

## APHIDS IN MIDFIELD THICKETS IN LOWER VISTULA VALLEY LANDSCAPE PARK

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**Abstract:** Occurrence of aphid species was studied in four types of midfield thickets in the Lower Vistula Landscape Park in Poland. This paper presents and discusses the relationships between aphid communities, their species diversity and dominance structure in these thickets.

**Key words:** aphid communities, bushes, boundaries, landscape park, Pomerania Region

### I. INTRODUCTION

Polish agricultural landscape, very diversified or polycultural, is generally dominated by small arable fields, divided by numerous boundary strips, thickets with trees, bushes, and midfield woodlots, which constitute so-called “environmental islands” (Banaszak 1998). Such habitats stimulate the use of the so-called natural habitat resistance in restoring homeostasis in agrocenoses and their surroundings (Barczak 1994). However, little is known of ecological relationships in the biocenoses accompanying different kinds of midfield thickets.

The role of midfield wood islands as biocenoses in the agricultural landscape has been summarized in the monographic study of this issue (Banaszak 1998). By comparison, the function and structure of the fauna occurring in other habitats than typical midfield thickets with trees is still relatively unexplored. The monographic study of aphidophagous insects in midfield thickets in Pomerania partly fills the gap, especially with reference to entomophagous beneficial fauna (Barczak et al. 2000).

Investigations of midfield thickets in agricultural resources, within the protected landscape areas, may determine the role of these units in integrated plant production systems, combining scientific aspects of ecological characters with agricultural activity. In fact they favour proecological agricultural production.

The aim of the present study was to determine the abundance, species spectrum and dominance structure of aphid communities, accompanying different kinds of midfield thickets in the Lower Vistula Valley Landscape Park.

## II. MATERIAL AND METHODS

### 1. Characteristics of the investigated sites

Four kinds of midfield thickets were selected for investigations, differing in the degree of the succession processes and spatial distribution of the vegetation. Accordingly, the closest to wooded areas were the bushes with a large participation of trees at Grabówko (stand "Z1"). The next inspected stand, "Z2" at Gruczno, comprised bushes with relatively undeveloped patches of herb layer, and the habitat gradient was complemented by the stand "Z3" at Topolinek, with a dominant share of herb layers and relatively numerous bushes, and "Z4" at Chrystkowo, characterized by the slightest spatial differentiation, and dominated by the equal and abundant herb layers with isolated trees and bushes. All the investigated stands were located in the Lower Vistula Valley Landscape Park and were inspected in 1997 and 1998.

The "Z1" stand at Grabówko was situated at the bottom of the Vistula Valley. It is fertile and well moistened, overgrown with big trees: *Salix alba*, *Evonymus europaea*, *Sambucus nigra*. Bushes are represented by *Rosa canina*, *Cornus sanguinea*, *Prunus cerasifera*, *P. spinosa*. Under the canopy of trees and in open spaces: *Elymus repens*, *Aegopodium podagraria*, *Urtica dioica*, *Phragmites communis*, *Galium aparine* prevail.

The bushes at Gruczno, "Z2", are situated on a little slope at the lower part of the Vistula Valley. They consist of the following species: *Crataegus* spp., *Rhamnus catharticus*, *P. spinosa*, *R. canina*, *Malus domestica*, *S. alba*, *Rubus caesius*, *Acer platanoides*. The herbal layers occur in smaller exposed places and are of thermophilous xerothermic swards, which are evidenced by the occurrence of: *Vincetoxicum hirundina*, *Fragaria vesca*, *Pimpinella saxifraga*, *Salvia pratensis*, and *Euphorbia esula*. These species are complemented by other ca. 70, which contributes to the considerable biodiversity of the habitat.

The "Z3" stand at Topolinek is a fertile boundary strip, periodically wet, located at the flat bottom of the alluvial Vistula Valley. It is composed of *P. spinosa*, with a small admixture of *R. caesius* and *R. canina*. In spring the dominant species are *Anthriscus sylvestris*, *Lamium album*, *Petasites officinalis*, *E. repens*. *P. communis*, *A. podagraria*, *Symphytum officinale*, *Poa pratensis* are also found in great number.

The boundary strip at Chrystkowo, "Z4", is situated on a rich alluvial stand. The area is flat, well moistened, periodically wet. The stand of tree is scant, with a few specimens of *Alnus glutinosa* and *Fraxinus excelsior*. Of the bushes, also occurring in small number, the following were found: *Cornus sanguinea*, *R. caesius*, *P. spinosa* and *R. canina*. The herbal layer prevails and densely covers the whole strip. The most numerous representatives are *A. sylvestris* in spring, *Tanacetum vulgare* in summer and *Solidago serotina* in autumn. Abundant is also *E. repens* and *Phalaris arundinacea*. The remaining species occur singly or in small numbers.

## 2. Subject of the study, sampling and faunistic analysis

The subject of the study were aphids of the *Aphididae* family (*Homoptera: Aphidodea: Aphididae*). Aphids were trapped using plastic Moericke's traps of 11 cm diameter, put up on poles, on a herb level. The insects were collected from the traps every ten days. Three containers were located at each investigated stand. Afterwards microscopic preparations were made in order to identify the aphids.

The collected material was characterized in faunistic and ecological terms using the following parameters: number and abundance of species, and relative abundance – D (participation in a given community in percentages): D4 – dominants: 20% individual specimens, D3 – subdominants: 10–20%, D2 – relatively numerous species: 3 – 10%, D1 – scarce species: 3% (Klimaszewski et al. 1980) and keys (e.g. Blackman and Eastop 1989; Remaudiere and Remaudiere 1997).

## II. RESULTS

### 1. List of the collected species<sup>1</sup>

The material collected in the traps consisted of aphids invading the thickets and related with them in different ways. Some species settled the thickets because they found appropriate feeding source, e.g. *Aphis sambuci*, *Brachycaudus lychnidis*, *Microlophium evansi*, *Hyalopterus pruni* (Barczak et al. 2000). Other species treated these habitats as a stopover place before moving into neighboring agrocenoses, into crops, e.g. *Aphis fabae*, *Rhopalosiphum padi*, *Sitobion avenae* (Banaszak 1998; Barczak et al. 2000; Szelegiewicz 1968).

Ordo: *Homoptera*

Subordo: *Aphidinea* (*Aphidodea*)

Familia: *Aphididae*

1. *Acyrtosiphon pelargonii* (Kalt.)
2. *Acyrtosiphon pisum* (Harris.) \*
3. *Amphorophora rubi* (Kalt.)
4. *Aphis* sp.
5. *Aphis fabae* Scop. \*
6. *Aphis frangulae* Kalt. \*
7. *Aphis nasturtii* Kalt
8. *Aphis pomi* De Geer
9. *Aphis sambuci* L.
10. *Brachycaudus cardui* (L.) \*
11. *Brachycaudus helichrysi* (Kalt.) \*
12. *Brachycaudus lychnidis* (L.)

<sup>1</sup> The species composition is presented in a systematic order, following the study edited by Razowski (1990)

13. *Capitophorus similis* v. Goot
14. *Cavariella aegopodii* (Scop.) \*
15. *Cavariella theobaldi* (Gill.et B.)
16. *Coloradoa achilleae* Hille Ris Lamb.
17. *Cryptomyzus galeopsidis* (Kalt.) \*
18. *Dysaphis crataegi* (Kalt.) \*
19. *Hayhurstia atriplicis* (L.)
20. *Hyalopterus pruni* (Geoff.)
21. *Hyperomyzus pallidus* H.R.L. \*
22. *Macrosiphum euphorbiae* (Thom.) \*
23. *Macrosiphoniella artemisiae* (Boy. de Fons.)
24. *Macrosiphoniella millefolii* (De Geer)
25. *Macrosiphoniella oblongata* (Mordv.)
26. *Metopeurum fuscoviride* Stroy.
27. *Metopolophium dirhodum* (Walk.) \*
28. *Megoura viciae* Buckt.
29. *Microlophium evansi* (Theob.)
30. *Myzus* sp.
31. *Myzus persicae* (Sulz.) \*
32. *Ovatus insitus* (Walk.)
33. *Phorodon humuli* (Schrk.) \*
34. *Pterocomma populeum* (Kalt.)
35. *Pterocomma salicis* (L.)
36. *Rhopalosiphum padi* (L.) \*
37. *Rhopalosiphonius latysiphon* (David.) \*
38. *Sitobion avenae* (F.) \*
39. *Uroleucon achilleae* (Koch)
40. *Uroleucon cirsii* (L.)
41. *Uroleucon inulicola* (H.R.L.)
42. *Uroleucon tanacetii* (L.)
43. *Uroleucon tussilaginis* (Walk.)
44. *Uromelan campanulae* (Kalt.)
45. *Uromelan taraxaci* (Kalt.)

\* species recognized as potential pests

The investigations of the midfield thickets carried out in 1997 and 1998, with a view to assessing the abundance of aphids, comprised 45 species belonging to the *Aphididae* family. Among the 45 reported species, 16 may be recognised as potential crop pests. The main of this species were: *Acyrtosiphon pisum*, *Aphis fabae*, *Macrosiphum euphorbiae*, *Metopolophium dirhodum*, *Myzus persicae*, *Phorodon humuli*, *Rhopalosiphum padi* and *Sitobion avenae* (Szelegiewicz 1968). The most dangerous are: *Aphis fabae*, *Myzus persicae*, *Rhopalosiphum padi* and *Sitobion avenae*, while polyphagous insects are mostly *Myzus persicae*, *Aphis fabae* and *Macrosiphum euphorbiae*.

## 2. Analysis of the number and seasonal occurrence of aphids in the particular types of midfield thickets

The weather in 1997 was unfavorable to the development of aphids. As a result of the prolonged cold spring, only single specimens of some species appeared in the second decade of May. Throughout June the number of aphids increased slowly, however, exceptionally heavy rainfalls in July stopped their development and reduced their number drastically. The warm spring in 1998 and moderate rainfalls were more favorable for the reproduction of aphids, which were first observed early in May. They were trapped in greatest numbers in June and July, during dry and warm weather.

The degree to which the investigated midfield thickets were invaded by aphids varied from one stand to another. In both years, the greatest number of aphids was trapped at Chrystkowo (the Z4 stand), in 1997 – almost 140 specimens, and in 1998 – 200. In the

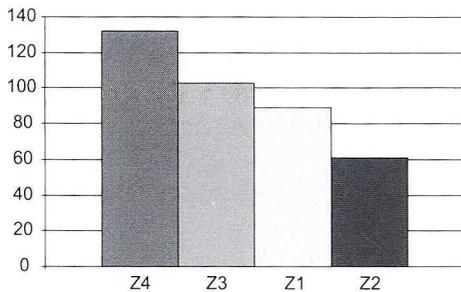


Fig. 1. Number of aphids (*Aphididae*) in midfield thickets in 1997

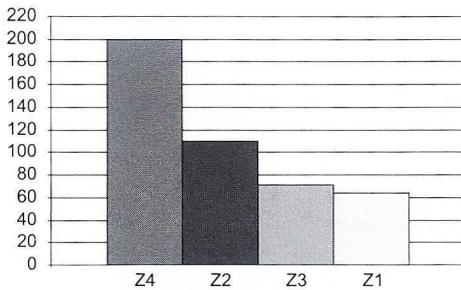


Fig. 2. Number of aphids (*Aphididae*) in midfield thickets in 1998

Z1 – bushes with a large participation of trees at Grabówko,

Z2 – bushes with herb layer at Gruczno,

Z3 – boundary with herb layer and relatively numerous bushes at Topoleń,

Z4 – boundary with herb layer and isolated trees and bushes at Chrystkowo

midfield thickets at Grabówko (Z1), Gruczno (Z2) and Topoleń (Z3) between 60 and 100 aphids were recognized (Figs. 1 and 2). Among the aphids trapped in the Z1 thickets, 8 species were found in 1997 and 13 in 1998. In 1997, they were observed only during one decade of May, June or July, with the exception of *Aphis sambuci*, which occurred in the second and third decade of May, *D. crataegi*, observed in the first and second decade of June, and *P. humuli* occurred in the third decade of May, the second decade of June, and the third decade of July (Tab. 1). In the following year, *A. fabae* aphids were trapped from the third decade of May to the third decade of July, next *R. padi* trapped from the second decade of May to the third decade of June (Tab. 5). In the Z2 thickets, in both years the total of 14 aphid species was found. In 1997 *D. crataegi* was observed during the longest period of time and was trapped from the third decade of May to early July. Throughout June *P. humuli* was found in the traps, and *R. padi* – late in May and in June (Tab. 2). In 1998 *R. padi* was trapped during the longest period of time – from late May to mid-July, whereas *P. humuli* occurred from the third decade of May to mid-June (Tab. 6). In the next stand at Topoleń (Z3), in 1997 20 species of aphids were trapped (Tab. 3). In this habitat most

Table 1

Aphid species (*Aphididae*) in bushes Z1 (Grabówko) in 1997

Month	May			June			July		
	I	II	III	I	II	III	I	II	III
<i>Aphis fabae</i>				■			■		
<i>Aphis sambuci</i>		■							
<i>Cavariella aegopodii</i>				■	■		■		
<i>Dysaphis crataegi</i>				■	■				
<i>Microlophium evansi</i>							■	■	
<i>Myzus persicae</i>				■			■		
<i>Phorodon humuli</i>			■	■	■		■		
<i>Rhopalosiphum padi</i>							■		■

Table 2

Aphid species (*Aphididae*) in bushes Z2 (Gruczno) in 1997

Month	May			June			July		
	I	II	III	I	II	III	I	II	III
<i>Acyrtosiphon pisum</i>			■			■			
<i>Aphis fabae</i>						■			
<i>Aphis sambuci</i>						■			
<i>Brachycaudus helichrysi</i>				■				■	
<i>Brachycaudus lychnidis</i>				■		■			
<i>Cryptomyzus galeopsidis</i>							■	■	
<i>Dysaphis crataegi</i>			■		■	■	■		
<i>Hyperomyzus pallidus</i>							■	■	
<i>Phorodon humuli</i>				■	■	■	■		
<i>Rhopalosiphum padi</i>			■	■	■	■			
<i>Rhopalosiphonius latysiphon</i>							■	■	
<i>Sitobion avenae</i>				■					
<i>Uromelan campanulae</i>								■	■
<i>Uromelan taraxaci</i>						■			

aphids occurred early in June and were trapped throughout July. Of special attention is *A. fabae*, one of the most dangerous beet, broad bean, faba bean and opium poppy pest (Müller 1982), observed from the second decade of June to early August, and this was the longest period that aphids were observed in these thickets. Additionally, *Cavariella aegopodii* and *P. humuli* occurred from early June to the first decade of July. *R. padi*, a cereal pest, occurred in mid-May and was observed until late June. In 1998 at Topolinek (Z3), where 19 aphid species were stated, a similar pattern was found – the longest observed spe-

Table 3

Aphid species (*Aphididae*) in boundary Z3 (Topolinek) in 1997

Month	May			June			July			August		
	I	II	III	I	II	III	I	II	III	I	II	III
<i>Acyrtosiphon pisum</i>					■	■						
<i>Amphorophora rubi</i>			■									
<i>Aphis</i> spp.					■	■	■	■	■		■	
<i>Aphis fabae</i>					■	■						
<i>Aphis frangulae</i>					■	■						
<i>Brachycaudus cardui</i>					■	■						
<i>Brachycaudus helichrysi</i>					■	■						
<i>Brachycaudus lychnidis</i>						■						
<i>Capitophorus similis</i>					■	■						
<i>Cavariella agopodii</i>				■	■	■						
<i>Cavariella theobaldi</i>				■	■	■						
<i>Dysaphis crataegi</i>				■	■	■						
<i>Hyperomyzus pallidus</i>									■			
<i>Macrosiphum euphorbiae</i>					■	■						
<i>Metopolophium dirhodum</i>									■			
<i>Phorodon humuli</i>				■	■	■						
<i>Rhopalosiphum padi</i>		■		■	■	■						
<i>Rhopalosiphonium latysiphon</i>						■						
<i>Sitobion avenae</i>									■			
<i>Uromelan taraxaci</i>								■				

Table 4

Aphid species (*Aphididae*) in boundary Z4 (Chrystkowo) in 1997

Month	May			June			July			August		
	I	II	III	I	II	III	I	II	III	I	II	III
<i>Acyrtosiphon pisum</i>			■						■			
<i>Aphis fabae</i>								■	■			
<i>Brachycaudus cardui</i>											■	
<i>Cavariella agopodii</i>		■		■	■	■						
<i>Cavariella theobaldi</i>						■						
<i>Dysaphis crataegi</i>											■	
<i>Metopolophium dirhodum</i>						■			■			
<i>Myzus persicae</i>				■	■	■		■				
<i>Phorodon humuli</i>				■	■	■		■				
<i>Rhopalosiphum padi</i>					■	■						
<i>Sitobion avenae</i>									■			

Table 5

Aphid species (*Aphididae*) in bushes Z1 (Grabówko) in 1998

Month	May			June			July			August		
	I	II	III	I	II	III	I	II	III	I	II	III
<i>Acyrtosiphon pisum</i>					■	■						
<i>Amphorophora rubi</i>					■	■						
<i>Aphis</i> spp.					■	■						
<i>Aphis fabae</i>			■		■	■			■		■	
<i>Aphis pomi</i>								■				
<i>Aphis sambuci</i>					■	■						
<i>Brachycaudus cardui</i>				■	■							
<i>Hyalopterus pruni</i>					■	■				■	■	
<i>Metopolophium dirhodum</i>					■	■						
<i>Microlophium evansi</i>					■	■						
<i>Phorodon humuli</i>				■	■					■	■	
<i>Rhopalosiphum padi</i>		■	■		■	■						
<i>Sitobion avenae</i>					■	■						

Table 6

Aphid species (*Aphididae*) in bushes Z2 (Gruczno) in 1998

Month	May			June			July			August		
	I	II	III	I	II	III	I	II	III	I	II	III
<i>Aphis fabae</i>							■	■	■		■	
<i>Cavariella aegopodii</i>			■	■	■							
<i>Dysaphis crataegi</i>							■	■				
<i>Hayhursia atriplicis</i>								■	■			
<i>Hyalopterus pruni</i>							■	■				
<i>Hyperomyzus pallidus</i>					■	■						
<i>Macrosiphoniella millefolii</i>					■	■						
<i>Myzus persicae</i>					■	■						
<i>Phorodon humuli</i>			■	■	■							
<i>Pterocomma salicis</i>			■	■	■							
<i>Rhopalosiphum padi</i>			■	■	■							
<i>Sitobion avenae</i>												
<i>Uroleucon achilleae</i>								■	■			
<i>Uroleucon inulicola</i>					■	■						

cies was also *A. fabae*, trapped from mid-May to late July. In addition, *Hyalopterus pruni* (prune pest) was found in the traps in the second decade of June and was observed until the

first decade of August (Tab. 7). In the last examined stand, at Chrystkowo (Z4), in 1997 11 aphid species were identified, whereas in 1998 as many as 33 species were recorded. In the first year the species the longest observed was *C. aegopodii* – from mid-May to early August. Of the species of agricultural importance, *A. pisum*, *M. dirhodum*, *M. persicae* and *P. humuli* were observed in a longer period of time (Tab. 4). In 1998, the species the longest observed was *H. pruni* – from June to early August, moreover, *A. fabae* occurred from the second of May to the first decade of July, and *P. humuli* was recorded in June and July (Tab. 8).

Comparing the occurrence of aphids, one should emphasize the fact that in both years *A. fabae*, *P. humuli* and *R. padi* were found in all the investigated stands (Tab. 9). In 1997 in the examined thickets *P. humuli* was the dominant species (D4), and in 1998 in the Z1 thicket it was quite numerous (D2), and in Z4 it was dominant among many trapped species (33). Its dominance was probably due to the proximity of plum orchards and the presence of wild plum trees in the investigated thickets.

The thickets at Topolinek (Z3) and Chrystkowo (Z4) have been most abundant in the aphid fauna, of all the examined stands. The greatest number of the species was identified; here in both years in Z3 the presence of the same 13 species was observed, out of the total of

Table 7

Aphid species (*Aphididae*) in boundary Z3 (Topolinek) in 1998

Month	May			June			July			August		
	I	II	III	I	II	III	I	II	III	I	II	III
<i>Acyrtosiphon pisum</i>						■	■	■				
<i>Aphis fabae</i>		■			■	■	■	■	■	■		
<i>Aphis franfulae</i>					■	■						
<i>Aphis sambuci</i>			■				■	■				
<i>Brachycaudus cardui</i>				■	■	■						
<i>Brachycaudus lychnidis</i>					■	■						
<i>Cavariella aegopodii</i>			■	■	■	■						
<i>Cryptomyzus galeopsidis</i>			■	■	■	■						
<i>Dysaphis crataegi</i>				■	■	■	■	■				
<i>Hyalopterus pruni</i>					■	■	■	■	■		■	
<i>Hyperomyzus pallidus</i>		■	■									
<i>Macrosiphoniella oblonga</i>					■	■						
<i>Metopolophium dirhodum</i>							■	■				
<i>Myzus persicae</i>						■	■	■				
<i>Ovatus insitus</i>					■	■	■	■				
<i>Phorodon humuli</i>				■	■	■	■	■				
<i>Rhopalosiphum padi</i>				■	■	■	■	■				
<i>Rhopalosiphonium latysiphon</i>								■	■			
<i>Sitobion avenae</i>					■	■	■	■				

Table 8

Aphid species (*Aphididae*) in boundary Z4 (Chrystkowo) in 1998

Month	May			June			July			August		
	I	II	III	I	II	III	I	II	III	I	II	III
<i>Acyrtosiphon pelargonii</i>							■					
<i>Acyrtosiphon pisum</i>						■	■					
<i>Amphorophora rubi</i>					■							
<i>Aphis fabae</i>		■	■	■	■	■	■	■				
<i>Aphis franfulae</i>					■		■					
<i>Aphis nasturticii</i>									■			
<i>Brachycaudus cardui</i>				■								
<i>Cavariella aegopodii</i>			■	■	■	■	■	■				
<i>Cavariella theobaldi</i>				■								
<i>Coloradora achilleae</i>				■								
<i>Dysaphis crataegi</i>							■					
<i>Hayhursia atriplicis</i>			■	■		■	■					
<i>Hyalopterus pruni</i>				■	■		■		■	■	■	
<i>Hyperomyzus pallidus</i>				■								
<i>Macrosiphum euphorbiae</i>					■		■					
<i>Macrosiphoniella artimisiae</i>				■								
<i>Macrosiphoniella millefolii</i>					■							
<i>Metopeurum fuscoviridae</i>							■					
<i>Metopolophium dirhodum</i>						■	■					
<i>Megoura viciae</i>		■			■			■				
<i>Microlophium evansi</i>		■				■	■					
<i>Myzus spp.</i>		■			■							
<i>Phorodon humuli</i>				■	■	■	■			■		
<i>Pterocomma populeum</i>				■								
<i>Pterocomma salicis</i>			■	■	■							
<i>Rhopalosiphum padi</i>		■		■	■							
<i>Sitobion avenae</i>						■		■				
<i>Uroleucon achilleae</i>					■				■			
<i>Uromelan campanulae</i>								■				
<i>Uroleucon cirsi</i>					■							
<i>Uroleucon inulicola</i>							■					
<i>Uroleucon tanacetii</i>				■								
<i>Uroleucon tussilaginis</i>				■								

20 and 19 that were found, whereas in Z4 10 out of 11 and 33 species that were identified here. In both years at Topolinek *A. fabae* and *R. padi* were subdominant species (D3). At Chrystkowo *P. humuli* was the dominant species, both in 1997 and in 1998. *A. fabae* in both

Table 9

Structure of relative abundance of aphids (*Aphididae*) in midfield thickets

Species	Midfield thickets							
	Z1		Z2		Z3		Z4	
	1997	1998	1997	1998	1997	1998	1997	1998
Aphididae								
<i>Acyrtosiphon pelargonii</i>								D1
<i>Acyrtosiphon pisum</i>		D2	D2		D1	D1	D2	D1
<i>Amphorophora rubi</i>		D1			D1			D1
<i>Aphis</i> spp.		D1			D1			
<i>Aphis fabae</i>	D2	D4	D2	D2	D3	D3	D2	D2
<i>Aphis frangulae</i>					D1	D1		D1
<i>Aphis nasturtii</i>								D1
<i>Aphis pomi</i>		D2						
<i>Aphis sambuci</i>	D2	D2	D2			D2		
<i>Brachycaudus cardui</i>		D1			D1	D2	D1	D1
<i>Brachycaudus helichrysi</i>			D1		D1			
<i>Brachycaudus lychnidis</i>			D2		D1	D1		
<i>Capitophorus similis</i>					D1			
<i>Cavariella aegopodii</i>	D1			D1	D2	D2	D3	D2
<i>Cavariella theobaldi</i>					D1		D1	D1
<i>Coloradoa achilleae</i>								D1
<i>Cryptomyzus galeopsidis</i>			D2			D1		
<i>Dysaphis crataegii</i>	D1		D3	D1	D3	D2	D1	D1
<i>Hayhurstia atryplicis</i>				D1				D1
<i>Hyalopterus pruni</i>		D2		D1		D3		D2
<i>Hyperomyzus pallidus</i>			D1	D1	D1	D1		D1
<i>Macrosiphum euphorbiae</i>					D1			D1
<i>Macrosiphoniella artemisiae</i>								D1
<i>Macrosiphoniella millefolii</i>				D1				D1
<i>Macrosiphoniella oblonga</i>						D1		
<i>Metopeurum fuscoviridae</i>								D1
<i>Metopolophium dirhodum</i>		D2			D1	D1	D1	D1
<i>Megoura viciae</i>								D1
<i>Microlophium evansi</i>	D3	D1						D1
<i>Myzus</i> spp.								D1
<i>Myzus persicae</i>	D2			D1		D1	D1	
<i>Ovatus insitus</i>						D1		
<i>Phorodon humuli</i>	D4	D2	D4	D1	D4	D2	D4	D4
<i>Pterocomma populeum</i>								D1
<i>Pterocomma salicis</i>				D1				D1
<i>Rhopalosiphum padi</i>	D1	D4	D2	D4	D3	D3	D1	D1

Table 9 cd.

Structure of relative abundance of aphids (*Aphididae*) in midfield thickets

Species	Midfield thickets							
	Z1		Z2		Z3		Z4	
	1997	1998	1997	1998	1997	1998	1997	1998
<i>Aphididae</i>								
<i>Rhopalosiphonium latysiphon</i>			D1		D1	D1		
<i>Sitobion avenae</i>		D1	D1	D1	D1	D2	D1	D1
<i>Uroleucon achilleae</i>				D1				D1
<i>Uroleucon cirsi</i>								D1
<i>Uroleucon inulicola</i>				D1				D1
<i>Uroleucon tanacetii</i>			D1					D1
<i>Uroleucon tussilaginis</i>								D1
<i>Uromelan campanulae</i>			D1					D1
<i>Uromelan taraxaci</i>			D1		D1			

D1 – not numerous species; D2 – numerous species; D3 – subdominants; D4 – dominants

years was quite numerous (D2), and *C. aegopodii* was the subdominant species (D3) in 1997, and quite numerous (D2) in the following year (Tab. 9).

In conclusion, it should be stated that in the examined period the aphids of the *Aphididae* family occurred with varying intensity. In both years differences were found between the inspected thickets in terms of number of the species and the abundance of the aphids. Two habitats were the most abundant in the aphid fauna i.e. the fertile boundary strip at Topolinek (Z3), where a similar number of the aphid species was determined in 1997 and 1998 (20 and 19, respectively), and the boundary strip at Chrystkowo, where in 1998 the greatest number of the species was trapped (33). At Topolinek the dominant and subdominant species were pests: *R. padi*, feeding on cereals, *A. fabae*, feeding on the sugar beet, *D. crataegi*, feeding on the carrot, and *P. humuli*, feeding on the plum tree and the hop. Of the above listed species, only *A. fabae* was trapped from May to early August, the remaining ones were observed for a much shorter period of time. On the other hand, at Chrystkowo in both years *P. humuli* was dominant, determined in June and July, like most of other species, which however, occurred in small number. In the thickets at Grabówko (Z1) most of the species were crop pests.

In 1998 they were represented mainly by *R. padi* and *A. fabae* (the dominant ones), and in 1997 by *P. humuli*. This habitat also attracted *Microlophium evansi*, the aphid feeding on the nettle, and *Aphis sambuci*, feeding on the common elder, which were more numerous here than in the other stands.

## IV. DISCUSSION

Among the trapped aphid species of special attention are dominants:

1. *Phorodon humuli* (Schrk.) – was the dominant species in most of the investigated thicket types. It migrates from *Prunus spinosa*, *P. domestica* and *P. insitia* to leaves of hop plants. The aphids may remain on the primary host until the end of June and even July (Szelegiewicz 1968). In our study it was observed in the traps from late May to early July. Its occurrence was without any doubt related to the presence of plum trees in the numerous adjacent orchards as well as wild growing plum trees and *P. spinosa* in the midfield thickets (Barczak et al. 2000).
2. *Rhopalosiphum padi* (L.) – was identified in all the stands in both years. In 1998 it was the dominant species (D4) in the Z1 and Z2 thickets, and in both years it was the subdominant species (D3) in the Z3 thicket at Topolinek. In late spring it occurs on cereals, sometimes in a great number (Szelegiewicz 1968).

In the examined thickets its greatest number was traced in June. According to the earlier investigations carried out in this area (Barczak et al. 2000), it was not found on any wild growing plants. However, it occurs in different habitats (Hałaj and Wojciechowski 1998).

3. *Aphis fabae* Scop. – (the black bean aphid) was determined as the subdominant species (D3) at the Topolinek in both years. This aphid is one of the most dangerous crop pests in the world, causing direct damage to crops and vectoring virus diseases (Szelegiewicz 1968; Müller 1982). It was trapped in all the habitats in both years. In 1998 it was seen from May to late July, whereas in 1997 only at Topolinek it was observed in June and July, and in the remaining stands only for one decade in June or July. However, it was at Chrystkowo that *A. fabae* formed colonies on wild growing plants (Barczak et al. 2000). The species has been reported in various habitats, on plants as well as in traps or sweep-nets (Czylok et al. 1982; Hałaj and Wojciechowski 1998; Bennewicz and Kaczorowski 1999).

Other species of agricultural importance, but trapped in small numbers in the examined stands, are: *Acyrtorhaphon pisum* (Harris), *Sitobion avenae* (Fab.), *M. persicae* Sulz., *M. dirhodum* (Walk.), and *Brachycaudus cardui* (Kalt.), found in Z1, Z3 and Z4, and *B. helichrysi* and *Cryptomyzus galeopsidis* (Kalt.), reported in Z2 and Z3.

The majority of the trapped aphids in the examined thickets were rather incidental, treating them as a place of dispersion on proper hosts, including crops.

The presence of colonies of *Aphis sambuci* provides an opportunity for multiplication of beneficial aphidophagous insects, predators and parasitoids (Barczak and Bennewicz in press). For this reason the boundary strip at Chrystkowo (Z4) deserves a special attention, because the aphid communities at that place showed a significant difference compared with the remaining thickets. Moreover, species of pest status, only *P. humuli* was abundant, the other species of agricultural importance such as *A. fabae*, *R. padi* and *A. pisum* were less numerous. The dominance of *P. humuli* in all the investigated stands indicates that this species is strongly connected with the study area. Because most species of a pest status in the inspected thickets were not so abundant and the species spectrum varied from one year to the

other, one may infer that their occurrence in the area is not permanent (Hałaj and Wojciechowski 1996). What follows then is that the thickets do not seem to be a reservoir of the above-mentioned species, which was also established by Bennewicz and Kaczorowski (1999). In addition, such species as *A. fabae*, *M. persicae* or *R. padi* rarely settled wild growing plants in the thickets and did not form large colonies (Barczak et al. 2000). This point, however, must be verified by further studies.

On the basis of the obtained data it would be difficult to come up with an unequivocal assessment of the examined types of thickets, since each of them may pose a potential threat to the adjacent crops (given high reproductive possibilities of aphids, despite their low abundance noted in both years). On the other hand, each may be a reservoir of alternative hosts for beneficial insects (Bennewicz 1996; Bennewicz and Krasicka-Korczyńska 1997; Barczak et al. 2000). It is worth pointing out, however, that most aphid species preferred habitats with undeveloped vegetation layers.

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## VI. POLISH SUMMARY

### MSZYCE WYSTĘPUJĄCE W ZAROŚLACH SRÓDPOLNYCH NA TERENIE PARKU KRAJOBRAZOWEGO DOLINY DOLNEJ WISŁY

W latach 1997 i 1998 na terenie dzisiejszego Parku Krajobrazowego Doliny Dolnej Wisły przeprowadzono badania nad mszycami (*Homoptera*, *Aphidodea*: *Aphididae*). W czterech rodzajach zarośli śródpolnych, zróżnicowanych stopniem zaawansowania procesów sukcesyjnych, a przede wszystkim strukturą przestrzenną roślinności, mszyce odławiano do pułapek Moerickego. Pułapki zawieszono na palikach na wysokości wierzchołków roślin zielnych, po trzy na każdej z powierzchni, przy czym materiał wybierano co 10 dni od kwietnia do października. Powierzchniami badawczymi były – zakrzewienia z dużym udziałem drzew w Grabówku (Z1), zakrzewienia ze słabo rozwiniętymi płatami roślinności zielnej w Grucznie (Z2), zakrzewienia z dużym udziałem roślinności zielnej w Topolinku (Z3) oraz typową miedzą zielną z pojedynczymi krzewami w Chrystkowie (Z4). Wszystkie siedliska scharakteryzowano pod względem fitosocjologicznym. Najbogatszym w faunę mszyc były dwa siedliska – żyzna miedza w Topolinku (ok. 20 gatunków) oraz zakrzewienia w Chrystkowie (średnio 20 gatunków). W Topolinku najliczniejsze były potencjalnie szkodliwe gatunki: zbóż – *Rhopalosiphum padi*, buraka – *Aphis fabae*, marchwi – *Dysaphis crataegi* oraz śliwy i chmielu – *Phorodon humuli*, przy czym jedynie *A. fabae* występowała licznie i przez większą część sezonu wegetacyjnego (maj–sierpień).

W Chrystkowie zaś w obu latach badań dominował *P. humuli*, notowany w czerwcu i lipcu. Większość gatunków mszyc w badanych zaroślach odławiana była w krótkich okresach, a ponadto, jak stwierdzono w innych badaniach, jedynie *A. fabae*, *M. persicae* i *R. padi*, i to stosunkowo rzadko, zasiedlały rośliny dziko rosnące, nie tworząc licznych kolonii. Przypuszczać zatem można, że badane zarośla nie powinny stanowić rezerwuarów szkodliwych gatunków mszyc dla pobliskich agrocenoz. Stosunkowo często odławiana *P. humuli* natalywała z licznie występujących w okolicy dziko rosnących śliw. Większość gatunków mszyc preferowała zatem siedliska z dominującą roślinnością zielną, o słabo wykształconej piętrowości.