

## Aphids /Hemiptera, Aphidoidea/on maple *Acer platanoides* in the urban green areas of the city of Lublin

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### Introduction

Because of their diversity of species and subspecies as well as great decorative value, maple trees (*Acer* spp.) are often planted in parks and gardens, and are also applied in urban spaces such as squares, along the streets and around the housing estates (SIEWNIAK 1990; SIEWNIAK & MĘDRZYCKI 1990). In contrast to exotic maple species these popular, domestic maple species are resistant to changeable climate conditions and, therefore, they are selected to be planted in urban conditions. Only three species of maples grow in natural conditions in Poland: *Acer platanoides*, *Acer pseudoplatanus* and *Acer campestre* (SENETA & DOLATOWSKI, 1997). From the research carried out in the city of Warsaw, it follows that these plants are severely attacked by sucking-piercing arthropods, the number of which is the highest on trees that are planted along the streets (CICHOCKA *et al.* 1990a). Their number is sometimes several times higher than on park trees or those growing outside the cities. In urban areas factors that stimulate the biotic potential of these species have a great impact (KROPCZYŃSKA – LINKIEWICZ *et al.* 1990; CICHOCKA *et al.*, 1990b).

So far the research on aphids on domestic maple trees was primarily concerned with species composition and number dynamics in the urban zones of Warsaw and Poznań (CICHOCKA *et al.*, 1998, KROPCZYŃSKA – LINKIEWICZ *et al.*, 1990; WILKANIEC & PIEKARSKA – BONIECKA, 1996). At present, the following aphid species on *A. platanoides* are registered in Poland: *Drepanosiphum pla-*

*tanoidis* (Schrank, 1801), *Periphyllus aceris* (Linnaeus, 1761.), *Periphyllus coracinus* (Koch, 1854), *Periphyllus lyropictus* (Kessler, 1886), *Periphyllus testudinaceus* (Ferne, 1852), *Stomaphis graffii* (Cholodkovsky, 1894).

Some data concerning the species composition and morphology of aphids of the *Periphyllus* genus occurring on *A. platanoides* may be found in papers by both Polish and foreign authors (BLACKMAN & EASTOP, 2000; HEIE, 1982; RUPAIS 1969, STROYAN, 1977; SZELEGIEWICZ, 1985). These authors did not follow precisely the life cycles of particular species and did not describe particular morphs in the growth season. Usually they limited their research to collecting wingless parthenogenetic females and determining the species or describing aestivating larvae and partenogenetic females. Only RUPAIS (1969) presented the fundatrix of *P. testudinaceus* in graphic pictures.

The described research was concerned with observations on the species composition of aphids settling *A. platanoides* in the urban zones of Lublin. Furthermore, introductory observations of the bionomy of aphids of the *Periphyllus* genus were carried out. An attempt to describe particular morphs of aphids of this genus from fundatrices up to sexulaes was made.

## Material and methods

The research was carried out in the city of Lublin in 2006-2007 and will be continued. Three research sites were determined: two in a housing estate and one by the street, where 4 – 5 trees were selected for the observation. From every site, every 10-14 days (from the end of March until the end of October) 100 leaves were collected along with green and lignified shoots. The collected material was searched under a stereoscopic microscope and the aphids were counted, described and placed in alcohol. The collected aphid samples were mounted on microscopic slides and identified. The keys of BLACKMAN & EASTOP (2000), HEIE (1982), RUPAIS (1969), STROYAN (1977) and SZELEGIEWICZ (1985) were used to determine aphid species.

Aphid species identification directly on the plant is indispensable to determine the population dynamics and to follow the life cycles of the species under observation. However, aphids of the *Periphyllus* genus are difficult to distinguish since they are changeable in colour and very similar morphologically. Therefore, additional laboratory experiments had to be carried out on 0.5 m maples put in wooden-glass growth cages. Single fundatrices larvae in early spring, collected from the trees were put to these cages on 0.5 m plants and the appearance of subsequent generations was observed as well as possible aestivation and the appearance of both sexual forms and egg laying.

Photographs of alive aphids taken under the stereoscopic microscope were additionally used to determine the species of particular morphs of the

studied aphids. Aphids which were photographed were mounted on slides. The comparison between alive aphids in photographs with those on the slides enabled one to describe precisely the particular morphs of the species of the *Periphyllus* genus. All photographs included in the chapter have been taken by the author.

## Results

### Collected species

The following aphid species were so far collected from the *Acer platanoides* in Lublin:

*D. platanoidis*: single specimens of this species were registered on maple tree leaves in spring and summer, and most often in autumn.

*P. aceris* was very numerous throughout the entire growth season. The fundatrices settled the buds and lignified shoots in large numbers in early spring. A large number of winged and wingless virginoparae settled mostly leaves and fruit at spring. The only aestivating larvae were registered through summer and autumn. Males occurred in autumn.

*P. testudinaceus* was numerous, usually on leaves, flowers, fruit and shoots. In the case of *P. aceris*, the fundatrices numerously settled the buds and lignified shoots in early spring. In spring virginoparae were giving birth the aestivating larvae which occurred on leaves from early summer until autumn. Sexual morphs did not develop until autumn.

*P. coracinus* was not numerous. It settled slightly lignified shoots and upper parts of leaves from late spring until autumn. The presence of these aphids was marked by ants which attended their colonies in high numbers.

*P. lyropictus* was registered on single shoots and sometimes also on leaves. It developed well on maple trees in laboratory cages where in autumn a sexual generation (winged males and oviparous wingless females) as well as egg lying were observed.

Apart from the abovementioned aphids from the observed maple trees also *Periphyllus* spp., which could not be included into any of the previously mentioned species of this genus, was collected. Significant differences in the appearance of fundatrices and wingless viviparous in relation to other species were recorded. This species did not aestivate.

*Eucalipterus tiliae* (Linnaeus, 1758) (Fig. 1) was not numerous. It is considered to be a monophagous species on lime-trees (*Tilia* spp.), which settles maple tree leaves from June until September. Its larvae and winged samples were registered. Previously it was also registered to occur on rose in a green zone of the city of Lublin (Kmieć, 2004; Jaśkiewicz, 2005).

*S. graffi*, which has been referenced in publications, has not been registered so far.

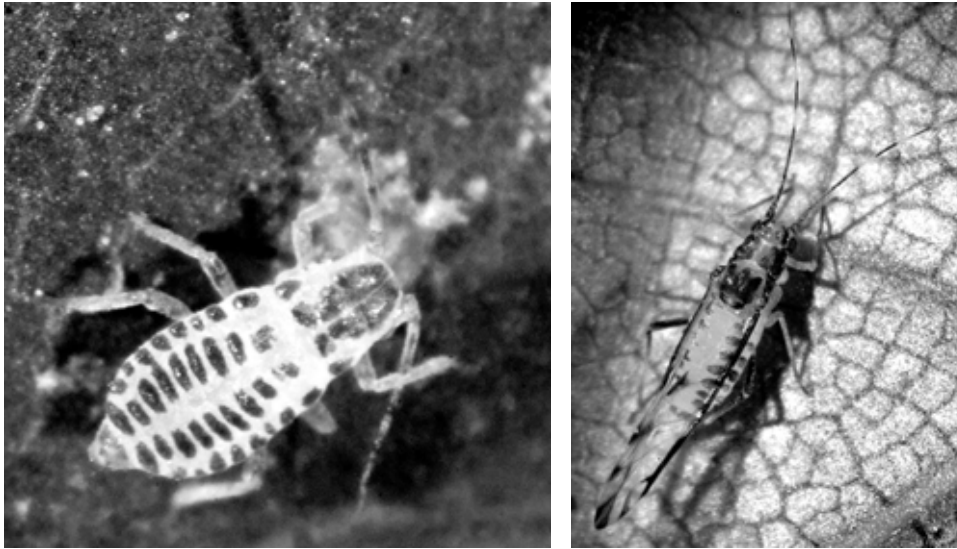


Figure 1. *Eucalipterus tiliae* wingless larva and winged aphid

### Introductory observations on morphology and bionomy of aphids of the *Periphyllus* genus

In order to follow the bionomy and dynamics of the number of species of this genus one had to find out about the particular morphs of all the species. The research was begun with the determination of fundatrices species, collected on trees in the city, which were then taken one by one to growth cages. The observations of the development of females of the following generations enabled one to find out about the remaining morphs in the growth season. In the studied period the fundatrigeniae of *P. aceris* and *P. testudinaceus* as well as an unidentified species of the *Periphyllus* spp. were successfully obtained.

The fundatrix of *P. aceris* (Fig. 2A) is light brown, strongly hairy with light creamy siphunculi and light legs. The fundatrices of *P. testudinaceus* are brown with dark dorsal sclerites, dark siphunculi and femurs (Fig. 2B). They are distinctly smaller and less hairy than *P. aceris*.

Wingless viviparous of *P. aceris* (Fig. 3A) and the *Periphyllus* spp. (Fig. 3B) can be easily confused. *P. aceris* is creamy, with a green design, has bright-coloured legs and siphunculi. The virginoparae of the *Periphyllus* spp. are creamy-green and also have a green design. Their legs are light but their tarsus is dark. Contrary to *P. aceris*, they have a darkened end of the siphunculi. Winged virginoparae of *P. aceris* and *Periphyllus* spp. are entirely different. The winged *P. aceris* has dark-green stripes and black siphunculi, legs are

completely light and quite large. *Periphyllus* spp. is light, homogeneously coloured and small-sized. *Periphyllus* spp. does not aestivate, whereas *P. aceris* undergoes a summer diapause.

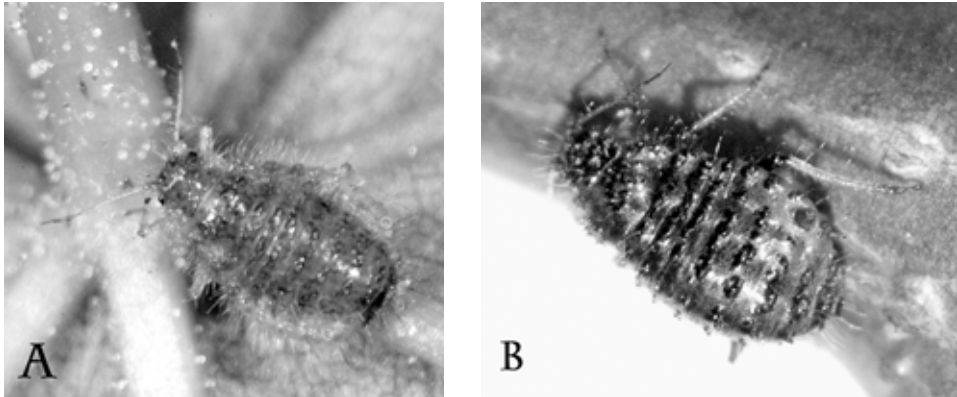


Figure 2. Fundatrices A – *Periphyllus aceris*, B – *Periphyllus testudinaceus*

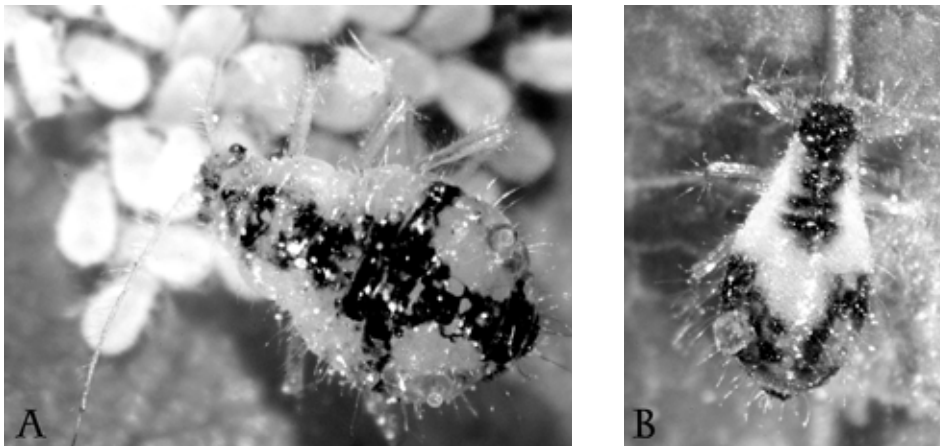


Figure 3. Apteræ virginoparæ A- *Periphyllus aceris*, B- *Periphyllus* spp.

The colour of *P. testudinaceus* virginoparæ ranges from dark green to black. They can be easily distinguished from the remaining species by means of dark femurs, ends of tibiae and quite long and dark siphunculi (Fig. 4).

Viviparous *P. coracinus* are brown, brown-greenish and dark-green. Similar records are provided by BLACKMAN & EASTOP (2000), HEIE (1982), STROYAN (1977) and SZELEGIEWICZ (1985). This changeability of colour makes them easily confused with *P. lyropictus*, of amber colour with a brown design. *P. coracinus* and *P. lyropictus* have bright legs and their siphunculi are usually slightly darkened at their ends.



Figure 4. Winged *Periphyllus testudinaceus*

*P. testudinaceus* and *P. aceris* undergo aestivation in the larval form. This phenomenon was described previously by SZELEGIEWICZ (1985), STROYAN (1977), RUPAIS (1969) and others.

Aestivating larvae of *P. aceris* are creamy, small-sized, heavily hairy and right after birth they form gatherings on the bottom side of leaves (Fig. 5). One leaf may be infested by few gatherings and about 40-50 larvae may be present in each. Their heads are turned towards the middle of the circle which they form. Sometimes they form very numerous gatherings. It has been recorded that in case of emergency (e.g. approaching ladybirds) they disperse on the leaf and when the danger is over they form a circle gathering again. Diapausing larvae were born both, by wingless and winged virginoparae (Fig. 6).

Diapausing larvae of *P. testudinaceus* are pea-green, flattened with short spoon-shaped hairs (Fig. 7). Single specimens were found on both sides of the leaf blade, most often by the veins. The aestivation of both species ended in September.

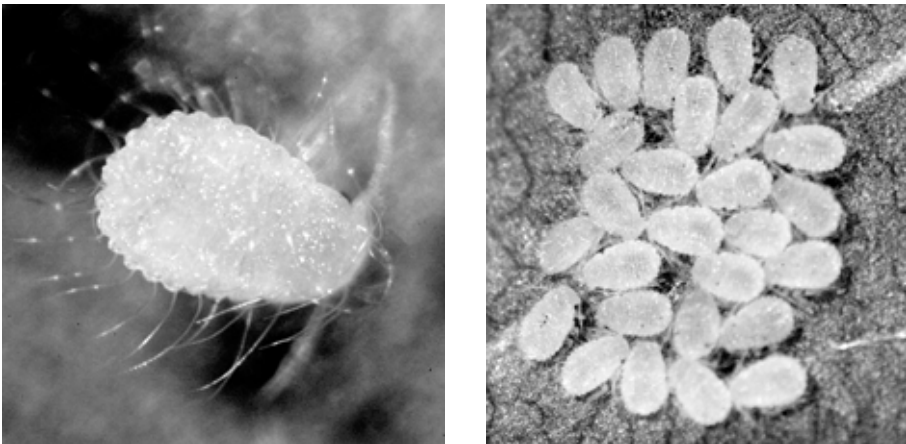


Figure 5. Aestivating larvae of *Periphyllus aceris*

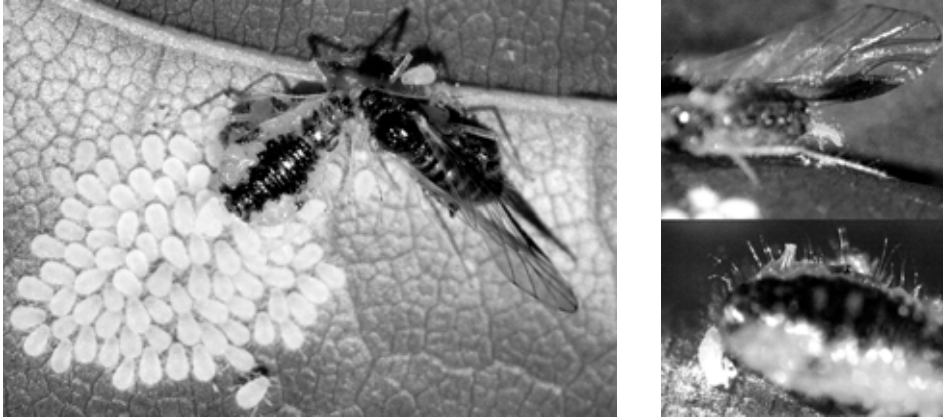


Figure 6. Winged and wingless giving-birth of aestivating morphs

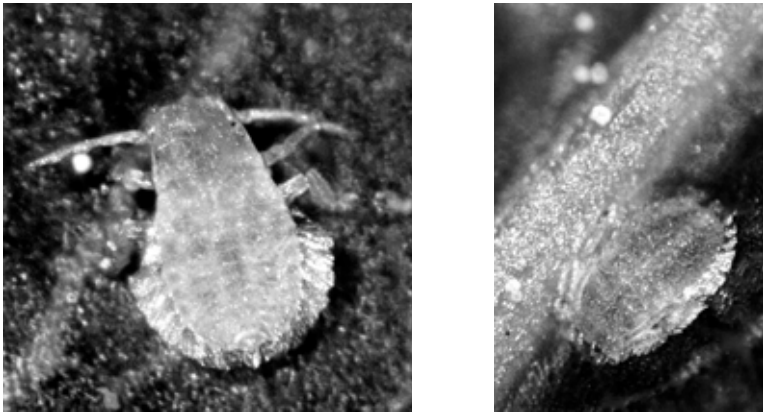


Figure 7. Aestivating larvae of *Periphyllus testudinaceus*

## Conclusions

Maple trees in the street site were more numerous settled by aphids from the *Periphyllus* genus in comparison with the housing estate sites. Similar observations were made on the basis of research carried out in Warsaw (CICHOCKA *et al.*, 1990). In all the research sites *P. testudinaceus* and *P. aceris* appeared, while *P. coracinus* and *P. lyropictus* were registered only in the street site. *E. tiliae* was observed in maples in both street and housing estate sites.

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**Mszyce /Hemiptera, Aphidoidea/ zasiedlające klon pospolity (*Acer platanoides*)  
w zieleni miejskiej Lublina**

**Streszczenie**

Badania prowadzono na klonie pospolitym (*Acer platanoides*) na terenie Lublina, w latach 2006-2007. Przeprowadzono wstępne obserwacje nad morfologią i bionomią mszyc z rodzaju *Periphyllus*. Oprócz gatunków wcześniej wykazanych z terenu Polski stwierdzono również gatunek z rodzaju *Periphyllus*, dotąd nie opisany. Zaobserwowano również występowanie na klonie pospolitym *Eucalipterus tiliae*, gatunku powszechnie uważanego za monofaga lipy.

