Time travelling beetles - using of historical samples to study the dynamic of trophic interactions

Yohann Graux[1], Marina Querejeta[1], Vincent Bretagnolle[2], Sabrina Gaba[2], and Stéphane Boyer*[3]

[1]Institut de recherche sur la biologie de l'insecte – CNRS – France
[2]Centre d'Études Biologiques de Chizé - UMR 7372 – CNRS – France
[3]Institut de recherche sur la biologie de línsecte UMR7261 (IRBI) – Université de Tours, Centre National de la Recherche Scientifique : UMR7261 – Av Monge 37200 TOURS, France

Résumé

Most predatory carabid species are considered as opportunistic feeders with a wide diet breadth including major crop pests. They are therefore considered as efficient biological control agents and often targeted in ecological surveys. Hence, significant carabid collections have been built in many research institutes as part of studies focusing on biodiversity assessments or biological control in agricultural landscapes. Often specimens are preserved in ethanol, and these collections therefore constitute potential repositories of information about prey communities in agricultural landscapes in the recent past.
We used a metabarcoding approach to analyse the gut contents of 200 specimens from two generalist carabid species (Nebria salina and Poecilus cupreus) collected between 2013 and 2021 in oil seed rape fields in Western France. Specimens were dissected and prey DNA was amplified from the insects' crop using generalist PCR primers and illumina sequencing. Specimens were also measured to detect potential morphometric variation through time, that may be related to shifts in their diet. By using existing collections of ethanol preserved specimens, such analysis has the potential to inform on the biocontrol services provided by carabids and highlight shifts in arthropod communities that may be related to global changes, agricultural practices or changes in land management.
The diet of the two studied carabid species varied annually, showing significant switches between years in particular in *Nebria salina*, which stresses the importance of multi-year studies to fully describe the diet of carabid beetles. In addition, we detected a significant temporal trend in the diversity of prey caught by the two carabid species. In particular, we found that the two carabid beetles that dominate oil seed rape crop carabid community displayed a decreasing trend over the last decade in the number and the diversity of prey, which supports the general hypothesis of a decline in the diversity of invertebrate communities in intensive agricultural landscapes.

Mots-Clés: Carabids, diet analysis

*Intervenant