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SYNECOLOGICAL CHARACTERIZATION OF THRIP COMMUNITIES (INSECTA, THYSANOPTERA) OF THE UMCS BOTANICAL GARDEN IN LUBLIN

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Abstract. The article presents an ecological characterization of thrips caught in Moericke traps in the Botanical Garden in Lublin. The objective of the research was to study the species composition and abundance of thrips in a man-made environment, where alongside native plants there are also trees and bushes brought in from other parts of the world. A total of 396 adult Thysanoptera individuals belonging to 39 species were caught. This is 17.2% of the thrip fauna in Poland. Among the individuals collected there were 10 dendrophilous species and 3 mycophagous species associated with tree bark and living in rotting wood. This is 25% of the Thysanoptera occurring in Poland with these food preferences. The trap method chosen is effective at catching thrips appearing in the spring and early summer, i.e. *Taeniothrips inconsequens*, *Thrips minutissimus*, *Oxythrips ajugae* and *O. bicolor*, as well as deeply hidden species that are difficult to capture using other methods. Using the Moericke trap method we collected four species rarely recorded in Poland.

Key words: thrips, Thysanoptera, Moericke traps, synecological groups, botanical garden

INTRODUCTION

Thrips (Thysanoptera) are very small insects, 1–3 mm in size, among which the largest group consists of phytophages feeding on sap, which they extract with their piercing-sucking mouthparts. When these insects feed they mechanically damage plants, deforming them or inhibiting their growth. Thrips also include a group of mycophagous species and zoophages that feed on aphids and the larvae of other insects [Kucharczyk 2004b].

In Poland there is little information concerning thrips occurring in artificial environments such as botanical gardens, which contain plants that do not occur naturally in this country, including trees, shrubs and herbaceous plants [Pobożniak *et al*. 2008, Łabanowski and Soika 2010, Pobożniak and Sobolewska 2011].

Thus far 226 thrip species have been recorded in Poland, of which 51 have a diet associated with trees and shrubs, feeding on their leaves and in their flowers, or as mycophages live on rotting wood [Kucharczyk and Kucharczyk 2013]. Due to their often hidden way of life, Moericke traps are an effective method of collecting them.

The aim of the study was a synecological characterization of thrip communities in the man-made habitat of a botanical garden. We analysed the effect of the collection method using Moericke traps on the qualitative composition of the thrips.

MATERIAL AND METHODS

The Botanical Garden in Lublin is one of the youngest in Poland. It was established in 1965 thanks to the efforts of the administration of the Maria Curie-Skłodowska University. It was officially made available to the public in May 1974. The garden is located in the western part of the city. It is one of the largest in Poland and one of the most beautiful in terms of landscape. It currently occupies 25 ha. Here one can see plants from all over the world, occurring naturally or obtained by breeding [Chmielewski and Sawicki 1986, Czarnecka *et al*. 1997].

Research in the UMCS Botanical Garden in Lublin was carried out in the years 2001–2002 at four selected sites. The sites were varied in terms of trees and flowers.

Site 1 – an open area by a pond, with dominance of grassy vegetation. Site 2 – a moist, shaded ravine covered by a dense complex of various species of trees. Site 3 – a flat area with dense and varied woody plants penetrated by sunlight. Site 4 – sunlit flower beds.

The study material was collected using Moericke traps. This method is usually used mainly to catch insects in treetops. Studies show that the largest numbers of insects, including thrips, fall into white traps that reflect ultraviolet light [Kirk 1984, Czepiel and Kucharczyk 1998]. For this reason traps of this colour were suspended among tree branches at a height of about 1.5 m and in the flower beds. They did not contain attractants, but were filled only with glycol diluted with water. Material was collected from them twice a month.

The thrips were assigned to 6 ecological groups on the basis of food preferences and habitat [zur Strassen 1993]: graminicolous, floricolous, herbicolous, foliicolous, zoophagous and saprophagous species – occurring mainly under tree bark and in litter.

To identify Thysanoptera species we used keys by Mound *et al*. [1976], Schliephake and Klimt [1979], zur Strassen [2003], and Zawirska [1994], and nomenclature according to the list of thrips of Poland [Kucharczyk 2004b].

RESULTS AND DISCUSSION

At the four sites at the UMSC Botanical Garden in Lublin 396 adult Thysanoptera individuals belonging to 39 species were collected in Moericke traps. This is 17.2% of the thrips fauna occurring in Poland. The species belonged to three families: Aeolothripidae, Thripidae and Phlaeothripidae (Table 1).

Two trophic groups were distinguished among the thrips collected – phytophages and zoophages. Phytophages were dominant in the material (98.5%, 36 sp.). Only three species were included among zoophages: *Aeolothrips intermedius*, *Aeolothrips melaleucus* and *Xylaplothrips fuliginosus*.

Among these predators, *Aeolothrips intermedius* is very common and abundant throughout Poland. It sucks the larvae of other thrips, aphids, and the larvae and eggs of small insects [Kucharczyk *et al*. 2006]. Its larvae puncture plant tissues, mainly flower petals, and suck out their contents [Zawirska 1969]. This species, taking in a variety of food, develops more rapidly and produces large numbers of offspring [Trdan *et al*. 2005].

The dominant species feeding on herbaceous plants were *Thrips fuscipennis* (26.0%), *T. flavus* (14.9%), *T. major* (13.9%), *T. tabaci* (8.3%) and *Frankliniella intonsa* (7.8%). Thrips living in flowers account for the largest group, mainly species of the genera *Thrips* and *Frankliniella* [Funderburk 2001]. Aided by the wind, these small insects make their way to various flowering plants, including flowering trees, and pollinate them [Sakai 2002].

Polyphages were the most numerous group in terms of food preferences – 20 species in this group accounted for 91.4% of the fauna caught in the traps. The quantitative share of the other two groups – monophages and oligophages – was the same (4.3% each), but considerably more oligophagous species were noted (13 sp.) than monophagous ones (6 sp.).

Among the oligophages in the traps, species found on monocotyledonous plants were dominant: *Aptinothrips rufus*, *A. stylifer*, *Chirothrips manicatus*, *Frankliniella tenuicornis* and *Limothrips denticornis*. This is indicative of the tendency of thrips towards migratory flight.

The most abundant of the monophagous species was *Pezothrips dianthi*, a thermophilic species found on plants of the genus *Dianthus*. It was caught in traps placed among flower beds, where the flowers of these plants were present. The other monophagous species were the graminicolous species *Chirothrips ambulans* (associated with *Poa pratensis*) and *Limothrips consimilis* (associated with *Bromus* sp.), the floricolous *Thrips albopilosus* (associated with *Humulus lupulus*), the hygrophilous *Hoplothrips ulmi*, found under tree bark, and the foliicolous *T. calcaratus* (associated with *Tilia* sp.), which having been introduced to South America became a serious pest defoliating American Linden (*Tilia Americana*) [Werner *et al*. 2004].

Table 1. List of species and ecological structure of thrips (*Thysanoptera*) collected in UMCS Botanical Garden in Lublin in 2001–2002

	Thysanoptera	Preferences		Total
		trophic	food	
	Aeolothripidae			
1.	*Aeolothrips intermedius* Bagnall, 1934	Polyphagous	z	3
2.	*Aeolothrips melaleucus* (Haliday, 1852)	Oligophagous	z	2
	Thripidae			
3.	*Anaphothrips obscurus* (Müller, 1776)	Polyphagous	g	2
4.	*Aptinothrips elegans* Priesner, 1924	Polyphagous	g	1
5.	*Aptinothrips rufus* Haliday, 1836	Oligophagous	g	1
6.	*Aptinothrips stylifer* Trybom, 1894	Oligophagous	g	1
7.	*Chirothrips ambulans* Bagnall, 1932	Monophagous	g	1
8.	*Chirothrips manicatus* Haliday, 1836	Oligophagous	g	2
9.	*Dendrothrips degeeri* Uzel, 1895	Polyphagous	fo	12
10.	*Frankliniella intonsa* (Trybom, 1895)	Polyphagous	h	31
11.	*Frankliniella tenuicornis* (Uzel, 1895)	Oligophagous	h	1
12.	*Limothrips consimilis* Priesner, 1926	Monophagous	g	1
13.	*Limothrips denticornis* Haliday, 1836	Oligophagous	g	1
14.	*Myterothrips albidicornis* (Knechtel, 1923) ●	Polyphagous	fo	2
15.	*Mycterothrips latus* (Bagnall, 1912)	Polyphagous	fo	1
16.	*Neohydatothrips abnormis* (Karny, 1909) ●	Oligophagous	fl	1
17.	*Oxythrips ajugae* Uzel, 1895	Oligophagous	fo	1
18.	*Oxythrips bicolor* (O.M.Reuter, 1879)	Oligophagous	fo	1
19.	*Pezothrips dianthi* (Priesner, 1921)	Monophagous	fl	8
20.	*Riubiothrips sordidus* (Uzel, 1895)	Oligophagous	h	1
21.	*Taeniothrips inconsequens* (Uzel, 1895)	Polyphagous	fo	19
22.	*Thrips albopilosus* Uzel, 1895	Monophagous	fl	2
23.	*Thrips atratus* Haliday, 1836	Polyphagous	h	11
24.	*Thrips calcaratus* Uzel, 1895	Monophagous	fo	4
25.	*Thrips flavus* Schrank, 1776	Polyphagous	h	59
26.	*Thrips fuscipennis* Haliday, 1836	Polyphagous	h	103
27.	*Thrips major* Uzel, 1895	Polyphagous	h	55
28.	*Thrips minutissimus* Linnaeus, 1758	Polyphagous	fo	3
29.	*Thrips nigropilosus* Uzel, 1895	Polyphagous	h	3
30.	*Thrips physapus* Linnaeus, 1758	Polyphagous	h	13
31.	*Thrips pillichi* Priesner, 1924	Polyphagous	fl	6
32.	*Thrips tabaci* Lindeman, 1889	Polyphagous	h	33
33.	*Thrips trehernei* Priesner, 1927	Polyphagous	h	1
34.	*Thrips validus* Uzel, 1895	Polyphagous	fl	2
35.	*Thrips viminalis* Uzel, 1895	Oligophagous	fo	2
	Phlaeothripidae			
36.	*Haplothrips kurdjumovi* Karny, 1913	Polyphagous	fo	2
37.	*Hoplothrips ulmi* (Fabricius, 1781)	Monophagous	m	1
38.	*Poecilothrips albopictus* Uzel, 1895 ●	Oligophagous	m	2
39.	*Xylaplothrips fuliginosus* (Schille, 1910) ●	Oligophagous	m, z	1
	Total			396

Abbreviations: fl – floricolous, fo – foliicolous, g – graminicolous, h – herbicolous, z – zoophagous, m – mycophagous, ● – rare species

In terms of food preferences, the largest group in the samples from the Moericke traps comprised herbicolous species (11 sp., 78%). The most abundant of these was *Thrips fuscipennis* (26%) (Table 1).

The material collected contained 10 foliicolous species (11.8%). Leaves are a permanent food source for the larvae of numerous species in the absence of flowers (Sakai 2002). The most numerous was *Taeniothrips inconsequens*, which feeds on fruit trees and attacks maples, hawthorn and blackthorn [Zawirska 1994].

A smaller group comprised graminicolous species (8 sp.) and floricolous species (6 sp.).

The smallest and least abundant group was mycophages associated with tree bark and living on rotting wood: *Hoplothrips ulmi*, *Poecilothrips albopictus* and *Xylaplothrips fuliginosus*. The last of these is also a zoophage and is found in natural forest habitats in Europe. It is little known in Poland [Kucharczyk 2008].

The dendrophilous and mycophagous species caught accounted for 25% of the Thysanoptera of Poland with these food preferences.

Dendrophilous species, i.e. *Taeniothrips inconsequens*, *Thrips minutissimus*, *Oxythrips ajugae* and *Ox. bicolor*, were collected in the Moericke traps only in spring. This is confirmed by numerous studies conducted in a forest environment [Kucharczyk and Sęczkowska 1990, Kucharczyk 2004a, Kucharczyk and Kucharczyk 2011, Lubiarz 2011]. These species have only one generation per year and hibernate in the form of pupae or as adult forms. They are caught in the largest numbers in the spring, when they leave their wintering places and feed on young leaves [Kucharczyk and Kucharczyk 2013].

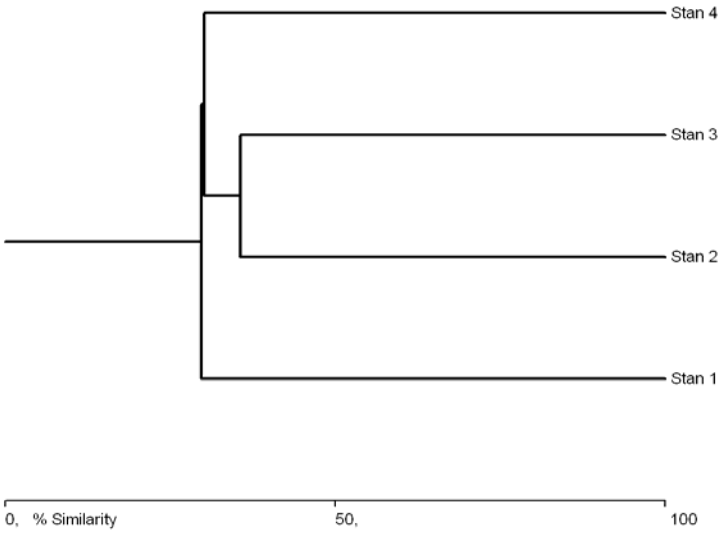

Fig. 1. Faunistic similarity between study sites where Moericke traps were set up

The hygrophilous species *Thrips viminalis*, found on willow (*Salix* L.), alder (*Alnus* Mill.) and poplar (*Populus* L.), was caught only in autumn.

The highest faunistic similarity was found between sites 2 and 3 (35.6%) (Fig. 1). The high similarity between the fauna of these two sites was probably due to habitat similarity, as there were dense complexes of various tree species at both sites. The lowest similarity was noted between sites 1 and 2 (14.2%). Site 1 was an open area near a pond and was covered with grassy vegetation, so the two sites were substantially different.

Using the Moericke trap method we caught 4 species that are rare in Poland: *Neohydatothrips abnormis* (floricolous), *Mycterothrips albidicornis* (dendrophilous), *Xylaplothrips fuliginosus* and *Poecilothrips albopictus* (both mycophages).

These mycophages have been caught in Moericke traps at other sites in Lublin and its outskirts [Czepiel-Mil 2006].

CONCLUSIONS

1. A total of 396 adult Thysanoptera individuals belonging to 39 species were collected. This is 17.2% of the thrips fauna occurring in Poland.
2. There were 10 dendrophilous Thysanoptera species and 3 mycophagous species associated with tree bark in the material collected. This is 25% of the Thysanoptera fauna occurring in Poland with these food preferences.
3. Most of the species caught were early-spring species, which are most abundant in the spring and early summer when the leaves and flowers of trees begin to develop.
4. The highest faunistic similarity was noted at the sites with many trees of different species growing in a dense complex.
5. The highest species diversity among the thrips was noted at the site with a trap set up in a flower bed. Here herbicolous species living on various herbaceous plant species were dominant.
6. The Moericke trap method is an effective method for catching deeply hidden species that are difficult to capture using other methods.

REFERENCES

Chmielewski T., Sawicki R., 1986. Ogród Botaniczny UMCS w Lublinie. Przewodnik. Wojewódzki Ośrodek Informacji Turystycznej, Lublin.

Czarnecka B., Dybkowska M., Sawicki R., 1997. Ogród Botaniczny UMCS. Przewodnik dydaktyczny. Wyd. UMCS, Lublin.

Czepiel-Mil K., 2006. Rzadkie dla fauny Polski gatunki wciornastków (Thysanoptera) stwierdzone w Lublinie. Wiad. Entomol. 25, Supl. 2, 59–64.

Czepiel K., Kucharczyk H., 1998. Liczebność wciornastków (*Thysanoptera*) na tle innych owadów odławianych do kolorowych pułapek Moericke'go w Poleskim Parku Narodowym. Wiad. Entomol. 17 (supl.), s. 163.

Funderburk J., 2001. Ecology of thrips. In: Thrips and tospoviruses: Proceedings of the 7th International Symposium on *Thysanoptera*, Marullo R., Mound L. (eds.), e-book: www.ento.csiro.au-/thysanoptera/Symposium/, 121–128.

Kirk W.D.J., 1984. Ecologically selective coloured traps. Ecol. Entomol. 9, 35–41.

Kucharczyk H., 2004a. Wciornastki (Insecta: Thysanoptera) jako element monitoringu ekologicznego w Puszczy Białowieskiej. Leś. Pr. Bad. 3, 85–94.

Kucharczyk H., 2004b. Wciornastki (*Thysanoptera*) Polski. W: Fauna Polski. W. Bogdanowicz (red.). Wyd. IZ PAN, Warszawa.

Kucharczyk H., 2008. Xylaplothrips zawirskae n. sp. a new species from Poland (Thysanoptera: Phlaeothripidae). Genus 19 (1), 7–13.

Kucharczyk H., Kucharczyk M., 2011. Wciornastki (Thysanoptera) lasów bukowych południowo--wschodniej Polski. Leś. Pr. Bad. 72 (4), 329–337.

Kucharczyk H., Kucharczyk M., 2013. Charakterystyka i cechy diagnostyczne wciornastków z rodziny Thripidae (Insecta, Thysanoptera) najczęściej występujących w koronach drzew lasów centralnej Europy. Leś. Pr. Bad. 74 (1), 5–11.

Kucharczyk H., Setniewska M., Legutowska H., 2006. Zróżnicowanie fauny wciornastków (Thysanoptera) na roślinach zielarskich w rejonie warszawskim. Post. Ochr. Rośl. 46 (2), 429–432.

Kucharczyk H., Sęczkowska K., 1990. Przylżeńce (Thysanoptera) zespołu grądowego (Tilio-Carpinetum) w rezerwacie Bachus (Wyżyna Lubelska). Fragm. Faun. 33(20), 349–360.

Lubiarz M., 2011. Thrips (Thysanoptera) inhabiting *Quercus robur* L. in the town landscape of Puławy and the natural landscape of Poleski National Park. Urban Fauna. Studies of animal biology, ecology and conservation in European cities. Bydgoszcz, 161–170.

Łabanowski G., Soika G., 2010. Przylżeńce (Thysanoptera) występujące na trawach ozdobnych. Prog. Plant Prot. 50(3), 1274–1286.

Mound L.A., Morison G.B., Pitkin B.R., Palmer J.M., 1976. Handbooks for the identification of British insects. Roy. Entomol. Soc. London, 12–79.

Pobożniak M., Bisaga A., Bussler M., 2008. Atrakcyjność kwiatów drzew i krzewów dla wciornastków Thysnoptera w Ogrodzie Botanicznym w Krakowie. W: Fauna miast. Ochronić różnorodność biotyczną w miastach. SAR „Pomorze", Bydgoszcz, 373–382.

Pobożniak M., Sobolewska A., 2011. Thrips (Thysanoptera) species infesting herbaceous plants in Botanical Garden in Krakow (Poland). Urban Fauna. Studies of animal biology, ecology and conservation in European cities. UTP, Bydgoszcz, 171–179.

Sakai S., 2002. A review of brood-site pollination mutualism: plants providing breeding sites for their pollinators. J. Plant Res., Tokyo, 115, 161–168.

Schliephake G., Klimt K., 1979. *Thysanoptera* Fransenflügler. Gustav Fischer Verlag, Jena, 71–477.

Strassen zur R., 1993. Fransenflügler (*Insecta: Thysanoptera*) in Naturschutzgebiet „Arschleife Altenahr" und in einer benachbarten Weinbergbrachfläche. Beiträge Landespflege Rheinland-Pfalz 16, 359–381.

Strassen zur R., 2003. Die terebranten Thysanopteren Europas. Goecke & Evers, Keltern.

Trdan S., Andjus L., Raspudić E., Kać M., 2005. Distribution of *Aeolothrips intermedius* Bagnall (Thysanoptera:Aeolothripidae) and its potential prey Thysanoptera species on different cultivated host plants. J. Pest Sci. 78, 217–226.

Werner S.M., Nordheim E.V., Raffa K.F., 2004. Comparison of methods for sampling Thysanoptera on basswood (Tilia americana L.) trees in mixed northern hardwood deciduous forests. Forest Ecol. Manage. 201, 327–334.

Zawirska I., 1969. Fauna przylżeńców (Thysanoptera) w kwiatach roślin strączkowych w Polsce. Pr. Nauk. IOR 11(2), 81–89.

Zawirska I., 1994. Klucz do oznaczania wciornastków (*Thysanoptera*). W: Diagnostyka szkodników roślin i ich wrogów naturalnych. SGGW, Warszawa, 145–174.

CHARAKTERYSTYKA SYNEKOLOGICZNA ZGRUPOWAŃ WCIORNASTKÓW (INSECTA, THYSANOPTERA) OGRODU BOTANICZNEGO UMCS W LUBLINIE

Streszczenie. W artykule zaprezentowano charakterystykę ekologiczną wciornastków złowionych do pułapek Moerickego na terenie ogrodu botanicznego w Lublinie. Celem pracy było zbadanie składu gatunkowego i liczebności wciornastków w środowisku sztucznie stworzonym przez człowieka, gdzie obok rodzimych roślin, drzew i krzewów występują także te sprowadzone z innych części świata. Ogółem zebrano 396 osobników dorosłych Thysanoptera należących do 39 gatunków. Stanowi to 17,2% fauny wciornastków Polski. Wśród zebranych osobników stwierdzono 10 gatunków dendrofilnych Thysanoptera oraz 3 gatunki mykofagiczne związane z korą drzew i żyjące na rozkładającym się drewnie. Stanowi to 25% fauny Thysanoptera Polski o takich preferencjach pokarmowych. Wybrana metoda pułapkowa jest skuteczną metodą do połowu wciornastków pojawiających się wiosną i wczesnym latem, tj. *Taeniothrips inconsequens*, *Thrips minutissimus*, *Oxythrips ajugae* i *O. bicolor* oraz gatunków głęboko ukrytych, trudnych do schwytania innymi metodami. Metodą pułapek Moerickego pozyskano 4 gatunki rzadko wykazywane w Polsce.

Słowa kluczowe: wciornastki, Thysanoptera, pułapki Moerickego, grupy synekologiczne, ogród botaniczny