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PIMPLINAE, DIACRITINAE AND *POEMENIINAE* (*HYMENOPTERA, ICHNEUMONIDAE*) OCCURRING IN A FRUIT-GROWING ENVIRONMENT IN PRZYBRODA

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Abstract: Studies on *Ichneumonidae* were carried out in the years 1999–2001 in the fruit-growing environment and in shrubs growing in its closest surroundings. The occurrence of 45 *Pimplinae* species was recorded (32.8% of the Polish fauna of this subfamily) and one species each of *Diacritinae* and *Poemeniinae* subfamilies. Qualitative and quantitative analyses of the *Ichneumonidae* groups occurring on fruit trees and shrubs were carried out.

Key words: *Ichneumonidae*, fruit-growing environment, faunistics, Wielkopolska

INTRODUCTION

Studies on ichneumonids (*Hymenoptera, Ichneumonidae*) occurring in fruit-growing environments of Wielkopolska have been carried out in that region for many years. They aim at a better knowledge of the species composition of *Ichneumonidae* settling in fruit-growing localities (Kadłubowski and Piekarska 1984; Piekarska-Boniecka and Wilkaniec 1996; Piekarska-Boniecka 1997; 1998) and at the determination of the parasitization degree caused by these parasitoids in the butterflies of tortricid family (*Lepidoptera, Tortricidae*) occurring in orchards. Information connected with the natural control of number of *Lepidoptera* was presented, among others, in the publications of Piekarska 1989, Piekarska and Kuśmierczak 1990, Piekarska-Boniecka 1994. In the years 1999–2001, the terrain of faunistic studies on *Ichneumonidae* was extended to the shrubs found in the closest surroundings of the orchard.

The objective of the studies was to define the species composition and the number of ichneumonids belonging to selected subfamilies of *Ichneumonidae* occurring in the orchard and in the shrubs adjacent to the orchard, and to compare the groups of *Ichneumonidae* occurring in both investigated environments.

MATERIAL AND METHODS

The studies were carried out in the years 1999–2001 in the orchard of the Experimental Station of the Pomology Department of Agricultural University in Poznań. The *Ichnuemonidae* were caught from May till October using yellow Moericke's traps. In selected areas, 12 traps each were distributed and checked at 10-day intervals. The ichneumonids were caught on fruit trees, in the quarters of apple-trees, sweet cherry-trees and plum-trees, and in the belt of shrubs adjoining to the orchard. A total of 650 samples were taken in the orchard and 631 samples in the shrubs. The orchard in Przybroda was established on the area of 52 ha. The studies were carried out in quarters covering a total area of 1.5 ha where trees of the following fruit cultivars were grown: (a) apples: Primula, Novamac, Priam, Cortland, McIntosh; (b) sweet cherries: Red Büttnera, Hedelwińska, and (c): plums: Anna Späth, Cacańska Rodna and Węgierka Dąbrowicka. The green belt adjacent to the orchard, about 1 km long and 7–8 m wide, consisted mainly of: blackthorn plum-tree (*Prunus spinosa* L.), common pear-tree (*Pirus communis* L.), common elm (*Ulmus campestris* L.), European spindle tree (*Evonymus europaea* L.), hawthorn (*Crataegus monogyna* Jacq.), whitethorn (*C. oxyacantha* L.), elder (*Sambucus nigra* L.), dewberry (*Rubus caesius* L.), blackberry (*R. suberectus* Anders.), briarrose (*Rosa carina* L.), common carrot (*Daucus carota* L.), common yarrow (*Achillea millefolium* L.), common nettle (*Urtica dioica* L.) and couch-grass (*Agropyron repens* (L.)). In the quarters of fruit trees, chemical treatments were carried out against pests and plant diseases. The caught *Ichneumonidae* were characterized on the basis of the following parameters: dominance, frequency, coefficient of the general species diversity H' (Shannon and Weaver 1963), uniformity index J' (Pielou 1966) and index of species richness d (Simpson after Odum 1977). The H' properties were statistically elaborated basing on Hutcheson's test (1970) at the significance level = 0.05. For the comparison of the species composition of *Ichneumonidae* settling fruit trees and shrubs, the species similarity index of Marczewski and Steinhaus (MS) (1959).

RESULTS

In the years 1999–2001, a total of 540 *Ichneumonidae* specimens were obtained. In this number, 209 ichneumonids were caught on fruit trees, and 331 in the shrubs. In the total number, 45 species belonged to the *Pimplinae* subfamily making 32.8% of the Polish fauna of this subfamily, and one species each of the *Diacritinae* and *Poemeniinae* subfamilies. In the environment of fruit trees, the occurrence of 34 species of *Pimplinae* and one species of *Diacritinae* were recorded. In the shrubs, 39 *Pimplinae* species and one species each of *Diacritinae* and *Poemeniinae* were found (Tab. 1). On fruit trees, there dominated two species: *Itoplectis maculator* (F.) (25.3%) and *Zatypota gracilis* (Holmgr.) (15.8%) (Fig. 1). In the shrubs, 7 dominating species were found including: *Diacritus aciculatus* (Voll.) (9.7%), *Itoplectis maculator* (7.1%), *Liotryphon crassisetus* (Thoms.) (7%), *L. punctulatus* (Ratz.) (6.3%), *Zatypota gracilis* (6%), *Pimpla turionellae* (L.) (5.7%) and *P. flavicoxis* Thoms. (5.4%) (Fig. 2).

Table 1. List of *Pimplinae, Diacritinae* and *Poemeniinae* caught in a fruit-growing environment in Przybroda

Species	Environment							
	Fruit-trees			Σ	Shrubs			Σ
	1999	2000	2001		1999	2000	2001	
				Pimplinae				
Acrodactyla degener (Haliday)	–	1	–	1	–	–	–	–
Acropimpla pictipes (Grav.)	–	2	–	2	–	1	–	1
Apechthis compunctor (L.)	1	1	3	5	2	1	–	3
Apechthis quadridentata (Thoms.)	1	–	1	2	2	3	–	5
Clistopyga incitator (F.)	–	1	–	1	–	2	–	2
Delomerista mandibularis (Grav.)	–	–	–	–	1	2	–	3
Dolichomitus agnoscendus (Roman)	5	–	1	6	16	–	–	16
Dolichomitus imperator (Kriechb.)	–	–	1	1	–	–	–	–
Dolichomitus mesocentrus (Grav.)	–	1	–	1	–	–	–	–
Dolichomitus sp.	–	–	1	1	–	–	–	–
Endromopoda detrita (Holmgr.)	2	6	2	10	3	1	1	5
Gregopimpla inquisitor (Scop.)	–	1	–	1	1	–	–	1
Itoplectis alternans (Grav.)	–	4	2	6	1	5	5	11
Itoplectis maculator (F.)	21	19	13	53	12	10	2	24
Itoplectis tunetana (Schmiedekn.)	3	–	–	3	9	–	–	9
Liotryphon crassisetus (Thoms.)	6	2	2	10	3	8	12	23
Liotryphon punctulatus (Ratz.)	1	1	2	4	6	11	4	21
Perithous divinator (Rossi)	–	–	1	1	5	4	1	10
Pimpla conmixta Kiss	3	1	1	5	7	4	3	14
Pimpla contemplator (Muell.)	–	1	–	1	2	8	–	10
Pimpla flavicoxis Thoms.	2	1	–	3	11	5	2	18
Pimpla hypochondriaca (Retz.)	5	1	2	8	4	–	1	5
Pimpla melanacrias Perkins	–	–	–	–	1	1	–	2
Pimpla spuria (Grav.)	–	–	–	–	–	1	–	1
Pimpla turionellae (L.)	1	2	1	4	12	5	2	19
Polysphincta tuberosa (Grav.)	1	3	3	7	–	–	1	1
Scambus annulatus (Kiss)	1	4	3	8	4	4	3	11
Scambus brevicornis (Grav.)	–	2	1	3	1	1	–	2
Scambus buolianae (Hartig)	–	–	–	–	1	–	–	1
Scambus calobatus (Grav.)	–	–	–	–	2	–	–	2
Scambus elegans (Wolst.)	–	1	–	1	–	–	–	–
Scambus nigricans (Thoms.)	–	3	5	8	2	–	1	3
Scambus planatus (Hartig)	–	–	–	–	3	1	–	4
Scambus pomorum (Ratz.)	–	4	1	5	9	3	3	15
Scambus sagax (Hartig)	–	–	–	–	1	–	–	1
Scambus sp.	–	–	–	–	–	–	1	1
Schizopyga circulator circulator (Panzer)	–	–	–	–	1	1	–	2
Theronia atalantae (Poda)	–	–	–	–	–	–	1	1
Tromatobia oculatoria (F.)	–	2	1	3	3	1	2	6
Tromatobia ovivora (Bohem.)	–	1	–	1	3	–	–	3
Zaglyptus multicolor (Grav.)	–	1	–	1	11	3	1	15
Zaglyptus varipes (Grav.)	–	1	1	2	–	–	–	–
Zatypota gracilis (Holmgr.)	3	15	15	33	6	12	2	20
Zatypota albicoxa (Walker)	–	–	–	–	1	–	–	–
Zatypota percontatoria (Muell.)	1	1	3	5	3	1	2	6
				Diacritinae				
Diacritus aciculatus (Voll.)	2	1	–	3	22	4	6	32
				Poemeniinae				
Deuteroxorides elevator (Panzer)	–	–	–	–	–	1	–	1
Total	59	84	66	209	171	104	56	331

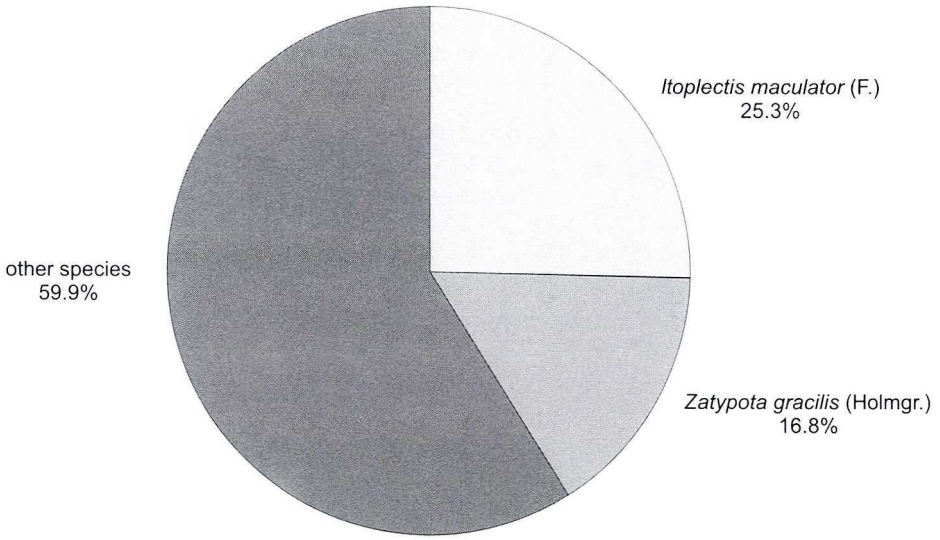

Fig. 1. Dominant species of *Ichneumonidae* caught on fruit trees

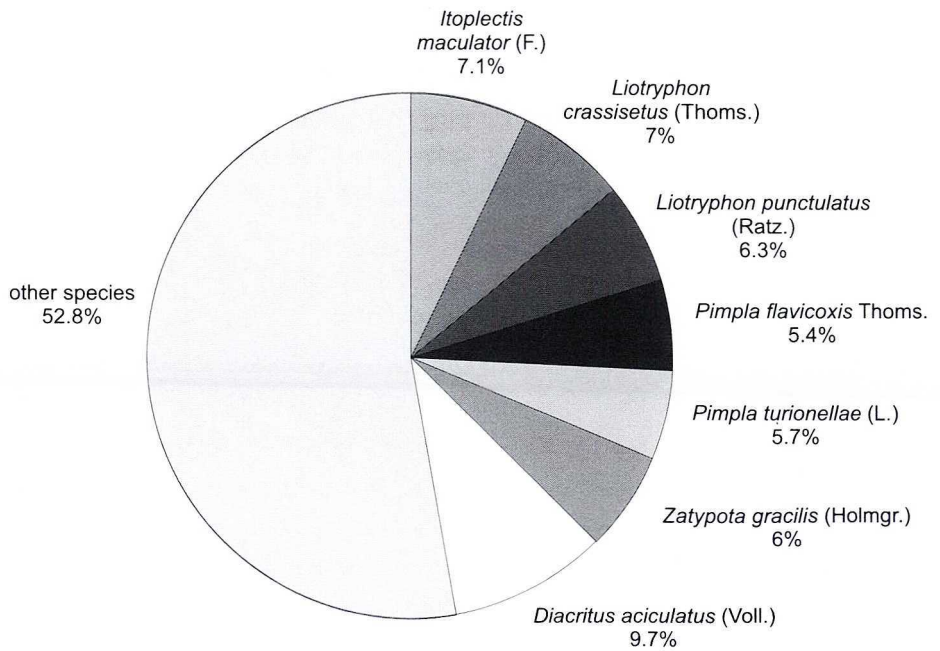

Fig. 2. Dominant species of *Ichneumonidae* caught in shrubs

On fruit trees and shrubs, there occurred 29 species found in both habitats making 61.7% of all species caught in both environments. On fruit trees, 4 species were identified which occurred exclusively in that environment making 11.4% of species

shown for that particular locality. In shrubs, 11 exclusive species were recorded making 26.8% species found in that environment. In each year of studies, on fruit trees, 12 species of *Ichneumonidae* (34.3%) were caught which represented stable species in that environment and 16 species (39%) were caught in the shrubs. There were 9 species stable and common for both environments, they included: *Endromopoda detrita* (Holmgr.), *Itoplectis maculatus, Liotryphon crassisetus, L. punctulatus, Pimpla conmixta* Kiss, *P. turionellae, Scambus annulatus* (Kiss), *Zatypota gracilis* and *Z.percontatoria* (Muell.). All species caught in the environment of fruit trees and shrubs were accidental species with a frequency below 25%.

The coefficient of species diversity H' of *Ichneumonidae* occurring in the environment of fruit trees reached the value of 4.11, and for *Ichneumonidae* caught in the shrubs, the value was 4.69. The index of species richness d was 14.65 for *Ichneumonidae* found in fruit trees, and 15.87 for those found in the shrubs. The uniformity index J' reached the value of 0.8 for *Ichneumonidae* caught in the fruit tree environment and 0.88 in the shrubs. The index of species similarity MS in the studied environments was 61.7%.

The majority of *Ichneumonidae* species found in both environments represented parasitoids of phytophages mining and gnawing leaves, leaf buds, flower buds and inflorescences and fruits. To this group belonged species of the following genera: *Acropimpla, Apechthis, Delomerista, Endromopoda, Gregopimpla, Itoplectis, Liotryphon, Pimpla* and *Scambus*. The second numerously represented group of *Ichneumonidae* consisted of parasitoids of *Aranei* including species of the following genera: *Acrodactyla, Clistopyga, Polysphincta, Schizopyga, Tromatobia, Zaglyptus* and *Zatypota*. The third group included parasitoids of xylophages comprising the species of *Dolichomitus* genus and the species *Deuteroxorides elevator* (Panzer). The remaining two species: *Perithous divinator* (Rossi) and *Theronia atalantae* (Poda) belonged to parasitoids of *Aculeata* (the first one) and to hyperparasitoids of *Tachinidae, Braconidae* and *Ichneumonidae* (the second one). The trophic relations of the species *Diacritus aciculatus* are unknown.

Four species new for Wielkopolska have been found. They are: *Dolichomitus imperator* (Kriechb.) and *Scambus elegans* (Wolst.) caught in the environment of fruit trees, and *Deuteroxorides elevator* (Panzer) and *Zatypota albicoxa* (Walker) found in shrubs.

DISCUSSION

During our 3-year studies carried out in the fruit-growing environment and in shrubs growing in its immediate surroundings, we have found the occurrence of 45 species of *Ichneumonidae* belonging to *Pimplinae* subfamily (23.8% of the Polish fauna of this subfamily) and one species each of *Diacritinae* and *Poemeniinae* subfamilies. The studies have shown higher species diversity and a greater number of ichneumonids settling the shrubs than those settling the fruit trees in the orchard. The same tendency was reported by the studies of Olszak (1992) referring to the investigation of the parasitizing entomofauna of orchards and their immediate surroundings. The coefficient of the general species diversity H' of Shannon and Weaver (1963), and the Simpson's formula (after Odum 1977) confirmed a higher

specific diversity of *Ichneumonidae* in shrubs than in the environment of fruit trees. The uniformity index J' of Pielou (1966) showed a similar distribution of the species number in both environments. The statistical analysis of the H' value indicated that both environments differed by the species composition. The index of species similarity MS (Marczewski and Steinhaus 1959) showed that the species composition of *Ichneumonidae* in the studied environments was similar in 61.7%.

The present studies have confirmed the occurrence of the majority of species in the fruit-growing environment of Wielkopolska, because they were identified earlier in that environment and region by Kadłubowski and Piekarska (1984), Piekarska-Boniecka and Wilkaniec (1996), Piekarska-Boniecka (1997, 1998) and Piekarska-Boniecka et al (2002). Four new species for Wielkopolska have been found including: *Deuteroxorides elevator* (Panzer), *Dolicomitus imperator* (Kriechb.), *Scambus elegans* (Wolst.) and *Zatypota albicoxa* (Walker).

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POLISH SUMMARY

PIMPLINAE, DIACRITINAE I *POEMENIINAE* (*HYMENOPTERA, ICHNEUMONIDAE*) WYSTĘPUJĄCE W ŚRODOWISKU SADOWNICZYM W PRZYBRODZIE

Badania nad gąsienicznikami (*Hymenoptera, Ichneumonidae*) występującymi w środowisku sadowniczym w Przybrodzie prowadzono w latach 1999–2002 w sadzie i w zakrzewieniach znajdujących się w jego najbliższym otoczeniu. Gąsieniczniki odławiano od maja do października w żółte pułapki Moericke'go.

Łącznie odłowiono 540 osobników *Ichneumonidae*. Stwierdzono 45 gatunków należących do podrodziny *Pimplinae* (32,8% fauny krajowej tej podrodziny) i po jednym gatunku podrodzin *Diacritinae* i *Poemeniinae*. W środowisku drzew owocowych odłowiono 34 gatunki *Pimplinae* i jeden gatunek należący do *Diacritinae*. Dominowały gatunki *Itoplectis maculator* (F.) (25,3%) i *Zatypota gracilis* (Holmgr.) (15,8%). W zakrzewieniach stwierdzono 39 gatunków *Pimplinae* oraz po jednym gatunku *Diacritinae* i *Poemeniinae*. Gatunkami dominującymi były *Diacritus aciculatus* (Voll.) (9,7%), *Itoplectis maculator* (7,1%), *Liotryphon crassiseus* (Thoms.) (7%), *L. punctulatus* (Ratz.) (6,3%), *Zatypota gracilis* (6%), *Pimpla turionellae* (L.) (5,7%) i *P. flavicoxis* Thoms. (5,4%).

Badania wykazały większe zróżnicowanie gatunkowe i większą liczebność *Ichneumonidae* występujących w zakrzewieniach niż w sadzie. Współczynnik ogólnej różnorodności gatunkowej Shannon'a-Weaver'a (1963) (H') i wskaźnik bogactwa gatunkowego Simpson'a wg Oduma (1977) (d) potwierdziły większe zróżnicowanie gatunkowe gąsieniczników występujących w zakrzewieniach niż w środowisku drzew owocowych. Wskaźnik równomierności Pielou (1966) (J') wskazał na podobny rozkład liczebności gatunków w obu środowiskach. Z analizy statystycznej wartości H' wynikało, że oba środowiska różniły się między sobą składem gatunkowym. Wskaźnik podobieństwa gatunkowego Marczewskiego & Steinhaus'a (1959) (MS) wykazał, że skład gatunkowy *Ichneumonidae* badanych środowisk był jednakowy w 61,7%.

Stwierdzono cztery gatunki nowe dla Wielkopolski. Były to: *Deuteroxorides elevator* (Panzer), *Dolichomitus imperator* (Kriechb.), *Scambus elegans* (Wolst.) i *Zatypota albicoxa* (Walker).