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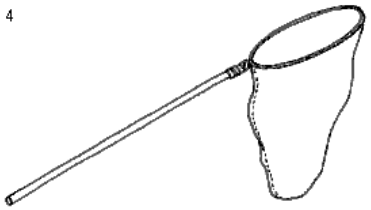
Bugs Across Trophic Levels Observe Valid Enrichments

Insects are extremely diverse in their functional roles, and whole trophic chains can be identified just within this ecologically heterogeneous class. Nitrogen and Carbon isotopes can be useful tools to describe trophic levels among insects and unveil unexpected patterns in their feeding ecology.

Additionally, because insects constitute a crucial food source for many animal groups, understanding variation in Nitrogen and Carbon isotopes among insects is fundamental for tracking these changes at higher trophic levels.

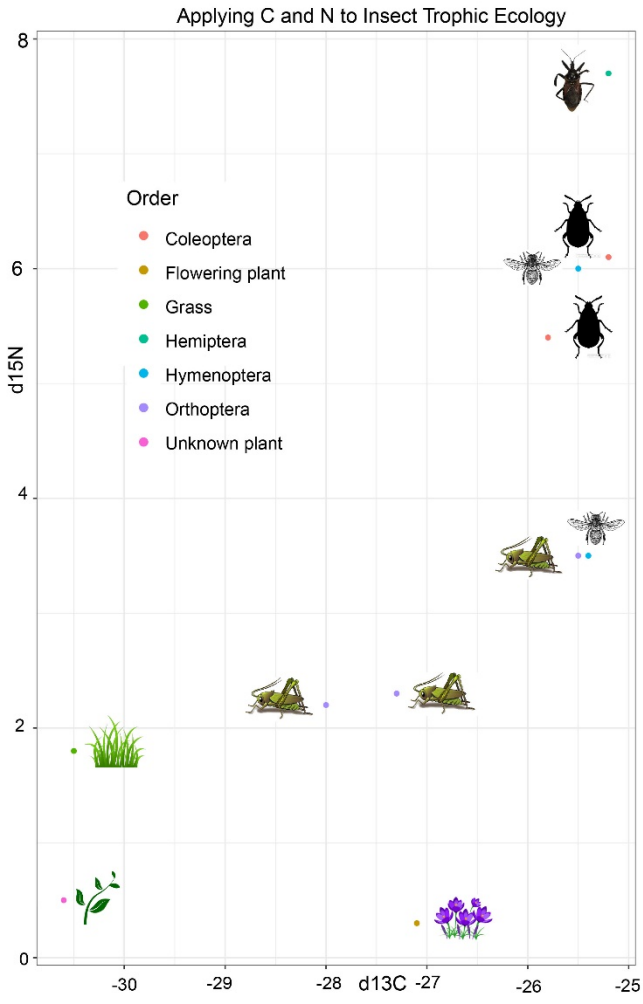
Aims of the study:

1) Identify whether insects in University of Utah Campus mainly depend on C3 and C4 plants;
2) Test the use of stable isotopes of Nitrogen to interpret trophic position of insects with known different feeding habits.



Study Design:

We collected insects from a low-management meadow at the campus border, capturing an expected diversity in trophic levels: herbivorous, nectarivorous, detritivorous, carnivorous. We also collected reference plants, basing our sample selection on signs of leaf consumption. Samples were boiled, dried, grinded and analysed to extract values of Carbon and Nitrogen isotopes.



Results and Discussion:

1) For all the insects that we collected, C3 photosynthetic pathway seems to be the primary source of energy at the base of the trophic chain. The slightly higher C-13 values of the insects relative to the plants is consistent with reports that the C-13 of consumers is 0.8 ± 1.1‰ higher than their diet.
2) Stable isotopes of Nitrogen seem to correctly identify trophic position of the insects analysed. Two of our plants show very low values of d15N and may represent N2 fixing plants. Among the insects we see the following patterns:
    a. Herbivorous: grasshoppers cluster together and show values of d15N closest to those of source plants. One grasshopper shows higher values. This could indicate that i was feeding on a higher N diet. An alternative explanation is that this is an artifact of sample processing: chitin, which is expected to show lower values of d15N, was removed for higher analysis, thus shifting d15N values to more enriched ones.
    b. Detritivorous: beetles (replicate) show intermediate values, possibly indicating an omnivorous diet. Also, an Hymenoptera falls in this cluster: it could either be a predatory Hymenoptera, or else it might have been misidentified from a bee-mimicking Diptera.
    c. Nectarivorous: One Hymenoptera, falls in between herbivores and detritivores possibly suggesting a nectar feeding insect, thus closer to plant d15N values.
    d. Finally, the highest level of our small trophic chain is occupied by a known predatory Hemiptera, the ‘assassin bug’ *Apiomerus montanus*, which shows a considerably higher value of d15N.