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LIFE FORM SPECTRA OF ORTHOPTERA FAUNA IN ALKALINE GRASSLANDS

I. A. Rácz

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Abstract. The reasons for the attachment of Orthoptera communities to grasslands have not been revealed yet. We can assume that similar plant associations - because of the species compositions - have similar structure, thus rather similar microclimatic conditions as well. Thus, the spreading of some species - mainly stenoc species - corresponds with the spreading of the given plant community in a great extent, so the given plant association groups have their characteristic Orthoptera groups with their species combination. Besides the quantitative analysis of these, there is a need to analyse the qualitative parameters as well, since the members of eco-faunas organized within the given habitat can be ranked among different life form types, so the given plant communities can be characterized not only on the basis of their Orthoptera group compositions, but with the ratio of life form types dependent on the plant structure.

In the present work we analysed data collected with quantitative methods from 10 sampling sites, which represents our alkaline grasslands - 3 from Kiskunság, 7 from Hortobágy. The aim of our research is to analyse the connection between the different grassland structure and the given life form types. Our results indicate, that the different alkaline grasslands - depending on their structure - can be characterized by the life form spectrum of the Orthoptera communities.

This calls our attention from the point of view of conservation and cultivation as well to fact, that disturbances which change the structure of the grasslands can extremely influence the composition of the given Orthoptera fauna, even cease the conditions of existence for some species.

Keywords: grassland structure, life form spectrum, life form types, Orthoptera communities.

I. A. Rácz, Department of Evolutionary Zoology and Human Biology, Kossuth Lajos University, H-4010 Debrecen P.O.Box. 3, Hungary

Introduction

Although the fact that the Orthoptera communities are highly connected to grassland communities (Rácz *et al.* 1994), the reasons for this are less known. We might assume, that similar plant associations - because of their species compositions - have similar structure, thus rather similar microclimatic conditions as well. Thus, the spreading of some species - mainly stenoc species - corresponds with the spreading of the given plant community in a great extent, so the given plant association groups have their characteristic Orthoptera groups with their special species combination (Nagy 1944, Rácz and Varga 1978, Varga and Rácz 1986, Rácz 1986, Vargáné Sipos *et al.* 1994).

With the quantitative analysis of these - qualitative and quantitative species composition analysis - the changes in the given associations can be well traced, however besides this there is a need to analyse the qualitative parameters as well, since the members of species-groups organized within the given habitat can be ranked among different life form types (Nagy 1944, 1947, Bei-Bienko 1950, Pravdin 1978, Stolyarov 1976, Stebaev and Nikitina 1976), so the given plant associations can be described not only by the characteristic composition of their Orthoptera groups, but with the ratio of life form types (Rácz and Varga 1996a, 1996b, Rácz 1997), which depends on the plant structure (Dorda 1998).

The aim of our research was to analyse the connection between the structure of different grasslands and the life form types of the connected Orthoptera groups, and to answer the question whether grasslands with different structures can be characterized by the life form spectrum of the Orthoptera communities.

Materials and Methods

In the present work we analysed data collected with quantitative methods from 10 sampling sites. The sites represent the most important alkaline grasslands of Hungary (3 sampling sites in Kiskunság (Rácz 1986), 7 in Hortobágy) (Table 1).

To determine the life form types we used the types of Bei-Bienko, modified by Pravdin (Bei-Bienko 1950, Pravdin 1978), and our field experiences.

Using the group-dominance values of the given sampling sites' Orthoptera groups we examined on one hand the life form spectrum of the given samples, and on the other hand we calculated quantitative distance value among the samples and the data matrix obtained was analysed by multivariable statistics (Nucosa 1.05: Czekanovsky index, cluster analysis, principal component analysis, Tóthmérész 1993).

Results

On the basis of the types of Bei-Bienko and our field experiences we could determine 7 life form types. These are the followings: thamnobiont, chortobiont, and geobiont, which can be separated on the basis of morpho-ecological and behaviour-ecological parameters, and the chorto-thamnobiont, chorto-geobiont, geo-chortobiont, geo-psammobiont life forms, which can be separated on the basis of their behaviour-ecological features.

Analysing the relative frequency distribution of the life form groups of different Orthoptera taxa we can state the following general findings:

From the results of the multivariate analyses we can conclude, that there is a clear separation among the Orthoptera taxa of the grasslands examined according toh their life form spectrum. The following samples form distinct groups (Fig. 1), which can be confirmed by the results of cluster analysis as well (Fig. 2): 1, 2, 5, 8, 9, 10, 11 and 3, 4, 6, 7.

The first main group (I) consists of associations of humid, almost or completely closed, well-structured loess and alkaline grasslands, with high (more than 40%) dominance of chortobionts, in two groups.

The associations of the group I/1 - (1, 2, 5, and 9; *Salvio-Festucetum, Peucedano-Asteretum, Agrosti-Alopecuretum, Agrosti-Caricetum*, respectively) which can be characterized by the high dominance of chortobionts and the lower dividend of geo-chortobionts - represent the closed, well-structured grasslands that contain undergrowth grasses. This type is indicated by the chorto-thamno- and thamnobiont life form types.

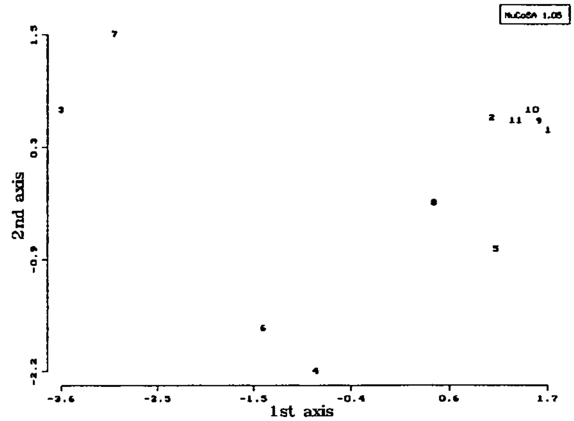

Fig. 1. Principal component analysis of sampling sites

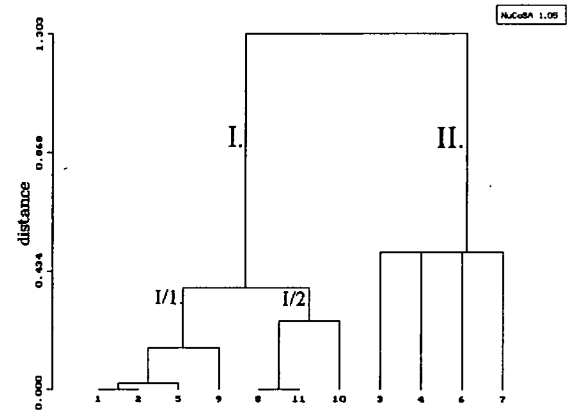

Fig. 2. Cluster analysis of sampling sites

The group I/2 is formed by the grasslands 8, 11, 10; *Suaedetum* and the typical and mosaic *Artemisio-Festucetum*, in which the chortobiont species are dominant. The lower covering values are indicated by the higher presence rate of geo-chortobiont life form type.

The second main group (II) is formed by the xerofil, usually - in some extent -open grass associations (3, 4, 6, 7; *Achilleo-Festucetum, Artemisio-Festucetum, Puccinellietum, Camphorosmetum*, respectively) with the significant dominance of geo-chortobiont life form. The geobiont life form indicates the plant shortages, however with relatively low values.

Table 1. The Orthoptera species of plant communities

		Hortobágy								Kiskunság		
		1	2	3	4	5	6	7	8	9	10	11
Life forms	Species Plant-communities	Salv.-Fest.	Peuc.-Aster.	Achill.-Fest.	Art.-Fest.	Agro.-Alop.	Pucci.	Camph.	Suaede-tum.	Agr.-Car.	Art.-Fest.	Art.-Fest.
ch	Paltycleis grisea	0.002	0.008	0	0	0	0	0	0	0	0	0
ch	Platycleis affinis	0.011	0	0.028	0.001	0	0.002	0	0	0	0.021	0.052
ch	Tesselana vittata	0.064	0.005	0.006	0.001	0	0	0	0	0	0.000	0.000
ch	Bicolorana bicolor	0.0004	0.008	0	0	0.003	0	0	0	0	0	0.010
ch	Roeseliana roeselii	0.005	0	0	0.001	0.017	0.002	0	0	0.015	0	0
ch	Parapleurus alliaceus	0.001	0.002	0	0	0	0	0	0	0.091	0	0
ch	Chrysochraon dispar	0	0.002	0	0	0	0	0	0	0.015	0	0
ch	Euthystira brachyptera	0	0.000	0	0	0	0	0	0	0.015	0	0
ch	Stenobothrus nigromaculatus	0.004	0.002	0.014	0.001	0	0	0	0	0	0	0
ch	Omocestus ventralis	0.102	0.204	0.047	0.017	0.010	0.020	0.051	0	0	0.021	0.073
ch	Glyptobothrus mollis	0.003	0.007	0	0	0	0	0	0	0	0	0
ch	Chorthippus albomarginatus	0.113	0.081	0.105	0.055	0.615	0.223	0	0.379	0.076	0.536	0.151
ch	Chorthippus dorsatus	0.036	0.071	0.044	0.002	0.048	0.008	0	0.034	0.030	0.05	0.016
ch	Chorthippus loratus	0.002	0	0.001	0.001	0.017	0.001	0	0	0	0	0
ch	Chorthippus dichrous	0.044	0	0.006	0.005	0.038	0	0.026	0	0.030	0	0
ch	Chorthippus parallelus	0.113	0.081	0.112	0.008	0	0.072	0	0	0.318	0.014	0.115
ch	Chorthippus montanus	0	0.005	0.001	0	0	0	0	0	0.061	0	0.016
ch	Tetrix subulata	0.0004	0.002	0	0	0	0.001	0	0	0	0	0
ch	Tetratetrix bipunctata	0	0.013	0	0	0	0	0	0	0	0	0
ch	Tetratetrix nutans	0.001	0.005	0.001	0	0	0	0	0	0	0	0
ch-g	Acrida hungarica	0.006	0.002	0	0	0	0	0	0	0	0	0
ch-g	Stenobothrus crassipes	0.052	0.156	0.013	0.005	0.007	0.028	0	0	0	0	0.042
ch-g	Stenobothrus stigmaticus	0.001	0.002	0.002	0.073	0	0.001	0	0	0	0	0
ch-g	Glyptobothrus biguttulus	0.016	0.003	0	0	0	0	0	0	0	0	0
ch-g	Glyptobothrus brunneus	0.060	0.005	0.028	0.005	0	0.013	0	0	0	0.007	0.016
ch-g	Dociostaurus maroccanus	0	0	0	0.001	0	0	0	0	0	0	0
ch-g	Dociostaurus brevicollis	0.022	0.002	0.087	0	0	0.244	0	0	0.136	0.021	0.063
ch-th	Decticus verrucivorus	0.002	0	0	0	0	0	0	0	0.030	0	0
ch-th	Gampsocleis glabra	0.010	0	0.003	0	0.017	0	0	0	0.030	0	0
g	Oedaleus decorus	0	0	0	0.002	0	0	0	0	0	0	0
g	Celes variabilis	0	0	0	0.022	0	0	0	0	0	0	0
g	Oedipoda coerulescens	0	0	0.009	0.015	0	0.002	0.128	0	0	0	0
g-ch	Calliptamus italicus	0.003	0	0.004	0	0	0	0	0	0.152	0	0
g-ch	Aiolopus thalassinus	0.002	0.028	0.011	0.021	0	0.020	0.154	0.276	0	0.164	0.021
g-ch	Epacromius coerulipes	0	0.005	0.012	0.026	0	0.153	0.179	0.276	0	0	0
g-ch	Dirschius haemorrhoidalis	0.044	0	0.149	0.064	0.027	0.039	0.026	0.034	0	0	0.010
g-ch	Dirschius petraeus	0	0	0.081	0.390	0	0.106	0.385	0	0	0	0.005
g-ch	Euchorthippus declivus	0.259	0.267	0.226	0.032	0.131	0.049	0.051	0	0	0.029	0.380
g-ch	Euchorthippus pulvinatus	0.001	0	0	0	0	0	0	0	0	0	0
g-ch	Myrmeleotettix maculatus	0.0004	0	0	0	0	0	0	0	0	0	0
th	Meconema thalassinum	0	0.002	0	0	0	0	0	0	0	0	0
th	Conocephalus discolor	0.001	0.032	0.006	0	0.041	0.008	0	0	0	0.007	0.026
th	Conocephalus dorsalis	0.002	0	0.001	0	0.027	0.002	0	0	0	0.064	0
th	Homorocoryphus nitidulus	0.0004	0	0	0	0	0	0	0	0	0.064	0
th	Tettigonia viridissima	0.001	0	0	0	0	0	0	0	0	0	0.005
th	Oecanthus pellucens	0.016	0.002	0.001	0	0	0	0	0	0	0	0
	No. of species	35	27	28	23	13	22	8	5	13	12	16

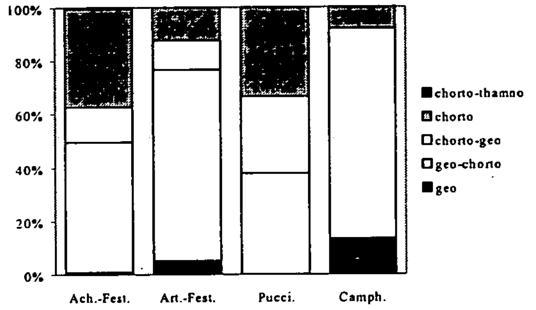

Fig. 3. Life form spectra of plant communities (main group I)

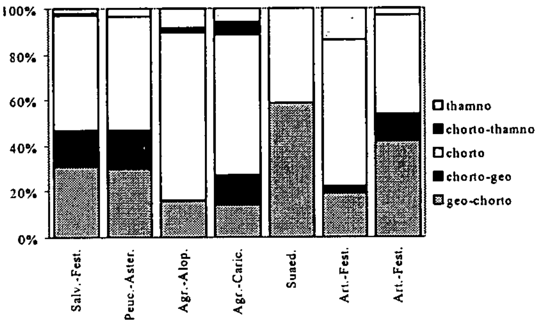

Fig. 4. Life form spectra of plant communities (main group II)

Discussion

It is clear, that the Orthoptera group of the *Peucedano-Asteretum* association shows the life form distribution characterizing the loess grasslands, and not the alkaline grasslands, that is, the chorto- and thamnobiont species are dominant with the characteristic Tettigonoidae (*Conocephalus discolor, Platycleis grisea, Tesselana vittata, Bicolorana bicolor, Gampsocleis glabra*), while the subdominant chorto-geobionts are the Acridoidae (*Stenobothrus crassipes, Glyptobothrus biguttulus* and *brunneus*).

The species compositions of the Orthoptera groups of the dry grasses of the better quality alkaline grasslands (Hortobágy, Kiskunság) can be regarded as the poorer version of loess grasslands. This manifests in their life form spectrum as well, since mainly the chorto-and geochortobiont groups are dominant (species of *Chorthippus, Glyptobothrus* and *Dirschius* genera), while the chorto-thamnobiont life form is subdominant (*Decticus verrucivorus, Gampsocleis glabra*).

In the semi-desert-type associations with short grasses the geo-chortobiont dominance is unambiguous (*Epacromius coerulipes, Aiolopus thalasinus*), and depending on the degree of the openness, geobiont species like *Oedipoda caerulescens, Calliptamus italicus* and *Celes variabilis* appear as well. However, we can clearly state, that these species groups are also poor in Tettigonoidae, similarly to the sandy grasslands.

From the above, the different dry and semi-dry grasslands can be clearly characterized by different Orthoptera life form distribution which depends on the degree of covering and levels. Open associations can be described by high geo- and geochortobiont dominance, while in the fairly closed grasses the chorto-geobionts are dominant, and in the closed grasses the chortoboints. In grasses which have more layered structures, however, besides the dominance of the chorto-geo- and chortobionts, the less closed ones are characterized by the geo-chortobionts, while the closed, well-structured ones are characterized by the chorto-thamno and thamnobiont life forms.

So, we can conclude that the given grasslands can be described not only by the quantitative features and the species compositions of the connected Orthoptera groups, but - depending on their structure - by their life form spectra as well. This also calls our attention to the fact which is important from the point of view of conservation and cultivation as well, that all disturbances (like cancellation of mowing, in appropriate grazing, afforestation) which can change the structure of the grasslands can extremely influence the quantitative and qualitative composition of the given Orthoptera fauna. In extreme case, by ceasing the conditions of existence for some species it can cause the extinction of them.

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