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HOVER FLIES (*DIPTERA, SYRPHIDAE*) OF WARSAW AND MAZOVIA

ABSTRACT

There are 193 syrphid species recorded in Mazovia, including 115 in Warsaw, but only 73 in urban green areas.

The species composition of syrphid communities is simplified with increasing urban pressure. They are dominated by the species with large geographical ranges such as Holarctic, Palaearctic, and Euro-Siberian. The species with small ranges are eliminated from urban fauna. Eurytopic species largely predominate, while oligo- and stenotopic species are significantly reduced. Also predatory species are favoured, while the number of saprophagous and phytophagous species have dropped. Moreover, the syrphids of urban habitats are dominated by the species with large ecological amplitude and highly expansive.

INTRODUCTION

The earliest data on the occurrence of *Syrphidae* in Mazovia can be found in the check-list prepared by Sznabl in 1881, and containing all the families of flies [3]. A more complete information on the occurrence of hover flies appeared only in 1953, the material being collected in Warsaw surroundings in the large sense, thus in the area corresponding to Mazovia [5]. Many data on the occurrence of hover flies in this region are also to be found in more recent works on the fauna of Poland [1, 6].

The present paper includes a list of syrphids reported from Mazovia so far. It is based on earlier publications and is supplemented by 47 species not reported earlier (Table 6). The *Syrphidae* of Warsaw have not been studied so far. It is impossible to tell whether the earlier materials were collected in the town itself or in the suburbs. For this reason the further analysis is based only on the materials collected in recent studies carried out at the Institute of Zoology PAS in urban green areas of Warsaw.

The material used here was collected by means of various quantitative methods such as yellow Moericke's traps placed in tree crowns and low in grass, entomological sweep-net sampling per time, quantitative sweeping, and also qualitative methods of catching with entomological net, as well as the material obtained from rearing larvae was analysed. To prepare the check-list of the species occurring in Mazovia, unpublished materials were

largely used, gathered for more than ten years for the collection of the Institute of Zoology. Also the materials collected in the recent study in the Kampinos forest and at Radziejowice were included.

SPECIES COMPOSITION

Mazovia is inhabited by the same hover flies which occur over the Central-European lowland. The hover flies of Mazovia consist of 193 species, this being much less than in the whole Poland, where about 350 species were found. All mountain species, which form a large group, are lacking in Mazovia, as well as many xerophilous and hygrophilous flies. Scantiness of Mazovian syrphids is an effect of a rather monotonous lowland landscape, thus of small habitat diversity, on the one hand, and an effect of man management, on the other. Most of the Mazovian area is occupied by crop fields and human settlements, while natural habitats are reduced to few forests such as the Kampinos forest, Biała forest, or Bolimów forest.

Only 63 syrphid species were recorded from the suburbs of Warsaw, i. e., less than from the urban areas. This is probably a result of insufficient sampling and not of the simplification of syrphid communities in the suburbs.

In urban green areas of Warsaw (not including the suburbs and urban woods such as e. g. the Bielany wood) 73 syrphid species were recorded, including 66 species in urban parks, 46 species in housing estates, and 37 species in the centre of the town, mostly in courtyards and squares. In addition, in the centre of the town a green belt along an artery with much traffic, polluted at a high rate, was distinguished. In this habitat 14 syrphid species were recorded. In general, 115 syrphid species were recorded so far within the administrative boundaries of Warsaw, which accounts for 60% of the species known from Mazovia and for 33% of the total number of species known from Poland.

It follows from this short review that many hover fly species cannot cross man-made barriers in urban habitats. The number of species distinctly drops with the deterioration of living conditions and increase in urban pressure (Fig. 1).

The refuges of syrphids and the centres from which they disperse into the areas subjected to heavy urban pressure are larger urban parks. The highest number of species was recorded there, and the composition of the syrphid communities was similar to that in natural habitats. Since these flies exhibit a high flying ability, some species are likely to come to Warsaw from rather distant habitats, like for instance the Kampinos forest.

All the syrphids recorded from Mazovia and Warsaw are native of the Polish fauna. Even partly synanthropized species such as *Eristalis tenax* or *Eumerus strigatus* also occur in natural habitats, and there are no

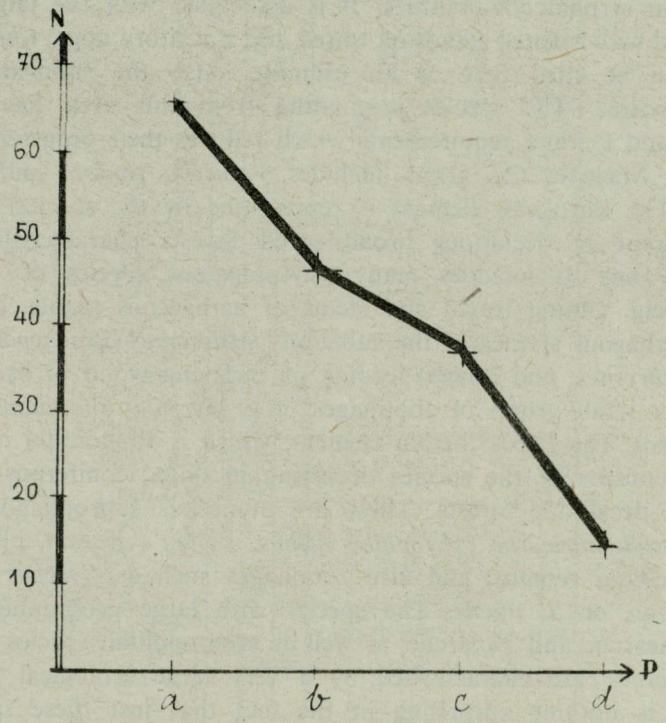

Fig. 1. Changes in the number of species along the gradient of urban pressure for syrphid communities.
a — urban parks, b — housing estates, c — centre of the town, d — streetside lawn.

indications of their foreign origin. Most species are associated with forests, and only a small group inhabiting meadows and other open habitats probably originates from the marginal zones of water bodies. Tischler classified the latter group as "Litoraea" [4]. It includes the species of small body sizes belonging to the genera *Melanostoma* Schin., *Sphaerophoria* St. Farg. Serv., *Platycheirus* St. Farg. Serv., *Pipizella* Rond., *Chrysogaster* Meig., and others.

ZOOGEOGRAPHICAL ANALYSIS

The fauna of Poland consists of many zoogeographical elements which were formed during permanent migrations of animals caused by large climatic changes in the Pleistocene. Syrphids occurring in Mazovia are characterized by a high proportion of the Euro-Siberian and Holarctic elements (28%) and a rather high proportion of the European element (23%). The proportion of the Palaearctic element is only 17%, and the proportion of the other elements is very low (Table 2). The boreal element is poorly

represented in syrphid communities. It is associated with the taiga biome, and in Poland with isolated stands on raised and transitory bogs. *Chrysotoxum arcuatum* can be cited here as an example. Also the submediterranean element is scarce. The species originating from this area have specific narrow site and thermal requirements which reduces their occurrence in our latitudes. In Mazovia this group includes *Volucella zonaria* and *Eumerus sabulonum*. The European element is represented by the species associated with the biome of deciduous broad-leaved forests characteristic of the temperature zone. It includes many phytophagous species of the genus *Cheilosia* Meig. mining leaves and stems of herbaceous plants, as well as many saprophagous species of the subfamily *Milesiinae* (*Brachypalpus bimaculatus*, *B. chrysites*, and others) feeding on decaying wood of broad-leaved trees. Also a small group of zoophages, e. g. *Syrphus bifasciatus*, belongs to this element. The Euro-Siberian element, which is abundantly represented in Poland, consists of the species occurring in taiga, coniferous-deciduous forests, and deciduous forests. These are numerous saprophagous species such as *Eristalis intricarius*, *Helophilus affinis*, *Xylota sylvarum*, phytophages such as *Cheilosia vernalis*, and also zoophages such as *Syrphus tricinctus*, *S. albostriatus*, or *S. nitens*. The species with large geographical ranges such as Palaearctic and Holarctic, as well as cosmopolitan species inhabiting different biomes, are characterized by a very large ecological amplitude. Thus there is nothing surprising in the fact that just these species can live in the habitats partly or completely transformed by man, and are partly synanthropized, like *Eristalis tenax*, *Syritta pipiens*, *Eumerus strigatus*, and many others.

An analysis of the material collected in the suburbs shows that there is a tendency to an increase in the proportion of the Holarctic and Palaearctic elements, combined with a decrease in the proportion of the Euro-Siberian and European elements (Table 1).

The same relationships are even more pronounced in urban green areas of Warsaw. As a result of heavy urban pressure, the proportion of species with large geographical ranges, e. g. Holarctic, increases, while the proportion of species with smaller ranges, e. g. European, drops. These tendencies become more and more clearly pronounced with increasing urban pressure. In syrphid communities inhabiting green areas of housing estates and the centre, the boreal element is absent and the proportion of the European and submediterranean elements is reduced, at an increase in the proportion of the Holarctic and cosmopolitan elements. In the extreme case of streetside lawns only the species with large ranges occur (Table 1).

Changes in the composition of syrphid communities as an effect of human activity, which consist in the promotion of the species with large geographical ranges at the expense of the species with small ranges, can be observed not only in towns. Similar tendencies occur in syrphid communities inhabiting agrocoenoses, and also in the areas subjected to industrial pollution [2].

Table 1. Proportions of zoogeographical elements in hover flies of Warsaw and non-urban habitats of Mazovia (N — number of species)

Zoogeographical element	Mazovia		Warsaw											
			Suburbs		Urban green areas									
					Total		Parks		Housing estates		Town centre		Streetside lawn	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Cosmopolitan	2	1.0	2	3.0	2	3.0	2	3.0	2	4.5	2	5.5	2	1.4
Holarctic	53	28.0	22	35.0	34	47.0	29	43.0	24	52.0	16	43.0	8	57.0
Palaearctic	34	17.0	16	25.0	15	22.0	13	20.0	9	20.0	9	24.0	3	22.0
Euro-Siberian	53	28.0	14	22.0	14	19.0	15	23.0	8	17.0	8	22.0	1	7.0
European	45	23.0	7	11.0	5	7.0	5	8.0	2	4.5	2	5.5	—	—
Boreal	3	1.5	1	2.0	1	1.0	1	1.5	—	—	—	—	—	—
Submediterranean	2	1.0	1	2.0	1	1.0	1	1.5	1	2.0	—	—	—	—
Mountain	1	0.5	—	—	—	—	—	—	—	—	—	—	—	—
Total number of species	193		63		73		66		46		37		14	

ECOLOGICAL ANALYSIS

Syrphids represent a very diversified group as far as the degree of their association with various habitat types is concerned. They consist of the species with very narrow habitat tolerance, the so-called stenotopic species, as well as of oligo-, poly-, and eurytopic species occurring in habitats of different types.

In Mazovia, the proportion of eurytopic species is relatively low (13%). They are represented by *Syrphus balteatus*, *S. vitripennis*, *S. corollae*, and *Sphaerophoria scripta*. Under urban conditions their proportion increases, particularly in the centre where it reached 79% (Table 2).

The proportion of polytopic species, thus with a little lower tolerance, is higher in Mazovia (20%). In urban areas it slightly increased, reaching 29%, and in the extreme case it dropped to 7%. This group of species includes *Syrphus nitens*, *S. latifasciatus*, *Pipiza festiva*, and others.

The most abundant syrphids under natural conditions are oligotopic species, thus characterized by narrow habitat requirements (e. g. hygrophilous species). In urban ecosystems the proportion of oligotopic species dropped markedly as compared with Mazovia (Table 2). The number and proportion of this group of species decreased with increasing urban pressure. It involves such species as *Cheilosia canicularis*, *Xylota sylvarum*, *Brachypalpus bimaculatus*, and others.

Stenotopic species are scarce in Mazovia and they account for only 13% of all syrphids. In the suburban zone their proportion is even lower and in urban green areas only two species of this group were caught — *Pyrophaena granditarsa* and *Helophilus hybridus*.

As noted above, most syrphids are associated with forests and only few species inhabit open spaces. In addition to hygrophilous species, originating from marginal zones of water bodies, the latter group is made up of very rare in Poland, xerophilous species of steppe and semi-arid origin. These species occur in Poland on few xerothermal grasslands in xerothermal oak forests, and in isolated xerothermal grasslands on rocks. Typical members of these flies are species of the genera *Merodon* Meig. and *Eumerus* Meig. Larvae of these syrphids are phytophagous. They destroy bulbs and roots of many plants covering xerothermal areas. From Mazovia several species of these syrphids have been recorded so far (Table 6). In urban areas there are only three species. They are partly synanthropized and destroy bulbs and rhizome of decorative flowers. These are *Merodon equestris*, *Eumerus strigatus*, and *E. tuberculatus*.

The group of hygrophilous species, inhabiting open areas, is poorly represented in the town. The overdrying of urban areas, the mowing of grass, application of chemical plant protection, and high toxicity of the urban habitat form an impassable barrier for many species abundantly occurring in meadows of Mazovia. Even such abundant species as *Melanostoma mellinum* and *Sphaerophoria scripta* are scarce in lawns of Warsaw.

Table 2. Proportions of groups with different ecological amplitudes in hover flies of Warsaw and non-urban habitats of Mazovia (N — number of species)

Group	Mazovia		Warsaw											
			Suburbs		Urban green areas									
					Total		Parks		Housing estates		Town centre		Streetside lawn	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Eurytopic	25	13.0	23	36.5	24	33.0	23	35.0	20	43.0	20	54.0	11	79.0
Polytopic	38	20.0	19	30.0	21	29.0	18	27.0	14	31.0	8	22.0	1	7.0
Oligotopic	105	54.0	15	24.0	26	35.0	24	36.0	11	24.0	8	22.0	2	14.0
Stenotopic	25	13.0	6	9.5	2	3.0	1	2.0	1	2.0	1	2.0	—	—

The most abundant species in urban areas are of forest origin. They mainly live in larger urban parks and well managed green areas of housing estates where, in addition to lawns, there are also trees and shrubs.

It is difficult to speak of the vertical distribution of hover flies. Adults are very mobile and they fly in both tree crowns and herbs. Small species of meadow origin show some preference to the herb layer. On the other hand, meadows with flowering plants attract all adult syrphids for which nectar and pollen are not only sources of food but also necessary products for further development of their gonads and for reproduction.

Saprophagous larvae of syrphids live mostly in humus or in small muddy water bodies, marshes, and flood waters. Phytophagous larvae occur mostly in the herb layer, but they can also occur in the root zone (rhizophages). Predatory larvae inhabit the herb layer, as well as tree crowns and herbs. Most of them overwinter in the surface soil layer and in litter in the form of the 3rd larval instar. They pupate in early spring and then emerge as adults.

Saprophagous larvae can be classified into two groups: aquatic, inhabiting eutrophic water bodies, and terrestrial, living in humus and in decaying wood. Aquatic larvae are characterized by specific modifications in their morphology. They have spiracles located on the apex of a very long siphon emerging from water. They feed on various organic remains and due to this they markedly account for the purification of water bodies. Some species are partially synanthropized and they can live in cesspools and liquid manure. These are, for instance, *Eristalis tenax* and *E. arbustorum*. The proportion of aquatic saprophages in urban areas is similar to that in Mazovia. It decreases in green areas of housing estates and in the centre, while markedly increases (by 25%) in the suburbs (Table 3).

The second group of saprophagous species, which inhabits the surface soil layer, is very diversified. Here there are included phyto-saprophages feeding on plant detritus and dead wood in different stages of decay (larvae of *Xylota* Meig and *Brachypalpus* Macq.) and also coprophages, living in cattle dung (*Syritta* St. Farg. Serv., *Rhingia* Scop.). These species play also an important part in the biocoenosis, transforming dead organic matter and due to this speeding up its cycling. The proportion of terrestrial saprophages in the *Syrphidae* of Mazovia is small, reaching 16%. In the suburbs their proportion has dropped to 11%, and in urban habitats to 7% (Table 3). The town does not provide suitable environmental conditions for saprophages. Heavy overdrying of the habitat, impoverishment of humus as a result of litter removal, and pollution with chemicals contribute to the fact that saprophages are only accidental visitors here from nearby areas, except for the coprophagous *Syritta pipiens* and hemisynanthropic *Xylota segnis*, living in the compost earth.

Phytophagous species form also a non-uniform group. The flies of the genera *Merodon* Meig. and *Eumerus* Meig., already mentioned above, are

Table 3. Proportions of trophic groups in hover flies of Warsaw and non-urban habitats of Mazovia (N — number of species)

Trophic groups in larvae	Mazovia		Warsaw											
			Suburbs		Urban green areas									
					Total		Parks		Housing estates		Town centre		Streetside lawn	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Aquatic saprophages	34	18.0	16	25.0	13	18.0	13	20.0	6	13.0	6	16.0	2	14.0
Phytophages	33	17.0	6	10.0	5	7.0	3	4.0	4	9.0	2	6.0	—	—
Terrestrial saprophages	32	16.0	7	11.0	5	7.0	4	6.0	3	6.0	3	8.0	1	7.0
Zoophages	94	49.0	34	54.0	50	68.0	46	70.0	33	72.0	26	70.0	11	79.0
Total number of species	193		63		73		66		46		37		14	

typical rhizophages, the species of the genus *Cheilosia* Meig. mine mostly leaves and stems of herbaceous plants, and some of them, e. g. *Cheilosia scutellata*, are fungivorous. All of them are endophages. The proportion of phytophages, like saprophages, is much lower in urban areas as compared with Mazovia (Table 3). In the town, the group of rhizophages is represented by pests of decorative plants feeding on bulbs and rhizome, quoted above, and the genus *Cheilosia* Meig. is represented by *Ch. albitarsis* in parks and by *Ch. vernalis* in lawns of housing estates, where they mine various weeds, including *Matricaria chamomilla*.

Predatory syrphids form the most abundant group. All of them are insectivorous. The larvae of *Volucella* Geottr. attack larval bumble-bees, the larvae of *Xanthandrus comtus* feed on scale insects. But the aphidophagous larvae are most abundant. They pierce the body of prey and suck the fluid content from inside. The proportion of predatory species in syrphids of Mazovia is rather high as it reaches 49%. In suburban and urban areas it is even higher. In most urbanized areas it exceeds 70% (Table 3).

Aphidophagous syrphids are the group least dependent on habitat conditions. Aphids, which are their food, can be much more abundant in the agricultural landscape and in towns than in natural conditions. In this situation, food is readily available for aphidophages. Trees in the town, weakened because of many factors, are susceptible to infestation by aphids, the number of which markedly increases in urban areas. Though the proportion of aphidophages increases in the centre of the town, the number of species drops to 50 in urban green areas of Warsaw and to 26 in the centre of the town as compared with natural habitats of Mazovia where 94 species were recorded. But since the number of species in the other thropic groups drops even more drastically, predators are the most abundant group in the centre of the town.

To analyse the biological activity of hover flies, their relative numbers in the field were considered (Table 4) and also the expansiveness expressed by changes in the size of the area occupied (Table 5).

The lowest changes in the number of species were observed for the class of abundant species. Their proportion, however, markedly increased in the town, particularly in the centre on streetside lawns (Table 4). This group includes *Eristalis teanax*, *E. arbustorum*, *Syrphus corollae*, *S. balteatus*, *S. vitripennis*, *Sphaerophoria scripta*, and others.

The group of numerous species consists of 42 species in Mazovia, this accounting for 22% of the syrphids of this region. Though the number of species in this group dropped with increasing urban pressure, their proportion increased, exceeding 50% in the centre of the town. This group includes *Syrphus bifasciatus*, *S. albostriatus*, *Sphaerophoria menthastri*, *Platycheirus peltatus*, *Pl. scutatus*, and others.

The group of scarce species consists of the hover flies caught singly or in groups of few specimens, such as *Volucella zonaria*, *Parapenium*

flavitarse, *Xanthandrus comtus*, and many species of the genus *Cheilosia* Meig. They contribute to 37% of the species recorded from Mazovia. It has been shown that a similar proportion was maintained in the suburbs and urban parks, only in green areas of housing estates and in the centre a significant decrease was observed. But this does not characterize the real number of species inhabiting these areas, which drops drastically already in the suburbs (Table 4).

From 193 syrphid species recorded in Mazovia a rather high proportion of 35% belong to the group of sporadically observed rare species, with specific habitats requirements. This group includes *Pelecocera tricincta*, *Syrphus guttatus*, *Xylota femorata*, and others. Their proportion dropped drastically to 5% already in the suburbs. Out of urban areas they are to be found only in parks and green areas of housing estates.

To obtain more complete characteristics of the syrphids of Warsaw and Mazovia, they were classified into three groups according to the biological expansiveness of particular species. The group of expansive species is made up of those which do not retreat from their habitats when they are subject to man-made transformations, and which, in addition, enlarge their area and increase in numbers. In many cases they become partially synanthropized, using man management for their needs. Typical examples here are *Eristalis tenax* or *Syritta pipiens*, and aphidophagous species feeding on aphids occurring in masses on decorative plants, such as *Syrphus balteatus*, *S. corollae*, and others. This group also includes pests of decorative plants, such as *Eumerus strigatus* or *Merodon equestris*. The proportion of expansive species in Mazovia is not high, as it does not exceed 20%, but in the urban habitat it is more than 50%. The contribution of expansive species is in direct proportion to increasing urban pressure. (Table 5).

The second category consists of stable species, which do not show large variability either in the size of the area occupied or in numbers. They account for as many as 41% of the total number of syrphid species recorded from Mazovia. In the suburbs and urban parks their proportion increased to 52%, and it dropped to 33% in green areas of housing estates and in the centre of the town.

The third category is made up of recessive species, which are characterized by a decrease in their range and numbers for various reasons such as overdrying, clearing of forests, air pollution, or other limiting factors. Here there are included most of aquatic saprophages, a large part of terrestrial saprophages with high humidity requirements, and also many phytophages, particularly of the genus *Cheilosia* Meig., frequently being mono- or oligophages and mining herbaceous plants growing wild. A total of 79 recessive species have been recorded from Mazovia, this accounting for 41 of all the syrphids known there. In the suburbs this group is represented by

Table 4. Proportions of groups with different abundances in hover flies of Warsaw and non-urban habitats of Mazovia (N — number of species)

Abundance class	Mazovia		Warsaw											
			Suburbs		Urban green areas									
					Total		Parks		Housing estates		Town centre		Streetside lawn	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Abundant	12	6.0	11	17.0	11	15.0	11	17.0	11	23.0	10	27.0	6	43.0
Numerous	42	22.0	25	40.0	29	40.0	27	40.0	22	48.0	20	54.0	7	50.0
Scarce	72	37.0	24	38.0	29	40.0	25	38.0	12	25.0	7	19.0	1	7.0
Sporadic	67	35.0	3	5.0	4	5.0	3	5.0	1	4.0	—	—	—	—

Table 5. Proportions of groups with different expansiveness in hover flies of Warsaw and non-urban habitats of Mazovia (N — number of species)

Group	Mazovia		Warsaw											
			Suburbs		Urban green areas									
					Total		Parks		Housing estates		Town centre		Streetside lawn	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Expansive	34	18.0	33	52.0	35	48.0	32	48.0	31	67.0	25	68.0	12	86.0
Stable	80	41.0	29	46.0	38	52.0	34	52.0	15	33.0	12	32.0	2	14.0
Recessive	79	41.0	1	2.0	—	—	—	—	—	—	—	—	—	—

only one species, *Xylota rufipes*, which probably has come from the Kampinos forest. No recessive species have so far been recorded from urban green areas (Table 5).

DISCUSSION AND CONCLUSIONS

The present paper sums up the data available so far on the occurrence of syrphids in Mazovia, with particular reference to their occurrence in Warsaw. All the species recorded in the town are also represented in syrphid communities of Mazovia. They are typical members of the native fauna.

The number of syrphid species known so far from Mazovia is 193, this accounting for 55% of the syrphids of Poland. Within the administrative boundaries of Warsaw, 115 species were recorded, including 73 species in urban green areas, this being 38% of the syrphids of Mazovia.

The syrphids of urban habitats are dominated by the species occurring in all terrestrial habitats of Poland [2]. These are *Syrphus balteatus*, *S. corollae*, *S. vitripennis*, *S. ribesii*, *S. torvus*, *Sphaerophoria scripta*, *Sph. menthastri*, *Melanostoma mellinum*, *Platycheirus clypeatus*, *Eristalis tenax*, *E. arbustorum*, *Helophilus pendulus*, *Eumerus strigatus*, and others.

Syrphid communities of urban areas show many regularities also observed to different extent in other insects inhabiting urban areas:

1. Syrphid communities living in towns become more and more simplified with increasing urban pressure (Fig. 1).

2. The species successfully colonizing towns have large geographical ranges such as Holarctic, Palaearctic, and Euro-Siberian. The species with smaller ranges are eliminated from urban habitats (Table 1).

3. Forms best adapted to urban conditions involve eurytopic species with a large ecological amplitude, while the steno- and oligotopic species are reduced (Table 2).

4. In urban areas, ubiquitous and forest species of syrphids predominate over those associated with meadows.

5. Predatory species are favoured while saprophages and phytophages are reduced (Table 3).

6. The proportion of the species with high ecological tolerance and expansiveness increases with urban pressure (Table 4), this being also the case of abundant species (Table 5). The recessive species or sporadically occurring under natural conditions are almost completely eliminated from urban habitats.

7. There are many partly synanthropized species, such as *Eristalis tenax*, *Syritta pipiens*, *Eumerus strigatus*, or *Syrphus balteatus*.

SPECIES NEW TO THE FAUNA OF POLAND

Eumerus tuberculatus Rond.

Warsaw: Wierzbno, green areas of housing estates; Skierniewice, a vegetable garden. A few specimens collected in June-August. Palaearctic species, recently brought with bulbs of decorative plants to North America.

Xylota rufipes Loew

Warsaw: Wilanów, 1 specimen; Białowieża National Park, 1 specimen in a carr. Palaearctic species.

Syrphus pilisquamis Ringd.

Kampinos forest, 1 male; Bieszczady mountains: Ustrzyki Górne, 1 male. Both specimens caught in a meadow from May to July. Euro-Siberian species.

Syrphus latilunulatus Collin

Skierniewice, 1 male; Bieszczady mountains: Bereżki, 2 specimens collected in July-August. European species.

SPECIES NEW TO THE FAUNA OF MAZOVIA

Eristalis pertinax Scop.

Warsaw: parks; Kampinos forest; Skierniewice; Sochaczew. Many specimens.

Eristalis vitripennis Strobl.

Warsaw: Ursynów, 2 specimens.

Eurinomyia lunulata Meig.

Kampinos forest, frequent in alder woods and wet meadows.

Eurinomyia versicolor Fabr.

Warsaw: Ursynów. Rather frequent in the same habitats as the preceding species.

Orthoneura intermedia Lundb.

Kampinos forest; Podkowa Leśna; Radziejowice. In wet meadows.

Orthoneura nobilis Fall.

Skierniewice; Kampinos forest. Caught in wet meadows.

Cheilosia melanura Beck.

Radziejowice; Trojanów near Sochaczew.

Cheilosia rufimana Beck.

Skierniewice; Trojanów near Sochaczew. Meadows.

Cheilosia proxima Zett.

Skierniewice, meadows.

Cheilosia chloris Meig.

Radziejowice; Podkowa Leśna.

Cheilosia flavipes Panz.

Warsaw: Ursynów, 1 specimen.

Cheilosia canicularis Panz.

Kampinos forest, a meadow.

Cheilosia longula Zett.

Radziejowice, an oak-hornbeam forest.

Cheilosia scanica Ringd.

Radziejowice, an oak-hornbeam forest.

Chrysogaster macquarti Loew.

Kampinos forest, a meadow.

Merodon equestris Fabr.

Warsaw, green areas of housing estates, parks: Podkowa Leśna: Brwinów. Many specimens caught in gardens surrounding houses.

Brachypalpus valgus Panz.

Radziejowice, an oak-hornbeam forest.

Xylota sylvarum L.

Kampinos forest; Skierniewice. Wet forests.

Xylota florum Fabr.

Kampinos forest; Radziejowice, an oak-hornbeam forest.

Xylota tarda Meig.

Radziejowice, 1 specimen in an oak-hornbeam forest.

Tropidia scita Harr.

Warsaw: Ursynów; Trojanów near Sochaczew. Wet meadows.

Neoascia interrupta Meig.

Radziejowice, an oak-hornbeam forest and a carr.

Melangyna quadrimaculata Verr.

Radziejowice, an oak-hornbeam forest in April.

Pipiza bimaculata Meig.

Warsaw: Ursynów; Skierniewice; Podkowa Leśna. Frequent in meadows.

Pipiza carbonaria Meig.

Warsaw: Saxon Garden, Ursynów.

Parapenium flavitarse Meig.

Warsaw: Łazienki park; Skierniewice.

Neocnemodon latitarsis Egg.

Kampinos forest, coniferous forest.

Baccha obscuripennis Meig.

Warsaw: green areas of housing estates and parks; Radziejowice; Skierniewice; Sochaczew.

Platycheirus immarginatus Zett.

Skierniewice; Trojanów near Sochaczew. Rather numerous in meadows.

Chrysotoxum vernale Loew.

Kampinos forest; Radziejowice: Otrębusy; Skierniewice. Rather numerous in meadows.

Chrysotoxum arcuatum L.

Warsaw: Saxon Garden, Bielany, Białołęka.

Syrphus hilaris Zett.

Kampinos forest; Skierniewice.

Syrphus cinctus Fall.

Warsaw: centre and urban parks. Rather numerous in tree crowns.

Syrphus lapponicus Zett.

Warsaw: Saxon Garden; Kampinos forest, moist coniferous forest.

Syrphus annulipes Zett.

Kampinos forest, moist coniferous forest.

Syrphus lunulatus Meig.

Warsaw: Białołęka; Kampinos forest, a few specimens in a coniferous forest.

Syrphus compositarum Verr.

Warsaw: Łazienki park.

Syrphus euchromus Kow.

Radziejowice, an oak-hornbeam forest.

Syrphus macularis Zett.

Kampinos forest, coniferous-deciduous forest.

Syrphus malinellus Coll.
Radziejowice, an oak-hornbeam forest.

Volucella inanis L.
Warsaw: Białołęka; Kampinos forest.

Volucella bombylans L.
Kampinos forest; Trojanów near Sochaczew.

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Table 6. Check-list of *Syrphidae* (*Diptera*) species occurring in Warsaw and Mazovia

No.	○ — literature data ● — proved literature data + — unpublished data Species	Mazovia	Warsaw				
			Suburban areas	Parks	Green areas in housing estates	Town centre	Other sampling areas
1	2	3	4	5	6	7	8
1	*Myiatropa florea* (L.)	●	+	+	+	+	○
2	*Eristalis cryptarum* (Fabr.)	●	—	—	—	—	—
3	*Eristalis tenax* (L.)	●	+	+	+	+	○
4	*Eristalis intricarius* (L.)	●	+	+	—	—	○
5	*Eristalis horticola* (Deg.)	●	+	+	—	—	○
6	*Eristalis arbustorum* (L.)	●	+	+	+	+	○
7	*Eristalis rupium* Fabr.	●	+	+	—	—	—
8	*Eristalis pratorum* Meig.	●	—	—	—	—	○
9	*Eristalis nemorum* (L.)	●	+	+	—	—	○
10	*Eristalis alpinus* (Panz.)	●	—	—	—	—	—
11	*Eristalis pertinax* (Scop.)	+	—	+	—	—	—
12	*Eristalis vitripennis* Strobl.	+	+	—	—	—	—
13	*Eristalinus sepulcralis* (L.)	●	—	+	—	—	○
14	*Lathyrophtalmus aeneus* (Scop.)	●	+	+	+	+	○
15	*Eristalis oestraceus* (L.)	○	○	—	—	—	—
16	*Eurinomyia lineata* (Fabr.)	○	○	—	—	—	—
17	*Eurinomyia lunulata* (Meig.)	+	—	—	—	—	—
18	*Eurinomyia versicolor* (Fabr.)	+	+	—	—	—	○
19	*Eurinomyia frutetorum* (Fabr.)	●	—	—	—	—	○
20	*Helophilus hybridus* Lw.	●	+	+	—	—	—
21	*Helophilus trivittatus* (Fabr.)	●	+	+	+	+	○
22	*Helophilus pendulus* (L.)	●	+	+	+	+	○
23	*Helophilus affinis* Whalb.	●	+	—	—	—	—
24	*Mallota cimbiciformis* (Fall.)	●	—	—	—	—	—
25	*Chrysogaster macquarti* Lw.	+	—	—	—	—	—
26	*Chrysogaster viduata* (L.)	●	—	—	—	—	○

1	2	3	4	5	6	7	8
27	*Chrysogaster chalybeata* Meig.	●	—	—	—	—	○
28	*Chrysogaster solstitialis* (Fall.)	●	—	—	—	—	○
29	*Liogaster metallina* (Fabr.)	●	—	—	—	—	○
30	*Liogaster splendida* (Meig.)	●	—	—	—	—	—
31	*Orthoneura intermedia* Lundb.	+	—	—	—	—	—
32	*Orthoneura nobilis* (Fall.)	+	—	—	—	—	—
33	*Orthoneura elegans* (Meig.)	●	—	—	—	—	—
34	*Orthoneura geniculata* Meig.	●	—	—	—	—	—
35	*Cheilosia pagana* (Meig.)	●	—	—	—	—	—
36	*Cheilosia scutellata* (Fall.)	●	—	—	—	—	—
37	*Cheilosia ruralis* (Meig.)	●	+	—	—	—	○
38	*Cheilosia albitarsis* (Meig.)	●	+	+	—	—	○
39	*Cheilosia barbata* Lw.	●	—	—	—	—	—
40	*Cheilosia impressa* Lw.	●	—	—	—	—	○
41	*Cheilosia melanura* Beck.	+	—	—	—	—	—
42	*Cheilosia bergenstammi* Beck.	●	—	—	—	—	—
43	*Cheilosia cynocephala* Lw.	●	—	—	—	—	—
44	*Cheilosia rotundiventris* Beck.	●	—	—	—	—	—
45	*Cheilosia velutina* Lw.	●	—	—	—	—	○
46	*Cheilosia fraterna* (Meig.)	●	—	—	—	—	○
47	*Cheilosia vulpina* (Meig.)	●	—	—	—	—	
48	*Cheilosia mutabilis* (Fall.)	●	—	—	—	—	—
49	*Cheilosia rufimana* Beck.	+	—	—	—	—	—
50	*Cheilosia pubera* (Zett.)	●	—	—	—	—	○
51	*Cheilosia proxima* (Zett.)	+	—	—	—	—	—
52	*Cheilosia vernalis* (Fall.)	●	+	+	+	+	○
53	*Cheilosia chloris* (Meig.)	+	—	—	—	—	—
54	*Cheilosia flavipes* (Panz.)	—	+	—	—	—	—
55	*Cheilosia canicularis* (Panz.)	+	—	—	—	—	—
56	*Cheilosia longula* (Zett.)	+	—	—	—	—	—
57	*Cheilosia scanica* Ringd.	+	—	—	—	—	—
58	*Cheilosia praecox* Zett.	○	—	—	—	—	—
59	*Cheilosia intonsa* Lw.	○	—	—	—	—	○
60	*Cheilosia carbonaria* Egg.	○	—	—	—	—	○
61	*Merodon equestris* (Fabr.)	+	—	—	+	—	—
62	*Eumerus sabulonum* (Fall.)	●	—	—	—	—	—
63	*Eumerus tuberculatus* Rond.	+	+	—	+	—	—
64	*Eumerus strigatus* (Fall.)	●	+	+	+	+	○
65	*Eumerus ruficornis* Meig.	●	—	—	—	—	—
66	*Eumerus ovatus* Lw.	●	—	—	—	—	—
67	*Eumerus flavitarsis* Zett.	●	—	—	—	—	—
68	*Brachypalpus chrysites* Egg.	●	—	—	—	—	—
69	*Brachypalpus bimaculatus* (Macq.)	+	—	—	—	—	—
70	*Brachypalpus valgus* (Panz.)	+	—	—	—	—	—
71	*Xylota segnis* (L.)	●	+	+	+	+	—
72	*Xylota nemorum* (Fabr.)	●	—	—	—	—	—
73	*Xylota femorata* (L.)	●	—	+	—	—	—
74	*Xylota sylvarum* (L.)	+	—	—	—	—	—
75	*Xylota florum* (Fabr.)	+	—	—	—	—	—
76	*Xylota tarda* Meig.	+	—	—	—	—	—
77	*Xylota pigra* (Fabr.)	○	—	—	—	—	—

1	2	3	4	5	6	7	8
78	*Xylota abiens* Meig.	○	—	—	—	—	—
79	*Xylota rufipes* Lw.	+	+	—	—	—	—
80	*Cynorrhina fallax* (L.)	●	—	—	—	—	○
81	*Pocota apiformis* (Schr.)	○	—	—	—	—	○
82	*Spilomyia diophthalma* (L.)	●	—	—	—	—	—
83	*Syritta pipiens* (L.)	●	+	+	+	+	○
84	*Tropidia scita* (Harr.)	—	+	—	—	—	—
85	*Cerioides conopoides* (L.)	●	—	—	—	—	○
86	*Myolepta luteola* (Gmel.)	○	—	—	—	—	○
87	*Ferdinandea ruficornis* (Fabr.)	●	—	—	—	—	—
88	*Ferdinandea cuprea* (Scop.)	●	—	—	—	—	○
89	*Ferdinandea nigrifrons* Egg.	●	—	—	—	—	—
90	*Rhingia campestris* Meig.	●	+	—	—	—	—
91	*Rhingia rostrata* (L.)	●	+	+	—	—	○
92	*Sericomyia silentis* Harr.	●	—	—	—	—	—
93	*Sphegina clunipes* (Fall.)	●	—	—	—	—	—
94	*Sphegina spheginea* (Zett.)	●	—	—	—	—	—
95	*Neoascia podagrica* (Fabr.)	●	—	—	+	+	—
96	*Neoascia floralis* (Meig.)	●	—	—	—	—	○
97	*Neoascia aenea* (Meig.)	●	—	—	—	—	—
98	*Neoascia dispar* (Meig.)	●	+	—	—	—	—
99	*Neoascia interrupta* (Meig.)	+	—	—	—	—	—
100	*Volucella pellucens* (L.)	●	—	—	—	—	—
101	*Volucella zonaria* (Poda)	●	+	+	+	—	—
102	*Volucella inanis* (L.)	+	—	—	—	—	—
103	*Volucella bombylans* (L.)	+	+	—	—	—	○
104	*Pelecocera tricincta* Meig.	●	—	—	—	—	○
105	*Chamaesyrphus scaevoides* (Fall.)	●	—	—	—	—	—
106	*Microdon devius* (L.)	●	—	—	—	—	—
107	*Microdon latifrons* Lw.	●	—	—	—	—	—
108	*Melangyna quadrimaculata* (Verr.)	+	—	—	—	—	—
109	*Pipiza luteitarsis* Zett.	●	—	—	—	—	—
110	*Pipiza bimaculata* Meig.	+	+	—	+	+	—
111	*Pipiza carbonaria* Meig.	+	+	+	—	—	—
112	*Pipiza quadrimaculata* (Panz.)	●	—	—	—	—	—
113	*Pipiza austriaca* Meig.	●	—	—	—	—	—
114	*Pipiza fenestrata* Meig.	●	—	—	—	—	—
115	*Pipiza lugubris* (Fabr.)	●	—	+	+	+	—
116	*Pipiza noctiluca* (L.)	●	—	+	—	—	—
117	*Pipiza festiva* Meig.	●	+	+	+	+	—
118	*Parapenium flavitarse* (Meig.)	—	+	+	—	—	—
119	*Neocnemodon fulvimanus* (Zett.)	●	+	—	—	—	○
120	*Neocnemodon vitripennis* (Meig.)	●	+	+	+	+	—
121	*Neocnemodon latitarsis* Egg.	+	—	—	—	—	—
122	*Pipizella varipes* (Meig.)	●	+	+	+	+	○
123	*Pipizella virens* (Fabr.)	●	—	—	—	—	○
124	*Heringia heringii* (Zett.)	●	+	+	+	+	○
125	*Triglyphus primus* Lw.	●	—	+	+	+	—
126	*Psarus abdominalis* (Fabr.)	●	—	—	—	—	○
127	*Didea fasciata* Macq.	●	—	+	—	—	—
128	*Didea intermedia* Lw.	●	+	+	+	+	—

1	2	3	4	5	6	7	8
129	*Xanthogramma ornatum* (Meig.)	●	+	+	+	—	○
130	*Baccha elongata* (Fabr.)	●	—	—	+	+	○
131	*Baccha obscuripennis* Meig.	+	—	+	+	+	—
132	*Xanthandrus comtus* (Harr.)	●	+	+	—	—	—
133	*Paragus bicolor* (Fabr.)	●	—	—	—	—	○
134	*Paragus tibialis* (Fall.)	●	—	—	—	—	○
135	*Paragus albifrons* (Fall.)	●	—	—	—	—	—
136	*Platycheirus podagratus* (Zett.)	●	—	—	—	—	—
137	*Platycheirus immarginatus* (Zett.)	+	—	—	—	—	—
138	*Platycheirus angustatus* (Zett.)	●	—	+	—	—	—
139	*Platycheirus peltatus* (Meig.)	●	+	+	+	—	○
140	*Platycheirus clypeatus* (Meig.)	●	+	+	+	+	○
141	*Platycheirus scutatus* (Meig.)	●	+	+	+	+	—
142	*Platycheirus albimanus* (Fabr.)	●	+	+	+	+	—
143	*Pyrophaena rosarum* (Fabr.)	●	—	—	—	—	○
144	*Pyrophaena granditarsa* (Först.)	●	—	—	+	+	—
145	*Melanostoma mellinum* (L.)	●	+	+	+	—	○
146	*Melanostoma scalare* (Fabr.)	●	—	—	—	—	—
147	*Melanostoma ambiguum* (Fall.)	●	—	+	+	—	—
148	*Scaeva pyrastri* (L.)	●	+	+	+	+	○
149	*Scaeva selenitica* (Meig.)	●	+	+	—	—	○
150	*Sphaerophoria scripta* (L.)	●	+	+	+	+	○
151	*Sphaerophoria menthastri* (L.)	●	—	+	+	—	○
152	*Sphaerophoria philanthus* (Meig.)	●	—	—	—	—	○
153	*Sphaerophoria rueppelli* (Wied.)	●	—	—	—	+	—
154	*Sphaerophoria dubia* (Zett.)	●	—	—	—	—	—
155	*Sphaerophoria picta* (Meig.)	●	—	—	—	—	—
156	*Chrysotoxum bicinctum* (L.)	●	—	+	—	—	○
157	*Chrysotoxum festivum* (L.)	●	+	—	—	—	○
158	*Chrysotoxum vernale* Lw.	+	—	—	—	—	—
159	*Chrysotoxum lineare* (Zett.)	●	—	—	—	—	○
160	*Chrysotoxum octomaculatum* Curt.	●	—	—	—	—	—
161	*Chrysotoxum arcuatum* (L.)	+	+	+	—	—	—
162	*Syrphus albostriatus* (Fall.)	●	+	+	+	+	—
163	*Syrphus tricinctus* (Fall.)	●	+	+	+	+	—
164	*Syrphus nitidicollis* Meig.	●	—	—	—	—	—
165	*Syrphus torvus* O.-S.	●	+	+	+	+	○
166	*Syrphus vitripennis* Meig.	●	+	+	+	+	○
167	*Syrphus ribesii* (L.)	●	+	+	+	+	○
168	*Syrphus luniger* Meig.	●	—	+	+	+	—
169	*Syrphus corollae* Fabr.	●	+	+	+	+	○
170	*Syrphus latifasciatus* Macq.	●	+	+	—	—	—
171	*Syrphus nitens* (Zett.)	●	—	—	—	—	—
172	*Syrphus venustus* Meig.	●	+	+	+	—	—
173	*Syrphus hilaris* (Zett.)	+	—	—	—	—	—
174	*Syrphus auricollis* Meig.	●	—	+	—	—	○
175	*Syrphus cinctus* (Fall.)	+	—	+	+	+	—
176	*Syrphus cinctellus* (Zett.)	●	+	+	+	—	○
177	*Syrphus balteatus* (Deg.)	●	+	+	+	+	○
178	*Syrphus guttatus* (Fall.)	●	—	+	—	—	—
179	*Syrphus bifasciatus* Fabr.	●	+	—	—	—	—

1	2	3	4	5	6	7	8
180	*Syrphus annulatus* (Zett.)	●	—	—	—	—	○
181	*Syrphus lapponicus* (Zett.)	+	—	+	—	—	—
182	*Syrphus braueri* Egg.	●	—	—	—	—	—
183	*Syrphus triangulifer* (Zett.)	●	+	+	+	—	—
184	*Syrphus annulipes* (Zett.)	+	—	+	—	—	—
185	*Syrphus lunulatus* Meig.	+	—	—	—	—	—
186	*Syrphus latilunulatus* Coll.	+	—	—	—	—	—
187	*Syrphus pilisquamis* Ringd.	+	—	—	—	—	—
188	*Syrphus compositarum* Verr.	+	—	+	—	—	—
189	*Syrphus euchromus* Kow.	+	—	—	—	—	—
190	*Syrphus macularis* (Zett.)	+	—	—	—	—	—
191	*Syrphus grossularius* Meig.	●	—	—	—	—	—
192	*Syrphus lundbecki* (S.-R.)	+	—	—	—	—	—
193	*Syrphus malinellus* Coll.	+	—	—	—	—	—

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BZYGOWATE (*DIPTERA, SYRPHIDAE*) WARSZAWY I MAZOWSZA

STRESZCZENIE

Opracowanie zawiera wykaz gatunków zebranych dotychczas z obszaru Niziny Mazowieckiej oraz z terenu Warszawy. Z Mazowsza wykazano 193 gatunki, w granicach administracyjnych Warszawy 115 gatunków, z czego na terenie zieleni miejskiej stwierdzono występowanie 73 gatunków.

Analiza zebranego materiału wykazała, że *Syrphidae* miasta wykazują następujące tendencje:

1. Wraz ze wzrostem presji urbanizacyjnej występuje wyraźne zubożenie składu gatunkowego. Uwidacznia się zdecydowana przewaga gatunków o szerokich zasięgach geograficznych — holarktycznych, palearktycznych i eurosyberyjskich. Gatunki o węższych zasięgach są eliminowane z fauny miejskiej.

2. Występuje znaczna przewaga gatunków eurytopowych przy równoczesnym ograniczeniu gatunków oligo- i stenotopowych.

3. Zaznacza się wyraźna preferencja gatunków drapieżnych przy jednoczesnym zmniejszeniu liczby gatunków saprofagicznych i fitofagicznych.

4. W mieście dominują gatunki o dużej plastyczności ekologicznej i wysokiej ekspansywności. Należą do nich: *Syrphus balteatus*, *S. corollae*, *S. vitripennis*, *S. ribesii*, *S. torvus*, *Sphaerophoria scripta*, *Sph. menthastri*, *Melanostoma mellinum*, *Platycheirus clypeatus*, *Eristalis tenax*, *E. arbustorum*, *Helophilus pendulus*, *Eumerus strigatus* i inne.

ЖУРНАЛКИ (*DIPTERA, SYRPHIDAE*) ВАРШАВЫ И МАЗОВИИ

РЕЗЮМЕ

В Мазовии встречается 193 вида *Syrphidae* 115 из них в пределах Варшавы, однако в городской зелени есть их только 73.

По мере роста урбанизационного пресса происходит четкое обеднение видового состава фауны *Syrphidae*. Наблюдается преимущество видов с широким географическим ареалом, как голарктические, палеарктические и европейско-сибирские. Виды с узкими географическими ареалами исчезают из городской фауны. Обозначается значительный перевес эвритопных видов при значительном ограничении олиго- и стенотопных. Обозначается также четкая преференция хищных видов при одновременном снижении количества видов сапрофагов и фитофагов. Кроме того в городской фауне *Syrphidae* доминируют виды, характеризующиеся большой экологической пластиностью и высокой экспансивностью.