

Importance of field margins and flower strips for Papilionoidea and Zygaenidae in agricultural landscapes



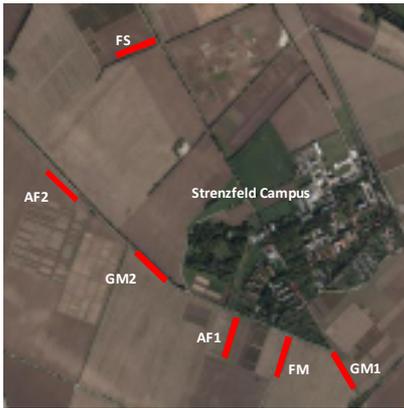
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Introduction

In the very productive chernozem regions of Saxony-Anhalt (Germany), natural vegetation is in steady decline during the last decades. The landscape is dominated by huge arable fields and landscape elements are scarce and mostly species-poor. In late summer 2010 and spring 2011, we established flower strips and field margins on nutrient-rich sites by sowing native wild plants. The results were used to shape the agri-environmental schemes of the new funding period in Saxony-Anhalt. In addition, practical guidelines for establishment and management of perennial flower strips on productive sites were summarized.

Location of study sites



Between April and September 2014, we registered the number of species and individuals of butterflies and burnet moths as well as the number of flowering nectar plants on sites near the Strenzfeld Campus of the Anhalt University of Applied Sciences. The following variants were selected:

- species-rich restoration sites (FS = perennial flower strips, FM = field margins)
- species-poor grass margins (GM)
- cultivated arable land (AF1 = rapeseed, AF2 = wheat)

The aim was to quantify the impact of diversification measures on butterflies and burnet moths.

Diversification measures on restoration sites

Perennial flower strips: In September 2010 and April 2011, we established a perennial flower strip on fertile arable land by sowing of 22-36 native forbs with a sowing density of 0.7–2.0 g/m² (block trial, 168m x 10m). The site is mown twice per year (March & stepwise in June or July) without removal of biomass (details see Fenchel et al. 2015).



Perennial flower strip in July 2013

Field margins: Begin of October 2010, 49 native species (5 grasses, 44 forbs) were sown with 2 g seeds/m² in a grass margin after thorough destruction of the grass sward (block trial, 540m x 3m). The site is mown stepwise in June or September with removal of biomass (details see Kiehl et al. 2014).



Field margin in Mai 2014, June-mowing variant

On both sites, the stepwise mowing regime increased structure variability and ensured a continuous availability of flowering nectar plants.

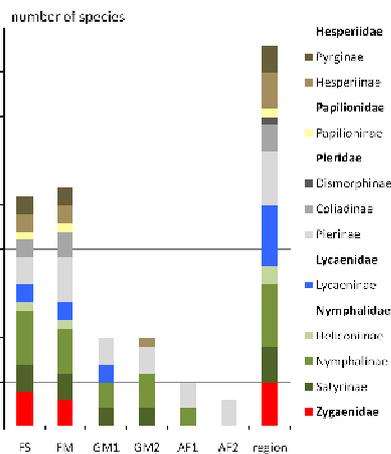
Survey methods

Species and individuals of butterflies and burnet moths were recorded via line-transect method in three 50 m sections. In addition, the following activities were registered for each individual: sucking, flying, sitting, reproductive behavior. Surveys were made once or twice a month in calm, sunny weather when temperatures were higher than 18°C. On each section of the study sites, the abundance of flowering nectar plants was recorded once a month from April until September 2014.

Recorded butterflies and burnet moths

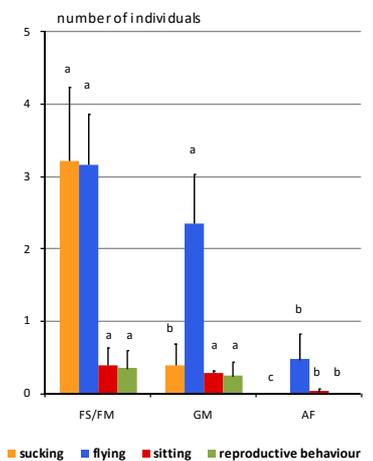
By comparison clearly most butterflies (21/24) and burnet moth species (4/3) were recorded on FS and FM sites, corresponding to approx. 60 % of the species inventory of the whole region.

In GM and AF sites, the number of observed butterflies (10/5) and burnet moths (1/0) was much lower and only generalist species occurred. In all study sites, ubiquitous species and species typical for mesic grasslands were over-represented. Only on FS and FM sites, xerophilous species as well as rare species were found. *Zygaena ephialtes*, *Zygaena loniceræ* and *Carcharodus alceae* are listed as threatened species in Saxony-Anhalt.



Activities of recorded butterflies and burnet moths

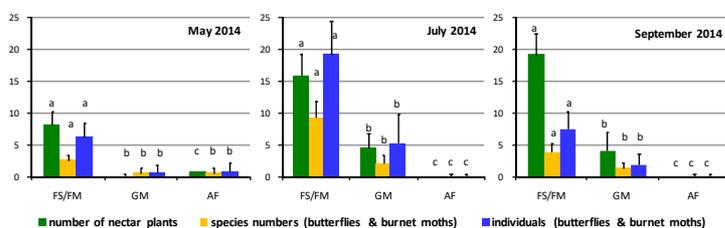
On flower-rich sites (FS/FM), the amount of nectar sucking individuals was significantly higher than on grass margins and arable fields (Kruskal-Wallis-test, n=4). Flying individuals were also recorded over grass margins but in arable fields, their number was significantly lower. Species-rich sites (FS/FM) and species-poor grass margins (GM) showed a similar number of sitting and reproducing individuals whereas in arable fields (AF), both numbers are significantly decreased. The results proved the high importance of species-rich sites as feeding habitats for butterfly and burnet moth species.



Relevance of flowering nectar plants

The graphs for May, July and September 2014 showed that the number of nectar plants, species numbers and individuals of butterflies and burnet moths are significantly different between variants (Kruskal-Wallis-Test, n=6). During the whole observation period, species-rich sites (FS/FM) had significantly higher numbers of flowering nectar plants than species-poor sites (GM and AF).

In addition, between April and September 2014, species and individual numbers of butterflies and burnet moths were strongly correlated to the number of flowering nectar plants (species numbers: R² = 0.428, individuals: R² = 0.527).



Conclusion

Our results indicate the high importance of perennial flower strips and field margins sown with high-diversity seed mixtures of native plant species for the conservation of butterflies and burnet moths. In highly productive agricultural landscape, even smaller sites (at least 0.2ha) can contribute considerably to the biological diversity in the region.



Zygaena filipendulae



Polyommatus icarus



Carcharodus alceae

Papilio machaon

Fenchel, J., Busse, A., Reichardt, L., Anklam, R., Schröder, M., Tischew, S., Mann, S., Kirmer, A. 2015. Hinweise zur erfolgreichen Anlage und Pflege mehrjähriger Blühstreifen und Blühflächen mit gebietseigenen Wildarten. Ministry for Agriculture and Environment Saxony-Anhalt (ed.), Magdeburg/Germany
Kiehl, K., Kirmer, A., Jeschke, D., Tischew, S. 2014. Restoration of Species-Rich Field Margins and Fringe Communities by Seeding of Native Seed Mixtures. In: Guidelines for Native Seed Production and Grassland Restoration, 246-275. Cambridge Scholars Publishing