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The snake-flies (*Neuropteroidea*: *Raphidioptera*) of Lublin agglomeration

Wielbłądki (*Neuropteroidea*: *Raphidioptera*) Lublina

SUMMARY

The first records about occurrence of snake-flies near Lublin (*Inocelia crassicornis*) were published by Dziędzielewicz (8). Since 1891, in the period of more than one century, in all Lublin region, only about 60 individuals, belonging to 5 species were caught. The recent researches were conducted during two seasons on 12 localities, which represented the most typical urban plant communities in Lublin agglomeration. In effect 62 specimens of snake-flies, belonging to 5 species were collected, using such methods as an entomological scoop, entomological umbrella, sticky traps and collecting by "picking out." The best effectiveness was acquired by application of the sticky traps.

STRESZCZENIE

Pierwsze dane o występowaniu *Inocelia crassicornis* w okolicach Lublina podaje Dziędzielewicz (8), a od roku 1891 na terenie Lubelszczyzny pozyskano około 60 okazów (5 gatunków). Badania prowadzono przez dwa sezony wegetacyjne na 12 stanowiskach, reprezentujących najbardziej charakterystyczne typy zieleni miejskiej Lublina. W efekcie prowadzonych badań pozyskano 62 egzemplarze (5 gatunków) wielbłądek. Spośród zastosowanych metod badawczych: pułapki lepowe, czerpak, parasol entomologiczny, „na upatrzonego", najwyższą skutecznością wyróżniły się pułapki lepowe.

Keywords: *Raphidioptera*, *Phaeostigma notata*, *Dichrostigma flavipes*, *Xantostigma xantostigma*, *Raphidia ophiopsis ophiopsis*, *Inocelia crassicornis,* urban fauna, faunistic records, environmental protection, sticky traps.

INTRODUCTION

Snake-flies are predacious insects, inhabiting only the northern hemisphere (1, 2, 5). As imagines, as larval stages feed on small invertebrates, including numerous pests of arboricultures. Because of mode of life the snake-flies are insects difficult to observe, especially as the occurrence of imagines is limited only to few months, from late spring summer to early summer (5, 7). Out of 100 species occurring in Europe only 9 have been recorded from Poland and their number can change only insignificantly (2).

The location of records known from Poland is distinguished by considerable disproportion, caused by the fact that faunistic researches on these insects were conducted mostly in the western part of our country (5, 6). The occurrence of snake-flies in eastern Poland seems to be insufficiently recognized. The first records about the presence of *Inocelia crassicornis* near Lublin were published by Dziędzielewicz (8). Information about occurrence of 4 species of snake-flies on the area of the Roztoczański National Park includes the faunistic review of Dobosz (5). Piotrowski (9) has given data about occurrence of 3 species collected from the area of the Poleski NP. Budzyńska et al. (3) and Czarniawski et al. (4) recorded about the next localities of 5 species. All referred sources together inform that only about 60 individuals, belonging to 5 species, have been caught in the region of Lublin during the period of about 110 years (therefore, scarcely, approximately one specimens per two years). So, a small number of collected snake-flies is caused not only by secretive mode of life, relative rarity of these insects, but especially by insufficient effectiveness of applied so far conventional methods of catching (9). Completely unknown remains the occurrence of snake-flies on the area of urbicenosis.

The aim of this study was to recognise the occurrence of snake-flies in the area of Lublin agglomeration, using such conventional methods as sticky traps, adapted for faunistic researches.

MATERIALS AND METHODS

Study area

The study was conducted in Lublin, the city in the Middle East Poland (circa 400,000 inhabitants).

The insects were collected on 12 localities, representing plant communities on the area of town with various origins and in various degree exposed to anthropopression, e.g. xerothermic grassland, ruderal communities, parks, streets, cemetery and botanical garden.

St. 1. Zemborzycka Street: suburban recreation area; double row of 64 horse-chestnuts about 40–50-year-old; trees partly mouldering, surrounded by fields under cultivation, grass areas used as sport courts;

St. 2. Świętochowski Street: suburban area, double row of 137 horse-chestnuts, about 55 years old (the monument of the nature), the trees partly mouldering, surrounded by one-family houses with gardens composed of decorative, herbaceous plants and fruit trees;

St. 3. Park Ludowy: recreation area, in the center of the city, at about 8 ha area; complex of forest community similar to floodplain forest (*Alno-Ulmion*); with many deciduous trees e.g.: maple-trees, poplar-trees, horse-chestnut trees (trees cultivated, without mould) and many herbaceous plants and shrubs, both local and acclimatized;

St. 4. Lipowa Street: cemetery founded in 1795, in the middle of the city; surrounded by magnificent deciduous trees, mostly lime-trees, maple-trees, 81 horse-chestnut trees about 60-year-old (trees considerably mouldering, neglected, partly necrotic) with scanty undergrowth;

St. 5. Głęboka Street: most important communication arteries of the city, double row of 45 horse-chestnuts, about 40 to 50-year-old. Horse-chestnut trees were set alternately with black poplar trees (*Populus nigra*) (the trees cultivated without signs of mould);

St. 6. Park Akademicki: the park in the center of the city at about 1 ha area, founded in 1950; many shrubs and deciduous trees mainly: maple-trees, lime-trees, poplar-trees and 50 horse-chestnuts (the trees partly mouldering). Undergrowth similar to dry-ground forest;

St. 7. Ogród Saski: the park in the center of the city at about 10 ha area, founded in 1837; surrounded by many splendor deciduous trees mainly: maple-trees, lime-trees, poplar-trees and 78 horse-chestnuts (the trees partly mouldering). Undergrowth similar to dry-ground forest;

St. 8. Górki Czechowskie: complex of xerothermic grass association (*Thalictro-Salvietum pratensis*) and thermophilous shrubbery (*Pruno-Crataegetum*), at about 21.4 ha area, localized on the border of the city;

St. 9. Botanic Garden: botanic garden on the area of 10 ha, complex of forest community similar to dry-ground forest with 44 horse chestnut trees about 50-year-old (trees cultivated, without mould) and many herbaceous plants and shrubs, both local and acclimatized;

St. 10. Dzbenin: post-manorial park at about 2 ha area, localized on the border of city. Many shrubs and deciduous trees mainly: maple-trees, lime-trees, poplar-trees and oak-trees (trees considerably mouldering, neglected, partly necrotic). Undergrowth similar to dry-ground forest;

St. 11. Jakubowice Murowane: post-manorial park at about 1 ha area, localized on the border of the city. Many shrubs and deciduous trees mainly: maple-trees, lime-trees and oak-trees (the trees partly mouldering). Undergrowth similar to dry-ground forest;

St. 12. Rudnik: xerothermic grass association (*Cirsio-Brachypodion pinnati*) at about 1.5 ha area, localized on the border of the city.

The samples were collected on each station in one-week interval, during two months (May – June) in the years 2004–2005.

METHODS

The specimens were collected, the following methods were applied:

– entomological scoop: 1 sample was material acquired from 200 scoops movements from herbaceous plants;

– entomological umbrella: 1 sample was material acquired from 10 trees or shrubs;

– the sticky traps: explored were professional traps, installed against horse-chestnut leaf-miner pest *Cameraria ohridella* on trees in Lublin agglomeration. Those were transparent, polyethylene foil pieces, 50 cm of width. They were wrapped around the tree stems about 1.5 meters above the ground. Therefore the area of the trap depended on the diameter (age) of the tree. The area of one sticky traps amounted on average to 1 m^2. The outer surface of the foil was covered with insects glue (sticky, insolvable in water and slowly drying substance, trademark – LEPOLEP). The traps were left on the trees from the beginning of May to the end of June. The traps were placed on 454 horse-chestnuts trees each year.

– collected by "picking out": on all stations during 30 min snake-flies were found on the surface of trunks and branches etc.

Collected material was determined, according to the key inserted in the monograph of world snake-flies (1), similarly as their taxonomical structure and nomenclature. Collected specimens are kept in the collection of Department of Zoology, Maria Curie-Skłodowska University in Lublin.

RESULTS AND DISCUSSION

During conducted researches on the area of Lublin agglomeration 62 individuals of snake-flies, from which 5 species were distinguished, were collected. There were no cases of occurrence of all five species at the same station, in 6 localities only one species has been caught. (St.: 1, 3, 8, 9, 11, 12). At five localities the simultaneous presence of two species was observed (St. 4, 5, 6, 7, 10). Only at one station simultaneous occurrence of three species was noticed (St. 2). The most numerous among the collected snake-flies was *Xantostigma xantostigma* (40 exx.). The occurrence of this species was recorded almost from all stations, on trees localized near streets, in parks and in suburban area. *Phaeostigma notata* has been caught somewhat *rarely* (totally 19 exx.) and it was present in a half of investigated stations. It seems that occurrence of this species was the most strictly connected with tree communities. It often occurs together with *Xantostigma xantostigma*. During researches only individual specimens of *Dichrostigma flavipes*, *Raphidia ophiopsis ophiopsis* and *Inocelia crassicornis* were caught.

Using an entomological scoop 128 samples were explored, giving 4 specimens. The presence of snake-flies on herbaceous plants is observed rather incidentally. Probably mature insects are looking for food or for temporary refuge during migrations from trees to trees.

In 112 samples collected with an entomological umbrella, 2 specimens have been found. Although trees are places of feeding and development of snake-flies, it seems that they avoid sticking around leafs, and definitely prefer fragments of trees such as healthy or mouldered trunks.

Additionally, in well visible places snake-flies could become the victims of other predacious insects, such as e.g. asilids feeding in upper branches of a tree (unpublished observation of R. G.).

In 192 samples collected by "picking out" 5 specimens have been caught. In three cases insects have been collected from trunks, and one individual from the branch of a tree.

Total number of 908 sticky traps has been explored. Despite this method, 51 specimens – 82% of all collected have been caught. The highest effectiveness of sticky traps appears from long time of exposition and localization on trees trunks – in the places of most frequent being of investigated insects.

In the Lublin agglomeration area the presence of all snake-flies species noted from central-east Poland has been confirmed. The total number of collected snake-flies (62 exx.) exceeds somewhat the quantity of specimens collected so far from all Lublin region in 110-year period (60 exx). Dobosz (6) noticed 17 individuals from the Roztoczański National Park. Piotrowski (9) using an entomological

Tab. 1. Snake-flies (*Raphidioptera*) collected in Lublin agglomeration in the years 2004–2005

LN	Species					
	Phaeostigma notata Fabr., 1781	*Dichrostigma flavipes* Stein, 1863	*Xantostigma xantostigma* Schumm., 1832	*Raphidia ophiopsis ophiopsis* L., 1758	*Inocelia crassicornis* (Schumm., 1832)	**Σ**
1.			2 exx., 18.06.05			**2**
2.	2 exx., 01.06.04 2 exx., 06.06.04 2 ex., 06.06.05 1 ex., 06.06.05 1 ex., 25.06.05		2 exx., 20.05.04 1 ex., 06.06.04 1 ex., 01.06.05 3 exx., 25.06.05		1 ex., 06.06.04	**15**
3.			1 ex., 14.05. 04			**1**
4.	3 exx., 24.05.05 1 ex., 15.06.05		1 ex., 12.05.05 3 exx., 19.05.05 2 exx., 24.05.05 1 ex., 15.06.05 1 ex., 15.06.05			**12**
5.	1 ex., 16.06.05 2 exx., 25.06.05		6 exx., 16.06.05 2 exx., 27.05.05			**11**
6.	2 ex., 01.06.04		1 ex., 18.05.04 3 exx., 11.06.04 2 exx., 29.06.05			**7**
7.	1 ex., 13.06.05		1 ex., 01.06.04 1 ex., 01.06.05 1 ex., 13.06.05			**4**
8.				1 ex., 11.05.04		**1**
9.			3 exx., 19.05.05			**3**
10.	1 ex., 02.06.05	1 ex., 07.06.04				**2**
11.			1 ex., 17.05.04			**1**
12.			1 ex., 27.05.04			**1**
Σ	**19**	**1**	**40**	**1**	**1**	**62**

The number of individuals and date of catch. Σ – sum of collected specimens, LN – number of locality. The numbering of localities like in chapter "Study area."

scoop, Moericke traps, lighted shield and "picking out" methods has acquired only 17 specimens from the area of the Poleski NP during 3 years of investigations. The author pointed to low ability of catch of all methods of catching. Budzyńska et al. (3), using entomological umbrella additionally, has collected 14 specimens during faunistic and ecological investigations conducted in the years 1986–99 on the selected protected areas of Lublin region. Czarniawski et al. (4), using similar methods during 7-year period has collected 12 individuals.

To the most often of those caught in Lublin belong: *Xantostigma xantostigma* and *Phaeostigma notata*. Individuals of the first species appear almost in all explored stations, the representative of the second was noted in a half of stations. The three next species occurred only occasionally. According to data given by Budzyńska et al. (3) and Czarniawski et. al. (4) on investigated areas of the Lublin region the most numerous was *Dichrostigma flavipes*, however, in the

town it was caught only occasionally. Comparatively high level of numbers, both in the city and in suburban districts, demonstrate *Phaeostigma notata* and *Xantostigma xantostigma*. Results of recent researches confirm remarks that *Raphidia ophiopsis ophiopsis*, species considered to be very common in Poland, seems to be not so popular in the Lublin region.

Most of specimens of snake-flies have been collected from communities with high contribution of trees, and in communities dominated by herbaceous plants only individual specimens have been caught. Preferred by these insects were old, mouldered trees (St. 2, 4).

CONCLUSIONS

Although the investigations, presented in these publications, did not concentrate on collecting of snake-flies only, the small number of collected insects during intensive exploration, confirms the opinion of Piotrowski (9) that all conventional methods of catching have small usefulness for investigation of snake-flies. Better effectiveness had sticky traps, but finally, relatively big number of collected material could be rather commented as the result of high intensity of exploration. Sticky traps, used as explorative methods for some group of insects, seem to be laborious and expensive, both during installation and weekly penetration of trees. Furthermore, sticky traps are characterised by low selectivity, so it is impossible to avoid the unintentional catch and death of individuals of very rare, endangered or protected by law species of insects. For this reason sticky traps cannot be recommended as a frequently employed method, particularly in the areas with high degree of protection.

Our results confirmed that the local environment of big town could create suitable habitat for snake-flies. To save old trees on town area could contribute to surviving of population of these insects, especially if it is possible to apply care treatments on selected old trees.

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