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CHLOROPIDAE (DIPTERA) OF MOIST MEADOWS ON
THE MAZOVIAN LOWLAND

ABSTRACT

Forty-nine species of the family *Chloropidae* were recorded on the Mazovian moist meadows (*Arrhenatheretum medioeuropaeum*), variously exploited by man. Eudominants included 3 phytophagous species, i.e. *Oscinella frit*, *O. hortensis* and *O. pusilla*, and one saprophagous species, i.e. *Incertella albipalpis*. These species accounted in total for 70% to 95% of the abundance in particular communities. A close similarity was observed in the species composition, dominance structure and trophic structure of the *Chloropidae* communities of the moist meadows. There were noted differences in the number of species and abundance of particular communities.

INTRODUCTION

Flies of the family *Chloropidae* occur in great numbers on meadows (Boness 1953). These are small flies, which do not cover any longer distances in any controlled way. Most frequently adult forms remain at the feeding sites of the larvae (Southwood 1961); hence the sampling of imagines provides a reliable information on the living places of earlier development stages. Consumers rank primarily among phyto-, sapro- and zoophagous larvae. Nutritive requirements of particular species are much diversified. As regards meadows, the most numerous *Chloropidae* group — both as regards the number of species as well as its abundance — is made up of phytophages. They may be further divided into mono- and poliphagous species, yet the preferences as to the host plant species concern a selective oviposition of females rather than the requirements of larvae, which are facultative pests of a majority of grasses and cereals (Nye 1959). Some *Chloropidae* species may cause much damage in agriculture. These species include *Oscinella frit*, *Oscinella hortensis*, *Oscinella pusilla*, *Meromyza saltatrix* and *Chlorops pumilionis* (Krasucki 1927, Vasina 1929, Nartschuk 1956, Smirnov 1958, Antonova 1959).

Many saprophages, e.g. the species of the genus *Elachiptera* Mcq. or *Incertella* Sabrosky, attack withering grasses damaged by herbivores or they may also rank among facultative phytophages (Nowakowski 1981).

The group of zoophages is most frequently represented by individuals of the aphidophagous genus *Thaumatomyia* Zenker (Jarkulov 1971).

Species composition of meadow *Chloropidae* differs depending on local habitat conditions. A specific set of *Chloropidae* species has been reported from humid meadows (Boness 1953), other *Chloropidae* species are characteristic of arid environments (Shtakel'berg 1958), still other species populate saline meadows (Tschirnhaus 1981).

The composition and abundance of meadow entomofauna depends, in a great measure, on the form of meadow cultivation and exploitation. Cultivated crop meadows are populated by only a part of dipterous species characteristic of natural meadows (Frydlewicz-Ciesielska 1961). *Diptera* species of mown meadows are less diversified than those of unmown grasslands (Frydlewicz-Ciesielska 1961, Southwood and van Emden 1967). Also meadow fertilization has a significant effect on *Chloropidae* communities, as it causes an increase in the abundance of the family in question (Olechowicz 1977). Furthermore, *Chloropidae* occur in greater numbers on grazed or mown meadows than on natural grasslands (Southwood and Jepson 1962).

The objective of the present paper was to examine the species composition, abundance and structure of the *Chloropidae* communities on the moist meadows (*Arrhenatheretum medioeuropaeum*) of the Mazovian Lowland.

STUDY AREA AND METHODS

The studies were carried out on 4 moist meadows (*Arrhenatheretum medioeuropaeum*) on the Mazovian Lowland, namely in Klembów (1980–1981), Białoleka Dworska (1976–1977), Chylice (1981–1982) and Zbroszki (1983–1984).

Klembów — the meadow recently set in place of a former cropland, overgrown with seeded tall grasses, subject to one mowing a year. The meadow abutted on the "Dębina" nature reserve (*Tilio-Carpinetum*) and a plot of a low linden-oak-hornbeam forest, the proximity of these habitats conditioning a high moisture content in the meadow soil. From the remaining sides the meadow was surrounded with crop fields.

Białoleka Dworska — fertilized, mown and occasionally cattle-grazed meadow. In the north it bordered on a narrow strip of a marshy meadow *Circaeo-Alnetum* and on the remaining sides it adjoined crop fields. The meadow was a regular, several-year-old grassland of an abundant floral composition.

Chylice — the meadow of rather poor floral composition, strongly fertilized, subject to several mowings a year. In the north it abutted on an ash-alder carr

(*Circaeo-Alnetum*), in the east it was skirted by a road and farm settlements. In the south and west the meadow bordered on a pasture.

Zbroszki — the meadow set in place of a cleared orchard, presently used as a pasture. It was sodded with low sward, not subject to fertilization. An orchard, farm settlements and crop fields were located in its direct vicinity.

A more detailed characteristic of the studied sites may be found in the work by Bańkowska (1989), whereas the work by Kotowska and Okołowicz (1989) provides a geobotanic account of the examined meadows.

The basis for analyses carried out in the present studies was the material sampled throughout vegetative season since April till October by means of a standard entomological sweep-net (10 samples 25 sweepings each).

The number of individuals in one sweep-net sample was regarded as the species abundance index (n). The dominance index (%) was calculated by Simpson formula, while the species similarity index — by Sørensen formula.

In order to classify the material according to the dominance index, the most frequently employed scale was taken use of, i.e. eudominants $n \geq 10\%$, dominants $5 \leq n < 10\%$, subdominants $2 \leq n < 5\%$, influents $1 \leq n < 2\%$, accessorial species $n < 1\%$. Constant species were considered all those which occurred in over 75% of the studied meadows.

I wish to acknowledge my debt to Dr. Jakub Tomasz Nowakowski, for determining the material from Klembów and Białoleka as well as for checking the correctness of the remaining determinations.

CHARACTERISTICS OF CHLOROPIDAE OF THE MOIST MEADOWS

Forty-nine species of the family *Chloropidae* were recorded on the studied moist meadows, which accounted for 55% of all the *Chloropidae* species reported from the Mazovian Lowland (Nowakowski 1981).

The constant species (75%–100%) of the Mazovian moist meadows included: *Elachiptera cornuta*, *E. tuberculifera*, *Tricimba cincta*, *Conioscinella frontella*, *Incertella albipalpis*, *Oscinella albiseta*, *O. frit*, *O. hortensis*, *O. pusilla*, *Meromyza femorata*, *M. nigriventris*, *M. saltatrix*, *Cetema cereris*, *C. elongata*, *Chlorops pumilionis*, *Ch. ringens*, *Ch. scalaris*, *Thaumatomyia glabra*, *Th. hallandica*, *Th. notata*. They accounted for 41% of the total number of species recorded.

The abundance of *Chloropidae* on the moist meadows was very high, on average 28.9 individuals per sweep-net sample.

On all the meadows eudominants included the same species. These were primarily the species of the genus *Oscinella* Beck, namely *Oscinella hortensis*, *O. frit* and *O. pusilla*, accounting for a larger part of the recorded *Chloropidae*. *O. frit* is a well-known oat pest, which may cause much damage in agriculture (Krasucki 1927); it also feeds on other cereals and grasses, showing preference

for *Phleum pratense* (Frydlewicz-Ciesielska 1961). *O. pusilla* prefers barley, though its nutritive requirements are far from being monophagous. It is more xerophilous than *O. frit*, unlike *O. hortensis*, other crop-field and meadow pest, which is usually found in more humid places. Another eudominant on the moist meadows was saprophagous *Incertella albipalpis*, whose larvae feed on decaying grass blades formerly often damaged by *Diptera* of the genus *Oscinella* Beck. The species most frequently occurs in well-insolated places.

Apart from the abundant species mentioned above, the four following species occurred fairly numerously on the moist meadows: *Meromyza saltatrix* (Białoleka dominant and Chylice subdominant, whose larvae feed on grass ears in arid spots), *Cetema cereris* (Chylice dominant, trophically bound to grass blades on forest edges), *Thaumatomyia hallandica* (Zbroszki dominant, root aphid zoophage) and *Chlorops ringens* (Klembów subdominant, xerophilous phytophage).

Eudominants and dominants among *Chloropidae* sampled in the studied sites ranked among hemerophilous species, i.e. the species preferring environments under anthropogenic impact (Nowakowski 1981). These species included *Incertella albipalpis*, *Oscinella frit*, *O. hortensis* and *Meromyza saltatrix*.

Besides the species occurring numerously on the moist meadows, also single individuals of several other accessorial species were sampled, accounting for 71% of the species composition of meadow *Chloropidae*.

As regards the division of *Chloropidae* species into three main trophic groups, the group of phytophages dominated on the moist meadows (about 86% of the individual abundance). This group was also marked for the greatest species number and the highest mean abundance (Tab. 1). The group included a majority of the most abundant species (the genus *Oscinella* Beck), as well as less numerous species of the genera *Oscinimorpha* Lioy, *Dicraeus* Lw., *Meromyza* Mg., *Haplegis* Lw., *Cetema* Hendel, *Lasiosina* Beck. The remaining trophic groups were less abundant. Saprophages accounted for about 11% of the material, including 19 species of the genera *Rhodesiella* Adams, *Elachiptera* Mcq., *Tricimba* Lioy, *Aphanotrigonum* Duda, *Trachysiphonella* Enderlein, *Conioscinella* Duda, *Incertella* Sabrosky (Tab. 2). The least numerous was the group of zoophages (merely about 2%), which comprised 4 species of the genus *Thaumatomyia* Zenker; *Th. hallandica* having been the species occurring most numerously (Tab. 1).

Phytophagous species most abundant on the moist meadows ranked among the species directly bound to grassland environments and cereals, a majority of which prefer dry and insolated places. *Oscinella frit* and *O. hortensis* are rather mesohygrophilous species, while *Chlorops hypostigma* and *Ch. speciosa* are hygrophilous species. A majority of saprophages has hygrophilous requirements, except for xerophilous species of the genus *Tricimba* Lioy and *Incertella* Sabrosky. Saprophagous species sampled on the moist meadows were not meadow inhabitants exclusively, they also occur in scarcely wooded sites and in forests.

Table 1. The number of species and abundance (the number of individuals in a sample) of the *Chloropidae* communities of the Mazovian moist meadows, the trophic group classification provided

Locality		Klembów			Białoleka			Chylice			Zbroszki			Total
		1980	1981	Total	1976	1977	Total	1981	1982	Total	1983	1984	Total	
Total	Abundance	8.95	11.57	10.25	10.58	11.30	10.94	38.33	51.01	44.67	51.91	48.03	49.97	28.96
	Number of species	17	24	27	22	32	38	23	23	28	21	16	22	49
Phytophages	Abundance	7.71	10.79	9.25	8.58	9.52	9.05	34.21	43.94	39.07	48.48	35.34	41.91	24.82
	Number of species	7	12	12	17	18	23	17	17	20	15	10	17	26
Saprophages	Abundance	1.00	0.73	0.86	2.00	1.00	1.50	3.77	6.51	5.14	1.68	9.58	5.63	3.28
	Number of species	8	11	14	6	10	11	4	4	5	3	3	4	19
Zoophages	Abundance	0.22	0.05	0.13	—	0.78	0.39	0.35	0.56	0.45	1.75	3.11	2.43	0.85
	Number of species	1	1	1	—	3	3	2	3	4	3	3	3	4

Table 2. Species composition, abundance (n — the number of individuals in a sample) and dominance index (%) of the *Chloropidae* communities of the Mazovian moist meadows
(+ — abundance less than 0.01%)

No.	Locality	Klembów		Białoleka		Chylice		Zbroszki	
		n	%	n	%	n	%	n	%
1	<i>Rhodesiella plumigera</i> (Mg.)	—	—	+	0.06	—	—	—	—
2	<i>Elachiptera brevipennis</i> (Mg.)	+	0.02	—	—	—	—	—	—
3	<i>Elachiptera cornuta</i> Fll.	0.29	2.83	—	—	0.04	0.09	0.01	0.02
4	<i>Elachiptera diastema</i> Cln.	0.06	0.58	+	0.06	+	0.01	—	—
5	<i>Elachiptera tuberculifera</i> Corti	0.22	2.14	0.08	0.73	0.03	0.07	0.05	0.10
6	<i>Tricimba cincta</i> (Mg.)	+	0.02	0.04	0.36	0.01	0.02	+	+
7	<i>Tricimba humeralis</i> (Lw.)	—	—	+	0.06	—	—	—	—
8	<i>Aphanotrigonum nigripes</i> (Ztt.)	0.01	0.10	—	—	0.04	0.09	+	+
9	<i>Aphanotrigonum trilineatum</i> (Mg.)	0.05	0.49	0.05	0.46	—	—	—	—
10	<i>Oscinimorpha arcuata</i> (Duda)	—	—	—	—	+	+	—	—
11	<i>Oscinimorpha minutissima</i> (Strobl)	—	—	—	—	0.01	0.02	—	—
12	<i>Oscinimorpha sordidissima</i> (Strobl)	—	—	0.02	0.18	—	—	—	—
13	<i>Trachysiphonella scutellata</i> v. Roser	+	0.01	0.04	0.36	—	—	+	+
14	<i>Conioscinella frontella</i> (Fll.)	0.01	0.10	0.02	0.18	+	0.01	—	—
15	<i>Conioscinella zetterstedti</i> Andersson	+	0.01	0.01	0.09	—	—	—	—
16	<i>Incertella albipalpis</i> (Mg.)	0.36	3.51	1.33	12.16	5.68	12.71	5.91	11.83
17	<i>Incertella kerteszi</i> (Beck.)	+	0.01	—	—	—	—	—	—
18	<i>Oscinella maura</i> (Fall.)	0.68	6.63	0.09	0.82	1.85	4.14	0.47	0.94
19	<i>Oscinella frit</i> (L.)	2.38	23.22	0.78	7.11	5.88	13.16	6.36	12.73
20	<i>Oscinella hortensis</i> Collin	4.36	42.53	2.66	24.30	14.91	33.38	16.60	33.23

21	<i>Oscinella pusilla</i> (Mg.)	0.92	8.97	2.90	26.54	13.95	30.23	15.25	30.53
22	<i>Dicraeus fennicus</i> Duda	+	0.02	0.02	0.18	+	0.01	+	+
23	<i>Dicraeus ingratus</i> (Lw.)	—	—	0.23	2.10	—	—	—	—
24	<i>Dicraeus tibialis</i> (Mcq.)	—	—	0.30	2.74	—	—	—	—
25	<i>Meromyza femorata</i> Mcq.	—	—	0.02	0.18	0.03	0.07	0.40	0.80
26	<i>Meromyza nigriventris</i> Mcq.	+	0.05	+	0.06	0.25	0.56	1.21	2.42
27	<i>Meromyza pluriseti</i> Peterfi	—	—	—	—	+	0.01	—	—
28	<i>Meromyza saltatrix</i> (L.)	0.03	0.29	0.60	5.40	0.89	1.99	0.71	1.42
29	<i>Meromyza sororcula</i> Fedoseeva	—	—	0.23	2.10	—	—	—	—
30	<i>Meromyza triangulina</i> Fedoseeva	—	—	0.07	0.64	—	—	—	—
31	<i>Meromyza variegata</i> Mg.	—	—	0.14	1.28	—	—	—	—
32	<i>Cryptonevra flavitarsis</i> (Mg.)	—	—	0.16	1.46	—	—	—	—
33	<i>Cryptonevra tarsata</i> (Fll.)	—	—	0.01	0.09	—	—	—	—
34	<i>Lasiosina approximatonervis</i> (Ztt.)	0.01	0.10	—	—	—	—	—	—
35	<i>Lasiosina cintipes</i> Mg.	+	0.04	0.01	0.09	—	—	—	—
36	<i>Cetema cereris</i> Fll.	0.18	1.75	0.40	3.65	0.60	1.34	0.07	0.14
37	<i>Cetema elongata</i> Mg.	0.01	0.10	0.20	1.83	+	0.01	0.07	0.14
38	<i>Chlorops hypostigma</i> Mg.	—	—	0.01	0.09	—	—	—	—
39	<i>Chlorops laeta</i> Mg.	—	—	—	—	+	0.01	—	—
40	<i>Chlorops meigeni</i> Lw.	—	—	0.10	0.91	—	—	—	—
41	<i>Chlorops pumilionis</i> (Bierk.)	+	0.02	—	—	0.01	0.02	0.21	0.42
42	<i>Chlorops ringens</i> Lw.	0.32	3.12	0.08	0.73	+	0.01	+	0.01
43	<i>Chlorops scalaris</i> Mg.	+	0.02	0.03	0.27	0.01	0.02	+	0.01
44	<i>Chlorops serena</i> Lw.	—	—	0.02	0.18	—	—	—	—
45	<i>Chlorops speciosa</i> Mg.	—	—	0.02	0.18	—	—	—	—
46	<i>Thaumatomyia glabra</i> (Mg.)	—	—	0.02	0.18	0.01	0.02	0.21	0.42
47	<i>Thaumatomyia hallandica</i> Andersson	0.34	1.32	0.17	1.55	0.43	0.96	2.35	4.70
48	<i>Thaumatomyia notata</i> (Mg.)	—	—	0.06	0.55	0.01	0.02	0.07	0.14
49	<i>Thaumatomyia rufa</i> (Mcq.)	—	—	—	—	0.01	0.02	—	—

Meadow zoophages were bound rather to fairly humid places, e.g. *Thaumatomyia hallandica* — to a linden-oak-hornbeam forest habitat.

From zoogeographical point of view, the species in question occur on the area of Palaearctic or Central and Northern Europe, the European part of the Soviet Union included. Only *Oscinimorpha minutissima* is a species of a south European origin, yet it is commonly encountered all over Europe.

DIVERSITY OF CHLOROPIDAE COMMUNITIES

Klembów. Twenty-seven *Chloropidae* species were recorded on the mown-grazed meadow. The dominants were: *Oscinella hortensis* (43%), *O. frit* (23%), *O. pusilla* (9%), *O. maura* (7%), *Incertella albipalpis* (4%) (Tab. 2). Mean community abundance index amounted to 10.25 individuals per sample.

Białołęka. Thirty-eight *Chloropidae* species occurred on the mown and grazed meadow. The dominant species were: *Oscinella pusilla* (27%), *O. hortensis* (24%), *Incertella albipalpis* (12%), *O. frit* (7%), *Meromyza saltatrix* (6%). Community abundance index came up to 10.94 individuals per sweep-net sample.

Chylice. Twenty-eight *Chloropidae* species were reported from the repeatedly mown meadow. The dominant species were: *Oscinella hortensis* (33%), *O. pusilla* (30%), *O. frit* (13%), *Incertella albipalpis* (13%). Abundance index 44.62 individuals per sample.

Zbroszki. Twenty-two *Chloropidae* species were noted on the pastured meadow. The dominants included: *Oscinella hortensis* (33%), *O. pusilla* (30%), *O. frit* (13%), *Incertella albipalpis* (12%), *Thaumatomyia hallandica* (5%). Community abundance numbered 49.97 individuals per sample.

Chloropidae communities occurring on sites subject to various exploitation forms had similar species composition and dominance structure, yet differed in the species number and abundance. The proximity of humid habitats to meadows, e.g. of a linden-oak-hornbeam forest or carrs, as in the case of the meadows at Klembów, Białołęka and Chylice, provides conditions for development of both zero- and hygrophilous species, whereas on an arid meadow, i.e. the site at Zbroszki, almost exclusively xerophilous species live and, most likely, for this reason the number of *Chloropidae* species occurring on this meadow was lower.

The species composition was alike on all the meadows (Tab. 2). According to Sørensen index, the greatest species composition similarity was recorded for the communities of Chylice and Zbroszki (84%), also much alike were the communities of Klembów and Zbroszki (84%) and somewhat less similar — the *Chloropidae* communities of Chylice and Klembów (62%). Only the community of

Białołęka was distinctly different from all the other sites in its species composition, and from the community of Chylice in particular (54%).

Flies of the family *Chloropidae* occurred very abundantly on the moist meadows. The greatest abundance was noted of the community on the pastured meadow at Zbroszki (49.97), and slightly lower — on the repeatedly mown meadow at Chylice (44.62). Approximately the same, lower abundance values were recorded for *Chloropidae* on the mown-grazed meadows, namely 10.94 in Białołęka and 10.25 in Klembów.

Dominance structure of *Chloropidae* communities was very similar (Fig. 1). On all the sites dominance was observed of four species prevalently of the genus *Oscinella* Beck, namely *O. frit*, *O. hortensis*, and *O. pusilla*; also *Incirtella albipalpis* occurred in large numbers. Total abundance of these species ranged from 70% of the community abundance (in Klembów and Białołęka) up to 95% (Chylice). For instance, the proportion of *O. frit* in the Klembów community and that of *O. hortensis* and of *O. pusilla* in the Zbroszki community amounted to 40% of the community abundance, whereas the proportion of *O. pusilla* and of *O. hortensis* in the Białołęka community — up to 25% each. *Chloropidae*

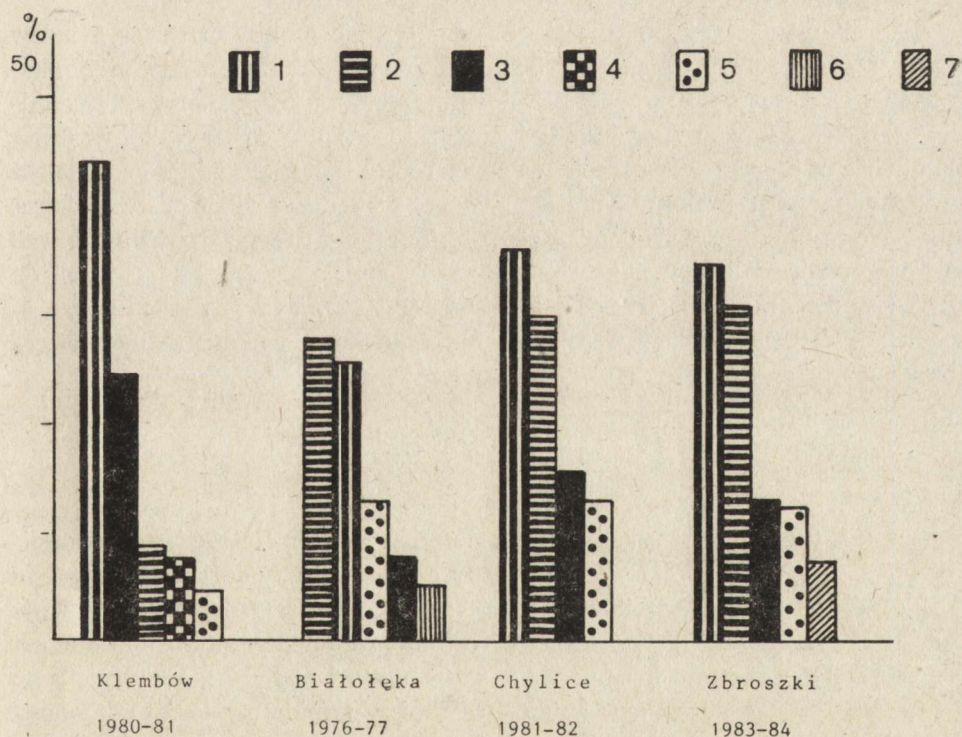


Fig. 1. Dominance structure of the *Chloropidae* communities of the Mazovian moist meadows: 1 — *Incirtella albipalpis*, 2 — *Oscinella maura*, 3 — *O. frit*, 4 — *O. hortensis*, 5 — *O. pusilla*, 6 — *Meromyza saltatrix*, 7 — *Thaumatomyia hallandica*

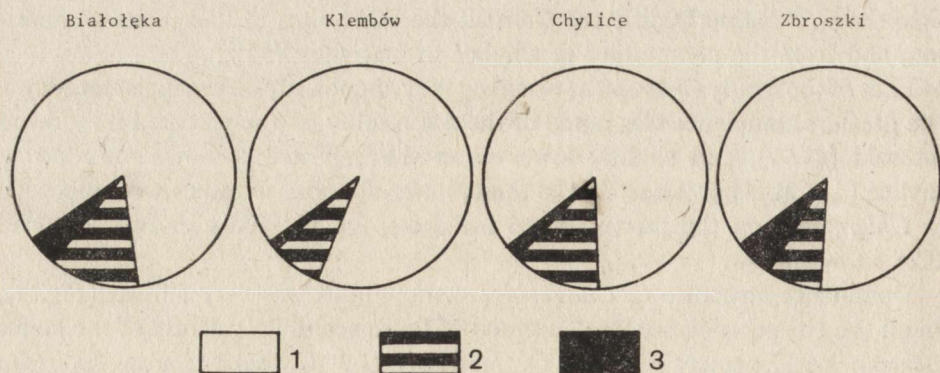


Fig. 2. Trophic structure of the *Chloropidae* communities of the Mazovian moist meadows: 1 — phytophages, 2 — saprophages, 3 — zoophages

communities on the meadows at Klembów, Chylice and Zbroszki were marked for a very strong dominance of two species only, whereas the community of the meadow at Białoleka was noted for a more uniform distribution of proportions of the most abundant species (Fig. 1).

The abundance rates of the three main trophic groups of moist meadow *Chloropidae* were much the same. The proportions of the dominating phytophagous species at particular stands hardly differed (Fig. 2). The *Chloropidae* communities on the meadows at Klembów and Zbroszki were marked for a slightly lower abundance of saprophagous species as compared to the communities of Białoleka and Chylice. As regards the Zbroszki pasture, a smaller number of saprophages may have resulted from the lack of grass residues due to regular grazing as well as from overdried habitat. The abundance of zoophagous species was small on all the studied meadows, ranging 1.0–4.4% (Fig. 2). The largest numbers of zoophages were sampled at Zbroszki, most likely owing to a greater than elsewhere abundance of aphides.

SEASONAL DYNAMICS

Seasonal fluctuations observed in the abundance of the *Chloropidae* communities on the moist meadows were primarily conditioned by seasonal changes in the abundance of the four following species: *Oscinella frit*, *O. hortensis*, *O. pusilla* and *Incertella albipalpis*. For instance, on the repeatedly mown meadow at Chylice a slight increase in abundance was observed at the beginning of June 1981, followed by subsequent abundance peaks in mid-July and mid-August (Fig. 3). In 1982 four abundance maxima were recorded, namely at the beginning of June, on the turn of June and July, in August and in the end of September (Fig. 4). On the pastured meadow at Zbroszki mass occurrences of *Chloropidae*

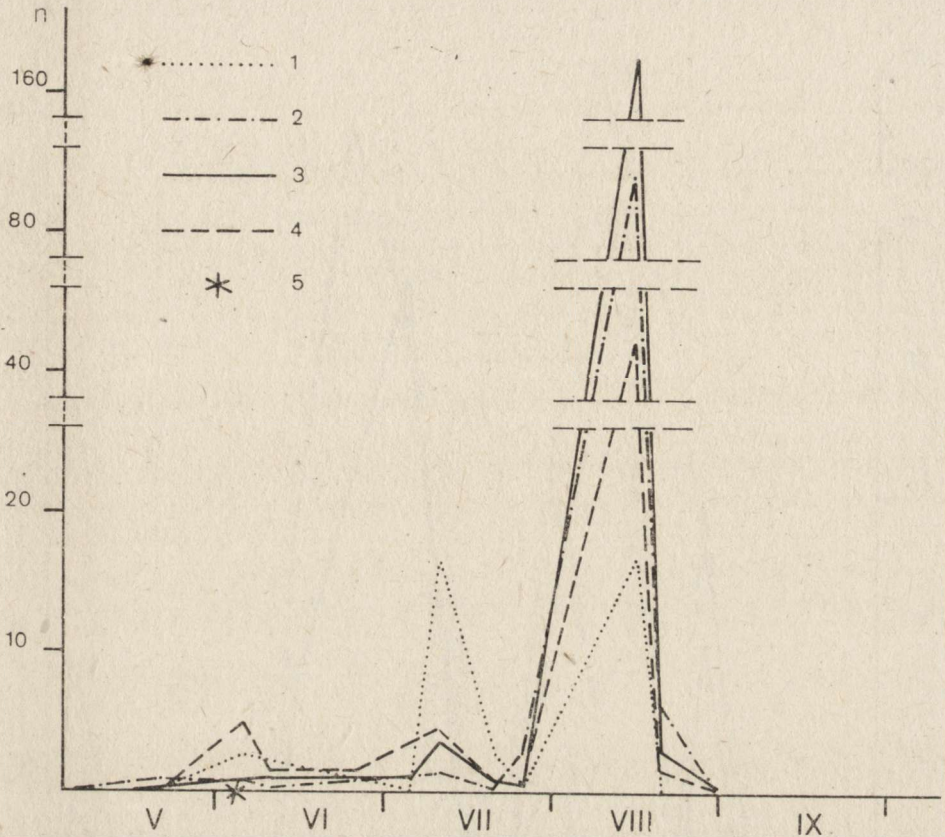


Fig. 3. Abundance dynamics of the *Chloropidae* communities of the Mazovian moist meadows — in Chylice, repeatedly mown meadow, 1981. Denotations: 1 — *Incertella albipalpis*, 2 — *Oscinella frit*, 3 — *O. hortensis*, 4 — *O. pusilla*, 5 — mowing; n — the number of individuals in a sample

in 1983 were noticed to fall on July and August (Fig. 5), whereas in 1984 — on June and July (Fig. 6). *Chloropidae* abundance peaks marked the appearances of successive generations of imagines. In the case of the meadow dominating species, the timing of the abundance peak of mature *Chloropidae* was approximately the same. The precise term of breeding and the number of generations depend, in a large measure, on weather conditions and vary in particular years. For instance, in hot seasons three or four *Chloropidae* generations were noted to appear, while in colder and humid season of 1984 only two generations were observed.

Mowing was not observed to affect seasonal mass occurrences of *Chloropidae*. Seemingly, mowing-due changes, ascertained by certain authors (Boness 1953), could have been observed on the repeatedly mown meadow at Chylice (Fig. 3 with denoted mowing terms). Mass occurrences of the dominating *Chloropidae* species took place shortly after successive mowings. However, analogous fluctua-

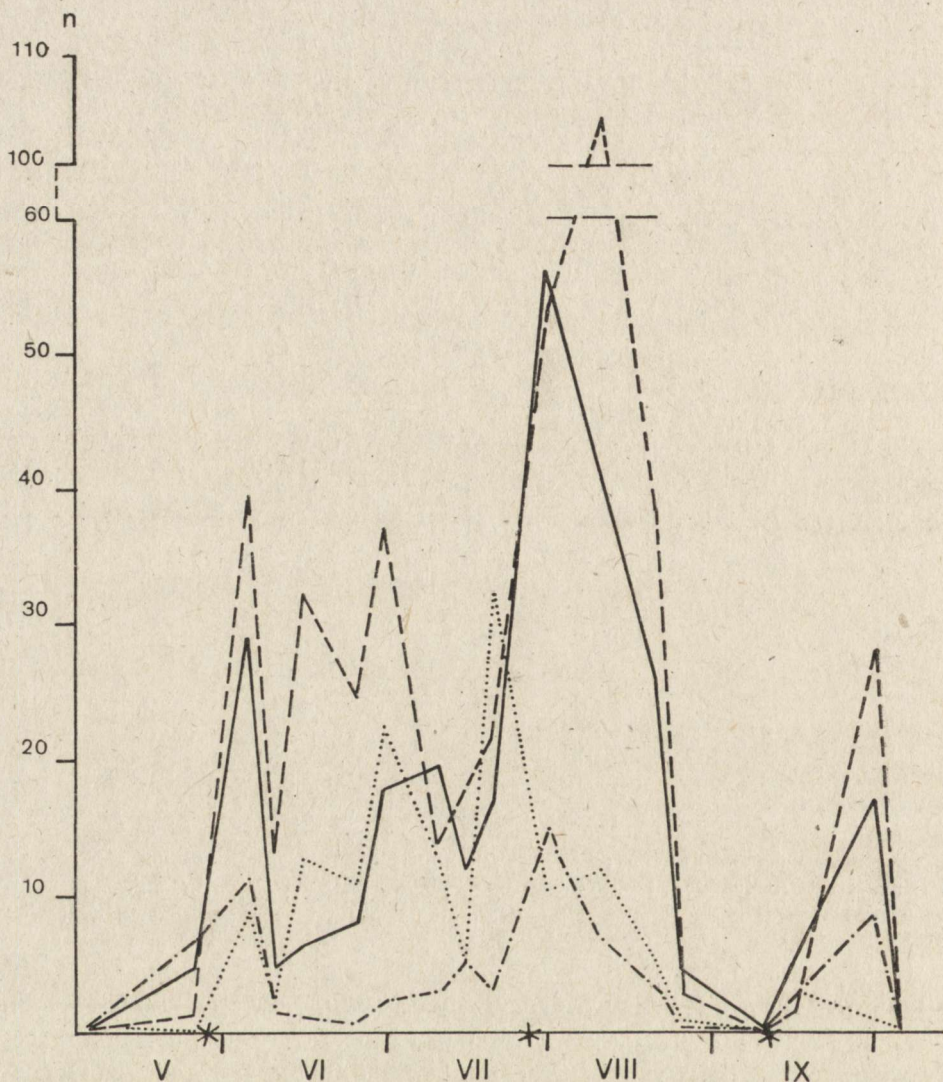


Fig. 4. Abundance dynamics of the *Chloropidae* communities of the Mazovian moist meadows — in Chylice, repeatedly mown meadow, 1982. Denotations: see Fig. 3.

tions in the abundance of *Oscinella frit* and *O. pusilla* might have been observed on a never mown, regularly cattle-grazed meadow at Zbroszki (Fig. 3). These abundance oscillations should be ascribed to the development cycles of these typically herbivorous species, which give several generations in a vegetative season. The term of imagines' appearance and its abundance are conditioned by the amount and accessibility of food to larvae, i.e. fresh grass blades, which, in turn, depends on mowing as well as on cattle-grazing of grass. The number and

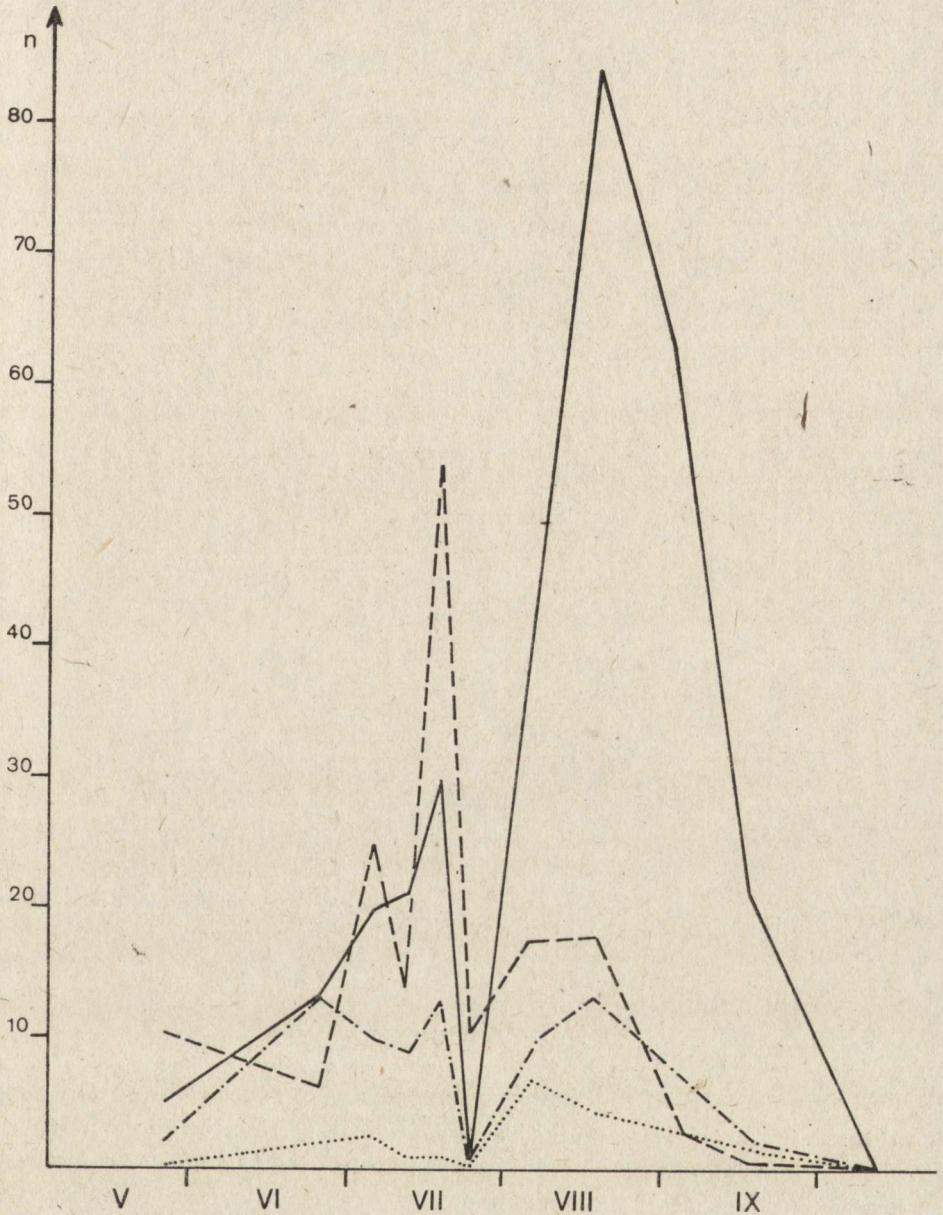


Fig. 5. Abundance dynamics of the *Chloropidae* communities of the Mazovian moist meadows — in Zbroszki, pastured meadow, 1983. Denotations: see Fig. 3

term of mowings as well as the abundance and timing of the appearance of successive generations of imagines all depend on weather conditions and on grass growth, thus these terms may be said to be indirectly related.

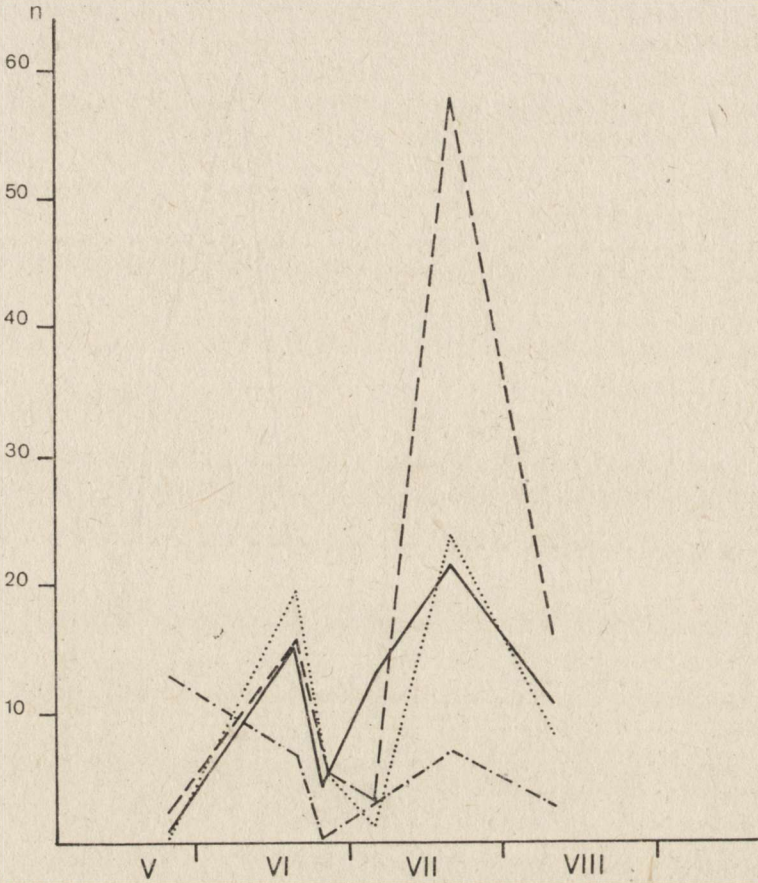


Fig. 6. Abundance dynamics of the *Chloropidae* communities of the Mazovian moist meadows — in Zbroszki, pastured meadow, 1984. Denotations: see Fig. 3

SUMMARY AND DISCUSSION

Forty-nine species of the family *Chloropidae* were reported from the moist meadows of the alliance *Arrhenatheretum medioeuropaeum*, located on the Mazovian Lowland. The greatest species richness was noted of the *Chloropidae* community at Białoleka (38 species); the amount of species in Chylice and Klembów was lower (28 and 27, respectively), whereas the smallest number of species occurred in Zbroszki (22).

The species composition of particular meadows was much alike (the similarity index ranging from 54% to 84%). About 41% of the total number of species was contributed by species constant in the *Chloropidae* communities on moist meadows.

Differences in species abundance of meadow *Chloropidae* are likely to result from local habitat conditions. It was noted that on the meadow where the amount of plant species was greater than in other sites, also a greater number of *Chloropidae* species occurred (Białoleka). The location of meadows in the vicinity of humid habitats, e.g. a linden-oak-hornbeam forest habitat and carrs abutting on the meadows at Klembów, Białoleka and Chylice, results in the presence of hygrophilous species on the meadows. On the dry meadow at Zbroszki almost exclusively xerophilous *Chloropidae* species were found: consequently, the species composition of the *Chloropidae* community was much impoverished.

Chloropidae occurred in large numbers on the moist meadows. The greatest *Chloropidae* abundance was recorded on the pastured meadow at Zbroszki (about 50 individuals per sample), slightly lower — on the repeatedly mown meadow at Chylice (about 45), whereas on the mown-grazed meadows similar, lower abundance values were recorded, namely about 11 in Białoleka and about 10 individuals per sample in Klembów.

On all the studied meadows the four dominating *Chloropidae* species included: *Oscinella hortensis*, *O. frit*, *O. pusilla* and *Incertella albipalpis*. The proportion of these species in *Chloropidae* communities was very high, as they accounted for about 70% of the community abundance at Klembów and Białoleka, over 95% at Chylice and about 90% at Zbroszki. The meadow communities at Klembów, Chylice and Zbroszki were marked for a downright dominance of two out of the following species: *Oscinella frit*, *O. hortensis*, *O. pusilla*, each of them accounting for about 40% of the community abundance. As regards the *Chloropidae* community at Białoleka each of the most abundantly occurring species, i.e. *Oscinella pusilla* and *O. hortensis* made up 25% of the community abundance. The dominating species were typical hemerophiles.

Apart from the species already mentioned, the following species occurred in smaller numbers on the meadows: *Cetema cereris*, *Thaumatomyia hallandica* and *Chlorops ringens*. The remaining species were scarce and only single individuals of other species were sampled.

Abundance rates among the *Chloropidae* three trophic groups (of phyto-, sapro- and zoophages) were much alike on all the studied meadows. Dominating was the group of phytophages (86% of the community abundance), which was also noted for the greatest number of species (26). This group was primarily made up of flies of the genus *Oscinella* Beck. Saprophages accounted for about 11% of the community abundance (19 species). Zoophages were scarce, constituting 2.3% of the community abundance (4 species). Phytophagous species usually prefer dry environments, while a majority of saprophages and zoophages rank among hygrophilous species.

Chloropidae communities of the moist meadows corresponded to the characteristics compiled by Frydlewicz-Ciesielska (1961) for the communities on seeded grasslands: a small number of species, great abundance of a few dominants.

and low abundance of scarce species. The aforelisted characteristics as well as the prevalence of hemerophilous species in the community attest to a strong degradation of the studied meadows as compared to natural grasslands. All the specified peculiarities could be most clearly seen while examining the pasture at Zbroszki. On the other hand, the floristically abundant, extensively exploited mown-grazed meadow at Białołęka was distinguished by the greatest number of *Chloropidae* species and their smaller abundance, as well as by a lower dominance rate of the prevailing species. As compared to the other sites, this meadow differed to the smallest extent from natural grasslands.

Seasonal fluctuations in the abundance of the dominating species of *Chloropidae* were observed and, consequently, of the entire communities. In hot seasons marked for long-lasting high air temperatures, 3–4 mass occurrences of *Chloropidae* were recorded, while in colder and rainy seasons — 2–3 peaks brought about by the appearances of successive generations of imagines.

Grass mowing was observed to have no effect on the timing of the appearance of the successive generations of *Chloropidae* imagines. On the repeatedly mown meadow as well as on the pasture, the seasonal fluctuations in the *Chloropidae* abundance were much alike. Frydlewicz-Ciesielska (1961) was also of the opinion that mowing did not affect the *Chloropidae* abundance directly after this agricultural procedure, but admitted that mowing might have a favourable effect on the development of these species whose larvae developed in young, sprouting grass blades and the terms of mowing concurred with the periods of development of new generations. These assumptions were corroborated by the observations by Doskočil and Hůrka (1962). While examining the entire entomofauna of a meadow of the alliance *Arrhenatherion elatioris*, the authors recorded two main abundance peaks falling on the turn of May and June and on the turn of July and August. According to these authors, the dynamics of the entire insect populations was related to vegetation dynamics. The first mowing took place already after the appearance of the spring generation, whereas the second mowing had even a smaller effect on the entomofauna abundance as at that time the meadow was swarmed with insects coming from adjacent, harvested crop fields and their appearance on the meadow might only affect an abundance increase.

The analysis of the species composition, abundance and structure relations in *Chloropidae* communities of the Mazovian moist meadows revealed that the studied grasslands were much anthropogenized. It could be easily noticed in particular on intensively cultivated and exploited areas, e.g. the mown meadow at Chylice and the pasture at Zbroszki, where the *Chloropidae* community abundance was four times greater than on other meadows.

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REFERENCES

- Antonova B. 1959. The role of wild cereals in the formation of the fauna of pests specialized on the crops of the cereals in the limans of the left bank of the Volga. Ent. Rev., 38: 734-737.
- Bañkowska R. 1989. Study area and methods of material collecting on moist meadows on the Mazovian Lowland. Memorabilia Zool., 43: 7-15.
- Boness M. 1953. Die Fauna der Wiesen unter besonderer Berücksichtigung der Mahd. Z. Morphol. Ökol. 42: 225-277.
- Doskočil J., Hůrka K. 1962. Entomofauna louky (svaz *Arrhenatherion elatioris*) a její vyvoj. Rozpr. Čsl. Akad. Ved. (Rada MPV), 72: 1-99.
- Frydlewicz-Ciesielska Z. 1961. Porównanie fauny *Diptera* na łąkach sztucznych i naturalnych w okolicy Kuwasów nad Biebrzą. Ekol. Pol., 9: 317-342.
- Jarkulov F. 1971. O biologii khishchnykh mukh *Thaumatomyia sulcifrons* i *Th. notata* (*Chloropidae*, *Diptera*). Zool. Zhurnal, 50: 1252-1254.
- Kotowska J., Okołowicz M. 1989. Geobotanic characteristic of meadow research sites on the Mazovian Lowland. Memorabilia Zool., 43: 17-30.
- Krasucki A. 1927. *Oscinis frit* L. (Ploniarka, Niezmiarka czarna, mucha szwedzka) w południowo-wschodniej Polsce w latach 1923-1925. Roczn. Nauk. Roln. Leśn., 17: 1959-223.
- Nartschuk E. P. 1956. Materialy k faune i ekologii zlakovykh mushek (*Diptera*, *Chloropidae*) okrestnostej g. Kurgana. Ent. Obozr., 35: 132-138.
- Nye J. 1959. The distribution of shoot-fly larvae (*Diptera*, *Acalypterae*) within pasture grasses and cereals in England. Bull. Ent. Res., 50: 53-62.
- Olechowicz E. 1977. Changes in the composition and numbers of *Diptera* under the influence of mineral fertilization of meadows. Ekol. Pol., 25: 467-490.
- Smirnov E. S. 1958. Obzor' podmoskovnej fauny *Chlorops* Mg. (*Diptera*, *Chloropidae*). Zool. Zhurn., 37: 1157-1174.
- Southwood T. 1961. Studies on the behaviour of *Oscinella frit* L. (*Diptera*) adults of the panicle generation. Ent. Exp. Appl., 4: 196-219.
- Southwood T., Emden H. v. 1967. A comparison of the fauna of cut and uncut grasslands. Z. Angew. Ent., 60: 188-198.
- Southwood T., Jepson W. 1962. The productivity of grasslands in England for *Oscinella frit* (L.) (*Chloropidae*) and other stem-boring *Diptera*. Bull. Ent. Res., 53: 395-407.
- Shtakel'berg A. A. 1958. Materialy po faune dvukrylykh Leningradskoj oblasti. 3. *Diptera Acalyptrata*. Tr. Zool. Inst. A. N. SSSR, 24: 103-191.
- Tschirnhaus M. 1981. Die Halm- und Minierfliegen im Grenzgebiet Land — Meer der Nordsee. Eine ökologische Studie mit Beschreibung von zwei neue Arten und neuen Fang- und Konservierungsmethoden. (*Diptera: Chloropidae* et *Agromysidae*). München, 405 pp.
- Vasina A. N. 1929. Obitan'e *Oscinella frit* L. na dikich zlakach. Zashch. Rast. Vred., 6.

NIEZMIARKOWATE (*CHLOROPIDAE*, *DIPTERA*) ŁĄK ŚWIEŻYCH
NIZINY MAZOWIECKIEJ

STRESZCZENIE

Na czterech łąkach świeżych ze związku *Arrhenatheretum medioeuropaeum* z Niziny Mazowieckiej stwierdzono 49 gatunków muchówek z rodziny *Chloropidae* (tabl. 2). Najwięcej gatunków występowało na łące kośno-pastwiskowej w Białolecie Dworskiej (38), najmniej — na pastwisku w Zbroszkach (22). Liczebności zgrupowań *Chloropidae* były wysokie (średnio 28,9 osobników

w próbie). Najwyższą liczebność stwierdzono na pastwisku (49,97) i na łące wielokośnej (44,67); niższa jest na łąkach kośno-pastwiskowych (10,25 i 10,94).

Na łąkach dominowały fitofagi: *Oscinella frit*, *O. hortensis*, *O. pusilla*, a także saprofag *Incertella albipalpis*. Spotkano też bardzo niewielkie ilości zoofagów z rodzaju *Thaumatomyia* Zenker (tabl. 1, rys. 1 i 2). Pozostałe gatunki występowały nielicznie.

Dominujące gatunki są charakterystyczne dla środowisk zantropogenizowanych. Gatunki te wykazują w ciągu sezonu wegetacyjnego, w zależności od warunków atmosferycznych, od 2 do 4 okresów wzmożonej liczebności, co związane jest z wylotem kolejnych pokoleń imagines (rys. 3). Nie stwierdzono wpływu koszenia na liczebność zgrupowań *Chloropidae*.

CHLOROPIDAE (DIPTERA) СВЕЖИХ ЛУГОВ МАЗОВЕЦКОЙ НИЗМЕННОСТИ

РЕЗЮМЕ

На свежих лугах (*Arrhenatheretum medioeuropaeum*) Мазовецкой низменности, используемых различным образом в хозяйственных целях, констатировано 49 видов мух из семейства *Chloropidae*. Из них евдоминантами являлись 3 вида фитофагов: *Oscinella frit*, *O. hortensis* и *O. pusilla*, а также сапрофаг *Incertella albipalpis*. Эти виды составили в сумме от 70% до 95% численности отдельных сообществ. Констатировано также сходство сообществ *Chloropidae* свежих лугов с точки зрения видового состава, структуры доминанции и трофической структуры. Наблюдаются также различия между отдельными сообществами в количестве видов и численности сообществ.