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HABITAT SPECIALIZATION OF LEAFHOPPER COMMUNITY LIVING IN A SANDY SOIL GRASSLAND

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Abstract

Dispersion according to the macrohabitat of a leafhopper community formed by a population of 54 species, living on a mosaic-complex-like sandy soil grassland was examined using cluster analysis. 5 groups can be separated on the ground of habitat-specialisation degree. 39% of species can be found in wind-furrows with more favourable environmental effects and 15% only on dry sand-hills. Frequency of 18% is the same in both habitats, 15% was more frequent in wind-furrows, 13% on sand-hills. Species groups can be reduced on a higher and higher similarity level, with a rising specialization degree in the direction of wind-furrows.

Key words: Leafhopper community, habitat specialization, grassland, cluster analysis.

Introduction

Beside the quantitative analysis of leafhopper communities their study according to dominance relations, bionomics and ecological valency has also been done (GYÖRFFY, 1980a, 1982) in the cource of complex ecological studies of the territory of Kiskunság National Park (Hungary) since 1976 (MÓCZÁR et al., 1980). The leafhopper populations living on the two terrains of the model area are sharply different both in species composition and in dominance as it appears from the above mentioned data. As mosaic character and concomitant local biotopdifferences can make the animal communities of an ecosystem rich and so they can influence their stability on a large scale (BANACH et al., 1979; and others), it is reasonable to look for these populations which can take most part in the functional connections of mosaics, respectively for those ones which become localised only on one of the habitats. Another advantage of stating habitatpreferency is that the importance of habitat dimension in realization the coexistence of leafhopper populations can be cleared up. SCHOENER (1974) stated that habitat can be many times more important than food-type. MÜLLER (1980) found that spatial dispersion of leafhopper communities is determined by host-plant relations not so much as by the animals' demands on microclimate. DENNO (1980) puts food-type-dimension (microhabitat) on the first place though he devided height above surface between 0—25 cm only, while there some meters differences in height at Müller's plant associations (1980). Our investigation -area is similar to the latter one, so division of habitat dimension is doubtless reasonable.

Investigated area and the methods

The investigated area in the Kiskunság National Park (Hungary) has a mosaic-complex character caused by the occurence of sand-hills and wind-furrows. These two terrains are different not only in their height but — depending on it — in their microclimate, plant associations, too (KÖRMÖCZI et al., 1981). On the highest places of sand hills *Festucetum vaginatae danubiale normale*, respectively degraded form of *Potentillo-Festucetum pseudovinae danubiale euphorbietosum sequerianae* and its

Bromus tectorum facies exist. Wind-furrows, laying 1.5—2 m deeper are covered partly by *Festuca pseudovina* facies of *Lolio-Potentilletum anserinae*, the deepest parts are occupied by *Festuca pseudovina* facies of *Molinio-Salicetum rosmarinifoliae* (Bodrogközy and Farkas, 1981).

Sampling were carried out from March to November, 1977 to 1981; between 1977 and 1979 monthly, in 1980—81 every second week. "Suction trap" was used (Györffy, 1980b) collecting 10—10 samples on both terrains. The collected material was selected by hand from debris in the first time, later, from 1978 by the xylene-method of Martson and Hennessey (1978).

For stating habitat preference the yearly average individual days were determined for both terrains converting the basic data into pieces/m^2 units. The distribution of the resulted occurence frequency data between the two terrains was taken as an index of habitat-preferency. From the average and standard deviation of five years' data we stated the certainty of habitat-preference of the single populations with the help of t-test choosing 5, resp. 10% as significancy level. Similarity level of dispersion of the single populations by habitat was determined by Renkonen index. We tried to separate resp. to choose species groups behaving alike by cluster analysis done with the method of weighted average using similarity matrix, which was constructed on the basis of Renkonen values.

Results and discussion

54 species — of the 94 ones known on area up to this time (Györffy, 1982) — remained in the course of the exact quantitative examinations the poulations of which gave enough data for the present study. These are found in Table 1., in alphabetical order, where we can find beside serial number (later we mark the single populations with their serial number) the rate of dispersion by terrains resp. and wether it is significant or not.

Representing the dispersion data of Table 1. on a diagram in the order of their size we get a more exact picture of dispersion by terrains for the whole leafhopper community (Fig. 1). It can be seen that significancy is higher at the end values, 17 species occur significantly (on a level of 5%) in wind-furrows, 5 ones on sand-hills. Besides these the dispersion rate of 8 species is significant on the same level. If we choose a significancy level of 10%, 4 further populations join the group of wind-furrow-friends, while the number preferring sand-hill rises with 3 populations. That is, outer groups stick stronger to the occupied biotop, while the intergrade populations are moving freely between the two habitats.

Table 1. Percentile distribution of the most frequent populations between the two terrains (s.n.: serial number, m. d. p. c.: mean distributional per cent, 1. s.: level of significancy, wf: wind-furrows, sh: sand-hills)

s. n.	Species	m. d. p. c.		l. s.
		wf	sh	
1.	*Anaceratagallia ribauti* Oss.	73.99	26.01	<0.05
2.	*Anakelisia perspicillata* Boh.	99.10	0.90	<0.05
3.	*Aphrodes albiger* Germ.	93.34	6.66	<0.05
4.	*Aphrodes bicinctus* Sch.	91.17	8.83	<0.05
5.	*Aphrodes elongatus* Leth.	40.14	59.86	n. s.
6.	*Arboridia parvula* Boh.	26.37	73.63	n. s.
7.	*Artianus interstitialis* Germ.	14.44	85.56	<0.05
8.	*Austroagallia sinuata* M. R.	46.51	53.49	n. s.
9.	*Batracomorphus irroratus* Lew.	57.61	42.39	n. s.
10.	*Bobacella corvina* Horv.	95.25	4.75	<0.05
11.	*Dictyophara pannonica* Germ.	0.00	100.0	<0.05
12.	*Delphacodes albifrons* Fieb.	100.00	0.00	<0.05
13.	*Deltocephalus pulicaris* Fall.	99.47	0.53	<0.05
14.	*Doratura homophyla* Flor.	16.94	83.06	n. s.
15.	*Doratura stylata* Boh.	77.85	22.15	<0.05
16.	*Eupelix cuspidata* F.	50.00	50.00	n. s.
17.	*Eupteryx notata* Curt.	96.09	3.91	<0.05
18.	*Eurysula lurida* Fieb.	99.55	0.45	<0.05

19.	*Euscelis incisus* Kirschb.	59.36	40.64	n. s.
20.	*Goniagnathus brevis* H. S.	79.43	20.57	<0.1
21.	*Graphocraerus ventralis* Fall.	100.00	0.00	<0.05
22.	*Gravesteiniella boldi* Scott.	99.09	0.91	<0.05
23.	*Hecalus glaucescens* Fieb.	5.06	94.94	<0.05
24.	*Jassargus sursumflexus* Then.	100.00	0.00	<0.05
25.	*Jassidaeus lugubris* Sign.	72.95	27.15	n. s.
26.	*Kelisia brucki* Fieb.	100.00	0.00	<0.05
27.	*Kelisia perrieri* Rib.	80.00	20.00	n. s.
28.	*Kelisia vittipennis* Sahlb.	100.00	0.00	<0.05
29.	*Kosswigianella exiqua* Boh.	16.04	83.96	<0.1
30.	*Kosswigianella spinosa* Fieb.	100.00	0.00	<0.05
31.	*Lepyronia coleoptrata* L.	57.09	42.91	n. s.
32.	*Macustus grisescens* Zett.	93.90	6.10	<0.1
33.	*Megophthalmus scanicus* Fall.	100.00	0.00	<0.05
34.	*Mendrausus pauxillus* Fieb.	17.35	82.65	<0.05
35.	*Metadelphax minuscula* Wagn.	33.33	66.67	n. s.
36.	*Mocydiopsis parvicauda* Rib.	85.71	14.29	<0.1
37.	*Neoaliturus fenestratus* H. S.	66.14	33.86	n. s.
38.	*Neophilaenus campestris* Thunb.	29.08	70.92	n. s.
39.	*Neophilaenus lineatus* L.	95.18	4.82	<0.05
40.	*Ommatidiotus inconspicuus* Stal.	22.61	77.39	<0.1
41.	*Paluda preyssleri* H. S.	85.44	14.56	<0.05
42.	*Paluda vitripennis* Flor.	33.31	66.69	n. s.
43.	*Philaenus spumarius* L.	64.92	35.08	n. s.
44.	*Psammotettix alienus* Dhlb.	10.14	89.86	<0.05
45.	*Psammotettix confinis* Dhlb.	69.38	30.62	n. s.
46.	*Psammotettix provincialis* Rib.	9.65	90.35	<0.05
47.	*Psammotettix slovacus* Dlab.	100.00	0.00	<0.05
48.	*Recilia schmidtgeni* Wagn.	22.46	77.54	<0.1
49.	*Ribautodelphax albostriatus* Fieb.	96.81	3.19	<0.05
50.	*Tettigometra impressopunctata* Duf.	100.00	0.00	<0.05
51.	*Trypetimorpha fenestrata* A. Costa.	90.56	9.44	<0.05
52.	*Turrutus socialis* Fl.	79.14	20.86	<0.05
53.	*Ulopa trivia* Germ.	65.01	34.99	n. s.
54.	*Zyginidia pullula* Boh.	52.53	47.47	n. s.

According to fig. 1 this intergrade group consists the populations of the most species, that is they play an important part in the leafhopper community of both terrains. If we want to segregate specialist and generalist species according to their biotop, we have to determine the rate of dispersion which means a limit—value. This can be 5 : 95%, when 17 spp are specific for wind-furrows, 2 for sand-hills and 35 ones are generalists; or 10:90% can be choosen, when 21 species are specific for wind-furrows, 4 for sand-hills and 29 are generalists. But this choice is rather arbitrary. To get more objective picture about grouping of populations by habitats we used a cluster analysis. Fig. 2 shows a cluster obtained as a result of an analysis made on the ground of the similarity matrix of dispersion rates — it's not published owing to lack of space. The order of species corresponds to that of fig. 1. It can be seen from the first approximation that it is more correct to distinguish 5 spp groups instead of the original 3 ones. The greatest of them is the group specific for wind-furrows, which consists 21 spp, 39% of the total species (12—51 groups in the cluster). Only 8 species (34—11) are specific for the sand-hills having extrem environmental effects, that is, 15% of the total species number. 10 spp (18%) can be taken for typical generalists, with serial number 45—8. To every specialist group joints one intergrade one. Populations, marked with numbers 36—25 mean wind-furrow-friend (8 spp = 15%), 5—48 ones (7 spp = 13%) sand-hill-friend intergrade groups.

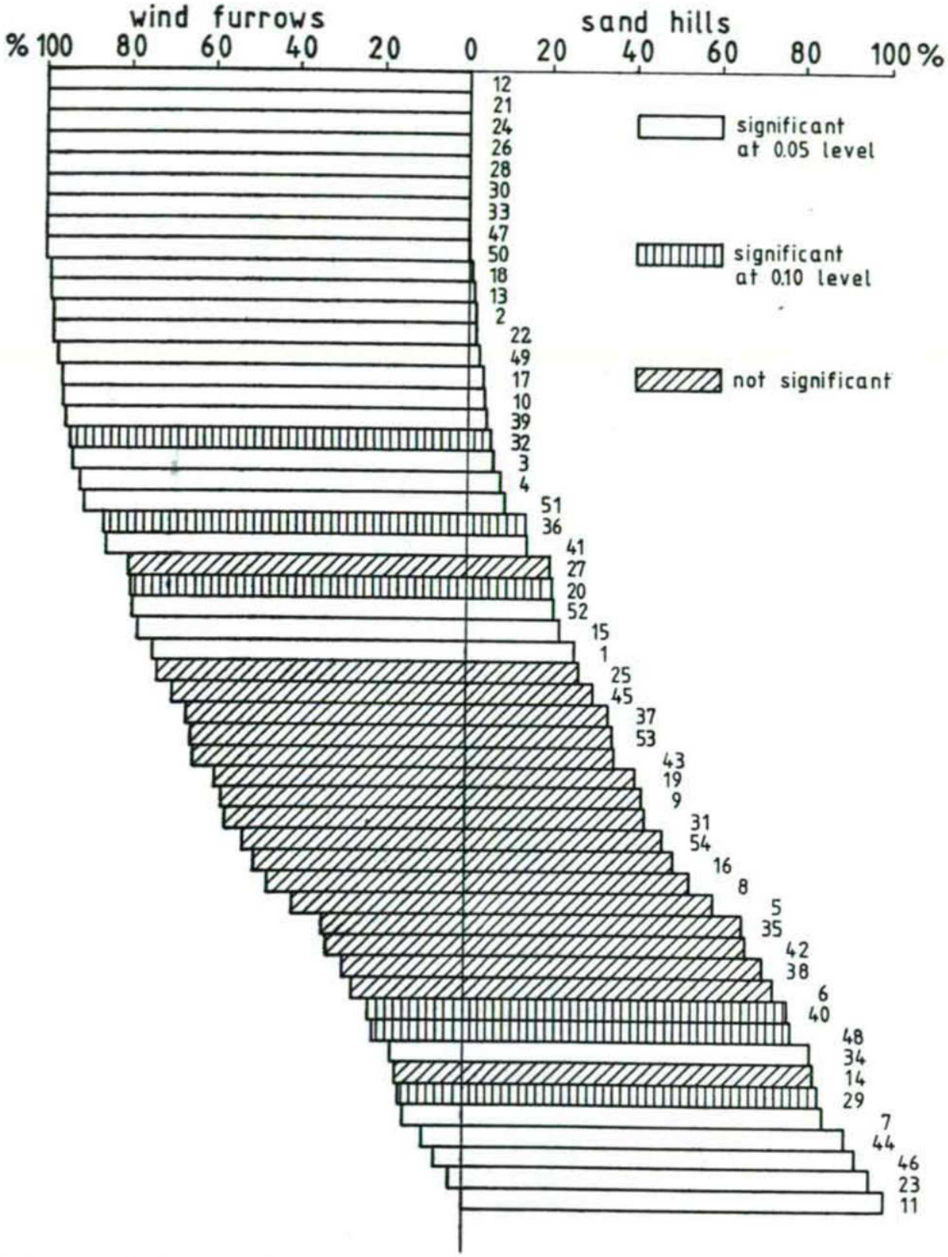

Fig. 1. Percental dispersion of the most frequent leafhopper populations between the two terrains (s. l. = level of significancy; numbers mean the serial numbers of species, see table 1.)

If we take into consideration reducing levels, as well, can be stated that these levels are rising with the rise of wind-furrow specifity, that is, the groups are getting more and more uniform. The determining character of wind-furrows having favourable environmental effects is proved by the joining groups on a higher and higher reducing level in the direction of wind-furrows (0.36, 0.66, 0.82).

Summarizing, it can be stated that in a habitat with mosaic-complex character the mosaic parts with more favourable environmental effects have a determining role in the intense habitat specialisation of leafhopper communities even if — as in our case — their rate is lower. A greater part of species sticks to this habitat (39%), while 15% is absolutely missing. If we want to study the functional connections between leafhop-

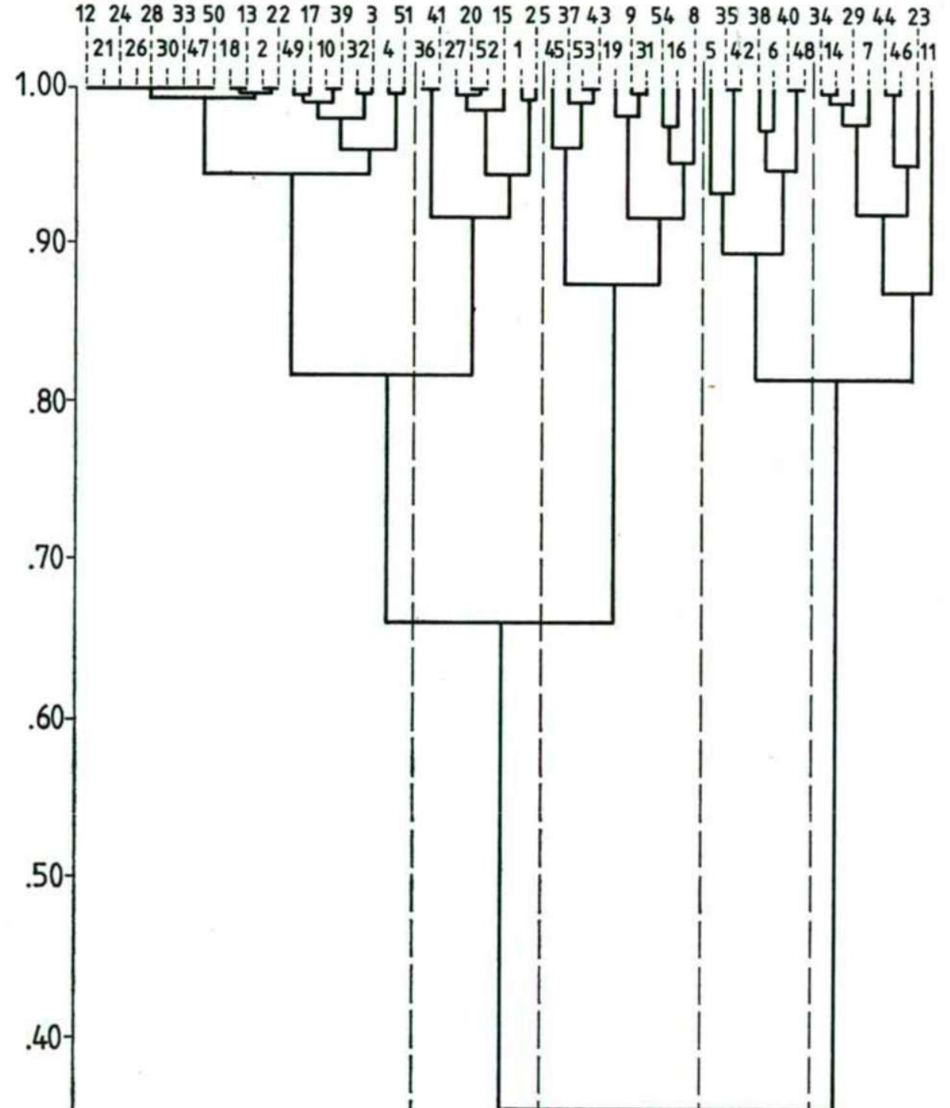

Fig. 2. Dendrogram of dispersion by habitats (serial numbers mean the same spp as in table 1.)

per populations of the two terrains, we can see that 10 spp (18%) take part most intensively in that, the populations of further 15 spp have to be taken into account as well. If the rate of dispersion between habitats is a result of a competetive situation, it can be used for examining the efficiency of it. The decision of this fact needs further examinations.

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