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Research note

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THYSANOPTERA COMMUNITY OF MIDFIELD SHELTERBELTS OF DIFFERENT AGE

ABSTRACT: The density and species composition of Thysanoptera were estimated in three shelterbelts with different age located in arable land (Turew area, West Poland). It was stated, that 100 years old shelterbelts supply favorable habitats for the community of these insects: the occurrence of species connected closely with the shelterbelt and the stable species composition were found there. In the young shelterbelt (two years after planting). Thysanoptera constituted a community dynamically changing. In several (7–8) years old shelterbelt the community of these insects showed the features characteristic for community noted in 100 years old shelterbelt.

KEY WORDS: Thysanoptera, midfield shelterbelts, density, species composition

Well-developed many-years old midfield shelterbelts constitute stable habitats, which are suitable for formation of animal communities with complicated taxonomical structure, specific relations between species and environment as well as with complicated connections between species. Shelterbelts contribute to enrichment of fauna of an agricultural landscape supplying source of food, suitable conditions for reproduction and shelter from unfavorable atmospheric conditions (Karg and Karlik 1993). Thysanoptera are one of many groups of insects occurring in midfield shelterbelts. These herbivorous insects are of very small sizes (0.05–0.5 mm). They are commonly occurring in different habitats in forests, meadows, and crop fields.

The aim of the study was to compare densities, species composition and dominance structure of Thysanoptera community occurring in three mid-field shelterbelts of different age.

The studies were carried out in Turew area (West Poland), in three midfield shelterbelts in the years 1999–2000. Insect communities were analysed in: newly planted (1–2 years old), several (7–8) years old and several dozen years (100 years) old shelterbelts. Vegetation, soil and meteorological conditions in the studied shelterbelts are given in Ryszkowski *et al.* (2003). To determine insects density all plants were cut within a frame of a size 25 × 25 cm. Insects were stirred from plants in the Berleze's apparatus. Series of samples were collected in each shelterbelt from spring to autumn every two weeks. In total 12 series

were collected, 12 samples in each. Number of individuals was expressed per 1 m^2. All adult Thysanoptera were determined to the species with Priesner's (1964) key. To estimate the association of a species with its environment the index of constancy C was calculated and expressed as a percent of samples, in which a given species was found. According to a scale proposed by Tischler (1948), the values 51–100% of index C reflect close connection of the species to given habitat. Dominance structure was evaluated in respect to scale proposed by Trojan (1975). According to the scale, dominating species represents above 5% of all individuals in the community, while species which represents 2–5% of all individuals is regarded as sub-dominating one.

Wilcoxon's test was used to assess the significance of differences in insect densities in shelterbelts between the two studied years. χ^2 test was used to evaluate the significance of differences in species composition of different sites.

In the first two years (1999, 2000) of existence of the newly planted (1–2 years old) shelterbelt the density of Thysanoptera did not significantly differ being 174.8 ind. m^{-2} on average (Table 1). The number of species was equal to 20 in the first year and 17 in the second year. Six species (*Thrips tabaci, Limothrips denticornis, Chirothrips manicatus, Haplothrips aculeatus, Taeniothrips atratus* and *Frankiniella tenuicornis*) dominated in the one year old shelterbelt and contributed in 91% to the total numbers. Subdominants were *Aptinothrips rufus* and *Anaphothrips obscurus* (Table 2). Second year of existence brought marked changes in both groups. *T. tabaci, Ch. manicatus* and *L. denticornis* remained the dominants and additionally *A. obscurus* appeared. *A. rufus* remained the subdominant and was joined by formerly dominating species: *H. aculeatus, T. atratus* and *F. tenuicornis* (Table 2). The difference in species composition between the first and the second year of studies was statistically significant

Table 1. Mean (May–October) density of Thysanoptera in three shelterbelts of different age (ind. m^{-2}). Average values for 144 samples.

	The youngest shelterbelt (1–2 years)		Several years old shelterbelt (7–8 years)		Old shelterbelt (*ca.* 100 years)	
Species	1999	2000	1999	2000	1999	2000
Aeolothrips intermedius Bagnall	0.8	0.8	0.2	0.7	0	0.4
Aeolothrips albicinctus Haliday	0	0	0.2	0.3	1.1	0.9
Dendrothrips degeeri Uzel	0.1	0	0	0	0	0
Aptinothrips rufus Gmelin	3.2	4.5	25.0	45.0	181.2	314.3
Aptinothrips stylifer Trybom	1.3	2.6	19.8	36.2	56.1	65.2
Anaphothrips obscurus Müller	4.7	11.2	6.0	30.4	17.7	180.8
Oxythrips ajugae Uzel	0.1	0	0	0	0	0
Oxythrips brevistylis Trybom	0.1	0	0.2	0	0	0
Tmetothrips subapterus Haliday	0	0	0.1	0	0	0
Frankliniella tenuicornis Uzel	10.1	4.3	3.8	2.8	0.8	2.8
Taeniothrips atratus Haliday	17.9	4.2	0.4	0.8	0.1	1.3
Taeniothrips inconseqens Uzel	0	0	0	0	0.1	0
Taeniothrips picipes Zetterstedt	0.1	0.8	0	0	0	0.1
Physothrips ulmifoliorum Uzel	0	0	0	0.1	0	0
Thrips angusticeps Uzel	0.1	0	0	0	0	0
Thrips physapus Linne	1.1	0	1.1	0.1	0.3	1.2
Thrips tabaci Lindeman	38.6	110.3	3.2	16.4	3.4	10.9
Thrips validus Uzel	0.2	0.3	0	0	0	0
Stenothrips graminum Uzel	0.2	0.1	0	0.1	0	0
Chirothrips manicatus Haliday	21.0	40.5	109.0	262.1	58.9	14.8
Limothrips denticornis Haliday	21.5	22.2	219.4	213.5	153.7	66.3
Limothrips cerealium Haliday	1.3	0,8	0	2,3	0,7	5,6
Nesothrips bicolor Heeger	0	0.1	0.2	0	2.2	0.7
Cephalothrips monilicornis O. M. Reuter	0.2	0.3	0.4	25.2	2.2	22.4
Haplothrips aculeatus Fabricius	18.8	4.8	15.2	13.1	19.3	17.6
Haplothrips acanthoscelis Karny	0	0.4	0.1	0	0	0
Total density	141.2	208.4	404.6	649.6	497.7	705.2
Number of species	20	17	17	16	15	16

($\chi^2 = 86.4$, $P < 0.0001$). The changes were caused by the strong increase of the numbers of A. obscurus and T. tabaci. In both the first and the second year of study no species were found of the constancy index higher than 51%, which proves a lack of species associated with this habitat (Table 2).

In the several (7–8) years old shelterbelt the mean density of Thysanoptera was 549.6 ind. m^{-2} and the total number of species was similar (17, 16) in both years of study (Table 1). Dominating species contributed in 86% to the total numbers in 1999 (the seventh year of shelterbelt existence). *L. denticornis, Ch. manicatus* and *A. rufus* were the dominants and the subdominants consisted of *A. stylifer* and *H. aculeatus*. In the next year of study *A. stylifer* joined the dominants and, as in the previous year of study, dominants contributed in 86% to the total numbers. Subdominant group was enlarged by *A. obscurus, T. tabaci* and *Cephalothrips monilicornis*. Species structure did not differ between the two years ($\chi^2 = 10.377$, $P > 0.05$). An analysis of constancy index revealed the occurrence of species closely associated with the shelterbelt (C>51%). In the first year these were *Ch. manicatus* and *L. denticornis* and in the second year – additionally *A. rufus* (Table 2).

Mean density of Thysanoptera in the old shelterbelt (*ca.* 100 years old) was 601.5 ind. m^{-2} (Table 1). The difference between the study years was insignificant. Total number of species was similar, being 15 and 16 in the first and second year of study, respectively. In 1999 four species (*A. rufus, A. stylifer, L. denticornis, Ch. manicatus*) formed a group of dominants; their percent contribution was equal to 91%. *A. obscurus* and *H. aculeatus* were the subdominants (Table 2). In the next year of study the dominant group was changed due to a large (10-fold) increase of *A. obscurus*. It replaced *Ch. manicatus*, which contribution decreased from 12% to 2% and therefore it became the subdominant. Dominating species contributed to 89% of total numbers. *Ch manicatus* and *H. aculeatus* were found in the subdominant group as well as *C. monilicornis*; density of

Table 2. Percentage share (in total density, see Table 1) of the species of Thysanoptera and their index of constancy C (%) in shelterbelts of different age. Average values for 144 samples.

	The youngest shelterbelt (1–2 years)				Several years old shelterbelt (7–8 years)				Old shelterbelt (*ca.* 100 years)			
Species	1999		2000		1999		2000		1999		2000	
	%	C	%	C	%	C	%	C	%	C	%	C
Aeolothrips intermedius Bagnall	1	4	<1	4	<1	1	<1	4	0		<1	3
Aeolothrips albicinctus Haliday	0		0		<1	1	<1	2	<1	7	<1	3
Dendrothrips degeeri Uzel	<1	1	0		0		0		0		0	
Aptinothrips rufus Gmelin	2	10	2	18	6	44	7	52	36	80	45	86
Aptinothrips stylifer Trybom	1	6	1	6	5	33	6	36	11	62	9	49
Anaphothrips obscurus Müller	3	13	5	31	2	14	5	33	4	36	26	34
Oxythrips ajugae Uzel	<1	1	0		0		0		0		0	
Oxythrips brevistylis Trybom	<1	1	0		<1	1	0		0		0	
Tmetothrips subapterus Haliday	0		0		<1	1	0		0		0	
Frankliniella tenuicornis Uzel	7	24	2	19	1	11	<1	14	<1	5	<1	13
Taeniothrips atratus Haliday	13	15	2	7	<1	1	<1	4	<1	1	<1	4
Taeniothrips inconseqens Uzel	0		0		0		0		<1	1	0	
Taeniothrips picipes Zetterstedt	<1	1	<1	3	0		0		0		<1	1
Physothrips ulmifoliorum Uzel	0		0		0		<1	1	0		0	
Thrips angusticeps Uzel	<1	1	0		0		0		0		0	
Thrips physapus Linne	1	3	0		<1	4	<1	1	<1	1	<1	2
Thrips tabaci Lindeman	27	21	53	39	1	4	3	19	1		2	24
Thrips validus Uzel	<1	1	<1	1	0		0		0		0	
Stenothrips graminum Uzel	<1	1	<1	1	0		<1	1	0		0	
Chirothrips manicatus Haliday	15	43	19	48	26	53	40	58	12	47	2	22
Limothrips denticornis Haliday	15	33	11	44	54	55	33	69	31	65	9	61
Limothrips cerealium Haliday	2	6	<1	5	0		<1	10	<1	4	1	19
Nesothrips bicolor Heeger	0		<1	1	<1	1	0		<1	3	<1	3
Cephalothrips monilicornis O. M. Reuter	<1	1	<1	3	<1	1	4	12	<1	5	3	22
Haplothrips aculeatus Fabricius	13	22	2	17	4	40	2	36	4	44	3	42
Haplothrips acanthoscelis Karny	0		<1	1	<1	1	0		0		0	

this last species increased tenfold (Table 2). Among dominating species of a constancy index higher than 51%, the species strictly associated with the shelterbelt were distinguished. *A. rufus, A. stylifer* and *L. denticornis* fell into this group in 1999 and *A. rufus* and *L. denticornis* in 2000 (Table 1). Species structure in the 100 years old shelterbelt did not differ between two study years ($\chi^2 = 6.3376$, $P > 0.05$).

Thysanoptera are poorly known group of insects. Former studies were limited to meadows (Oettingen 1942) and different cultivations of cereals and grasses (Holtmann 1962, Gromadska and Rolko 1971, Zawirska 1971, Żurańska 1985). Investigations in midfield shelterbelts contribute to the knowledge about Thysanoptera occurring in the habitats other than crop fields. Those habitats are important in respect to enhance species richness of these insects.

Old (~100 years) afforestations supply favorable habitas for existence of stable community of these fitofagous insects. It was characterized by similar number of species, stable species composition as well as by occurrence of the species closely related to this habitat, i.e. species for which the coefficient of constancy is higher than 51%.

In first two years after planting of shelterbelts Thysanoptera did not show the features of stable community. They created dynamically changing structure. Species composition was significantly changing; there was lack of species closely connected with this habitat. However, already several years (7–8 years) after planting of afforestation Thysanoptera became an assemblage characterized by the same features as in 100 years old afforestations. Thus, stable community of Thysanoptera establishes rather quickly.

The midfield shelterbelts in an agricultural landscape cause among others the increase of species richness. Among 26 species of these insects recorded together in studied shelterbelts only 8 were connected with cereals and maize cultivated in close neighborhood. The increase in species number was visible already in first years after planting of shelterbelts (Table 1).

Considerable increase in abundance of some species resulted probably from their out-breaks, which is well-known phenomenon characterizing among others insects occurring in forests (Szujecki 1983). The changes in the dominance structure caused by that increase did not influence stability of species composition both in 100 years and several years shelterbelts.

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