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Abstracts abgeschlossener Diplomarbeiten und Dissertationen

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Impact of semi-natural habitats on the diversity and density of carabid beetles in winter wheat

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About 15 years ago, sown wildflower areas (SWA) have been established in Swiss arable landscapes to enhance biodiversity in agricultural systems. SWA have generally shown to positively affect biodiversity. However, little is known about their effect in comparison to that one of grassy margins on carabid diversity and density in adjoining crop fields. Carabid beetles were investigated as they are considered important natural control agents of agricultural pests. In this work the influence of within field position, adjoining semi-natural habitat and landscape composition on the diversity and density of carabid beetles was explored. Moreover, treatment effects (SWA, grassy margins, fields adjoining SWA and fields adjoining grassy margins) on carabid assemblage similarity were studied. Twenty winter wheat fields from ten different Swiss agricultural landscapes were selected for this work, with two wheat fields (one with an adjoining SWA and one with an adjoining grassy margin) located in each landscape.

With respect to within field position, species richness was significantly higher at the edges than in the centres of wheat fields, while the numbers of individuals were significantly larger in the centres than at the edges of wheat fields. Overall, activity-density was higher in fields than adjoining SWA and species richness was significantly larger in

grassy margins than adjoining wheat fields. There was no significant difference of species and individual numbers between fields adjoining SWA and fields adjoining grassy margins. The response of carabid beetles to adjoining semi-natural habitat and landscape composition was species specific.



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Among the most abundant species, higher densities of *Agonum muelleri* and *Poecilus cupreus* were observed in field centres compared to the edges. *Pterostichus melanarius*, which was six times more abundant in centre than edge positions, showed significant interactions between within-field position and landscape composition, and between adjoining habitat and landscape composition. Activity-density of *Bembidion properans* increased at the field edges with increasing amount of perennial habitat; in addition, a significant interaction between within-field position and landscape composition was observed. *Harpalus rufipes* was more abundant in fields adjoining SWA than in fields adjoining grassy margins. The most abundant carabids observed in study sites were macropterous, polyphagous carnivorous and euryoecious open habitat beetles, whose activity-densities were significantly higher in fields than adjoining

SWA. Species richness of stenoeccious open habitat carabids was significantly higher in grassy margins compared to adjoining fields. Carabid assemblages of one treatment were more similar to each other than to assemblages of another treatment. Furthermore, a strong significant effect of the factor treatment and a weaker significant effect of landscape on carabid assemblages were observed.

Overall, the present work demonstrates the importance of adjoining semi-natural habitat for diversity and density of carabids on arable land. Our findings support most of our expectations but higher promotion of carabids in wheat fields by SWA compared to grassy margins could not be shown.

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