

EWA SKIBIŃSKA

PREDATORY ACULEATA (HYMENOPTERA) OF MOIST MEADOWS ON  
THE MAZOVIAN LOWLAND

## ABSTRACT

Forty-nine species, of predatory *Aculeata* were recorded on a flowerless mown moist meadow (*Arrhenatheretum medioeuropaeum*). They included 31 *Sphecidae* species, 8 *Pompilidae*, 7 *Vespoidea* and 3 *Chrysididae*. The *Aculeata* fauna (of the specified families) of this environment was not numerous and, except for *Sphecidae*, poor as regards its species composition.

The majority of the examined *Aculeata* populated afforested areas, penetrating the meadow only in search of food.

Only 7 out of all the species identified in the sampled material were more tightly associated with the meadow environment, namely *Cerceris rybyensis*, *Argogorytes fargei*, *Nysson interruptus*, *Oxybelus umiglumis*, *O. victor*, *O. nigripes* among *Sphecidae*, and *Paravespula germanica* among *Vespoidea*.

## INTRODUCTION

The links binding predatory *Aculeata* to various environments have been so far scarcely dealt with in literature. A majority of the published faunistic works supplied only fragmentary data on the occurrence of these insects in their preferred sites, e.g. on blooming shrubs or on melliferous herbaceous plants, yet no data defining the type of the environment were provided. No studies have been ever conducted on the predatory *Aculeata* fauna occurring on open areas in Poland. The only available scanty information dealt with their occurrence on potato (Anasiewicz 1976) and rapeseed cultures (Miczulski 1967). The data provided by the whole European literature are very scarce as well. The only complex studies on the entire *Aculeata* fauna of open areas were published by Professor Šnoflak in 1944. The work comprised the characteristics of the insects on Mohelnske Hadcove Stepi, vast xerothermic areas in Czechoslovakia. Moreover, cer-

tain information on the occurrence of social wasps on Belgian meadows may be found in the work by Delmotte and Marchall (1982).

Complex studies on insect communities (including *Aculeata*) in various types of environments have been carried out at the Institute of Zoology, Polish Academy of Sciences, for the last ten years. Both natural and anthropogeneous environment have been examined.

In 1981–1983 intensive studies were conducted of fauna populating moist meadows. Several moist meadows on the Mazovian Lowland were subject to these examinations. The epiphytous fauna was sampled mainly with the use of the entomologic sweep-net. Moreover, on the meadow at Chylice samples were also taken by means of Moericke traps placed in grass and fastened to pegs 50 cm above the soil surface, by Malaise traps and window traps (Bańkowska 1989). Furthermore, catching single individuals with an entomological net was also practised. As regards *Aculeata* sampling, the most effective were Moericke's traps on pegs, as about 63% of all the collected material was sampled in this way. Sweep-netting was totally unapplicable for *Aculeata* sampling and so was the stalking method. For these reasons the present work considered the material coming solely from one meadow located at Chylice.

The meadow, spreading on 7 ha, is a mown grassland, which has been under use for the last 30 years. It is subject to intensive mineral fertilization and is mown 2–3 times in the vegetation season. Due to the manner of its exploitation, the studied meadow is almost totally flowerless. The dominating plant species include the meadow species of a high yield, namely, *Dactylis glomerata*, *Festuca pratensis*, *Taraxacum officinale* and *Poa pratensis*. Also a large proportion of fodder species is noted, i.e. of *Rumex acetosa*, *Phleum pratense*, *Festuca rubra* and *Knautia arvensis* (Kotowska, Okołowicz 1989). On the south the meadow borders on an ash-alder carr (*Circeo-Alnetum*), to the east it abuts on a road and some farm buildings surrounded with a small orchard and on the two other sides it adjoins a multi-hectare pasture of numerous cattle stock.

#### CHARACTERISTICS OF THE ACULEATA FAUNA

Altogether 49 species (*Sphécidae*, *Vespoidea*, *Pompilidae*, *Chrysididae*) were recorded on the moist meadow under studies (Tab. 1).

The sampled material was not numerous, as during 3 years of studies only 300 individuals were sampled in total by means of several sampling methods. The material sampled in other environments of the Mazovian Lowland, e.g. in forests or on city greens, was much ampler, though only one sampling method was applied, i.e. Moericke's traps hung in the canopy of trees.

*Sphécidae* occurred in relatively great numbers and in the greatest amount

Table 1. The list of predatory *Aculeata* species sampled on the moist meadow on the Mazovian Lowland (+++ — numerous, ++ — scarce, + — sporadic, — — not found)

No.	Method Species	Window traps	Moericke's traps		Sweep-net	Total
			on pegs	in grass		
1	2	3	4	5	6	7
1.	<i>Pemphredon inornatus</i> Say	—	+	—	—	+
2	<i>Passaloecus singularis</i> Dahlb.	+	—	—	—	+
3	<i>Stigmus pendulus</i> Panz.	+	+	—	—	+
4	<i>Mimumesa dahlbomi</i> (Wesm.)	—	—	—	+	+
5	<i>Psenulus fuscipennis</i> (Dahlb.)	+	—	—	—	+
6	<i>Psenulus schencki</i> (Tourn.)	—	+	—	—	+
7	<i>Psenulus laevigatus</i> (Schck.)	—	—	+	—	+
8	<i>Cerceris rybyensis</i> (L.)	—	+	+	—	+
9	<i>Argogorytes fargei</i> (Shuck.)	—	+	—	—	+
10	<i>Nysson interruptus</i> (Fabr.)	—	—	+	—	+
11	<i>Tachysphex nitidus</i> (Spin.)	—	+	—	—	+
12	<i>Trypoxylon attenuatum</i> Smith	+	—	—	—	+
13	<i>Trypoxylon figulus</i> (L.)	—	+	—	—	+
14	<i>Oxybelus uniglumis</i> (L.)	+	++	++	+	+++
15	<i>Oxybelus victor</i> Lep.	—	+	—	—	+
16	<i>Oxybelus nigripes</i> Oliv.	+	—	—	—	+
17	<i>Crabro cribrarius</i> (L.)	—	++	—	—	++
18	<i>Crabro scutellatus</i> (Schev.)	—	—	+	—	+
19	<i>Ectemnius continuus</i> (Fabr.)	+	+++	+	—	+++
20	<i>Ectemnius borealis</i> (Zett.)	+	—	—	—	+
21	<i>Ectemnius rubicola</i> (Dufour et Perris)	—	+	—	—	+
22	<i>Enthomognathus brevis</i> (v.d. Lind.)	+	+	—	—	+
23	<i>Lindenius albilabris</i> (Fabr.)	+	+	+	—	++
24	<i>Rhopalum coarctatum</i> (Scop.)	—	+	—	—	+
25	<i>Crossocerus quadrimaculatus</i> (Fabr.)	+	—	—	—	+
26	<i>Crossocerus ovalis</i> Lep. et Brul.	—	+	—	—	+
27	<i>Crossocerus elongatulus</i> (v. d. Lind.)	—	+	—	—	+
28	<i>Crossocerus wesmaeli</i> (v. d. Lind.)	—	++	+	—	++
29	<i>Crossocerus denticrus</i> Herr.-Schaeff.	—	—	—	+	+
30	<i>Crossocerus megacephalus</i> (Rossi)	—	+	—	—	+
31	<i>Crossocerus vagabundus</i> (Panz.)	—	+	—	—	+
32	<i>Paravespula germanica</i> (Fabr.)	+	+++	+	+	+++
33	<i>Paravespula rufa</i> (L.)	+	+	—	—	+
34	<i>Paravespula vulgaris</i> (L.)	—	+	—	—	+
35	<i>Gymnomerus laevipes</i> (Shuck.)	+	—	—	—	+

1	2	3	4	5	6	7
36	<i>Ancistrocerus auctus</i> (Fabr.)	+	—	—	—	+
37	<i>Ancistrocerus parietinus</i> (L.)	+	—	—	—	+
38	<i>Ancistrocerus parietum</i> (L.)	+	—	—	+	+
39	<i>Calidurgus fasciatellus</i> (Spinola)	—	+	—	—	+
40	<i>Priocnemis perturbator</i> (Harris)	—	—	+	—	+
41	<i>Priocnemis fennica</i> Haupt	+	—	—	—	+
42	<i>Anoplius concinnus</i> Dahlb.	—	—	+	—	+
43	<i>Anoplius infuscatus</i> v.d. Lind.	+	—	+	—	+
44	<i>Anoplius viaticus</i> L.	—	+	—	—	+
45	<i>Arachnospila abnormis</i> (Dahlb.)	—	—	+	—	+
46	<i>Arachnospila anceps</i> (Wesm.)	—	+	+	—	+
47	<i>Holopyga gloriosa</i> (Fabr.)	—	+	—	—	+
48	<i>Hedychrum nobile</i> (Scop.)	+	—	—	—	+
49	<i>Chrysis ignita</i> L.	—	+	—	—	+

of species. They accounted for about 60% of the whole sampled material and occurred in 31 species.

The majority were the species of a notable ecological amplitude, reported from deciduous and coniferous forests and city green. Twenty-three *Sphecidae* species sampled on the studied moist meadow were recorded on Mazovian forest areas and 21 species were noted to make up the fauna occurring in the canopy of trees in Warsaw (Skibińska 1986). *Sphecidae* belonging to these species nest among tree or shrub branches or in mouldering wood, hence they cannot be regarded as strongly associated with any open areas. They were observed to penetrate the meadow area only in search of food and to nest in adjacent tree or shrub plots.

Among *Sphecidae* recorded on the moist meadow a group may be distinguished, made up of several species, which could be termed as the ones preferring open areas. The data on bionomics of these species as well as the available faunistic information give good reasons for the distinction of these species. These are species nesting in soil, which were reported neither from the examined deciduous forests nor from the coniferous forests of the Mazovian Lowland, i.e. *Cerceris rybyensis*, *Argogorytes fargei*, *Nysson interruptus*, *Oxybelus uniglumis*, *Oxybelus victor*, *Oxybelus nigripes*, *Tachysphex nitidus*.

The following *Sphecidae* species occurred in the greatest numbers in the sampled material: *Ectemnius continuus*, *Oxybelus uniglumis*, *Crabro cribrarius*, *Crossocerus wesmaeli* and *Lindenius albilabris*. Except for *Oxybelus uniglumis*, all the species had previously been reported from forest areas of the Mazovian Lowland and from the canopy of trees in Warsaw (Tab. 2). It should be emphasized however, that in linden-oak-hornbeam forest they had been observed to occur only sporadically, while in coniferous forests they were more frequently

Table 2. The occurrence of certain *Sphecidae* and *Vespoidea* species in various environments on the Mazovian Lowland (+++ — numerous, ++ — scarce, + — sporadic, — — not found)

Species	Linden-oak-hornbeam forest	Coniferous and mixed forests	City green	Moist meadow
<i>Ectemnius continuus</i>	—	+	+	+++
<i>Oxybelus uniglumis</i>	—	—	—	+++
<i>Crabro cribrarius</i>	+	+	+	++
<i>Crossocerus wesmaeli</i>	+	++	++	++
<i>Lindenius albilabris</i>	+	+	+	++
<i>Paravespula vulgaris</i>	+++	+++	+++	+
<i>Paravespula germanica</i>	+	+	+++	+++

sampled (Skibińska 1986). Hence it may be concluded that the species in question prefer drier and sunnier environments of podsol soils.

*Vespoidea* made up about 30% of the material sampled on the studied moist meadow and they were represented by 7 species. Thus *Vespoidea* fauna was poor in the studied environment not only as regards the number of individuals (90 specimens) but also as regards the species composition.

The most commonly sampled species was *Paravespula germanica*, which accounted for about 75% of all the *Vespoidea* species collected at Chylice. As regards the remaining species, only single individuals were sampled. A majority of the recorded *Vespoidea* species had been reported from forest areas, where they used to occur in notably greater numbers.

A high proportion of *P. germanica* and low of *P. vulgaris* are characteristics of *Vespoidea* fauna of the open areas. The numbers in which they occurred in Mazovian deciduous and coniferous forests were inversely related (Tab. 2). *P. vulgaris* dominated in the coniferous forest communities of *Vespoidea*, while the proportion of *P. germanica* was very low; also in linden-oak-hornbeam forests *P. vulgaris* was the dominating species while *P. germanica* was only sporadically found or did not occur at all (Skibińska 1986).

Moreover, 8 *Pompilidae* and 3 *Chrysididae* species were recorded to occur on the meadow at Chylice. *Aculeata* of these families were represented by single individuals.

All the *Pompilidae* species noted on the studied meadow are common in central Europe. They may be found in various environments, yet they prefer insolated forests (R. Wahis, unpublished data). The three species of this family, i.e. *Priocnemis perturbator*, *Arachnospila anceps* and *Calidurgus fasciatellus* occur in forests of the Mazovian Lowland; *C. fasciatellus* was reported from Warsaw as well, where it was found in parks in the verdure of residential districts and in streetside greenery (the author's unpublished data). The only species of *Pom-*

*pilidae* reported from open areas of the Mazovian Lowland was *Anoplius concinnus*, sampled on rapeseed crops (Miczulski 1967).

*Chrysididae* sampled on the studied meadow ranked among species common in Poland. They were also frequently sampled on the Mazovian Lowland (Ski-bińska 1982). These species parasitize in nests of various species of the family *Apidae* and solitary wasps. *Chrysis ignita* is the species of a very wide range of hosts. So far 24 hosts of this species have been identified. According to Bana-szak (1980) and Noskiewicz and Puławski (1958), *Chrysis ignita* is the most common species of the genus *Chrysis* L. in Poland.

#### SUMMARY

The comparison of the findings of the present research on the predatory *Aculeata* occurring on a moist meadow at the Mazovian Lowland to the findings of the author's corresponding research carried out in other environments of the Mazovian Lowland, e.g. in forests (deciduous, and mixed, and coniferous forests) or on city green, evidenced the scantiness of the *Aculeata* fauna on the examined open area. The material sampled on the studied meadow was quantitatively very modest and predominantly made up of *Aculeata* flying up there from adjacent afforested areas. Although the insects in question were not particularly associated with the meadow area, nonetheless, considering their predatory nature, they might be of some significance in regulating the entomofauna abundance in the studied ecosystem. As regards the nutritive requirements, the studied *Aculeata* fauna was noted for a considerable proportion of species feeding their offspring with insects and spiders, both occurring in great numbers in the examined environment. 30% of the recorded species were reported to feed on various *Diptera*, 20% of the species — on spiders and 10% — on beetles. The remaining species of *Aculeata* were observed to feed on aphids and various other *Homoptera*, *Orthoptera* and *Apidae*. Also pantophagous species were reported.

Although a majority of *Aculeata* occurring on the studied meadow came there from adjacent areas, nevertheless, certain species might be undoubtedly regarded as having been more tightly associated with the meadow environments. They included the species either not found or sporadically occurring in forest areas, i.e. *Cerceris rybyensis*, *Argogorytes fargei*, *Nysson interruptus*, *Oxybelus uniglumis*, *Oxybelus victor*, *Oxybelus nigripes*, *Tachysphex nitidus*, and *Paravespula germanica*.

Polska Akademia Nauk  
Instytut Zoologii  
ul. Wilcza 64, 00-679 Warszawa

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## ŻĄDLÓWKI DRAPIEŻNE (*HYMENOPTERA*, *ACULEATA*) ŁĄKI ŚWIEŻEJ NA NIZINIE MAZOWIECKIEJ

### STRESZCZENIE

Fauna żądłówek drapieżnych występujących na łące kośnej (*Arrhenatheretum medioeuropaeum*) w Chylicach, reprezentowana jest przez 49 gatunków: 31 gatunków *Sphecidae*, 8 — *Pompilidae*, 7 — *Vespoidea*, 3 — *Chrysididae*.

Zebrany materiał jest mało liczebny. W ciągu trzyletnich (1981–1983) intensywnych odłowów, przy zastosowaniu 6 różnych metod (szalki Moerickego wystawione w trawie i zawieszane na palikach na wysokości 50 cm, czerpak entomologiczny oraz odłowy „na upatrzonego”, szyby szklane, pułapki Malaise'a) odłowiono 300 osobników.

Większość stwierdzonych tu żądłówek zamieszkuje obszary zadrzewione, a łąka jest przez nie penetrowana w poszukiwaniu pokarmu. Jedynie 7 gatunków można uznać za ściślej związane ze środowiskiem łąkowym. Są to gatunki nie występujące, bądź spotykane sporadycznie na terenach leśnych: *Cerceris rybyensis*, *Argogorytes fargei*, *Nysson interruptus*, *Oxybelus uniglumis*, *Oxybelus victor*, *Oxybelus nigripes* i *Paravespula germanica*.

Gatunkami najliczniej reprezentowanymi w zebranych materiale są: *Ectemnius continuus*, *Oxybelus uniglumis*, *Crabro cribrarius*, *Crossocerus wesmaeli*, *Lindenius albilabris* i *Paravespula germanica*.

ЖАЛЯЩИЕ ПЕРЕПОНЧАТОКРЫЛЫЕ (*ACULEATA, HYMENOPTERA*) СВЕЖЕГО  
ЛУГА МАЗОВЕЦКОЙ НИЗМЕННОСТИ

РЕЗЮМЕ

На свежем сенокосном лугу, лишенном цветов (*Arrhenatheretum medioeuropaeum*), найдено 49 видов жалящих перепончатокрылых: 31 вид *Sphecidae*, 8 — *Pompilidae*, 7 — *Vespoidea*, 3 — *Chrysididae*. Фауна жалящих перепончатокрылых (из перечисленных семейств) малочисленна в рассматриваемой среде, за исключением *Sphecidae*, и бедна с точки зрения видового состава.

Большинство этих перепончатокрылых населяет древонасаждения, а на луга прилетает в поисках пищи. Только 7 видов из собранного материала более тесно связано с лугом. Это 6 видов из семейства *Sphecidae*: *Cerceris rybyensis* (L.), *Argogorytes fargei* (Shuck.), *Nysson interruptus* (Fabr.), *Oxybelus uniglumis* (L.), *O. victor* Lep., *O. nigripes* Oliv. и один вид из *Vespoidea* — *Paravespula germanica* (Fabr.).