POLISH ACADEMY OF SCIENCES • INSTITUTE OF ZOOLOGY
MEMORABILIA ZOOLOGICA

MEMORABILIA ZOOL.	43	371–413	1989

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DIPTERA ACALYPTRATAE (EXCLUDING *CHLOROPIDAE*) OF MOIST MEADOWS ON THE MAZOVIAN LOWLAND

ABSTRACT

Material of 203 acalyptrate species swept on grazed and/or mown moist meadows and a wet non-harvested forest meadow was compared to that sampled on Warsaw city lawns. A closer relationship of the mesophilous meadow acalyptrate community with that found on urban grassy areas than that on the boggy meadow was noted. Fertilization of moist meadows with domestic ungulate droppings brought about an increase in abundance of these flies as well as the prevalence of saprophages, *Sphaeroceridae* in particular, active since early spring till late autumn. The first dominant of the whole taxocoene was phytosaprophagous *Leptocera nigra*, outnumbering even *Scaptomyza pallida*. Among coprophages, *Sepsis* spp. prevailed, mainly *S. flavimana* and *S. cynipsea*. Phytophages were dominated by *Agromyzidae* and the association of graminivores, especially by *Cerodontha denticornis*, outnumbering *Chromatomyia nigra* and *Opomyzidae* (*Opomyza germinationis*). Among the remaining plant feeders the dominants were species mining composite plants, especially *Phytomyza wahlgreni*. As regards the acalyptrate individual number on the moist meadows, wide-range zoogeographical elements dominated over the European one, which prevailed on the wet forest meadow.

INTRODUCTION

So far dipteran flies of Mazovian meadow habitats have not been subject to any separate faunistic investigation. In the vicinity of Warsaw, Olechowicz (1970, 1971, 1976, 1977) carried out several interesting ecological studies on the effect of mineral fertilization on the abundance of adult *Diptera* identified, however, at most to the family level, though divided into trophic communities. She noted an increase in the total *Diptera* abundance and a marked prevalence of *Chloropidae* in particular, as well as quantitative changes among other families in dominance structure on a fertilized meadow as compared to a control one.

In his paper on the faunation of Białołęka Dworska, a prospective housing estate of Warsaw, Nowakowski (1981) examined, among others, two meadow

habitats, where he recorded 138 acalyptrate species (including 38 of *Chloropidae*) and distinguished 5 dominant ones (2 of *Chloropidae*). He observed greater abundance of *Diptera*, phytophages in particular, on meadow than in the forest herb layer. Data coming from these studies have been included in the present paper. Furthermore, while analysing the effect of urban pressure on *Acalyptratae*, Nowakowski (1982) distinguished a community characteristic of Warsaw city lawns. He noted there a high prevalence of *Chloropidae* as well as other graminivores and listed 10 dominant species (5 of them being *Chloropidae*).

Data on some acalyptrate species, taken also on meadows of Mazovia, may be also found in an old faunistic list by Sznabl (1881), in some papers on crop pests (e.g. Ruszkowski 1935, 1950, Szwejda 1974, 1979) as well as in synopsis of Polish *Chamaemyiidae* (Tanasijtshuk 1970) and in the monograph of European *Cerodontha* (Nowakowski 1973).

A separate study on meadow *Diptera* was carried out outside the Mazovian region, in Podlasie (vicinity of Kuwasy, on the Biebrza river), by Frydlewicz-Ciesielska (1961), her material being partly identified to the species level. She noted a relatively small species number with the high average abundance resulting from a conspicuous dominance of some species in seasonally mown meadows, and by contrast a high number of species (some characteristic ones), but with a low and stable abundance on more natural meadows. Furthermore she noticed a favourable effect of mowing on those dipteran flies whose larvae infest young grass blades, especially on mass occurrence of *Oscinella frit* s.l.

As regards foreign literature, the following papers were available to me: a study on fauna of wet meadows in the FRG (Boness 1953), an account of entomofauna of a moist meadow in Czechoslovakia (Doskočil, Hůrka 1962) and on dipterofauna of a montane one in this country (Doskočil 1973), as well as thorough studies by Tschirnhaus (1981) on *Chloropidae* and *Agromyzidae* of seaside pastures in Schleswig-Holstein (FRG).

The present paper was based on the material swept on five meadow plots in Warsaw suburbs and vicinity in 1976–1977 and 1979–1983. The four plots, namely Klembów, Białołęka Dworska, Chylice and Zbroszki, ranked among mown and/or grazed moist meadows (of the association *Arrhenatheretum medioeuropaeum*), while the fifth one (Cyganka nature reserve near Truskaw in the Kampinos Forest) presented a transitory stage in succession from a more natural wet meadow (belonging to *Molinietalia*) to the moist one, and hence it served the purpose of the control site. Furthermore, the comparative material included also all the available acalyptrate collections made on the Mazovian Lowland (Nowakowski 1981), especially those swept on Warsaw city lawns (the alliance *Arrhenatherion* and *Cynosurion*, Nowakowski E. 1982).

The material sampled on Mazovian meadows consisted of 8,850 specimens, belonging to 203 species and 25 families, the mean number of specimens per species totalling over 43. On harvested moist meadows, 8, 233 specimens repre-

senting 186 species were sampled, i.e. over 44 specimens per species. The comparative material swept on Warsaw lawns included 10,123 specimens of 207 species and 27 families, i.e. almost 49 specimens per species.

As regards *Chloropidae* of the Mazovian meadows, only the material taken at Klembów, Białołęka and Cyganka, 1979, was identified by me, the remaining part by Mrs. Ewa Siedlar, M.A. In the present paper use was made solely of comparative general data on its abundance, based partly (samples from Chylice and Zbroszki) on her information.

My identifications were based mainly on the key edited by Stackelberg and Nartschuk (1969–1970). Moreover, use was made also of work edited by Lindner (1938, 1949), that of Séguy (1934) as well as of some lesser papers, especially those of Knutson and Lyneborg (1965), Griffiths (1963, 1974), Spencer (1976), Remm and Elberg (1979) and Roháček (1982a, 1983). Systematic classification, nomenclature and zoogeographical data were based principally on the catalogue edited by Soós and Papp (1984), with some minor alterations in the sequence of genera and subgenera. Bionomic, autecological and zoogeographical data were supplemented on the basis of several recent papers. Only those cited in the present paper were enlisted in bibliography.

SPECIES COMPOSITION

The material sampled on the Mazovian meadows proved to be of faunistic interest as it included 8 species unknown to me in this region so far (denoted with an asterisk*), 26 species which to the present date had not been recorded to occur there, and 57 species which had been listed only in my two earlier papers (Nowakowski 1981, 1982) but neither had been marked "new to Poland" or "new to the Mazovian Lowland".

New to Poland:

Sepsis duplicata Haliday, 1938 (= *pilipes* v.d. Wulp, 1971)* — almost exclusively a pasture species developing in relatively fresh cattle droppings (Hammer 1941, Minder 1963, Papp 1971), known from northern, central and southern Europe (Soós, Papp 1984) and from its eastern part (Stackelberg, Nartshuk 1970), recently also found in Japan (Iwasa 1980); though observed at the Isle of Uznam (Hennig 1949, in Lindner 1949), yet not recorded from Pomerania by Karl (1936, 1944), albeit his collection includes 4 identified specimens, 1 coming from the vicinity of Słupsk at that.

Cerodontha (*Xenophytomyza*) *atronitens* (Hendel 1920)* — probably a graminivorous species, common in central, northern and northeastern Europe (Nowakowski 1973), recently noted in Czechoslovakia (Vála, Roháček 1983), yet not recorded from Poland so far, barring the catalogue of Soós and Papp

(1984). Recently, I obtained from T. Zatwarnicki (Wrocław) 4 specimens taken in Lower Silesia.

Anthomyza dissors Collin, 1944 — rather a rare, hygrophilous species, occurring on coasts and peatbogs in England, Sweden, Finland, Estonia, Latvia and Moravia (Hackman 1980, Roháček 1982, Soós, Papp 1984). In the collection of the Institute of Zoology, Polish Academy of Sciences, 14 specimens from Estonian Livonia, identified as "*Leptomyza pallida*" (coll. F. Sintenis), and 1 specimen from a lawn at the Park Cemetery of Soviet Soldiers in Warsaw.

Geomyza hendeli Czerny, 1928 — rare, noted in England, on the Island of Rügen, in Baltic and Leningrad districts of the Soviet Union, taken on seaside sands and in a steppe reserve in central Bohemia (Martinek 1978) and in the Soviet Far East (Soós, Papp 1984). In the collection of the Institute of Zoollogy, Polish Academy of Sciences, one specimen sampled on a lawn in the park "Saxon Garden" in Warsaw.

Coproica hirticula Collin, 1956* — a semicosmopolitan coprophage, already recorded from many European countries (Soós, Papp 1984).

Limosina alloneura (Richards, 1952)* — a rare polysaprophage, found in mice's burrows, in the forest litter and on a corpse of a hare, in Austria, Czechoslovakia and Hungary (Roháček 1983, Soós, Papp 1984).

New to the Mazovian Lowland: *Neria ephippium*, *Chamaepsila gracilis*, *Heringina guttata**, *Tephritis cometa*, *Sepsis biflexuosa*, *Sciomyza dryomyzina**, *Agromyza albipennis*, *Amauromyza monfalconensis*, *Liriomyza infuscata**, *Phytomyza brischkei*, *Ph. notata*, *Ischiolepta pusilla*, *Copromyza sordida*, *Opacifrons coxata*, *Limosina bifrons*, *L. longisetosa*, *Meoneura lamellata*, *Axysta cesta**, *Limnellia quadrata*, *Lamproscatella sibilans*.

Already recorded from Białołęka, yet not specified as "new to Poland": *Amauromyza* (*Cephalomyza*) *chenopodivora*, *Liriomyza phryne*, *Metopomyza xanthaspis*, *Cerodontha* (*Dizygomyza*) *grisea*, *Paraphytomyza buhri*, *Phytomyza wahlgreni*, *Meoneura bicuspidata*.

Already recorded from Białołęka, yet not specified as "new to the Mazovian Lowland": *Chamaepsila* (as "*Psila*") *limbatella*, *Ch. nigra*, *Paroxyna loewiana*, *Sepsis fulgens*, *Pteromicra pectorosa*, *Homoneura interstincta*, *Lauxania cylindricornis*, *Melanagromyza pubescens*, *Ophiomyia nasuta*, *O. orbiculata*, *O. pinguis*, *Metopomyza flavonotata*, *M. scutellata*, *Cerodontha* (*Cerodontha*) *affinis*, *Pseudonapomyza atra*, *Napomyza albipennis*, *Chromatomyia nigra*, *Phytomyza rhabdophora*, *Anthomyza gracilis* (as "*sordidella* Zett."), *A. pallida* (as "*unguicella* Zett."), *Opomyza petrei*, *Geomyza combinata*, *G. tripunctata*, *Gymnohiromyia* (as "*Chyromya*") *flavella*, *Asteia concinna*, *Coproica* (as "*Leptocera*") *acutangula*, *C. ferruginata*, *Halidayina* (as "*Leptocera*") *spinipennis*, *Chaetopodella* (as "*Leptocera*") *scutellaris*, *Pteremis* (as "*Leptocera*") *fenestralis*, *Limosina* (as "*Leptocera*") *heteroneura*, *L. luteilabris*, *L. moesta*, *L. nana*, *L. pullula*, *L. rufilabris*, *L. vitripennis*, *Desmometopa sordida*, *Meoneura flavifacies*, *M. vagans*, *Philygria* (as "*Hydrina*") *nigricau-*

da, *Ph. maculipennis* (as "*Hydrina sexmaculata* Beck."), *Nostima picta*, *Hyadina nitida*, *Scatophila despecta*, *Diastata fuscula*, *Drosophila phalerata*.

Due to considerable differences in the number of samples and plots examined, it was rather impossible to estimate the density of species on the moist meadows as compared to the forest herb layer (Nowakowski 1981) and city lawns. It follows from Tabs 1 and 2 that acalyptrate fauna (excluding *Chloropidae*) of all meadows examined (Cyganka included) accounted for 25.99% and of the moist meadows only — for 23.82%, i.e. about a quarter of the Mazovian fauna of these flies. However, if, of the total Mazovian fauna (781 species), the unconfirmed literature records (53 species) and those found solely in the tree crowns (91) (thus in total 144 species) were not taken into consideration, then meadow fauna would account for 31.87% or respectively 29.20%, i.e. about a third of 637 Mazovian species.

While comparing the fauna composition of exploited moist meadows (i.e. excluding Cyganka) to total Mazovian fauna of *Acalyptratae* (excluding *Chloropidae*) (Tab. 2), a very small percentage of the forest element was observed. Exclusively or prevalently forest families were absent at all (*Megamerinidae*, *Periscelididae*, *Pallopteridae*, *Lonchaeidae*, *Odiniidae*, *Clusiidae*, *Acartophthalmidae*, *Aulacigastridae*) or represented there by rather small numbers of species (*Psilidae* — 20.00% of the total Mazovian species number, *Lauxaniidae* — 17.50%, *Heleomyzidae* — only 3.45%, *Milichiidae* — 15.38%, *Drosophilidae* — 24.00%). A low species percentage was noted in mainly aquatic and uliginose families too (*Otitidae* — 10.00%, *Sciomyzidae* — 20.45%, *Ephydridae* — 25.00%, *Diastatidae* — 33.33%), whereas little stenotopic families (*Tanypezidae*, *Pyrgotidae*, *Ulidiidae*, *Tethinidae*, *Braulidae*, *Curtonotidae*) were entirely absent. Rather sparsely also those families were represented which consisted mostly of restricted oligophages and monophages and, thus, depended on floristic richness of an area. First of all *Tephritidae* were rare (16.67%) as grazing and mowing deprived them of inflorescences of composite plants. *Agromyzidae*, though ever most rich in species, contributed there merely 18.84%, having been outnumbered by the dominant *Sphaeroceridae*. The species composition was highest in the case of copro- and polysaprophagous families not associated with forests, i.e. *Sepsidae* (73.68%) and *Sphaeroceridae* (55.93%), as well as prevailingly or exclusively

Table 1. Species composition, abundance, zoogeographical and trophic characteristics of *Acalyptratae* (excl. *Chloropidae*) on Mazovian moist meadows and a wet one.

Zoogeographical elements: C — (semi)cosmopolitan, H — Holarctic, P — Palaearctic, E — European; Trophic associations; Saprophages: Phs — Phytosaprophages, Mc — mycophages, Ps — polysaprophages, Cp — coprophages; phytophages: Gr — graminivores, As — *Asteraceae* feeders, Ph — other phytophages (excl. rhizophages), Rh — rhizophages; zoophages: Ml — malacophages, Cc — coccidophages, Aph — aphidophages, Ar — arachnophages

No.	Family Species	Zoogeographical element	Trophic association	Relative abundance (specimen number/sample number)													
				Plots						Months							
				Moist meadows					Wet meadow	Moist meadows							
				Klembów	Białołęka	Chylice	Zbroszki	Total	Cyganka	III	IV	V	VI	VII	VIII	IX	X
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Micropezidae			0.070	—	0.029	0.040	0.040	0.006	—	—	—	0.082	0.072	0.027	—	—
1	*Neria ephippium* (Fabr.)	P?	Phs?	0.045	—	0.023	0.023	0.027	0.006	—	—	—	0.035	0.058	0.027	—	—
2	*Micropeza corrigiolata* (L.)	P?	Phs?	0.025	—	0.006	0.017	0.013	—	—	—	—	0.047	0.014	—	—	—
	Psilidae			0.017	0.050	—	0.006	0.012	0.018	—	—	—	0.053	—	0.007	—	—
3	*Chamaepsila gracilis* (Meig.)	P	Rh	—	—	—	0.006	0.001	0.012	—	—	—	—	—	0.007	—	—
4	*Chamaepsila limbatella* (Zett.)	E	Rh?	0.004	0.030	—	—	0.005	0.006	—	—	—	0.024	—	—	—	—
5	*Chamaepsila nigra* (Fall.)	E	Rh?	0.012	0.010	—	—	0.005	—	—	—	—	0.024	—	—	—	—
6	*Chamaepsila rosae* (Fabr.)	C	Rh	—	0.010	—	—	0.001	—	—	—	—	0.006	—	—	—	—
	Platystomatidae			0.012	—	0.035	—	0.017	0.339	—	—	—	0.053	0.024	—	—	—

7	*Rivellia syngenesiae* (Fabr.)	E	Phs?	0.012	—	0.035	—	0.017	0.339	—	—	—	0.053	0.024	—	—	—
	Otitidae			—	0.010	—	—	0.001	0.310	—	—	—	0.006	—	—	—	—
8	*Herina frondescentiae* (L.)	E	Phs?	—	0.010	—	—	0.001	0.310	—	—	—	0.006	—	—	—	—
	Tephritidae			0.223	0.100	0.058	0.098	0.120	0.232	—	—	0.009	0.059	0.130	0.342	0.125	0.014
9	*Urophora quadrifasciata* (Meig.)	P	As	—	0.040	—	—	0.005	—	—	—	—	0.006	0.014	—	—	—
10	*Urophora solstitialis* (L.)	P	As	—	—	—	—	—	0.036	—	—	—	—	—	—	—	—
11	*Sitarea scorzonerae* R.-D.	P	As	0.062	0.030	0.010	—	0.025	0.190	—	—	—	0.012	0.082	0.014	—	—
12	*Orellia tussilaginis* (Fabr.)	P	As	—	0.010	—	—	0.001	—	—	—	—	—	0.005	—	—	—
13	*Paroxyna bidentis* (R.-D.)	P	As	—	—	0.010	—	0.004	—	—	—	—	—	—	—	0.038	—
14	*Paroxyna loewiana* Hend.	P	As	0.021	—	—	0.011	0.008	—	—	—	—	—	—	0.014	0.050	0.014
15	*Ensina sonchi* (L.)	C	As	0.136	0.020	0.019	0.080	0.067	0.006	—	—	—	0.006	0.024	0.315	0.038	—
16	*Heringina guttata* (Fall.)	P	As	—	—	0.019	—	0.007	—	—	—	—	0.029	0.005	—	—	—
17	*Tephritis cometa* (Loew)	P	As	0.004	—	—	0.006	0.002	—	—	—	0.009	0.006	—	—	—	—
	Dryomyzidae			—	0.010	—	—	0.001	—	—	—	—	—	—	—	—	0.014
18	*Dryomyza flaveola* (Fabr.)	E	Ps	—	0.010	—	—	0.001	—	—	—	—	—	—	—	—	0.014
	Sepsidae			0.798	0.210	0.561	5.333	1.593	0.964	0.375	0.167	0.518	2.318	2.788	1.760	0.188	0.056
19	*Saltella sphondylii* (Schrank)	H	Cp	—	—	—	0.057	0.012	—	—	—	0.027	0.041	—	—	—	—
20	*Themira annulipes* (Meig.)	H	Ps?	0.236	0.010	0.229	0.299	0.219	—	—	—	0.098	0.294	0.380	0.260	0.038	—
21	*Themira leachi* (Meig.)	P	Ps	0.012	—	—	—	0.004	—	—	—	—	—	0.005	0.007	0.013	—
22	*Themira lucida* (Staeger)	P?	Ps?	0.008	—	—	0.098	0.023	—	—	—	—	0.041	0.029	0.041	—	—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
23	*Themira nigricornis* (Meig.)	H	Ps	0.008	0.030	—	—	0.006	—	0.375	—	0.018	—	—	—	—	—
24	*Themira superba* (Hal.)	E	Ps?	0.004	—	—	0.006	0.002	—	—	—	—	0.006	—	0.007	—	—
25	*Nemopoda nitidula* (Fall.)	C	Ps	0.004	0.070	—	—	0.010	—	—	—	—	0.029	0.010	0.007	—	—
26	*Sepsis biflexuosa* Strobl	C	Cp	0.037	—	—	0.437	0.103	—	—	—	0.063	—	0.212	0.205	—	0.056
27	*Sepsis cynipsea* (L.)	P	Cp	0.157	0.010	0.035	1.575	0.392	0.226	—	—	0.054	0.576	0.639	0.548	0.088	—
28	*Sepsis duplicata* Hal.	P?	Cp	—	—	0.016	0.793	0.173	—	—	—	0.036	0.088	0.409	0.260	0.013	—
29	*Sepsis flavimana* Meig.	H	Cp	0.252	0.060	0.258	1.684	0.533	0.661	—	0.167	0.170	1.041	0.923	0.301	0.038	—
30	*Sepsis fulgens* Meig.	P	Cp	0.012	0.020	0.023	0.276	0.073	0.006	—	—	0.009	0.135	0.129	0.062	—	—
31	*Sepsis punctum* (Fabr.)	H	Cp	0.062	0.010	—	0.080	0.036	0.054	—	—	0.045	0.047	0.048	0.048	—	—
32	*Sepsis violacea* Meig.	P	Cp	0.004	—	—	0.029	0.007	0.018	—	—	—	0.018	0.005	0.014	—	—
	Sciomyzidae			0.066	0.030	0.013	0.006	0.029	0.607	—	—	0.018	0.047	0.058	0.014	—	—
33	*Pherbellia cinerella* (Fall.)	C	Ml	—	—	—	—	—	0.101	—	—	—	—	—	—	—	—
34	*Pherbellia griseola* (Fall.)	H	Ml	0.004	—	—	—	0.001	—	—	—	0.009	—	—	—	—	—
35	*Pherbellia nana* (Fall.)	H	Ml	0.004	—	0.003	—	0.002	—	—	—	—	—	0.005	0.007	—	—
36	*Pherbellia schoenherri* (Fall.)	P	Ml	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
37	*Sciomyza dryomyzina* Zett.	H	Ml	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
38	*Pteromicra glabricula* (Fall.)	P	Ml	0.004	—	—	—	0.001	—	—	—	—	0.006	—	—	—	—
39	*Pteromicra pectorosa* (Hend.)	H	Ml	—	0.010	—	—	0.001	—	—	—	—	0.006	—	—	—	—
40	*Tetanocera elata* (Fabr.)	P	Ml	0.004	—	—	—	0.001	0.054	—	—	—	—	0.005	—	—	—
41	*Tetanocera hyalipennis* v. Ros.	P	Ml	—	—	—	—	—	0.042	—	—	—	—	—	—	—	—
42	*Tetanocera silvatica* Meig.	H	Ml	0.004	—	—	—	0.001	0.054	—	—	0.009	—	—	—	—	—

43	*Pherbina coryleti* (Scop.)	P	Ml	—	—	0.003	—	0.001	—	—	—	—	—	0.005	—	—	—
44	*Knutsonia albiseta* (Scop.)	P	Ml	0.004	—	—	—	0.001	—	—	—	—	—	0.005	—	—	—
45	*Limnia unguicornis* (Scop.)	P	Ml	0.041	0.020	0.006	0.006	0.018	0.333	—	—	—	0.035	0.038	0.007	—	—
46	*Sepedon spinipes* (Scop.)	P	Ml	—	—	—	—	—	0.012	—	—	—	—	—	—	—	—
	Lauxaniidae			0.017	0.850	0.010	0.006	0.113	0.018	—	—	0.009	0.388	0.067	0.062	0.025	0.014
47	*Homoneura interstincta* (Fall.)	P?	Phs	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
48	*Minettia fasciata* (Fall.)	P?	Phs	—	0.010	—	—	0.001	—	—	—	—	—	0.005	—	—	—
49	*Minettia lupulina* (Fabr.)	H	Phs	—	0.210	—	—	0.025	—	—	—	—	0.100	0.019	—	—	—
50	*Minettia plumicornis* (Fall.)	E?	Phs	—	0.020	—	—	0.002	—	—	—	—	—	0.005	0.007	—	—
51	*Lyciella decipiens* (Loew)	P	Phs	—	0.050	—	—	0.006	—	—	—	—	0.018	0.010	—	—	—
52	*Calliopum aeneum* (Fall.)	E?	Phs	0.012	0.420	0.006	0.006	0.058	—	—	—	—	0.206	0.019	0.048	0.025	0.014
53	*Calliopum elisae* (Meig.)	H	Phs	—	0.040	—	—	0.005	—	—	—	0.009	—	0.005	0.007	—	—
54	*Lauxania cylindricornis* (Fabr.)	H	Phs	0.004	0.100	0.003	—	0.015	0.012	—	—	—	0.065	0.005	—	—	—
	Chamaemyiidae			0.029	0.300	0.058	0.63	0.080	0.018	—	0.033	0.098	0.165	0.106	0.021	0.013	—
55	*Chamaemyia flavipalpis* (Hal.)	E?	Cc	0.004	—	—	—	0.001	—	—	—	—	—	—	0.007	—	—
56	*Chamaemyia geniculata* (Zett.)	P	Cc	0.008	0.150	0.023	0.006	0.030	—	—	—	0.080	0.088	0.005	—	—	—
57	*Chamaemyia juncorum* (Fall.)	P	Cc	0.012	0.050	0.035	0.046	0.033	0.012	—	—	0.009	0.053	0.072	0.007	0.013	—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
58	*Chamaemyia polystigma* (Meig.)	P	Cc	—	0.100	—	0.011	0.015	0.006	—	—	0.009	0.024	0.029	0.007	—	—
59	*Leucopis* sp.	P?	Aph	0.004	—	—	—	0.001	—	—	0.033	—	—	—	—	—	—
	Piophilidae			0.004	—	0.006	—	0.004	—	—	—	—	—	0.010	0.007	—	—
60	*Parapiophila vulgaris* (Fall.)	H	Ps	0.004	—	0.006	—	0.004	—	—	—	—	—	0.010	0.007	—	—
	Agromyzidae			1.008	2.390	1.197	3.264	1.722	0.208	—	0.700	0.616	3.582	1.803	1.664	1.000	0.347
61	*Agromyza albipennis* Meig.	H	Gr	0.025	—	0.010	0.057	0.023	—	—	—	—	0.059	0.024	0.027	—	—
62	*Agromyza ambigua* Fall.	H	Gr	—	—	0.003	—	0.001	—	—	—	0.009	—	—	—	—	—
63	*Agromyza cinerascens* Macq.	P	Gr	0.037	—	0.035	—	0.024	—	—	0.167	0.125	—	0.005	—	—	—
64	*Agromyza mobilis* Meig.	P	Gr	0.004	—	—	—	0.001	—	—	—	—	0.006	—	—	—	—
65	*Agromyza nana* Meig.	C	Ph	—	—	—	0.006	0.001	—	—	—	—	0.006	—	—	—	—
66	*Agromyza nigrella* (Rond.)	P	Gr	—	—	—	0.011	0.002	—	—	—	—	0.012	—	—	—	—
67	*Agromyza nigripes* Meig.	H	Gr	0.004	0.090	0.003	—	0.013	0.018	—	—	—	0.012	0.043	—	—	—
68	*Agromyza pseudoreptans* Now.	H	Ph	—	0.010	—	—	0.001	—	—	—	—	—	—	—	—	0.014
69	*Melanagromyza pubescens* Hend.	P	Ph?	—	0.020	—	—	0.002	—	—	—	—	0.012	—	—	—	—
70	*Ophiomyia cunctata* (Hend.)	P	As	—	0.010	—	0.006	0.002	—	—	—	—	0.012	—	—	—	—
71	*Ophiomyia maura* (Meig.)	H	As	—	0.010	—	—	0.001	—	—	—	—	0.006	—	—	—	—
72	*Ophiomyia nasuta* (Mel.)	H	As	0.012	0.010	0.016	0.057	0.023	—	—	—	0.018	0.065	0.014	0.021	—	—
73	*Ophiomyia orbiculata* (Hend.)	E	As	—	0.010	—	—	0.001	—	—	—	—	0.006	—	—	—	—

74	*Ophiomyia pinguis* (Fall.)	P	As	—	0.070	0.003	—	0.010	—	—	—	—	0.035	0.005	0.007	—	—
75	*Ophiomyia pulicaria* (Meig.)	H	As	0.008	0.040	—	0.086	0.025	—	—	—	—	0.065	0.038	0.014	—	—
76	*Amauromyza* (*Cephalomyza*) *chenopodivora* Spenc.	E	Ph	—	0.010	—	0.006	0.002	—	—	—	—	0.012	—	—	—	—
77	*Amauromyza* (*Cephalomyza*) *monfalconensis* (Strobl)	E	Ph?	—	—	—	—	—	0.012	—	—	—	—	—	—	—	—
78	*Liriomyza congesta* (Beck.)	P	Ph	—	0.010	—	0.006	0.002	—	—	—	—	—	—	0.007	0.013	—
79	*Liriomyza flaveola* (Fall.)	P	Gr	0.012	—	0.006	0.029	0.012	—	—	—	0.018	0.012	0.014	0.014	0.013	—
80	*Liriomyza infuscata* Her.	E	Gr?	—	—	0.003	0.006	0.002	—	—	—	—	—	—	0.007	0.013	—
81	*Liriomyza phryne* Hend.	E	Gr	0.012	—	0.013	—	0.008	0.006	—	—	0.009	0.006	0.019	—	0.013	—
82	*Liriomyza ptarmicae* de Meij.	H	As	0.029	—	0.032	0.264	0.076	—	—	—	—	0.153	0.087	0.103	0.038	0.014
83	*Liriomyza strigata* (Meig.)	P	As	0.004	—	—	—	0.001	—	—	—	—	—	—	0.007	—	—
84	*Liriomyza* spp. (hieracii group)	P?	As?	0.021	0.030	—	—	0.010	—	—	—	—	0.006	0.019	0.021	—	—
85	*Metopomyza flavonotata* (Hal.)	E	Gr	0.004	—	—	—	0.001	—	—	—	—	0.006	—	—	—	—
86	*Metopomyza scutellata* (Fall.)	E	Ph	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
87	*Metopomyza xanthaspis* (Loew)	P	Ph	—	0.010	—	—	0.001	—	—	—	—	—	0.005	—	—	—
88	*Cerodontha* (*Icteromyza*) *capitata* (Zett.)	H	Ph	—	—	—	—	—	0.024	—	—	—	—	—	—	—	—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
89	*Cerodontha* (*Cerodontha*) *affinis* (Fall.)	E	Gr?	—	0.010	—	—	0.001	0.006	—	—	—	0.006	—	—	—	—
90	*Cerodontha* (*Cerodontha*) *denticornis* (Panz.)	C?	Gr	0.281	0.310	0.261	1.069	0.443	0.006	—	—	0.054	0.676	0.389	0.877	0.288	0.181
91	*Cerodontha* (*Cerodontha*) *fulvipes* (Meig.)	E	Gr	0.004	—	—	—	0.001	0.006	—	—	—	—	—	0.007	—	—
92	*Cerodontha* (*Xenophytomyza*) *atronitens* (Hend.)	E	Gr?	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
93	*Cerodontha* (*Poemyza*) *atra* (Meig.)	E	Gr	0.045	0.400	0.003	0.006	0.064	0.042	—	—	0.018	0.141	0.091	0.055	—	—
94	*Cerodontha* (*Poemyza*) *incisa* (Meig.)	H	Gr	0.012	—	0.003	—	0.005	—	—	—	—	—	0.010	0.014	—	—
95	*Cerodontha* (*Poemyza*) *lateralis* (Macq.)	P	Gr	—	0.020	0.006	0.092	0.024	—	—	—	—	0.041	0.034	0.041	—	—
96	*Cerodontha* (*Poemyza*) *muscina* (Meig.)	H	Gr	0.008	—	0.003	—	0.004	—	—	—	0.018	—	0.005	—	—	—
97	*Cerodontha* (*Poemyza*) *pygmaea* (Meig.)	H	Gr	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
98	*Cerodontha* (*Dizygomyza*) *bimaculata* (Meig.)	P	Ph	—	0.020	—	—	0.002	0.006	—	—	—	0.012	—	—	—	—
99	*Cerodontha* (*Dizygomyza*) *gallica* Now.	E	Ph	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
100	*Cerodontha* (*Dizygomyza*) *grisea* (Ryd.)	H	Gr?	0.004	—	0.006	—	0.004	—	—	—	0.009	—	0.010	—	—	—
101	*Cerodontha* (*Dizygomyza*) *luctuosa* (Meig.)	P	Ph	0.004	—	—	—	0.001	—	—	—	—	—	—	0.007	—	—

102	*Cerodontha (Dizygomyza) morosa* (Meig.)	E	Ph	—	0.040	—	—	0.005	0.024	—	—	—	0.006	0.014	—	—	—
103	*Cerodontha (Dizygomyza) suturalis* (Hend.)	P	Ph	—	0.020	—	—	0.002	—	—	—	—	0.006	—	0.007	—	—
104	*Paraphytomyza buhri* (de Meij.)	E	Ph	—	0.010	—	—	0.001	—	—	—	—	0.006	—	—	—	—
105	*Pseudonapomyza atra* (Meig.)	P	Gr	0.017	0.020	0.048	0.236	0.075	—	—	—	0.036	0.129	0.096	0.082	0.050	—
106	*Napomyza albipennis* (Fall.)	E	Ph	—	0.020	—	—	0.002	—	—	—	—	0.012	—	—	—	—
107	*Napomyza lateralis* (Fall.)	H	As	0.012	0.110	—	0.011	0.019	—	—	—	—	0.059	0.019	0.014	—	—
108	*Chromatomyia fuscula* (Zett.)	H	Gr	—	0.050	0.006	0.011	0.011	—	—	—	—	0.035	0.010	—	0.013	—
109	*Chromatomyia horticola* (Gour.)	C	As	0.017	0.210	0.003	0.046	0.041	—	—	0.067	0.009	0.106	0.053	0.007	0.013	—
110	*Chromatomyia milii* (Kalt.)	H	Gr	—	0.110	—	—	0.013	—	—	—	—	0.006	—	0.021	0.088	—
111	*Chromatomyia nigra* (Meig.)	H	Gr	0.252	0.200	0.229	0.736	0.339	0.006	—	0.433	0.107	0.776	0.481	0.096	0.113	—
112	*Phytomyza brischkei* Hend.	E	Ph	0.004	—	0.003	0.103	0.024	—	—	—	0.009	0.053	0.024	0.034	—	—
113	*Phytomyza crassiseta* Zett.	E	Ph	0.004	0.010	—	—	0.002	—	—	—	—	0.006	0.005	—	—	—
114	*Phytomyza fallaciosa* Bri.	E	Ph	0.004	—	—	0.006	0.002	—	—	—	—	0.006	—	0.007	—	—
115	*Phytomyza notata* Meig.	E	Ph	—	—	0.003	0.138	0.030	—	—	—	—	0.071	0.053	0.014	—	—
116	*Phytomyza plantaginis* Gour.	H	Ph	0.012	0.030	0.006	0.029	0.016	0.012	—	—	—	0.018	0.029	0.021	0.013	—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
117	*Phytomyza ranunculi* (Schrank)	H	Ph	0.025	0.160	0.010	—	0.030	—	—	0.033	0.018	0.035	0.043	0.034	0.025	—
118	*Phytomyza rhabdophora* Griff.	E	As	0.004	0.090	0.006	—	0.015	—	—	—	—	0.041	—	0.007	0.050	—
119	*Phytomyza rufipes* Meig.	H	Ph	—	—	—	0.011	0.002	—	—	—	—	0.006	—	0.007	—	—
120	*Phytomyza tetrasticha* Hend.	P	Ph	—	—	—	—	—	0.018	—	—	—	—	—	—	—	—
121	*Phytomyza wahlgreni* Ryd.	E	As	0.095	0.200	0.471	0.184	0.268	—	—	—	0.134	0.835	0.120	0.068	0.250	0.125
122	*Phytomyza* sp. (affinis group)	E	Ph	0.029	0.020	—	0.052	0.022	—	—	—	0.027	0.006	0.043	0.021	0.013	0.014
	Heleomyzidae			0.004	—	—	—	0.001	0.036	—	—	—	—	—	0.007	—	—
123	*Suillia bicolor* (Zett.)	P	Mc	—	—	—	—	—	0.012	—	—	—	—	—	—	—	—
124	*Suillia flava* (Meig.)	P	Mc	0.004	—	—	—	0.001	0.018	—	—	—	—	—	0.007	—	—
125	*Suillia inornata* (Loew)	P	Mc	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
	Trixoscelididae			—	0.020	—	0.011	0.005	—	—	—	0.009	0.012	0.005	—	—	—
126	*Trixoscelis canescens* (Loew)	E	Phs?	—	0.020	—	—	0.002	—	—	—	—	0.012	—	—	—	—
127	*Trixoscelis marginella* (Fall.)	P	Phs?	—	—	—	0.006	0.001	—	—	—	0.009	—	—	—	—	—
128	*Trixoscelis obscurella* (Fall.)	P	Phs?	—	—	—	0.006	0.001	—	—	—	—	—	0.005	—	—	—
	Anthomyzidae			0.479	0.080	0.061	0.270	0.230	0.185	—	—	0.071	0.106	0.024	1.068	0.038	—
129	*Anthomyza dissors* Coll.	E	Gr?	—	0.010	—	—	0.001	—	—	—	—	—	0.005	—	—	—
130	*Anthomyza gracilis* Fall. s.l.	E	Gr	0.479	0.070	0.058	0.264	0.226	0.185	—	—	0.071	0.100	0.014	1.068	0.038	—
131	*Anthomyza pallida* (Zett.)	E	Gr?	—	—	0.003	0.006	0.002	—	—	—	—	0.006	0.005	—	—	—
	Opomyzidae			0.372	0.770	0.197	0.563	0.395	0.292	—	0.867	0.054	0.341	0.399	0.760	0.475	0.056

132	*Opomyza florum* (Fabr.)	P	Gr	—	0.150	0.003	—	0.019	—	—	—	—	0.006	0.063	0.007	0.013	—
133	*Opomyza germinationis* (L.)	E	Gr	0.029	0.440	0.113	0.356	0.179	0.042	—	—	—	0.165	0.144	0.418	0.313	0.056
134	*Opomyza petrei* Mésnil	E	Gr	—	0.030	—	—	0.004	—	—	—	—	0.018	—	—	—	—
135	*Geomyza combinata* (L.)	E	Gr	0.124	0.130	0.003	0.017	0.057	0.161	—	—	—	0.059	0.024	0.185	0.063	—
136	*Geomyza hendeli* Czerny	P	Gr?	—	—	0.006	0.006	0.004	—	—	—	—	0.006	0.005	0.007	—	—
137	*Geomyza tripunctata* Fall.	P?	Gr	0.219	0.020	0.071	0.184	0.132	0.089	—	0.867	0.054	0.088	0.163	0.144	0.088	—
	Chyromyidae			0.004	—	—	—	0.001	—	—	—	—	—	0.005	—	—	—
138	*Gymnochiromyia flavella* (Zett.)	E	Ps?	0.004	—	—	—	0.001	—	—	—	—	—	0.005	—	—	—
	Asteiidae			—	—	0.013	—	0.005	—	—	—	—	—	0.019	—	—	—
139	*Asteia concinna* Meig.	P	Mc	—	—	0.013	—	0.005	—	—	—	—	—	0.019	—	—	—
	Sphaeroceridae			4.446	0.860	0.703	9.132	3.594	0.196	1.500	14.567	1.045	2.435	4.014	2.171	8.088	2.639
140	*Ischiolepta pusilla* (Fall.)	C	Cp	0.008	—	—	0.006	0.004	—	—	0.033	0.009	—	—	0.007	—	—
141	*Ischiolepta vaporariorum* (Hal.)	P	Cp	0.004	0.020	—	—	0.004	—	—	—	0.009	—	—	0.014	—	—
142	*Copromyza* (*Copromyza*) *equina* Fall.	C	Ps	0.033	0.020	—	0.011	0.015	—	—	—	0.009	0.012	—	—	0.013	0.111
143	*Copromyza* (*Lotophila*) *atra* (Meig.)	H	Cp	0.103	0.050	0.016	0.356	0.117	0.024	—	0.033	0.045	0.224	0.101	0.123	0.163	0.014
144	*Copromyza* (*Borborillus*) *costalis* Zett.	P	Cp	—	—	—	0.006	0.001	—	—	—	—	—	—	0.007	—	—
145	*Copromyza* (*Borborillus*) *sordida* Zett.	C	Cp	—	—	—	0.011	0.002	—	—	—	0.009	0.006	—	—	—	—
146	*Copromyza* (*Borborillus*) *vitripennis* (Meig.)	P	Ps	—	—	—	0.011	0.002	—	—	—	0.018	—	—	—	—	—
147	*Coproica acutangula* (Zett.)	C	Cp	0.021	—	0.026	0.092	0.035	—	—	0.033	0.009	0.029	0.072	0.021	0.013	0.042

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
148	*Coproica ferruginata* (Stenh.)	C	Cp	0.004	—	0.016	0.052	0.018	—	—	—	—	0.012	0.048	0.014	—	0.014
149	*Coproica hirticula* Coll.	C	Cp	—	—	—	0.040	0.008	—	—	—	—	—	0.019	0.021	—	—
150	*Coproica lugubris* (Hal.)	P	Cp	0.004	—	—	0.810	0.172	—	—	—	0.036	0.029	0.442	0.253	0.050	—
151	*Halidayina spinipennis* (Hal.)	H	Ps	—	0.010	0.029	0.023	0.017	—	—	—	0.009	—	0.058	—	0.013	—
152	*Chaetopodella scutellaris* (Hal.)	C	Cp	0.008	0.020	0.003	0.316	0.073	0.024	—	—	—	0.047	0.115	0.164	0.038	0.014
153	*Pteremis fenestralis* (Fall.)	E	Ps	0.004	0.010	0.003	0.006	0.005	0.006	—	—	—	0.012	0.010	—	—	—
154	*Opacifrons coxata* (Stenh.)	C	Phs	0.273	—	0.003	—	0.081	—	—	—	—	0.024	0.005	0.103	0.588	—
155	*Leptocera* (*Leptocera*) *fontinalis* (Fall.)	H	Phs	0.029	—	—	—	0.008	0.006	—	0.100	—	—	—	0.007	0.038	—
156	*Leptocera* (*Leptocera*) *nigra* Oliv.	C?	Phs	2.884	0.460	0.397	6.828	2.487	0.012	1.375	11.367	0.723	1.306	2.933	0.932	6.263	2.125
157	*Leptocera* (*Rachispoda*) *lutosa* (Stenh.)	H	Phs	0.004	—	0.003	—	0.002	—	—	—	—	—	0.005	—	—	0.014
158	*Limosina alloneura* (Rich.)	E	Ps	—	—	0.003	—	0.001	—	—	—	—	—	0.005	—	—	—
159	*Limosina bifrons* Stenh.	C	Ps	—	—	0.003	0.006	0.004	—	—	—	—	—	0.010	—	—	—
160	*Limosina clunipes* (Meig.)	C	Ps	0.116	0.190	0.010	0.092	0.080	—	—	0.133	0.027	0.106	0.034	0.123	0.175	0.028
161	*Limosina heteroneura* Hal.	C	Ps	—	0.020	0.003	0.011	0.006	—	—	—	—	0.006	0.014	—	0.013	—
162	*Limosina longisetosa* Dahl	P	Ps	0.004	—	—	—	0.001	0.012	—	—	—	—	—	—	0.013	—
163	*Limosina luteilabris* Rond.	C	Ps	—	—	0.003	0.006	0.002	0.012	—	—	—	—	0.005	0.007	—	—
164	*Limosina moesta* Vill.	E	Phs	0.083	—	—	0.006	0.025	—	—	—	—	0.012	0.005	0.110	0.025	—
165	*Limosina nana* Rond.	E	Phs	0.145	—	0.016	0.011	0.051	—	—	0.167	0.009	0.035	0.024	0.068	0.163	0.028
166	*Limosina ochripes* (Meig.)	H	Phs	0.492	0.050	0.142	0.391	0.286	0.089	0.125	2.233	0.054	0.535	0.096	0.110	0.263	0.194

167	*Limosina pullula* Zett.	E	Phs	0.025	0.010	—	—	0.008	—	—	—	—	—	—	0.027	0.038	—
168	*Limosina rufilabris* Stenh.	P	Phs	0.120	—	—	—	0.035	—	—	0.133	0.045	—	—	0.034	0.150	0.042
169	*Limosina vitripennis* Zett.	P	Phs	0.070	—	0.019	0.023	0.033	0.012	—	0.333	0.036	0.006	0.014	0.027	0.063	—
170	*Limosina* sp. (aff. *claviventris* Strobl)	E?	Ps?	0.008	—	0.003	0.017	0.007	—	—	—	—	0.035	—	—	—	—
171	*Limosina* sp. (aff. *racovitzai* Bezzi)	E?	Ps?	0.004	—	—	—	0.001	—	—	—	—	—	—	—	—	0.014
172	*Limosina* sp. (aff. *talparum* (Rich.)	E?	Ps?	—	—	0.003	—	0.001	—	—	—	—	—	—	—	0.013	—
	Milichiidae			0.004	0.020	—	0.006	0.005	—	—	—	0.009	0.006	0.005	0.007	—	—
173	*Madiza glabra* Fall.	C?	Ps	0.004	0.010	—	0.006	0.004	—	—	—	0.009	—	0.005	0.007	—	—
174	*Desmometopa sordida* (Fall.)	H	Ps	—	0.010	—	—	0.001	—	—	—	—	0.006	—	—	—	—
	Carnidae			—	0.040	0.068	0.230	0.079	—	—	—	0.125	0.071	0.115	0.062	0.063	0.014
175	*Meoneura bicuspidata* Coll.	E	Ps?	—	0.040	—	0.017	0.008	—	—	—	—	0.024	0.010	—	0.013	—
176	*Meoneura flavifacies* Coll.	H	Cp	—	—	0.065	0.195	0.065	—	—	—	0.116	0.047	0.101	0.048	0.050	0.014
177	*Meoneura lamellata* Coll.	E	Ps	—	—	—	0.011	0.002	—	—	—	—	—	—	0.014	—	—
178	*Meoneura vagans* (Fall.)	H	Ps	—	—	0.003	0.006	0.002	—	—	—	0.009	—	0.005	—	—	—
	Ephydridae			1.033	0.950	0.313	1.184	0.785	0.054	—	0.500	0.268	1.065	0.856	1.342	0.575	0.028
179	*Psilopa apicalis* (Perr.)	E	Phs	—	—	0.006	0.011	0.005	—	—	—	—	0.006	0.010	0.007	—	—
180	*Psilopa nitidula* (Fall.)	P	Phs	0.070	0.190	0.190	0.207	0.159	0.012	—	0.133	0.098	0.176	0.188	0.274	0.075	—
181	*Psilopa polita* (Macq.)	P	Phs	0.273	0.090	0.068	0.810	0.287	—	—	0.133	0.125	0.224	0.288	0.678	0.263	0.014
182	*Trimerina madizans* (Fall.)	H	Ar	0.021	0.010	0.003	—	0.008	0.018	—	—	—	—	0.010	0.034	—	—
183	*Notiphila cinerea* Fall.	P	Phs	—	—	0.003	—	0.001	—	—	—	—	—	0.005	—	—	—
184	*Philygria maculipennis* (R.-D.)	E	Phs	0.004	0.130	—	—	0.017	—	—	—	—	0.035	0.014	0.007	0.050	—
185	*Philygria nigricauda* (Stenh.)	E	Phs	—	0.010	—	0.040	0.010	—	—	—	—	0.006	0.019	—	0.038	—
186	*Nostima picta* (Fall.)	H	Phs	—	0.060	—	0.011	0.010	—	—	—	—	0.012	0.010	0.007	0.038	—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
187	*Hydrellia griseola* (Fall.)	C?	Gr	0.260	0.430	0.016	0.086	0.153	0.012	—	—	—	0.259	0.183	0.267	0.050	0.014
188	*Axysta cesta* (Hal.)	H	Phs	—	—	—	—	—	0.006	—	—	—	—	—	—	—	—
189	*Hyadina guttata* (Fall.)	P	Phs	0.037	0.010	—	—	0.012	0.006	—	0.133	0.018	—	0.005	0.014	0.013	—
190	*Hyadina nitida* (Macq.)	P	Phs	—	0.010	—	—	0.001	—	—	—	—	—	—	—	0.013	—
191	*Limnellia quadrata* (Fall.)	H	Phs	0.021	—	0.003	—	0.007	—	—	0.100	0.018	0.006	—	—	—	—
192	*Limnellia stenhammari* (Zett.)	H	Phs	0.008	—	—	—	0.002	—	—	—	—	0.006	—	0.007	—	—
193	*Scatophila despecta* (Hal.)	H	Phs	—	0.010	—	—	0.001	—	—	—	—	0.006	—	—	—	—
194	*Lamproscatella sibilans* (Hal.)	H	Phs	0.012	—	0.003	0.011	0.007	—	—	—	0.009	0.018	—	0.014	—	—
195	*Scatella stagnalis* (Fall.)	C?	Phs	0.326	—	0.019	0.006	0.104	—	—	—	—	0.312	0.120	0.034	0.038	—
	Camillidae			—	—	0.003	—	0.001	—	—	—	—	—	0.005	—	—	—
196	*Camilla glabra* (Fall.)	E	Ps?	—	—	0.003	—	0.001	—	—	—	—	—	0.005	—	—	—
	Diastatidae			—	0.010	—	—	0.001	0.006	—	—	—	0.006	—	—	—	—
197	*Diastata fuscula* (Fall.)	P	Phs	—	0.010	—	—	0.001	0.006	—	—	—	0.006	—	—	—	—
	Drosophilidae			1.649	1.800	0.239	1.632	1.134	0.185	—	0.567	0.295	0.982	0.971	3.116	0.588	0.222
198	*Drosophila* (*Drosophila*) *phalerata* Meig.	P	Mc	—	—	—	0.006	0.001	—	—	—	—	—	—	0.007	—	—
199	*Drosophila* (*Lordiphosa*) *fenestrarum* Fall.	C	Phs	0.012	0.030	—	—	0.007	0.012	—	—	—	—	—	0.027	—	0.028
200	*Drosophila* (*Sophophora*) *melanogaster* Meig.	C	Phs	—	—	0.006	0.011	0.005	—	—	—	—	0.012	0.005	—	0.013	—
201	*Scaptomyza* (*Parascaptomyza*) *pallida* (Zett.)	C	Phs	1.438	1.670	0.187	1.540	1.018	0.167	—	0.400	0.152	0.888	0.870	3.007	0.438	0.083
202	*Scaptomyza* (*Scaptomyza*) *flava* (Fall.)	H	Ph	—	0.010	—	—	0.001	—	—	—	—	—	—	0.007	—	—
203	*Scaptomyza* (*Scaptomyza*) *graminum* (Fall.)	H	Ph	0.198	0.090	0.045	0.075	0.102	0.006	—	0.167	0.143	0.082	0.096	0.068	0.138	0.111

The fauna of Warsaw city lawns resembled that of moist meadows. It differed mainly by a larger admixture of the forest element (*Periscelididae*, *Pallopteridae*, *Lonchaeidae*, *Lauxaniidae* and *Heleomyzidae*) derived from the adjacent tree plots or even sub-canopy sampling on the lawns, and by a larger percentage of rather necrophagous *Piophilidae* (57.14%) at the expense of coprophagous *Sepsidae* (57.89%), due to greater amounts of garbage and the lack of manure in the city.

While comparing the species composition of the material taken on the particular meadow plots (Tabs 1, 2), it has been particularly noted that exploited moist meadows differed markedly from the forest non-harvested boggy meadow at Cyganka. A smaller number of species found in this more natural biotope may have been only apparent due to less frequent sampling as well as to a lower relative abundance and, thus, density of individuals (Tab. 3). However, an equal number of sapro- and phytophagous species, an increase in the percentage of the zoophagous ones, the occurrence of 17 exclusive species absent on moist meadows, which accounted for 25.73% of the Cyganka fauna, as well as its totally different dominance structure (Tabs 2, 4, 5), attested to a distinct character of acalyptrate community on the wet forest meadow, resembling more those on fens. As regards the moist meadows, the largest numbers of species were sampled at Klembów and Białołęka, i.e. on plots bordering on tree stands (ecotone effect) and noted for either higher air humidity (Klembów adjoining an oak-hornbeam forest reserve), or a greater richness of the flora (Białołęka). The effect of grazing was most pronounced in the fauna composition on the plots at Klembów and Zbroszki and manifested itself in a higher percentage of coprophilous *Sepsidae* and *Sphaeroceridae*, while the non-pastured but profusely minerally fertilized meadow at Chylice presented a considrable decrease in the species number, although sampling was most intensive there. The number of copro- and polysaprophages at Chylice would have been even smaller, were it not for a neighbourhood of vast pastures, stables and pens as well as dung heaps, from where *Sphaeroceridae* might have been easily drifted by the wind (Papp 1976).

Having estimated the number of species common to the particular plots, I calculated their similarity coefficients (Tab. 6). Surprisingly enough, the greatest value of Sörensen index was calculated for Chylice and Zbroszki. It may be explained partly by the absence of any nearby forest and the previously mentioned influence of the pasture surrounding the Chylice meadow, and partly by a similar effect of frequent mowing and intensive grazing. It is even more difficult to explain the similarity between Chylice and Klembów. On the other hand, low similarity between Chylice and Białołęka and between all moist meadow plots, first of all those in quite open areas, and Cyganka was to be expected. It is also clear that all the moist meadow types were more similar to city lawns than to the fairly natural wet forest meadow and that the latter proved to be most different from the rather arid urban grassy areas.

Table 2. Dominance indices (left) and species numbers (right) in families and trophic communities and associations of *Acalyptratae* (excl. *Chloropidae*) on Mazovian moist meadows as compared to those on a wet one, Warsaw city lawns (swept material) and Mazovia (in general)

Family	Moist meadows					Wet meadow	City lawns	Mazovia
	Klembów	Białołęka	Chylice	Zbroszki	Total	Cyganka	Warsaw	Whole material and literature data
Micropezidae	0.69 2	—	0.81 2	0.18 2	0.40 2	0.16 1	0.26 1	5
Megamerinidae	—	—	—	—	—	—	—	1
Tanypezidae	—	—	—	—	—	—	—	1
Psilidae	0.16 2	0.59 3	—	0.03 1	0.12 4	0.49 2	0.06 1	20
Pyrgotidae	—	—	—	—	—	—	—	1
Platystomatidae	0.12 1	—	1.00 1	—	0.17 1	9.24 1	0.20 1	2
Otitidae	—	0.12 1	—	—	0.01 1	8.43 1	—	10
Ulidiidae	—	—	—	—	—	—	—	1
Tephritidae	2.18 4	1.18 4	1.63 4	0.45 3	1.20 8	6.32 3	0.13 3	48
Dryomyzidae	—	0.12 1	—	—	0.01 1	—	0.01 1	2
Sepsidae	7.79 12	2.47 7	15.75 5	24.41 11	15.98 14	26.26 5	5.12 11	19
Sciomyzidae	0.65 7	0.35 2	0.36 3	0.03 1	0.29 9	16.53 8	2.12 11	44
Lauxaniidae	0.16 2	9.99 7	0.27 2	0.03 1	1.13 7	0.49 2	2.78 13	40
Chamaemyiidae	0.28 4	3.53 3	1.63 2	0.29 3	0.80 5	0.49 2	3.10 4	9
Periscelididae	—	—	—	—	—	—	0.01 1	1
Piophilidae	0.04 1	—	0.18 1	—	0.04 1	—	0.96 4	7
Pallopteridae	—	—	—	—	—	—	0.02 2	11
Lonchaeidae	—	—	—	—	—	—	0.02 1	29
Odiniidae	—	—	—	—	—	—	—	3
Agromyzidae	9.85 31	28.12 34	33.57 26	14.94 26	17.27 55	5.67 17	25.67 66	292
Clusiidae	—	—	—	—	—	—	—	2
Acartophthalmidae	—	—	—	—	—	—	—	1
Heleomyzidae	0.04 1	—	—	—	0.01 1	0.97 3	0.06 3	29
Trixoscelididae	—	0.24 1	—	0.05 2	0.05 3	—	1.22 3	4
Anthomyzidae	4.68 1	0.94 2	1.72 2	1.24 2	2.31 3	5.02 1	0.51 4	6

Opomyzidae		3.63	3	9.06	5	5.52	5	2.58	4	3.96	6	7.94	3	17.48	5	9
Chyromyidae		0.04	1	—		—		—		0.01	1	—		0.01	1	4
Aulacigastridae		—		—		—		—		—		—		—		1
Asteiidae		—		—		0.36	1	—		0.05	1	—		0.01	1	4
Sphaeroceridae		43.44	23	10.12	11	19.73	19	41.80	23	36.06	33	5.35	9	10.21	30	59
Tethinidae		—		—		—		—		—		—		0.04	1	1
Milichiidae		0.04	1	0.24	2	—		0.03	1	0.05	2	—		0.05	4	13
Carnidae		—		0.47	1	1.90	2	1.05	4	0.79	4	—		0.41	4	7
Ephydridae		10.09	10	11.18	10	8.78	9	5.42	8	7.87	16	1.46	5	10.51	22	64
Braulidae		—		—		—		—		—		—		—		1
Camillidae		—		—		0.09	1	—		0.01	1	—		—		1
Diastatidae		—		0.12	1	—		—		0.01	1	0.16	1	0.10	2	3
Drosophilidae		16.11	3	21.18	4	6.70	3	7.47	4	11.38	6	5.02	3	18.95	7	25
Curtonotidae		—		—		—		—		—		—		—		1
Association																
Saprophages	Phytosaprophages	62.78	25	42.59	23	32.04	20	45.62	19	48.65	42	27.23	15			
	Mycophages	0.04	1	—		0.36	1	0.03	1	0.07	3	0.97	3			
	Polysaprophages	4.44	15	5.06	12	8.51	13	2.87	16	4.32	28	0.81	3			
	Coprophages	6.62	13	2.24	7	12.85	9	31.20	18	18.35	19	27.55	7			
	Total	73.88	54	49.88	42	53.76	43	79.72	54	71.40	92	56.56	28	42.10	107	327
Phytophages	Graminivores	17.92	20	29.29	17	25.70	24	14.52	17	18.57	32	16.05	14			
	Asteraceae feeders	4.16	13	10.47	15	16.56	10	3.45	10	6.15	21	6.32	3			
	Other phytophages (excl. rhizophages)	2.75	8	5.76	16	1.90	5	1.97	10	2.59	22	3.08	9			
	Rhizophages	0.16	2	0.59	3	—		0.03	1	0.12	4	0.49	2			
	Total	24.99	43	46.12	51	44.16	39	19.97	38	27.43	79	25.93	28	52.66	84	393
Zoophages	Malacophages	0.65	7	0.35	2	0.36	3	0.03	1	0.29	9	16.53	8			
	Coccido- and aphido-phages	0.28	4	3.53	3	1.63	2	0.29	3	0.80	5	0.49	2			
	Arachnophages	0.20	1	0.12	1	0.09	1	—		0.09	1	0.49	1			
	Total	1.13	12	4.00	6	2.08	6	0.32	4	1.18	15	17.50	11	5.24	16	61
Total species number			109		99		88		96		186		67		207	781

Table 3. Relative abundance of *Acalyptratae* and their trophic communities on Mazovian moist meadows as compared to that on a wet one and on Warsaw city lawns (swept material)

			Plots							Months							
			Moist meadows					Wet meadow	City lawns	Moist meadows							
			Klembów	Białołęka	Chylice	Zbroszki	Total	Cyganka	Warszawa	III	IV	V	VI	VII	VIII	IX	X
excl. *Chloropidae*	Number of samples		242	100	310	174	826	168	1,144	8	30	112	170	208	146	80	72
	Number of specimens	Saprophages	1,830	424	594	3,030	5,878	349	4,262	15	469	239	1,204	1,803	1,195	747	206
		Phytophages	619	392	488	759	2,258	160	5,331	—	52	100	762	548	611	146	39
		Zoophages	28	34	23	12	97	108	530	—	1	13	36	36	10	1	—
		Total	2,477	850	1,105	3,801	8,233	617	10,123	15	522	352	2,002	2,387	1,816	894	245
	Relative abundance	Saprophages	7.562	4.240	1.916	17.414	7.116	2.077	3.726	1.875	15.633	2.134	7.082	8.668	8.185	9.338	2.861
		Phytophages	2.558	3.920	1.574	4.362	2.734	0.952	4.660	—	1.733	0.893	4.482	2.635	4.185	1.825	0.542
		Zoophages	0.116	0.340	0.074	0.069	0.117	0.643	0.463	—	0.033	0.116	0.212	0.173	0.068	0.013	—
		Total	10.236	8.500	3.565	21.845	9.967	3.673	8.849	1.875	17.400	3.143	11.775	11.476	12.438	11.175	3.403
incl. *Chloropidae*	Number of samples		242	100	310	174	826	88	1,144								
	Number of specimens	Saprophages	2,018	574	2,475	3,806	8,873	197	5,212								
		Phytophages	2,807	1,297	12,308	8,571	24,983	169	29,552								
		Zoophages	50	73	172	409	704	86	632								
		Total	4,875	1.944	14.955	12.786	34.560	452	35.396								
	Relative abundance	Saprophages	8.339	5.740	7.984	21.874	10.742	2.239	4.556								
		Phytophages	11.599	12.970	39.703	49.259	30.246	1.920	25.832								
		Zoophages	0.207	0.730	0.555	2.351	0.852	0.977	0.552								
		Total	20.145	19.440	48.242	73.483	41.840	5.136	30.941								

ABUNDANCE

The relative abundance of the swept material was subject not only to local and seasonal alternations but it also varied within a wide range of values depending on weather conditions and due to cluster distribution of many species, further augmented by an irregular distribution of animal droppings on the pastures. Hence only the data from relatively large series of samples could be compared (Tab. 3). The average abundance of *Acalyptratae* (excluding *Chloropidae*) was greater on the moist meadows than in the forest herb layer (e.g. in four Mazovian natural habitats it amounted to 7.17), furthermore, it was even somewhat higher than that on city lawns. The latter condition may have resulted from the pollution of city soil and fertilization of the lawns with sterilized peat, garbage and excrements of domestic carnivores and urban birds, being less profuse and attractive than those of ungulates. On the other hand, a low *Diptera* abundance on the partly waterlogged forest meadow at Cyganka nature reserve seemed to corroborate the assumption of a lesser productivity of non-harvested meadows as compared to those under economical use, and of boggy meadows as compared to moist ones.

The abundance of *Acalyptratae* (excluding *Chloropidae*) on the moist meadows varied considerably. It reached the greatest value at Zbroszki and the lowest at Chylice, what seemed to indicate that the density of most of these flies is positively affected by the natural fertilization and negatively by the mineral one. Notwithstanding frequent grazing, the meadow at Zbroszki grew quite lush each spring, and due to that phytophages appeared in large numbers, though saprophages were dominant. If *Chloropidae* were taken into account, then the abundance of phytophages would be twice as large as that of scavengers there. On the other hand, mineral eutrophization of the Chylice meadow benefited only certain groups of species of grass feeders, especially *Chloropidae*, and *Oscinella frit* s.l. in particular. For this reason, if this family were to be taken into account, the *Acalyptratae* abundance at Chylice would hardly decrease, on the contrary — it would show above average values, coming next after that at Zbroszki, plant feeders having been there five times more numerous than scavengers. The mass occurrence of *Chloropidae* at Chylice may have been caused not only by mineral fertilization, but also by frequent mowing of that meadow.

As sampling was done usually once a week during almost the entire vegetation season, it was possible to grasp the seasonal abundance dynamics (Tab. 3). The curve illustrating the general *Acalyptratae* abundance as well as those of sapro- and phytophages on the moist meadows were three-apical, exhibiting three successive peaks in April, June and August or September, deep depressions in March, May and October, while shallow ones in July and September or August. The highest peak of saprophage abundance apparently occurred in April (samples were taken only at Klembów then), most probably due to random

Table 4. Dominance indices of families and species dominant in trophic communities of *Acalyptratae* (excl. *Chloropidae*) on Mazovian moist meadows as compared to those on a wet one and Warsaw city lawns (swept material)

	Plots							Months							
	Moist meadows					Wet meadow	City lawns	Moist meadows							
	Klembów	Białołęka	Chylice	Zbroszki	Total	Cyganka	Warsaw	III	IV	V	VI	VII	VIII	IX	X
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Saprophages															
Sphaeroceridae	58.80	20.28	36.70	52.44	50.51	9.46	24.26	80.00	93.18	48.95	34.39	46.31	26.53	86.61	92.23
Leptocera nigra	38.14	10.85	20.71	39.21	34.96	—	15.04	73.33	72.71	33.89	18.44	33.83	11.38	67.07	74.27
Sepsidae	10.55	4.95	29.29	30.63	22.39	46.42	12.15	20.00	—	24.27	32.72	32.17	21.51	2.01	—
Drosophilidae	19.18	40.09	10.10	8.94	14.49	8.60	37.17	—	2.56	7.11	12.71	10.09	37.15	4.82	3.88
Scaptomyza pallida	19.02	39.39	9.76	8.84	14.31	8.02	35.85	—	2.56	7.11	12.54	10.04	36.74	4.69	2.91
Ephydridae	9.95	12.03	15.32	6.30	8.76	—	11.85	—	3.20	12.55	11.38	7.65	12.72	5.62	—
Sepsis flavimana	3.33	—	13.47	9.67	7.49	31.81	2.16	—	—	7.95	14.70	10.65	3.68	—	—
Sepsis cynipsea	2.08	—	—	9.04	5.51	10.89	—	—	—	2.51	8.14	7.38	6.69	—	—
Psilopa polita	3.61	2.12	3.54	4.65	4.03	—	6.34	—	—	5.86	3.16	3.33	8.28	2.81	—
Limosina ochripes	6.50	—	7.41	2.24	4.01	4.30	2.51	6.67	14.29	2.51	7.56	—	—	2.81	6.80
Themira annulipes	3.11	—	11.95	—	3.08	—	—	—	—	4.60	4.15	4.38	3.18	—	—
Sepsis duplicata	—	—	—	4.55	2.43	—	—	—	—	—	—	4.71	3.18	—	—
Coproica lugubris	—	—	—	4.65	2.42	—	—	—	—	—	—	5.10	3.10	—	—
Psilopa nitidula	—	4.48	9.93	—	2.23	—	—	—	—	4.60	2.49	2.16	3.35	—	—
Copromyza atra	—	—	—	2.05	—	—	—	—	—	2.09	3.16	—	—	—	—
Lauxaniidae	—	20.05	—	—	—	—	6.59	—	—	—	5.48	—	—	—	—
Scatella stagnalis	4.32	—	—	—	—	—	—	—	—	—	4.40	—	—	—	—
Sepsis biflexuosa	—	—	—	2.51	—	—	—	—	—	2.93	—	2.46	2.51	—	—
Opacifrons coxata	3.61	—	—	—	—	—	—	—	—	—	—	—	—	6.29	—
Carnidae	—	—	3.54	—	—	—	—	—	—	5.86	—	—	—	—	—

Limosina clunipes	—	4.48	—	—	—	—	—	—	—	—	—	—	—	—	—
Chaetopodella scutellaris	—	—	—	—	—	—	—	—	—	—	—	—	2.01	—	—
Meoneura flavifacies	—	—	3.37	—	—	—	—	—	—	5.44	—	—	—	—	—
Calliopum aeneum	—	9.91	—	—	—	—	5.19	—	—	—	2.91	—	—	—	—
Sepsis punctum	—	—	—	—	—	2.58	—	—	—	2.09	—	—	—	—	—
Limosina rufilabris	—	—	—	—	—	—	—	—	—	2.09	—	—	—	—	—
Limosina vitripennis	—	—	—	—	—	—	—	—	2.13	—	—	—	—	—	—
Minettia lupulina	—	4.95	—	—	—	—	—	—	—	—	—	—	—	—	—
Philygria maculipennis	—	3.07	—	—	—	—	—	—	—	—	—	—	—	—	—
Rivellia syngenesiae	—	—	—	—	—	16.33	—	—	—	—	—	—	—	—	—
Lauxania cylindricornis	—	2.36	—	—	—	—	—	—	—	—	—	—	—	—	—
Copromyza equina	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.88
Nemopoda nitidula	—	—	—	—	—	—	3.71	—	—	—	—	—	—	—	—
Trixoscelididae	—	—	—	—	—	—	2.89	—	—	—	—	—	—	—	—
Themira nigricornis	—	—	—	—	—	—	—	20.00	—	—	—	—	—	—	—
Piophilidae	—	—	—	—	—	—	2.28	—	—	—	—	—	—	—	—
Trixoscelis canescens	—	—	—	—	—	—	2.16	—	—	—	—	—	—	—	—
Herina frondescentiae	—	—	—	—	—	14.90	—	—	—	—	—	—	—	—	—
Phytophages															
Agromyzidae	39.42	60.97	76.02	74.84	62.98	21.88	48.75	—	40.38	69.00	79.92	68.43	39.77	54.79	64.10
Cerodontha denticornis	10.99	7.91	16.60	24.51	16.21	—	23.04	—	—	6.00	15.09	14.78	20.95	15.75	33.33
Opomyzidae	14.54	19.64	12.50	12.91	14.44	30.63	33.18	—	50.00	6.00	7.61	15.15	18.17	26.02	10.26
Chromatomyia nigra	9.85	5.10	14.55	16.86	12.40	—	—	—	25.00	12.00	17.32	18.25	2.29	6.16	—
Phytomyza wahlgreni	3.72	5.10	29.92	4.22	9.79	—	5.55	—	—	15.00	18.64	4.56	—	13.70	23.08
Anthomyzidae	18.74	2.04	3.89	6.19	8.41	19.38	—	—	—	8.00	2.36	—	25.53	2.05	—
Anthomyza gracilis s. l.	18.74	—	3.69	6.06	8.28	19.38	—	—	—	8.00	2.23	—	25.53	2.05	—
Opomyza germinationis	—	11.22	7.17	8.17	6.55	4.38	29.54	—	—	—	3.67	5.47	9.98	17.12	10.26
Ephydridae (*Hydrellia*)	10.18	10.97	—	—	5.58	—	10.47	—	—	—	5.77	6.93	6.38	2.74	2.56
Hydrellia griseola	10.18	10.97	—	—	5.58	—	10.43	—	—	—	5.77	6.93	6.38	2.74	2.56
Geomyza tripunctata	8.56	—	4.51	4.22	4.83	9.38	2.49	—	50.00	6.00	—	6.20	3.44	4.79	—
Tephritidae	8.72	2.55	3.69	2.24	4.38	24.38	—	—	—	—	—	4.93	8.18	6.85	2.56
Drosophilidae (Scaptomyza p.p.)	7.75	2.55	2.87	—	3.76	—	6.27	—	9.62	16.00	—	3.65	—	7.53	20.51

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Scaptomyza graminum	7.75	2.30	2.87	—	3.72	—	6.15	—	9.62	16.00	—	3.65	—	7.53	20.91
Liriomyza ptarmicae	—	—	2.05	6.06	2.79	—	—	—	—	—	3.41	3.28	2.45	2.05	2.56
Pseudonapomyza atra	—	—	3.07	5.40	2.75	—	2.81	—	—	4.00	2.89	3.65	—	2.74	—
Ensina sonchi	5.33	—	—	—	2.14	—	—	—	—	—	—	—	7.53	2.05	—
Cerodontha (Poemyza) atra	—	10.20	—	—	2.35	4.38	—	—	—	—	3.15	3.47	—	—	—
Geomyza combinata	4.85	3.32	—	—	2.08	16.88	—	—	—	—	—	—	4.42	3.42	—
Chromatomyia horticola	—	5.36	—	—	—	—	—	—	3.85	—	2.36	2.01	—	—	—
Phytomyza notata	—	—	—	3.16	—	—	—	—	—	—	—	2.01	—	—	—
Phytomyza ranunculi	—	4.08	—	—	—	—	—	—	—	—	—	—	—	—	—
Sitarea scorzonerae	2.42	—	—	—	—	20.00	—	—	—	—	—	3.10	—	—	—
Agromyza cinerascens	—	—	2.25	—	—	—	—	—	9.62	14.00	—	—	—	—	—
Cerodontha (Poemyza) lateralis	—	—	—	2.10	—	—	—	—	—	—	—	—	—	—	—
Phytomyza brischkei	—	—	—	2.37	—	—	—	—	—	—	—	—	—	—	—
Napomyza lateralis	—	2.81	—	—	—	—	—	—	—	—	—	—	—	—	—
Opomyza florum	—	3.83	—	—	—	—	—	—	—	—	—	2.37	—	—	—
Phytomyza rhabdophora	—	2.30	—	—	—	—	—	—	—	—	—	—	—	2.74	—
Agromyza nigripes	—	2.30	—	—	—	—	—	—	—	—	—	—	—	—	—
Chromatomyia milii	—	2.81	—	—	—	—	—	—	—	—	—	—	—	4.79	—
Paroxyna loewiana	—	—	—	—	—	—	—	—	—	—	—	—	—	2.74	2.56
Paroxyna bidentis	—	—	—	—	—	—	—	—	—	—	—	—	—	2.05	—
Agromyza pseudoreptans	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.56
Phytomyza sp. (*affinis* group)	—	—	—	—	—	—	—	—	—	3.00	—	—	—	—	2.56
Cerodontha (Dizygomyza) morosa	—	—	—	—	—	2.50	—	—	—	—	—	—	—	—	—
Urophora solstitialis	—	—	—	—	—	3.75	—	—	—	—	—	—	—	—	—
Cerodontha (Icteromyza) capitata	—	—	—	—	—	2.50	—	—	—	—	—	—	—	—	—
Zoophages															
Chamaemyiidae	25.00	88.24	78.26	91.67	68.04	2.78	59.25	—	100.00	84.62	77.78	61.11	30.00	100.00	—
Chamaemyia juncorum	10.71	14.71	47.83	66.67	27.84	—	45.47	—	—	7.69	25.00	41.67	10.00	100.00	—

Chamaemyia geniculata	7.14	44.12	30.43	8.33	25.77	—	3.77	—	—	69.23	41.67	2.78	—	—	—
Sciomyzidae	57.14	8.82	17.39	8.33	24.74	94.44	40.57	—	—	15.38	22.22	33.33	20.00	—	—
Limnia unguicornis	35.71	5.88	8.70	8.33	15.46	51.85	—	—	—	—	16.67	22.22	10.00	—	—
Chamaemyia polystigma	—	29.41	—	16.67	12.37	—	9.06	—	—	7.69	11.11	16.67	10.00	—	—
Trimerina madizans	17.86	2.94	4.35	—	7.22	2.78	—	—	—	—	—	5.56	50.00	—	—
Pherbellia nana	3.57	—	4.35	—	2.06	—	2.26	—	—	—	—	2.78	10.00	—	—
Pherbellia griseola	3.57	—	—	—	—	—	3.21	—	—	7.69	—	—	—	—	—
Pteromicra glabricula	3.57	—	—	—	—	—	—	—	—	—	2.78	—	—	—	—
Pteromicra pectorosa	—	2.94	—	—	—	—	—	—	—	—	2.78	—	—	—	—
Pherbina coryleti	—	—	4.35	—	—	—	—	—	—	—	—	2.78	—	—	—
Knutsonia albiseta	3.57	—	—	—	—	—	—	—	—	—	—	2.78	—	—	—
Chamaemyia flavipalpis	3.57	—	—	—	—	—	—	—	—	—	—	—	10.00	—	—
Leucopis sp.	3.57	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—
Pherbellia cinerella	—	—	—	—	—	15.74	30.57	—	—	—	—	—	—	—	—
Tetanocera elata	3.57	—	—	—	—	8.33	—	—	—	—	—	2.78	—	—	—
Tetanocera silvatica	3.57	—	—	—	—	8.33	—	—	—	7.69	—	—	—	—	—
Tetanocera hyalipennis	—	—	—	—	—	6.48	—	—	—	—	—	—	—	—	—

Table 5. Dominance indices of families and species dominant in trophic associations of *Acalyptratae* (excl. *Chloropidae*) on Mazovian moist meadows and a wet one

	Moist meadows	Wet meadow		Moist meadows	Wet meadow
1	2	3	1	2	3
Phytosaprophages			*Sepsis fulgens*	3.97	—
Sphaeroceridae	62.25	11.90	*Chaetopodella scutellaris*	3.97	2.35
Leptocera nigra	51.32	—	*Meoneura flavifacies*	3.57	—
Drosophilidae	21.25	17.86	*Sepsis punctum*	—	5.29
Scaptomyza pallida	21.00	16.67	Graminivores		
Ephydridae	12.86	—	*Agromyzidae*	58.01	17.17
Limosina ochripes	5.89	8.93	*Cerodontha denticornis*	23.94	—
Psilopa polita	5.92	—	*Opomyzidae*	21.32	49.49
Psilopa nitidula	3.27	—	*Chromatomyia nigra*	18.31	—
Lauxaniidae	2.32	—	*Anthomyzidae*	12.43	31.31
Scatella stagnalis	2.15	—	*Anthomyza gracilis* s.l.	12.23	31.31
Rivellia syngenesiae	—	33.93	*Opomyza germinationis*	9.68	7.07
Herina frondescentiae	—	30.95	*Hydrellia griseola*	8.24	—
Mycophages			*Geomyza tripunctata*	7.13	15.15
Asteia concinna	66.66	—	*Pseudonapomyza atra*	4.05	—
Heleomyzidae	16.67	100.00	*Cerodontha (Poemyza) atra*	3.47	7.07
Suillia flava	16.67	50.00	*Geomyza combinata*	3.07	27.27
Suillia bicolor	—	33.33	*Agromyza nigripes*	—	3.03
Drosophila phalerata	16.67	—	*Asteraceae* feeders (incl. polyphages)		
Suillia inornata	—	16.67	*Agromyzidae*	80.43	—
Polysaprophages			*Phytomyza wahlgreni*	43.68	—
Sepsidae	61.24	—	*Phytomyza plantaginis*	6.10	10.53
Themira annulipes	50.84	—	*Cerodontha(Icteromyza) capitata*	—	21.05
Sphaeroceridae	32.87	—	*Cerodontha (Dizygomyza) morosa*	—	21.05
Limosina clunipes	18.54		*Phytomyza tetrasticha*	—	15.79
Themira lucida	5.34		*Amauromyza monfalconensis*	—	10.53
Halidayina spinipennis	3.93	—	*Metopomyza scutellata*	—	5.26
Copromyza equina	3.37	—	*Cerodontha (Dizygomyza) gallica*	—	5.26
Carnidae	3.09	—	Rhizophages		
Nemopoda nitidula	2.25	—	*Psilidae*	100.00	100.00
Limosina longisetosa	—	40.00	*Psila limbatella*	40.00	33.33
Limosina luteilabris	—	40.00	*Psila nigra*	40.00	—
Pteremis fenestralis	—	20.00	*Psila gracilis*	10.00	66.67
Coprophages			*Psila rosae*	10.00	—
Sepsidae	72.67	95.29	*Tephritidae*	19.56	100.00
Sepsis flavimana	29.12	65.29	*Liriomyza ptarmicae*	12.45	—
Sphaeroceridae	23.76	4.71			
Sepsis cynipsea	21.44	22.35			
Sepsis duplicata	9.46	—			
Coproica lugubris	9.40	—			
Copromyza atra	6.42	2.35			
Sepsis biflexuosa	5.63	—			

1	2	3	1	2	3
Ensina sonchi	10.87	2.56	Malacophages		
Chromatomyia horticola	6.72	—	*Sciomyzidae*	100.00	100.00
Sitarea scorzonerae	4.15	82.05	*Limnia unguicornis*	62.50	54.90
Ophiomyia pulicaria	4.15	—	*Pherbellia nana*	8.33	—
Ophiomyia nasuta	3.75	—	*Pherbellia griseola*	4.17	—
Napomyza lateralis	3.16	—	*Pteromicra glabricula*	4.17	—
Phytomyza rhabdophora	2.37	—	*Pteromicra pectorosa*	4.17	—
Urophora solstitialis	—	15.38	*Pherbina coryleti*	4.17	—
Other phytophages (excl. rhizophages)			*Knutsonia albiseta*	4.17	—
			Pherbellia cinerella	—	16.67
Agromyzidae	60.09	94.74	*Tetanocera elata*	—	8.82
Drosophilidae (*Scaptomyza*)	39.91	5.26	*Tetanocera silvatica*	—	8.82
			Tetanocera hyalipennis	—	6.86
Scaptomyza graminum	39.44	5.26	Coccido- and aphidophages		
Phytomyza notata	11.74	—			
Phytomyza ranunculi	11.74	—	*Chamaemyiidae*	100.00	100.00
Phytomyza brischkei	9.39	—	*Chamaemyia juncorum*	40.91	66.67
Phytomyza sp. (*affinis* group)	8.45	—	*Chamaemyia geniculata*	37.88	—
			Chamaemyia polystigma	18.18	33.33

Table 6. Similarity coefficients of *Acalyptratae* communities (excl. *Chloropidae*) on Mazovian moist meadows, a wet one and Warsaw city lawns (swept material)

	Cyganka			
Klembów	47.73	Klembów		
Białołęka	44.58	52.88	Białołęka	
Chylice	41.29	62.94	47.06	Chylice
Zbroszki	36.81	59.51	50.26	65.22

	Wet meadow Cyganka	
Moist meadows (total)	39.53	Moist meadows (total)
City lawns Warsaw	27.74	63.10

sweeping of larger concentrations of *Sphaeroceridae*, which occurred aboundantly on organic residues in spring. Scavengers began to appear in March (in this month 8 samples were taken, at Białołęka only), their abundance in September being as high as the annual average one of *Acalyptratae* (excluding *Chloropidae*), and even in October remaining still quite sufficient. This resulted from a multivoltine annual cycle of the dominant species, *Sphaeroceridae* in particular, and a numerous occurrence of active adults on manure and decaying plant residues not only in early spring but also in late autumn. Phytophages, however, did not appear before April, reaching their maxima in June and August and minimum in October, and disappeared at the end of the vegetative season. Only in the case of zoophages, occurring from April to September, was there a single peak on the abundance curve, falling in June.

TROPHIC AND DOMINANCE STRUCTURE

Although segregation of swept adults according to bionomics of their larvae still arouses many doubts (Nowakowski 1981), yet it allows for a better recognition of their dominance structure, even if only three trophic communities are distinguished. As regards physiology, the classification in question proved to be artificial, since numerous phyto- and saprophages (e.g. *Chloropidae*, *Drosophilidae*, *Ephydridae*) belong actually to microphages, i.e. bacterio-, myco- or phytophages (Deonier 1979, Tschirnhaus 1981), nevertheless, it might be of some ecological value. By contrast to destruents, consumers of living plants increase the secondary production at the expense of the primary one. Furthermore, a close association of an overwhelming majority of acalyptrate meadow species with their habitat is due to breeding requirements and developmental needs (Boness 1953).

The preponderance of phytophagous *Acalyptratae* on the moist exploited meadows was clearly changed in favour of the saprophagous ones, once the dominant *Chloropidae* were excluded from the count (Tab. 2). Lack of this dominance reversion on the city lawns constituted the main difference in the trophic structure of the two related acalyptrate taxocoenes, i.e. community on the meadows and that on the lawns. Even if *Chloropidae* were disregarded, plant feeders preserved their preponderance, though diminished indeed, on lawns due to a marked dominance of *Agromyzidae*, *Opomyzidae* as well as certain *Ephydridae* (*Hydrellia griseola*) and *Drosophilidae* (*Scaptomyza graminum*). On the moist meadows however, they were outnumbered by saprophagous *Sphaeroceridae* and *Sepsidae*, the latter being partly replaced on Warsaw lawns by certain *Drosophilidae* (*Scaptomyza pallida*). This may have been caused by the lack of ungulate manure in the city, by raking away the litter off the lawns as well as by the influence of urban tree stands, as *Agromyzidae*, *Opomyzidae* and *Drosophilidae* survive much better in park landscape than in completely open areas.

As regards the dominance structure (Tabs 2, 4, 5), acalyptrate community on the partly waterlogged forest meadow markedly differed from that on exploited moist meadows as well as from that on city lawns. It was dominated by hygrophilous and uliginose species, especially by zoophagous *Sciomyzidae*, saprophagous *Platystomatidae* and *Otitidae* and phytophagous *Opomyzidae*, *Anthomyzidae* and *Tephritidae* which found more inflorescences of *Asteraceae* there. The families listed outnumbered both *Sphaeroceridae* and *Agromyzidae*, the latter though having been represented by certain uliginose species, yet in most cases not adapted to survive on waterlogged and acidified substrate. A general prevalence of scavengers diminished in favour of zoophages, mainly of *Sciomyzidae*. Besides *Rivellia syngenesiae* and *Herina frondescentiae*, only the coprophagous *Sepsis* spp. notably increased its dominance, accordingly with its preference for peatbogs (the ungrazed by cattle boggy meadows included), observed by Randall, Coulson and Butterfield (1981).

In Table 4 dominance indices are given of the families and species which were dominants (including sub- and eudominants) within trophic acalyptrate communities, calculated for particular plots and months for the moist meadows as compared with the wet one and city lawns. Nevertheless, more recent advances in knowledge of bionomics of certain dipteran families allow for distinguishing some more distinct ecological associations of species interrelated with competitive dependencies (Tab. 2, 5). Some of these taxocoenes, however, have not been precisely separated yet, furthermore, at particular plots or in particular months they included too small numbers of specimens to estimate their local and seasonal dominance.

The most numerous and almost ever-dominant association was formed by phytosaprophages feeding on decaying plant parts and residues. I included here also certain aquatic microphages (especially phytophagous *Ephydridae*, e.g. *Scatella stagnalis*), some polysaprophages of prevailing phytosaprophagy (*Opacifrons coxata*, *Limosina moesta*, *L. nana*, *L. ochripes*, *L. pullula*, *L. rufilabris* and *L. vitripennis*, Roháček 1982b), as well as some taxons of uncertain larval bionomics (*Neria*, *Rivellia*, *Herina*, *Trixoscelis* and *Diastata* spp.), even these, which were frequently misclassified as phytophages (*Micropeza corrigiolata*, *Calliopum aeneum*). Among phytosaprophages, the prevailing were *Sphaeroceridae*, especially *Leptocera nigra* (= *curvinervis* Stenh.), which was the first eudominant of all the scavengers and even of all the *Acalyptratae* (excluding *Chloropidae*) on the moist meadows in general and occurred most numerously on pasture plots (Zbroszki and Klembów). This sphaerocerid was observed to develop in moist, humic soil, including the arable one (Papp 1976), and it was also taken on manure (Papp 1971). It is rather a polythermal species, which in southern European countries is considered to be, however, a spring-autumn inhabitant of wet meadows (Roháček 1982a), while in Poland it prevails on mesophilous grazed meadows and man-set lawns, occurring not only in spring and autumn

but also in July, yet hardly ever found on boggy meadows. Another dominant of phytosaprophagous *Sphaeroceridae* was *Limosina ochripes*, characteristic of decaying grasses and mosses, common also on peatbogs (Roháček 1982b), hence on the meadow at Cyganka, whereas receding sphaerocerids included all the polysaprophages mentioned above as well as scarce hygrophilous species, i.e. *Leptocera fontinalis* and *L.* (*Rachispoda*) *lutosa*. The second eudominant of the taxocoene were *Drosophilidae* (except for two phytophagous *Scaptomyza* spp.), mainly *Scaptomyza pallida*, a well-known ubiquitous scavenger, yet preferring rather shaded and not too dry habitats. *Ephydridae* (except for grass-mining *Hydrellia griseola*) came the third, the prevailing having been *Psilopa polita* and *P. nitidula*. According to the studies of American dipterologists (Deonier 1979), the larvae of certain Nearctic *Psilopa*, *Nostima*, *Philygria*, *Hyadina* and *Ditrichophora* spp. feed on decaying hay. Hence it may be assumed that European representatives of these genera (as well as *Limnellia* spp.), found constantly on meso- and sometimes even xerophilous meadows, belong to the native element there, and, contrary to some suppositions (Boness 1953), they do not necessarily come from water bodies and swamps; this could be further evidenced by their scarce occurrence on the unmown boggy meadow at Cyganka. Yet eurytopic *Scatella stagnalis*, found not only on slimy banks of fresh water bodies (Deonier 1979) and sea-algae films (Sen 1931), but also on manure (Papp 1975) and even on faeces (Howard 1900), might develop in temporary, greened, small puddles of liquid manure on pastures as well. Phytosaprophages include also *Lauxaniidae*, whose larvae were mostly noted to feed in fallen tree leaves, under tree bark and in touchwood. On the investigated meadows (mainly at Białołęka) there occurred several shrub representatives of that family. The most numerous was *Calliopum aeneum*, a relatively eurytopic, omnivorous species, which had been reared not only from fallen leaves, but also from ovaries of violet fruits and clover hypocotyls, probably decaying due to parasitic fungi (Miller 1977), as well as from cut cabbage heads (Szwejda 1974, 1979). *Rivellia syngenesiae* (*Platystomatidae*) and *Herina frondescentiae* (*Otitidae*), characteristic of wet meadows, dominated in the Cyganka reserve.

Mycophages, i.e. mycetophages, or more strictly, macromycophages, feeding in fungus fructifications, are mainly forest inhabitants. Hence on the examined meadows they occurred in very small numbers (the largest was recorded at Cyganka). This association was represented there by fire species, out of which four (*Suillia bicolor*, *S. flava*, *S. inornata* and *Drosophila phalerata*) are the genuine forest species, while one (*Asteia concinna*) is known from sandy habitats. As *Suillia* spp. in question were also litter micromycophages feeding on spawn hyphae (Martinek 1974), they constituted a transitory link with phyto- and polysaprophagous associations.

Polysaprophages which feed on dead substances of animal origin (especially in animal excrements and residues) or of plant origin (including decaying mush-

rooms and spawn hyphae) were distinguished by Roháček 1982) as an association of *Sphaeroceridae*, frequently found in burrows of mammals and birds (microcavernicoles). This taxocoene was not very abundant on the meadows examined and it formed there a transitory stage between phytosapro- and coprophages. I have included in it certain other *Acalyptratae*, namely *Themira* spp. (dominant here) and *Nemopoda nitidula* of *Sepsidae*, moreover certain *Meoneura* spp. (*Carnidae*) as well as all the sampled *Milichiidae*, *Chyromyidae*, *Piophilidae*, *Dryomyzidae* and *Camillidae*. Unlike *Sepsis* spp. and *Saltella sphondylii*, *Themira* spp. do not develop in fresh ungulate droppings, but, judging by scarce and uncertain data, rather in compost heaps of old dung and in liquid manure, faeces, rodent and poultry excrements, garbage, scrap-heaps as well as in rotting grass, litter and garden soil (Lobanov 1962, Minder 1963, Zuska, Laštovka 1969, Iwasa 1981, Roháček, Zuska 1983), in cut cabbage (samples supplied by Dr. J. Szwejda), and, perhaps, in accumulations of stranded marine algae (Szadziewski 1983). Unfortunately, alimentary requirements of the species prevailing on the moist meadows (*Th. annulipes*, the first dominant in this association, and *Th. lucida*) have been least known. On the other hand, *Nemopoda nitidula*, whose larvae develop, most probably, in human and canine excrements, dead snails, rotting carrion, fish and mushrooms (Lobanov 1962, Nowakowski 1982, Roháček, Zuska 1983), is a shrub species, widespread also on urban areas (e.g. at Warsaw), but scarce on meadows. Among the typical polysaprophagous *Sphaeroceridae* the dominating was *Limosina clunipes*, while receding were: *Copromyza equina*, *C. vitripennis*, *Halidayina spinipennis*, *Pteremis fenestralis* as well as the remaining *Limosina* spp. Of *Carnidae* three recedent *Meoneura* spp. were also ranked there, namely *M. lamellata*, found in bird nests (nidicolous), *M. vagans*, which prefers rotting carrion and carcass (Gregor, Papp 1981) and *M. bicuspidata*. The acalyptrate families hardly occurring on meadows and represented there only by their most common species included rather arboreal *Milichiidae* (hemisynanthropic *Madiza glabra* a.o.), *Chyromyidae* (most probably nidicolous), *Dryomyzidae* (forest myco- and coprophages) and *Piophilidae* (mainly necrophages, common especially in settlements). Scarce *Camillidae* were ranked among polysaprophages too.

Coprophages, feeding mainly on mammalian excrements, formed another scavenger association dominant on meadows, characteristic of pastures and most abundant at Zbroszki and Cyganka. *Sepsidae*, particularly *Sepsis* spp. were prevalent in it. They ranked mainly among pasture species, developing in small pieces of very fresh (*S. cynipsea*) or somewhat older cattle droppings (*S. flavimana* and *S. duplicata*) (Hammer 1941, Minder 1963). Less abundant were the species rather widespread in settlements on heaps of old dung (*S. biflexuosa*, *S. fulgens*, *S. violacea* and *Saltella sphondylii*) as well as ubiquitous *Sepsis punctum* (Minder 1963). Two species dominant on moist meadows grazed by cattle (*S. flavimana* and *S. cynipsea*) were also prevailing on the waterlogged reserve meadow, manu-

red, if ever, by roe-deer and elk. This seems to corroborate the existing recent data on hygrophily of these flies, their preference for peatbogs and ability to develop in excrements of wild ungulates (Roháček, Zuska 1983). While on a Hungarian pasture, the abundance of *Sepsidae* was approximately balanced by that of *Sphaeroceridae* (Papp 1971), coprophagous sphaerocerids (even polysaprophages included) were evidently outnumbered by sepsids on the Mazovian meadows. Among these sphaerocerids the prevailing were there also pasture species abundant on fresh cattle droppings (Hammer 1941), i.e. *Coproica lugubris* (the first dominant in excrements on the Hungarian pasture, Papp 1971), *Copromyza atra* and *Chaetostomella scutellaris*, both the latter common on the boggy meadow too. They outnumbered the species characteristic of large dung heaps and/or horse droppings, namely *Coproica acutangula*, C. *ferruginata*, *Ischiolepta pusilla*, *I. vaporariorum* and remaining *Coproica* and *Copromyza* spp. Also *Meoneura flavifacies* was ranked among coprophages (Gregor, Papp 1981). It was the only *Carnidae* species frequently occurring on the moist meadows examined, at Zbroszki in particular.

The trophic associations of phytophages (all being endophages, temporary internal parasites of vascular plants) may be more accurately distinguished on their host plant groups rather than their larval feeding manner. Then it is possible to suspect certain competitive dependencies between monophages by their coexistence with oligophages. As the material sampled included solely herbaceous plant feeders (herbivores), it may be assumed that those of arboreal plants (xylophages, rather uncommon among *Diptera*) could hardly be expected on mown meadows and pastures.

The most abundant taxocoene in all the meadow habitats was formed by graminivores feeding in blades (rarely in inflorescences) of grasses (*Chloropidae*, *Opomyzidae* and *Anthomyzidae*), or mining their leaf sheaths and leaves (*Agromyzidae*). Those graminicoles prevail which develop in young growing blades and, thus, are favoured by mowing of the old ones (Boness 1953). However, if *Chloropidae* which generally predominated (although not in all the seasons) are excluded, the dominants were the true mining flies, which always prevail, as regards the number of species. Among *Agromyzidae*, the most abundant were grass feeders, especially *Cerodontha denticornis*, regarded as one of the commonest dipteran meadow species (Boness 1953), and the dominant of *Agromyzidae* on moist meadows (Doskočil, Hůrka 1962). It accounted approximately for half of the number of graminivorous *Agromyzidae* sampled on the Mazovian meadows and for as much as half of the total number of this family specimens swept at Warsaw (Nowakowski 1982). This rather polythermal though ubiquitous species which mines leaf sheaths predominated particularly on intensively grazed and overfertilized sites (as observed by me on material from the Małe Pieniny Mountains sampled by Dr. E. Olechowicz), as well as in places frequently mown (lawns included), i.e. at Zbroszki, Chylice, Klembów and Warsaw. The second dominant

among grass mining *Agromyzidae* on the Mazovian meadows was *Chromatomyia nigra*, the first dominant on seaside pastures in Schleswig-Holstein (Tschirnhaus 1981) and on peatbogs in Moravia (Vála, Roháček 1983). Haemerophilous *Psedonapomyza atra* was the third dominant. On the other hand, *Cerodontha* (*Poemyza*) *atra* and *Agromyza nigripes*, dominant at Cyganka, preferred (like *Liriomyza flaveola*) more natural meadows. Recedent grass miners included also the remaining *Agromyza* (except for *A. nana* and *A. pseudoreptans*), *Cerodontha* s. str. and *Poemyza* spp. as well as *Liriomyza phryne*, *Metopomyza flavonotata*, and most probably *Cerodontha* (*Dizygomyza*) *grisea*, *C.* (*Xenophytomyza*) *atronitens* and *Liriomyza infuscata*. The majority of true mining flies preferred habitats at least partly shaded but not waterlogged. The latter were populated rather by hygrophilous *Anthomyzidae* (especially *Anthomyza gracilis* s.l., dominating at Cyganka and Klembów) and by *Opomyzidae*, their most common representative, i.e. *Opomyza florum*, preferring wet meadows and moving in the forest herb layer in summer (Martinek 1978). As regards *Opomyzidae*, only rather polythermal and mesophilous *Opomyza germinationis* preferred moist meadows, reaching its optimum on city lawns (Nowakowski 1982). These habitats were tolerated also by rather eurytopic *Geomyza tripunctata* and, to a smaller extent, *G. combinata*, both species being most abundant, however, at Cyganka and Klembów. *Hydrellia griseola*, though regarded as rather a hygrophilous species, if not bound to waterlogged or flooded areas (Deonier 1971), and noted as the first or, rarely, the second *Ephydridae* dominant on all the Bohemian meadows examined by Pešková (1978), was by far less numerous at Cyganka than on the moist meadows (at Klembów and Białołęka in particular) and city lawns, albeit it was mass sampled solely in tree crowns at Warsaw (Nowakowski 1981).

The majority of remaining meadow herbivores included species trophically associated with *Asteraceae*. The true mining flies infesting hypocotyls, stems and leaf bases predominated among them. *Phytomyza wahlgreni* (= *taraxacocecis* Her., = *robustella* auctt.), common on *Taraxacum officinale* Web. also in Warsaw (Nowakowski 1982), was the first dominant in this association. *Ph. rhabdophora* and *Ophiomyia* spp., such as *O. nasuta* and *O. pulicaria* (deeply penetrating leaf blades) as well as *Napomyza lateralis* (formerly regarded as a polyphage) were widespread too. The next came oligophagous fruit flies, developing in capitula of various composite plants, especially *Ensina sonchi*, *Sitarea scorzonerae* (= *Chaetostomella cylindrica* /R.-D./) and *Urophora solstitialis*, which found richest inflorescences on the forest reserve meadow. The most numerous composite leaf miner was *Liriomyza ptarmicae* (= *millefolii* Her.), feeding on *Achillea* spp. Also such polyphages as *Chromatomyia horticola* (= *Phytomyza atricornis* auctt.) and *Liriomyza strigata*, most frequently found on *Asteraceae*, may be included into this association. They formed a transitory link with other acalyptrate taxocoenes on dicotyledons.

Other *Dicotyledoneae* feeders were dominated by *Scaptomyza graminum*,

developing in leaf blades of *Silenaceae* and *Fabaceae*, while *S. flava* and *Phytomyza rufipes*, as rather field and crop *Brassicaceae* feeders, hardly occurred there. The remaining were *Agromyzidae* mining leaves of *Ranunculus* (frequent *Ph. notata* and *Ph. ranunculi*, scarce *Ph. fallaciosa* and caulophagous *Napomyza albipennis*), *Trifolium* (*Phytomyza brischkei*, seldom *Agromyza nana*), *Plantago* (*Phytomyza plantaginis*), *Veronica* (*Ph. crassiseta*), rarely those of *Urtica* spp. (*Agromyza pseudoreptans*), as well as stems of *Galium* (*Paraphytomyza buhri*) and *Chenopodium* spp. (*Amauromyza chenopodivora*), and finally species with unknown host plants (*Phytomyza* sp., *Melanagromyza pubescens*, *Amauromyza monfalconensis*). The last of these agromyzids was found at Cyganka reserve along with some leaf miners of uliginose plants, such as *Mentha* (*Phytomyza tetrasticha*), *Carex* (*Metopomyza scutellata*, *Cerodontha* |*Dizygomyza*| *morosa*, *C.* |*D.*| *gallica*) and *Juncus* spp. (*C.* |*Icteromyza*| *capitata*). Also other *Monocotyledoneae* miners happened to occur on the moist meadows, namely those of *Carex* (*Metopomyza xanthaspis*, *Cerodontha* |*Dizygomyza*| *suturalis*), *Juncus* (*C.* |*D.*| *luctuosa*) and *Luzula* spp. (*C.* |*D.*| *bimaculata*).

Known or probable rhizophages, represented there by a few *Psilidae*, should be dealt with separately. *Chamaepsila rosae*, the most common but field-forest representative of the family, hardly occurred on meadows. Its larvae infest roots of vegetables or forest *Apiaceae*, while adults occur most frequently in tree crowns (Dąbrowski, Legutowska 1976, Nowakowski 1981, 1982). On the moist meadows (at Klembów and Białołęka in particular) and on the wet forest one at Cyganka, two hygrophilous species of unknown bionomics were sampled (*Chamaepsila limbatella* and *Ch. nigra*) as well as *Ch. gracilis*, which develops in clover hypocotyl.

The few zoophages were divided into two unrelated associations (malaco- and coccidophages) and one distinct (arachnophagous) species. The malacophagous association was formed by *Sciomyzidae*, whose larvae (either predators or parasitoids, temporary necrophagous) invade freshwater or (temporarily) land snails. As either coastal or uliginose species feeding on primarily hygrophilous hosts, they occurred on moist meadows (most numerously at Klembów) more seldom than in city parks, yet they prevailed on the waterlogged forest meadow. The dominant was *Limnia unguicornis*, an aquatic and very common species, followed by *Pherbellia cinerella*, a most mesophilous representative of this family, invading (temporarily) land snails and prevailing on city lawns (Nowakowski 1982).

Coccidophagous association consisted of *Chamaemyiidae*, namely of the moderately xerophilous *Chamaemyia* spp., occurring in the herb layer, as its larvae feed on graminivorous *Coccidae* (Soós, Papp 1984), while aphidophagous *Leucopis* spp. search for aphides mainly on trees. The abundance of *Chamaemyia* spp. on the moist meadows and at Cyganka in particular was smaller than on Warsaw lawns. The dominant was *Ch. juncorum*, usually the commonest herb layer chamaemyiid.

Table 7. Percentages of zoogeographical elements as estimated in specimen (above) and species (below) numbers in families and trophic communities of *Acalyptrates* (excl. *Chloropidae*) on Mazovian moist meadows and compared to those on a wet one and Warsaw city lawns (swept material) (see p. 407)

	Moist meadows																				Wet meadow				City lawns			
	Klembów				Białołęka				Chylice				Zbroszki				Total				Cyganka				Warszawa			
	Cosmo-politan	Holarctic	Palae-arctic	Euro-pean	Cosmo-politan	Holarctic	Palae-arctic	Euro-pean	Cosmo-politan	Holarctic	Palae-arctic	Euro-pean	Cosmo-politan	Holarctic	Palae-arctic	Euro-pean	Cosmo-politan	Holarctic	Palae-arctic	Euro-pean	Cosmo-politan	Holarctic	Palae-arctic	Euro-pean	Cosmo-politan	Holarctic	Palae-arctic	Euro-pean
Micropezidae	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—
	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—
Psilidae	—	—	—	100.00	20.00	—	—	80.00	—	—	—	—	—	—	100.00	—	10.00	—	10.00	80.00	—	—	66.67	33.33	100.00	—	—	—
	—	—	—	100.00	33.33	—	—	66.67	—	—	—	—	—	—	100.00	—	25.00	—	25.00	50.00	—	—	50.00	50.00	100.00	—	—	—
Platystomatidae	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00
	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00
Otitidae	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	—	—	—
	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	—	—	—
Tephritidae	61.11	—	38.89	—	20.00	—	80.00	—	33.33	—	66.67	—	82.35	—	17.65	—	55.56	—	44.44	—	2.56	—	97.44	—	—	—	100.00	—
	25.00	—	75.00	—	25.00	—	75.00	—	25.00	—	75.00	—	33.33	—	66.67	—	12.50	—	87.50	—	33.33	—	66.67	—	—	—	100.00	—
Dryomyzidae	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00
	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00
Sepsidae	5.18	69.95	24.35	0.52	33.33	52.38	14.29	—	—	86.78	13.22	—	8.19	39.76	51.94	0.11	7.07	0.61	48.17	0.15	—	74.07	25.93	—	30.50	27.80	41.51	0.19
	16.67	33.33	41.67	8.33	14.29	57.14	28.57	—	—	40.00	60.00	—	9.09	36.36	45.45	9.09	14.29	35.71	42.86	7.14	—	40.00	60.00	—	9.09	27.27	54.55	9.09
Sciomyzidae	—	18.75	81.25	—	—	33.33	67.66	—	—	25.00	75.00	—	—	—	100.00	—	—	20.83	79.17	—	16.67	9.80	73.53	—	75.35	13.95	9.30	1.40
	—	42.86	57.14	—	—	50.00	500.0	—	—	33.33	66.67	—	—	—	100.00	—	—	44.44	55.56	—	12.50	25.00	62.50	—	9.09	27.27	36.36	27.27
Lauxaniidae	—	25.00	—	75.00	—	41.18	7.86	51.76	—	33.33	—	66.67	—	—	—	100.00	—	39.78	6.45	53.76	—	66.67	33.33	—	—	1.78	4.63	93.59
	—	50.00	—	50.00	—	42.86	28.57ę	28.57	—	50.00	—	50.00	—	—	—	100.00	—	42.86	28.57	28.57	—	50.00	50.00	—	—	15.38	38.46	46.15
Chamaemyiidae	—	—	85.71	14.29	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	98.48	1.52	—	—	100.00	—	—	—	100.00	—
	—	—	75.00	25.00	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	80.00	20.00	—	—	100.00	—	—	—	100.00	—
Periscelididae	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—
Piophilidae	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	5.15	94.85	—	—
	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	50.00	50.00	—	—
Pallopteridae	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50.00	50.00
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50.00	50.00
Lonchaeidae	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—
Agromyzidae	29.51	40.16	9.84	20.49	21.76	34.31	9.62	34.31	22.10	27.49	8.36	42.05	34.33	38.73	11.62	15.32	28.20	35.30	10.13	26.37	2.86	31.43	11.43	54.29	48.25	13.89	12.93	24.93
	6.45	38.71	22.58	32.26	5.88	32.35	29.41	32.35	7.69	46.15	19.23	26.92	11.54	34.62	23.08	30.77	5.45	32.73	29.09	32.73	5.88	29.41	11.76	52.94	4.55	30.30	21.21	43.93
Heleomyzidae	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	50.00	—	50.00	—
	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	66.67	—	33.33	—
Trixoscelididae	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	100.00	—	—	—	50.00	50.00	—	—	—	—	—	—	25.20	74.80
	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	100.00	—	—	—	66.67	33.33	—	—	—	—	—	—	66.67	33.33
Anthomyzidae	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00
	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00	—	—	—	100.00
Opomyzidae	—	—	58.89	41.11	—	—	22.08	77.92	—	—	40.98	59.02	—	—	33.67	66.33	—	—	9.26	60.74	—	—	30.61	69.39	—	—	8.48	91.52
	—	—	33.33	66.67	—	—	40.00	60.00	—	—	60.00	40.00	—	—	50.00	50.00	—	—	50.00	50.00	—	—	33.33	66.67	—	—	40.00	60.00
Chyromyidae	—	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00
	—	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00
Asteiidae	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—
	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	100.00	—
Sphaeroceridae	75.28	14.13	4.55	6.04	82.56	12.79	2.33	2.33	66.06	27.06	2.75	4.13	81.81	8.43	9.31	0.44	78.31	11.99	6.90	2.80	24.24	60.61	12.12	3.03	75.44	14.31	2.80	7.45
	34.78	17.39	21.74	26.09	45.45	27.27	9.09	18.18	47.37	21.05	5.26	26.32	52.17	13.04	17.39	17.39	39.39	15.15	21.21	24.24	33.33	33.33	22.22	11.11	50.00	16.67	13.33	20.00
Tethinidae	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100.00
Milichiidae	100.00	—	—	—	50.00	500.0	—	—	—	—	—	—	100.00	—	—	—	75.00	25.00	—	—	—	—	—	—	60.00	20.00	—	20.00
	100.00	—	—	—	50.00	50.00	—	—	—	—	—	—	100.00	—	—	—	50.00	50.00	—	—	—	—	—	—	50.00	25.00	—	25.00
Carnidae	—	—	—	—	—	—	—	100.00	—	4.76	—	95.24	—	9.50	—	97.50	—	3.08	—	96.92	—	—	—	—	—	41.46	—	58.54
	—	—	—	—	—	—	—	100.00	—	50.00	—	50.00	—	25.00	—	75.00	—	25.00	—	75.00	—	—	—	—	—	25.00	—	75.00
Ephydridae	56.80	6.00	36.80	0.40	45.26	8.42	31.58	14.74	11.20	3.06	83.67	2.04	7.77	1.94	85.92	4.37	32.67	4.62	58.71	4.01	22.22	44.44	33.33	—	55.26	3.76	32.42	8.55
	20.00	40.00	30.00	10.00	10.00	30.00	40.00	20.00	20.00	30.00	30.00	20.00	25.00	25.00	25.00	25.00	11.76	35.29	29.41	23.53	20.00	40.00	40.00		9.09	27.27	36.36	27.27
Diastatidae	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	—	—	10.00	90.00
	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	—	—	—	—	100.00	—	—	—	100.00	—	—	—	50.00	50.00
Drosophilidae	87.97	12.03	—	—	94.44	5.56	—	—	81.08	18.92	—	—	95.07	4.58	0.35	—	90.82	9.07	0.11	—	96.77	3.23	—	—	81.07	18.93	—	—
	66.67	33.33			50.00	50.00			66.67	33.33			50.00	25.00	25.00		50.00	33.33	16.67		66.67	33.33			57.14	42.86		
Saprophages	68.36	16.34	11.26	4.04	58.73	15.33	9.91	16.04	35.35	36.36	20.88	77.41	54.39	16.77	26.96	1.88	57.13	18.51	20.23	4.13	10.89	40.97	16.62	31.52	59.50	11.22	15.58	13.70
	25.93	24.07	29.63	30.37	21.43	30.95	23.81	23.81	27.91	25.58	23.26	23.26	31.48	18.52	29.63	20.37	21.74	22.83	30.43	25.00	17.86	25.00	46.43	10.71	25.23	20.56	27.10	27.10
Phytophages	27.14	23.59	15.83	33.44	25.00	23.47	12.24	39.29	19.06	23.77	13.93	43.24	29.51	30.70	13.57	26.22	25.82	26.00	14.04	34.15	2.50	7.50	36.88	53.13	34.06	13.04	9.38	43.52
	9.30	30.32	25.58	34.88	19.80	25.49	29.41	35.29	10.26	33.33	28.21	28.21	13.16	26.32	28.95	31.58	7.59	25.32	34.18	32.91	10.71	21.43	21.43	46.43	5.95	26.19	23.81	44.05
Zoophages	—	28.57	67.86	3.57	—	5.88	94.12	—	—	8.70	91.30	—	—	—	100.00	—	—	12.37	86.60	1.03	15.74	12.04	72.22	—	30.57	5.85	63.02	0.57
		33.33	58.33	8.33		33.33	66.67			33.33	66.67				100.00			33.33	60.00	6.67	9.09	27.27	63.64		6.25	25.00	50.00	18.75
Total	57.28	18.29	13.04	11.38	40.82	18.71	14.35	26.12	27.42	30.23	19.28	23.08	49.25	19.49	24.52	6.74	47.87	20.49	19.31	12.33	9.56	27.23	31.60	31.60	44.59	11.89	14.80	28.72
	16.51	27.52	31.19	24.77	14.14	28.28	29.29	28.28	18.18	29.55	28.41	23.86	22.92	20.83	32.29	23.96	13.98	24.73	34.41	26.88	13.43	23.88	38.81	23.88	15.94	23.19	27.54	33.33

Arachnophages were represented by a single species of *Ephydridae*, i.e. *Trimerina madizans*, whose larvae infest spider egg cases, hence ranking among the so-termed nest parasites.

ZOOGEOGRAPHICAL ELEMENTS

As fliers, often passively drifted by wind, *Acalyptratae* usually are rather vagile forms of wide, trans-zonal areas of distribution unfortunately, as yet, insufficiently known. For this reason they are not a suitable object for zoogeographical studies. Their existing zoogeographical classifications seem to be barely preliminary and restricted to certain families, e.g. *Sphaeroceridae* (Hackman 1969), *Sepsidae* (Zuska 1970), *Sciomyzidae* (Elberg 1968, Rozkošný, Jeremies 1977), *Agromyzidae* (Spencer 1976). In the present paper an attempt was made to carry out virtually the first chorological analysis of a majority of these flies sampled on the Mazovian meadows. Due to the scantity of data on their distribution (especially the quantitative and biotopic ones), I had to disregard the genetic aspect and give up detailed chorology, thus restricting the analysis to the four basic components, determined by actual geographical ranges, i.e. the (semi)-cosmopolitan, Holarctic, Palaearctic and European element (Tab. 7). Estimations on their percentages, especially those based on the specimen numbers, were very difficult and uncertain, due to vagueness of data on the ranges of many species, the dominants included. The degree of dominance of the (semi)cosmopolitan element seemed to be most questionable, as some recent works (e.g. the catalogue by Soós and Papp 1984) neither have denied nor confirmed the former information on certain common species crossing the southern limits of Palaearctic (*Cerodontha denticornis*, *Leptocera nigra*, *Chaetopodella scutellaris*) or Holarctic (*Limosina clunipes*, *Madiza glabra*, *Hydrellia griseola*, *Scatella stagnalis*).

The (semi)cosmopolitan element consisted of some symbovile, synanthropic or extremely eurytopic species, preferring anthropogenic habitats, i.e. haemerophilous species as well as of certain freshwater ones (in the broadest sense). The symbovile species, i.e. copro- and polysaprophages, which develop in excrements of domestic ungulates, may be further divided into stable species (ranked among hemisynanthropes) and pasture ones, usually occurring outside stables (Roháček 1982). The former belonged to *Sphaeroceridae* and were mostly (semi)cosmopolites (*Ischiolepta pusilla*, *Copromyza equina*, *Coproica acutangula*, *C. ferruginata*, *Chaetopodella scutellaris*, *Limosina bifrons*, *L. clunipes*, *L. heteroneura*, *L. luteilabris*), while among the latter *Sepsidae* dominated, their ranges of distribution not extending beyond the Holarctic borders (except for *Sepsis biflexuosa*). Another (semi)cosmopolitan sepsid, *Nemopoda nitidula* was often regarded as a synanthropic species, as frequently taken on faeces and developing there. Of the remaining (semi)-cosmopolitan hemisynanthropes, only several specimens of *Madiza glabra* and

Drosophila melanogaster were found on the meadows examined. The basic constituent of (semi)cosmopolitan scavengers was formed there by the two dominant phytosaprophagous, eurytopic and haemerophilous species, i.e. *Leptocera nigra* (of uncertain Afrotropical occurrence, Roháček 1983) and *Scaptomyza pallida*. As regards phytosaprophages, worldwide distribution was recorded also for *Opacifrons coxata* and, according to the same authors (Stackelberg, Nartshuk 1970, Papp 1975), for *Scatella stagnalis*, whose polymicrophagous larvae inhabit margins of various alga-covered water bodies. Phytophages supposingly ranging beyond Holarctic southern limits included two dominant grass feeders, also noted as cereal pests, i.e. *Cerodontha denticornis* (unconfirmed data by Spencer 1959, from Afrotropic), and *Hydrellia griseola* (Deonier 1971), as well as several receding species, namely *Agromyza nana* (alphalpha and clover pest), *Chromatomyia horticola* (common polyphage, associated mainly with synanthropic flora), *Psila rosae* (pest of root vegetables, especially of carrot) and *Ensina sonchi* (occurring also on composite weeds). As regards zoophages, a distinct semicosmopolite was *Pherbellia cinerella*, most eurytopic and mesophilous representative of *Sciomyzidae* (Bratt et al. 1969). Owing to the joint dominance of this common haemerophilous species, the assumed worldwide element prevailed on the moist meadows and city lawns in total as well as in the trophic community of saprophages, especially among *Sphaeroceridae* and *Drosophilidae*, and also among *Agromyzidae* and *Ephydridae* in the city. This element is generally considered to be rather a derivative of polythermal species of southern origin, the Mediterranean ones in particular.

Just as the (semi)cosmopolitan element seemed to dominate over the Holarctic one, the Holarctic element seemed to prevail over the Palaearctic one (providing the questionable (semi)cosmopolites were excluded from the latter) and over the European element, although both these receding components comprised species which may have been regarded as Euro-Siberian, south Euro-Siberian (Euro-Caucasian), sub-Mediterranean or south-eastern (steppe) ones. The Euro-Siberian element seemed to be poorly represented on the Mazovian meadows by certain receding uliginose or forest species, e.g. *Tetanocera elata* (Rozkošný, Jeremies 1977), *Suillia bicolor* (Martinek 1974), *Limosina longisetosa*, *L. rufilabris*, *L. vitripennis* (Roháček 1983). Both the southern components mentioned above might include certain xerophilous *Ephydridae* (*Hyadina guttata*, *H. nitida*, Dahl 1959) and *Opomyzidae* (*Geomyza hendeli* and, what was most important though most questionable at the same time, the dominant *Opomyza germinationis*).

While among *Acalyptratae* (as a whole) and in their trophic community of scavengers on exploited moist meadows, the wide-range elements seemed to prevail over the narrower-range ones, or at least over the European component, quite an opposite relation was noted on the more natural forest meadow, i.e. on the whole, the European element prevailed there and the (semi)cosmopolitan one came the last. Apparently, this biotope, being most humid and less exposed

to anthropogenic pressure, has preserved more stenotopic and native fauna. The dominance of wide-range elements, as clearly visible in Zbroszki, may have also been diminished under the influence of adjacent tree stands in Białołęka, and on Warsaw city lawns in particular. Although (semi)cosmopolites dominated there, yet the European species prevailed over the Palaearctic and Holarctic ones. The forest, even in its degraded form, may still be regarded as a refuge of indigeneous fauna, while a mesophilous meadow, being alien habitat supported by man, is more apt to become affected by the process of fauna unification.

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DIPTERA ACALYPTRATAE (BEZ *CHLOROPIDAE*) ŁĄK ŚWIEŻYCH NIZINY MAZOWIECKIEJ

STRESZCZENIE

Praca opiera się na materiale złowionym czerpakiem na czterech łąkach świeżych (*Arrhenatheretum medioeuropaeum*), użytkowanych przez koszenie i/lub wypas, oraz na bardziej naturalnej, częściowo podmokłej łące śródleśnej (*Molinietalia*) i porównanym z materiałem, który został zebrany podobną techniką na trawnikach miejskich Warszawy (*Arrhenetherion, Cynosurion*). Wykaz 203 gatunków z łąk mazowieckich zawiera 6 gatunków nowych dla Polski (wśród nich pastwiskowy *Sepsis duplicata*) i 26 nowych dla Mazowsza. Pod względem składu gatunkowego, liczebności oraz struktury troficznej i dominacyjnej *Acalyptratae* (bez *Chloropidae*) użytkowane łąki świeże Mazowsza przypominają trawniki warszawskie, natomiast różnią się dość zasadniczo od łąki wilgotnej. Fauna łąk świeżych składa się głównie z mezofilnych gatunków łąkowych, zaroślowych lub pastwiskowych, których larwy żerują w trawach i innych ziołach łąkowych lub ich szczątkach albo w odchodach ssaków kopytnych. Najpełniejszy skład gatunkowy wykazują rodziny koprofilne, nie związane z lasami (*Sepsidae* i *Sphaeroceridae*), skutkiem czego liczba gatunków saprofagicznych nieco przewyższa liczbę roślinożernych. Częściowo zadrzewione trawniki miejskie mają natomiast większą domieszkę elementu leśnego, a wilgotna łąka śródleśna (pozornie?) obniżoną liczbę gatunków do prawie 1/3 fauny łąk świeżych, przy czym aż 1/4 tej liczby stanowią gatunki wyłączne. Przeciętna liczebność *Acalyptratae* na łąkach świeżych jest nieco wyższa niż na trawnikach, a znacznie wyższa niż w runie lasów i na łące wilgotnej, najwyższa na powierzchni intensywnie wypasanej, a najniższa (przy pominięciu *Chloropidae*) na powierzchni obficie sztucznie nawożonej i często koszonej, która wykazuje też wyraźny spadek liczby gatunków. Krzywa liczebności sezonowej byłaby trójwierzchołkowa, zwłaszcza u saprofagów, dość silnie zagęszczonych nie tylko wiosną ale i jesienią. Ich dominacja nad fitofagami (nie obserwowana na trawnikach miejskich) spowodowana jest obfitością nawozu zwierząt kopytnych na łąkach lub w ich bliskim sąsiedztwie. Dominują fitosaprofagi, zwłaszcza *Sphaeroceridae*, a wśród nich nieco koprofilna *Leptocera nigra*, której ustępuje nawet *Scaptomyza pallida*, panująca na trawnikach warszawskich. Wśród koprofagów (częściowo zastępowanych w mieście przez głównie nekrofagiczne *Piophilidae*) przeważają (także na łące wilgotnej, nie wypasanej przez bydło) *Sepsis* spp., zwłaszcza *S. flavimana* i *S. cynipsea*. Fitofagi zdominowane są głównie przez *Agromyzidae* i przez zespół trawożerców, w którym przoduje *Cerodontha denticornis* przed *Chromatomyia nigra*, *Opomyza germinationis* i *Hydrellia griseola*. Wśród reszty roślinożerców dominują minowce *Asteraceae*, zwłaszcza *Phytomyza wahlgreni*, a na łące śródleśnej *Tephritidae*. Bardzo nieliczne zoofagi są reprezentowane głównie przez *Chamaemyia* spp. i *Sciomyzidae*, dominujące na łące śródleśnej. Obliczając udział elementów zoogeograficznych według złowionych osobników, stwierdza się na łąkach świeżych przewagę elementów szerzej rozprzestrzenionych nad elementem europejskim, który dominuje na wilgotnej łące śródleśnej.

DIPTERA ACALYPTRATAE (БЕЗ *CHLOROPIDAE*) СВЕЖИХ ЛУГОВ МАЗОВЕЦКОЙ НИЗМЕННОСТИ

РЕЗЮМЕ

Сравнивая материал 203 видов, отловленных при помощи энтомологического сачка на используемых в хозяйственных целях свежих лугах и влажном средилесном лугу, с материалом, собранным на городских газонах Варшавы, автор констатирует большее сходство сообщества *Acalyptratae* из мезофильных лугов с их таксоценом из газонов, чем из луга на торфянике. Удобрение свежих лугов отходами домашних копытных ведет к повышению численности этих мух и доминации сапрофагов, особенно *Sphaeroceridae*, активных с ранней весны до поздней осени. Первым эвдоминантом всего таксоцена является фитосапрогический вид *Leptocera nigra* (которому уступает даже *Scaptomyza pallida*). Среди копрофагов преобладает *Sepsis* spp., в основном *S. flavimana* и *S. cynipsea*. Над фитофагами доминируют *Agromyzidae* и ассоциация злакоядных, в которой наиболее многочисленными являются *Cerodontha denticornis*, затем *Chromatomyia nigra* и *Opomyzidae* (*Opomyza germinationis*). Среди остальных растительноядных доминируют минеры сложноцветных растений, особенно *Phytomyza wahlgreni*. По численности особей *Acalyptratae* на свежих лугах зоогеографические элементы, характеризующиеся более широким распространением, превышают европейский элемент, который доминирует на влажном средилесном лугу.