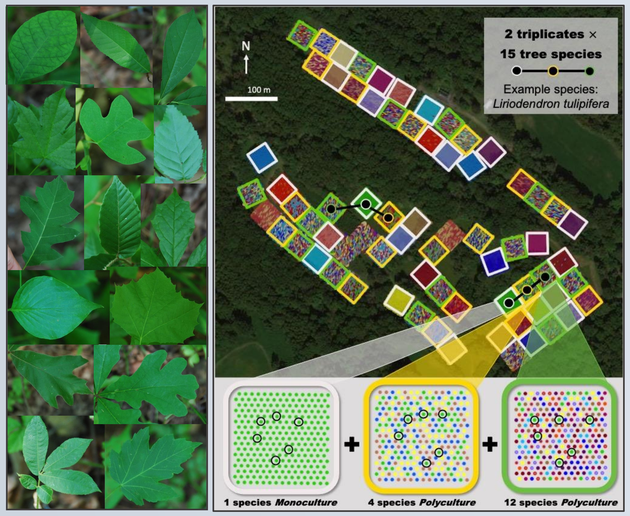
Motivation

- How do higher trophic levels respond to plant host diversity?
- We expect forests with higher tree species diversity to recruit a larger, more diverse caterpillar community, which in turn supports increased diversity and abundance in higher trophic levels ("diversity begets diversity")

Methods

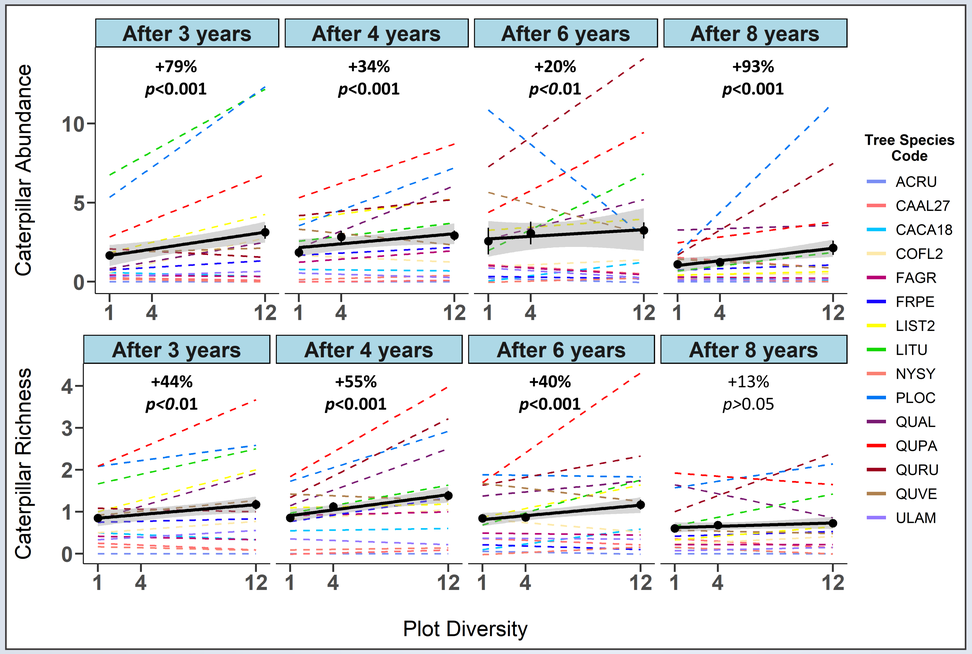


- BiodiversiTREE was planted in 2013 near Edgewater, MD. Plots are composed of 16 native tree species grown in single species or mixed species plots
- Subset of ~540 trees each year, visually searched 4 minutes per tree. All caterpillars collected and identified to morphospecies
- Larvae of moths, butterflies (Lepidoptera) and sawflies (Hymenoptera: Symphyta) included
- Analyzed results with generalized linear mixed model in R and (Poisson distribution)

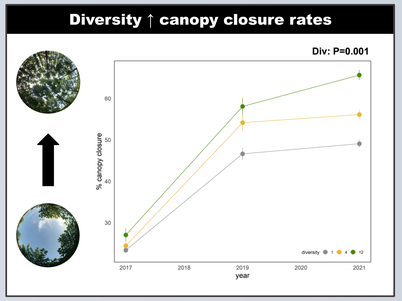
References

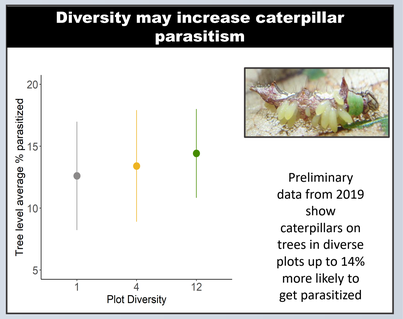
BiodiversiTREE: https://serc.si.edu/research/projects/biodiversitree. R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/. Douglas Bates, Martin Maechler, Ben Bolker, Steve Walker (2015). Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software, 67(1), 1-48. doi:10.18637/jss.v067.i01.

Trees in mixed species plots host more caterpillar individuals and morphospecies

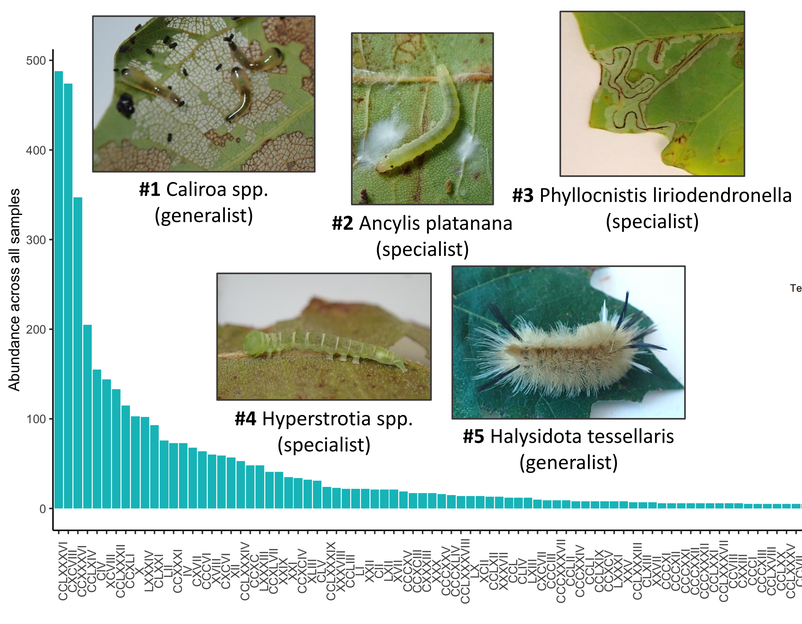


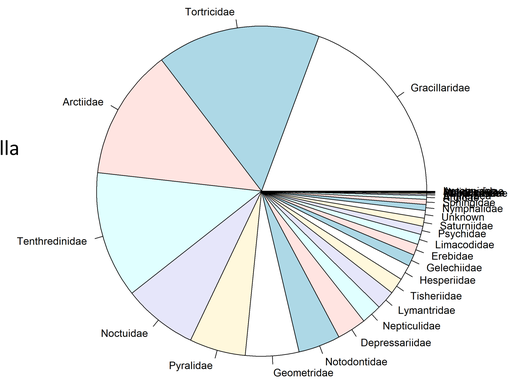
- Overall, 12 species mixture plots host 57% more caterpillars than single species plots
- Overall, 12 species mixture plots host 38% more caterpillar morphospecies than single species plots
- Structural complexity in diverse plots seems to provide habitat for more caterpillar predators and parasitoids, likely preventing increased host damage from larger caterpillar community





187 morphospecies from 29 families have been recruited to the forest so far





- Leafminers (Lepidoptera: Gracillaridae, Nepticulidae, Tisheriidae) are often overlooked, but they constitute ~23% of individuals
- Many published species descriptions are lacking info on host plant use and larval natural history. We are compiling a database
- Approximately 30% of morphospecies records are singletons

Singletons