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HETEROPTERA OF MOIST MEADOWS ON THE MAZOVIAN LOWLAND

ABSTRACT

Analyses were carried out of species composition, abundance and dominance structure of *Heteroptera* on the moist meadows of the Mazovian Lowland. The *Heteroptera* abundance did not differ significantly on particular areas under studies, whereas the number of species estimated on the repeatedly mown meadow exceeded their number on the meadows mown only once a year. The species most abundantly occurring on all the studied areas was *Trigonotylus coelestialium*, and the greatest proportion was observed of species of Palaearctic range of distribution and of polytopic phytophages. Eleven species were recorded which had not been previously reported from the Mazovian Lowland.

INTRODUCTION

Heteroptera rank among the diversified trophically insects (phytophages, zoophages, phytozoophages). They are found in almost all environments, yet, due to thermic requirements, a majority of species prefer open areas. Abundance and species compositon of *Heteroptera* are much conditioned by the manner in which the meadows are exploited as well as by the intensity of agricultural treatments applied. Morris (1969, 1979) as well as Southwood and van Emden (1967) ascertained that diversified manner of gaining plant mass was an important factor determining the qualitative and quantitative structure of *Heteroptera* communities.

Intensification of agricultural procedures on regular grasslands over the period of the last more than ten years provided some additional factors affecting fauna, such as a man-established structure of plant coverage and mineral fertilization.

THE SITES AND METHODS

The studies were carried out on three sites located in the vicinity of Warsaw. The sites differed in size, soil conditions and, above all, in the manner of their exploitation. The meadow at Chylice, spreading over a vast area (of about 7 ha), was subject to fertilization and it was mown three times a year. The meadows at Klembów and Zbroszki were of a small area (up to 0.5 ha). The former was mown only once a year in spring, and then was subject to grazing, whereas the latter was grazed all the year long. All of them ranked among the association *Arrhenatheretum medioeuropaeum* (Kotowska, Okołowicz 1989).

The present studies were based mainly on the quantitative material sampled by means of an entomological sweep-net. Two parameters specifying insect fauna were taken into consideration, namely, abundance index (the number of individuals gathered in 25 sweepings of a sweep-net) and dominance. With respect to the latter there were distinguished the following classes: dominants (of a proportion exceeding 10%), subdominants (5–10%) and accessorial species. The total sweep-netted material numbered 3,021 individuals.

Sampling on the meadow at Chylice was also performed by means of supplementary methods, using Moericke cups and window traps. It allowed to check the accuracy of depicting *Heteroptera* dominance structure on the basis of the sweep-net material.

SPECIES COMPOSITION AND DOMINANCE STRUCTURE

In the course of the present studies 86 species of *Heteroptera* were recorded (Tab. 1). The following 11 species were for the first time reported from the Mazovian Lowland: *Cymus obliquus*, *Stygnocoris fuligineus*, *Spharagisticus nebulosus*, *Myrmedobia exilis*, *Lyctocoris campestris*, *Xylocoris galactinus*, *Monalocoris filicis*, *Calocoris quadripunctatus*, *Harpocera thoracica*, *Plagiognathus fulvipennis*, and *Tytthus pygmaeus*.

Fifty-six species were sampled by means of a sweep-net. The greatest number of species, i.e. 37, were recorded on the mown meadow at Chylice. Fewer species occurred on the mown and grazed meadow at Klembów, i.e. 29, and 23 species were found on the pasture at Zbroszki. The smaller number of species noted on these two meadows may be the consequence of the fact that they had only recently been set in the place of former croplands and, therefore, the structure of their fauna was not fully established yet.

On the other hand, the abundance index differed on particular sites. Slightly higher values were estimated on the mown and grazed meadows (4.47 at Klembów and 3.99 at Zbroszki) as compared to that recorded on the repeatedly mown meadow (3.21 at Chylice). The developmental cycle of *Heteroptera* communities

Table 1. Species composition of *Heteroptera* on the three meadows of the Mazovian Lowland (xxx — dominants, xx — subdominants, x — accessorial species, + — species recorded by means of supplementary methods, * — dendrophilous species)

No.	Species / Sites	Chylice	Klembów	Zbroszki
1	2	3	4	5
1	*Aelia acuminata* (L.)	x	x	—
2	*Eusarcoris aeneus* (Scop.)	—	x	x
3	*Dolycoris baccarum* (L.)	x	x	x
4	*Eurydema oleraceum* (L.)	—	x	—
5	**Elasmucha grisea* (L.)	+	—	—
6	*Stictopleurus punctatonervosus* (Gz.)	x	—	—
7	*Myrmus miriformis* (Fall.)	x	—	—
8	*Nysius thymi* (Wff.)	x	x	—
9	*Cymus obliquus* Horv.	x	x	—
10	*Cymus claviculus* (Fall.)	+	x	—
11	*Geocoris dispar* (Waga)	x	—	—
12	*Stygnocoris rusticus* (Fall.)	+	—	—
13	*Stygnocoris fuligineus* (Geoffr.)	x	—	—
14	*Drymus silvaticus* (F.)	+	—	—
15	*Scolopostethus affinis* (Schill.)	x	—	—
16	*Trapezonotus arenarius* (L.)	+	—	—
17	*Spharagisticus nebulosus* (Fall.)	x	—	—
18	*Megalonotus chiragra* (F.)	x	—	x
19	*Neides tipularius* (L.)	—	—	x
20	*Berytinus minor* (H.-S.)	x	x	—
21	*Piesma capitatum* (Wff.)	x	—	—
22	*Saldula saltatoria* (L.)	x	x	—
23	*Dictyonota tricornis* (Schrk.)	+	—	—
24	*Dictyla humuli* (F.)	x	—	—
25	*Nabicula limbata* (Dahlb.)	+	—	—
26	*Nabicula flavomarginata* (Sz.)	x	x	—
27	*Nabis ferus* (L.)	x	x	x
28	*Nabis pseudoferus* Rem.	x	xx	x
29	*Nabis punctatus* Costa	—	x	—
30	*Myrmedobia exilis* (Fall.)	+	—	—
31	**Anthocoris nemorum* (L.)	—	—	x
32	**Anthocoris confusus* Reut.	+	—	—
33	*Orius niger* Wff.	x	—	—
34	*Orius minutus* (L.)	x	—	—
35	**Lyctocoris campestris* F.	+	—	—
36	**Xylocoris galactinus* (Fieb.)	+	—	—
37	*Monalocoris filicis* (L.)	+	—	—
38	**Deraeocoris lutescens* (Schill.)	+	—	—
39	**Deraeocoris punctulatus* (Fall.)	+	—	—
40	*Dicyphus globulifer* (Fall.)	x	—	—
41	*Pithanus maerkeli* (H.-S.)	—	—	x

1	2	3	4	5
42	*Leptopterna dolobrata* (L.)	—	x	—
43	*Leptopterna ferrugata* (Fall.)	x	—	—
44	*Stenodema calcaratum* (Fall.)	x	xx	x
45	*Stenodema virens* (L.)	x	x	x
46	*Stenodema laevigatum* (L.)	x	x	x
47	*Notostira elongata* (Geoffr.)	x	—	—
48	*Notostira erratica* (L.)	xx	xx	xxx
49	*Trigonotylus coelestialium* (Kirk.)	xxx	xxx	xxx
50	**Phytocoris tiliae* (F.)	+	—	—
51	**Phytocoris longipennis* Flor	+	—	—
52	**Megalocoelum infusum* (H.-S.)	+	—	—
53	*Adelphocoris seticornis* (F.)	—	x	—
54	*Adelphocoris lineolatus* (Gz.)	—	—	x
55	**Calocoris quadripunctatus* (Vill.)	—	x	—
56	*Calocoris norvegicus* (Gmel.)	+	x	—
57	**Lygus viridis* (Fall.)	—	—	x
58	*Exolygus rugulipennis* (Popp.)	xxx	xx	xxx
59	*Exolygus pratensis* (L.)	x	xxx	x
60	*Orthops kalmi* (L.)	x	—	—
61	**Orthops cervinus* (H.-S.)	+	—	—
62	*Capsus ater* (L.)	x	x	—
63	*Halticus apterus* (L.)	x	xx	—
64	*Orthocephalus saltator* (Hhn.)	+	—	—
65	*Orthocephalus vittipennis* (H.-S.)	+	x	—
66	**Orthotylus nassatus* (F.)	+	—	—
67	*Orthotylus flavosparsus* (Sahlb.)	+	—	—
68	**Orthotylus ericetorum* (Fall.)	+	—	—
69	**Blepharidopterus angulatus* (Fall.)	+	—	—
70	**Pilophorus perplexus* (D.Sc.)	+	—	—
71	**Harpocera thoracica* (Fall.)	—	x	—
72	*Macrotylus paykulli* (Fall.)	+	—	—
73	*Plagiognathus chrysanthemi* (Wff.)	x	—	x
74	*Plagiognathus fulvipennis* (Kb.)	—	—	x
75	*Plagiognathus arbustorum* (F.)	x	—	—
76	*Plagiognathus albipennis* (Fall.)	+	—	—
77	*Campylomma verbasci* (M.-D.)	+	—	x
78	*Chlamydatus pulicarius* (Fall.)	x	x	x
79	*Chlamydatus saltitans* (Fall.)	x	—	—
80	*Criocoris crassicornis* (Hhn.)	—	—	x
81	**Atractotomus mali* (M.-D.)	+	—	—
82	**Psallus ambiquus* (Fall.)	+	—	—
83	*Tytthus pygmaeus* (Zett.)	+	—	—
84	*Amblytylus nasutus* (Kb.)	—	—	x
85	*Hoplomachus thunbergi* (Fall.)	+	—	—
86	*Megalocoleus molliculus* (Fall.)	+	—	—

took a similar course on the studied areas. The first individuals were observed to appear in April and during spring their abundance remained low. The period of the highest abundance fell on mid-summer (July, August), followed by a gradual decrease in the insect density; in October only individual specimens were sampled (Fig. 1).

Dominance structure on all the studied areas was much alike. The prevailing species was a mesophilous *Trigonotylus coelestialium*, accounting for 35–55% of the total number of individuals. The dominant class included also the three following species: *Exolygus rugulipennis*, *E. pratensis* and *Notostira erratica*. In the vegetation season the mass appearance of grass-associated dominants (*T. coelestialium*, *N. erratica*) was observed to occur earlier than that of dominants living on dycotyledons (*E. regulipennis*, *E. pratensis*) (Fig. 1). Subdominants occurred in scanty numbers, being slightly more abundant only on the meadow at Klembów (Fig. 2).

On the meadow at Chylice 53 species were collected by means of supplementary methods. The most numerously sampled species included: *Exolygus rugulipennis*, *Trigonotylus coelestialium* and *Stenodema calcaratum*. A large number of species sampled by means of these methods was affected by two bioecological groups: dendrophilous species — alien to grassy environments, which were represented by 16 taxa, and species associated with the soil surface (12 species), in the case of which sweep-netting was little effective. Differences in the quantitative structure reflected insect activity, which was attested by a large proportion of *Exolygus regulipennis*, i.e. the species noted for periods of an increased dispersion. It followed from the comparision of the quantitative and qualitative structure

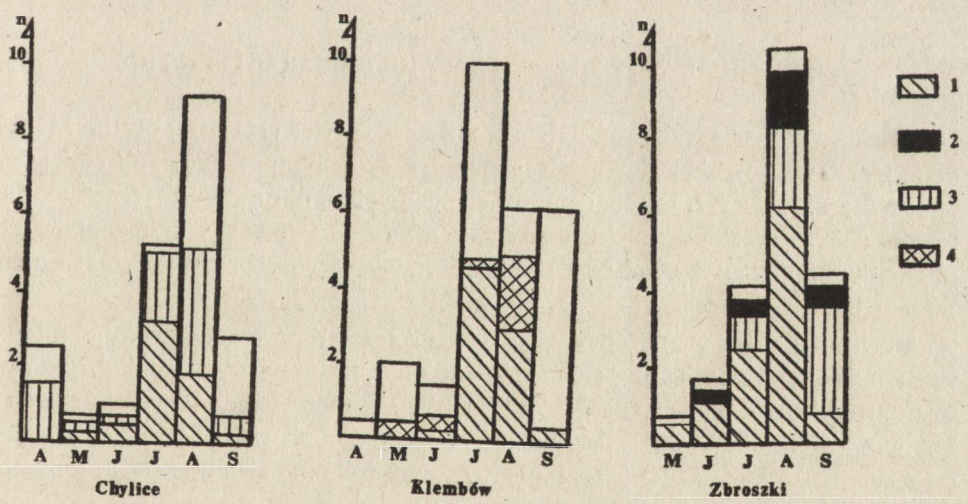

Fig. 1. Seasonal changes in *Heteroptera* abundance on the studied meadows including the proportion of dominants: n — abundance index; 1 — *Trigonotylus coelestialium*; 2 — *Notostira erratica*; 3 — *Exolygus rugulipennis*; 4 — *E. pratensis*; A–S — months in chronological order

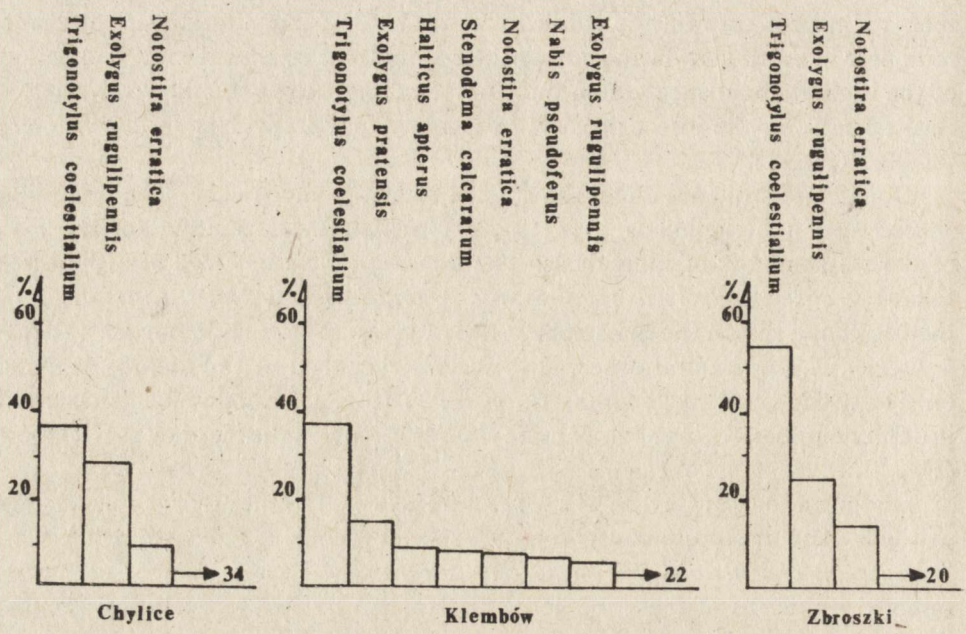

Fig. 2. Dominance structure of *Heteroptera* on the studied meadows

estimated on the basis of the applied methods that sweep-netting was more accurate than all the other applied methods at reflecting dominance relations of *Heteroptera* inhabiting meadow sward.

ECOLOGICAL AND ZOOGEOGRAPHICAL CHARACTERISTICS

Analysis of ecological amplitude of particular species occurring on the Mazovian meadows revealed the greatest number of polytopes and, subsequently, of eurytopes. However, the sequence of elements of amplitude with regard to the number of represented species was different. In this case the dominants were oligotopes, followed by polytopes and eurytopes. Stenotopes were represented merely by one species.

Qualitative and quantitative structure of the proportions of trophic guilds was similar. The dominating elements were phytophages accounting for 76–87% of the number of species and 90–98% of the number of individuals. The most abundant were the species feeding on grasses, though the number of species associated with dicotyledons was higher. Attention should also be paid to a relatively low proportion of predatory forms (Tab. 2).

Heteroptera inhabiting the studied meadows ranked among five zoogeographical elements (Tab. 3). Both with regard to the species number as well as to the abun-

Table 2. Percentage of ecological elements of *Heteroptera* communities estimated on the basis of the species composition (N%) and number of individuals (n%)

	Ecological elements	Chylice		Klembów		Zbroszki	
		N%	n%	N%	n%	N%	n%
Amplitude	Eurytopic	16.2	42.3	20.7	31.8	30.4	27.5
	Polytopic	27.0	50.5	34.5	63.2	30.4	70.7
	Oligotopic	54.1	7.2	41.4	4.9	39.1	1.8
	Stenotopic	2.7	0.01	3.4	0.03	—	—
Diet	Phytophages:	81.1	89.2	75.9	90.5	87.0	98.5
	connected with grass	32.4	49.4	31.0	57.0	34.8	70.6
	Zoophytophages	—	—	6.9	0.5	—	—
	Zoophages	18.9	9.4	17.2	9.0	13.0	1.5

Table 3. Percentage of zoogeographical elements of *Heteroptera* fauna estimated on the basis of species composition (N%) and number of individuals (n%); N — number of species

Element	N	N%	n%
Holarctic	8	14.3	42.3
Palaearctic	21	37.5	46.4
Euro-Siberian	10	17.8	6.6
European	14	25.0	4.4
Other	3	5.4	0.2

dance index, the prevailing were Palaearctic forms. A great deal of the remaining species ranked among European and Euro-Siberian elements, whereas Holarctic species indexed high abundance.

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HETEROPTERA ŁĄK ŚWIEŻYCH NIZINY MAZOWIECKIEJ

STRESZCZENIE

W pracy przedstawiono wyniki badań nad fauną pluskwiaków różnoskrzydłych (*Heteroptera*) występujących na łąkach świeżych (zespół *Arrhenatheretum medioeuropaeum*) Mazowsza. Stwierdzono występowanie 86 gatunków, w tym 11 nie podawanych dotychczas z Niziny Mazowieckiej (tabl. 1).

W strukturze zgrupowań badanych łąk najwyższym udziałem charakteryzował się *Trigonotylus coelestialium*, mezofilny gatunek biologicznie związany z trawami, a maksimum liczebności pluskwiaków różnoskrzydłych przypadło na lipiec, sierpień (rys. 1, 2). Stwierdzono, że fauna użytków koszonych, a następnie wypasanych jest uboższa w liczbę występujących gatunków niż fauna łąki kilkakrotnie koszonej. Natomiast liczebność *Heteroptera* na powierzchniach koszonych i wypasanych osiąga nieco wyższy poziom w porównaniu z łąką wyłącznie koszoną.

Analiza struktury ekologicznej i zoogeograficznej wykazała, że w faunie badanych zbiorowisk przeważają elementy o szerokiej walencji ekologicznej (politopy, eurytopy) i gatunki palearktyczne (tabl. 2, 3).

HETEROPTERA СВЕЖИХ ЛУГОВ МАЗОВЕЦКОЙ НИЗМЕННОСТИ

РЕЗЮМЕ

Проанализированы видовой состав, численность и доминационная структура наземных полужесткокрылых на свежих лугах Мазовецкой низменности. Численность *Heteroptera* на исследованных площадках была сходна, но число видов было выше на лугах, кошенных по несколько раз на протяжении сезона, чем на лугах, кошенных однократно, и пастбищах. Повсеместно наиболее многочисленным был *Trigonotylus coelestialium*, а наиболее высоким процентным содержанием характеризовались палеарктические виды и политопные фитофаги. Найдено 11 видов, не приводимых до настоящего времени с Мазовецкой низменности.