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ICHNEUMONIDAE (*HYMENOPTERA*) OF MOIST MEADOWS ON THE MAZOVIAN LOWLAND

ABSTRACT

Over 280 species of *Ichneumonidae* were recorded on exploited meadows of the association *Arrhenatheretum medioeuropaeum* Br.-Bl. on the Mazovian Lowland. The species dominating were *Aclastus minutus* (Bridgm.) and *Stenomacrus* sp. Out of the six distinguished *Ichneumonidae* guilds bound to specific biotic groups of hosts, the greatest number of species was recorded for parasitoids of phytophages, while the greatest abundance — for parasitoids of zoophages, the parasitoids of *Aranei* in particular. In the course of seasonal changes in abundance, two maxima were observed in summer. Also the greatest amount of species was recorded in summer.

INTRODUCTION

Ichneumonidae living in biocoenoses of moist meadows have not been subject to any research so far. As regards open habitats under agricultural use in Poland, studies were carried out on field *Ichneumonidae* (Kościelska 1959) and on those occurring in some chosen field crops, namely in cereals (Miczulski 1983) and in rapeseed crops (Miczulski 1966). In West Germany, *Ichneumonidae* of open seaside regions in Schleswig-Holstein were thoroughly examined (Horstmann 1970, 1985). Moreover, some scarce data on the occurrence of *Ichneumonidae* on various crop fields and meadows may be found in some papers (Bańkowska et al. 1975, Bauer 1961, Boness 1953).

The larvae of *Ichneumonidae* are parasitoids which perform a significant function in reducing the number of insects and *Aranei* in ecosystems. In meadow biocoenoses they are a regular and numerously occurring element of fauna, functioning as a factor diminishing the number of phytophages, zoophages and saprophages in this habitats.

Therefore it was important and purposeful to examine the number, species

composition and dominance structure of the communities of *Ichneumonidae* living in meadow biocoenoses, as well as to define their trophic relationships, which, in turn, was the basis for determining their role in this environment. Certain information on *Ichneumonidae* was also acquired from phenological analyses.

The studies were conducted on four exploited meadows, identified to belong to the association *Arrhenatheretum medioeuropaeum* Br.-Bl. (Kotowska, Okołowicz 1989). The basic quantitative material, amounting to about 2,800 specimens, was collected on a repeatedly mown meadow at Chylice near Warsaw, where flying insects were sampled by employing seven methods[1]: in yellow pan traps for 3 seasons (568 specimens), in window traps (1,271 specimens), in control vessels (87 specimens), in Malaise traps (451 specimens), in biocoenometers (180 specimens), with an entomological sweep-net for 3 seasons (224 specimens) and in Barber traps (20 specimens). The supplementary material for qualitative analyses was sampled by the method of sweeping on the three other meadows, i.e. Klembów at Warsaw (88 specimens), Białołęka Dworska (Warsaw) (66 specimens) and on the pasture in Zbroszki at Pułtusk (113 specimens). Altogether the study material included about 3,070 specimens.

ANALYSIS OF MATERIAL

ABUNDANCE AND DENSITY

The index of abundance of *Ichneumonidae* on a regularly mown meadow in Chylice sampled by means of the yellow pan trap method (Moericke's trap) considerably differed in particular years of studies, most probably due to different weather conditions. In 1981, under conditions of abundant precipitation and low air temperatures, their abundance amounted to 0.5 individuals per trap per 24 hours, and it was twice as large as in particularly dry and hot year of 1982 and 1983, when they numbered 0.18 and 0.25, respectively. However, the abundances of *Ichneumonidae* swept with an entomological net in the three years of experiment were approximately the same (0.38–0.40 individuals per sample). Thus it may be concluded that in the periods of drought *Ichneumonidae* did not transfer to moister habitats, e.g. onto the edges of the meadow, yet only their activity in penetration of the meadow dwindled, which, naturally, diminished their catchability in the yellow pan traps. The abundances recorded on the studied meadow were 2–6 times smaller than those estimated in the canopy of a linden-oak-hornbeam forest (Sawoniewicz 1986).

As compared to the regularly mown meadow at Chylice, the pasture at Zbroszki was marked for almost two times greater abundance of swept *Ichneumonidae*

[1] The comparison of methods may be found in a separate paper.

(0.6 and 0.8 individuals per sample). The greater abundance of *Ichneumonidae* recorded in pasture conditions may have resulted from purely technical aspect of sampling itself, namely sweeping over low grass (pasture) was more effective than over tall grass, which greatly hindered this form of sampling flying insects.

The density of *Ichneumonidae* at Chylice was calculated by means of biocoenometers arranged on the meadow. *Ichneumonidae* hatching there have been trapped for 5 months (from June till October, the biocoenometers having been redistributed every two weeks). During the sampling time, approximately 64 individuals per 1 m^2 were caught, i.e. 0.42 individuals per 1 m^2 per 24 hours. As compared to the counts of number sampled in yellow pan traps, i.e. 0.5 individuals per 1 pan per 24 hours, it follows that in 24 hours in one yellow pan *Ichneumonidae* hatching on the area of 1.2 m^2 of the meadow were trapped. Correspondingly, in one Malaise trap *Ichneumonidae* hatching on the area of 2.4 m^2 were caught, while window traps collected *Ichneumonidae* hatching on the area of 6.6 m^2. Hence window traps were considered most effective in quantity as well as in quality samplings of *Ichneumonidae* on the studied meadow.

SPECIES COMPOSITION AND DOMINANCE

The number of *Ichneumonidae* species recorded on the examined meadows totalled 282 (Tab. 1). This number, obviously, did not include all the species occurring in the studied environments, their total being, undoubtedly, greater. On the meadow at Chylice 240 species were noted; 64 species were common for all the studied meadows and 42 species complemented the list of species recorded at Chylice.

On the basis of the whole sampled material it was observed that the dominance structure of *Ichneumonidae* on the regularly mown meadow at Chylice was marked for a pronounced dominance of two species, a few subdominant species and a few hundred accessorial species (Fig. 1). The dominating species were *Aclastus minutus* (14.2%) and *Stenomacrus* sp. (9.1%). The larvae of the former infest *Aranei* eggs laid in cocoons, while the latter infest larvae of saprophagous *Diptera*. As regards subdominants (5–2%), there also were recorded parasitoids of *Aranei* laid eggs (*Gelis spinulus*, G. *micrurus* and *Aclastus solutus*), parasitoids of *Microlepidoptera* (*Lissonota coracina*), parasitoids of saprophagous *Coleoptera*, i.e. *Byrrhidae* and *Staphylinidae* (*Barycnemis harpura*), of egzophytophagous grazing *Symphyta* (*Schenkia graminicola* and *Eridolius* sp.), of aphidophagous *Syrphidae* (*Sussaba flavipes* and *Promethes sulcator*), of soil-saprophagous *Diptera* (*Mesoleptus ripicolus* and *Atractodes croceicornis*), and of small phytophagous *Coleoptera* (*Probles neoversutus*).

In successive years of the experiment, the values of dominance index of particular species were subject to some minor alterations, but the basic dominance

Table 1. Check list of *Ichneumonidae* species recorded on moist meadows of the Mazovian Lowland, their trophic interrelations and periods of imagines occurrence

(+++ — dominating species, ++ — numerously occurring species, + — scarce species; hosts: Mph — gall-forming, leaf-mining and leaf-folding; L and Sa — egzophytophagous *Lepidoptera* and *Symphyta*; A — *Aranei*; Sy and Nu — aphidophagous *Syrphidae* and *Neuroptera*; P — parasitoids; D and C — saprophagous *Diptera* and *Coleoptera*; occurrence of imagines: Sp — spring, Sm — summer, Au — autumn, Pn — throughout the whole study period)

No.	Species	Locality				Hosts	Occurrence
		Klembów	Białołęka Dworska	Chylice	Zbroszki		
1	2	3	4	5	6	7	8
	Pimplinae						
1	*Zaglyptus varipes* (Grav.)	—	+	—	—	A	Sp
2	*Itoplectis alternans* (Grav.)	—	+	—	—	Mph,L Sa,P	Au
3	*Itoplectis maculator* (Fabr.)	—	—	+	—	Mph,L P	Sm
4	*Pimpla contemplator* (Müll.)	—	+	—	—	Mph,L	Sm
5	*Pimpla geniculata* Hensch	—	+	—	—	Mph	Sm
6	*Pimpla melanacrias* Perk.	—	—	+	+	Mph	Sm
7	*Pimpla spuria* Grav.	—	—	+	—	Mph	Au
	Tryphoninae						
8	*Ctenochira propinqua* (Grav.)	—	—	+	—	Sa	Sm
9	*Ctenochira* sp.	—	—	+	—	Sa	Au
10	*Polyblastus varitarsus* (Grav.)	—	+	++	—	Sa	Sm-Au
11	*Tryphon auricularis* Thoms.	—	+	+	—	Sa	Sm
12	*Tryphon brunniventris* Grav.	—	—	+	—	Sa	Sm
13	*Tryphon nigrinus* Brischke	—	—	+	—	Sa	Sp
14	*Tryphon obtusator* (Thunb.)	+	++	+	—	Sa	Sp
15	*Tryphon rutilator* (L.)	—	—	—	+	Sa	Sp
16	*Tryphon thomsoni* Roman	—	+	—	—	Sa	Sm
17	*Tryphon trochanteratus* Holmgr.	—	—	+	—	Sa	Sm
18	*Exyston sponsorius* (Fabr.)	—	—	+	—	Sa	Sm
19	*Eridolius hofferi* (Gregor)	—	—	+	—	Sa	Au
20	*Eridolius* sp. 1	+	+	++	—	Sa	Pn
—	*Eridolius* spp. (2 species)	—	—	+	—	Sa	Sm-Au
	Eucerotinae						
21	*Euceros pruinosus* (Grav.)	—	—	+	—	P	Sm
	Labeninae						
22	*Brachycyrtus ornatus* Kriechb.	—	—	—	+	Nu	Sm
	Phygadeuontinae						
23	*Acrolyta distincta* (Bridgm.)	+	+	+	—	P	Sm-Au
24	*Acrolyta submarginata* (Bridgm.)	—	—	+	—	P	Sm-Au
25	*Lysibia nanus* (Grav.)	—	—	++	+	P	Pn
26	*Aclastus gracilis* (Thoms.)	—	—	++	+	A	Sm-Au

1	2	3	4	5	6	7	8
27	*Aclastus flavipes* Horstm.	—	—	+	—	A	Sm-Au
28	*Aclastus micator* (Grav.)	—	—	+	—	A	Au
29	*Aclastus minutus* (Bridgm.)	+++	+	+++	—	A	Pn
30	*Aclastus solutus* (Thoms.)	—	+	+++	+	A	Sm-Au
31	*Xiphulcus floricolator* (Grav.)	—	—	—	+	?A	Sp
32	*Dichrogaster aestivalis* (Grav.)	—	—	+	+	Nu	Sm
33	*Dichrogaster longicaudatus* (Thoms.)	—	—	+	—	Nu	Sm-Au
34	*Dichrogaster mandibularis* Horstm.	—	—	+	—	Nu	Au
35	*Gelis instabilis* (Först.)	—	—	+	+	P	Sm-Au
36	*Gelis micrurus* (Thoms.)	—	+	+++	—	A	Sm
37	*Gelis spinulus* (Thoms.)	+	+	+++	++	A	Sm-Au
38	*Gelis sulcatus* (Blunck)	—	—	+	—	P	Sm-Au
—	*Gelis* spp. (10 species)	—	+	+	+	A	Sm-Au
39	*Zoophthorus graculus* (Grav.)	—	—	+	—	Mph	Sm
40	*Mastrus castaneus* (Taschenb.)	—	—	+	—	Sa,P	Au
41	*Mastrus sordipes* (Grav.)	—	—	+	—	Sa,P	Au
42	*Rhembobius perscrutator* (Thunb.)	—	—	+	—	D	Sm
43	*Rhembobius quadrispinus* (Grav.)	—	—	+	—	D	Au
44	*Ethelurgus vulnerator* (Grav.)	—	—	+	—	Sy	Sm
45	*Glyphicnemis profilgator* (Fabr.)	—	—	+	—	Sa	Sm
46	*Endasys* sp. 1	—	—	+	—	Sa	Sm
47	*Endasys* sp. 2	—	—	+	—	Sa	Sm
48	*Bathythrix claviger* (Taschenb.)	—	+	—	—	Sa	Sp
49	*Bathythrix decipiens* (Grav.)	—	—	+	—	P	Sm
50	*Bathythrix maculata* (Hell.)	+	—	+	—	P	Pn
51	*Bathythrix pellucidator* (Grav.)	—	+	—	—	Sy	Sp
52	*Bathythrix pleuralis* Sawon.	—	—	+	—	?	Sm
53	*Bathythrix thomsoni* (Kerr.)	—	+	—	—	P	Sp
—	*Stibeutes* spp. (5 species)	+	—	+	—	?	Pn
54	*Theroscopus rufulus* (Gmel.)	—	—	+	—	?D	Sm
55	*Theroscopus pedestris* (Fabr.)	—	+	+	—	?D, ?Sa	Sm
56	*Theroscopus semicrocerus* (Schmiedekn.)	—	—	++	—	?D	Sm-Au
—	*Theroscopus* spp. (5 species)	+	+	+	+	?D	Pn
57	*Phygadeuon ovatus* Grav.	—	+	—	—	Sy	Sm
58	*Phygadeuon rotundipennis* Thoms.	—	+	—	—	D	Sm
59	*Phygadeuon subtilis* Grav.	—	—	++	+	D	Sm-Au
—	*Phygadeuon* spp. (ca. 15 species)	+	+	+	+	D	Pn
60	*Phygadeuon* sp.	—	—	+	—	?	Au
61	*Creatophygadeuon maritimus* Horstm.	—	—	+	—	D	Sm
62	*Ceratophygadeuon* sp.	—	—	+	—	D	Sm
63	*Stilpnus* sp.	—	—	+	—	D	Sm
64	*Atractodes croceicornis* Hal.	++	+	++	+	D	Pn
65	*Atractodes assimilis* Först.	—	—	+	—	D	Sm
66	*Atractodes* sp.	—	—	+	—	D	Au
67	*Mesoleptus laevigatus* (Grav.)	—	—	+	—	D	Sm-Au
68	*Mesoleptus ripicolus* (Thoms.)	—	—	++	++	D	Sm-Au
69	*Mesoleptus scrutator* (Hal.)	—	—	+	—	D	Sm

1	2	3	4	5	6	7	8
70	*Cremnodes atricapilus* (Grav.)	—	—	+	—	Mph	Sm
71	*Cremnodes* sp.	—	+	++	—	?Mph	Sm
72	*Pleolophus micropterus* (Grav.)	—	—	+	—	Sa	Sm
73	*Parmartha pleuralis* (Thoms.)	—	—	+	—	Mph	Au
74	*Cubocephalus sperator* (Müll.)	—	—	+	—	Mph	Sm-Au
75	*Schenkia graminicola* (Grav.)	+	+	++	+	Sa	Pn
76	*Aptesis nigrocincta* (Grav.)	—	+	+	—	Sa	Sm
77	*Aptesis gravipes* (Grav.)	—	—	+	+	Sa	Sm-Au
78	*Aptesis* sp.	—	+	—	—	Sa	Sm
79	*Agrothereutes abbreviator* (Fabr.)	—	+	—	—	Sa	Au
80	*Gambrus tricolor* (Grav.)	—	—	+	—	L	Sm-Au
81	*Gambrus* sp.	—	—	—	+	L	Sm
82	*Ischnus alternans* (Grav.)	—	—	+	—	Mph	Au
83	*Ischnus inquisitorius* (Müll.)	—	—	—	+	Mph	Sm
84	*Pycnocryptus director* (Thunb.)	—	++	++	+	Mph	Sm
85	*Cryptus viduatorius* (Fabr.)	—	+	+	—	Mph	Sm
86	*Buathra laborator* (Thunb.)	—	+	—	—	L	Sm
87	*Trychosis legator* (Thunb.)	—	+	+	+	A	Sm
88	*Hidryta sordida* (Tschek)	—	—	+	—	A	Sm
89	*Idiolispa analis* (Grav.)	+	—	—	—	A	Sp
	Banchinae						
90	*Lissonota coracina* (Gmel.)	+	+++	+++	+	Mph	Sm-Au
91	*Lissonota fundator* (Thunb.)	—	+	++	—	Mph	Sm-Au
92	*Lissonota clypeator* Grav.	—	—	+	—	Mph	Sm
93	*Lissonota histrio* (Fabr.)	—	+	—	—	Mph	Sm
94	*Meniscus catenator* (Panz.)	—	+	—	—	Mph	Au
95	*Lissonota proxima* (Fonscol.)	—	—	+	—	Mph	Au
96	*Cryptopimpla quadrilineata* (Grav.)	—	—	+	—	Mph	Sm
97	*Glypta ?bifoveolata* Grav.	—	—	+	—	Mph	Sm
	Ctenopelmatinae						
98	*Olethrodotis modesta* (Grav.)	—	—	+	—	Mph	Sp
99	*Sympherta ambulator* (Thunb.)	—	—	+	—	Sa	Sm
100	*Perilissus filicornis* (Grav.)	—	+	+	—	Sa	Sp
101	*Perilissus lutescens* Holmgr.	—	+	—	—	Sa	Sm
—	*Perilissus spp.* (3 species)	—	—	+	—	Sa	Pn
102	*Lathrolestes* sp.	—	—	+	—	Sa	Sm
103	*Synomelix albipes* (Grav.)	—	—	+	—	Sa	Sm
104	*Euryproctus geniculosus* (Grav.)	—	—	+	—	Sa	Au
105	*Rhorus longicornis* (Holmgr.)	—	+	—	—	Sa	Sm
106	*Synodites* sp.	—	—	+	—	Sa	Sm
107	*Phobetes atomator* (Müll.)	—	—	++	—	Sa	Sm-Au
108	*Phobetes* sp.	—	—	+	—	Sa	Sm
109	*Pantorhaestes xanthostomus* (Grav.)	—	—	+	—	Sa	Sm-Au
110	*Alexeter sectator* (Thunb.)	—	—	+	—	Sa	Sm-Au
111	*?Otlophorus* sp.	—	—	+	—	Sa	Sm
—	*Mesoleius* spp. (2 species)	—	—	+	—	Sa	Pn
112	*Hadrodactylus fugax* (Grav.)	—	—	++	—	Sa	Sm-Au
113	*Hadrodactylus* sp. 1	—	—	+	—	Sa	Sm

1	2	3	4	5	6	7	8
114	?*Hadrodactylus* sp. 2	—	—	+	—	Sa	Sp,Au
	Campopleginae						
115	*Casinaria petiolaris* (Grav.)	—	—	+	+	L	Sm-Au
116	*Cymodusa leucocera* Holmgr.	—	—	++	+	L	Sm-Au
117	*Pyracmon fuscipennis* (Zett.)	—	—	+	—	?Mph	Sm
118	*Nepiera collector* (Thunb.)	—	—	—	+	Mph	Sm
—	*Dysona* spp. (3 species)	—	—	+	—	L	Sp-Sm
119	*Campoletis annulata* (Grav.)	—	—	+	—	L	Au
120	*Campoletis erythropa* (Thoms.)	—	—	+	—	L	Sm
121	*Campoletis maculipes* (Tschek)	—	—	+	—	L	Sm
122	*Campoletis zonata* (Grav.)	—	—	+	—	L	Sm-Au
123	*Campoletis* sp.	—	—	+	—	L	Sm-Au
124	*Spudastica kriechbaumeri* (Bridgm.)	—	—	+	—	Mph	Sp
125	*Bathyplectes anurus contractus* (Thoms.)	—	—	+	—	Mph	Sp
126	*Bathyplectes quinquengularis* (Ratz.)	—	—	+	—	Mph	Sp
127	*Biolysia immolator* (Grav.)	—	—	+	—	Mph	Sp
128	*Diadegma fenestralis* (Holmgr.)	—	—	++	+	Mph	Pn
129	*Diadegma crassicornis* (Grav.)	—	—	+	—	Mph	Sm
130	*Diadegma elongata* (Thoms.)	—	—	+	—	Mph	Sm
131	*Diadegma neomajalis* Horstm.	—	—	+	—	Mph	Sm
—	*Diadegma* spp. (6 species)	—	+	+	—	Mph	Sm-Au
132	*Hyposoter ebenina* (Grav.)	—	+	—	—	L	Sm
133	*Hyposoter didymator* (Thunb.)	—	—	+	—	L	Au
134	*Hyposoter* sp.	—	+	+	—	L	Sm
135	*Olesicampe fulcrans* Thoms.	—	—	+	—	Sa	Sp
—	*Olesicampe* spp. (2 species)	—	—	+	—	Sa	Sm
	Cremastinae						
136	*Temelucha interruptor* (Grav.)	—	—	—	+	Mph	Sm
137	*Cremastus infirmus* (Grav.)	—	++	—	—	Mph	Sm
	Tersilochinae						
138	*Tersilochus jocator* Holmgr.	—	—	+	—	Mph	Sp
139	*Tersilochus* sp.	+	—	+	—	Mph	Sp-Sm
140	?*Epistathmus* sp.	—	—	+	—	Mph	Sm
141	*Sathropterus pumilus* (Holmgr.)	—	—	++	+	Mph	Sm
142	*Aneuclis melanarius* (Holmgr.)	—	—	+	—	Mph	Sp
143	*Aneuclis maritimus* (Thoms.)	—	—	+	—	Mph	Sm-Au
144	*Probles neoversutus* (Horstm.)	—	+	++	+	Mph	Sm-Au
145	*Probles* sp.	—	—	+	—	Mph	Sm
146	*Phradis morionellus* (Holmgr.)	—	—	+	—	Mph	Sm
147	*Barycnemis harpura* (Schrank)	—	+	+++	+++	C	Sm-Au
148	*Barycnemis* sp.	—	—	+	—	C	Sm
149	*Gonolochus caudatus* (Holmgr.)	+	—	+	—	Mph	Sp-Sm
—	*Diaparsis* spp. (2 species)	—	—	+	—	Mph	Sm
	Mesochorinae						
150	*Mesochorus vitticollis* Holmgr.	—	—	++	—	P	Sm
—	*Mesochorus* spp. (6 species)	—	—	+	+	P	Sm-Au
	Metopiinae						
151	*Exochus consimilis* Holmgr.	—	—	++	—	Mph	Sm-Au

1	2	3	4	5	6	7	8
	Oxytorinae						
152	*Cylloceria caligata* (Grav.)	—	—	+	—	D	Au
153	*Catastenus femoralis* Först.	—	—	+	—	D	Sm
—	*Helictes* spp. (3 species)	—	—	+	+	D	Pn
—	*Eusterinx* spp. (4 species)	—	—	+	—	D	Sm
154	*Megastylus* sp.	—	—	+	—	D	Sm-Au
155	*Aperileptus* sp.	—	—	+	—	D	Sm
—	*Plectiscidea* spp. (2 species)	—	—	+	—	D	Sm-Au
156	*Microleptes* sp.	—	—	++	—	D	Sm
	Orthocentrinae						
157	*Stenomacrus* sp.	++	+	+++	—	D	Sm-Au
—	*Stenomacrus* spp. (3–4 species)	+	+	+	—	D	Sm-Au
158	*Orthocentrus* sp.	—	—	+	—	D	Sm
	Diplazontinae						
159	*Syrphoctonus elegans* (Grav.)	+	—	—	—	Sy	Sm
160	*Syrphoctonus signatus* (Grav.)	—	—	+	—	Sy	Sm
161	*Syrphoctonus strigator* (Fabr.)	—	+	—	—	Sy	Sm
162	*Syrphoctonus tarsatorius* (Panz.)	—	+	—	—	Sy	Sm
163	*Syrphoctonus* sp.	+	—	—	—	Sy	Sm
164	*Enizemum ornatum* (Grav.)	—	—	+	—	Sy	Sm
165	*Woldstedtius bigutattus* (Grav.)	+	—	+	—	Sy	Sm
166	*Syrphophilus bizonarius* (Grav.)	—	—	+	+	Sy	Sm-Au
167	*Tymmophorus rufiventris* (Grav.)	++	—	++	—	Sy	Sm-Au
168	*Diplazon laetatorius* (Fabr.)	—	—	+	++	Sy	Pn
169	*Promethes sulcator* (Grav.)	+	++	++	+	Sy	Sm-Au
170	*Sussaba cognata* (Holmgr.)	+	—	+	+	Sy	Sm
171	*Sussaba pulchella* (Holmgr.)	—	+	+	++	Sy	Sm
172	*Sussaba dorsalis* (Holmgr.)	+	—	+	—	Sy	Sm-Au
173	*Sussaba flavipes* (Lucas)	++	+	++	+	Sy	Pn
174	*Sussaba erigator* (Fabr.)	—	+	—	+	Sy	Sm
	Ichneumoninae						
175	*Vulgichneumon suavis* (Grav.)	—	+	+	—	L	Sm
176	*Barichneumon bimaculatus* (Schrank)	—	+	—	—	L	Sm
177	*Barichneumon praeceptor* (Thunb.)	—	+	—	—	L	Sm
178	*Chasmias motatorius* (Fabr.)	—	—	+	—	L	Sm-Au
179	*Ichneumon confusor* Grav.	+	—	+	—	L	Sm
180	*Ichneumon latrator* Fabr.	—	—	+	—	L	Au
181	*Ichneumon sarcitorius* L.	—	—	+	—	L	Au
182	*Ichneumon* sp.	—	—	+	—	L	Sm
183	*Ichneumon nereni* Thoms.	—	—	+	—	L	Sm-Au
184	*Probolus concinnus* (Wesm.)	—	—	+	—	L	Au
185	*Eutanyacra pallidicornis* (Grav.)	—	—	+	—	L	Sm-Au
186	*Diphyus pulchellus* (Christ)	—	—	+	—	L	Sm
187	*Spilichneumon ammonius* (Grav.)	—	—	+	—	L	Sm
188	*Achaius oratorius* (Fabr.)	—	—	+	—	L	Sm
189	*Limerodes arctiventris* (Boie)	—	—	+	—	L	Sm-Au
190	*Exephanes ischioxanthus* (Grav.)	—	+	+	—	L	Sp-Sm
191	*Hoplismenus albifrons* (Grav.)	—	—	+	—	L	Sm

1	2	3	4	5	6	7	8
192	*Linycus exhortator* (Fabr.)	—	—	+	—	Mph	Sp
193	*Pseudoplatylabus violentus* (Grav.)	—	—	+	—	L	Sp
194	*Heterischnus truncator* (Fabr.)	—	+	—	—	Mph	Sp
195	*Epitomus infuscatus* (Grav.)	—	—	+	—	Mph	Sm-Au
196	*Diadromus* sp.	—	—	+	—	Mph	Sm
197	*Centeterus opprimator* (Grav.)	—	—	—	+	Mph	Sm
198	*Colpognathus celerator* (Grav.)	—	—	+	—	Mph	Sm
199	*Colpognathus armatus* Thoms.	—	—	+	—	Mph	Sm
200	*Colpognathus divisus* Thoms.	+	—	+	—	Mph	Sm-Au
201	*Oronotus binotatus* (Grav.)	—	—	+	—	Mph	Sm-Au
202	*Aethecerus dispar* Wesm.	—	+	—	—	Mph	Sm
203	*Aethecerus* sp.	—	—	+	—	Mph	Sm
204	*Phaeogenes bellicornis* Wesm.	—	—	+	—	Mph	Sm
205	*Phaeogenes fuscicornis* Wesm.	—	—	+	—	Mph	Sp-Sm
—	*Phaeogenes* spp. (3 species)	—	—	+	—	Mph	Sm

pattern and subdominance pattern remained unchanged. Only *A. croceicornis* (the 1981 subdominant) was replaced by *M. ripicolus* (the 1983 subdominant), and a considerable decrease was noted in the proportion of *P. neoversutus* and *P. sulcator*.

Some of the dominating and subdominating species were common for all the studied meadows. These included such numerously occurring species as *A. minutus*, *B. harpura*, *S. flavipes* and *L. coracina*. The proportion of *Stenomacrus* sp., i.e. of the Chylice meadow dominant, was small on all the other meadows studied.

Surprisingly enough, only a few species represented by single individuals of the family *Pimplinae* were noted on the meadow under research. Furthermore, not a single individual of the family of subfamilies *Anomaloniinae*, *Adelognathinae* and *Collyrinae* was recorded, though many of them rank among the parasitoids of *Aranei*, *Lepidoptera* and *Symphyta*. Most likely microhabitational conditions specific for this environment as well as the lack of adequate hosts, precluded the occurrence of parasitoids of any of these subfamilies.

Many of the recorded species were noted to occur in other open habitats. For instance, 7 species of the subfamily *Diplazontinae* were common for the studied meadows and alfalfa fields (Bańkowska et al.), several *Ichneumonidae* species had been noted among the field fauna (Kościelska 1959), or occurred on cereals and rapeseed crops (Miczulski 1966, 1983). *Aclastus minutus* dominated also on seaside meadows in West Germany (Horstmann 1970, 1985), while on moist-like meadows in West Germany the following species were recorded: *Diplazon laetatorius*, *Promethes sulcatus*, *Aclastus gracilis* (Boness 1953).

Species sampled on meadows could sometimes be found in forest habitats (in tree stands), namely certain species of *Diplazontinae*, ecopolyphages *Itoplectis*

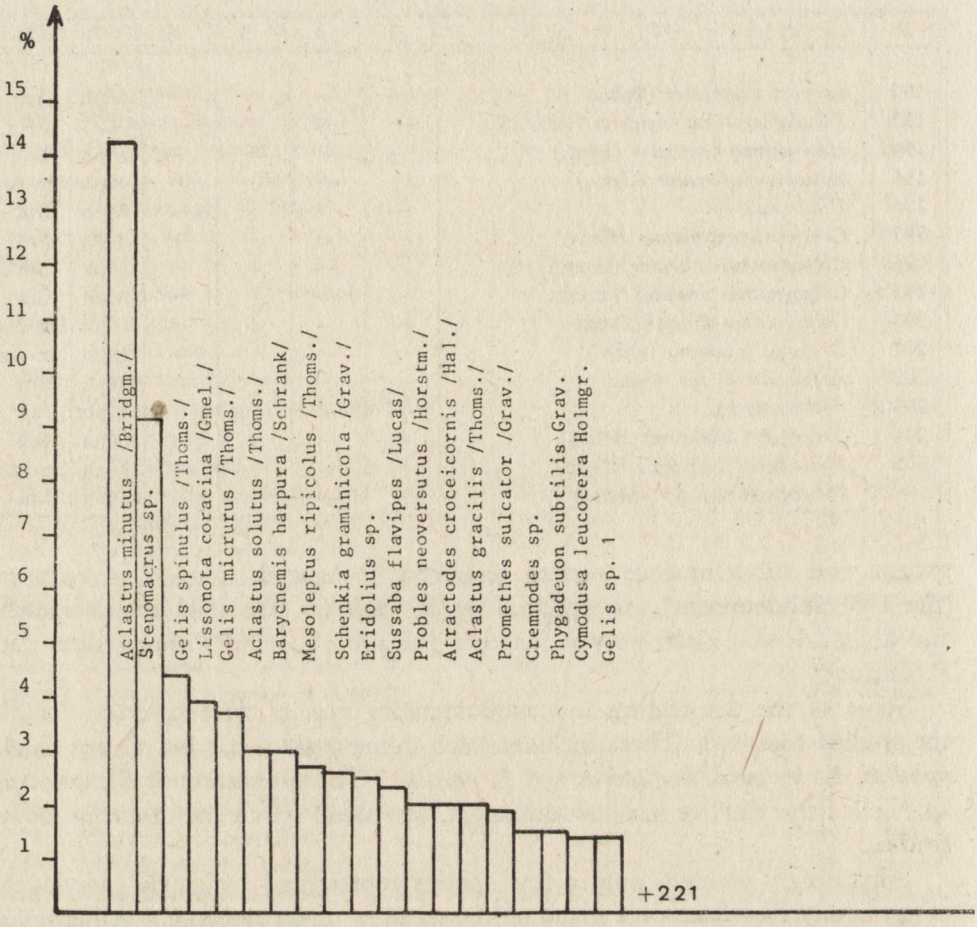

Fig. 1. *Ichneumonidae* dominance structure on the regularly mown meadow at Chylice

alternans, *I. maculator*. As regards the meadow subdominant species, *Barycnemis harpura* was an exceptional species, large numbers of which had also been recorded in pine stands on coniferous forest sites.

TROPHIC GUILDS

Considering their proper position in the trophic structure, *Ichneumonidae* sampled on the studied meadows were classified into 6 guilds of parasitoids associated with specific biotic groups of their hosts. This grouping was based on the classification of parasitoids by Garbarczyk and Sawoniewicz (1984), as well as on data on hosts available in literature (e.g. Owen et al. 1981) (Tabs 1 and 2).

In the entire sampled *Ichneumonidae* material, the greatest number of species belonged to the guild of parasitoids of grazing egzophytophages (52 species of

Table 2. The number of species (N), the abundance (n') and percentage of *Ichneumonidae* associated with specific biotic groups of hosts on the moist meadows under use

Group of hosts		All the studied meadows		Chylice 1981 yellow pantrap	
	Locality	N[1]	%N	n'	%n'
Phytophages	Gall-forming, leaf-mining, and leaf-folding (Mph)	71	25.2	0.070	13.7
	Grazing egzophytophages (L+Sa)	89	31.5	0.036	7.1
	Total	160	56.7	0.106	20.8
Zoophages	General predators — *Aranei* (A)	22	7.8	0.213	42.9
	Predators — aphidophages (Sy + Nu)	23	8.2	0.042	8.4
	Parasitoids (P)	16	5.7	0.004	0.9
	Total	61	21.7	0.259	52.2
Saprophages (D + C)		54	19.1	0.134	27.0
Unknown host		7	2.5	—	—
Total		282	100.0	0.499	100.0

[1] Total number of *Ichneumonidae* species sampled on all the studied sites and by means of all the employed methods.

parasitoids of *Symphyta* — Sa and 37 species of parasitoids of *Lepidoptera* — L), followed by the guild of parasitoids of gall-forming, leaf-mining and leaf-folding phytophages (Lph — 71 species). Thus the number of species of parasitoids of phytophages (160 species) accounted for 57% of the total number of species of the recorded *Ichneumonidae* and was 2.6 times higher than the number of species of parasitoids of zoophages and about 3 times greater than the number of species of parasitoids of saprophages.

Of the six distinguished *Ichneumonidae* guilds the parasitoids of general predators (*Aranei*) were particularly important for the reason of their high abundance in spite of the small number of species. They accounted for 43% of the total *Ichneumonidae* abundance, and, consequently, parasitoids of zoophages made up over 52% of all the *Ichneumonidae* and their abundance was at least twice as large as that of parasitoids of phytophages or of parasitoids of saprophages.

The analysed relations among parasitoid guilds on meadows were totally different from those observed among parasitoid guilds in the canopy of the linden-oak-hornbeam forest. The number of parasitoids of phytophages in the latter was 5 times larger than that of zoophages (Sawoniewicz 1986).

As regards plant protection and soil processes, almost 80% of *Ichneumonidae*

belonging to about 115 species (40% of all the recorded species) may have an unfavourable effect on meadow biocoenoses through the reduction of predators, parasitoids and saprophages.

PHENOLOGY

The course of seasonal changes in *Ichneumonidae* abundance on the mown meadow at Chylice in 1981 was marked for one apparent maximum in the beginning of summer (by the end of June) and for one, much less pronounced, peak at the end of summer (by the end of August) (Fig. 2). Subsequent abundance peaks were observed to follow successive mowings. This was probably caused by the fact that grass mowings not only aroused *Ichneumonidae* activity, but also fully exposed the traps. Consequently, there were noted short periods of an increased trap efficiency. Already then a certain number of individuals could leave the meadow. Then, in a short period, rapid stabilization was observed of activity and density of *Ichneumonidae* under new habitat conditions, which, in turn, was reflected in a decrease in trappability. Furthermore, this phenomenon may have additionally been strongly influenced by variable weather conditions, since all the quantitative changes were closely related to *Ichneumonidae* phenology.

In the summer months, along with the greatest abundance of *Ichneumonidae*, also the greatest number of their species was recorded (Tabs 1 and 3). Altogether, in summer 197 species were recorded, which accounted for about 70% of the total species' number.

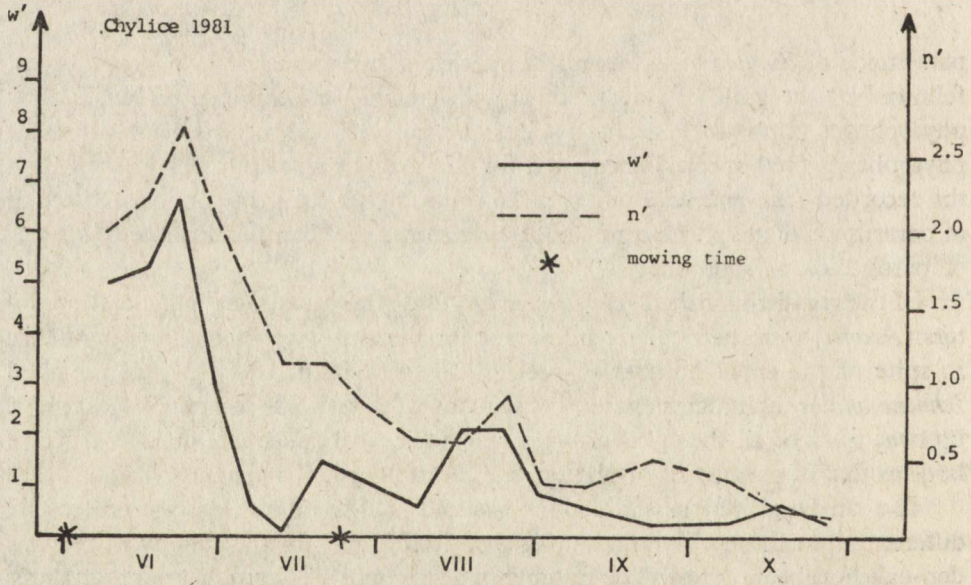

Fig. 2. Dynamics of sampling of *Ichneumonidae* imagines in yellow pan traps (n' — the number of individuals per pan trap per 24 hours) and window traps (w' — number of individuals per window trap per 24 hours) on the mown meadow at Chylice

Table 3. The number of species and percentage of *Ichneumonidae* of moist meadows recorded in particular phenological seasons: Sp — spring, Sm — summer, Au — autumn, and Pn — throughout the whole period of studies

Phenological seasons	Sp	Sp–Sm	Sm	Sm–Au	Au	Pn
Months	IV–V	IV–VIII	VI–VIII	VI–XI	IX–XI	IV–XI
Number of species	23	7	128	62	36	26
Percentage contribution	8.2	2.5	45.3	22.0	12.8	9.2

SUMMARY

Moist meadows under use, though being relatively a homogeneous environment of a little, if any, vegetation diversity (both as regards the species composition and areal lay-out), were marked for a large number of *Ichneumonidae* species and their low abundance. Over 280 species, i.e. approximately 10% of all the *Ichneumonidae* species occurring in Poland found favourable living conditions there.

In the mown meadow habitat a pronounced dominance was noted of *Aclastus minutus* and *Stenomacrus* sp. The larvae of the former parasitoid infest *Aranei* laid eggs, while those of the latter parasitize saprophagous *Diptera*.

Out of the six distinguished *Ichneumonidae* guilds associated with particular biotic groups of hosts, parasitoids of phytophages were observed to account for the greatest number of species at a relatively low abundance. On the other hand, the guild of parasitoids of predators (*Aranei* in particular), was characterized by a very high abundance at a relatively small number of species.

On the meadow at Chylice two maxima of *Ichneumonidae* abundance were observed, namely at the beginning and by the end of summer. Also, the greatest number of species was observed there in this period.

It is difficult to define the effect of *Ichneumonidae* on the ecosystem balance. High abundance of parasitoids of zoophages, mainly of *Aranei* and of saprophagous *Diptera* and *Coleoptera*, which are advantageous to the habitat, should be judged as unfavourable. Parasitoids of phytophages explicitly conduce to an increase in meadow productivity.

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ICHNEUMONIDAE (*HYMENOPTERA*) ŁĄK ŚWIEŻYCH NIZINY MAZOWIECKIEJ

STRESZCZENIE

Łącznie na użytkowanych łąkach świeżych zespołu *Arrhenatheretum medioeuropaeum* Br.-Bl. na Mazowszu w latach 1981–1984 zebrano 3070 osobników *Ichneumonidae* należących do ponad 280 gatunków (tabl. 1). Zasadniczy materiał odłowiono na wielokośnej łące w Chylicach za pomocą następujących metod: przegrody szklane, żółte miski, pułapki Malaise'a, pułapki Barbera, naczynia kontrolne, biocenometry i czerpak ilościowy. Uzupełniający materiał zebrano metodą czerpakowania na łąkach w Klembowie, Białołęce Dworskiej oraz na pastwisku w Zbroszkach.

Dla łąki wielokośnej w Chylicach wykazano 240 gatunków *Ichneumonidae*, a ich liczebność wynosiła 0,18–0,5 osobnika na dobo-miskę. Stwierdzono dwa gatunki dominujące (*Aclastus minutus* i *Stenomacrus* sp.), kilka subdominantów oraz kilkaset gatunków akcesorycznych (rys. 1). Z sześciu wyróżnionych kompleksów *Ichneumonidae*, związanych z określonymi grupami biotycznymi żywicieli, największą liczbę gatunków mają parazytoidy fitofagów (stanowią one blisko 75% ogólnej liczby gatunków), ale równocześnie charakteryzują się one stosunkowo niską liczebnością. Natomiast odwrotną sytuację odnotowano w przypadku parazytoidów drapieżników niewyspecjalizowanych (*Aranei*) oraz parazytoidów saprofagów, które to parazytoidy przy stosunkowo niedużej liczbie gatunków osiągają wysokie liczebności, około 2 razy wyższe niż parazytoidy fitofagów (tabl. 2).

Omawiana łąka charakteryzuje się dwoma szczytami występowania ilościowego *Ichneumonidae*, przypadającymi na okres lata (na początek i koniec lata) (rys. 2). Również w lecie występuje około 70% ogólnej liczby gatunków (tabl. 3).

Określenie wpływu *Ichneumonidae* na równowagę ekosystemów badanych łąk jest trudne. Należy raczej negatywnie ocenić wysoką liczebność parazytoidów zoofagów (głównie parazytoidów *Aranei*) oraz saprofagicznych *Diptera* i *Coleoptera*, które to zwierzęta często pełnią pozytywne role w badanym środowisku.

ICHNEUMONIDAE (*HYMENOPTERA*) СВЕЖИХ ЛУГОВ МАЗОВЕЦКОЙ НИЗМЕННОСТИ

РЕЗЮМЕ

На культивируемых лугах типа *Arrhenatheretum madioeuropaeum* Br.-Bl. в Мазовии констатировано свыше 280 видов *Ichneumonidae*. Доминирует *Aclastus minutus* (Bridgm.) и *Stenomacrus* sp. Из шести выделенных сообществ *Ichneumonidae*, связанных с определенными биотическими группами хозяев наибольшее количество видов относится к паразитоидам фитофагов, в то время как с точки зрения численности больше всего отмечено паразитоидов зоофагов (среди них, главным образом, паразитоиды *Aranei*). На протяжении сезона отмечены две вершины изменения численности, в летний период. В это время наблюдалось также самое большое количество видов.