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CHANGES IN THE FAUNA OF ZOOPHAGOUS HOVERFLIES (SYRPHIDAE, DIPTERA) OF GREEN URBAN ENVIRONMENTS OF POZNAŃ IN THE LIGHT OF MULTI-YEAR OBSERVATIONS

ZMIANY W FAUNIE ZOOFAGICZNYCH BZYGOWATYCH (SYRPHIDAE,
DIPTERA) W ŚRODOWISKACH ZIELENI MIEJSKIEJ POZNANIA
W ŚWIETLE WIELOLETNICH OBSERWACJI

Summary. Observations of zoophagous hoverflies communities were carried out in 2006–2015 in the study area which covers the Botanical Garden of the Adam Mickiewicz University, Poznań, and the adjacent collection of decorative plants of the Faculty of Horticulture and Landscape Architecture of the Poznań University of Life Sciences. The insects were caught in Moericke's yellow traps. The study yielded the occurrence of 42 zoophagous hoverflies species of 22 genera, which constitutes about 25% of predatory Syrphidae in Poland. The largest numbers of individuals were recorded in 2008, 2013 and 2015. The highest species diversity was observed in 2015, namely 21 species of zoophagous Syrphidae. *Episyrphus balteatus* (De Geer, 1776) was the only species reported in each study year and also caught in the highest numbers. The resulting 336 individuals of *E. balteatus* constituted 49% of the collected material. The abundance of this species in each study year helped to classify it as a eudominant. Depending on the year the group also comprised: *Epistrophe eligans* (Harris, 1780), *Eupeodes corollae* (Fabricius, 1794), *Melangyna pavlovskyi* Violovitsh, 1956, *M. quadrimaculata* Verrall, 1873, *Parasyrphus punctulatus* (Verrall, 1873), *Pipizella viduata* (Linnaeus, 1758), *Syrphus torvus* Osten-Sacken, 1875 and *S. vitripennis* Meigen, 1822.

Key words: zoophagous hoverflies, Syrphidae, city greenery, Poznań

Introduction

Zoophagous hoverflies from the Syrphidae family, apart from beetles from the Coccinellidae family, as well as Neuroptera from the Chrysopidae family, play a significant role in the process of limiting the number of harmful Invertebrata. It particularly corresponds to the group of stinging-sucking Arthropoda (*Tetranychus* sp., Hemiptera), as well as mining species (Chudzicka, 1979; Lubiarsz et al., 2011).

The group comprises aphids colonizing the plant cover of urbiceneses in high amounts which is indicated by numerous authors (Borowiak-Sobkowiak et al., 2009; Wilkaniec et al., 2005).

The pests eagerly colonize the fauna of strongly modified urban areas, bringing about worsening of its health. The beneficial role of predatory Syrphidae taking part in the number-regulating processes of phytophages is of a particular significance in such habitats, in respect, for example, of the limited possibility of fertilisers application. The literature presents abundant information concerning beneficial insects, among others Syrphidae and their importance in agricultural, vegetable, fruit and some ornamental plants cultivation (Kozłowska, 1978; Králiková and Králik, 2009; Łabanowski and Soika, 2010; Trzciński and Piekarska-Boniecka, 2012; Trzciński et al., 2011; Wnuk, 1972, 1979; Wnuk and Medvey, 1986). At the same time the degree of knowledge concerning the fauna of urbiceneses is still insufficient which is stressed by many authors. The reports available concerning Syrphidae come both from the urban areas and the surroundings of Warsaw (Bańkowska, 1982; Cichocka and Goszczyński, 2008), Łódź (Kowalczyk and Kurzac, 2003; Kowalczyk and Watała, 1991), Cracow (Wojciechowicz-Żytko and Jankowska, 2011), as well as from the surroundings of Lublin (Malinowska, 1979). The useful entomofauna of the Poznań urban areas was researched by Trzciński (2008), Trzciński et al. (2014) and Rzańska et al. (2014, 2015). However, the literature lacks long-period observations concerning the changes taking place in the fauna of insects colonizing the habitats of the type. The below work aims at analysing both the species and dominance structure of the zoophagous hoverflies community colonizing urbanized environments exemplified by one of the bigger urban greenery areas, i.e. the Botanical Garden of the Adam Mickiewicz University, Poznań, and the adjacent collection of decorative plants surrounding the buildings of the Faculty of Horticulture and Landscape Architecture of the Poznań University of Life Sciences, in the scope of the decade 2006–2015.

Material and methods

The research on the zoophagous hoverflies communities was carried out in 2006–2015. The research area was the Botanical Garden of the Adam Mickiewicz University, Poznań and the adjacent collection of decorative plants surrounding the buildings of the Faculty of Horticulture and Landscape Architecture of the Poznań University of Life Sciences. The total area under observations covers approx. 24.5 ha. It is situated in the western part of Poznań, in the quarter Jeżyce, at the crossing of Dąbrowskiego, Botaniczna and św. Wawrzyńca streets (latitude: N 52°25'19"–52°25'02", longitude: E 16°

52°20"–16°53'12"). Presently, the Garden covers an area of approx. 22 ha. Its surface consists of assumptions of various character of the successive parts both in visual and species aspects. Today about 8 thous. plant taxons can be found there. The plants of the garden are distributed in the following sections: plant geography, ecological-geographical, plant systematics, plant biology, ornamental plants, rare and endangered plants, water plants, as well as dendrological collections and nurseries. The plant geography section is the biggest one and it comprises approx. 1800 taxons. The Garden also houses the biggest Polish alpinarium with its 1.7 thous. alpine vegetation species (Mierzejewska, 2001). Additionally, ponds and a brook can be found there. The ornamental plants collection surface covers approx. 2.5 ha. A collection of grasses and sedges can be found there, represented by species from the genera: *Carex* sp., *Festuca* sp., *Miscanthus* sp., *Molinia* sp., *Spartina* sp., annuals and biannuals: *Campanula* sp., *Clarkia* sp., *Matthiola* sp., *Tropaeolum* sp., *Consolida* sp., *Verbascum* sp., *Zinnia* sp., perennials: *Anemone* sp., *Aquilegia* sp., *Aster* sp., *Dianthus* sp., *Filipendula* sp., *Lavandula* sp., *Liatris* sp. The whole is surrounded by a park area covered with trees and shrubs. Tree species of *Acer* sp. genus (*Acer platanoides* L., *A. pseudoplatanus* L.), *Betula* sp., *Robinia* sp., *Ulmus* sp., and shrubs of genera: *Cornus* sp., *Philadelphus* sp., *Spiraea* sp., as well as *Syringa* sp., prevail in the dendroflora of the object.

The material caught to the so-called Moericke's traps was used in the carried out analyses. It is collected in order to monitor the activity of imagines from various insect groups, among others Hymenoptera, Diptera or Aphidae. The traps are yellow vessels of approx. 1.5 dm³ capacity, filled with a mixture of water and glicol in ratio 5 : 1, with an addition of an agent reducing surface tension.

The traps were hung at the height of approx. 1.5 m in insolated places, which effectively influenced the Diptera catch. The research observations were conducted each year starting at the beginning of April and completing at the end of October. 20 Moericke's traps were distributed in the observation area (10 in the Botanical Garden and 10 on the area of the ornamental plants collection of the Poznań University of Life Sciences). The location of the traps was unchanged at the time of the research. Samples were taken in ten-days intervals, three times a month.

Mature forms of hoverflies, after a selection, were placed in 70% ethanol (they are kept at Department of Entomology and Environmental Protection, Poznań University of Life Sciences). The taxons were marked with an application of van Veen's (2004) key. Zoophagous species of hoverflies were selected from the obtained material, and next a list of species was built, and their abundance, as well as dominance structure of the community were presented for each of the researched years. Dominance coefficient (D) was accepted (percentage share of individuals of each species in the community), comprising five dominance classes: eudominants $\geq 10.1\%$, dominants 5.1–10%, subdominants 2.1–5.0%, recedents 1.1–2.0%, subrecedents $\leq 1\%$ (Kasprzak and Niedbała, 1981).

Results and discussion

More than 4 thous. samples were collected from the research area in the decade 2006–2015, applying the above described method. 686 specimens of zoophagous hoverflies were obtained belonging to 42 species and 22 genera (Table 1). It constitutes about 25% of the Polish zoophagous Syrphidae fauna. In prevailing numbers the group was built of Syrphinae subfamily species (37 species), and 5 species: *Pipiza festiva* Meig., *P. luteitarsis* Zett., *P. noctiluca* (L.), *Pipizella viduata* (L.) and *Volucella pellucens* (L.) from Eristalinae subfamily. All the zoophagous species excluding *V. pellucens* (ectoparasite of Auculeata) can be regarded as members of obligatory aphidophages.

Table 1. Abundance and dominance structure of zoophagous hoverflies caught into Moericke's yellow traps in the Botanical Garden of the Adam Mickiewicz University, Poznań and in the collection of decorative plants of the Poznań University of Life Sciences in 2006–2015

Tabela 1. Liczebność oraz struktura dominacji zoofagicznych bzygowatych odłowionych metodą żółtych pułapek Moerickego na terenie Ogrodu Botanicznego Uniwersytetu im. Adama Mickiewicza w Poznaniu oraz w kolekcji roślin ozdobnych Uniwersytetu Przyrodniczego w Poznaniu w latach 2006–2015

Species Gatunek	Years – Lata																					
	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		total suma	
	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>Baccha elongata</i> (Fabricius, 1775)	1	2.6			1	1							1	1.4	2	1.7					5	0.7
<i>Chrysotoxum</i> <i>cautum</i> (Harris, 1776)																	1	3.8			1	0.1
<i>Dasysyrphus</i> <i>albostriatus</i> (Fallen, 1817)			1	2.2																	1	0.1
<i>D. hilaris</i> (Zetterstedt, 1843)																			1	1	1	0.1
<i>D. tricinctus</i> (Fallen, 1817)					2	2			2	2.4			1	1.4					2	2.1	7	1
<i>D. venustus</i> (Meigen, 1822)																			1	1	1	0.1
<i>Didea alneti</i> (Fallen, 1817)							2	7.4													2	0.3
<i>D. fasciata</i> Macquart, 1834																			1	1	1	0.1
<i>Epistrophe</i> <i>eligans</i> (Harris, 1780)			6	13									1	1.4			3	11.5			10	1.5

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Table 1 – cont. / Tabela 1 – cd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>E. melanostoma</i> (Zetterstedt, 1843)			2	4.3																	2	0.3
<i>Epistrophella</i> <i>euchroma</i> (Kowarz, 1885)															1	0.9					1	0.1
<i>Episyrphus</i> <i>balteatus</i> (De Geer, 1776)	11	28.9	5	10.9	76	76	19	70.4	51	60.7	39	49.4	25	33.8	56	48.3	10	38.5	44	45.8	336	49
<i>Eupeodes</i> <i>corollae</i> (Fab- ricius, 1794)	3	7.9	1	2.2	7	7	4	14.8	4	4.8	13	16.5	3	4.1	1	0.9			4	4.2	40	5.8
<i>E. luniger</i> (Meigen, 1822)	1	2.6																			1	0.1
<i>Melangyna</i> <i>lasiophthalma</i> (Zetterstedt, 1843)											2	2.5			2	1.7			2	2.1	6	0.9
<i>M. lucifera</i> Nielsen, 1980	1	2.6									3	3.8	4	5.4	7	6	1	3.8	3	3.1	19	2.8
<i>M. pavlovskiyi</i> Violovitsh, 1956												8	10.8	25	21.6			15	15.6	48	7	
<i>M. quadrimacu- lata</i> Verrall, 1873	7	18.4							2	2.4			6	8.1	4	3.4	1	3.8	5	5.2	25	3.6
<i>Melanostoma</i> <i>mellinum</i> (Lin- naeus, 1758)			4	8.7					3	3.6					1	0.9			1	1	9	1.3
<i>M. scalare</i> (Fabricius, 1794)	1	2.6	3	6.5	1	1									2	1.7			1	1	8	1.2
<i>Meligramma</i> <i>cincta</i> (Fallen, 1817)	1	2.6	2	4.3							1	1.3							2	2.1	6	0.9
<i>M. guttata</i> (Fallen, 1817)									1	1.2					1	0.9					2	0.3
<i>M. triangulifera</i> (Zetterstedt, 1843)																			1	1	1	0.1
<i>Meliscaeva</i> <i>auricollis</i> (Meig- en, 1822)																			2	2.1	2	0.3
<i>Parasyrphus</i> <i>punctulatus</i> (Verrall, 1873)			5	10.9					8	9.5	2	2.5	3	4.1	1	0.9	2	7.7			21	3.1
<i>Pipiza festiva</i> Meigen, 1822									2	2.4											2	0.3
<i>P. luteitarsis</i> Zetterstedt, 1843															1	0.9					1	0.1

Table 1 – cont. / Tabela 1 – cd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>P. noctiluca</i> (Linnaeus, 1758)													1	1.4							1	0.1
<i>Pipizella viduata</i> (Linnaeus, 1758)							1	3.7	1	1.2	7	8.9	1	1.4	2	1.7	4	15.4			16	2.3
<i>Platycheirus clypeatus</i> (Meigen, 1822)																			1	1	1	0.1
<i>P. discimanus</i> (Loew, 1871)											1	1.3	5	6.8			1	3.8	1	1	8	1.2
<i>P. scutatus</i> (Meigen, 1822)			1	2.2											1	0.9					2	0.3
<i>Scaeva pyrastris</i> (Linnaeus, 1758)					1	1					3	3.8	1	1.4					3	3.1	8	1.2
<i>S. selenitica</i> (Meigen, 1822)					1	1			1	1.2	1	1.3									3	0.4
<i>Sphaerophoria scripta</i> (Linnaeus, 1758)			3	6.5	2	2					5	6.3	2	2.7					1	1	13	1.9
<i>Syrphus ribesii</i> (Linnaeus, 1758)	3	7.9	1	2.2	3	3					1	1.3	2	2.7			1	3.8			11	1.6
<i>S. torvus</i> Osten-Sacken, 1875	3	7.9	6	13	2	2			3	3.6	1	1.3	4	5.4			1	3.8	2	2.1	22	3.2
<i>S. vitripennis</i> Meigen, 1822	5	13.2	1	2.2	1	1	1	3.7	4	4.8			6	8.1	9	7.8	1	3.8	3	3.1	31	4.5
<i>Volucella pellucens</i> (Linnaeus, 1758)			4	8.7																	4	0.6
<i>Xanthandrus comtus</i> (Harris, 1780)	1	2.6			2	2			1	1.2											4	0.6
<i>Xanthogramma pedissequum</i> (Harris, 1776)			1	2.2																	1	0.1
<i>X. stackelbergi</i> Violovitsh, 1975					1	1			1	1.2											2	0.3
Total number of species Razem liczba gatunków		12		16		13		5		14		13		17		16		11		21		42
Number of specimens Liczba osobników		38		46		100		27		84		79		74		116		26		96		686

L – number of specimens, D – coefficient of dominance.

L – liczba osobników, D – współczynnik dominacji.

The above results confirmed the earlier observations of Trzciński (2008), as well as Trzciński et al. (2014), who, conducting fauna observations with an application of a broader methodological spectrum, had proved till then 48 zoophagous species of hoverflies from the area.

The highest number of caught specimens was characteristic for the season of 2013 (116 individuals); a similar number was recorded in 2008 (100) and 2015 (96), while the lowest number of zoophagous hoverflies in samples was observed in: 2014 (26), 2009 (27) and 2006 (38) (Fig. 1).

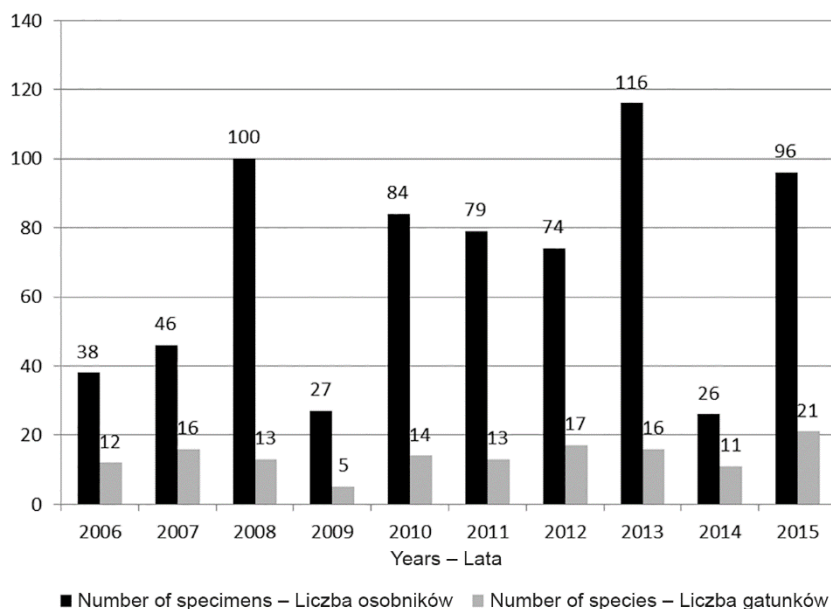


Fig. 1. Abundance and number of species caught in the Botanical Garden of the Adam Mickiewicz University, Poznań and in the collection of decorative plants of the Poznań University of Life Sciences in 2006–2015

Rys. 1. Liczba osobników oraz liczba gatunków odłowionych na terenie Ogrodu Botanicznego Uniwersytetu im. Adama Mickiewicza w Poznaniu oraz w kolekcji roślin ozdobnych Uniwersytetu Przyrodniczego w Poznaniu w latach 2006–2015

The highest diversity of species was recorded in 2015 – 21 of confirmed species, and the lowest in 2009 – 5 species (Fig. 1). The average number of species at the level 12–17 (Table 1, Fig. 1) characterized the other research years. While analysing the above data in the successive years no clear tendencies of falling numbers or poorer diversity of species were observed in the interval research. The highest species diversity and a high number of individuals were noticed in the last year of the observation (2015), and the lowest values in 2009, i.e. in the mid-stage of the research. Short-period fluctuations connected with the abundance and species diversity are most probably connected with the course of the climatic conditions in a given year. They have a direct impact on zo-

ophagous Syrphidae species, and indirect, influencing the populations of host species, i.e. aphids. Climatic conditions have a crucial importance for aphids since they directly influence their abundance and pace of their population's development (Wilkaniec, 2005; Wilkaniec et al., 2005). The course of climatic conditions in a given year shows less meaningful significance for polyvoltine species (e.g. *Episyrphus balteatus*), and bigger for univoltine ones (e.g. *Melangyna pavlovskyi*, *Epistrophe eligans*). In the course of all the observation years *Episyrphus balteatus* was the most abundantly represented species. During the research time 336 specimens were caught which comprised 49% of the whole material (Table 1). The next abundantly represented species were: *Melangyna pavlovskyi* (48 individuals, 7% share), *Eupeodes corollae* (40 individuals, 5%), and *Syrphus vitripennis* (31 individuals, 4.5%). The other species occurred in lower numbers (Table 1). In the analysed time interval, however, significant changes were observed in the dominance structure of the communities in successive research years. In all the years when the investigations were conducted *E. balteatus* occurred in the number qualifying it to the group of eudominants ($\geq 10.1\%$). It was the only species present in the samples collected each research year.

Similar dependencies were observed in the case of *Melangyna pavlovskyi*, yet this species was recorded exclusively in 2012, 2013 and 2015. In the successive years the group of eudominants showed a different species composition. *Epistrophe eligans* in 2007 and 2014, *Eupeodes corollae* – 2009 and 2011, *Melangyna quadrimaculata* – 2006, *Parasyrphus punctulatus* – 2007, *Pipizella viduata* – 2014, *Syrphus torvus* – 2007, and *S. vitripennis* – 2006 were also numbered among the group. Depending upon the year as many as 9 different species in total were recorded in the group.

The highest number of eudominants was recorded in 2007 – 4 species, the lowest in 2008 and 2010 – one species (*E. balteatus*) and in the other years there were 2 or 3 species. Such a distribution of dominance structure proves there are meaningful oscillations in the communities of zoophagous species of hoverflies infesting strongly modified urban environment.

It also implies a significant impact of environmental or anthropogenic factors on the communities of insects, taking place or introduced into the habitats. As far as few species are concerned, expansive tendencies can be observed, e.g. *Melangyna pavlovskyi*. The species was observed for the first time in 2012. It was always numbered among the group of eudominants in all the years of its occurrence. The species has been recently evidenced from the territory of Poland (Mielczarek, 2011). The species noted only in the first stage of investigations, and their presence not confirmed afterwards, are among others: *Eupeodes luniger*, *Didea alneti* and *Xanthogramma pedissequum*. They are species commonly occurring in natural environments (Bańkowska, 1980). It is possible that changes occurring in urbiceneses bring about withdrawal of the insects from the strongly modified habitats.

Conclusions

1. Urban greenery, i.e. botanical gardens, collections, and parks in a strongly modified landscape of urban agglomeration constitute a fothergilla for beneficial insects (on the example of zoophagous Syrphidae) enabling their survival and development.

2. Meaningful impact on both abundance and dominance structure of this group of insects is imposed by climatic conditions which may directly, as well as indirectly influence the host species' populations (aphids).

3. Strongly modified environments promote the development of some species (*E. balteatus*, *M. pavlovskyi*), which tolerate or even well accept the pressure of urbanization and may constitute a specific fothergilla for insects beneficial from the economic point of view, Diptera, becoming a dispersion centre of the insects onto the reclaimed areas.

References

- Bańkowska, R. (1980). Fly communities of the family *Syrphidae* in natural and anthropogenic habitats of Poland. *Memorabilia Zool.* 33.
- Bańkowska, R. (1982). Hover flies (*Diptera*, *Syrphidae*) of Warsaw and Mazovia. *Memorabilia Zool.* 35, 57–78.
- Borowiak-Sobkowiak, B., Wilkaniec, B., Wilkaniec, A., Piekarska-Boniecka, H., Trzcíński, P. (2009). Stopień zasiedlenia dendroflory Parku Cytadela w Poznaniu przez mszyce. [Degree of dendroflora infestation by aphids in Cytadela park in Poznań]. *Prog. Plant Prot. / Post. Ochr. Rośl.*, 49, 1, 91–94.
- Chudzicka, E. (1979). Wpływ struktury zieleni miejskiej na skład gatunkowy i liczebność fitofagów koron (na przykładzie *Tilia* sp.). In: Warunki rozwoju drzew i ich fauny w Warszawie. Materiały konferencji naukowo-technicznej, 28 stycznia 1978 r. (pp. 74–84). Wrocław: Ossolineum.
- Cichočka, E., Goszczyński, W. (2008). The impact of urban pressure on species composition and number of Arthropoda on trees in a city on the example of Warsaw. *Aphids Other Hemipter. Insects*, 14, 63–72.
- Kasprzak, K., Niedbała, W. (1981). Wskaźniki biocenotyczne stosowane przy porządkowaniu i analizie danych w badaniach ilościowych. In: M. Górny, L. Grüm (eds.), *Metody stosowane w zoologii gleby* (pp. 397–409). Warszawa: PWN.
- Kowalczyk, J. K., Kurzac, T. (2003). Owady chronione, zagrożone i rzadkie Ogrodu Botanicznego w Łodzi. *Biul. Ogrod. Bot. Muz. Zbior.*, 12, 207–217.
- Kowalczyk, J. K., Watała, C. (1991). Interesujące muchówki (*Diptera*, *Syrphidae*, *Conopidae*) Łodzi i okolic. *Przegl. Zool.*, 35, 3–4, 295–297.
- Kozłowska, A. (1978). Występowanie drapieżnych Syrphidae (*Diptera*) w koloniach mszyc na drzewach i krzewach owocowych okolic Lublina. *Pol. Pismo Entomol.*, 48, 2, 677–686.
- Králiková, A., Králik, T. (2009). Preliminary studies of hoverflies (*Diptera*: *Syrphidae*) on bullwort (*Ammi majus* L.). [Wstępne badania nad bzygami (*Diptera*: *Syrphidae*) na aminku większym (*Ammi majus* L.)]. *Dipteron*, 25, 30–37.
- Lubiarz, M., Cichočka, E., Goszczyński, W. (2011). Landscape type and species richness and composition of Arthropoda Part II. Urban landscape. *Aphids Other Hemipter. Insects*, 17, 39–51.

Trzcíński, P., Piekarska-Boniecka, H., Rzańska-Wieczorek, M., Kubasik, W. (2016). Changes in the fauna of zoophagous hoverflies (Syrphidae, Diptera) of green urban environments of Poznań in the light of multi-year observations. *Nauka Przyr. Technol.*, 10, 3, #39. DOI: 10.17306/J.NPT.2016.3.39

- Łabanowski, G., Soika, G. (2010). Organizmy pożyteczne związane ze szkodnikami roślin ozdobnych. [Beneficial organisms associated with ornamental pests]. *Prog. Plant Prot. / Post. Ochr. Rośl.*, 50, 4, 2003–2007.
- Malinowska, D. (1979). Communities of aphidophagous syrphids (Diptera, Syrphidae) in the Lublin region. *Memorabilia Zool.*, 30, 37–62.
- Mielczarek, Ł. (2011). Pierwsze stwierdzenie *Melangyna pavlovskyi* (Violovitsh, 1956) (Diptera: Syrphidae) w Europie. *Dipteron*, 27, 43–47.
- Mierzejewska, L. (2001). Tereny zielone w strukturze przestrzennej Poznania. *Pr. Kom. Geogr.-Geol. PTPN*, 29.
- Rzańska, M., Piekarska-Boniecka, H., Trzcíński, P. (2014). Parazytoidy z podrodziny Pimplinae (Hymenoptera, Ichneumonidae) występujące w kolekcji roślin ozdobnych Uniwersytetu Przyrodniczego w Poznaniu. In: P. Indykiewicz, J. Böhner (eds.), *Urban fauna: animal, man and the city – interactions and relationships* (pp. 127–135). Bydgoszcz: UTP.
- Rzańska, M., Piekarska-Boniecka, H., Trzcíński, P. (2015). Występowanie parazytoidów z rodziny gąsienicznikowatych (Hymenoptera, Ichneumonidae) w Ogrodzie Botanicznym Uniwersytetu im. Adama Mickiewicza w Poznaniu. *Prog. Plant Prot. / Post. Ochr. Rośl.*, 55, 3, 340–345. DOI: 10.14199/ppp-2015-058
- Trzcíński, P. (2008). Predatory Syrphids (Diptera, Syrphinae) found in urban green spaces. *Aphids Other Hemipter. Insects*, 14, 193–198.
- Trzcíński, P., Dolańska-Niedbała, E., Piekarska-Boniecka, H. (2011). Wpływ otoczenia sadu jabłoniowego na występowanie drapieżnego gatunku *Episyrphus balteatus* (Deg.) (Diptera, Syrphidae). [Effect of surroundings of apple orchard on the occurrence of predatory species *Episyrphus balteatus* (Deg.) (Diptera, Syrphidae)]. *Prog. Plant Prot. / Post. Ochr. Rośl.*, 51, 4, 1792–1796.
- Trzcíński, P., Piekarska-Boniecka, H. (2012). Fauna bzygowatych (Diptera, Syrphidae) w sadach z integrowaną ochroną roślin w Wielkopolsce. [Hoverflies (Diptera, Syrphidae) in apple orchards with integrated pest management in Wielkopolska region (Poland)]. *Prog. Plant Prot. / Post. Ochr. Rośl.*, 52, 4, 975–980.
- Trzcíński, P., Piekarska-Boniecka, H., Rzańska, M. (2014). Bzygowate (Diptera, Syrphidae) występujące na terenach zieleni miejskiej na przykładzie Ogrodu Botanicznego Uniwersytetu im. Adama Mickiewicza w Poznaniu. [Hoverflies (Diptera, Syrphidae) of urban greenery as illustrated by the example of Adam Mickiewicz University Botanical Garden, Poznań]. *Prog. Plant Prot. / Post. Ochr. Rośl.*, 54, 3, 326–333. DOI: <http://dx.doi.org/10.14199/ppp-2014-053>
- van Veen, M. P. (2004). *Hoverflies of Northwest Europe: identification keys to the Syrphidae*. Utrecht: KNNV Publishing.
- Wilkaniac, B. (2005). Many years' dynamics of aphid recurrence in urban green spaces of Poznań. *Aphids Other Hemipter. Insects*, 11, 203–212.
- Wilkaniac, B., Piekarska-Boniecka, H., Trzcíński, P. (2005). Mszyce jako stały element entomofauny zieleni parkowej Poznania. [Aphids as a permanent component of entomofauna in the green area of Poznań]. *Prog. Plant Prot. / Post. Ochr. Rośl.*, 45, 1, 516–523.
- Wnuk, A. (1972). Badania nad składem gatunkowym drapieżnych bzygowatych (Syrphidae, Diptera) występujących w koloniach mszyc na drzewach i krzewach owocowych. *Pol. Pismo Entomol.*, 42, 235–247.
- Wnuk, A. (1979). *Episyrphus balteatus* (De Geer), (Diptera, Syrphidae) jako drapieżca mszyc (Homoptera, Aphidodea). *Rozpr. Hab. AR Krak.*, 72.
- Wnuk, A., Medvey, M. (1986). Drapieżne bzygowate (Diptera, Syrphidae) występujące w koloniach mszyc (Homoptera, Aphidinea) na porzeczkach. *Pol. Pismo Entomol.*, 56, 209–215.
- Wojciechowicz-Żyto, E., Jankowska, B. (2011). Aphids and their predators occurring on some shrubs in the Botanical Garden of the Jagiellonian University in Kraków. *Aphids Other Hemipter. Insects*, 17, 145–154.

ZMIANY W FAUNIE ZOOFAGICZNYCH BZYGOWATYCH (SYRPHIDAE, DIPTERA) W ŚRODOWISKACH ZIELENI MIEJSKIEJ POZNAŃIA W ŚWIETLE WIELOLETNICH OBSERWACJI

Streszczenie. Obserwacje zgrupowań zoofagicznych bzygowatych prowadzono w latach 2006–2015 na terenie badawczym obejmującym powierzchnię Ogrodu Botanicznego Uniwersytetu im. Adama Mickiewicza w Poznaniu oraz przylegającą do niego kolekcję roślin ozdobnych Wydziału Ogrodnictwa i Architektury Krajobrazu Uniwersytetu Przyrodniczego w Poznaniu. Do odłowu owadów wykorzystano metodę żółtych pułapek Moerickego. W wyniku badań stwierdzono występowanie 42 gatunków zoofagicznych bzygowatych należących do 22 rodzajów, co stanowi około 25% fauny drapieżnych Syrphidae w Polsce. Największą liczbę osobników zarejestrowano w latach: 2008, 2013, 2015. Największą różnorodność gatunkową odnotowano w roku 2015, było to 21 gatunków *Episyrphus balteatus* (De Geer, 1776) był jedynym gatunkiem wykazanym w każdym roku prowadzenia badań, był też gatunkiem najliczniej odławianym. W toku badań pozyskano 336 osobników *E. balteatus*, co stanowiło 49% zebranego materiału. Liczebność tego gatunku w każdym roku obserwacji pozwoliła zakwalifikować go do grupy eudominantów. W niektórych latach do tej grupy zaliczono również gatunki: *Epistrophe eligans* (Harris, 1780), *Eupeodes corollae* (Fabricius, 1794), *Melangyna pavlovskyi* Violovitsh, 1956, *M. quadrimaculata* Verrall, 1873, *Parasyrphus punctulatus* (Verrall, 1873), *Pipizella viduata* (Linnaeus, 1758), *Syrphus torvus* Osten-Sacken, 1875 oraz *S. vitripennis* Meigen, 1822.

Słowa kluczowe: zoofagiczne bzygowate, Syrphidae, środowisko miejskie, Poznań

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