Grasshopper and ground beetle fauna of calcareous grasslands in Abava River valley

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Introduction

Abandoned calcareous grassland near Sabile

Extensively grazed calcareous grassland near Kandava

Introduction

Chorthippus bruneus
Photo: V. Vintulis

Euthystira brachyptera
Photo: V. Spuņģis

Harpalus latus
Photo: V. Spuņģis

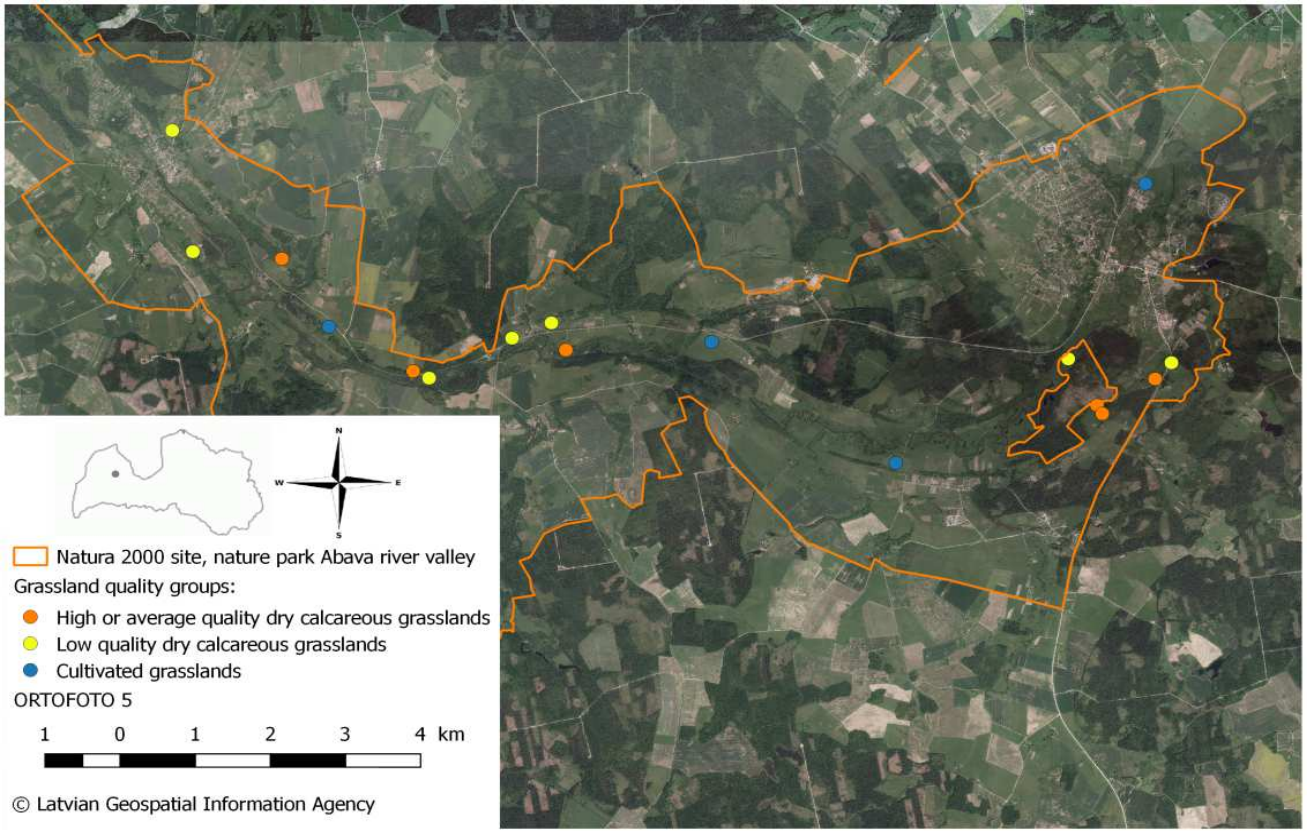
Aim of study:

to analyze how the grassland quality, management and abandonment affect grasshopper and ground beetle diversity in dry calcareous grasslands of the Abava River valley

Hypothesis:

grassland quality and management can have diverse effects on insect species, depending on their ecology

Study area - Abava River valley



Methods

The variety of grasslands (n=17) researched in Abava River valley

- ❖ average to high quality calcareous grasslands* (n = 6);
- ❖ abandoned, low quality calcareous grasslands (n = 7);
- ❖ cultivated grasslands** (n = 4)

* Extensive razing (n=2), mowing in august (n=1) or no management

** Mowing in June/July

Good quality calcareous grassland with no management

Good quality, extensively grazed calcareous grassland

Low quality, abandoned calcareous grassland

Mowed, cultivated calcareous grassland

Methods

All photos: R. Rozenfelde




Vegetation characterization:

All plant species 25m^2

All plant species 1m^2

Structures 10 x 1m^2

Expansive species

SNG indicator species

Soil parameters: pH, relative humidity

Grasshoppers and ground beetles:

10 pitfall traps per grassland, exposed in periods of two weeks:

1) 15. June – 29. June
2) 21. July – 4. August
2) 25. August – 8. September

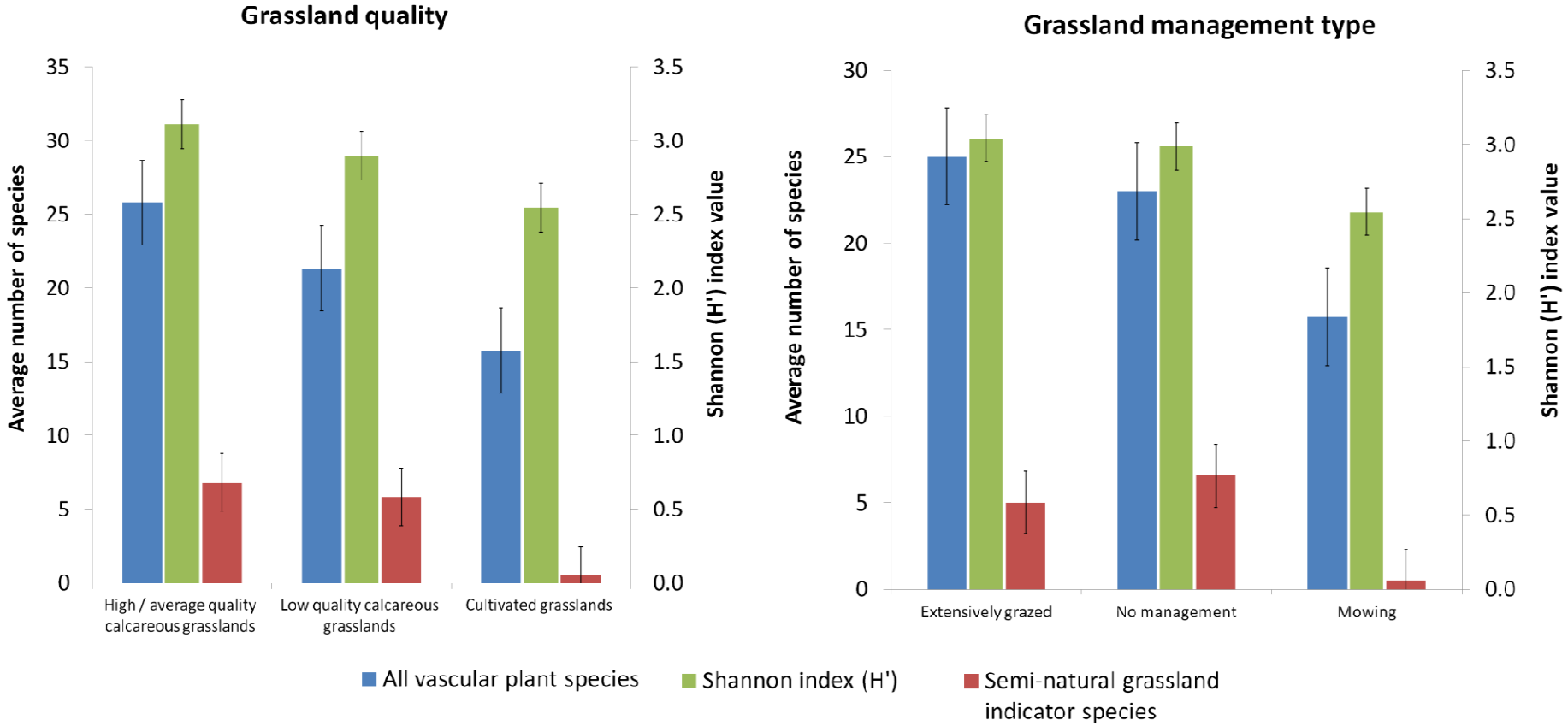
Results – soil parameters

Soil parameter	High / average quality calcareous grasslands	Low quality calcareous grasslands	Cultivated grasslands
Average pH level	6.89	7.49	6.34
Average relative humidity (%)	8.41	8.37	2.44

- The differences are not significant ($p>0.05$, *Kruskal-Wallis* test)
- Soil humidity and pH level tend to be relatively lower in cultivated, mown grasslands

Results – Vegetation

All differences are statistically significant (Kruskal-Wallis test, $p<0.05$).



Characteristic vegetation parameters for grassland **quality groups**, obtained from **indicator species analysis**.

High / average quality calcareous grasslands

- Number of semi-natural grassland indicator species (IV=54.5)
- *Agrimonia eupatoria* (IV=55.1), *Filipendula vulgaris* (IV=55.0), *Fragaria viridis* (IV=63.6), *Potentilla erecta* (IV=58.4), *Trifolium arvense* (IV=56.5)

Low quality calcareous grasslands

- Litter cover (IV=51.3) and thickness (IV=54.9)
- *Inula salicina* (IV=66.7)

Cultivated grasslands

- Cover of expansive species (IV=64.3)
- *Dactylis glomerata* (IV=58.2), *Taraxacum officinale* (IV=95.5), *Trifolium pratense* (IV=56.2)

Only significant results are shown ($p<0.05$)

Characteristic vegetation parameters for grassland **management groups**, obtained from **indicator species analysis**.

Extensive grazing

- Moss cover (IV=76.7)
- *Centaurea jacea* (IV=75.0), *Daucus carrota* (IV=93.1), *Fragaria viridis* (IV=61.2), *Potentilla erecta* (IV=73.8), *Prunella vulgaris* (IV=100.0), *Primula veris* (IV=62.6)

Abandoned

- Number of semi-natural grassland indicator species (IV=57.6)
- Litter cover (IV=62.2) and thickness (IV=56.8)
- *Centaurea scabiosa* (IV=68.4)

Mowing

- Cover of expansive species (IV=70.2)
- *Dactylis glomerata* (IV=59.4), *Taraxacum officinale* (IV=96.9)

Only significant results are shown ($p<0.05$)

Results – grasshopper and ground beetle fauna

Grasshoppers

506 individuals of 18 species

The most common species:

- *Omocestus viridulus*
- *Chorthippus paralellus*
- *Euthystira brachyptera*
- *Chorthippus albomarginatus*

Euthystira brachyptera
Photo: V. Spuņģis

Ground beetles

1094 individuals of 41 species

The most common species:

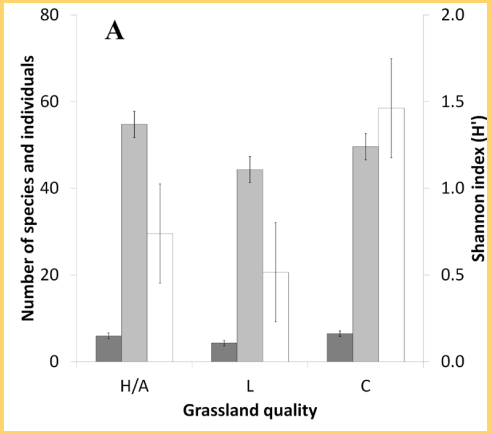
- *Poecilus versicolor*
- *Poecilus cupreus*
- *Amara aenea*

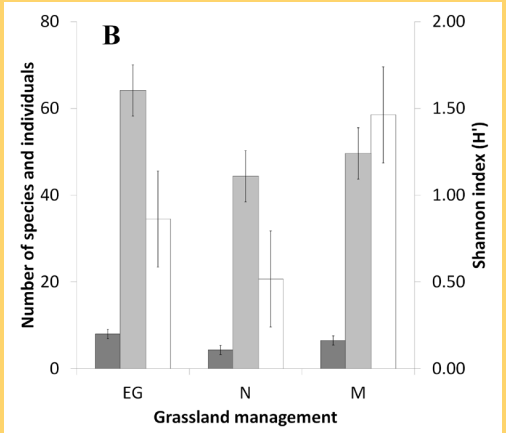
23 species characteristic to dry, calcareous grasslands

Grassland quality

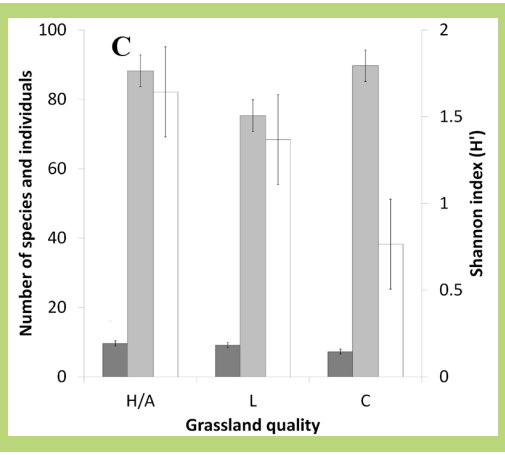
Grassland management

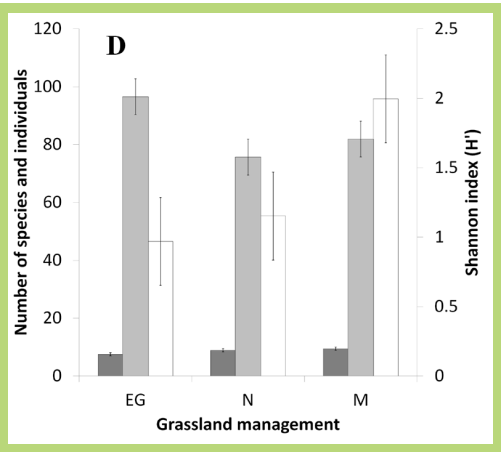
Grasshoppers





Ground beetles





Species

Individuals

Shannon index (H')

Indicators

Grassland group		Family	Species	Indicator value (IV)
Relative quality	High / average quality calcareous grasslands	-	-	-
	Low quality calcareous grasslands	-	-	-
	Cultivated grasslands	Acrididae	*Chorthippus dorsatus*	100.0
		Carabidae	*Amara communis*	88.8
		Carabidae	*Amara aenea*	73.5
		Acrididae	*Chorthippus albomarginatus*	73.1
		Carabidae	*Poecilus versicolor*	69.8
		Carabidae	*Poecilus cupreus*	66.7
		Carabidae	*Harpalus latus*	64.5
		Carabidae	*Ophonus rufipes*	63.9
Management type	Extensive grazing	Acrididae	*Chorthippus apricarius*	87.1
	No management	Tettigoniidae	*Metrioptera brachyptera*	75.7
	Mowing	Acrididae	*Chorthippus dorsatus*	100.0
		Carabidae	*Amara aenea*	84.1
		Carabidae	*Amara communis*	78.1
		Acrididae	*Chorthippus albomarginatus*	73.8
		Carabidae	*Harpalus latus*	68.7

Significance level 0.05. Only species with indicator value (IV) greater than 50.0 are shown.

Discussion – further research

- characteristic species of calcareous grasslands

- broader range of insect functional groups – multitaxon approach

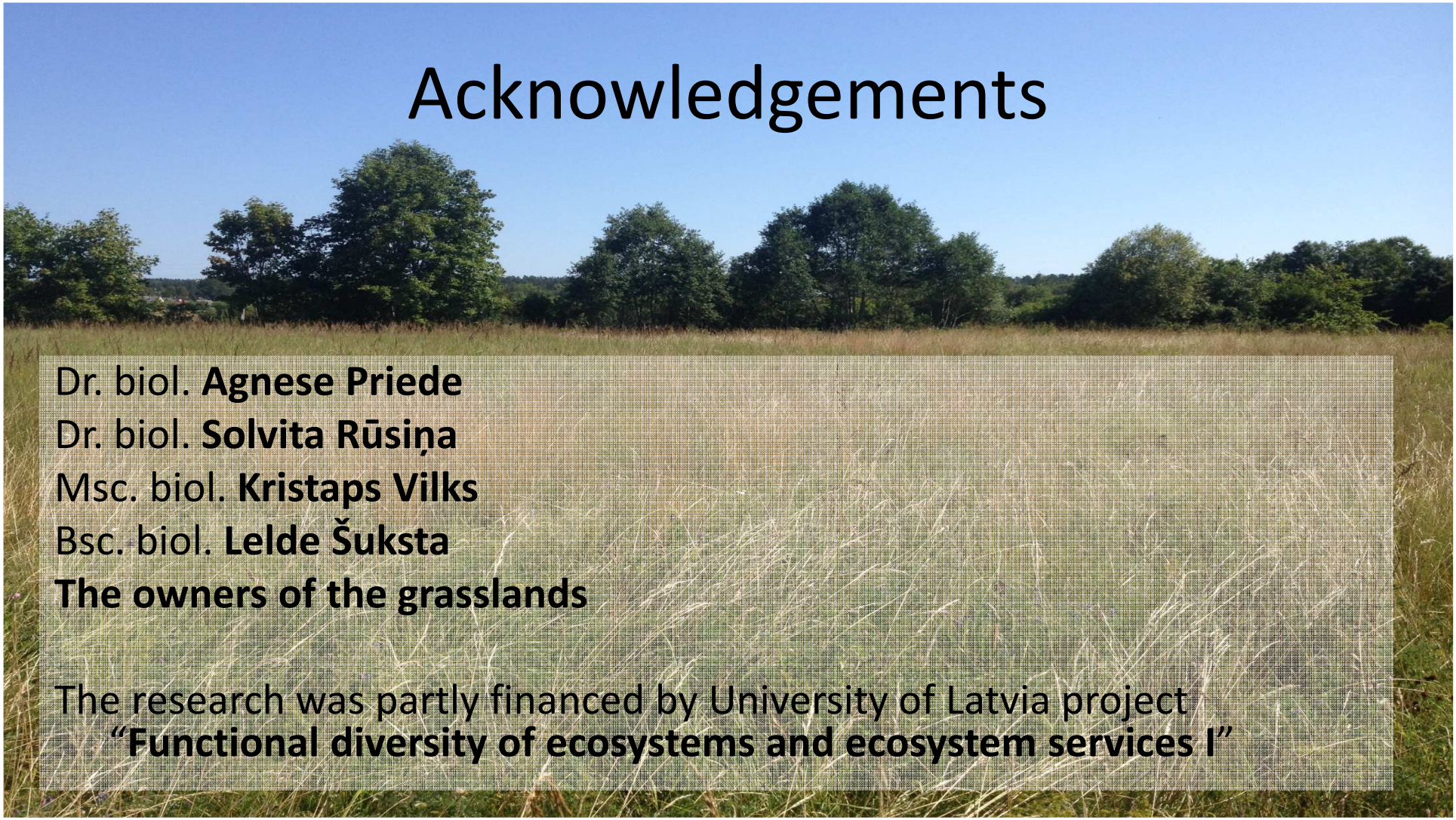
Discussion – the negative role of *Inula salicina* and *Rubus caesius* codomination

Conclusions

- High/average botanical quality grasslands have the highest value for the conservation of grasshopper and ground beetle diversity. **Extensive grazing** also had a positive influence on both grasshopper and ground beetle species diversity.

- The main factors that influence **grasshoppers** in dry, calcareous grasslands are microclimate, vegetation structure and species composition and grassland management. The main factors influencing **ground beetles** were vegetation height, herbaceous plant cover and soil pH level.

- **Grasshopper and ground beetle species composition has to be considered when assessing the importance of dry, calcareous grasslands for insect conservation.**



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