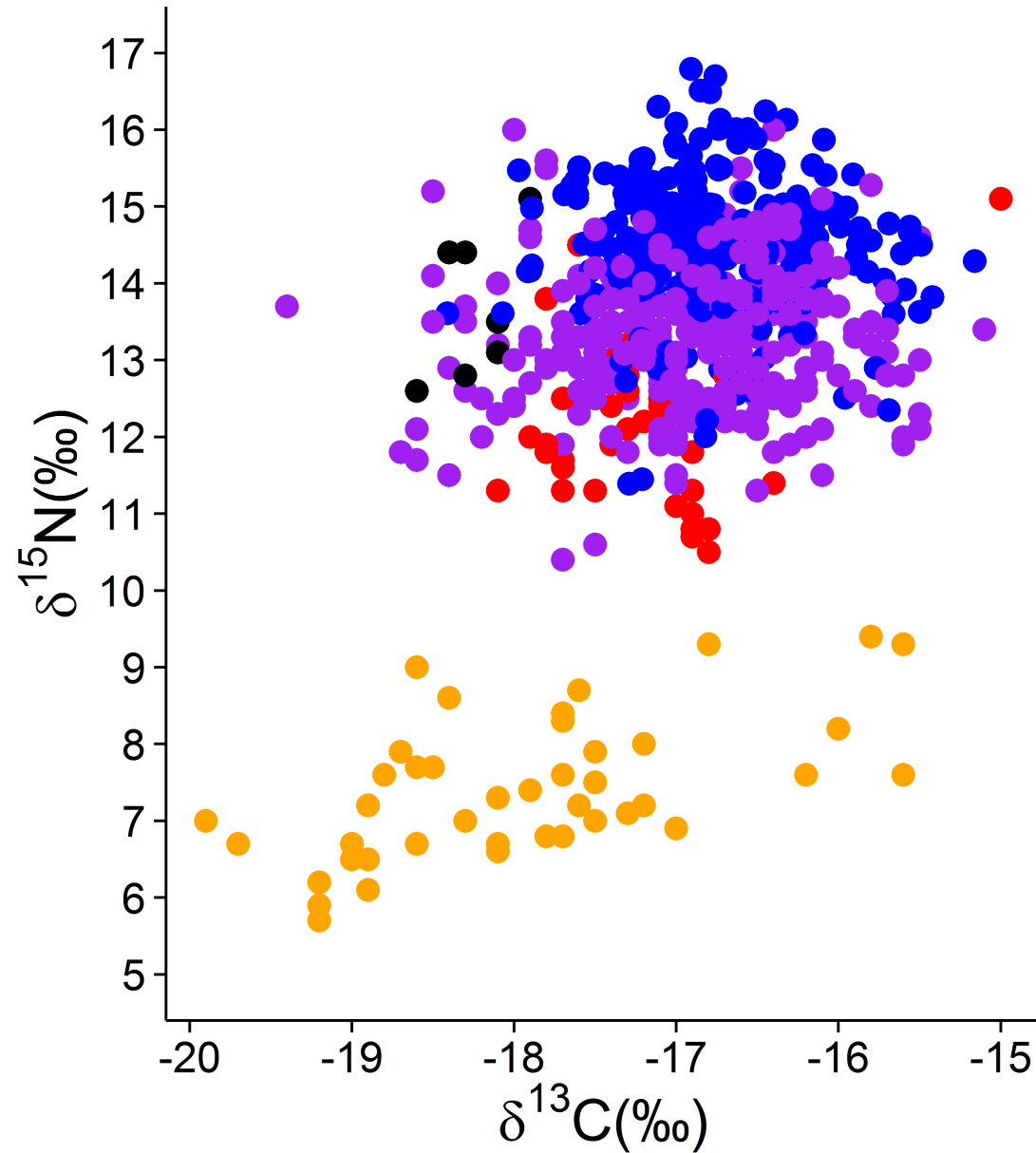
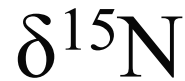
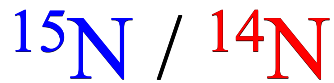


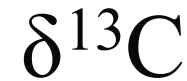
Data Visualization: Isotope biplots



• Stable Isotopes Ratios



‰



Heavier isotope

Lighter isotope

$$\delta = \left(\frac{R_{\text{sample}}}{R_{\text{standard}}} - 1 \right) \times 1000$$

$$\delta^{13}\text{C} = \left(\frac{[^{13}\text{C}/^{12}\text{C}]_{\text{sample}}}{[^{13}\text{C}/^{12}\text{C}]_{\text{standard}}} - 1 \right) \times 1000$$

Units of δ are “‰” or “per mil”

δ values are measures of the amounts of heavy and light isotopes in a sample.

Higher $\delta^{15}\text{N}$ and more positive $\delta^{13}\text{C}$ values indicate that samples have higher content of the heavier isotopes.

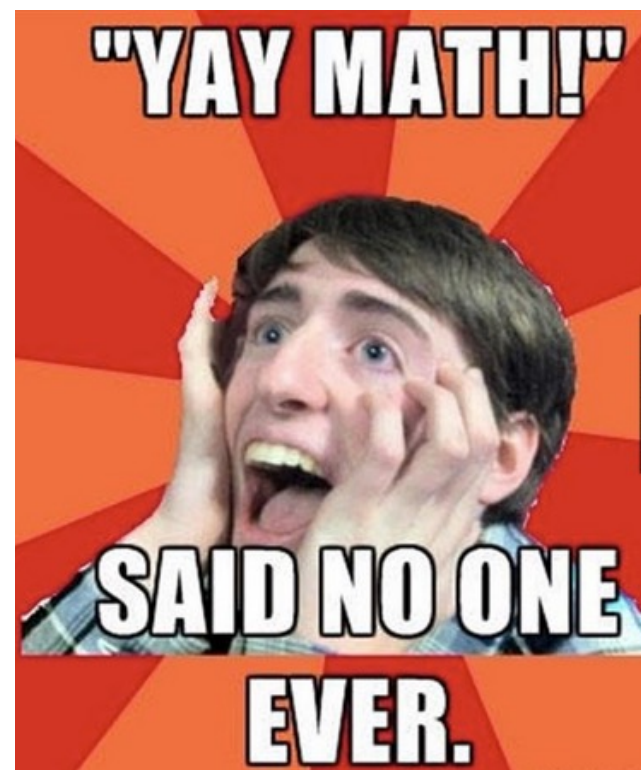
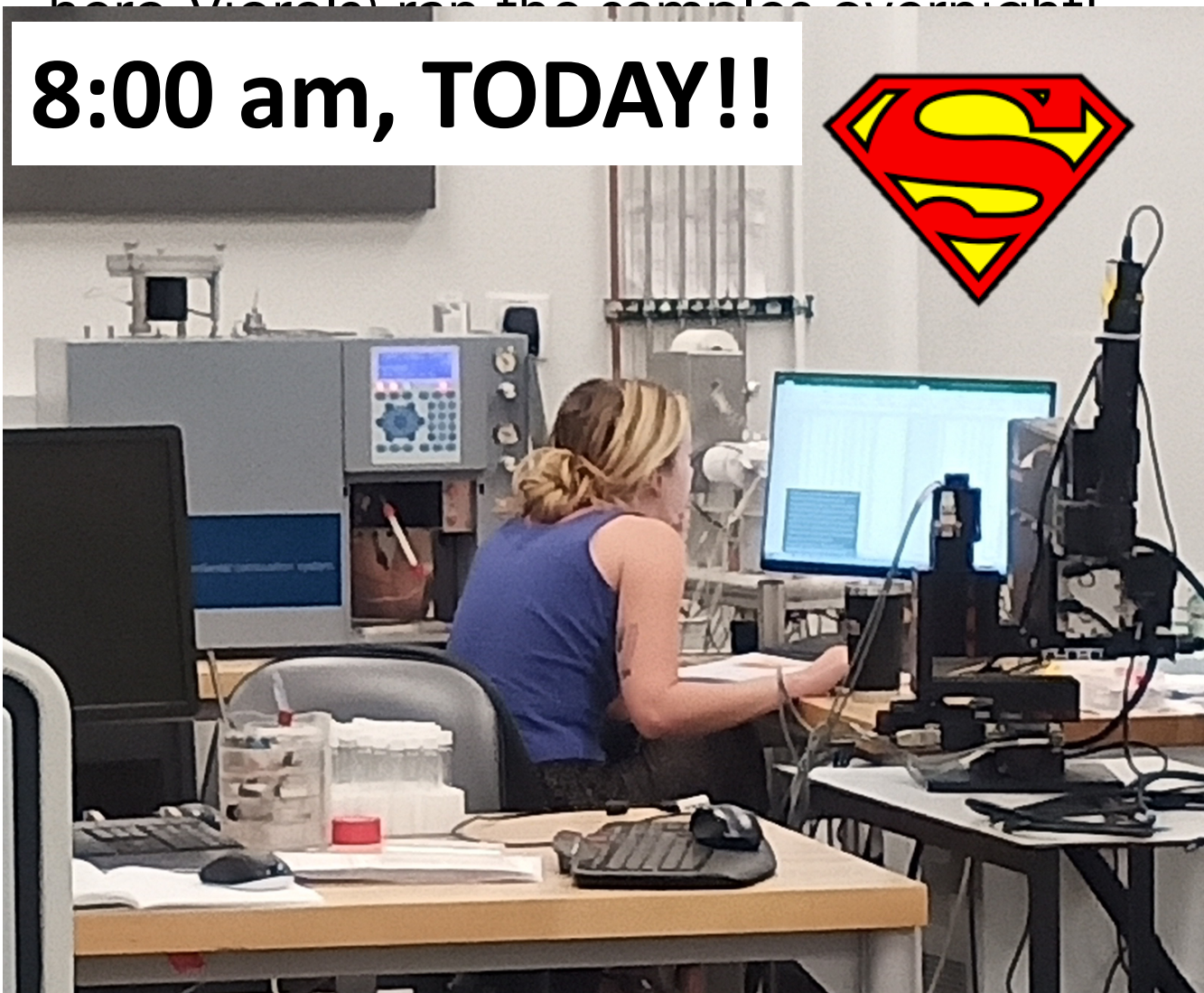
Asked questions, collected samples, processed the samples, weighed

into tin capsules and Caitlin (super-Caitilin, with the help of our
here, Michal) ran the samples overnight.

Now you have a bunch of data! YAY!!

TIME TO DO SOME MATH

8:00 am, TODAY!!



Mean

$$\text{Mean} = \frac{\text{Sum of All Data Points}}{\text{Number of Data Points}}$$

Data point 1



$\delta^{15}\text{N} = 4.0$

Data point 2



$\delta^{15}\text{N} = 5.5$

Data point 3



$\delta^{15}\text{N} = 3.5$

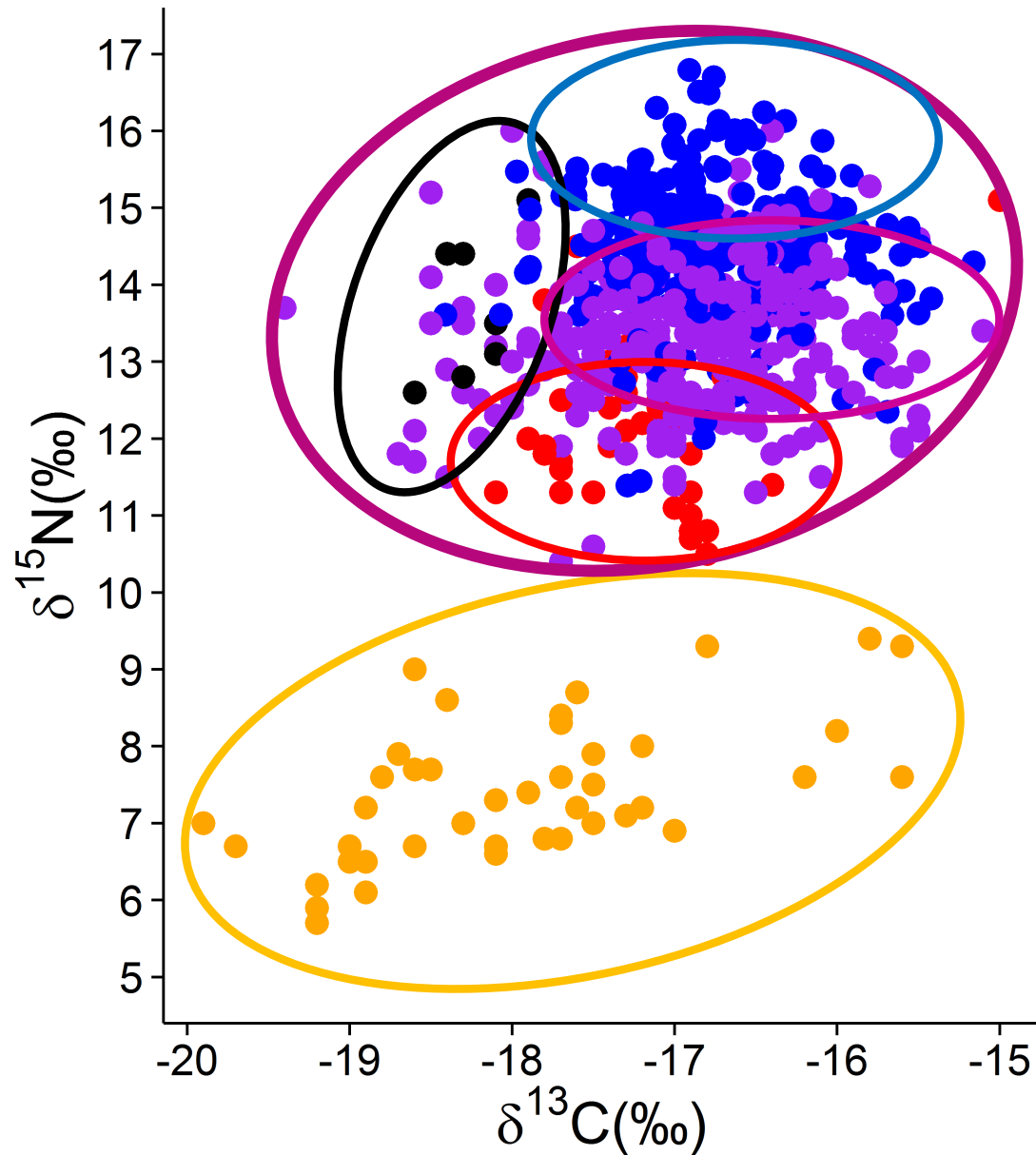
Data point 4



$\delta^{15}\text{N} = 8$

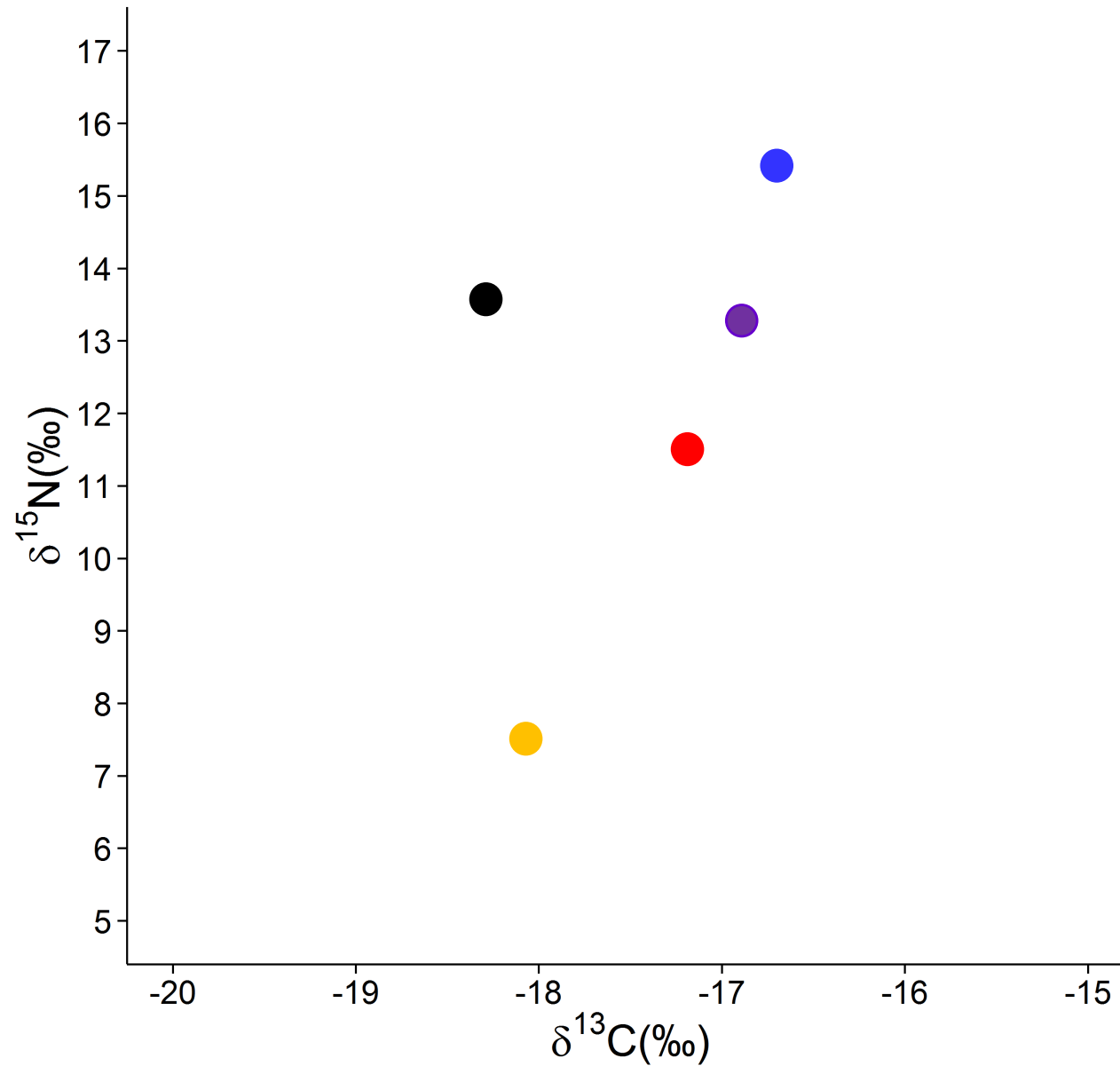
$$\text{Mean } \delta^{15}\text{N} = \frac{4.0 + 5.5 + 3.5 + 8}{4} = 5.2$$

Graph of all data points



**Useful, but we can't see
If there is any separation
among the groups, except
for the orange group**

Graph of the Means and Standard deviation



Standard Deviation

A measure of variation (spread, dispersion):

Data point 1



$\delta^{15}\text{N} = 4.0$

Data point 3



$\delta^{15}\text{N} = 3.5$

Data point 4



$\delta^{15}\text{N} = 8$

The big
Pogo Ant

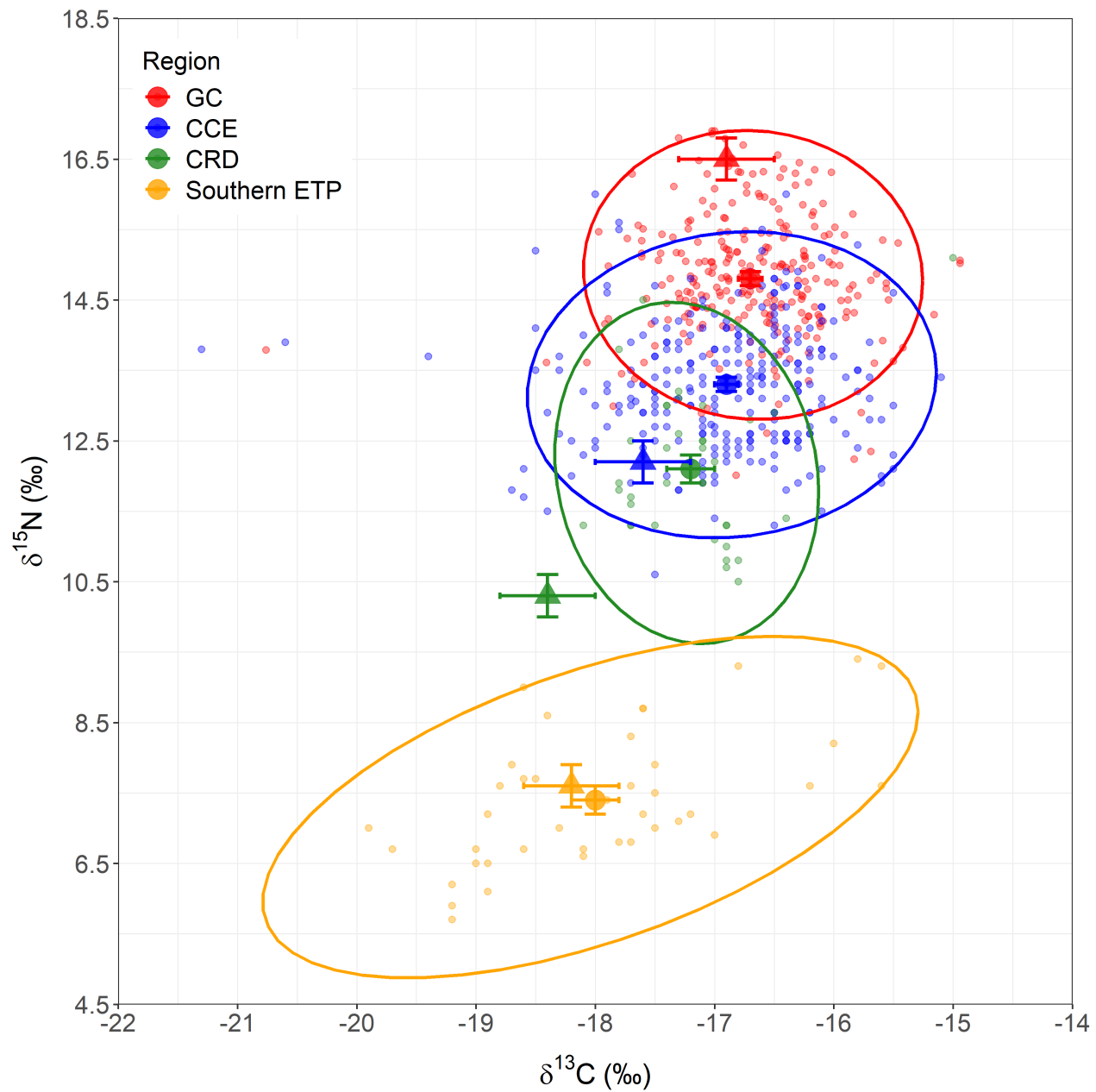
Data point 2

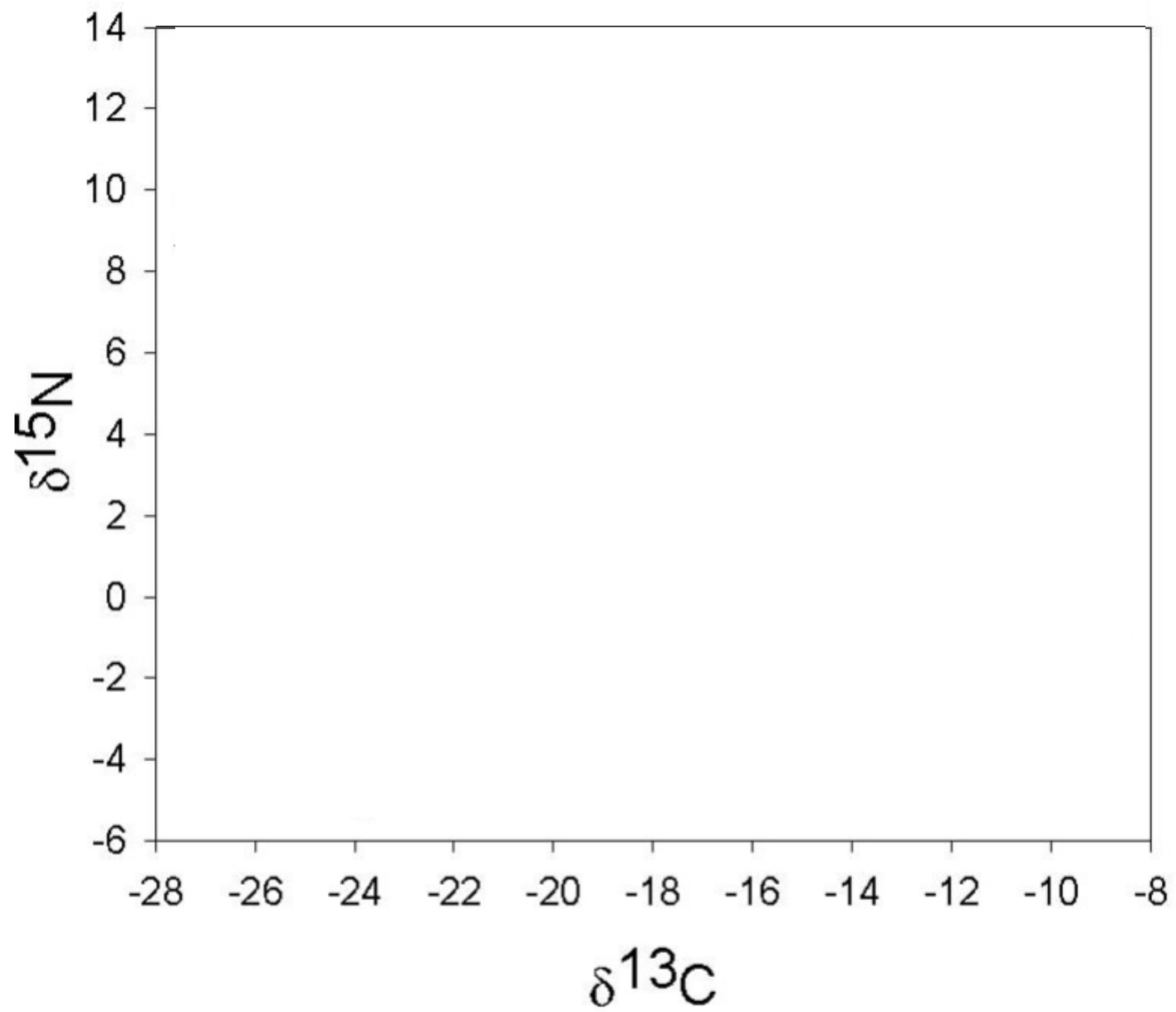


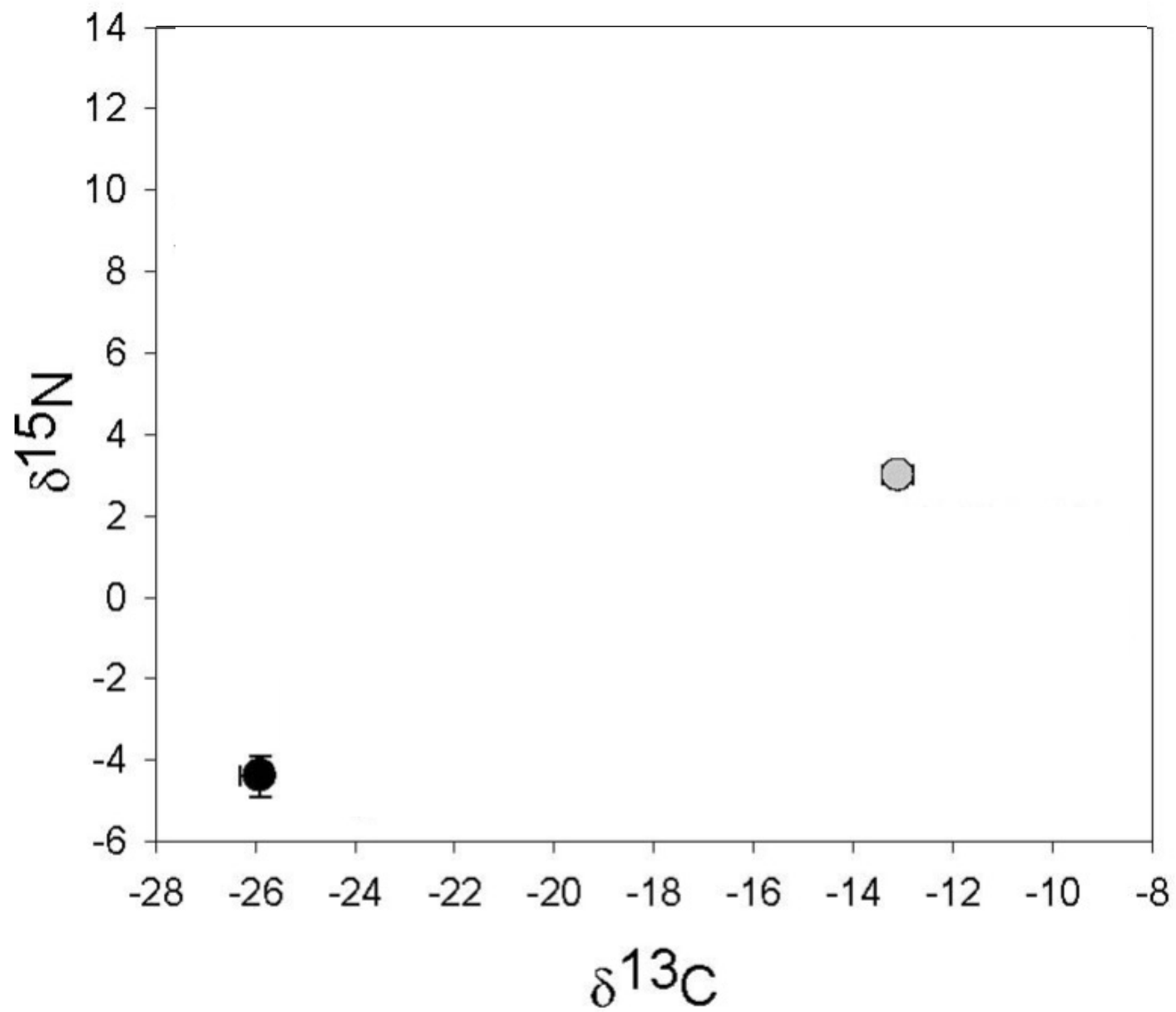
$\delta^{15}\text{N} = 5.5$

NOT ALL ANTS EAT THE SAME THING

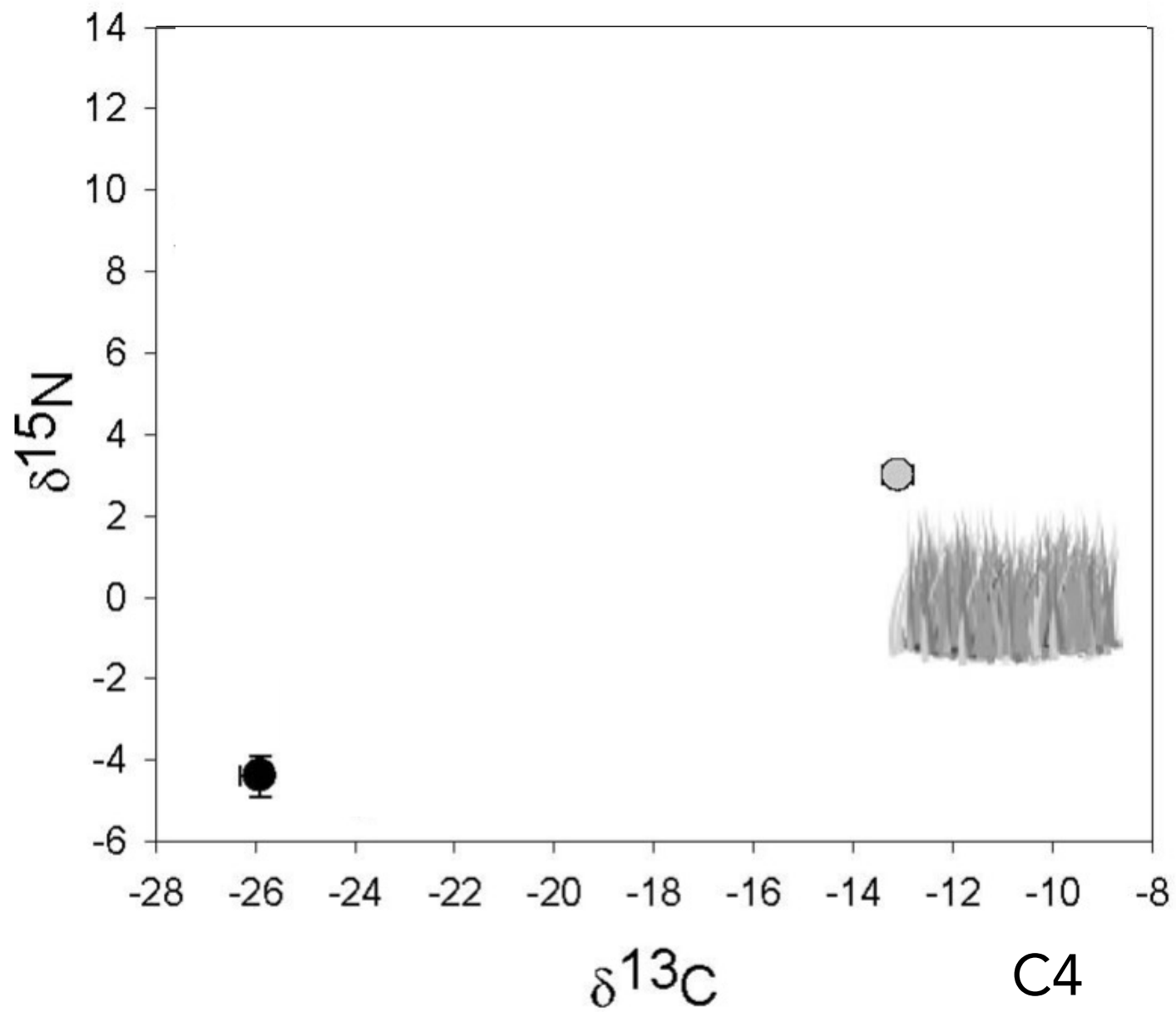
Three-layer graphs: Data, Means, SD, Ellipses: Provides visual information



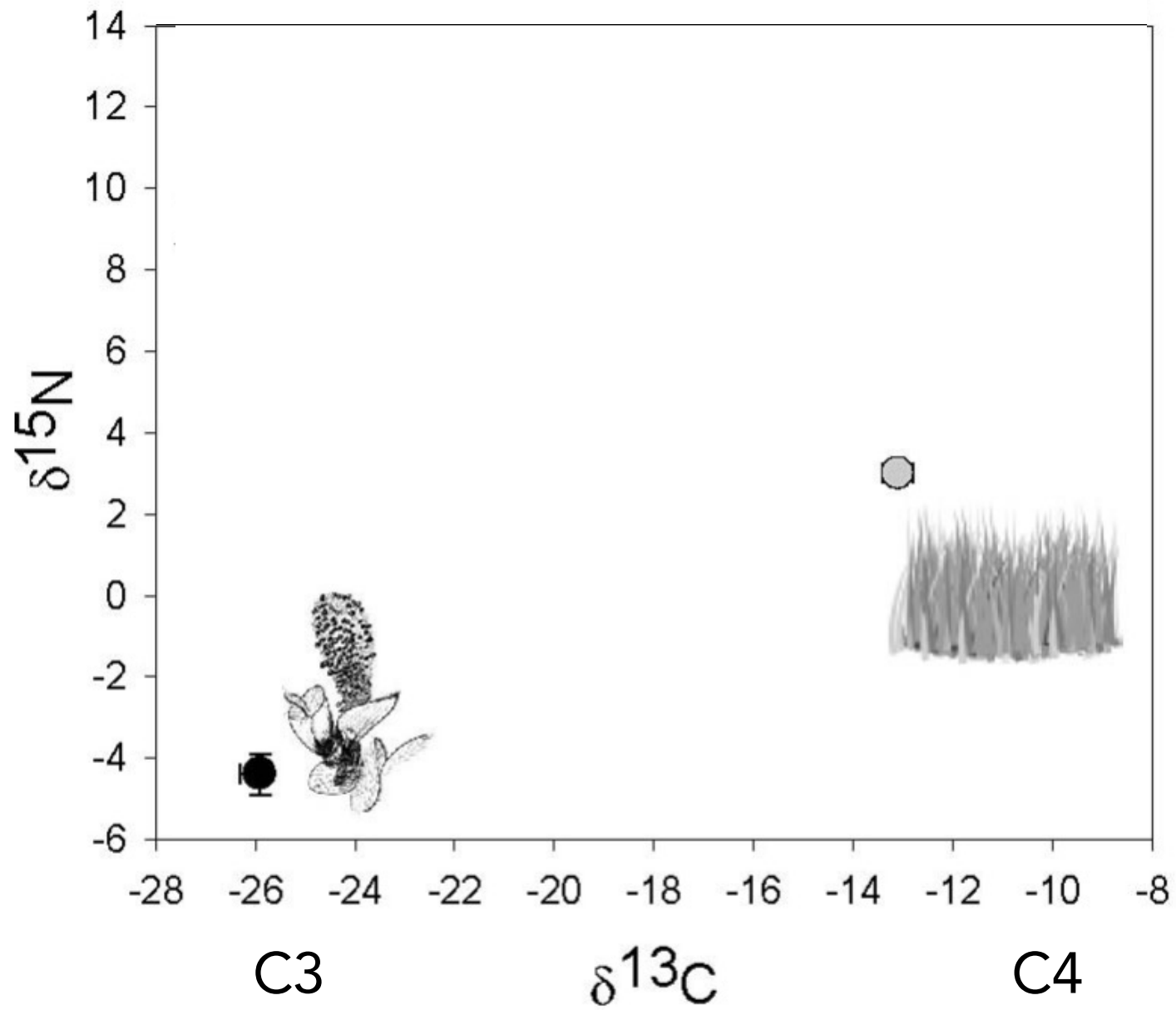




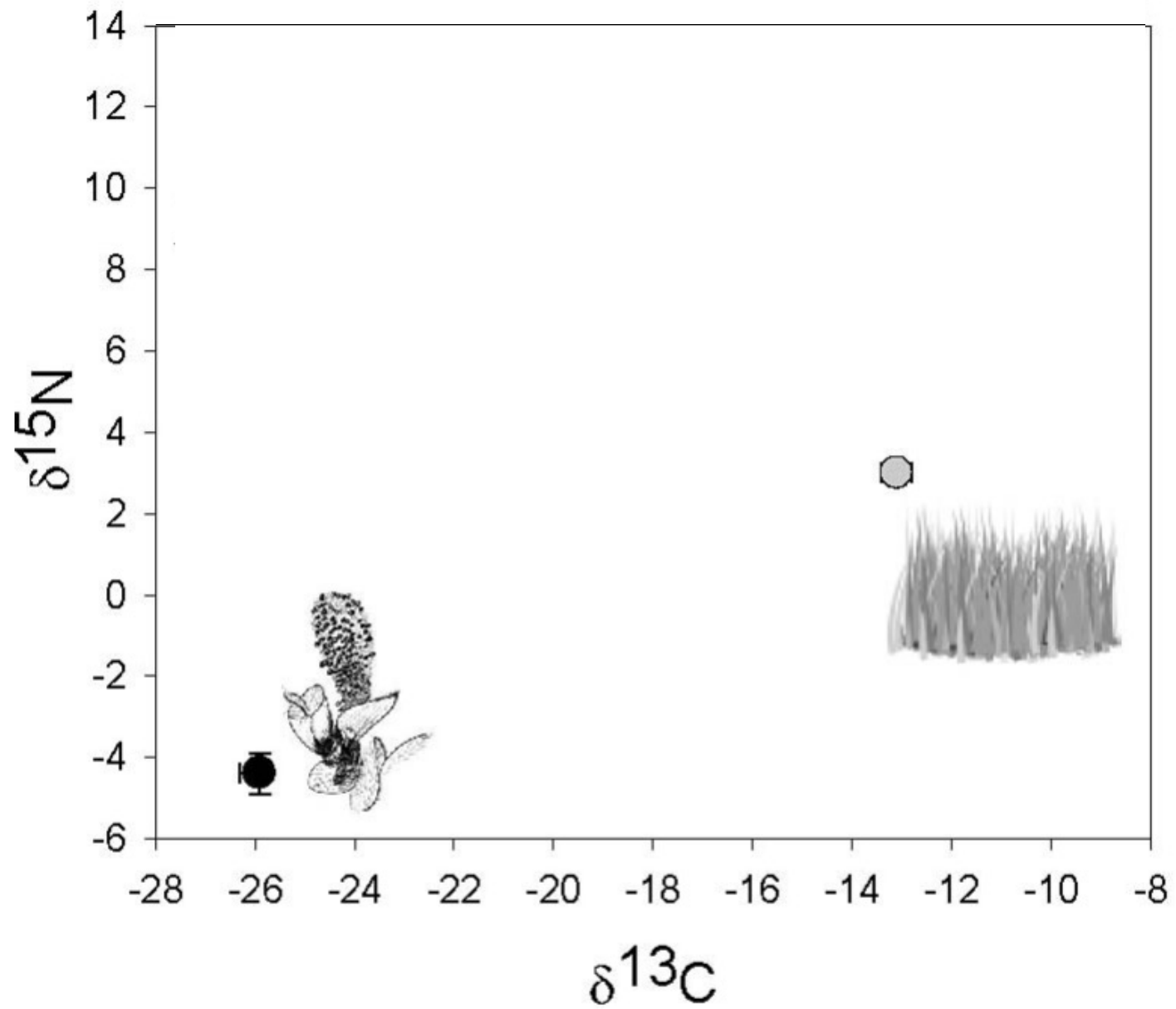
Primary Producers



Primary Producers



Primary Producers

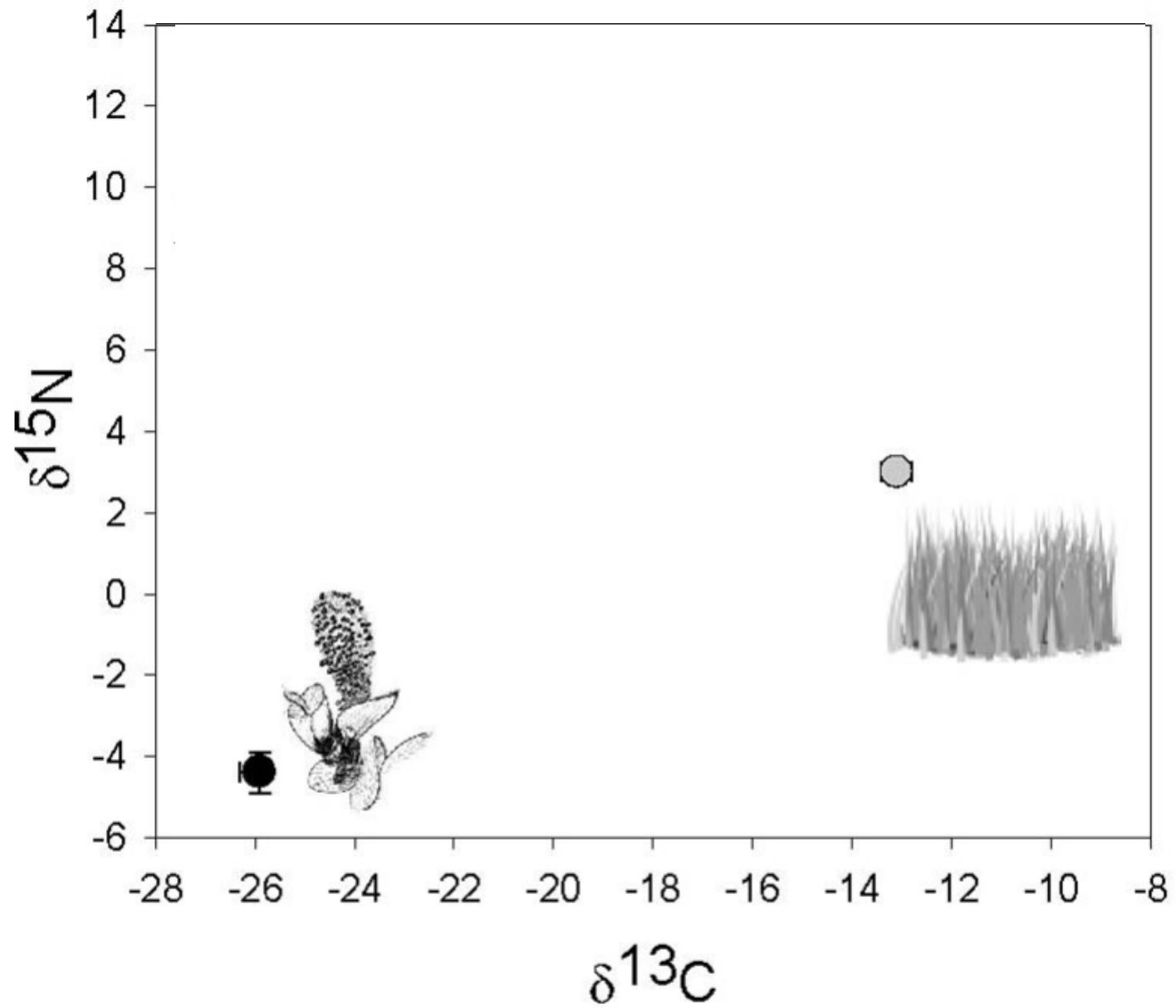


More C3

Primary Producers

More C4

Trophic Level

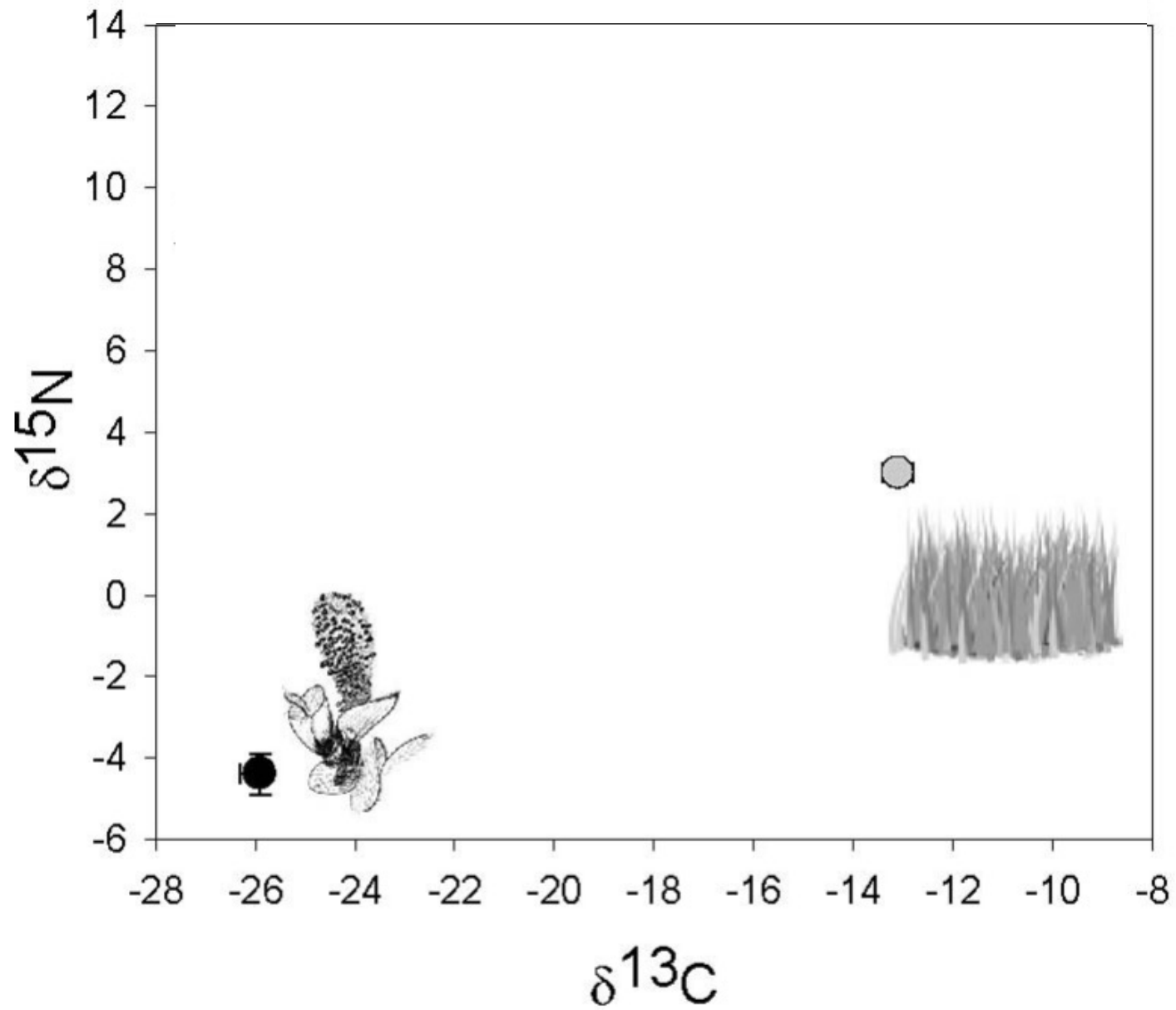


More C3

Primary Producers

More C4

Trophic Level



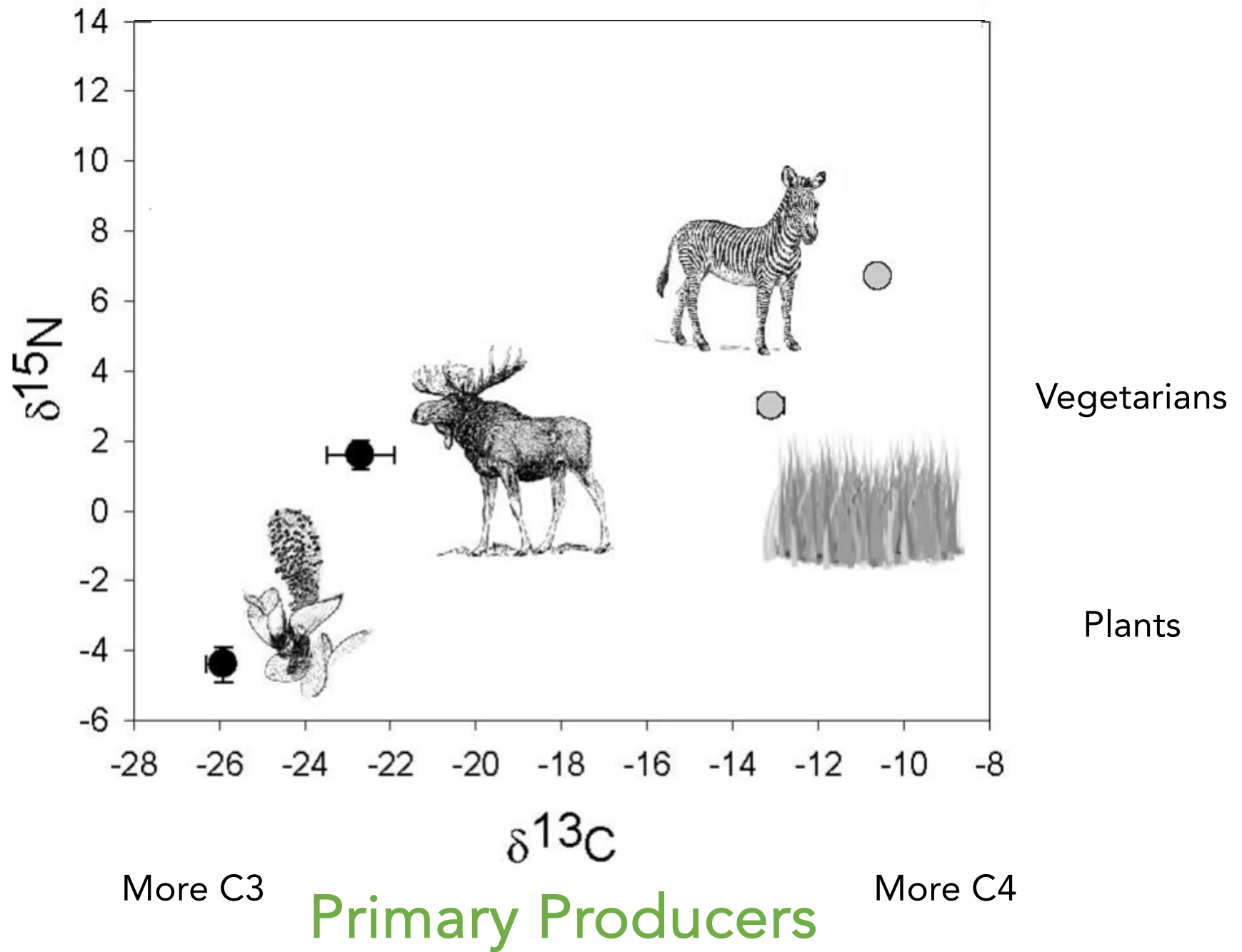
More C3

Primary Producers

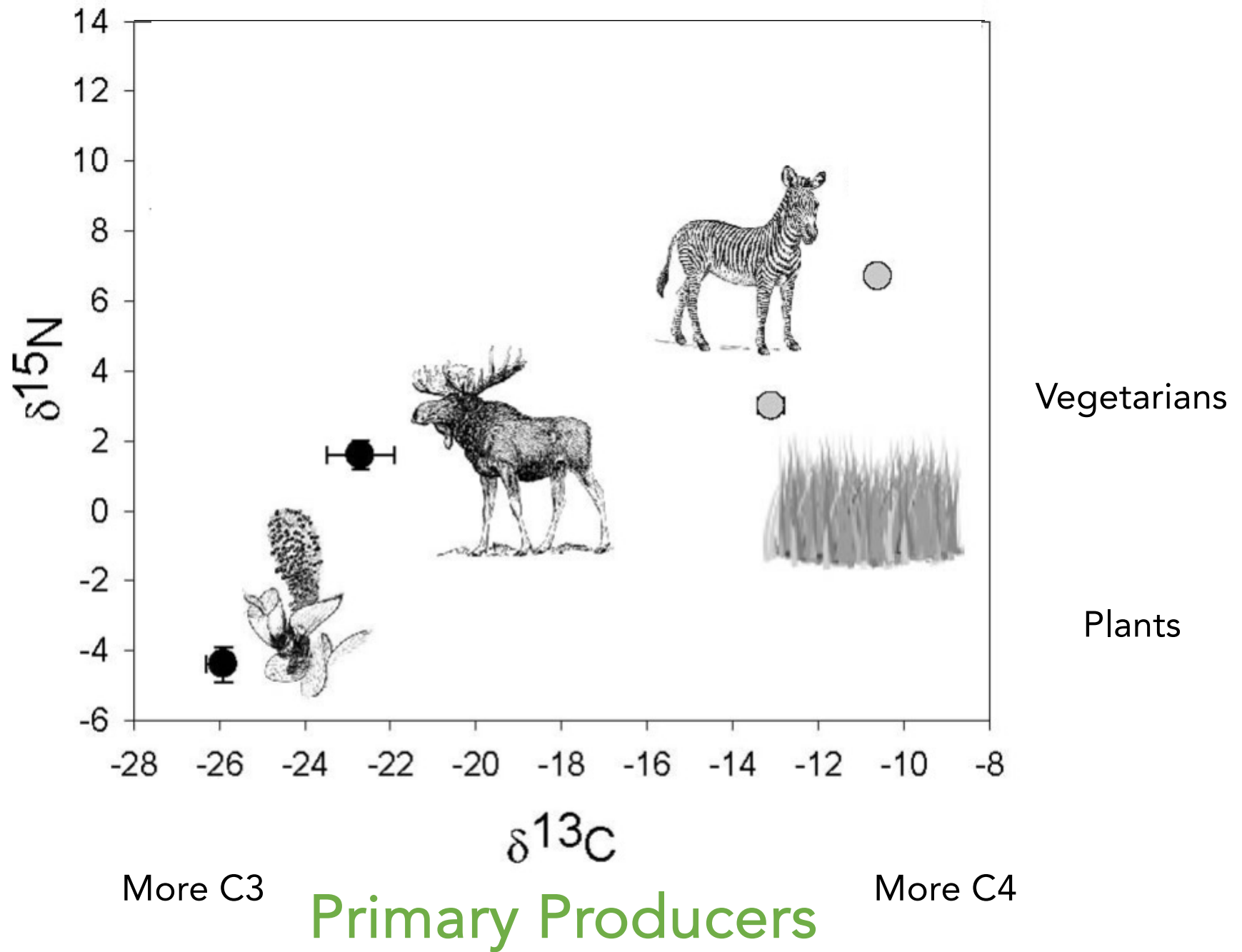
More C4

Plants

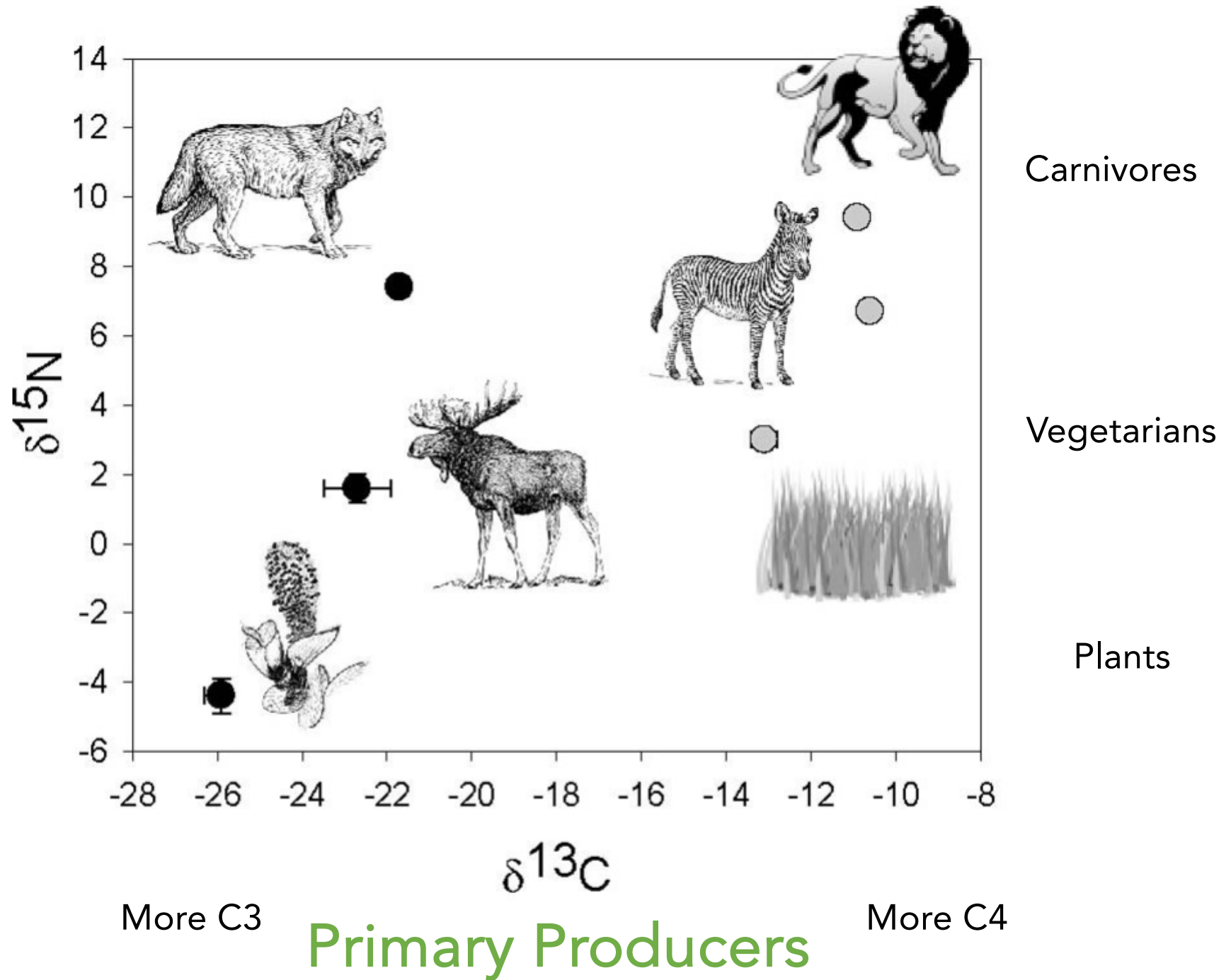
Trophic Level

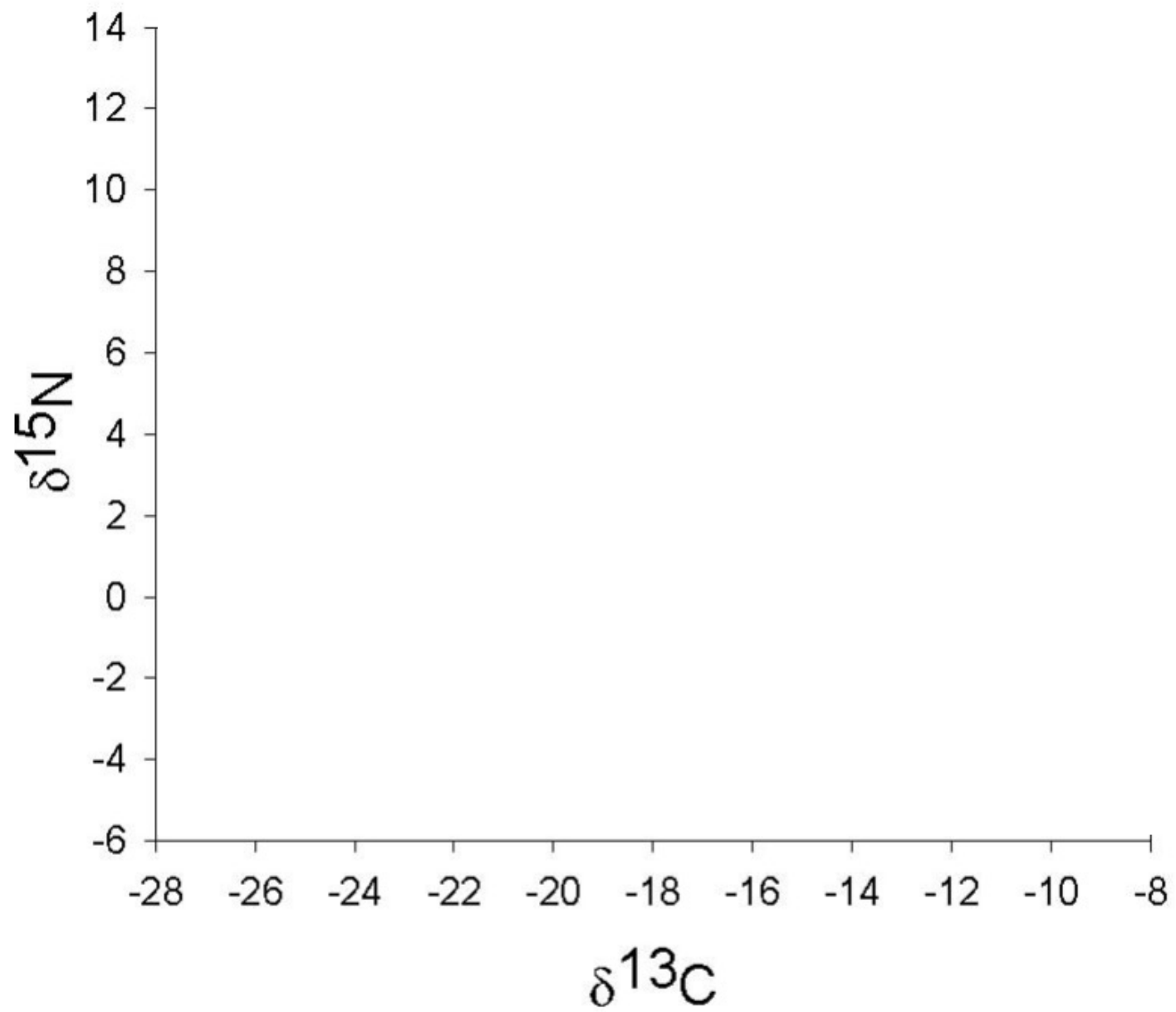


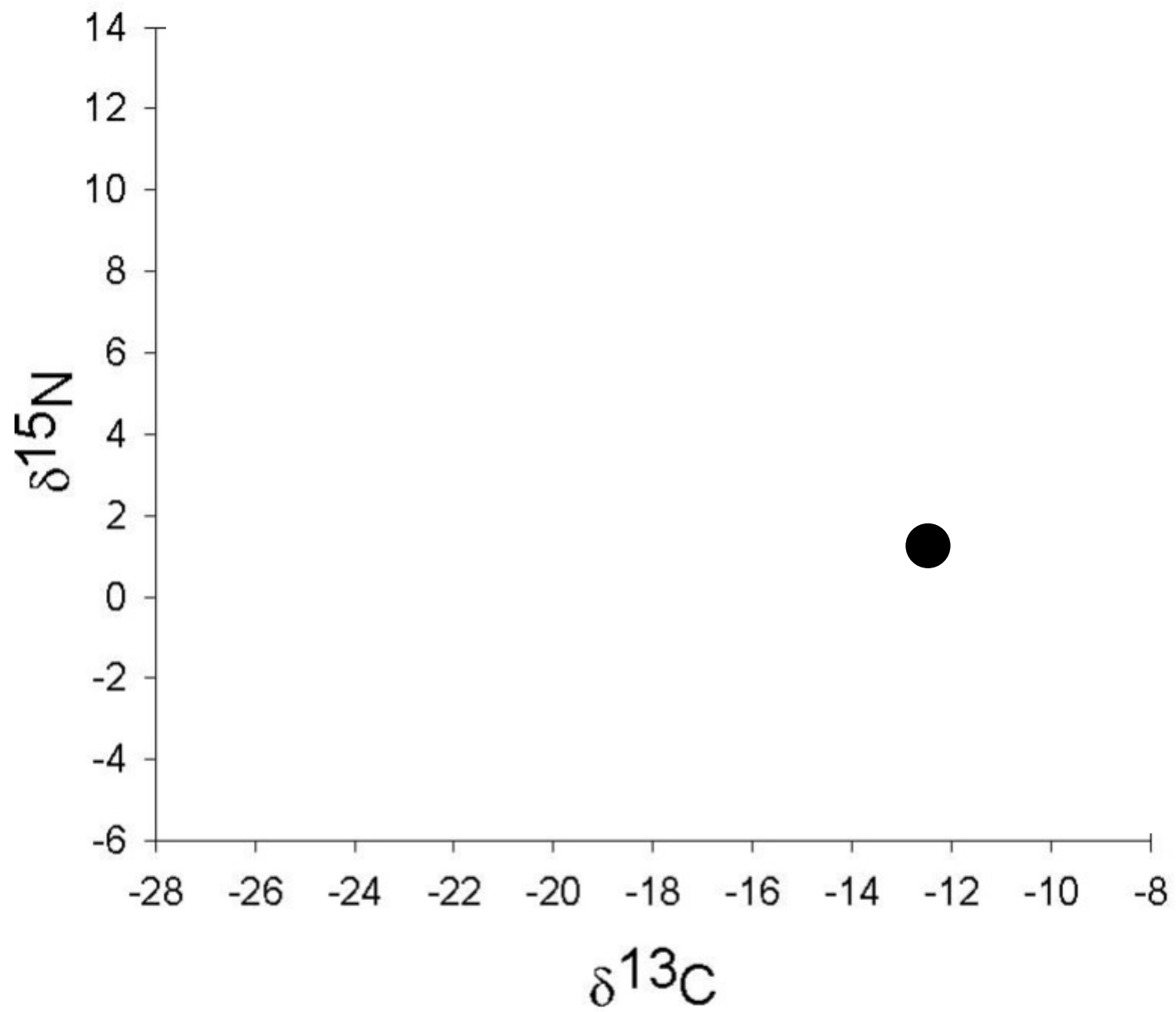
Trophic Level

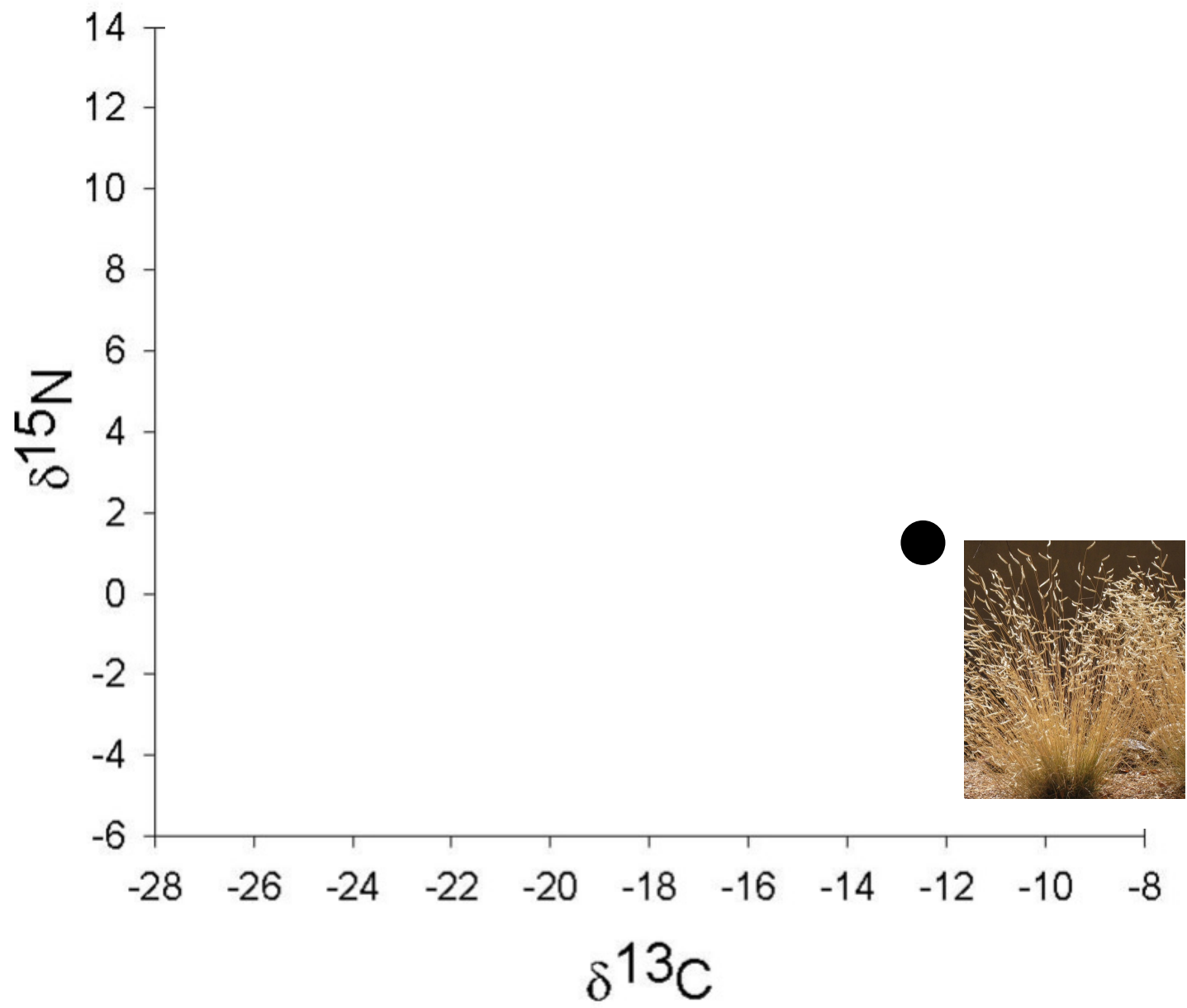


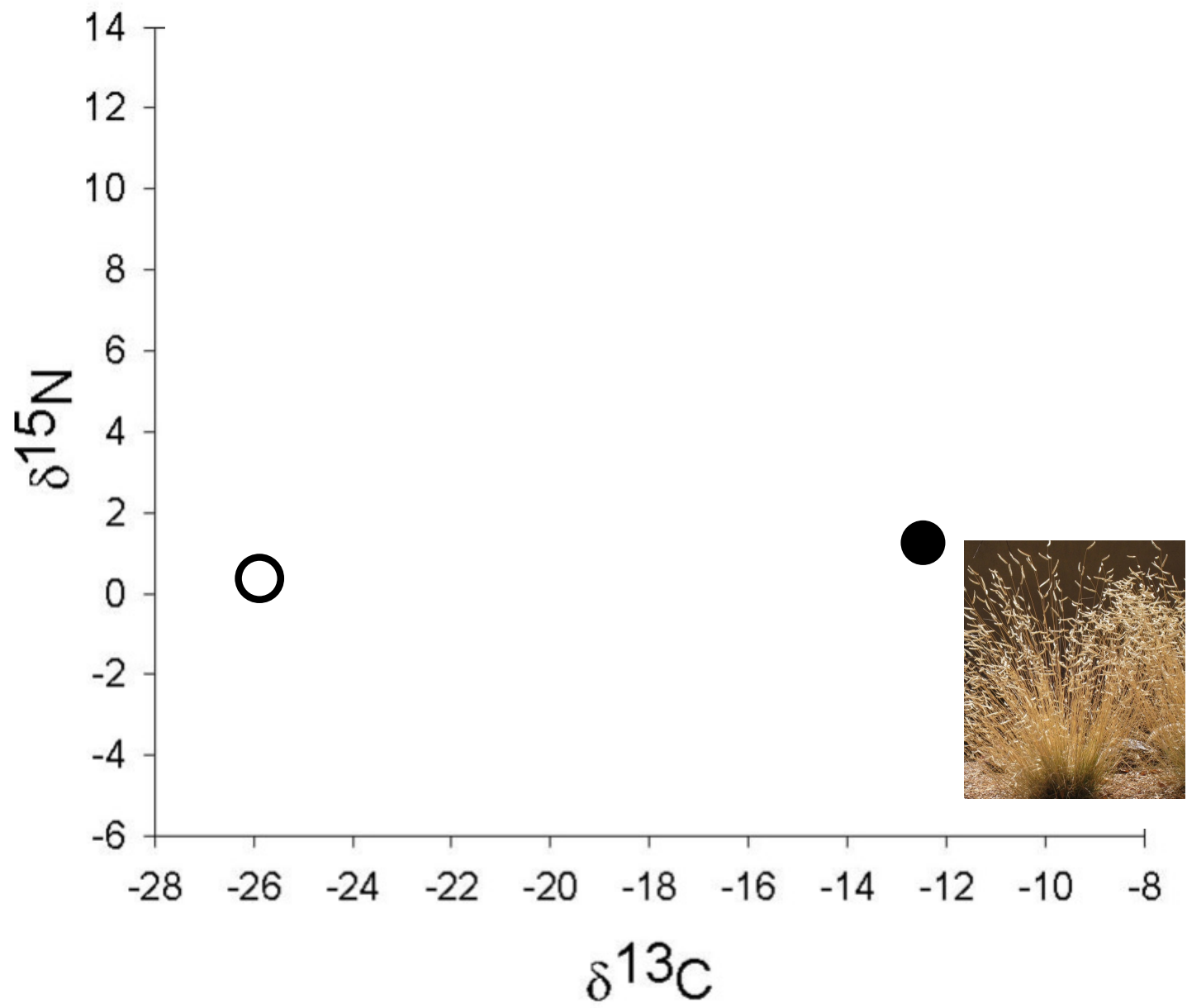
Trophic Level

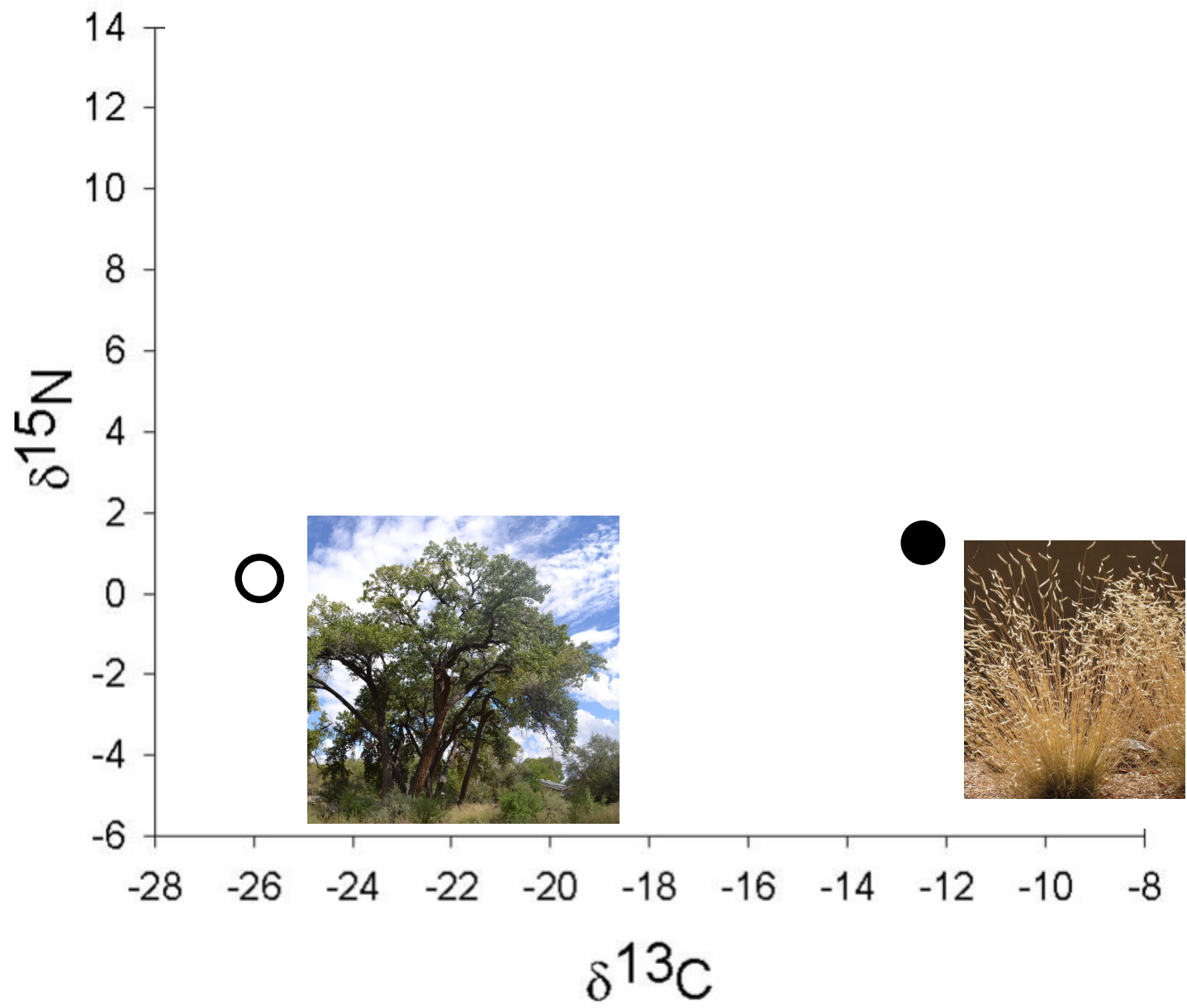


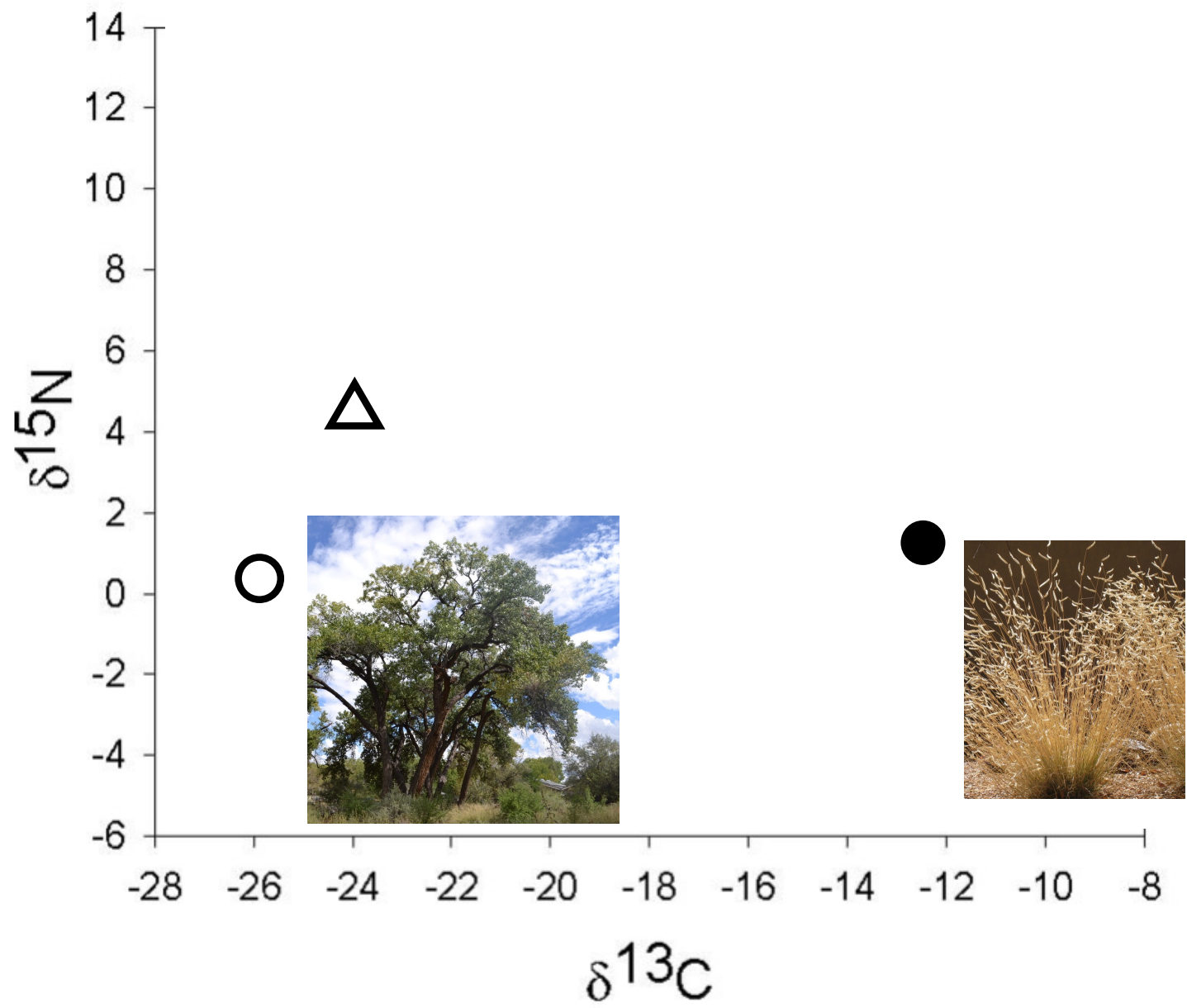


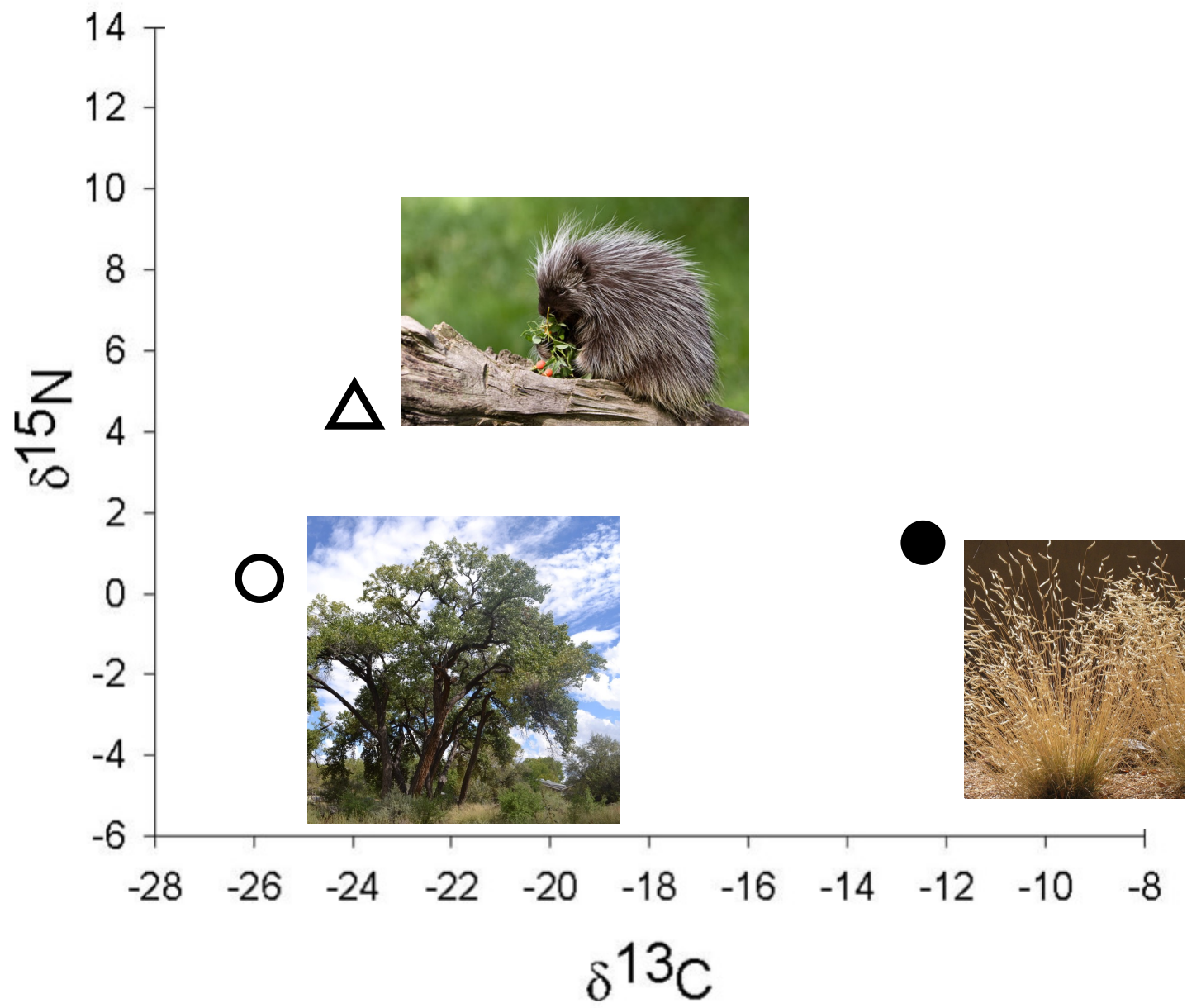


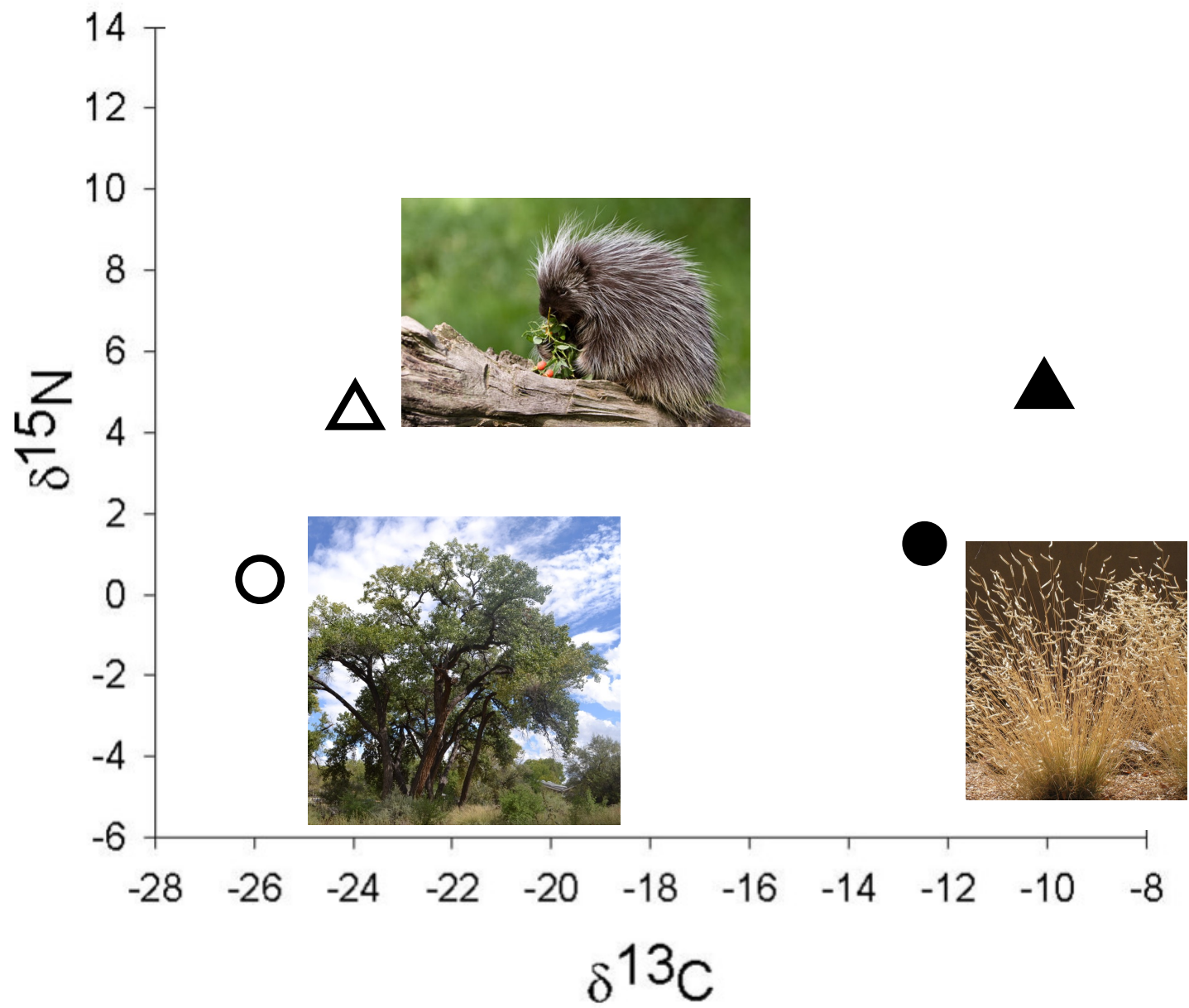


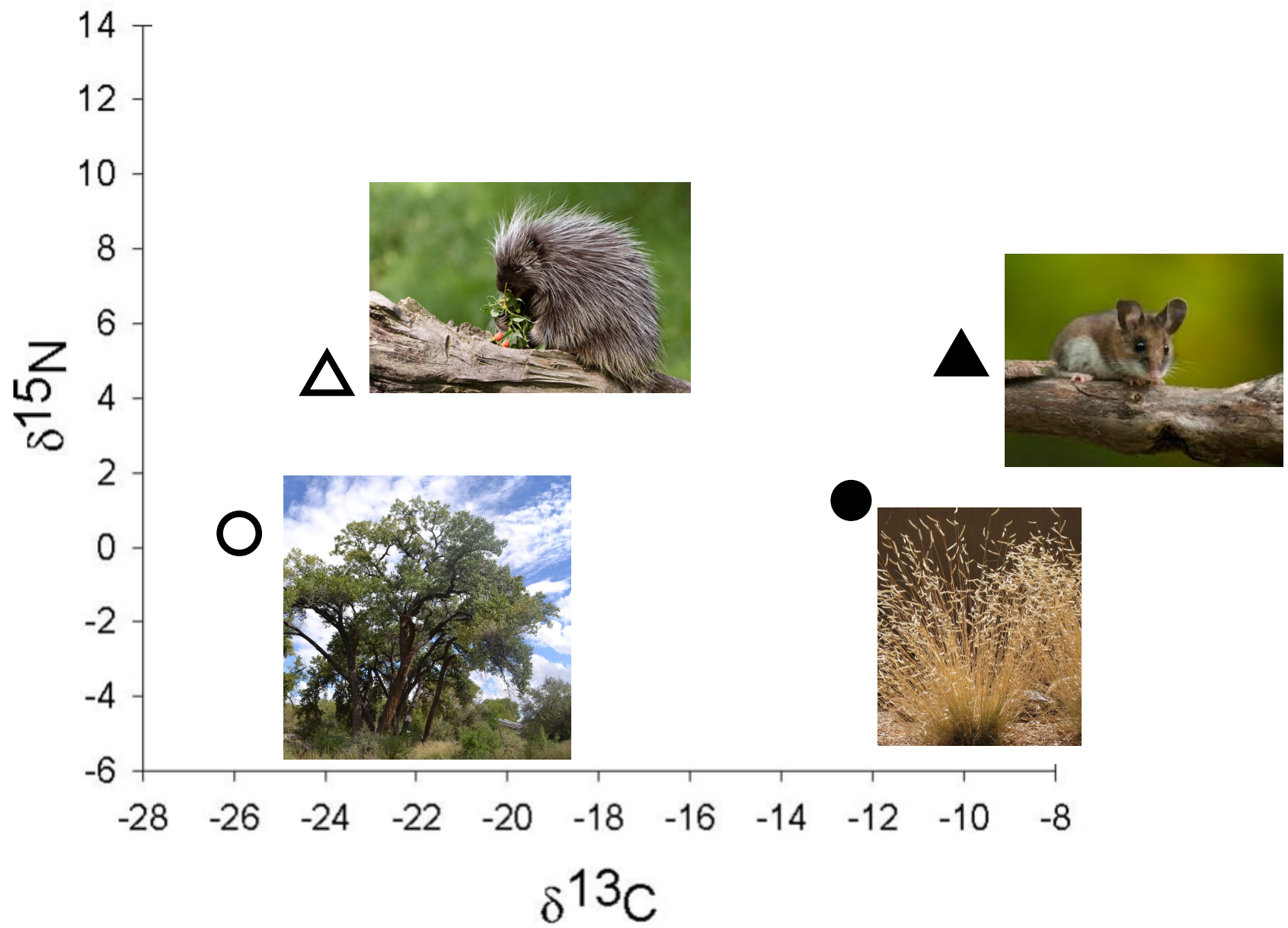


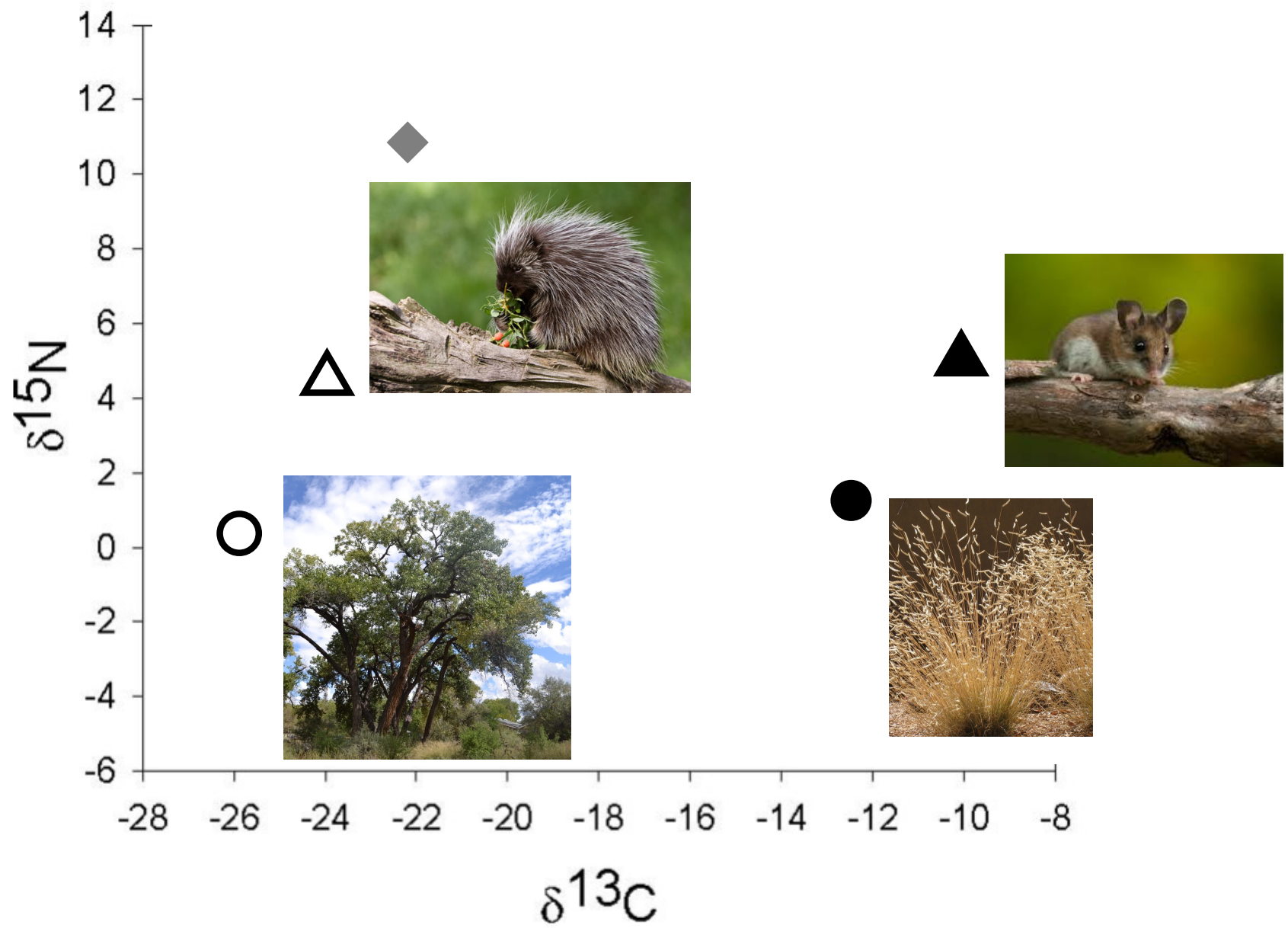


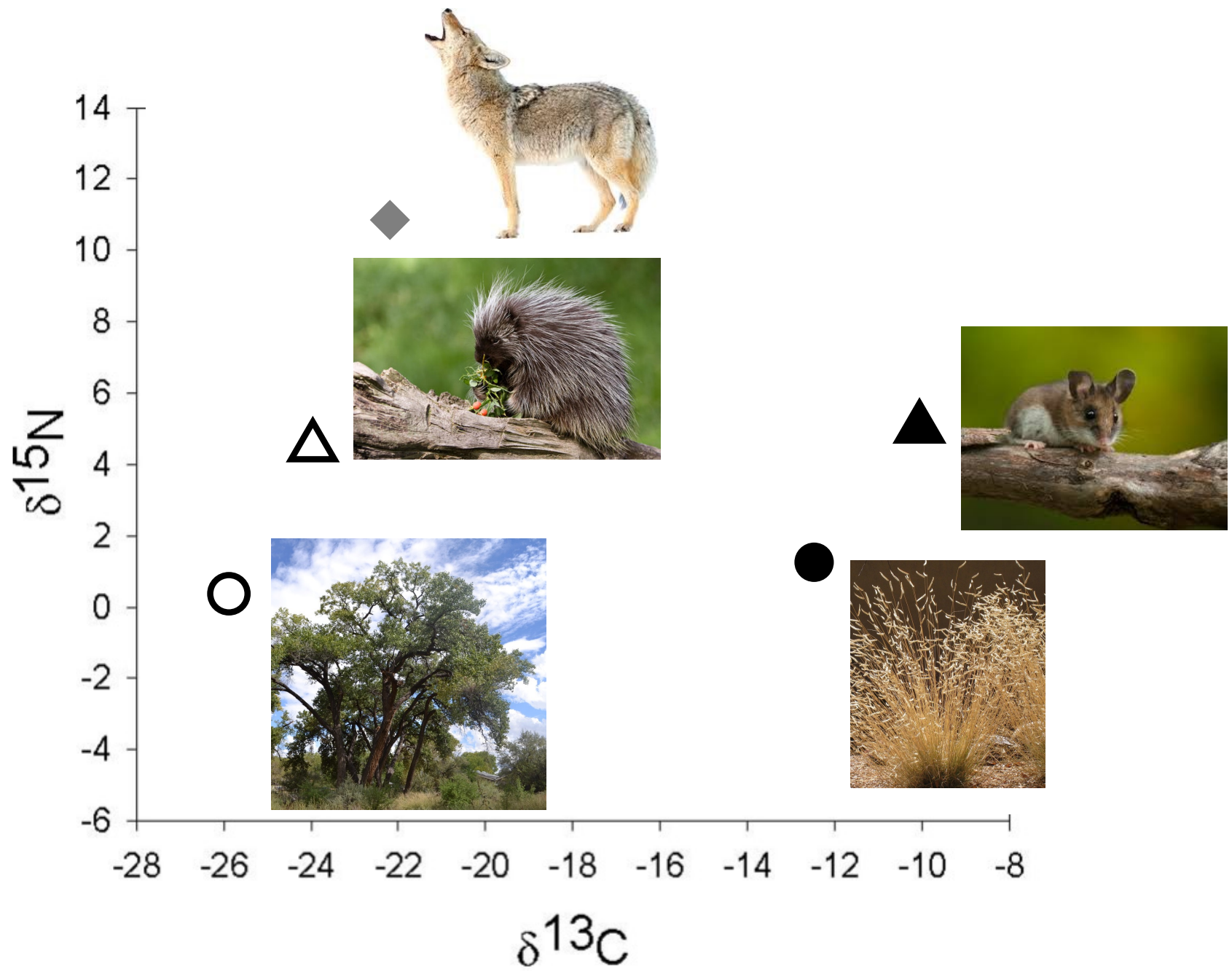


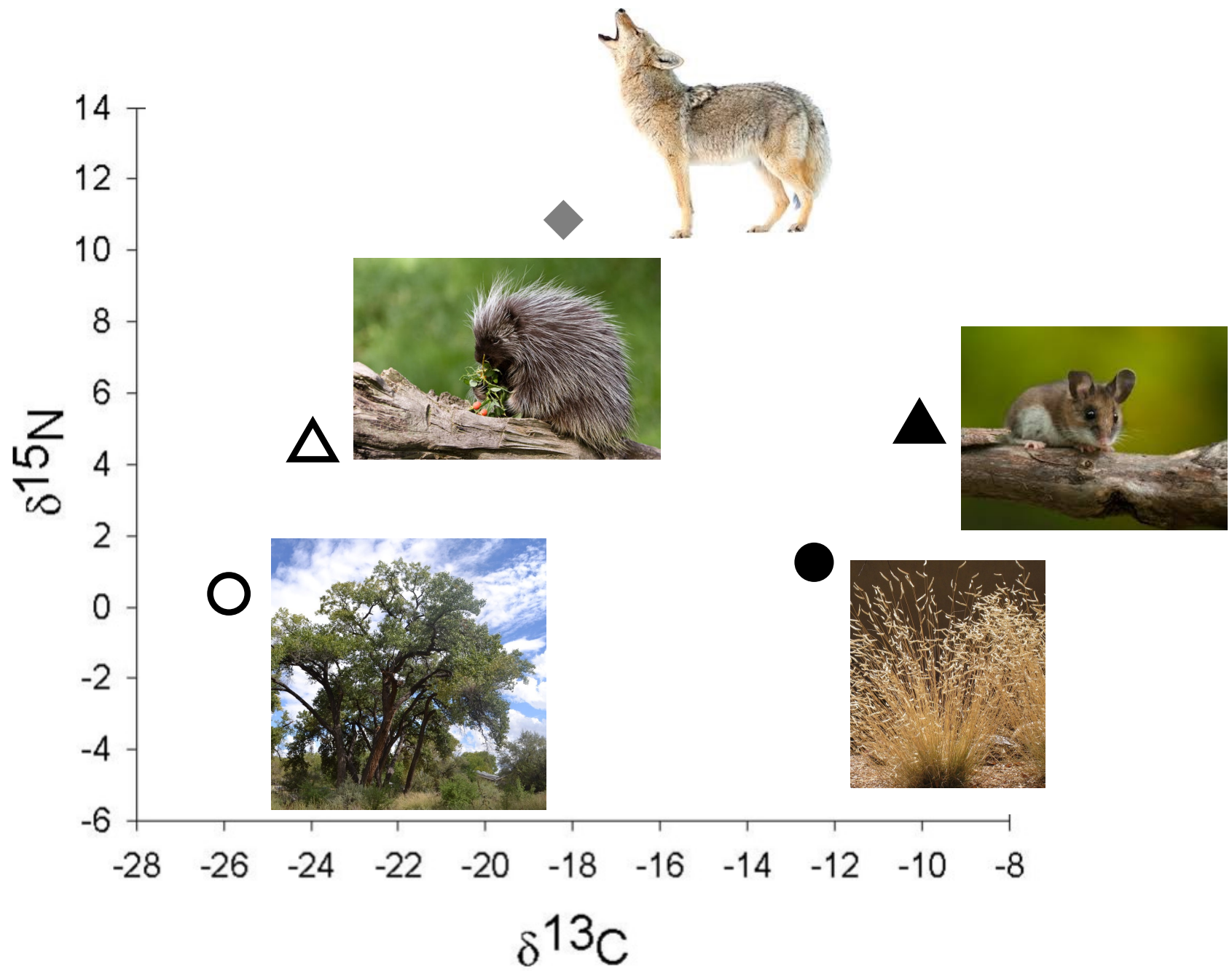


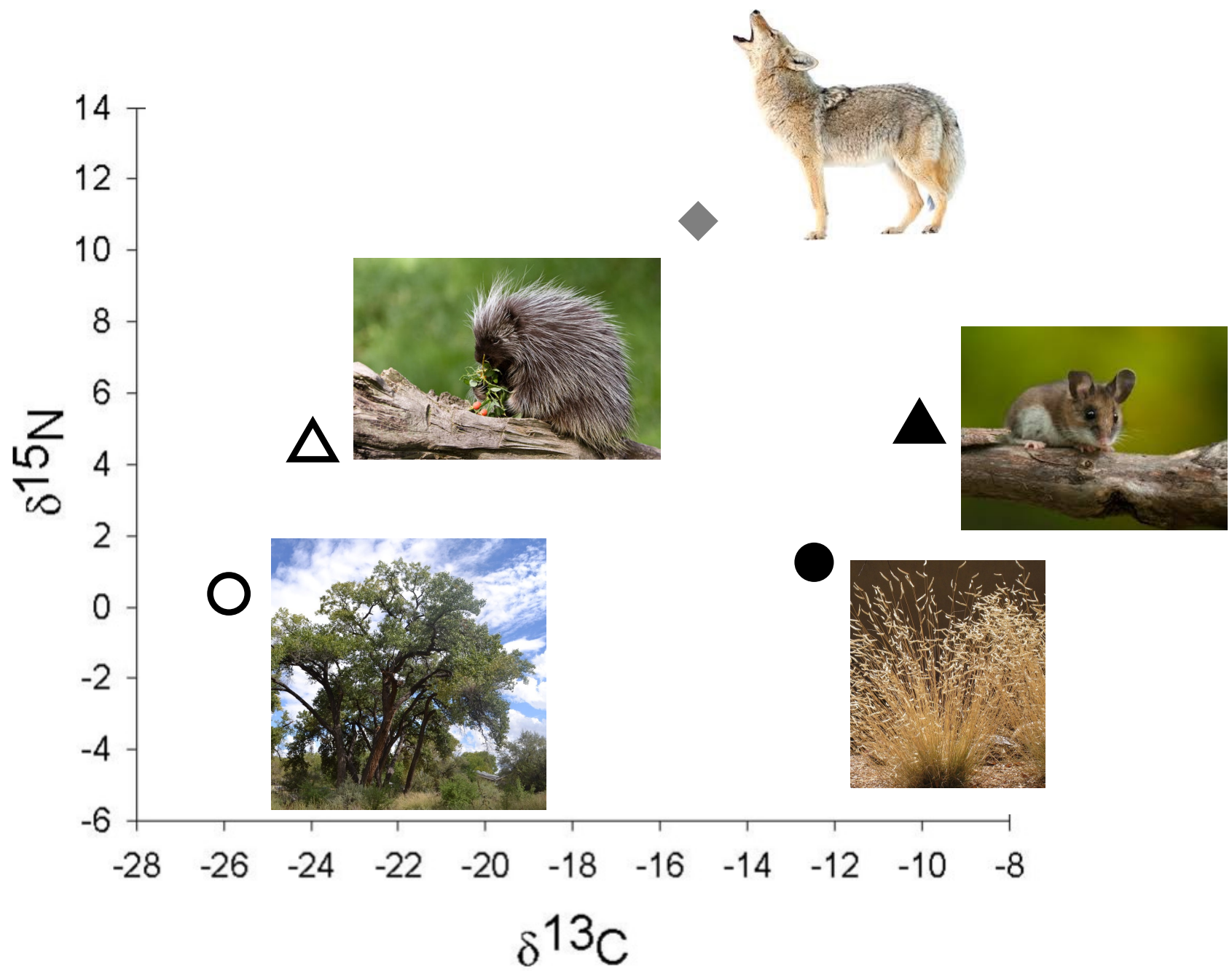


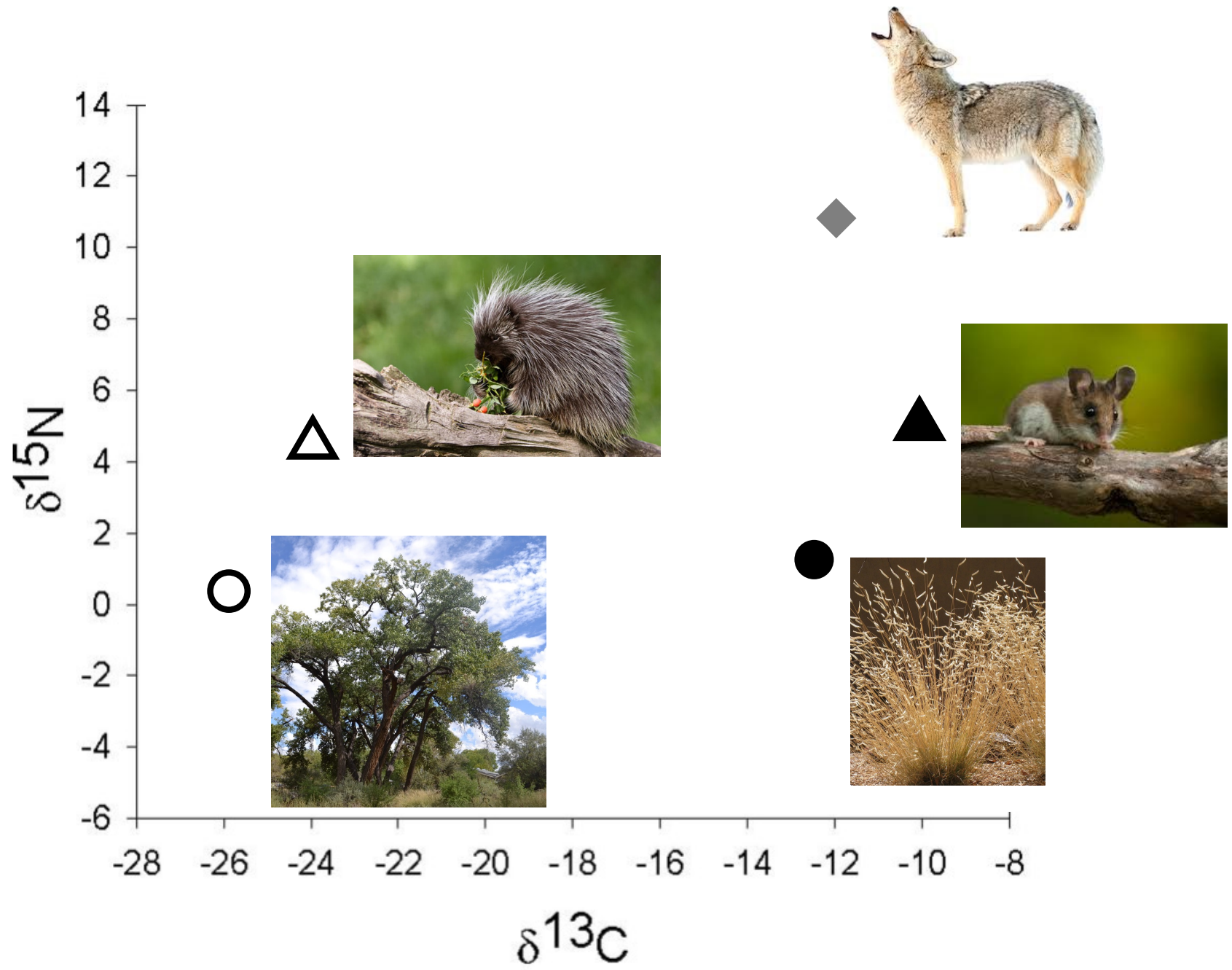


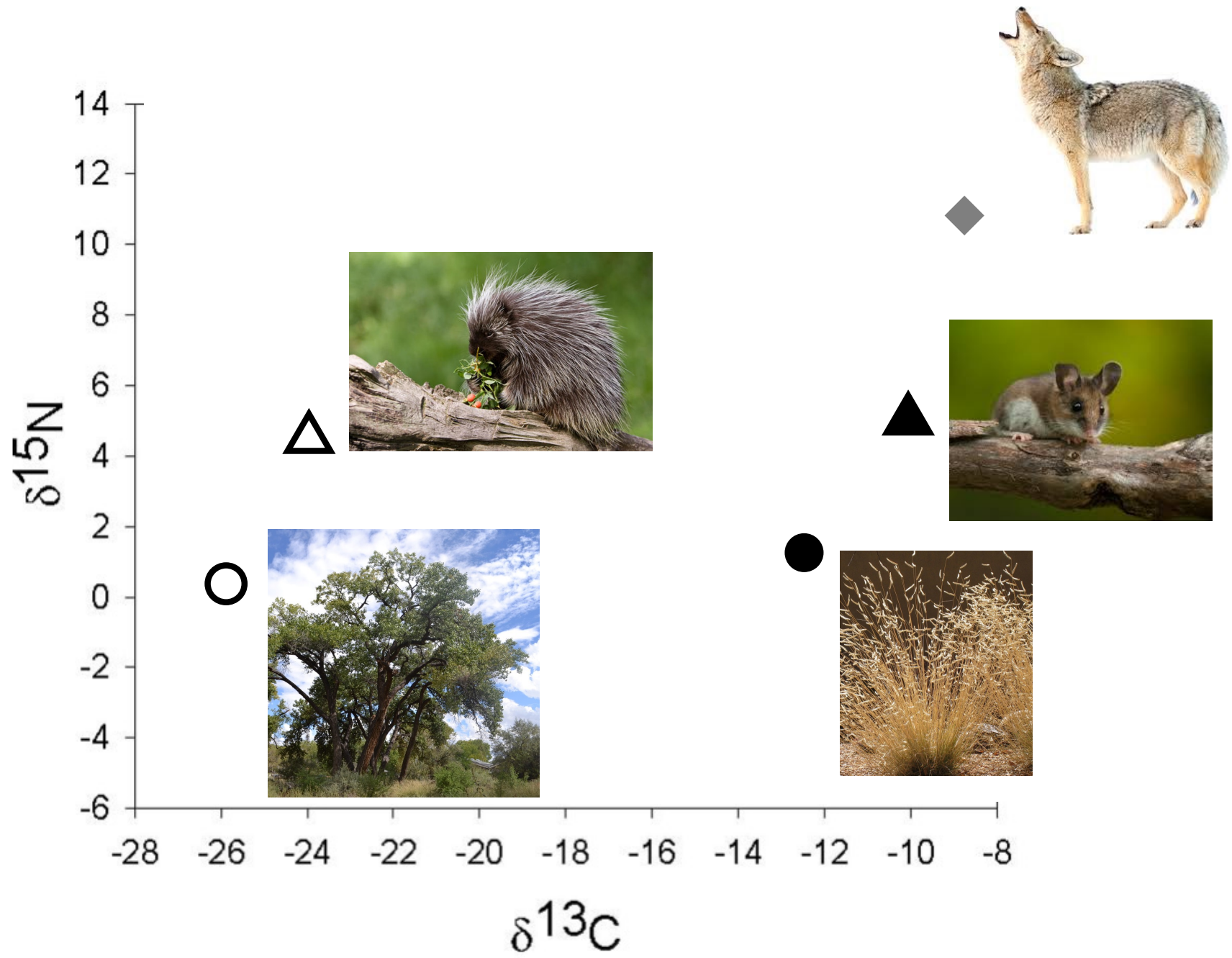








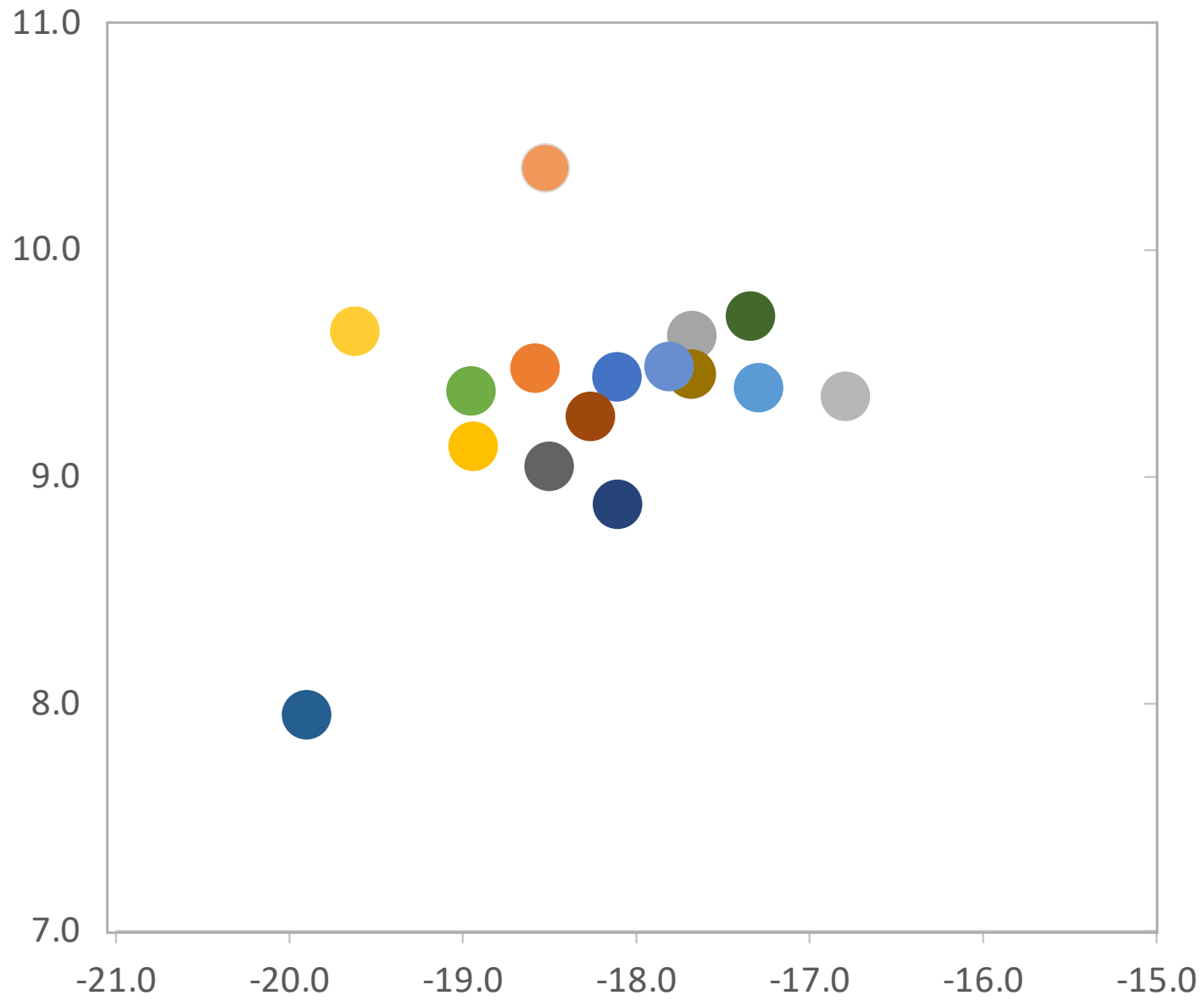




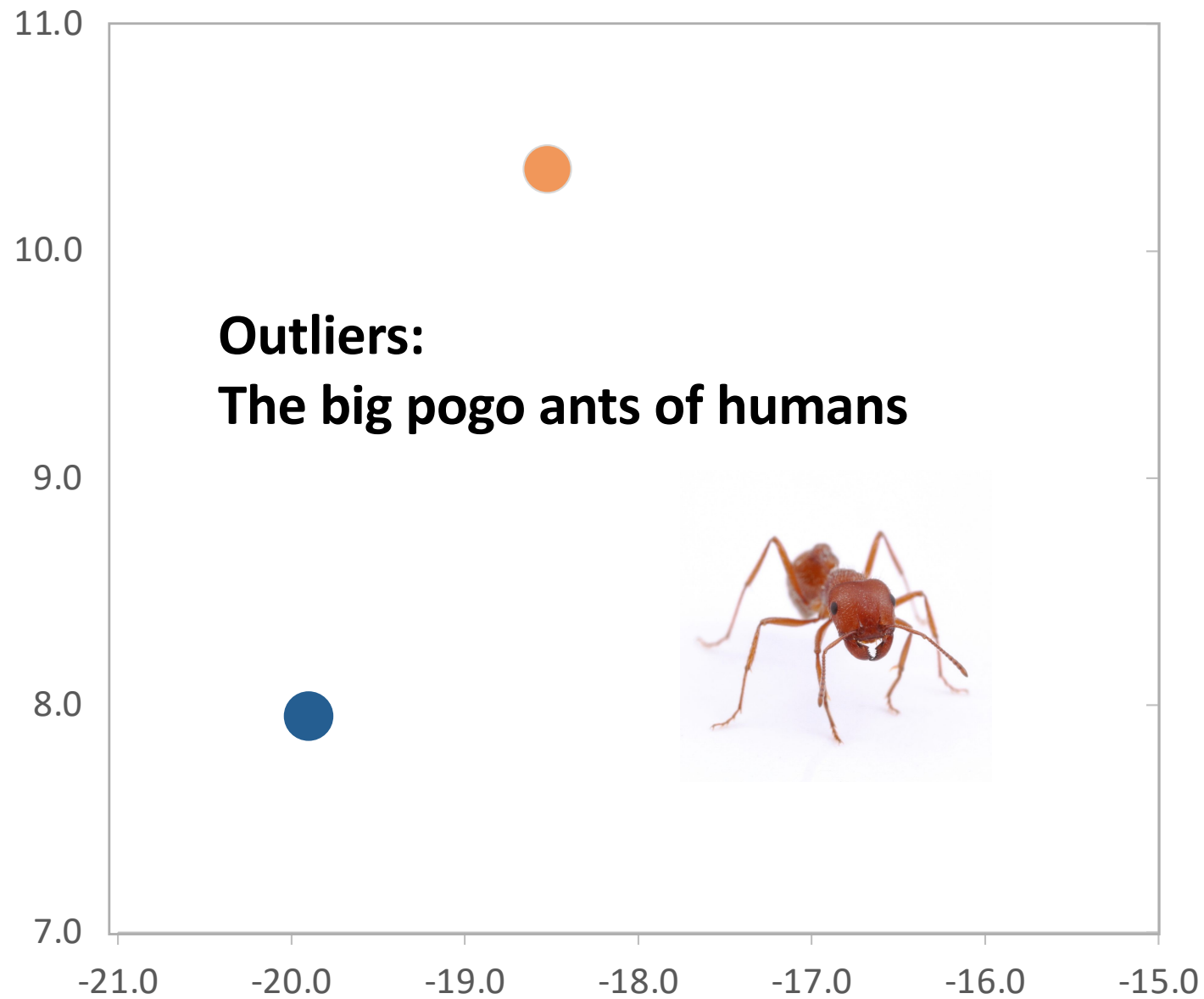
Summary

- Isotopes can be visualized in “isotope maps”
- Carbon on the bottom (x axis)
- Nitrogen on the side (y axis)
- Looking at where an animal is in this space can tell us about their ecology!

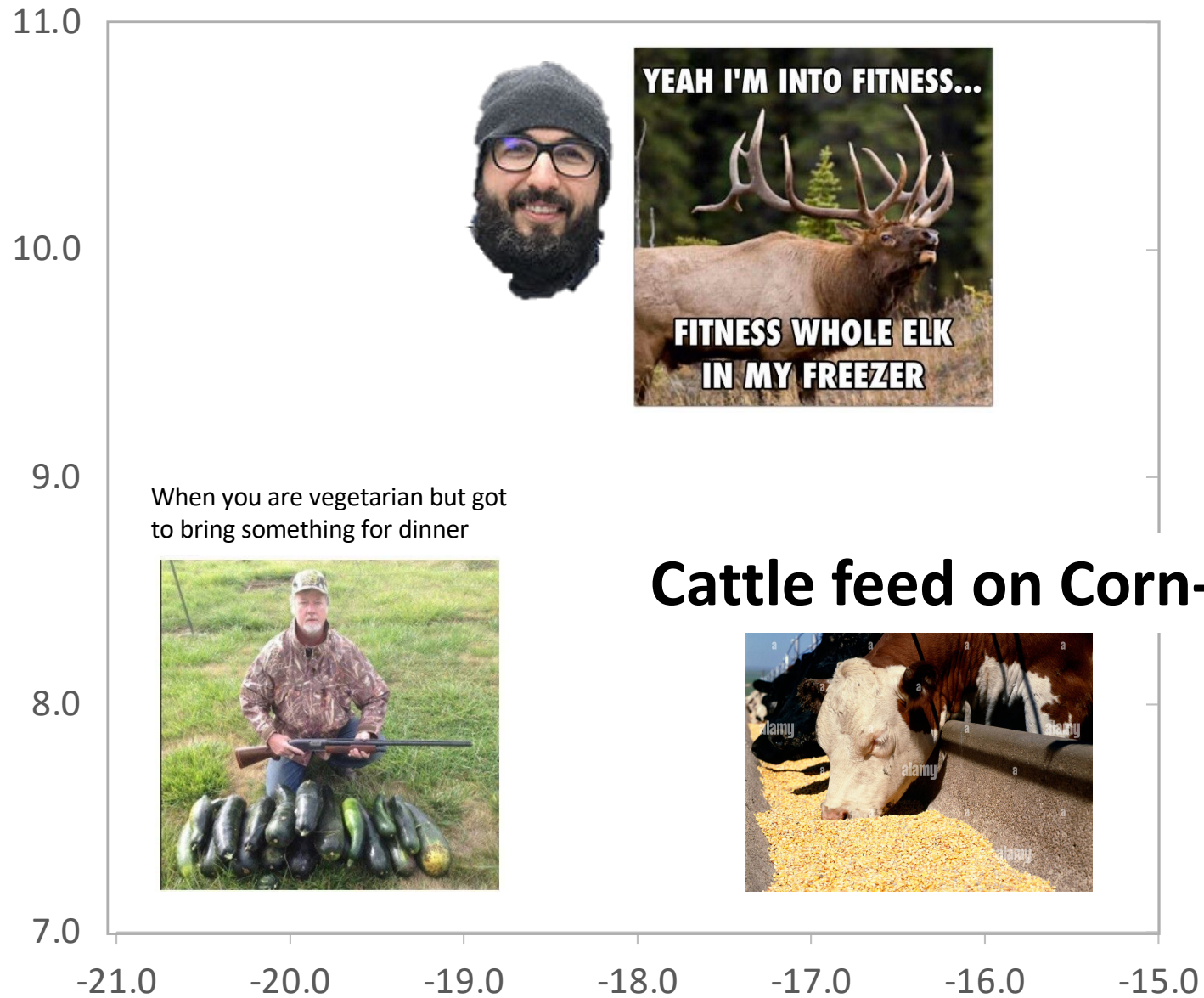
Past students and instructors



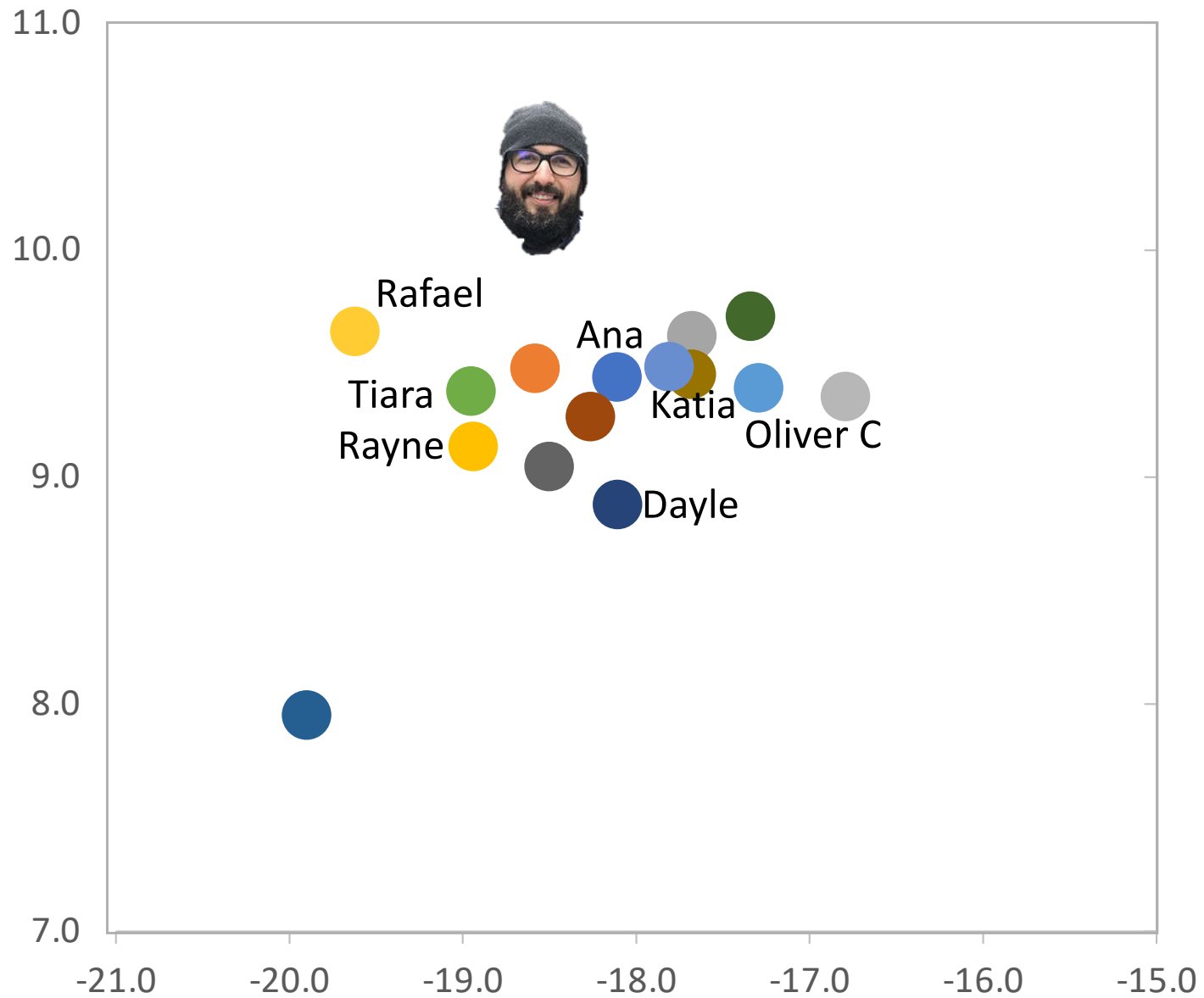
Individual dietary specialization in humans



Individual dietary specialization in humans



Individual dietary specialization in humans



Individual dietary specialization in humans

