

**Selected insect groups of shrubbery complexes of „Biedrusko”
Protected Landscape. Part II: Parasitic wasps of Pimplinae
and Poemeniinae subfamily (Hymenoptera, Ichneumonidae)**

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ABSTRACT. In shrubbery complexes of „Biedrusko” Protected Landscape Area 43 species of Pimplinae subfamily and 2 species of Poemeniinae subfamily (Hymenoptera, Ichneumonidae) were found. The species of Pimplinae subfamily constituted 31.1% of Polish fauna species and 62.3% of those reported from Wielkopolska. The following were dominant: *Pimpla contemplator* ($D_5 = 35.1\%$), *Itopectis maculator* ($D_5 = 14.7\%$), *Itopectis alternans* ($D_5 = 11.6\%$) and *Pimpla turionellae* ($D_4 = 5.3\%$). The most numerous group were parasitoids of Micro- and Macrolepidoptera (55.5% of the reported species) and of Arachnida (22.3%). For the first time in Wielkopolska shrubbery the following species were found: *Ephialtes manifestator*, *Itopectis viduata*, *Perithous albicinctus*, *Polysphincta boops* and *Theronia atalantae* (Pimplinae) and *Podoschistus scutellaris* (Poemeniinae).

KEY WORDS: Hymenoptera, Pimplinae, Poemeniinae, shrubbery complexes, „Biedrusko” Protected Landscape Area, Wielkopolska.

INTRODUCTION

This study presents the results of research on ichneumonids of Pimplinae and Poemeniinae subfamilies belonging to Ichneumonidae families, reported from shrubbery complexes on „Biedrusko” Protected Landscape Area. The material presented herein constitutes a further part of published results of the research on the ecology and fauna of selected insect groups in the area, conducted at the Entomology Department of University of Life Sciences in Poznań. The military range at Biedrusko is a very attractive area due to its natural values.

No comprehensive research on Insecta invertebrates has been carried out in the area so far. Information presenting the state of knowledge on insects of this area was included in part I, which describes Hemiptera of Aphidoidea suprafamily (WILKANIEC et al. 2008).

The aim of the research was to determine species composition, the number of individuals, the seasonal dynamics of ichneumonids belonging to Pimplinae and Poemeniinae sub-family of the margin zone between the thicket and its surroundings, in initial and terminal thickets as well as determining the functions of those habitats towards entomofages.

MATERIAL AND METHODS

The research was conducted in the years 2003-2005 in the vicinity of Biedrusko (UTM: XU32), located in Suchy Las commune, north of the city of Poznań (Fig. 1).

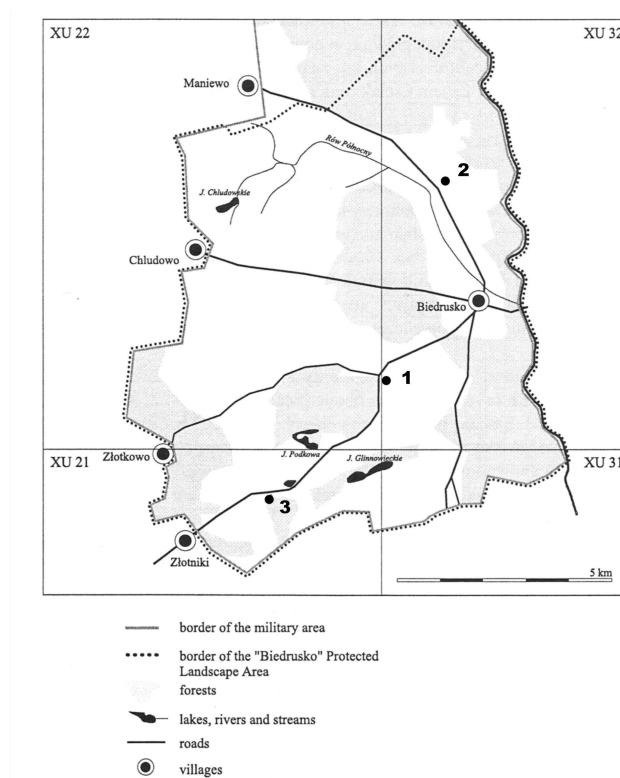


Fig. 1. The map of the investigated area. 1 – locality of studies in 2003; 2 – locality of studies in 2004; 3 – locality of studies in 2005.

The town is situated on „Biedrusko” Protected Landscape Area. Hymenoptera were caught in the ecotone zone between open fields and blackthorn thickets (*Pruno-Crataegetum*), and in thickets at an initial stage of development or fully developed - terminal type. Detailed characteristics of phytosociology of the studied areas was presented in part I on Aphidoidea (WILKANIEC et al. 2008).

Insects were caught from May to October in each year of study. In 2003 the research was conducted only in terminal thickets, while in the other years in all the selected habitats. In the research the method of catching imagines Ichneumonidae into yellow Moericke's traps was used. On each site 5 traps were laid out. The insects were taken out of the traps mainly at ten-day intervals. The assumed sample was the number of insects caught in the trap within 10 days. The detailed description of the catching method of Hymenoptera and characteristics of the groups found, created on the basis of selected biocenotic indices such as Simpson's index (d) (SIMPSON 1949), Shannon's index (H') (SHANNON & Weaver 1963), Pielou's index (J') (PIELOU 1966), was presented in part I concerning Aphidoidea (WILKANIEC et al. 2008).

RESULTS

During the three-year study of shrubbery on „Biedrusko” Protected Landscape Area 590 samples were taken, as a result of which 948 specimens of Pimplinae, belonging to 43 species (Table 1) and 8 specimens of Poemeniinae, classified in 2 species were caught. Poemeniinae were represented by *Deuteroxorides elevator* (PANZER, 1799) (4 individuals), reported from all the habitats and *Podoschistus scutellaris* (DESV., 1856) (4 individuals), caught in the margin thickets zone and in initial thicket. Due to a low number of Poemeniinae subfamily we resigned from creating a characteristics of this subfamily community on the basis of biocenotic indices. The Ichneumonidae of Pimplinae subfamily caught constituted 31.1% of Polish fauna and 62.3% reported for Wielkopolska. Species diversity of Pimplinae on Biedrusko range was higher than the one defined in the shrubbery in agricultural landscape of central Wielkopolska. In that habitat 26 to 33 species of this subfamily were found (PIEKARSKA-BONIECKA 2005, PIEKARSKA-BONIECKA, WILKANIEC 2006).

The highest species diversity was found in terminal thickets, where 34 species of Pimplinae were caught, while the lowest one was in margin zone, where 26 species were found (Table 1). Such a form of species diversity was confirmed by the value of Simpsons' species richness index (d), which reached its peak in terminal thickets, and the lowest in the margin zone (Table 2).

In shrubbery complexes of the range 4 numerous species in the form of eudominant and dominant were reported, namely: *Pimpla contemptator* ($D_5 = 35.1\%$), *Itoplectis maculator* ($D_5 = 14.7\%$), *Itoplectis alternans* ($D_5 = 11.6\%$) and *Pimpla turionellae* ($D_4 = 5.3\%$) (Table 1).

Table 1. List of Pimplinae caught in shrubbery complexes in “Biedrusko” Protected Landscape Area in 2003-2005.

No	Species	Environment							
		Margin zone		Initial thicket		Terminal thicket		Total	
		Number of specimens (N)	Domination index (D) (%)	Number of specimens (N)	Domination index (D) (%)	Number of specimens (N)	Domination index (D) (%)	Number of specimens (N)	Domination index (D) (%)
-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
1.	<i>Acrodactyla degener</i> (HAL., 1839)	-	-	-	-	2	0.5	2	0.2
2.	<i>Acropimpla pictipes</i> (GRAV., 1829)	-	-	-	-	1	0.2	1	0.1
3.	<i>Apechthis compunctor</i> (L., 1758)	3	1.3	-	-	6	1.4	9	0.9
4.	<i>Apechthis quadridentata</i> (THOMS., 1877)	1	0.4	2	0.7	17	4.0	20	2.1
5.	<i>Apechthis rufata</i> (GMEL., 1790)	-	-	7	7.2	6	1.4	13	1.4
6.	<i>Delomerista mandibularis</i> (GRAV., 1829)	-	-	-	-	6	1.4	6	0.6
7.	<i>Dolichomitus</i> sp.	2	0.8	-	-	2	0.5	4	0.4
8.	<i>Endromopoda detrita</i> (HOLMGR., 1860)	8	3.3	4	1.4	3	0.7	15	1.6
9.	<i>Ephialtes manifestator</i> (L., 1758)	-	-	-	-	1	0.2	1	0.1
10.	<i>Gregopimpla inquisitor</i> (SCOP., 1763)	-	-	1	0.3	-	-	1	0.1
11.	<i>Iseropus stercorator</i> (F., 1793)	-	-	1	0.3	1	0.2	2	0.2
12.	<i>Itoplectis alternans</i> (GRAV., 1829)	47	19.7	32	11.1	31	7.4	110	11.6
13.	<i>Itoplectis maculator</i> (F., 1775)	35	14.6	31	10.8	73	14.3	139	14.7
14.	<i>Itoplectis tunetana</i> (SCHMIED., 1914)	-	-	1	0.3	-	-	1	0.1
15.	<i>Itoplectis viduata</i> (GRAV., 1829)	1	0.4	-	-	-	-	1	0.1
16.	<i>Liotryphon caudatus</i> (RATZ., 1848)	-	-	-	-	1	0.2	1	0.1
17.	<i>Liotryphon crassiseta</i> (THOMS., 1877)	1	0.4	5	1.7	5	1.2	11	1.2
18.	<i>Liotryphon punctulatus</i> (RATZ., 1848)	1	0.4	4	1.4	-	-	5	0.5
19.	<i>Perithous albicinctus</i> (RATZ., 1829)	-	-	-	-	1	0.2	1	0.1
20.	<i>Perithous divinator</i> (ROSSI, 1790)	1	0.4	1	0.3	4	1.0	6	0.6
21.	<i>Pimpla contemplator</i> (MUELL., 1776)	81	33.9	147	51.0	105	24.9	333	35.1
22.	<i>Pimpla flavicoxis</i> THOMS., 1877	4	1.8	10	3.5	27	6.4	41	4.3
23.	<i>Pimpla insignatoria</i> (GRAV., 1807)	3	1.3	1	0.3	5	1.2	9	0.9
24.	<i>Pimpla melanacrias</i> PERKINS, 1941	5	2.1	6	2.1	29	6.9	40	4.2
25.	<i>Pimpla rufipes</i> (MILL., 1759)	11	4.6	10	3.5	18	4.3	39	4.1

-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
26.	<i>Pimpla spuria</i> GRAV., 1829	-	-	1	0.3	2	0.5	3	0.3
27.	<i>Pimpla turionellae</i> (L., 1758)	10	4.2	4	1.4	36	8.6	50	5.3
28.	<i>Polysphincta boops</i> TSCHKE, 1869	-	-	-	-	1	0.2	1	0.2
29.	<i>Polysphincta tuberosa</i> GRAV., 1829	-	-	1	0.3	5	1.2	6	0.6
30.	<i>Scambus brevicornis</i> (GRAV., 1829)	2	0.8	1	0.3	-	-	3	0.3
31.	<i>Scambus calobatus</i> (GRAV., 1829)	1	0.4	-	-	-	-	1	0.2
32.	<i>Scambus inanis</i> (SCHRANK, 1802)	5	2.1	1	0.3	2	0.5	8	0.8
33.	<i>Scambus nigricans</i> (THOMAS., 1877)	6	2.5	2	0.2	5	1.2	13	1.4
34.	<i>Scambus pomorum</i> (RATZ., 1848)	3	1.3	2	0.7	3	0.7	8	0.8
35.	<i>Scambus</i> sp.	-	-	1	0.3	-	-	1	0.2
36.	<i>Theronia atalantae</i> (PODA, 1761)	-	-	2	0.7	3	0.7	5	0.5
37.	<i>Tromatobia lineatoria</i> (VILL., 1789)	1	0.4	-	-	-	-	1	0.2
38.	<i>Tromatobia ornata</i> (GRAV., 1829)	-	-	1	0.3	-	-	1	0.2
39.	<i>Tromatobia ovivora</i> (BOHEM., 1821)	-	-	1	0.3	2	0.5	3	0.3
40.	<i>Zaglyptus multicolor</i> (GRAV., 1829)	2	0.8	2	0.7	5	1.2	9	0.9
41.	<i>Zaglyptus varipes</i> (GRAV., 1829)	2	0.8	2	0.7	2	0.5	6	0.6
42.	<i>Zatypota gracilis</i> (HOLMGR., 1860)	1	0.4	3	1.0	9	2.4	13	1.4
43.	<i>Zatypota percontatoria</i> (MUELL., 1776)	2	0.8	1	0.3	2	0.5	5	0.5
Total number of specimens		239	100.0	288	100.0	421	100.0	948	100.0
Number of species		26		31		34		43	

Table 2. Biocenotic indices characterising communities of Pimplinae caught in shrubbery complexes of "Biedrusko" Protected Landscape Area in 2003-2005.

Environment	Number of samples (<i>n</i>)	Number of specimens (<i>N</i>)	Number of species (<i>S</i>)	d^*	H'^{**}	J'^{***}
Margin zone	148	239	26	10.51	3.43	0.87
Initial thicket	150	288	31	12.20	3.73	0.76
Terminal thicket ****	292	421	34	12.58	3.47	0.69
Total	590	948	43	14.11	-	-

* d – Simpson's index (SIMPSON 1949)

** H' – Shannon's index (SHANNON & WEAVER 1963)

*** J' – Pielou's index (PIELOU 1966)

**** three years data, others only two years

Table 3. List of Pimplinae caught in margin zone of „Biedrusko” Protected Landscape Area in 2004-2005.

No	Species	Year					
		2004		2005		2004-2005	
		Number of specimens (N)	Domination index (D) (%)	Number of specimens (N)	Domination index (D) (%)	Number of specimens (N)	Domination index (D) (%)
1.	<i>Apechthis compunctor</i> (L.)	-	-	3	2.8	3	1.3
2.	<i>Apechthis quadridentata</i> (THOMS.)	1	0.8	-	-	1	0.4
3.	<i>Dolichomitus</i> sp.	2	1.5	-	-	2	0.8
4.	<i>Endromopoda detrita</i> (HOLMGR.)	7	5.3	1	0.9	8	3.3
5.	<i>Itopectis alternans</i> (GRAV.)	23	17.3	24	22.6	47	19.7
6.	<i>Itopectis maculator</i> (F.)	24	18.0	11	10.4	35	14.6
7.	<i>Itopectis viduata</i> (GRAV.)	-	-	1	0.9	1	0.4
8.	<i>Liotryphon crassiseta</i> (THOMAS.)	-	-	1	0.9	1	0.4
9.	<i>Liotryphon punctulatus</i> (RATZ.)	1	0.8	-	-	1	0.4
10.	<i>Perithous divinator</i> (ROSSI)	1	0.8	-	-	1	0.4
11.	<i>Pimpla contemplator</i> (MUELL.)	38	28.6	43	40.6	81	33.9
12.	<i>Pimpla flavicoxis</i> THOMS.	3	2.3	1	0.9	4	1.7
13.	<i>Pimpla insignatoria</i> (GRAV.)	-	-	3	2.8	3	1.3
14.	<i>Pimpla melanacrias</i> PERKINS	2	1.5	3	2.8	5	2.1
15.	<i>Pimpla rufipes</i> (MILL.)	7	5.3	4	3.8	11	4.6
16.	<i>Pimpla turionellae</i> (L.)	10	7.5	-	-	10	4.2
17.	<i>Scambus brevicornis</i> (GRAV.)	1	0.8	1	0.9	2	0.8
18.	<i>Scambus calobatus</i> (GRAV.)	-	-	1	0.9	1	0.4
19.	<i>Scambus inanis</i> (SCHRANK)	2	1.5	3	2.8	5	2.1
20.	<i>Scambus nigricans</i> (THOMAS.)	3	2.3	3	2.8	6	2.5
21.	<i>Scambus pomorum</i> (RATZ.)	2	1.5	1	0.9	3	1.3
22.	<i>Tromatobia lineatoria</i> (GRAV.)	-	-	1	0.9	1	0.4
23.	<i>Zaglyptus multicolor</i> (GRAV.)	2	1.5	-	-	2	0.8
24.	<i>Zaglyptus varipes</i> (GRAV.)	2	1.5	-	-	2	0.8
25.	<i>Zatypota gracilis</i> (HOLMGR.)	1	0.8	-	-	1	0.4
26.	<i>Zatypota percontatoria</i> (MUELL.)	1	0.8	1	0.9	2	0.8
Total number of specimens		133	100.0	106	100.0	239	100.0
Number of speccies		20		18		26	

Table 4. List of Pimplinae caught in initial thicket of „Biedrusko” Protected Landscape Area in 2004-2005.

No	Species	Year					
		2004		2005		2004-2005	
		Number of specimens (N)	Domination index (D) (%)	Number of specimens (N)	Domination index (D) (%)	Number of specimens (N)	Domination index (D) (%)
-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
1.	<i>Apechthis quadridentata</i> (THOMS.)	2	1.0	-	-	2	0.7
2.	<i>Apechthis rufata</i> (GMEL.)	7	3.4	-	-	7	2.4
3.	<i>Endromopoda detrita</i> (HOLMGR.)	3	1.5	1	1.2	4	1.4
4.	<i>Gregopimpla inquisitor</i> (SCOP.)	-	-	1	1.2	1	0.3
5.	<i>Iseropus stercorator</i> (F.)	-	-	1	1.2	1	0.3
6.	<i>Itopectis alternans</i> (GRAV.)	8	3.9	24	28.9	32	11.1
7.	<i>Itopectis maculator</i> (F.)	18	8.8	13	15.7	31	10.8
8.	<i>Itopectis tunetana</i> (SCHMIED)	1	0.5	-	-	1	0.3
9.	<i>Liotryphon crassiseta</i> (THOMAS.)	4	2.0	1	1.2	5	1.7
10.	<i>Liotryphon punctulatus</i> (RATZ.)	3	1.5	1	1.2	4	1.4
11.	<i>Perithous divinator</i> (ROSSI)	1	0.5	-	-	1	1.0
12.	<i>Pimpla contemplator</i> (MUELL.)	128	62.4	19	22.9	147	51.0
13.	<i>Pimpla flavicoxis</i> THOMS.	8	3.9	2	2.4	10	3.5
14.	<i>Pimpla insignatoria</i> (GRAV.)	1	0.5	-	-	1	0.3
15.	<i>Pimpla melanacrias</i> PERKINS	1	0.5	5	6.0	6	2.1
16.	<i>Pimpla rufipes</i> (MILL.)	3	1.5	7	8.4	10	3.5
17.	<i>Pimpla spuria</i> GRAV.	-	-	1	1.2	1	0.3
18.	<i>Pimpla turionellae</i> (L.)	3	1.5	1	1.2	4	1.4
19.	<i>Polysphincta tuberosa</i> GRAV.	1	0.5	-	-	1	0.3
20.	<i>Scambus brevicornis</i> (GRAV.)	1	0.5	-	-	1	0.3
21.	<i>Scambus inanis</i> (SCHRANK)	-	-	1	1.2	1	0.3
22.	<i>Scambus nigricans</i> (THOMAS.)	1	0.5	1	1.2	2	0.7
23.	<i>Scambus pomorum</i> (RATZ.)	2	1.0	-	-	2	0.7
24.	<i>Scambus</i> sp.	1	0.5	-	-	1	0.3
25.	<i>Theronia atalantae</i> (PODA)	2	1.0	-	-	2	0.7
26.	<i>Tromatobia ornata</i> (GRAV.)	-	-	1	1.2	1	0.3
27.	<i>Tromatobia ovivora</i> (BOHEM.)	-	-	1	1.2	1	0.3

-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
28.	<i>Zaglyptus multicolor</i> (GRAV.)	1	0.5	1	1.2	2	0.7
29.	<i>Zaglyptus varipes</i> (GRAV.)	2	1.0	-	-	2	0.7
30.	<i>Zatypota gracilis</i> (HOLMGR.)	2	1.0	1	1.2	3	1.0
31.	<i>Zatypota percontatoria</i> (MUELL.)	1	0.5	-	-	1	0.3
Total number of specimens		205	100.0	83	100.0	288	100.0
Number of species		25		19		31	

When comparing the number of ichneumonids caught in the margin zone and initial thickets, without terminal ones, where research was carried out during 3 vegetation seasons, the values turned out to be similar. 239 individuals were caught in the margin zone and 288 in initial thickets (Table 1).

After analyzing the value of Shannon's general species diversity index (H') it was found that the quality and quantity structures of Pimplinae communities of the studied habitats were similar, as the values of H' index were similar (Table 2).

When comparing the values of Pielou's evenness of species distribution index (J') it was found that in the margin thicket zone the community of Pimplinae showed the highest value of this index. This proves that the communities included species of more even number distribution than in other communities (Table 2).

In both years of study in the margin zone a similar number of Pimplinae species and number of individuals was found (Table 3). The dominants in this habitat were *Pimpla contemplator* ($D_5 = 33.9\%$), *Itopectis alternans* ($D_5 = 19.7\%$) and *Itopectis maculator* ($D_5 = 14.6\%$). In 2004 numerous species were: *Pimpla contemplator* ($D_5 = 28.6\%$), *Itopectis maculator* ($D_5 = 18.0\%$), *Itopectis alternans* ($D_5 = 17.3\%$), *Pimpla turionellae* ($D_4 = 7.5\%$), *Pimpla rufipes* and *Endromopoda detrita* ($D_4 = 5.3\%$ each), while in 2005 only 3 following species: *Pimpla contemplator* ($D_5 = 40.6\%$), *Itopectis alternans* ($D_5 = 22.6\%$) and *Itopectis maculator* ($D_5 = 10.4\%$).

In initial thickets there was a clear differentiation of species and individual number of Pimplinae in both study years (Table 4). In 2004 definitely more species were caught and twice as many individuals as in 2005. 3 species were dominant, namely *Pimpla contemplator* ($D_5 = 51.0\%$), *Itopectis alternans* ($D_5 = 11.1\%$) and *Itopectis maculator* ($D_5 = 10.8\%$). In 2005 dominants were also *Pimpla contemplator* ($D_5 = 62.4\%$) and *Itopectis maculator* ($D_4 = 8.8\%$), and in 2005 the following species: *Itopectis alternans* ($D_5 = 28.9\%$), *Pimpla contemplator* ($D_5 = 22.9\%$), *Itopectis maculator* ($D_5 = 15.7\%$), *Pimpla rufipes* ($D_4 = 8.4\%$) and *Pimpla melanacrias* ($D_4 = 6.0\%$).

In the three years of study in terminal thickets definitely fewer species and higher number of individuals were found in 2003-2004 than in 2005 (Table 5). Numerous species were: *Pimpla contemplator* ($D_5 = 24.9\%$), *Itopectis maculator* ($D_5 = 17.3\%$), *Pimpla turionellae* ($D_4 = 8.6\%$), *Itopectis alternans* ($D_4 = 7.4\%$), *Pimpla melanacrias* ($D_4 = 6.9\%$) and *Pimpla flavicoxis* ($D_4 = 6.4\%$). In 2003 dominants included *Itopectis maculator* ($D_5 =$

26.1%), *Pimpla turionellae* ($D_5 = 26.1\%$), *Apechthis quadridentata* and *Pimpla contemplator* ($D_4 = 8.0\%$ each) and *Pimpla melanacrias* ($D_4 = 7.4\%$). In 2004 numerous species were *Pimpla contemplator* ($D_5 = 43.2\%$), *Pimpla flavicoxis* ($D_5 = 13.7\%$) and *Itopectis maculator* ($D_4 = 8.2\%$). In 2005 the dominants were: *Pimpla contemplator* ($D_5 = 28.3\%$), *Itopectis alternans* ($D_5 = 23.2\%$) and *Itopectis maculator* and *Pimpla melanacrias* ($D_5 = 15.2\%$ each).

In 2003 the maximum number of ichneumonids was caught during the first ten-day period of July, when 32.2% of the total number were reported. In 2004 the maximum catch occurred later and lasted from the third ten-day period in July to the first ten days of August. During this period 23.8% of the number was caught. In 2005 the largest number of ichneumonids was caught in August, probably in the middle of the month. The ten-day period was not specified as the number of samples in the month was too low. The phenology of dominant species, on the basis of which the dynamics of ichneumonids catch was determined, is presented in Fig. 1-3.

When comparing the Pimplinae communities in terms of quality, using Marczewski-Steinhaus' index (*MS*) (MARCZEWSKI & STEINHAUS 1959), it was found that the communities of ecotone zone and initial thickets as well as on the border and in terminal ones showed significant similarity. *MS* indices reached high values of 58.3% and 53.8%. Clearly less similarity in species composition was found between initial and terminal thickets. The *MS* index reached a lower value of 44.0%.

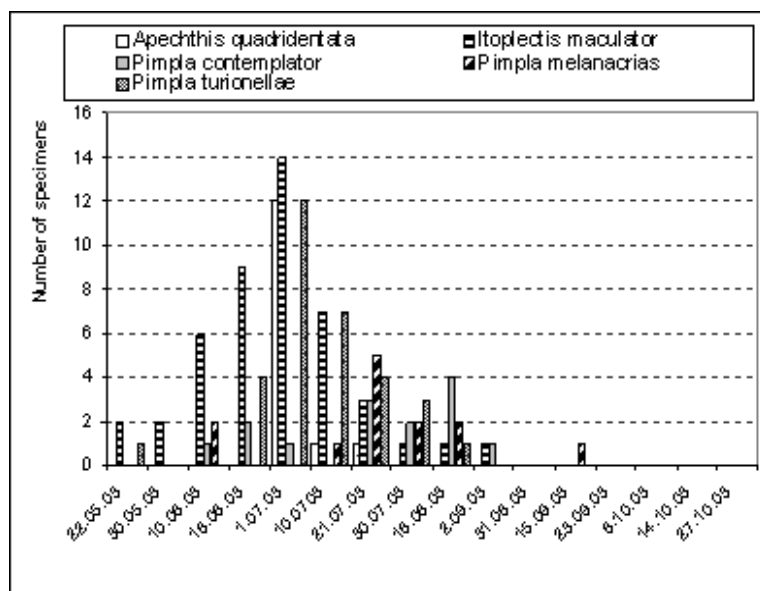


Fig. 2. Phenology of dominant Pimplinae species in shrubbery complexes of "Biedrusko" Protected Landscape Area in 2003.

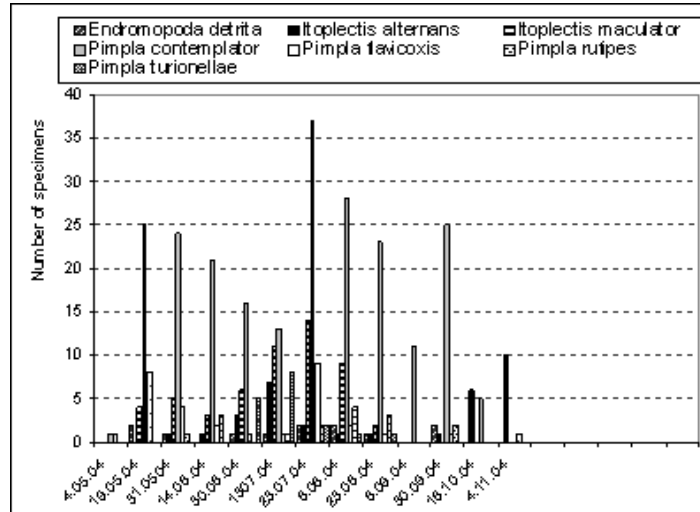


Fig. 3. Phenology of dominant Pimplinae species in shrubbery complexes of “Biedrusko” Protected Landscape Area in 2004.

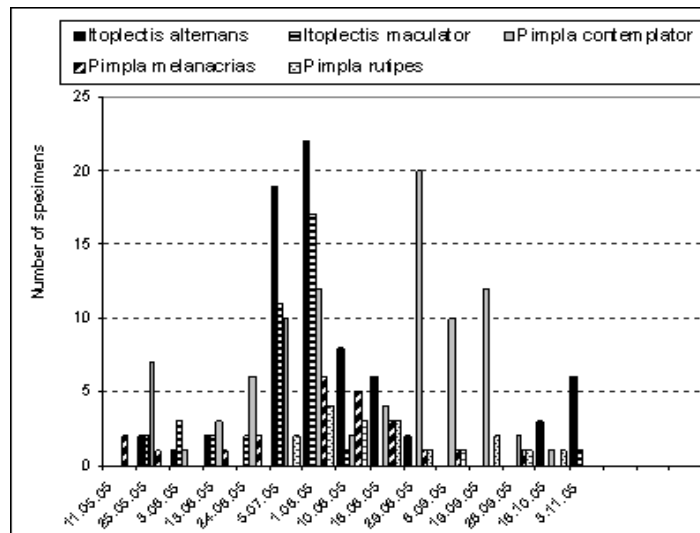


Fig. 4. Phenology of dominant Pimplinae species in shrubbery complexes of “Biedrusko” Protected Landscape Area in 2005.

Table 5. List of Pimplinae caught in terminal thicket of „Biedrusko” Protected Landscape Area in 2003-2005.

No	Species	Year											
		2003		2004		2005		2003-2005					
		Number of specimens (N)	Domination Index (D) (%)	Number of specimens (N)	Domination Index (D) (%)	Number of specimens (N)	Domination Index (D) (%)	Number of specimens (N)	Domination Index (D) (%)				
-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-				
1.	<i>Acrodactyla degener</i> (HALIDAY)	-	-	2	1.4	-	-	2	0.5				
2.	<i>Acropimpla pitaipe</i> (GRAV.)	1	0.6	-	-	-	-	1	0.2				
3.	<i>Apechthis compunctator</i> (L.)	6	3.4	-	-	-	-	6	1.4				
4.	<i>Apechthis quadridentata</i> (THOMS.)	14	8.0	3	2.1	-	-	17	0.4				
5.	<i>Apechthis rufata</i> (GMEL.)	6	3.4	-	-	-	-	6	1.4				
6.	<i>Delomeristia mandibularis</i> (GRAV.)	-	-	6	4.1	-	-	6	1.4				
7.	<i>Dolichomitus</i> sp.	1	0.6	1	0.7	-	-	2	0.5				
8.	<i>Endromopoda detrita</i> (HOLMGR.)	-	-	2	1.4	1	1.0	3	0.7				
9.	<i>Ephialtes manifestator</i> (L.)	1	0.6	-	-	-	-	1	0.2				
10.	<i>Iseropus stercorator</i> (F.)	-	-	1	0.7	-	-	1	0.2				
11.	<i>Itopectis alternans</i> (GRAV.)	6	3.4	2	1.4	23	23.2	31	7.4				
12.	<i>Itopectis maculata</i> (F.)	46	26.1	12	8.2	15	15.2	73	17.3				
13.	<i>Liotryphon caudatus</i> (RATZ.)	1	0.6	-	-	-	-	1	0.2				

-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
14.	<i>Liotryphon crassiset</i> (THOMS.)	2	1.1	3	2.1	-	-	5	1.2
15.	<i>Perithous albicinctus</i> (GRAV.)	1	0.6	-	-	-	-	1	0.2
16.	<i>Perithous divinator</i> (ROSSI)	1	0.6	2	1.4	1	1.0	4	1.0
17.	<i>Pimpla contemulator</i> (MUELL.)	14	8.0	63	43.2	28	28.3	105	24.9
18.	<i>Pimpla flavicoxis</i> THOMS.	6	3.4	20	13.7	1	1.0	27	6.4
19.	<i>Pimpla insignitatoria</i> (GRAV.)	2	1.1	1	0.7	2	2.0	5	1.2
20.	<i>Pimpla melanacrius</i> PERKINS	13	7.4	1	0.7	15	15.2	29	6.9
21.	<i>Pimpla rufipes</i> (MILL.)	5	2.8	6	4.1	7	2.0	18	4.3
22.	<i>Pimpla spuria</i> GRAV.	1	0.6	1	0.7	-	-	2	0.5
23.	<i>Pimpla turionellae</i> (L.)	31	17.6	4	2.7	1	1.0	36	8.6
24.	<i>Polysphincta boops</i> TSCHEK	1	0.6	-	-	-	-	1	0.2
25.	<i>Polysphincta tuberosa</i> GRAV.	1	0.6	3	2.1	1	1.0	5	1.2
26.	<i>Scambus inanis</i> (SCHRANK)	2	1.1	-	-	-	-	2	0.5
27.	<i>Scambus nigricans</i> (THOMAS.)	3	1.7	1	0.7	1	1.0	5	1.2
28.	<i>Scambus pomorum</i> (RATZ.)	3	1.7	-	-	-	-	3	0.7
29.	<i>Theronia atalantae</i> (PODA)	1	0.6	2	1.4	-	-	3	0.7
30.	<i>Tromatobia ovivora</i> (BOHEM.)	-	-	1	0.7	1	1.0	2	0.5
31.	<i>Zaglyptus multicolor</i> (GRAV.)	1	0.6	4	2.7	-	-	5	1.2
32.	<i>Zaglyptus varipes</i> (GRAV.)					2	2.0	2	0.5
33.	<i>Zatypota gracilis</i> (HOLMGR.)	6	3.4	3	2.1	-	-	9	2.4
34.	<i>Zatypota percontatoria</i> (MUELL.)	-	-	2	1.4	-	-	2	0.5
Total number of specimens		176	100.0	146	100.0	99	100.0	421	100.0
Number of species			27	24		14		34	

Table 6. Trophic complexes of Pimplinae and Poemeniinae species.

Trophic complexes of parasitoids			Species of parasitoids
F – Parazytoidy fitofagów Parasitoids of phytophages			
F1 parasitoids of endophytophages	Mi	parasitoids of Microlepidoptera and part of Macrolepidoptera	<i>Acropimpla pictipes</i> , <i>Apechthis compunctor</i> , <i>A. quadridentata</i> , <i>A. rufata</i> , <i>Endromopoda detrita</i> , <i>Gregopimpla inquisitor</i> , <i>Iseropus stercorator</i> , <i>Itopectis tunetana</i> , <i>I. viduata</i> , <i>Liotryphon caudatus</i> , <i>L. crassiseta</i> , <i>L. punctulatus</i> , <i>Pimpla contemplator</i> , <i>P. flavicoxis</i> , <i>P. insignatoria</i> , <i>P. melanacrias</i> , <i>P. spuria</i> , <i>Scambus brevicornis</i> , <i>S. calobatus</i> , <i>S. inanis</i> , <i>S. nigricans</i> , <i>S. pomorum</i> , <i>Scambus</i> sp.
	C1	parasitoids of Coleoptera	<i>Scambus calobatus</i> , <i>S. pomorum</i>
	S1	parasitoids of Symphyta	<i>Endromopoda detrita</i>
	D	parasitoids of Diptera	<i>Endromopoda detrita</i>
F 2 parasitoids of egzophytophages	Ma	parasitoids of Macrolepidoptera	<i>Acropimpla pictipes</i> , <i>Apechthis compunctor</i> , <i>A. quadridentata</i> , <i>A. rufata</i> , <i>Gregopimpla inquisitor</i> , <i>Iseropus stercorator</i> , <i>Itopectis tunetana</i> , <i>I. viduata</i> , <i>Pimpla contemplator</i> , <i>P. flavicoxis</i> , <i>P. insignatoria</i> , <i>P. melanacrias</i> , <i>P. rufipes</i> , <i>P. spuria</i>
	C2	parasitoids of Coleoptera	<i>Endromopoda detrita</i> , <i>Liotryphon punctulatus</i> , <i>Scambus brevicornis</i> , <i>S. calobatus</i> , <i>S. inanis</i>
	S2	parasitoids of Symphyta	<i>Delomerista mandibularis</i>
Z – Parasitoids of zoophages			
PD parasitoids of predators	Ac	parasitoids of Aculeata (melitophages/predators)	<i>Ephialtes manifestator</i> , <i>Perithous albicinctus</i> , <i>P. divinator</i>
	A	parasitoids of Arachnida	<i>Acrodactyla degener</i> , <i>Polysphincta boops</i> , <i>P. tuberosa</i> , <i>Tromatobia lineatoria</i> , <i>T. ornata</i> , <i>T. ovivora</i> , <i>Zaglyptus multicolor</i> , <i>Z. varipes</i> , <i>Zatypota gracilis</i> , <i>Z. percontatoria</i>
	PP	parasitoids of parasitoids	<i>Itopectis alternans</i> , <i>I. maculator</i> , <i>Pimpla turionellae</i> , <i>Theronia atalantae</i>
PS – Parasitoids of saprophages			
K	parasitoids of cambio- and xylophages		<i>Dolichomitus</i> sp., <i>Deuteroxorides elevator</i> , <i>Podoschistus scutellaris</i>
E	ecopolyphages		<i>Itopectis alternans</i> , <i>I. maculator</i> , <i>Pimpla turionellae</i> , <i>Theronia atalantae</i>

When analyzing trophic relationships of ichneumonids caught in shrubberies in „Biedrusko” Protected Landscape Area, it was found that the most numerous groups were Micro- and Macrolepidoptera parasitoids (Table 6). This included 25 species and made up 55.5% of all the reported ones. Another numerous group were parasitoids of Arachnida, to which 10 species were classified (22.2%). Such trophic relationships show that the studied habitats were inhabited by endo- and exophytophagous species belonging to Lepidoptera, whose number could have been regulated by parasitoids of Pimplinae and Poemeniinae subfamilies. In those habitats also numerous arachnids parasitized by some Pimplinae species occurred.

DISCUSSION

Among 43 *Pimplinae* species reported from the Biedrusko range, 30 species (69.8%) were parasitoids of phytophages, 10 species (23.2%) parasitized on Arachnida and 3 species (7%) on Aculeata. Among parasitoids of phytophagous species, pupae endoparasitoids and larvae ectoparasitoids had a similar quantity share. The first group included 16 species, mainly those of *Apechthis*, *Iseropus*, *Itopectis*, *Pimpla* and *Theronia* genera. Another group was made up by 14 species, where those belonging to *Acropimpla*, *Delomerista*, *Dolichomitus*, *Endromopoda*, *Gregopimpla*, *Liotryphon* and *Scambus* genera were classified. Both species of *Poemeniinae* subfamily belonged to larvae ectoparasites of cambio- and xylophages. In the years 2004-2005 in terminal thickets a very numerous occurrence of foliophagous *Neurotoma nemoralis* (L.) (Hymenoptera, Pamphiliida) was observed, which resulted in bald patches. Previous studies by KARG (1989), RYSZKOWSKI and KARG (1991) as well as KARG and RYSZKOWSKI (1996), conducted in an agricultural landscape in Wielkopolska also proved that parasitoids of Ichneumonidae family infested in larger numbers the landscape elements such as shrubbery and forest complexes. In those habitats this family reached the highest density and biomass values on hawthorn and blackthorn. In May 2004 5.126 individuals of this species were caught and in 2005 - 704 individuals (PIOTROWSKI 2007). Some species of parasitoids of Pimplinae subfamily could have regulated the population size of this foliophagous.

Research results clearly showed that shrubbery complexes, located on open fields of the range, were places of concentration of parasitoids of Pimplinae subfamily. Previous studies by KARG (1989), RYSZKOWSKI and KARG (1991) as well as KARG and RYSZKOWSKI (1996), conducted in agricultural landscape of Wielkopolska also showed that the parasitoids of Ichneumonidae more numerous infested landscape elements such as shrubbery and forest complexes. In those habitats this family reached the highest values of density and biomass. Positive impact of those habitats on the number and effectiveness of parasitoids belonging to Ichneumonidae was presented in the studies by ALTIERI et al. (1993), IDRIS and GRAFIUS (1995), DYER and LANDRIS (1996), MARINO and LANDIS (1996, 2000) and DENNIS et al. (2000). The studies proved higher species diversity of Pimplinae in thick-

ets of the range than in thickets in agricultural landscape of the vicinity of Poznań (PIEKARSKA-BONIECKA, 2005, PIEKARSKA-BONIECKA, WILKANIEC 2006). A correlation between the state of plant development forming thickets and the species diversity of parasitoids was proved. In terminal thickets more entomophagous species were found than in initial ones. A tendency of parasitoids to move from thickets to neighbouring habitats was observed, as the *MS* index of species similarity reached its peak values for Pimplinae communities infesting ecotone and thickets. The results obtained confirmed the domination of the prevailing part of species occurring in those habitats most numerously as those species, except for *Apechthis quadridentata* and *Pimpla turionellae*, had been previously reported as dominant in shrubberies in cultivated fields of the vicinity of Poznań (PIEKARSKA-BONIECKA, 2005, PIEKARSKA-BONIECKA, WILKANIEC 2006). The following species of Ichneumonidae were found in shrubberies in Wielkopolska for the first time: *Ephialtes manifestator*, *Itopectis viduata*, *Perithous albicinctus*, *Polysphincta boops*, *Theronia atalantae* (Pimplinae) and *Podoschistus scutellaris* (Poemeniinae).

As a result of the research conducted it was established that the shrubbery complexes of "Biedrusko" Protected Landscape Area constitute attractive habitats for parasitoids of Pimplinae and Poemeniinae subfamilies. Those entomophages may lower the size of phytophagous species, infesting those and neighbouring biocenoses.

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