

Christian Pázmándi and Michael Traugott

**Calibration of isotopic turnover rates in wireworms,
common agricultural pests**

**Centre for Mountain Agriculture and Institute for Zoology and Limnology,
University of Innsbruck, Austria**



FWF



Why wireworms?

Wireworms are the larvae of elaterid beetles. They can feed on field crops, like maize and potato, causing thereby considerable damage.



The most common genus in Central Europe is *Agriotes*. Besides crops, weeds are also fed on. The dynamics of the dietary switches, and the underlying causes, are poorly known.



Knowledge about their food selection is fundamental for the development of successful control strategies.

Stable isotope analysis as a tool to characterize the diet of wireworms in arable land.

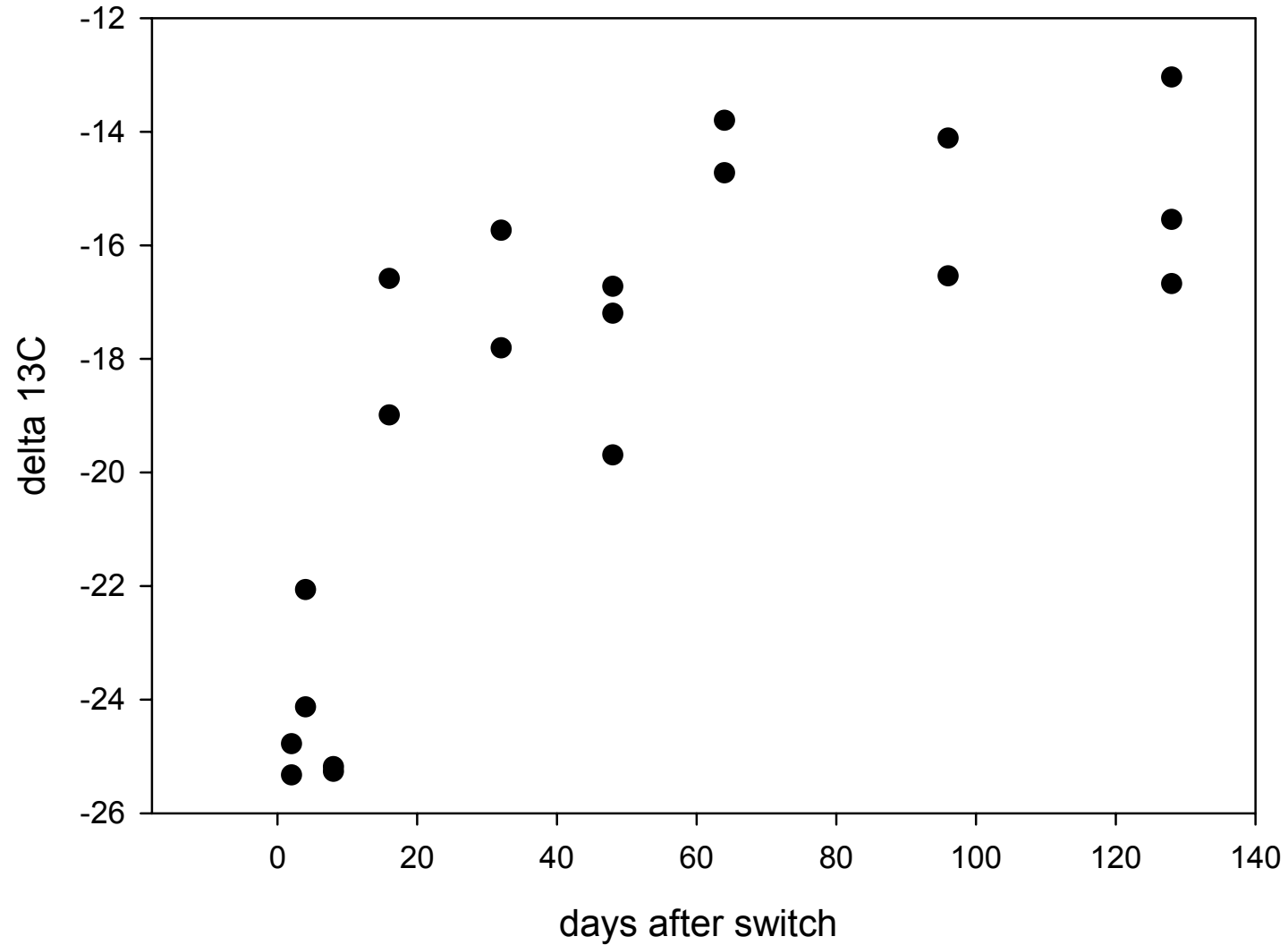
Two-step approach

- 1) Feeding experiments clarify how the isotopic signal in the diet is reflected in the wireworms' tissue. They are performed at constant temperatures, constant light regimes, constant soil conditions and constant feeding regimes. Thereby, the "noise" in the relationship between both isotopic signals is reduced to a minimum.
- 2) The results of these experiments are used to interpret the isotopic data from wireworms and food candidates gathered in the field, with all pertaining complexities.

Results from diet switch experiments between wheat and maize are shown on the following slides, followed by data from the field.

Agriotes obscurus:

Diet switch from wheat (delta 13C: **-25.6**) to maize (delta 13C: **-11.2**)



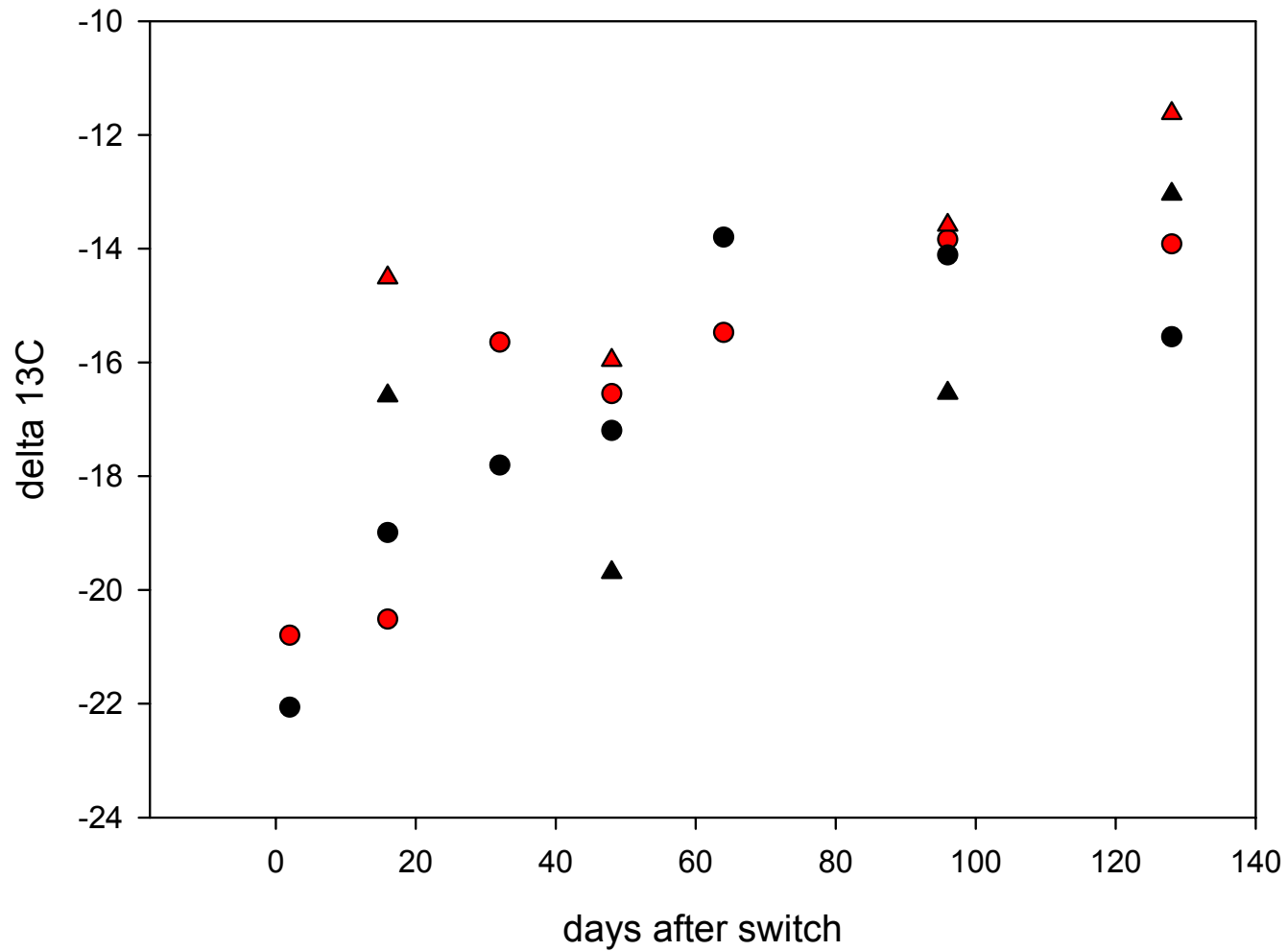
Agriotes obscurus:

Diet switch from wheat (delta 13C: **-25.6**) to maize (delta 13C: **-11.2**)

Black symbols stand for whole tissue samples, red ones for fat samples.

Multiple samples from the same day are individualized by symbols:

Circles stand for samples from one specimen, triangles for the other one.

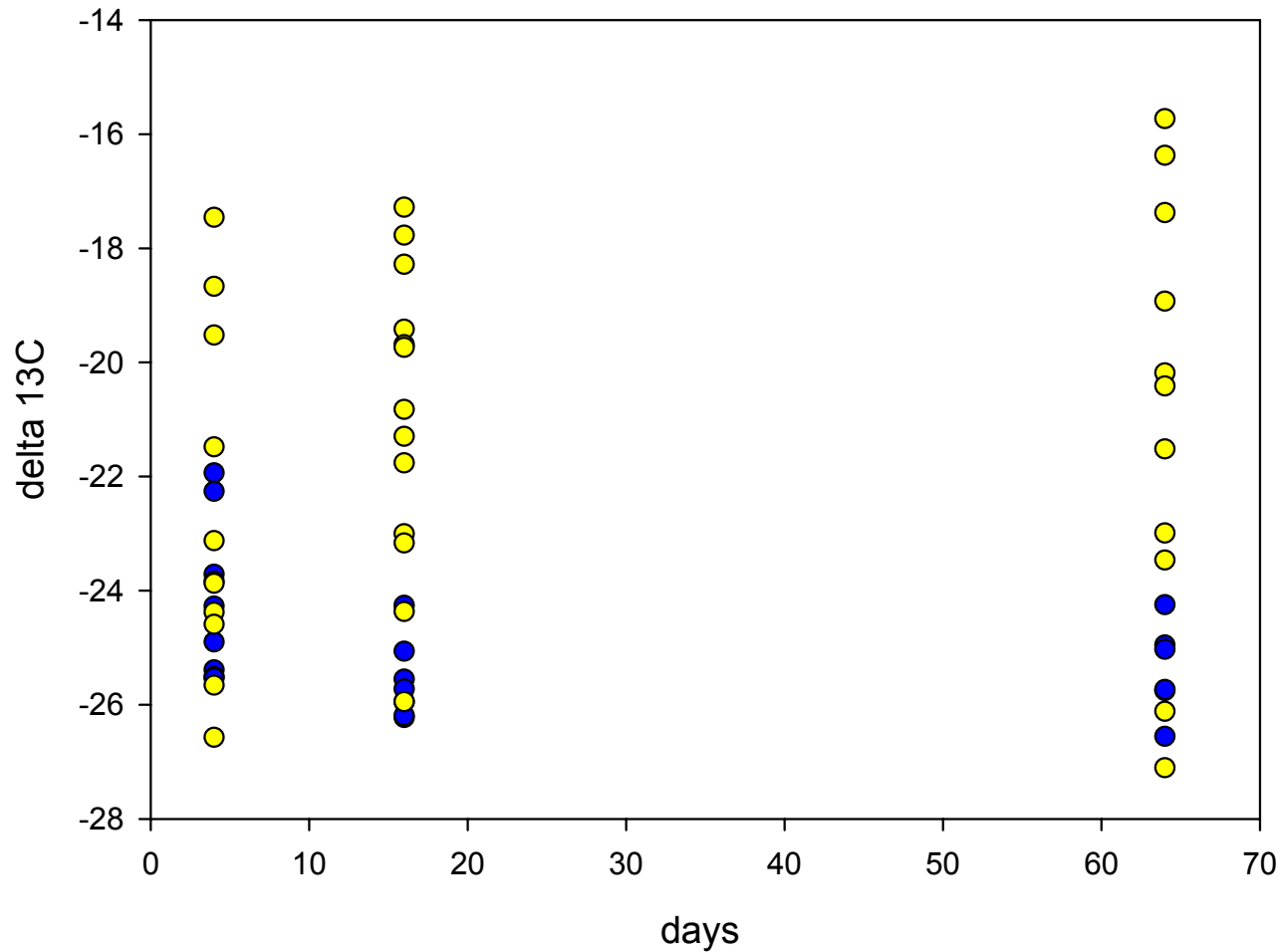


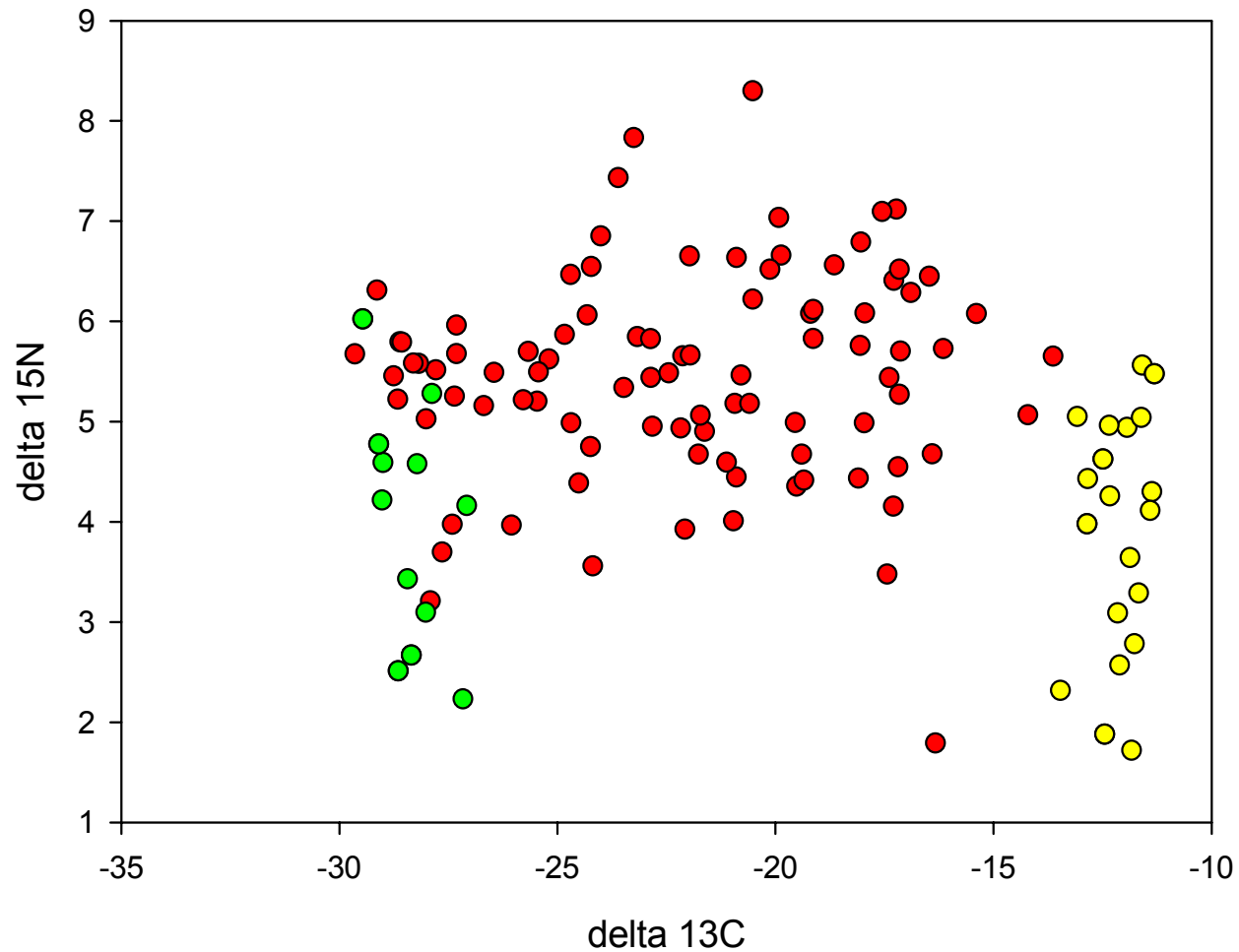
Agriotes obscurus from grassland:

Yellow: Group fed with maize

Blue: Group with wheat, isotopically similar to grassland vegetation

Wheat: delta 13C: -25.6, maize: delta 13C: -12.0





Agriotes obscurus (red) from an organic maize field in Kolsass, Austria: Most are mixed feeders, showing a stronger tendency for the less frequent weeds (green) than for the prevalent plant, maize (yellow).

Further perspectives

- 1) Frequent diet switches are likely in the field.
- 2) Fatty acids differ in their isotopic turnover rates:
 - Short ones are taken over directly from the diet, diet switches show up quickly in the isotopic composition.
 - Long ones are synthesized *de novo*, diet switches take more time to show up in the isotopic composition.
- 3) An isotope analysis of different fatty acids should be able to track diet switches at different time points in the feeding history of the individual.

It could help to test the relevance of short term changes in the environment, like heavy rainfalls or sudden temperature drops, for the feeding ecology of facultative agricultural pests like *Agriotes*:

What are the triggers that cause switches from weeds to field crops?