

Rare aphid species /Hemiptera, Aphidoidea/ in Poland and the protection of biological diversity

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Abstract

The paper presents rare and endangered aphids species in Poland. Specific habitat requirement were the major criteria in their selection. Particularly valuable Aphidoidea species included: 16 aphid species of the *Aphis* genus (including all from the *Protaphis* subgenus), 2 species of the *Brachycaudus* genus and 2 of the *Uroleucon* genus – connected with the *Inula* spp. In the paper each species has been assigned a short note on its biology, settlement and distribution in Poland. The species discussed in the paper are present only in dry habitats and are characteristic to plant communities of xerothermic grassland. These habitats are endangered, both in Poland and in other parts of Europe.

Introduction

Contrary to the common opinion which holds that aphids are pests, most insect species of this sub-order of hemipterous insect which are present in Poland are an important element of natural biocenoses. From the general-environmental point of view aphids play an important role as a nutrient for many species (including rare and protected ones) of insects, spiders and birds. Out of over 700 aphid species registered in Poland (WĘGIEREK & WOJCIECHOW-

SKI, 2004) one can also find such species that can be considered rare or even endangered.

Aphid species connected with plant communities of xerothermic grassland of the *Festuco-Brometea* class (code Natura 2000-6210) deserve particular attention. They include most of all: rock grassland from the community of *Festucetum pallentis*, grasslands from the community of *Festuco stipion* and floral xerothermic grasslands, such as plant community of *Inuletum ensifoliae* and *Organo-Brachypodietum pinatti* (MATUSZKIEWICZ, 2007).

These are stenothermal, grassy of a steppe character and highly diversified communities. They are present in sunny areas at the south, with high temperatures of air and soil. Their flora is diversified which is connected with a rich fauna of invertebrates. A small part of them has a natural character, constituting early holocen relics (rock grassland) and the majority is of anthropogenic origin (MAZUR & KUBISZ, 2000; PERZANOWSKA & KUJAWA-PAWLACZYK, 2004).

Plants of xerothermic grasslands are stabilized and to a large extent formed as a result of extensive meadow's and shepherd's economy. Their ecosystems, though popular in southern and eastern Poland are considered to be endangered both in Poland and in Europe (which results from them being placed in a Directive of the Council 92/43/EEG habitat directive) and an Act on the Nature Protection (Dz. U. 2004, Nr. 92, poz. 880). The major threat to these habitats is secondary succession which primarily concerns synanthropic and floristically poorer plant communities. The preservation of such habitats requires protective treatment such as mowing, pasturage, cutting or controlled burning. The remaining threats include: mechanical damage through trampling damage, hiking, fertilizers flowing downwards and areas using for construction sites (PERZANOWSKA & KUJAWA-PAWLACZYK, 2004).

Material and methods

Factors which decide on the choice of the presented aphid species include: the life environment, host plant species, trophic criteria, developmental cycle, way of feeding, geographical distribution, frequency, and the most important criterion was a specific habitat requirement. For the purpose of the research, Polish aphidological literature was analysed and contrasted with my own results and observations conducted for several years in different xerothermic communities of Poland localized in the following areas: Kraków-Wieluń Upland, Pieniny Mountains, Miechów Upland, Kielce Upland, Głubczyce Plateau, Chełm Massif and the ridge of the Odra River valley near Kostrzyn on the Odra. All the data concerning particular species distribution in Poland

was related to region division after the series of Catalogue of Poland's Fauna (SZELEGIEWICZ, 1968).

Results

Aphis (Aphis) antherici Holman, 1966

Note: dark aphids, colour ranges from olive to black, they feed in numerous colonies on *Anthericum* spp. shoots, always attended by ants. A European species. In Poland registered for the first time on 7 xerothermic localities in the Ojcowski National Park on *Anthericum ramosum* (OSIADACZ & WOJCIECHOWSKI, 2008). In that year it was registered for the first time on *Anthericum lilago*, on xerothermic grasslands in Owczary. Apart from Poland recorded in the Czech Republic, Slovakia and Germany (NIETO NAFRIA *et al.*, 2007).

Stations: Wielkopolsko-Kujawska Lowland: Owczary (Osiadacz, 02.06.2009); Świętokrzyskie Mountains: Chęciny (Osiadacz 11.07.2009); Kraków-Wieluń Upland: Ojcowski National Park (OSIADACZ & WOJCIECHOWSKI, 2008); Małopolska Upland: Raclawice (Osiadacz, 19.07.2008), Klonów (Osiadacz, 19.07.2009), Sobków (Osiadacz, 11.07.2009).

Aphis (Aphis) austriaca Hille Ris Lambers, 1950

Note: light, green-blue aphids, feeding quite deeply on the roots of *Silene* spp., often attended by ants. Species of a European extent. In Poland it has been registered only on the roots of *Silene otites*. Apart from Poland it is known only in the Czech Republic, Slovakia and Hungary (SZELEGIEWICZ, 1981; NIETO NAFRIA *et al.*, 2007).

Stations: Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka near Olsztyn by Częstochowa (HAŁAJ & WOJCIECHOWSKI, 1996), Podzamcze (Osiadacz, 08.07.2009); Małopolska Upland: Skorocice (SZELEGIEWICZ, 1981), Winiary Zagojskie (HAŁAJ, 1996a).

Aphis (Aphis) breviseta Holman, 1966

Note: yellow-green aphids, feeding on near the ground parts of *Potentilla* spp., attended by ants. Apart from Poland the species is known only from xerothermic communities in the Czech Republic, Slovakia and Hungary (SZELEGIEWICZ, 1981).

Stations: Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka, Wzgórze Zamkowe near Olsztyn by Częstochowa (HAŁAJ & WOJCIECHOWSKI, 1996); Małopolska Upland: Grabowiec, Skorocice (SZELEGIEWICZ, 1981), reservoir Grabowiec near Pińczów (SZELEGIEWICZ, 1964), Winiary Zagojskie (HAŁAJ, 1996a).

Aphis (Aphis) bupleuri (Börner, 1932)

Note: nearly black, matte aphids, feeding on stalks and in inflorescences of *Bupleurum* spp. Apart from Poland it is known also in Austria, Belgium, Italy, France, Spain, Germany, the Czech Republic, Slovakia, Hungary, Ukraine and Romania.

Stations: Kraków-Wieluń Upland: Lusławice near Janów (HAŁAJ, 1995).

Aphis (Aphis) calaminthae (Börner, 1952)

Note: from dark-green to nearly black, matte aphids feeding in inflorescences of *Calamintha* spp., *Clinopodium vulgare* and *Acinos arvensis*. This is a typical stenothermal species, probably sub-Mediterranean. In Poland it has been recorded only on *Acinos arvensis*. Apart from Poland it is known also in: the Czech Republic, Slovakia, Hungary, Germany, Italy and Switzerland (NIETO NAFRIA *et al.*, 2007).

Stations: Masurian Lake District: Pasym near Szczytno (HUCULAK, 1967); Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka, Wzgórze Zamkowe near Olsztyn by Częstochowa (HAŁAJ & WOJCIECHOWSKI, 1996), Olkusz (HAŁAJ, 1999), Mirów (Osiadacz, 25.07.2009); Małopolska Upland: Grabowiec (SZELEGIEWICZ, 1981), Winiary Zagojskie (HAŁAJ, 1996a).

Aphis (Aphis) sanguisorbae poterii (Börner, 1940)

Note: brown aphids, feeding on hypocotyl and near the ground parts of *Sanguisorba minor*, always attended by ants. Apart from Poland, the species is also recorded in Great Britain, France, the Czech Republic, Slovakia, Hungary, the Ukraine, Bulgaria and states of Foremost Asia (NIETO NAFRIA *et al.*, 2007).

Stations: Upper Silesia: Chrzanów (OLESIŃSKI & SZELEGIEWICZ, 1974); Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka, Wzgórze Zamkowe near Olsztyn by Częstochowa (HAŁAJ & WOJCIECHOWSKI, 1996), Mirów (Osiadacz, 25.07.2009); Małopolska Upland: Polichno, Iłża – Góra Zamkowa (SZELEGIEWICZ, 1981), Winiary Zagojskie (HAŁAJ, 1996a); Pieniny Mountains: Głębokki Potok (SZELEGIEWICZ, 1966).

Aphis (Aphis) stachydis Mordvilko, 1929

Note: yellow-green aphids, feeding in inflorescences of *Stachys* spp. It is a westpaleartic – steppe, sub – pontic species. In Poland it has been recorded only in xerothermic localities on *Stachys recta*.

Stations: Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka, Wzgórze Zamkowe near Olsztyn by Częstochowa (HAŁAJ, 1996b; HAŁAJ & WOJCIECHOWSKI, 1996), Ojcowski National Park (OSIADACZ & WOJCIECHOWSKI, 2008), Niegowonice (Osiadacz, 25.07.2009).

Aphis (Aphis) stroyani Szelegiewicz, 1961

Note: yellow aphids with black siphons, feeding on hypocotyl or near the ground leaves of *Picris* spp. It is a ponto-Mediterranean species, present in xerothermic environments of Southern, Central and Eastern Europe. In Poland it has been recorded only on *Picris hieracioides*.

Stations: Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka, Wzgórze Zamkowe near Olsztyn by Częstochowa (HAŁAJ & WOJCIECHOWSKI, 1996); Małopolska Upland: Skowronno (SZELEGIEWICZ, 1981).

Aphis (Aphis) teuctri (Börner, 1942)

Note: green aphids, slightly matte, feeding on leaves, stalks and inflorescences of *Teucrium* spp. Apart from Poland the species is also recorded in France, Spain, Germany, Italy, the Czech Republic, Slovakia, Hungary, Romania and the Ukraine (NIETO NAFRIA *et al.*, 2007). In Poland it has been recorded only in plant communities of xerothermic grasslands on *Teucrium botrys*.

Stations: Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka, Wzgórze Zamkowe near Olsztyn by Częstochowa (HAŁAJ, 1996b; HAŁAJ & WOJCIECHOWSKI, 1996).

Aphis (Aphis) thesi Holman, 1966

Note: black aphids, feeding on hypocotyl and roots of *Thesium* spp. attended by ants. Probably it is a sub-Mediterranean species. Apart from Poland it is known only in southern France, south Slovakia and Hungary (SZELEGIEWICZ, 1981; NIETO NAFRIA *et al.*, 2007). In Poland it has been recorded only on *Thesium linophyllum*.

Stations: Małopolska Upland: Grabowiec (SZELEGIEWICZ, 1981), Winiary Zagojskie (HAŁAJ, 1996a).

Aphis (Protaphis) anthemidis (Börner, 1940)

Note: aphids feed on hypocotyl of *Anthemis tinctoria*, always attended by ants. The species is present in south and eastern Europe.

Stations: Masurian Lake District: Waplewo near Nidzica, Ługwałt near Olsztyn, Pasym near Szczytno (HUCULAK, 1967); Wielkopolsko-Kujawska Lowland: Czechów in Gorzów Wielkopolski district (ACHREMOWICZ, 1972).

Aphis (Protaphis) carlinae (Börner, 1940)

Note: dark, blue-green aphids, feeding on hypocotyl and leaves of *Carlina* spp. Attended by ants. The species is present in south and eastern Europe. In Poland it has been recorded on *Carlina vulgaris* and *C. acaulis*.

Stations: Pomeranian Lake District: Sienica (KLIMASZEWSKI & PŁACHTA, 1977); Masurian Lake District: Olsztyn (HUCULAK, 1966); Upper Silesia: Chrza-

nów, Borowiec k/Chrzanowa (OLESIŃSKI & SZELEGIEWICZ, 1974); Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka, Wzgórze Zamkowe near Olsztyn by Częstochowa (HAŁAJ & WOJCIECHOWSKI, 1996), Małopolska Upland: Winiary Zagojskie (HAŁAJ, 1996a).

Aphis (Protaphis) elongata (Nevsky, 1928)

Note: green aphids, feeding on above the ground parts of *Artemisia* spp., attended by ants. It is an eastern-palearctic species. Apart from Poland, the species is also recorded in Denmark, Moldova, Romania and the Ukraine (NIETO NAFRIA *et al.*, 2007). In Poland it has been recorded only on *Artemisia campestris*.

Stations: Pomeranian Lake District: Kalisz Pomorski (KLIMASZEWSKI & PŁACHTA, 1977), Masurian Lake District: Olsztyn (HUCULAK, 1966); Mazovian Lowland: Warszawa (SZELEGIEWICZ, 1968); Podlasie Lowland: Dolistowo (CZYŁOK *et al.*, 1982); Upper Silesia: Chrzanów (OLESIŃSKI & SZELEGIEWICZ, 1974); Małopolska Upland: Skowronno (SZELEGIEWICZ, 1981), Grodzisko k. near Pińczów (SZELEGIEWICZ, 1964), Winiary Zagojskie (HAŁAJ, 1996a).

Aphis (Protaphis) erigerontis Holman, 1966

Note: dark-green aphids, feeding on hypocotyl of *Ergieron acris*, built around with soil by ants. Apart from Poland, the species is recorded only in the Czech Republic (NIETO NAFRIA *et al.*, 2007).

Stations: Masurian Lake District: Olsztyn (HUCULAK, 1966), Pasym near Szczytno (HUCULAK, 1967); Upper Silesia: Chrzanów (OLESIŃSKI & SZELEGIEWICZ, 1974); Kraków-Wieluń Upland, Błędowska Desert (WOJCIECHOWSKI *et al.*, 1989), Wzgórze Zamkowe, Biskupice near Olsztyn by Częstochowa (HAŁAJ & WOJCIECHOWSKI, 1996); Bieszczady Mountains: Ustrzyki Górne, Terebowiec Valley (CZYŁOK *et al.*, 1988).

Aphis (Protaphis) hartigi (Hille Ris Lambers, 1931)

Note: dark-green aphids, feeding on hypocotyl and near the ground parts of *Centaurea* spp., they are always attended by ants. Apart from Poland this species is recorded only in France, Spain, Italy, Romania and Lithuania (NIETO NAFRIA *et al.*, 2007). In Poland it has been recorded on *Centaurea stoebe* and *C. scabiosa*.

Stations: Masurian Lake District: Olsztyn (HUCULAK, 1965), Olsztyn-Dajtki (SZELEGIEWICZ, 1975); Wielkopolsko-Kujawska Lowland: Pawłówek near Bydgoszcz (SZELEGIEWICZ, 1961), Poznań (ACHREMOWICZ, 1972); Mazovian Lowland: Warszawa, Świder near Otwock (SZELEGIEWICZ, 1967), Jadwisin near Nowy Dwór (SZELEGIEWICZ, 1967); Upper Silesia: Mikołów (HAŁAJ, 1999); Kraków-Wieluń Upland: Wzgórze Brodło, Góra Lipówka, Wzgórze Zamkowe, Biskupice near Olsztyn by Częstochowa (HAŁAJ & WOJCIECHOWSKI, 1996); Ma-

łopolska Upland: Skowronno near Pińczów (SZELEGIEWICZ, 1964, 1981); Świętokrzyskie Mountains: Kielce (Osiadacz, 26.07.2008); Lublin Upland: Żuków (ACHREMOWICZ, 1986); Rostocze Upland: Tomaszów Lubelski (KARWAŃSKA, 1975).

Aphis (Protaphis) picridicola Holman, 1966

Note: grey-green aphids, feeding on near the ground parts of *Hypochoeris* spp., *Leontodon* spp., *Picris* spp., always attended by ants. A European species. In Poland it has been recorded only on *Hypochoeris radicata* and *Leontodon hispidus*.

Stations: Upper Silesia: Chrzanów (OLESIŃSKI & SZELEGIEWICZ, 1974).

Brachycaudus (Brachycaudus) salicinae Börner, 1939

Note: dark grey aphids, feeding on leaves of *Inula* spp. causing their rolling. European species. Apart from Poland it is known also in Germany, France and the Czech Republic (NIETO NAFRÍA *et al.*, 2007). In Poland it has been recorded on *Inula salicina* and *I. ensifolia*.

Stations: Lower Silesia: Kietrz (Osiadacz, 29.07.2008); Małopolska Upland: Skowronno (CZYŁOK & WOJCIECHOWSKI, 1987), Winiary Zagojskie (HAŁAJ 1996a), Sobków (Osiadacz, 26.07.2008), Raclawice (Osiadacz, 03.08.2009), Kałina Lisiniec (Osiadacz, 03.08.2009); Rostocze Upland: Tomaszów Lubelski (SZELEGIEWICZ, 1968).

Brachycaudus (Appelia) cerinthis Bozhko, 1961

Note: dark grey aphids, feeding on stalks and flower peduncles of *Cerinthe* spp., causing flower deformation. European species. Apart from Poland, it is also known in the Czech Republic, Hungary and the Ukraine (NIETO NAFRÍA *et al.*, 2007). In Poland it has been recorded on *Cerinthe minor*.

Stations: Małopolska Upland: Polana Polichno near Pińczów (HAŁAJ, 1996b).

Uroleucon (Uroleucon) inulicola (Hille Ris Lambers 1939)

Note: brown and large (up to 3.5 mm) aphids, feeding on shoots and lower side of leaves of *Inula* spp. The species is present in Europe, Western Siberia and Central Asia. In Europe it is known in the Czech Republic, Slovakia, Sweden, Finland, France, Germany, Italy, Spain, Lithuania, Hungary, Moldova, the Ukraine and Romania (NIETO NAFRÍA *et al.*, 2007). In Poland it has been recorded on *Inula salicina* and *I. helenium*.

Stations: Lower Silesia: Kietrz (Osiadacz, 29.07.2008); Wielkopolsko-Kujawska Lowland: Gołuchów near Kalisz (ACHREMOWICZ, 1972); Pieniny Mountains: Pieniński National Park (Osiadacz, 13.07.2008).

Uroleucon (Uromelan) ensifoliae (Holman, 1965)

Note: large (up to 4.6 mm), dark brown aphids, feeding on shoots and lower side of leaves of *Inula* spp. The species is known in Eastern Europe, including the Czech Republic, Slovakia, Hungary, Romania and the Ukraine (NIETO NAFRÍA *et al.*, 2007). In Poland it has been recorded on *Inula ensifolia*.

Stations: Małopolska Upland: Skowronno (SZELEGIEWICZ, 1981; CZYŁOK & WOJCIECHOWSKI, 1987), Krzyżanowice, Młodzawy (CZYŁOK & WOJCIECHOWSKI, 1987), Winiary Zagojskie (HAŁAJ, 1996a), Kalina Lisiniec (Osiadacz, 19.07.2008, 18.07.2009), Raclawice (Osiadacz, 19.07.2008), Klonów (Osiadacz, 19.07.2008), Sobków (Osiadacz, 11.07.2009); Lublin Upland: Kazimierz Dolny (ACHREMOWICZ, 1986).

Discussion

Xerothermic environments are a specific area for many species of xerothermophilic flora and fauna (WIŚNIEWSKI 2003; KUŚKA, 2006; OSIADACZ & WOJCIECHOWSKI, 2008), and since usually they occupy small areas and are isolated from each other they are the first ones when it comes to exposure to damage. A unique aphid fauna is associated with such specific area only. Most aphid species, which are present in these environments, are considered to be stenotopic species.

Analysing the native Aphidoidea fauna characteristic to xerothermic specific area one should include the following as rare or even endangered in Poland, 16 aphid species of the *Aphis* genus (including all from the *Protaphis* subgenus), 2 species of the *Brachycaudus* genus and 2 of the *Uroleucon* genus – connected with the *Inula* spp. The discussed species are without host alternation – homoecious and monophagous aphids, with the exception of *Aphis calamintae* and *A. picridicola*, which are oligophagous. Their geographic distribution in most cases is limited to Europe, especially its south and eastern areas. The environment is a feature that they all have in common. These species occur only in dry habitats and are characteristic for xerothermic land-grasses. One also should highlight that these habitats are considered to be endangered, both in Poland and Europe.

Since aphids are sucking phytophags, it ought to be assumed that a host plant species, apart from habitat requirements should be an essential criterion when selecting valuable species. This can be observed for the following species: *Uroleucon inulicola*, *U. ensifoliae* and *Brachycaudus salicinae*. Different species of *Inula* spp., are their host plants, all of which are rare in Poland, except for *Inula britannica* (ZAJĄC & ZAJĄC, 2001) and their occurrence is limited to xerothermic communities. Aphids of the *Uroleucon* genus are relatively large and form large colonies, thus, in theory they should be easily spotted in natural

habitats. However, they are not – because a decisive factor is rarity of the host plant and kind of the environment in which they might live. *Aphis antherici* also deserves particular attention as it was registered for the first time in that year in Poland on *Anthericum lilago*, which is listed in the Polish Red Book of Plants (KAŹMIERCZAKOWA & ZARZYCKI, 2001). In the case of species of the *Protaphis* subgenus, it is the habitat that is especially rare and not the host plant. Although these species are associated with relatively frequent plants in Poland such as: *Artemisia campestris*, *Erigeron acris*, *Carlina vulgaris*, *Leontodon* spp., *Centaurea* spp. (ZAJĄC & ZAJĄC, 2001), where they form large colonies, they are always attended by ants, and are difficult to find and rare. In case of those species apart from a characteristic habitat also acidity structure of soil is relevant. The soil has to be appropriately beaten, it cannot consist of gravel heap or loose sand. Therefore, when selecting valuable aphid species the presence of a host plant is not enough because there are many other factors, out of which specific habitat requirements seem to be the most important.

Unfortunately, despite intensive research lasting for many years in different xerothermic communities of Poland, one could not so far confirm the presence of the above mentioned aphid species.

Pointing out to the most valuable species in the fauna which are stenotopic, rare and endangered is practically important when planning protective treatment and also in attempts to preserve and protect biodiversity within habitat, species and genes.

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Rzadkie gatunki mszyc /Hemiptera, Aphidoidea/ w Polsce i ochrona różnorodności biologicznej

Streszczenie

W pracy przedstawiono rzadkie i zagrożone wyginięciem w Polsce gatunki mszyc. Głównym kryterium ich wyboru stanowiły specyficzne wymagania siedliskowe. Do szczególnie cennych gatunków *Aphidoidea* zaliczono: 16 gatunków mszyc z rodzaju *Aphis* (w tym wszystkie z podrodzaju *Protaphis*), 2 gatunki z rodzaju *Brachycaudus*, oraz 2 z rodzaju *Uroleucon* – związane z *Inula* spp. Przy każdym gatunku podano krótką informację na temat jego biologii, rozsiedlenia oraz rozmieszczenia w Polsce. Omówione w pracy gatunki występują wyłącznie w siedliskach suchych i są charakterystyczne dla zbiorowisk roślinnych muraw kserotermicznych. Siedliska te należą do zagrożonych na terenie zarówno Polski jak i Europy.

