Macropterous ground beetles (Coleoptera: Carabidae) prevail in European oilseed rape fields

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During a research conducted in oilseed rape (*Brassica napus* L.) fields in four European countries (Bulgaria, Germany, Romania and Switzerland), species composition and ecological structure of the ground beetle (Coleoptera: Carabidae) fauna associated with the rape were studied.

Introduction

Wing polymorphism in carabid beetles (Coleoptera: Carabidae) is well known and relatively well studied, as constantly macropterous, constantly brachypterous or apterous as well as di- and polymorphic species are reported.

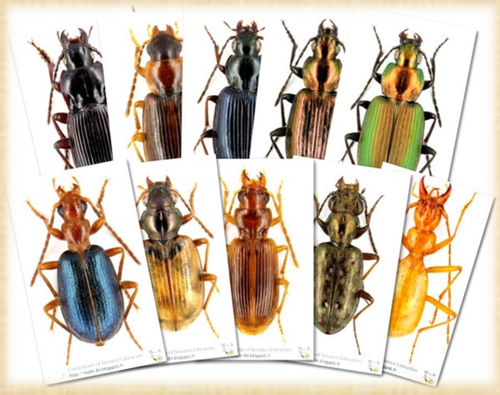
It is known that habitat type and disturbance influence wing morphology of carabids.

A number of studies have suggested that in areas with increased disturbance the numbers of specialist, large bodied and poorly dispersing species decrease in abundance, whilst generalist, small bodied effective dispersers increase. The more stable the occupied habitats are, the more natural selection will reduce relative wing size, and the numbers of flightless species will rise.

This study **aimed** at establishing the composition of the carabid fauna in relation to their wing morphology.

Model organisms

Ground beetles (Coleoptera: Carabidae)



Material and Methods

Field work was carried out in 2017 in Germany, Romania and Switzerland, and in 2018 in Bulgaria. Pitfall traps (5 in each site) with salt and 6% acetic acid saturated solution (with small amount of dishwasher detergent) as a preserving fluid, were set in each sampling site in each country.

The sampling periods were three in all countries and they were during the ***flowering***, during the ***ripening*** and ***after the harvest*** of the oilseed rape.

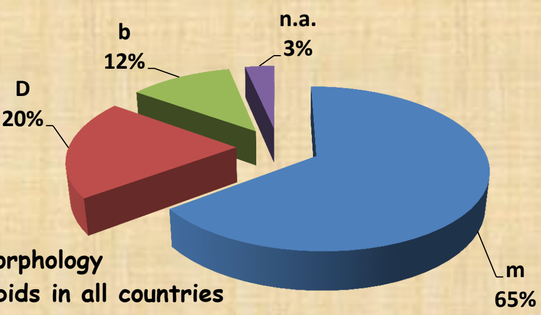
Results

During the study altogether 37912 beetles were collected. They belonged to 179 species and 51 genera. In Bulgaria were collected 5018 specimens from 107 species, in Germany – 14285 specimens from 68 species, in Romania – 7576 specimens from 71 species, in Switzerland – 11033 specimens from 45 species. Fourteen species were common in all countries.

Macropterous were 116 species of all collected carabids (in all countries). Pteridimorphic were 36 species, and brachypterous were only 21 species. For 6 species there were no data about their wing morphology.

Macropterous beetles prevailed in number of specimens too (79% of the specimens in all countries).

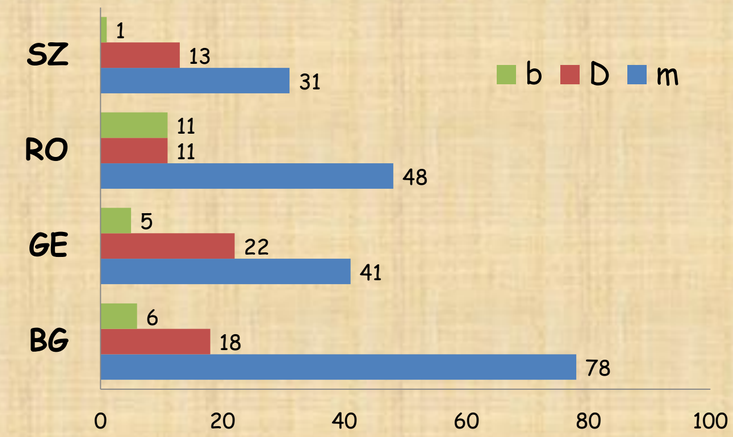
The results were similar in each country. Macropterous 78 species in Bulgaria, 41 species in Germany, 48 species in Romania, and 31 species in Switzerland. Pteridimorphic species were 18 species) in Bulgaria, 22 species in Germany, 11 species in Romania, and 13 species in Switzerland. Brachypterous species were less abundant in all four countries

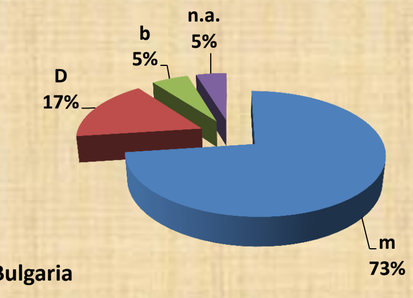


Wing morphology of carabids in all countries

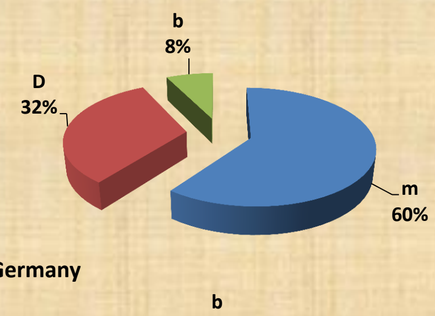
m – macropterous, D – pteridimorphic

b - brachypterous

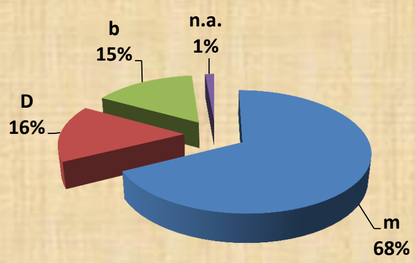




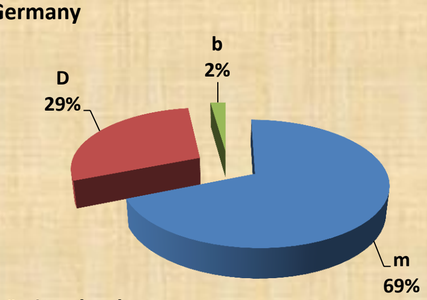
Bulgaria



Germany

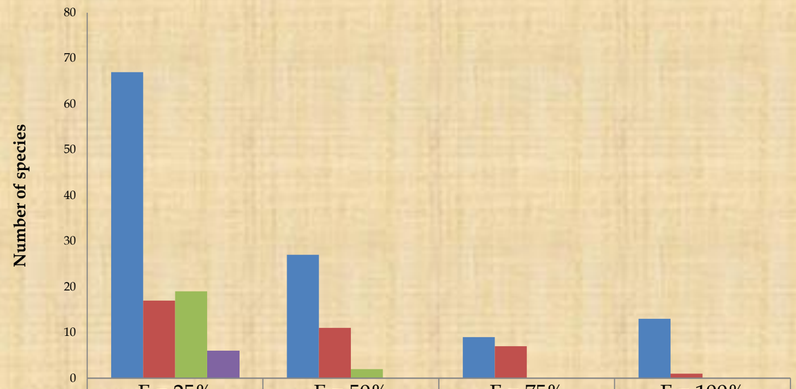


Romania



Switzerland

In relation of their frequency of occurrence, carabids were separated in four classes: with occurrence of 25% (occurring in only one country), 50% (two countries), 75% (three countries) and 100% (constant species, occurring in all countries). Common species with occurrence of 100% in our study where mostly winged and only one species was dimorphic.



	F = 25%	F = 50%	F = 75%	F = 100%
m	67	27	9	13
D	17	11	7	1
b	19	2	0	0
n.a.	6	0	0	0

Conclusions

Oilseed rape fields, being young and less stable habitats, harbor more macropterous ground beetles, while brachypterous species with lower dispersion abilities seem to be more vulnerable to anthropogenic interference in the crops.

The prevalence of the macropterous carabids reflects their higher mobility and adaptiveness, and evidences the initial stage of formation of coenoses, as well as the unstable state of carabid populations in the oilseed rape fields in all studied countries.

The combination of less species diversity and greater abundance of the established beetles in Germany and Switzerland might be a sign of some catastrophic effect in the biocoenoses there, e.g. stronger intensification of the agriculture.

Intensification of the agriculture leads to the decline of natural habitats and associated biota worldwide. In this study the ground beetles were used as a model, as they are well studied bioindicators and have a proved role in the ecosystems as valuable pest control factor.

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