Effects of prescribed burning on arthropods

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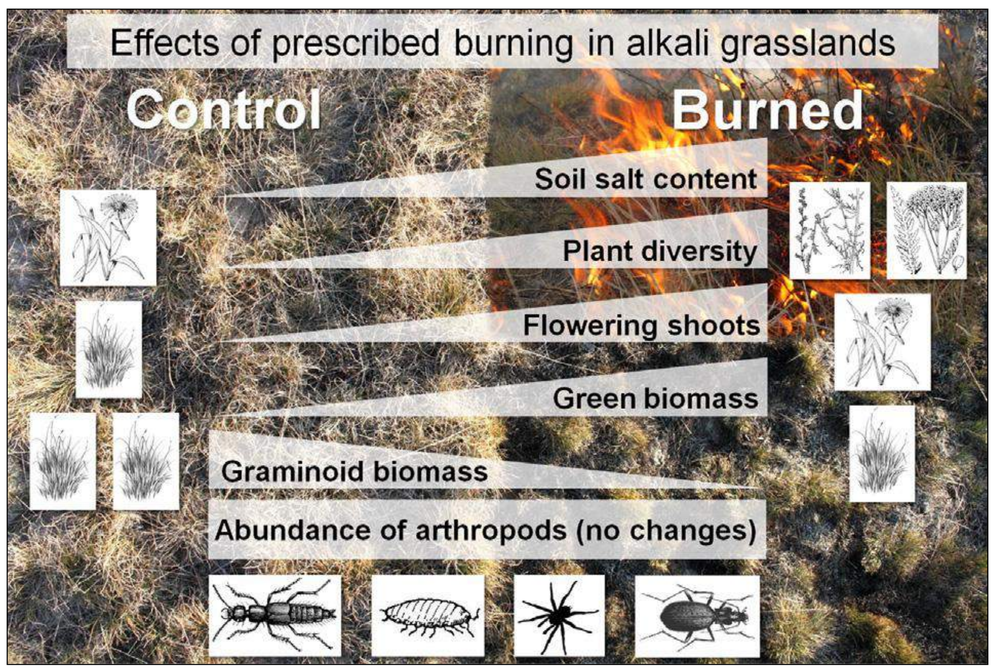
Graphical abstract



Introduction

Grasslands in Europe are threatened by the cessation of traditional management (grazing, mowing). Appropriate prescribed burning management could be a crucial treatment in maintaining these grasslands. Prescribed burning can prevent the accumulation of litter, increasing of fuel loads resulting in regular wildfires, and encroachment of herbaceous competitors or woody species.

Question

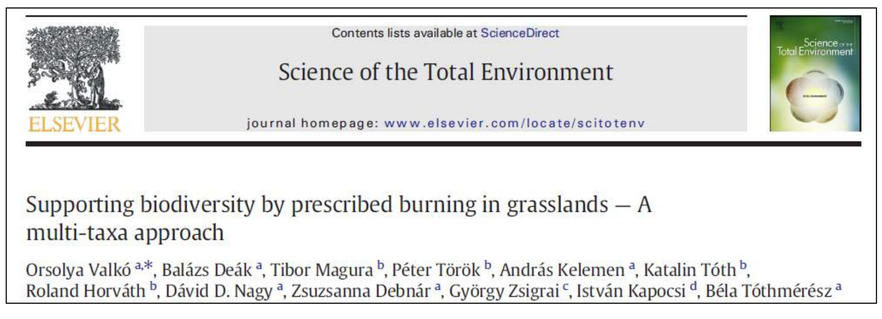
How does dormant-season prescribed burning influance ground-dwelling arthropods (spiders, carabids, isopods and staphylinids) in a low-productivity steppe grassland?

Material and methods

Arthropods (spiders, carabids, isopods and staphylinids) were collected using pitfall traps. Six plots were sampled of dry alkaline grasslands. Three plots were designated as unburnt control, and three plots as burnt (10th November 2011). There were ten randomly placed traps at each plot (in total 60 traps). Arthropods were collected fortnightly. Traps were emptied monthly from May to October 2012.

Results

Our findings showed slight increase in the total abundance and species richness in the burnt plots compared to the controls; however, these differences were not statistically significant (Table 1). Number of individuals and species as well as Shannon diversity of the three most abundant arthropod groups did not differ significantly between the burnt and control plots (Table 1). Species-level analyses demonstrated that most arthropod species were not affected by fire. Out of the most frequent arthropods, the abundance of *Titanoteca veteranica* spider species increased and the abundance of *Trochosa robusta* spider species decreased in the burnt plots (Table 2).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Supporting biodiversity by prescribed burning in grasslands – A multi-taxa approach

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Table 1. Number of individuals, species number and the Shannon diversity of the trapped invertebrates (mean±SD) in the control and burnt plots, as well as the results of the Generalized Linear Models for these variables.

Variables	Control	Burnt	Estimate	SE	Wald stat.	p
Spiders						
No. of individuals	48.73±18.4	47.83±24.7	-0.009	0.058	0.026	0.873
No. of species	9.83±2.35	10.33±2.68	0.025	0.032	0.591	0.442
Shannon diversity	1.87±0,25	1.97±0,23	0.026	0.016	2.557	0.110
Carabids						
No. of individuals	3.10±2.90	3.53±2.90	0.065	0.113	0.335	0.563
No.of species	1.80±1.10	2.03±1.25	0.061	0.079	0.596	0.440
Shannon diversity	0.55±0.41	0.57±0.50	0.018	0.106	0.027	0.869
Isopods						
No. of individuals	14.53±7.71	16.37±13.2	0.059	0.089	0.442	0.506
No. of species	1.83±0.38	1.67±0.48	-0.048	0.032	2.200	0.138
Shannon diversity	0.39±0.22	0.30±0.25	-0.122	0.090	1.845	0.174
Total						
No. of individuals	66.6±20.2	67.9±28.1	0.010	0.047	0.042	0.837
N. of species	13.7±2.6	14.2±2.5	0.018	0.024	0.560	0.454
Shannon diversity	2.2±0.2	2.2±0.2	0.006	0.012	0.213	0.645

Table 2. Number of individuals of the trapped abundant invertebrate species (mean±SD) in the control and burnt plots, as well as the results of the Generalized Linear Models for these variables. Significant effects are marked with boldface.

Variables	Control	Burnt	Estimate	SE	Wald stat.	*p*
Armadillidium vulgare	2.67±3.21	2.80±4.23	0.024	0.177	0.019	0.890
Gnaphosa lucifuga	0.80±1.16	0.80±1.16	0.000	0.187	0.000	1.000
Gnaphosa rufula	5.23±3.62	5.60±2.79	0.034	0.077	0.192	0.662
Harpalus affinis	0.77±0.89	1.13±1.59	0.195	0.171	1.312	0.252
Pardosa agrestis	5.57±3.34	5.8±2.87	0.021	0.071	0.084	0.772
Pterostichus macer	1.60±2.30	1.60±2.50	0.000	0.194	0.000	1.000
Titanoeca veteranica	1.53±1.68	2.93±2.18	0.032	0.120	7.364	**0.007**
Trachelipus rathkii	11.87±6.5	13.57±11.01	0.067	0.091	0.545	0.460
Trachyzelotes pedestris	1.33±1.42	1.13±1.17	-0.081	0.136	0.357	0.550
Trochosa robusta	10.67±5.23	8.13±4.34	-0.136	0.067	4.170	**0.041**
Xysticus kochi	1.27±1.48	0.83±1.15	-0.209	0.166	1.594	0.207
Zelotes longipes	2.83±2.34	2.4±1.96	-0.083	0.106	0.610	0.435

Conclusion

Our findings suggested that autumn prescribed burning does not damage the arthropod fauna, because these can easily recolonize the burnt patches from the surrounding unburnt areas. Our results supported that dormant-season prescribed burning could be a feasible management method in alkaline grasslands, because it did not threaten the majority of arthropods.

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