

# Dynamics of numbers and bionomy of *Lachnus roboris* (L.) on pedunculate oak (*Quercus robur* L.) in natural and degraded landscape

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## Introduction

The research aims at determining the number and bionomy of clouded-winged oak aphid *Lachnus roboris* (L.). The research was carried out 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. Description of sites

The area of the Poleski National Park is characterized by high naturalness of plant reservations. Although it undergoes human interference the shortage of water in the soil has never been registered in the research sites. The surroundings of the Poland-based producer of nitrogen fertilizers, Zakłady Azotowe Puławy S.A. in the town of Puławy are highly degraded as the trees that grow there were planted in a strongly polluted area. Plant reservations in the town of Puławy have either totally or extensively damaged species composition, therefore, they are difficult to classify with respect to phytosociology. Moreover, water shortage was observed in the surface layers of the soil there. The following abbreviations are used in the paper: Puławy referring to the surroundings of the Nitrogen Factory in the town of Puławy, and PNP to the Poleski National Park.

### The Poleski National Park (PNP)

**Site 1** (PNP 1) is situated on the border between the forest and wasteland about 1500m in a straight line away from the highway leading from the city of Lublin to Warsaw. Oak trees are grown here in *Tilio-Carpinetum* communities.

**Site 2** (PNP 2) is situated between former drainage ditch. The oaks that grow here are uncovered, and behind the ditch there is *Potentillo albae-Quercetum* community where sessile oak, (*Quercus petraea* (Matt). Liebl.) dominates.

**Site 3** (PNP 3) is situated in the *Ribeso nigri-Alnetum* community, just next to young trees of *Quercus robur* L.

**Site 4** (PNP 4) is a site where oaks grow on the border of the *Ribeso nigri-Alnetum* community surrounded by European white birch (*Betula pendula* Roth.). The site is located 400m away from the highway leading from the city of Lublin to Warsaw.

### Area of the Nitrogen Factory in the town of Puławy

**Site 1** (Puławy 1) is situated by the highway leading from the town of Puławy to the town of Dęblin. Oaks grow here by the highway surrounded by Scots pine (*Pinus sylvestris* L.), black locust (*Robinia pseudoacaccia* L.) and European white birch (*Betula pendula* Roth.).

**Site 2** (Puławy 2) is situated 200m away from the Nitrogen Factory. Oaks in this site grow in an open area, surrounded by herbal plants.

**Site 3** (Puławy 3) is situated 400m away from the Nitrogen Factory. Oaks grow here together with black locust (*Robinia pseudoacaccia* L.), bird cherry (*Prunus padus* L.), apple trees (*Malus domestica* Borkh.) and European white birch (*Betula pendula* Roth.).

**Site 4** (Puławy 4) is situated by the highway from the town of Puławy to the town of Dęblin. It is located on old river-bed of the Vistula River, on the other side of the road with respect to site 1. Oaks are surrounded by Scots pine (*Pinus sylvestris* L.), black locust (*Robinia pseudoacaccia* L.) and European white birch (*Betula pendula* Roth.).

### b. Methods of sample collection

In each of the selected sites samples were collected from 3 – 5 trees. From each site at least 100 leaves and 10 green and wooden shoots were collected, the length of each of which was about 30-40cm, as well as flowers and fruit that were found on them. The samples were collected every 14 days from May to October. The collected material was observed under the stereoscopic microscope. Species were identified on the basis of aphids on slide collection. Mainly the keys by BLACKMAN & EASTOP (2000) and SZELEGIEWICZ (1978) as well as

MÜLLER (1976) were used for identification. The number of aphids in the paper is submitted in the number of specimens/ current 10cm of shoots.

## Results

### a. Aphid number

*Lachnus roboris* (L.) was recorded on wooden, thin twigs of oaks, both in the Poleski National Park and in Puławy. It fed in numerous colonies which were eagerly attended by ants of the *Formica* genus.

*Lachnus roboris* represented by 1176.76 specimens was collected during the research. It was found to be more numerous in PNP, where 856.5 specimens were registered. In Puławy 2.7 times fewer specimens were collected and their number was 320.26.

In Puławy this aphid occurred irregularly. Rarely was it observed in site 2, and most often it was collected from oaks in site 1 (Fig. 1.). The earliest the species settled the oaks on May 15, and October 2 was the latest possible time it could feed. Their highest number in each year of the research and in particular sites took place in different times.

In the Poleski National Park the species occurred regularly in three research sites (1, 2 and 3). Never was it recorded in site 4 (Fig. 2.). Its highest number in different years and sites was registered in various times of the growth season. The increase in number was recorded again in the second part of September when oviparous females appeared (Fig. 2.).

### b. Observation of bionomy

Species of the *Lachnus* genus are very much alike (BLACKMAN & EASTOP, 2000). *Lachnus longirostris* can be differentiated from *Lachnus roboris* by the colour of its wings and the lack or the presence of wings in males. The length of body of *Lachnus longirostris* ranges from 3.5-4mm. According to BLACKMAN & EASTOP (2000) *Lachnus longirostris* settles older branches or even trunks of the *Quercus* sp. and *Fagus sylvatica*. HEINZE (1962) allows for its feeding in the summer on the roots of *Fagus*. *Lachnus roboris* may be slightly larger than the previous species (3.5-5mm), and it feeds on small twigs of the *Quercus* sp., as well as on *Castanea vesca* (BLACKMAN & EASTOP, 2000). Oviparous females are wingless while males are large and winged.

*Lachnus* sp. that was observed on the studied oaks usually settled the thin but always wooden shoots. *Lachnus roboris* was observed to occur regularly and in large numbers. *Lachnus longirostris*, on the other hand, was recorded to occur twice in PNP throughout the three years of research and totally amounted to 7 females only.

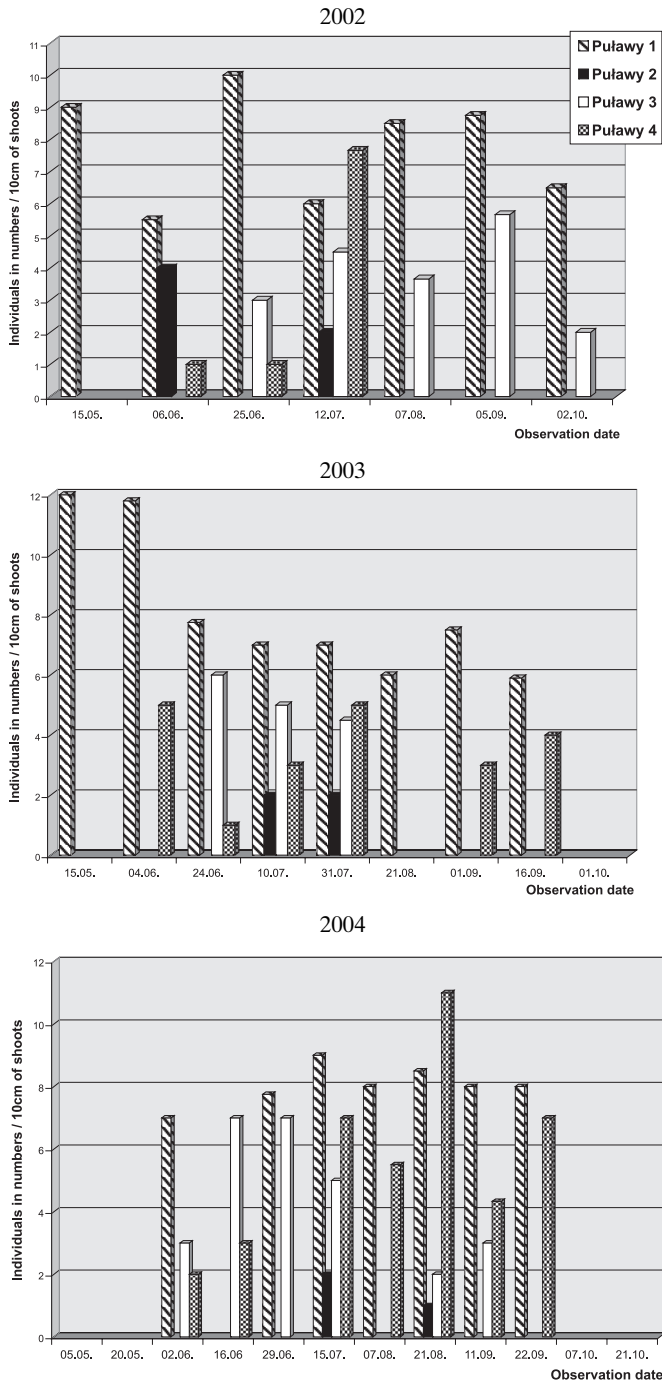


Fig. 1. Dynamics of *Lachnus roboris* in numbers, Puławy 2002-2004

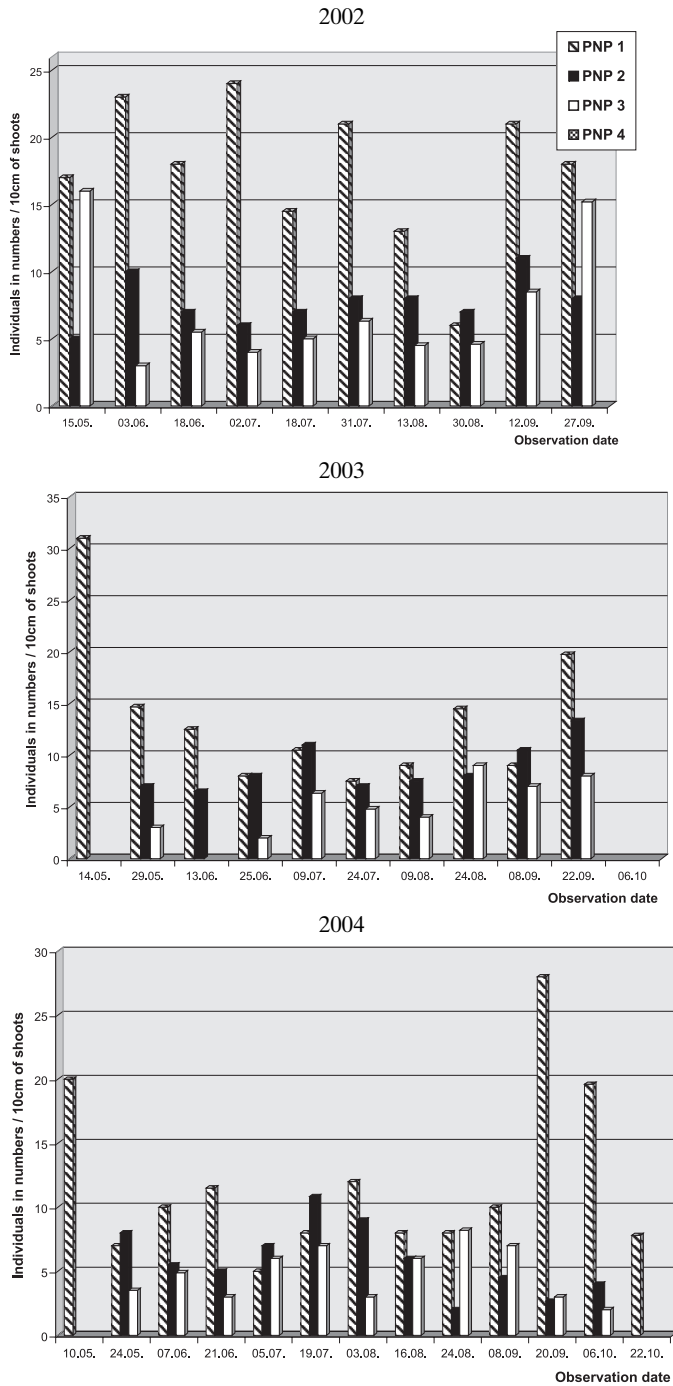


Fig. 2. Dynamics of *Lachnus roboris* number in PNP, 2002-2004

*Lachnus roboris* overwinters in a form of eggs laid in agglomeration on the oaks' shoots. Such collections of eggs were recorded quite frequently in PNP. Towards the end of April or in the beginning of May the fundatrices larvae hatched from the eggs and then they settled the 2-3-year-old twigs. Also in May there appeared first generations of wingless virginoparae. The winged females were recorded rarely. They were collected in 2003 (in site 1 in PNP) and at the end of May (29<sup>th</sup>). This amounted to several females only. For the following months only wingless females were recorded. At the end of September (20.09.2004) winged males of *Lachnus roboris* were registered. At around this time wingless females of the hetero-sexual generation, oviparae also appeared. BLACKMAN & EASTOP provided similar records (2000). Pseudosensoria on the hind tibia which are well visible on the slides with aphids mounted are the characteristic feature of the oviparae. SZELEGIEWICZ provided similar records (1978). The process of egg-laying lasted from the last days of September until the last days of October. For example in 2002 wingless oviparous females were recorded from 27. 09 and in 2004 from 06.10. The females gathered and laid eggs in large agglomeration on twigs. They would lay over 500 eggs on each twig. From 19 to 71 eggs were recorded on 1cm of a shoot (Tab. 1.). In PNP adult ladybirds were registered to have fed on the freshly laid eggs of *Lachnus roboris*.

Table 1. Number of eggs laid per 1cm of shoot by *Lachnus roboris*

Eggs number/1 cm of shoot	Year	
	2002	2003
The lowest	6	2
The highest	87	121
<b>average</b>	<b>46.50</b>	<b>61.50</b>

## Summary

Throughout the three years of research 1176.76 specimens of *Lachnus roboris* (L.) were collected. The aphid occurred regularly in the Poleski National Park, where 856.5 specimens were recorded, whereas in the town of Puławy it occurred less regularly and 320.26 specimens were recorded. All the generations of *Lachnus roboris* fed on thin but always wooden oak twigs. Throughout the three years of research, the observed virginoparae females were usually wingless, only once in 2003 were the winged virginoparae aphids of *Lachnus roboris* recorded in PNP. In the autumn the appearance of winged males was recorded, and later the laying of eggs by females of the bisexual

generation. Oviparous females laid eggs in large groups on twigs, up to 71 eggs were laid on each 1cm of the shoot.

## References

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### **Dynamika liczebności i bionomia *Lachnus roboris* (L.) na dębie szypułkowym (*Quercus robur* L.) w krajobrazie naturalnym i zdegradowanym**

#### **Streszczenie**

Badania prowadzono na dębie szypułkowym w latach 2002-2004 w naturalnych zbiorowiskach leśnych Poleskiego Parku Narodowego i w nasadzeniach leśnych znajdujących się przy Zakładach Azotowych w Puławach. Zebrano 1176,76 osobników *Lachnus roboris* (L.) w przeliczeniu na 10cm pędu. Regularnie mszyca ta występowała w Poleskim Parku Narodowym, ale tylko w 3 stanowiskach badawczych. Na tym obszarze badawczym obserwowano ją od wiosny do jesieni. Udało się zaobserwować pojawianie się kolejnych pokoleń od założycielek rodów, przez samice dzieworodne aż do pokolenia dwupłciowego. Obserwowano również proces składania jaj na pędach. Wszystkie pokolenia *Lachnus roboris* żerowały na cienkich, zdrewniałych gałązkach dębów. W Puławach badany gatunek występował nieregularnie.

