



The comparison of carabid communities sampled at three different field sites during 5 years of ecological biosafety research provides useful information for the design of a post market environmental monitoring of this arthropod family.

Each evaluated field site demonstrated a unique composition of carabid species. A baseline for the carabid beetle communities would therefore be necessary for each field site to detect any changes in its composition over time.

Aside from the influence of the location, the impacts of weather, the date of sampling and of course the chosen sampling method have to be considered. A standardized method is a basic requirement for a replicable assessment. The number of traps per square meter, and the size and the design of the traps have to be determined a priori. The influence of the weather has to be taken into account and only a monitoring over a longer time period may yield reliable data. Multiple samples taken subsequently during the growing season would minimize potential mistakes in the interpretation of data.

However, the main problem implementing a PMEM with carabids considering the mentioned obstacles will be the long-term financing of such a project.

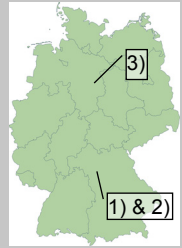


Fig. 1: Location of the evaluated field sites: 1) & 2) Schwarzenau 3) Braunschweig

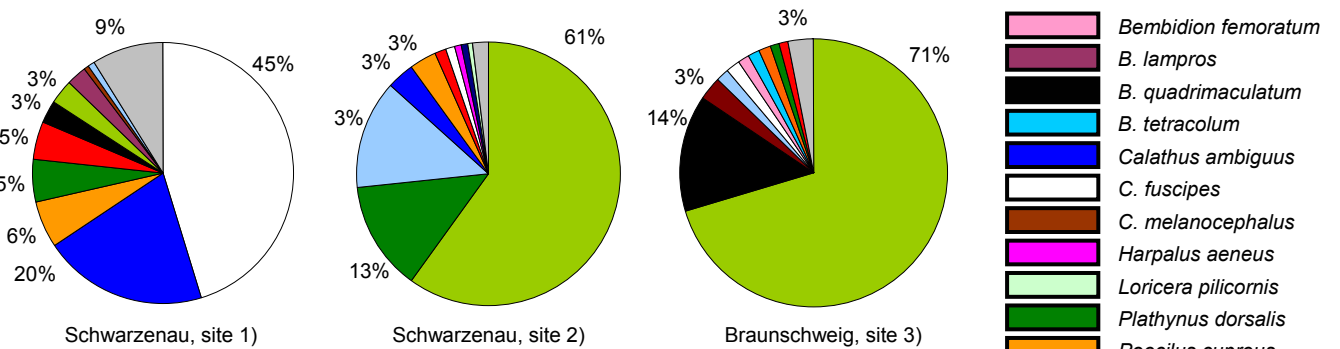


Fig. 2: Comparison of the carabid communities of three different field sites 1) & 2) in Schwarzenau (2006) and 3) in Braunschweig (2008). Presented are the ten most abundant species of each location. Percentage numbers below 3% are not displayed. The photographs show the carabid species *Calathus fuscipes*, a pitfall trap used for sampling and the species *Pseudophonus rufipes* (top to bottom).

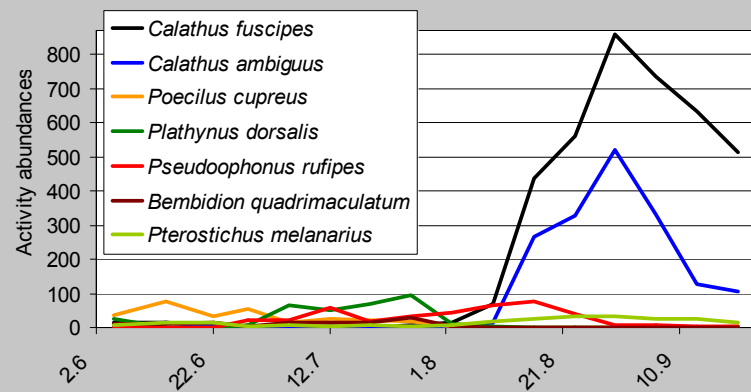


Fig. 3: The development of the carabid community during the growing season 2006 at the site 1) in Schwarzenau

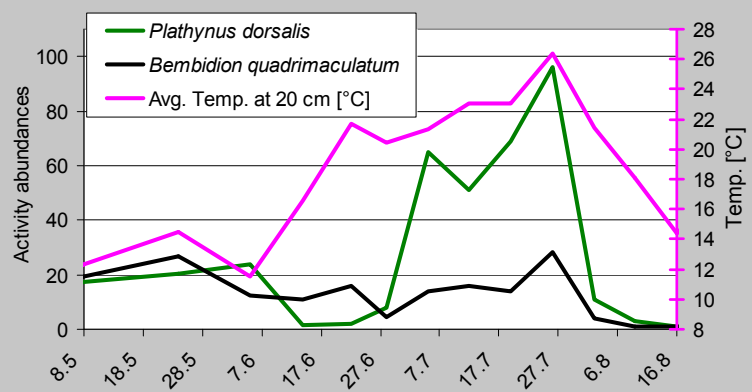


Fig. 4: Dependence of the activity abundances of two carabid species at site 1) in Schwarzenau on the temperature during the sampling period in 2006

Summary:

Each evaluated field site (Fig.2) demonstrated a unique composition of carabid species. The field sites 1) and 2) in Schwarzenau at the Bavarian State Research Center for Agriculture (LFL) were separated by only 800 meters. In contrast the field 3) in Braunschweig at the Friedrich-Loeffler-Institute (FLI) lay about 300 km away. However, the dominant carabid species of 2) and 3) is the common *Pterostichus melanarius*, while the carabid community in 1) is dominated by *Calathus fuscipes*. The strong differences between beetle communities, also described by Lövei and Sunderland, 1996, reveal the requirement of locally differentiated baseline data in a general surveillance program to gain comparable information.

The data presented in Fig. 3 illustrate the different composition of the carabid beetle community on different sampling dates during the growing season of maize: e.g. the most dominant beetle at the field site 1) *Calathus fuscipes* could not be found in June and July of the year 2006. Fig. 4 includes temperature data during the surveyed time period. Temperature drops had a negative influence on the recorded activity abundances of the arthropods, as the activity of arthropods is temperature dependent. Therefore PMEM has to take both aspects, the temporal diversity of the carabid community and the dependence on external factors like weather, into account. The annual variability should also be kept in mind. A monitoring is therefore reasonably conducted over a longer period of time during maize cultivation.

As the pre-market risk assessment revealed no risk for these beneficial arthropods (Priesnitz, unpublished data) and the expenses for a PMEM would be enormous regarding the above-mentioned aspects, an indirect approach analysing the biological control function of carabids may be appropriate (Sanvido et al., 2008).

Acknowledgements:

Thanks to the BMBF and the PtJ for funding (0313279A and 0315215F), to my supervisors and colleagues, to the LVFZ Schwarzenau and the JKI/FLI Braunschweig for the management of the field trials.

References:

Lövei, G.L., Sunderland, K.D., 1996. Ecology and behavior of ground beetles (Coleoptera: Carabidae). Annu. Rev. Entomol. 41, 231–236

Sanvido, O., Romeis, J., Bigler, F. 2009. An approach for post-market monitoring of potential environmental effects of Bt-maize expressing Cry1Ab on natural enemies. J. Appl. Entomol. 133, 236-248

Fig. 1: http://commons.wikimedia.org/wiki/File:Karte_Bundesrepublik_Deutschland.svg