The Comparison of Trapping Methods and the Effects of Environmental Variables for "Saproxylic" and "Other Woodland Using" Beetles.

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Research Background:

"Saproxylic beetles"- depend on dead, decaying and live woody substrates, as well as the process and products of wood decay.

Important ecologically through their sheer abundance and diversity and the provision of ecosystem services e.g. decomposition, nutrient cycling and pollination.

Many European species in decline and threatened, due to change/loss of woody habitats and substrates (particularly ancient/old-growth). A further threat is lack of knowledge regarding their conservation status and ecological requirements. There is a particular paucity of this information in Ireland, where this insect group, and forest invertebrates as a whole, are understudied.

To ensure the future conservation of saproxylic beetles in Ireland, conducting targeted, scientific research on their ecology is imperative.

Aims:

Overarching: Develop a robust sampling strategy for saproxylic and other woodland using beetles and broaden the knowledge of saproxylic beetle ecology in Ireland.

Specific:

1) Compare beetle abundance and diversity using three trapping methods in an ancient woodland.
2) Evaluate the influence of trap location (Interior versus Exterior) on beetle assemblages.
3) Quantify the influence of environmental variables on beetle populations.

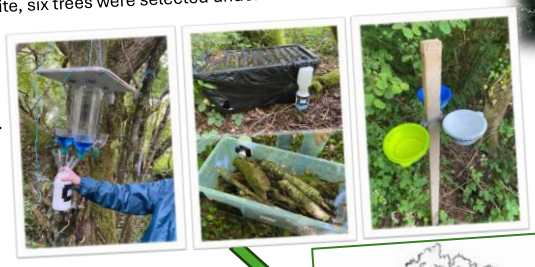
Methods:

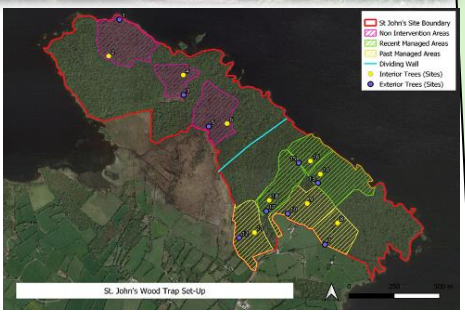
Study Area: St. John's Wood (SAC and SPA) located in the midlands (Co. Roscommon).
One of Ireland's largest surviving ancient woodlands (110ha) and hosts ~ 20% of the total Irish saproxylic invertebrate fauna.

Sampling Locations: Veteran *Quercus Robur* trees (n=18) were randomly selected across the woodland (>50m apart).
Nine trees were >20m from a woodland edge (Interior Trees), and nine were <20m from an edge (Exterior Trees).
Three different types of woodland management were identified on site, six trees were selected under each management.

At each sampling location three trap types used to collect beetles:

A) Bottle Intercept Trap, **B)** Container Emergence Trap, **C)** Pan Trap.



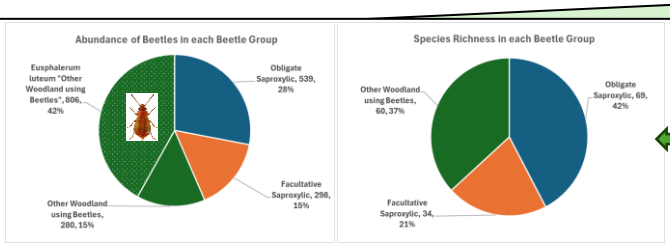


Environmental variables recorded around each tree (20m);

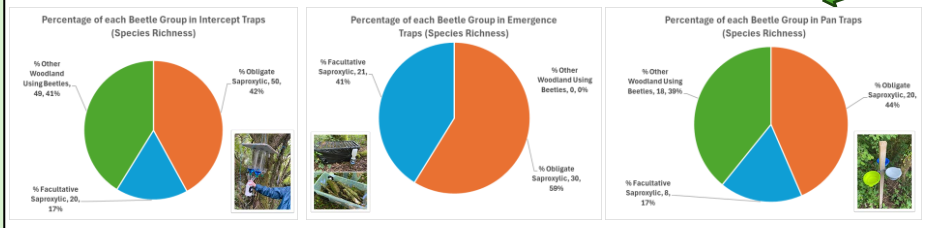
- Grounded deadwood volume and diversity,
- Vegetation diversity and structure,
- Light and temperature,
- Soil pH, moisture and organic matter.

Results:

1) Traps



Beetle Groups (All Traps Combined) - Saproxylic beetles are important in terms of overall abundance and species richness.

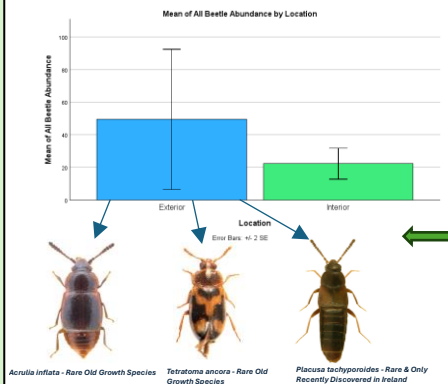


Beetle Groups (Per Trap Type) - Intercepts collected the highest biomass (86% of all beetles) and also the highest abundance of saproxylic beetles. However, when looking at the percentage of saproxylic beetle species collected per trap type, relative to all species collected per trap type, Emergence traps were most effective, followed by Pan and Intercepts.

When statistically testing the effects of trap type on the abundance and composition of beetles across all groups, the results varied.

All three trap types had species unique to them. Dropping any trap type would have resulted in the exclusion of these species (which included some new species to Ireland and many rare old-growth species). Results show that in a complex 3D habitat such as an ancient woodland, and when sampling for an ecologically diverse insect group, a combination of trap types is required. Intercepts should be used to collect a high abundance, but should be supplemented with Emergence and Pan traps for a more accurate representation of family and species richness.

2) Location



Beetle Groups and Sampling Location - Across all beetle groups there were no statistical differences in beetle abundance or family and species richness across location (Interior Vs Exterior). In all groups, however, the raw data shows that a higher abundance and richness of beetles were found from Exterior locations.

Both Interior and Exterior locations had species unique to them. If Exterior trees were dropped (as done in some studies to exclude edge-effect) 68 species (136 beetles) would have been missed. This includes two new species to Ireland and many rare species. It is, therefore, important to sample the Interior and Exterior of the woodland to collect a full suite of beetle species.

Woodland management also had no statistical significance for beetle abundance or richness, across all beetle groups. Again unique species were found under each of the management units. Further analysis of environmental variables will likely tease out the reasons for the presence of specific species in different sampling locations e.g. vegetation present, light levels....

3) Environmental Variables

GLMMs and Multivariate Analysis in Process

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