TISCIA 29, 37-40

SPATIAL AND TEMPORAL VARIATION OF THE LEAFHOPPER (CICADINA) ASSEMBLAGES ASSOCIATED WITH *HIERACIUM PILOSELLA* IN HUNGARY

M. Sárospataki and Gy. Györffy

Sárospataki, M. and Györffy, Gy. (1995): Spatial and temporal variation of the leafhopper (Cicadina) assemblages associated with Hieracium pilosella *in Hungary. - Tiscia 29, 37-40.*

Abstract. We studied the structure of the leafhopper assemblages associated with *Hieracium pilosella* at different sites of Hungary in 1992-1994. A total of 225 individuals of 24 species were collected during the three years. The high variance of species number between sites and years indicated a large number of accidental or tourist species. The local species abundance was positively correlated with the regional distribution. One species (*Eupterix notata*) was very abundant at one site but was not regionally widespread. The regional distribution of the species did not show bimodality predicted by the core and satellite species hypothesis.

Key words: insect-plant relationship, local abundance, regional distribution.

M. Sárospataki, Department of Zoology and Ecology, Gödöllő University of Agricultural Sciences, Gödöllő, Hungary; Gy. Györffy, Department of Ecology, József Attila University, H-6701 Szeged, P.O.Box 659, Hungary

Introduction

The study of the local and regional variations in assemblage structure can bring us closer to find out what are the most important factors affecting this structure.

The study of the herbivore assemblages associated with a plant species has produced an extensive literature since the first attempts to use insects as biological control agents of weeds. Most of these studies were faunistical, producing lists of species associated with the given plant species (Goeden, 1971, 1976; Goeden and Ricker, 1974, 1976; Batra, 1984; Batra et al., 1986; Kingsolver et al., 1984). There are few papers examining the structure of an insect assemblage of a plant species and comparing the local and regional variations in this structure (Lawton, 1976; Gaston and Lawton, 1989; Basset and Kitching, 1991; Briese et al., 1994).

We studied the leafhopper assemblages associated with *Hieracium pilosella* in order to find out the spatial and temporal variation in different parts of Hungary.

Material and Methods

Hieracium pilosella is a widespread plant species in the dry open grasslands in Europe. It is distinguished from the other *Hieracium* species by its large solitary pale yellow capitula and dense stellate pubescence on stolons and on the underside of leaves. In Hungary, *H. pilosella* occurs especially in hilly - low mountainous regions. It has a good ability of vegetative reproduction, and usually forms dense mats.

Seven sites at different parts of the low mountain and hill regions of Hungary were selected for regular sampling visits (Fig. 1.). Four of them (J; H; R; S) were grazed or used as hay meadows the remaining three were natural or seminatural grasslands with different degrees of human disturbance. *Hieracium pilosella* formed dense mats at each sites. The sampling sites were visited weekly in the flowering season (late April and May), and fortnightly afterwards until the end of September in 1992-1994. The insects were collected by hand picking from 100 randomly selected rosettes at each sites and on each sampling occasion.

The ANOVA was made by using Minitab 8.2 program package (General Linear Modeling).

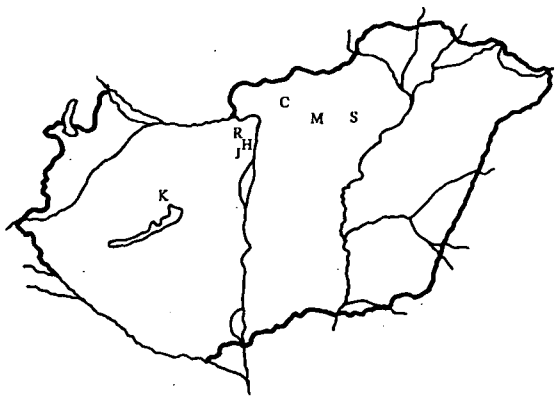

Fig. 1. : The map of the regular sampling sites. K) Kádárta (Bakony mountains); J) Julianna major (Budai mountains); H) Hármashatárhegy (Budai mountains); R) Budapest-RADELKIS (Budai mountains); C) Romhány (Cserhát mountains); M) Recsk (Mátra mountains); S) Síkfőkút (Bükk mountains).

Results

A total of 225 individuals of 24 leafhopper species were collected during the three years (Table 1). Both the species and individual numbers varied widely between sites (Figs. 2-3.). The sites differ significantly both in the numbers of species and individuals (ANOVA p= 0.015 and 0.018 respectively). The species number varied less widely between years than between sites, however the species turnover between years were very high at all sites (Table 1.).

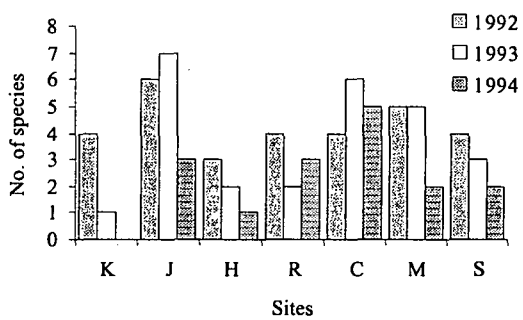

Fig. 2.: The number of species collected at different sites in the different years. For the explanation of the letters in X axis see Fig. 1.

The local species abundance was positively correlated with the regional distribution (Fig. 4.). However, *Eupteryx notata* Curtis was very abundant at "J" site in 1992 (48 individuals) but was collected from only 3 sites so had a moderately large regional distribution. The regional distribution of species is shown in the Fig 5. A large number of species was found only at one site, while only one species, *Aphrodes makarovi* was found at all the seven sites.

Discussion

The total species number was much higher than those of similar surveys of other herbaceous plant species (Goeden, 1971, 1976; Batra, 1984; Batra et al., 1986). The high variance in species and individual numbers between sites suggests a large regional variance in the structure of the assemblages. It seems from the high species turnover between years that there are a large number of accidental species, which are only occasional visitors on *Hieracium* patches.

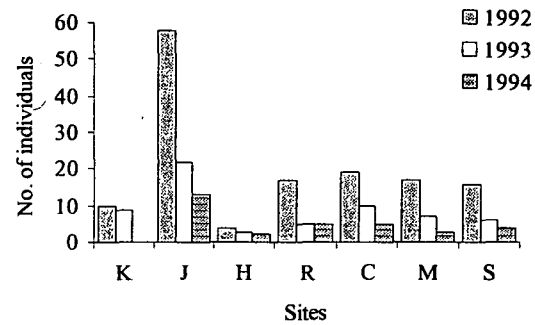

Fig. 3.: The number of individuals collected at different sites in the different years. For the explanation of the letters in X axis see Fig 1.

Fig. 4.: Relationship between regional distribution and average local abundance of leafhopper species (Y= 0.112*X-0.027; R^2=0.3959; p= 0.001)

The positive correlation between local abundance and regional distribution has been demonstrated for a number of taxa (Bock and Ricklefs, 1983; Cornell, 1985; Gaston and Lawton,

1989; Maurer, 1990; Hanski et al., 1993; Gallé, 1986). We also found this positive correlation. The large number of *Eupteryx notata* in 1992 at "J" site seems to be exceptional, because *Hieracium pilosella* is only an occasional host of this species (Payne, 1981).

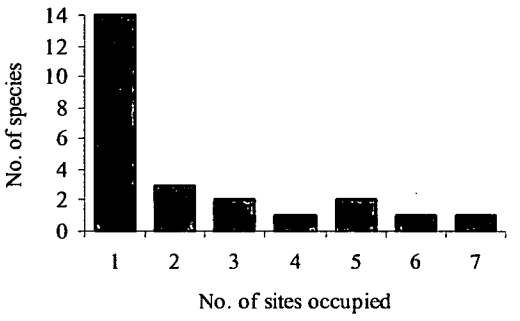

Fig. 5.: Distribution of species across the sampling sites.

The core and satellite species hypothesis (Hanski, 1982a,b) predicts a bimodal distribution of species across the sites, where the two modes of the histogram represent the satellite species with very small, and the core species with very large regional distribution. However, Nee et al. (1991) argued that this bimodality in the regional distribution can be a sampling or a measurement scale artefact in a number of cases. Similarly to the results of Gaston and Lawton (1989) on bracken herbivores we did not found the bimodality in our data. We found only the mode of the satellite species, and this mode can be explained by the presence of the large number of accidental species, which species do not represent genuine members of the community (Nee et al., 1991). Although *H. pilosella* occurs in a large number of different plant communities, the presence of *H. pilosella* may be not a principal component in the habitat selection of polyphagous leafhoppers found on this plant. In this case these species do not have similar habitat selection and this can be the reason of the lack of bimodality (Hanski, 1982a).

Table 1.: The list of species collected on *H. pilosella* at seven different sites in Hungary during 1992-1994. (l): only larve were found (list of other abbreviations as on Fig. 1.)

Species/Sites	K.	J.	H.	R.	C.	M.	S.	Σ
Agallia ribauti Ossiannilson, 1938	0	6	0	8	6	3	5	28
Aphrodes makarovi Zachvatkin, 1948	16	27	2	6	14	10	6	81
Arocephalus lanquidus Flor, 1861	1	0	0	0	0	0	0	1
Artianus interstitialis Germar, 1821	0	1	0	0	0	0	0	1
Delphacidae sp.	0	1	0	0	0	0	1	2
Dictyophara europaea (Linnaeus, 1767)	0	0	0	1	0	0	0	1
Dictyophara pannonica (Germar, 1830) (l)	0	0	0	0	1	0	0	1
Diplocolenus sp. (l)	0	0	0	0	0	1	0	1
Doratura stylata (Boheman, 1847)	1	3	1	0	3	2	0	10
Emelyanoviana mollicula (Bohemaan, 1845)	0	0	0	0	0	1	0	1
Eupteryx notata Curtis, 1837	0	49	0	0	1	0	2	52
Euscelis incisus Kirschbaum, 1858	0	1	0	1	0	0	0	2
Goniagnathus brevis (H.-S., 1835)	0	1	1	3	1	3	3	12
Graphocraerus ventralis (Fallén, 1806) (l)	0	0	0	0	2	1	0	3
Jassargus sp.	0	2	0	0	0	0	0	2
Lepyronia coleoptrata (Linnaeus, 1758)	0	0	0	0	1	0	0	1
Macrosteles sp.	0	0	3	0	0	0	0	3
Mendrausus pauxillus (Fieber, 1869)	0	0	1	0	0	0	0	1
Mocuellus collinus (Boheman, 1850)	0	1	0	0	0	0	0	1
Neoaliturus fenestratus (H.-S., 1834)	0	0	0	5	1	2	4	12
Philaenus spumarius (Linnaeus, 1758)	0	0	0	0	1	0	0	1
Psammotettix sp.	0	1	0	0	0	0	0	1
Turrutus socialis (Flor, 1861)	1	0	0	0	0	0	0	1
Ulopa trivia Germar, 1821 (l)	0	0	0	0	3	1	2	6
Total No. of species	4	11	5	6	11	9	7	24
Average No. of species/year	1.7	5.3	2	3	5	4	3	12.3
Number of individuals	19	93	8	24	34	24	23	225
Average No. of individuals/year	6.3	31	2.7	8	11.3	8	7.7	75
Mean species turnover	2	6.5	3.5	3	5.5	5.5	3	14

Acknowledgement

During the study the first author was a PhD fellow of the Hungarian Academy of Sciences. The project was partially funded by the Miss E. L. Hellaby Indigenous Grasslands Trust and by the Hieracium Control Trust, New Zealand. We would like to thank Pauline Syrett and Gábor Lövei for their assistance in different stages of the project. We are also grateful to Gábor Bakonyi and Árpád Szentesi for their helpful comments on the manuscript.

References

Basset, Y. and Kitching, R. L. (1991): Species number, species abundance and body length of arboreal arthropods associated with an Australian rainforest tree. - Ecol. Ent. 16, 391-402.

Batra, S. W. T. (1984): Phytophages and Pollinators of *Galium* (Rubiaceae) in Eurasia and North America. - Env. Ent. 13, 1113-1124.

Batra, S. W. T., Schroeder, D., Boldt, P. E. and Mendl, W. (1986): Insects associated with purple loosestrife (*Lithrum salicaris* L.) in Europe. - Proc. of the Entomol. Soc. of Washington, 88, 748-759.

Bock, C. E. and Ricklefs, R. E. (1983): Range size and local abundance of some North American songbirds: a positive correlation. - Am. Nat. 122, 295-299.

Briese, D. T., Sheppard, A. W., Zwolfer, H. and Boldt, P. E. (1994): Structure of the phytophagous insect fauna of Onopordum thistles in the northern Mediterranean basin. - Biol. J. Linn. Soc. 53, 231-253.

Cornell, H. V. (1985): Local and regional richness of cynipinae gall wasps on California oaks. - Ecology 66, 1247-1260.

Gallé, L. (1986): Habitat and niche analysis of grassland ants (Hymenoptera: Formicidae). - Entomol. Gener. 11, 197-211.

Gaston, K. J. and Lawton, J. H. (1989): Insect herbivores on bracken do not support the core-satellite hypothesis. - Am. Nat. 134, 762-777.

Goeden R. D. (1971): The phytophagous insect fauna of milk thistle in Southern California. - J. Econ. Ent. 64, 1101-1104.

Goeden R. D. (1976): The palearctic insect fauna of milk thistle, Silybum marianum, as a source of biological control agents for California. - Env. Ent. 5, 345-353.

Goeden, R. D. and Ricker, D. W. (1974): The phytophagous insect fauna of the ragweed Ambrosia acanthicarpa, in southern California. - Env. Ent. 3, 827-834.

Goeden, R. D. and Ricker, D. W. (1976): The phytophagous insect fauna of the ragweed Ambrosia psilostachia, in southern California. - Env. Ent. 5, 1169-1177.

Hanski, I. (1982a): Communities of bumblebees: testing the core-satellite species hypothesis. - Ann. Zool. Fenn. 19, 65-73.

Hanski, I. (1982b): Dynamics of regional distribution: the core and satellite species hypothesis. - Oikos 38, 210-221.

Hanski, I., Kouki, J. and Halkka, A. (1993): Three explanation of the positive relationship between distribution and abundance of species. - In.: Ricklefs, R. E., and Schluter, D. (eds.): Species Diversity in Ecological Communities. University of Chicago Press, Chicago.

Kingsolver, J. M., Batra, S. W. and Utmar, J. A. (1984): A selected bibliography of insect - vascular plant associational studies - United States Department of Agriculture, Agricultural Research Service.

Lawton, J. H. (1976): The structure of the arthropod community on bracken. - Bot. J. Linn. Soc. 73, 187-216.

Maurer, B. A. (1990): The relationship between distribution and abundance in a patchy environment. - Oikos 58, 181-189.

Nee, S., Gregory, R. D. and May, R. M. (1991): Core and satellite species: theory and artefacts. - Oikos 62, 83-87.

Payne, K. (1981): The life history and host-plant relationships of *Eupteryx notata* Curtis (Homoptera: Cicadellidae). - Entomologist's Monthly Magazine 117, 167-173.