

LAND USE IMPACT ON BUTTERFLY DIVERSITY: A CASE STUDY FROM BULGARIA IN THE FRAMEWORK OF STACCATO PROJECT



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Photo: Milka Elshishka

Rapeseed cropland plot near Malak chardak village (R1)

STACCATO project is a BiodivERsA funded EU project which focus on the evaluation of ecosystem services and their sensitivity to land use patterns in agriculturally dominated landscapes. It aims to investigate the interactions between crop production areas and landscapes in which they are imbedded across an European site network. The impact of land use type and intensity on diversity of different bioindicators (plants, wild bees, ground beetles, nematodes, butterflies and pteromalids) will be evaluated. Two habitat types – **rapeseed fields** and **grasslands** were selected and investigated in five European countries (Bulgaria, Germany, Romania, Sweden and Switzerland). Preliminary results on butterfly diversity from Bulgaria are presented below.

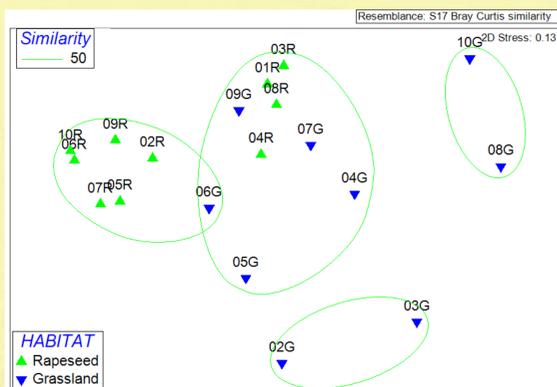


Photo: Milka Elshishka

Grassland field plot near Momino selo village (G6)

SAMPLING AND ANALYSES

Ten sites located in South-Central Bulgaria have been studied. Each site is consisted of rapeseed field and semi-natural grassland with different percent area (0%, 5%, 10%, 20% and 100 %). The butterfly diversity was sampled along two 500 m transects - one in the grasslands and one in the arable fields/field margins. The sites were visited in April and May 2018. Data were analysed using MS Excel and Primer v6.



Multi-dimensional scaling (MDS) plot comparing butterfly assemblages of rapeseed fields and grasslands areas

The **butterfly assemblages** of rapeseed fields were strongly dominated by one species (*P. rapae*) which had relative abundance between 49.1 - 84.5%. Half of the species were rare and were found in one or two plots. The *small cabbage white* was one of the dominant species in grasslands as well (15.9 - 64.3%), however few more species had relative abundance \geq than 10% depending of the site location (e.g. *C. pamphilus*, *M. jurtina*, *C. crocea*, *P. icarus*, *A. crataegi*, *Z. polyxena*, *P. argus*, *L. dispar*). Species distribution is presented as heatmap.

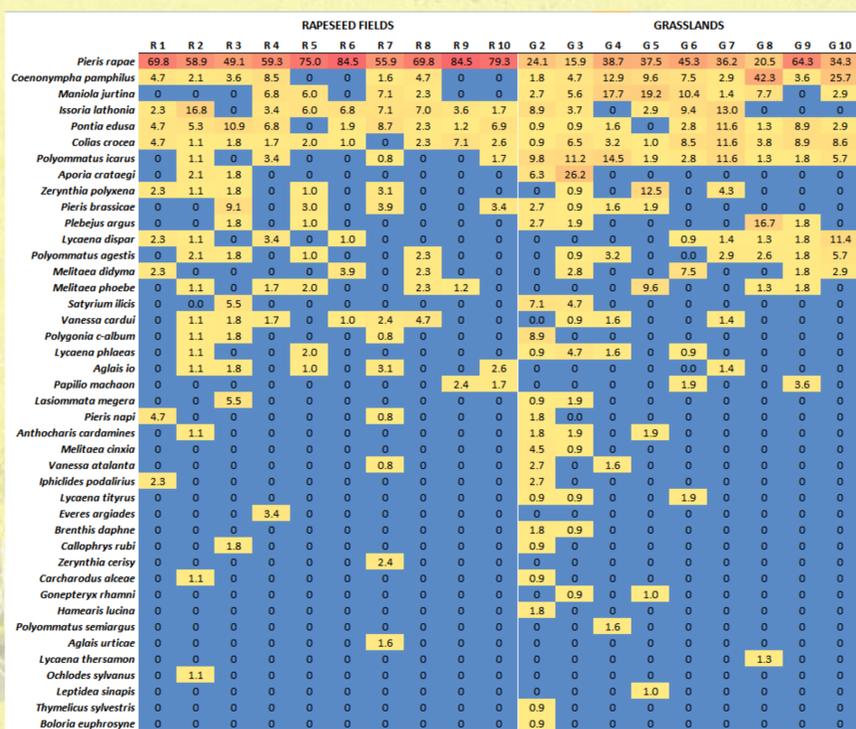
Conclusion: Although this study revealed a higher butterfly diversity in the semi-natural grasslands it is evident that the butterfly assemblages of this habitat are strongly affected by intensively managed croplands located in close proximity.

RESULTS

Overall 42 butterfly species were found, most of them (28) being common for both habitat types. Ten vs four butterfly species were registered in grasslands vs rapeseed fields, only. Species richness in grasslands was slightly higher as compared to rapeseed fields having similar range values. However, both habitat types differ significantly when diversity indices were compared (figures marked with *, $p < 0.05$, MW U test).

	RAPESEED FIELDS				GRASSLANDS			
	MEAN	SD	MIN	MAX	MEAN	SD	MIN	MAX
Number of individuals	82.5	28.9	43	127	81.0	26.6	35	107
Number of species	11.1	4.1	6	18	14.1	3.9	9	22
Sahnnon's Diversity Index	1.25*	0.46	0.64	1.90	1.96*	0.31	1.38	2.50
Pielou's Evenness Index	0.52*	0.13	0.34	0.70	0.75*	0.08	0.58	0.82
Simpson's Diversity Index	0.51*	0.17	0.28	0.74	0.79*	0.09	0.58	0.88

Heatmap summarising the relative abundances of all 42 butterfly species per sampling plot



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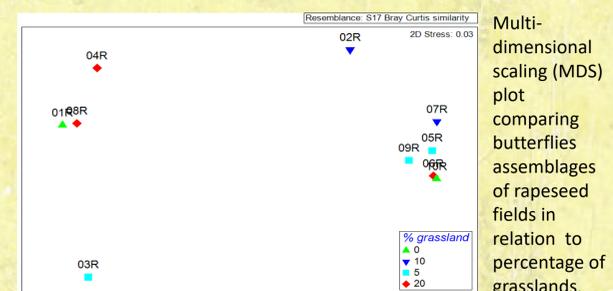
Photo: B. Zlatkov

Pieris rapae known also as 'small cabbage white' was the dominant species in the rapeseed fields and partly in the grasslands. Its primary hosts are plants of Brassicaceae. The larvae are host plants generalists and serious pests in agriculture.



Photo: B. Zlatkov

Butterfly species with conservation status were found in both grasslands and rapeseed fields: *Zerynthia polyxena* (Bern Convention, CORINE Biotopes) and *Lycaena dispar* (Habitat Directive 92/43, Bern Convention, CORINE biotopes). *Zerynthia cerisy*, registered in R7 plot only, is a species listed as near threatened in the Red Data Book of the European Butterflies.



No relation between the grassland coverage and butterfly diversity in rapeseed fields was found.