APHIDS AND OTHER HEMIPTEROUS INSECTS	VOL. 13 137-144

Life cycle and number dynamics of *Phylloxera* sp. on pedunculate oak (*Quercus robur* L.) in industrial and protected areas

Magdalena Lubiarz

Department of Nature Preservation, The John Paul II Catholic University of Lublin
Konstantynów 1H, 20-708 Lublin, Poland
lubiarz@kul.lublin.pl

Introduction

The aim of the research was to determine the number and bionomy of hemipterons from the Phylloxera (*Phylloxera sp.*) genus. The research was carried out on pedunculate oak (*Quercus robur* L.) in the Poleski National Park and in the wooded area around the Zakłady Azotowe Puławy S.A. (Nitrogen Factory) in the town of Puławy.

Material and methods

a. Methods of sample collection

In each of the eight selected locations, samples were collected from 3 to 5 trees. From each location 100 leaves and at least 10 green and lignified shoots were collected, the length of which was 30-40cm each, and inflorescences and fruits that were on them, too. The samples were collected in 14 day periods since May to October. Identification of particular species was carried out on the basis of mounted microscopic slides and referred mostly to the keys by Blackman & Eastop (2000) and Eastop (1965).

b. Description of locations

The area around Zaklady Azotowe in the Puławy town is a highly degraded area and trees that grow here were planted in a place where in the past there used to be a forest but it was damaged by impurities. Plant communities have a changed species composition that is why they are difficult to classify phytosociologically. Moreover, during the course of the research in the Puławy town the shortage of water in surface layers of soil was observed.

The area of the Poleski National Park is characterized by quite large naturalness of plant communities. Never before was water shortage in soil observed there.

In this paper the following abbreviations are used: Puławy, for Zakłady Azotowe in the Puławy town and PNP for the Poleski National Park.

The area surrounding Zaklady Azotowe in Puławy (Puławy)

Site 1 (Puławy 1) is located by the road from the town of Puławy to Warsaw. Oak trees grow here by the road surrounded by European white birch (*Betula pendula* Roth), Scots pine (*Pinus sylvestris* L.) and black locust (*Robinia pseudoacaccia* L.).

Site 2 (Puławy 2) is 200m away from Zakłady Azotowe in the Puławy town. Oak trees are planted in an open space surrounded by green plants.

Site 3 (Puławy 3) is 400m away from Zaklady Azotowe in the Puławy town. Oak trees are planted along with apple trees (*Malus domesticus* Borkh.), black locust (*R. pseudoacaccia*), European white birch (*B. pendula*) and bird cherry (*Prunus padus* L.).

Site 4 (Puławy 4) is situated by the road from the Puławy town to the city of Warsaw. It is situated on an old river-bed of the Vistula River, opposite site 1. Oak trees are planted along with European white birch (*B. pendula*), Scots pine (*P. sylvestris* L.) and black locust (*R. pseudoacaccia* L.).

Poleski National Park (PNP)

Site 1 (PNP 1) is located right on the borderline between the forest and wasteland, about 1500 m away in a straight line from the Lublin-Warsaw road. Oak trees are planted in a *Tilio-Carpinetum* community.

Site 2 (PNP 2) is located between former drainage ditch. Behind one of these drainage ditch there is *Potentillo albae-Quercetum* community, where sessile oak (*Quercus petraea* (Matt) Liebl.) dominates.

Site 3 (PNP 3) is located in community (*Ribeso nigri-Alnetum*) neighbouring with young trees of *Q. robur*.

Site 4 (PNP 4) is located 400m away from the Lublin – Włodawa road. Oak trees were planted on the edge of *Ribeso nigri-Alnetum* community surrounded by European white birch (*B. pendula*) neighbouring with common segetal communities.

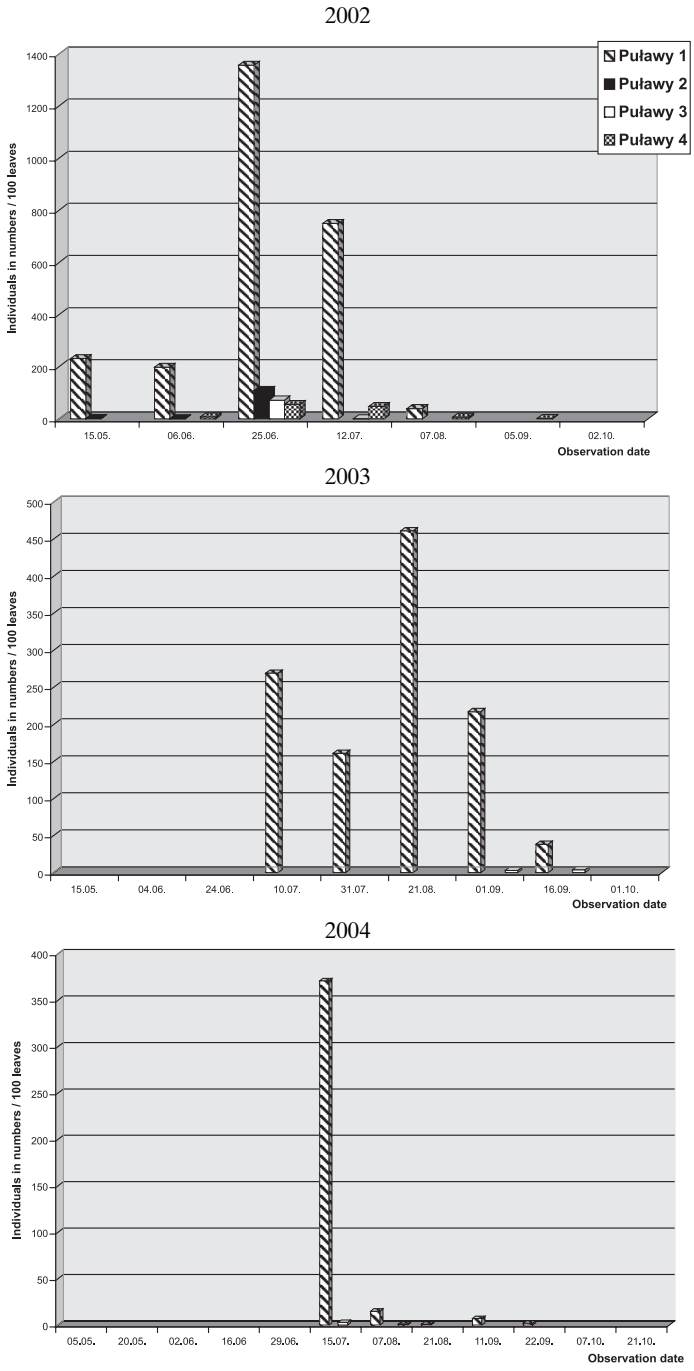
Results

a. Number

Two species from the Phylloxera genus (Heyd.) *Phylloxera coccinea* (Heyd.) and *Phylloxera glabra* (Heyd.) were observed in this research. These were the smallest insects (0.7 – 1.2mm) ever registered on oaks, and their yellow or orange colour made it difficult to identify their genus. Species identification was possible only after having mounted microscope slides. Hence the number of both species was provided together. *Phylloxera glabra* was found to be a more numerous species (also after having made the microscope slides). Altogether 5460 specimens of *Phylloxera* sp. were registered, out of which 4433 – in Puławy, and 1027 – in PNP.

In Puławy phyloxers occurred irregularly (Fig. 1.). They were most numerous in Site 1, where throughout the three years of research 4116 specimens were collected (1.47 per 1 leaf). In each year of research the number dynamics of this species was different. Only in 2002 they were observed until mid-May. In the remaining years of the research the first observations of this species took place in mid-July. Peak appearance was registered between 25 June (2002) and 21 August (2004). The most numerous specimens were collected in the most contaminated Site 1. They were registered to be the most numerous in this site in 2002 (13.56 per 1 leaf), and the least numerous in 2004 (3.71 per 1 leaf). In the remaining sites they were registered in much smaller numbers. In all the years of research the last specimens of phyloxers were registered around mid-September (Fig. 1.).

In the Poleski National Park phyloxers were registered more regularly than in Puławy. Only in 2002 was their number similar to the one in Puławy. Once only (13th August 2002) in Site 2, 185 specimens per 100 leaves were collected. In the remaining years they were much less numerous (0.14 – 0.24 specimens per 1 leaf) (Fig. 2.). First specimens of *Phylloxera* sp. were registered on oak leaves in the last days of May or the first days of June. Numerous aphids (peak numbers) appeared in different times of the growth season – in June, July and even in October (2004) (Fig. 2.).



'Fig. 1. *Phylloxera* sp. number dynamics in Puławy in 2002-2004

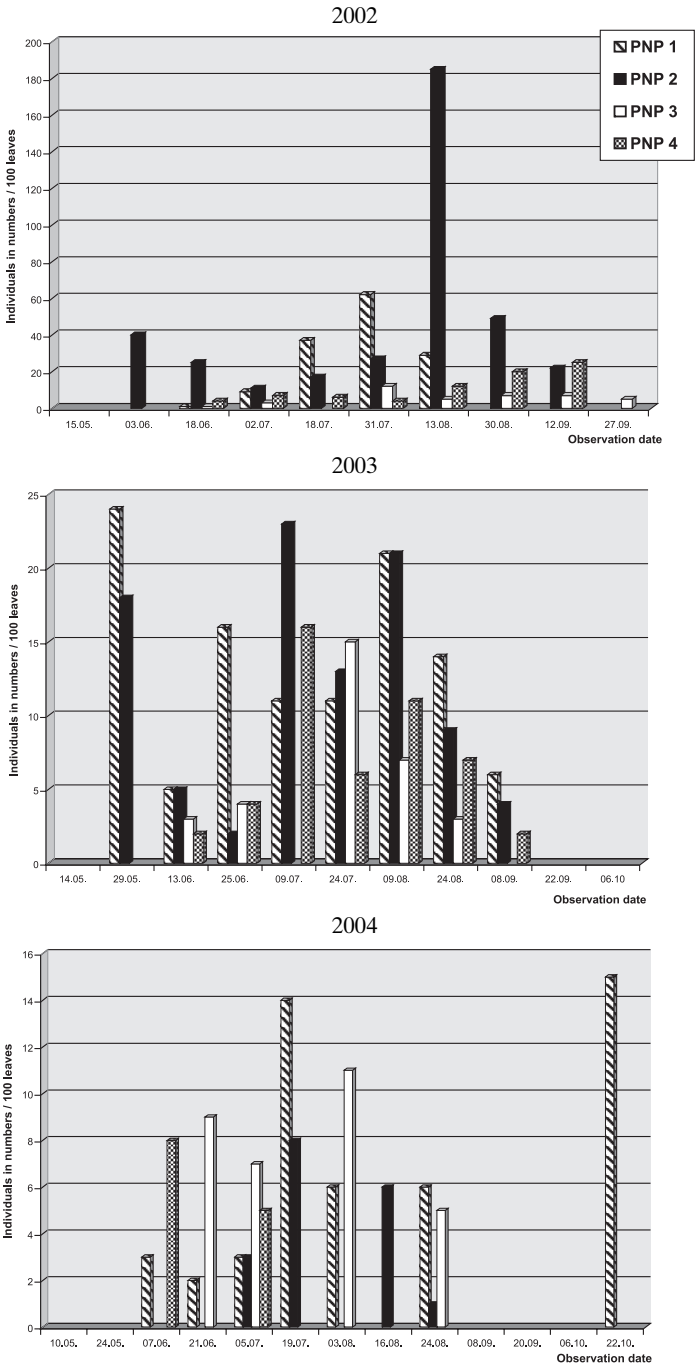


Fig. 2. *Phylloxera* sp. number dynamics in PNP in 2002-2004

b. Observations of bionomy

Larvae hidden in slits of the bark were the overwintering forms of the *Phylloxera* sp. On the studied oak trees no stock mothers of *Phylloxera coccinea* and *P. glabra* were recorded. CICHOCKA & GOSZCZYŃSKI (1991) observed them on oak trees by the side of a road in Warsaw. Virginoparae females of this species appeared the earliest i.e., in mid-May (2002) and remained there until the end of September. In 2003 they were recorded since 29 May – in PNP, and in Puławy only since 10 July. In 2004 females of the *Phylloxera* were recorded in PNP since 7 June until 24 August, and since 15 July until 22 September in Puławy. Virginoparous wingless and winged females laid eggs radiantly around their own body. Similar observations are provided by BÖRNER & HEINZE (1957), CICHOCKA *et al.* (1990) and CICHOCKA & GOSZCZYŃSKI (1991). Around the females both in Puławy and in PNP from 2 to 121 eggs were found (Tab. 1.). CICHOCKA & GOSZCZYŃSKI (1991) observed from 20 to 89 eggs laid around the aphid female in Warsaw. Females of the summer generation fed on the backside of the leaf causing necrotic spots on leaves.

On 22 October of 2004 in Poleski National Park 6 females which laid eggs in bark slits were registered. A single female laid from 6 to 24 eggs from which overwintering larvae hatched. Larvae of both species from the *Phylloxera* genus which appeared in the spring and summer on leaves were tiny sometimes even smaller than spider mites. They settled quite numerously young leaves covered by powdery mildews. Females and larvae of the *Phylloxera* eagerly hid under nets of spiders where they were attended by other spider mites and predatory mites. In 2003 in Puławy ladybird larvae covered with wax were recorded and they damaged *Phylloxera* larvae. No parasitized aphids from the Phylloxera genus were observed.

Table 1. Number of *Phylloxera* sp. eggs laid around a female

Number of eggs laid around a female	**Year**	
	2002	**2003**
lowest	6	2
highest	87	121
medium	**46.50**	**61.50**

Summary

During the three years of research 5460 specimens of the Phylloxera sp. in total were collected, out of which 4433 – in Puławy, and 1027 in PNP. Particu-

larly numerous hymenopterons were registered in the first year of research (2002) in both research sites. In Puławy *Phylloxera* sp. were irregular while in PNP they were more regular but in smaller numbers. Females of the spring and summer generations fed on the back-side of the leaf causing the formation of yellow necrotic spots on leaves. Virginoparae wingless and winged females laid eggs radiantly around their bodies. In one such deposition from 2 to 121 eggs were recorded. In October 2004 in the Poleski National Park 6 females which laid eggs in slits of shoot bark were observed. From these eggs overwintering larvae hatched.

References

Blackman R.L., Eastop V.F. 2000. Aphids on the World's Trees. An Identification and Information Guide. University Press, Cambridge, 986p.

Börner C., Heinze K. 1957. Aphidoidea. [In:] Sorauer P. Handbuch der Pflanzenkrankheiten. 1-402.

Cichocka E., Czajkowska B., Goszczyński W. Kropczyńska-Linkiewicz D. 1990. Ważniejsze szkodniki drzew w miastach, sposoby ograniczania ich liczebności. [In:] CPBP 04.10 Ochrona i Kształtowanie Środowiska Przyrodniczego. Wykorzystanie układów ekologicznych w systemie zieleni miejskiej. Wyd. SGGW-AR, Warszawa, 64:166-174.

Cichocka E., Goszczyński W. 1991. Mszyce zasiedlające drzewa przyuliczne w Warszawie. [In:] Mszyce, ich bionomia, szkodliwość i wrogowie naturalni. PAN, Warszawa, 9-18.

Eastop V.F. 1965. A Taxonomic study of Australian *Aphidoidea* (*Homoptera*). Aust. J. Zool. 14:399-592.

Heinze K. 1962. European Lachnidae, Adelgidae, Phylloxeridae. Dt. Ent. Z.9: 143-227.

Müller F.P. 1976. Mszyce – szkodniki roślin. Terenowy klucz do oznaczania. PWN, Warszawa, 119p.

Cykl życiowy i dynamika liczebności *Phylloxera* sp. na dębie szypułkowym (*Quercus robur* L.) na terenie przemysłowym i chronionym

Streszczenie

Badania prowadzono na dębie szypułkowym w latach 2002-2004 w nasadzeniach leśnych znajdujących się w okolicach Zakładów Azotowych w Puławach oraz w naturalnych zbiorowiskach leśnych Poleskiego Parku Narodowego. Stwierdzono występowanie 2 gatunków mszyc z rodzaju *Phylloxera: Phylloxera coccinea* (Heyd.) oraz *Phylloxera glabra* (Heyd.). Prowadzono obserwacje nad ich dynamiką liczebności. W ciągu 3 lat badań ze-

brano w badanych obszarach 5460 osobników *Phylloxera* sp. Po wykonaniu preparatów mikroskopowych liczniejszym gatunkiem okazał się *Phylloxera glabra* (Heyd.). Poczyniono również pewne obserwacje nad bionomią *Phylloxera* sp. Wiosną i latem udało się zaobserwować składanie jaj na liściach przez bezskrzydłe i uskrzydlone samice. Ponadto jesienią zaobserwowano również proces składania jaj na korze pędów.