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Rare Scale Insect Species (Hemiptera, Coccoidea) in Urban Parks and Semi-Natural Habitats in Southern Poland

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Abstract: A survey of urban parks and semi-natural habitats in Upper Silesia between 2011-2013 found some rare scale insect species, amongst them *Puto superbus, Volvicoccus stipae* and *Trionymus hamberdi,* which were found in new localities. New data on biology of *Puto superbus* are given.

Key words: Scale insects, urban parks, semi-natural habitats

Introduction

Systematic faunistic research in Poland has been carried out for about fifty years. Currently, 141 species of scale insects have been found in Poland. These belong to 14 families, of which the largest is Pseudococcidae, followed by the Coccidae, Diaspididae and Eriococcidae (Koteja 1996, 2000, Łagowska 2004). A significant increase in the fauna was reported in the nineteen sixties and seventies, when intensive surveys started (e.g. Koteja 1964, 1969, 1970, 1971, 1972). The state of knowledge of the scale insect fauna in each region of Poland is very unequal. The number of the Coccoidea species exceeded 85 only in three regions: the Cracow-Wieluń Upland (Wyżyna Krakowsko-Wieluńska), Roztocze and the Świętokrzyskie Mountains (Góry Świętokrzyskie) (Łagowska, Golan 2005). Upper Silesia (Górny Śląsk) is an industrialized and urbanized region in southern Poland and has been poorly studied until recently. This region is usually associated with mining, steelworks and spoil heaps, although there are large areas of forests, parks and semi-natural habitats. Prior to 2005, only 51 coccoid species had been recorded in this region (Koteja 1972; Łagowska, Golan 2005). However, systematic faunistic research has been intensified in Upper Silesia during the past eight years (Simon, Herczek, 2010; Kalandyk, Węgierek, 2010: Simon, Kalandyk-Kołodziejczyk 2011), and this paper presents the results of our recent surveys between 2011 and 2013.

Material and Methods

The division of Poland into geographical regions is adopted from a series of Catalogues of Polish Fauna (e.g., Kawecki 1985). Upper Silesia is located in southern Poland in which the most important city is Katowice.

Our studies concern scale insect species occurring in parks and semi-natural habitats. Study plots were established in two urban parks in Katowice (Kościuszko's Park and Katowice Forest Park) and in psammophilous and xerothermic grasslands located mainly in the small villages. Study plots (20) in urban parks were established in different types of anthropogenic communities. Each of the urban parks encompassed two parts: one with flowerbeds and lawns and other with forest. These parks are

not protected areas. In psammophilous grasslands with *Koelerio glaucae – Corynephoretea canescentis* plant communities, 17 study plots were established, and in xerothermic grasslands with *Festuco – Brometea* plant communities, 15 study plots were established. Xerothermic grasslands with *Festuco – Brometea* plant communities occur on the steeper slopes and are not used for cultivation, but for grazing (Babczyńska-Sendek 2005, Matuszkiewicz 2006). Semi-natural psammophilous grasslands with *Koelerio glaucae – Corynephoretea canescentis* plant communities occur in dry sandy habitats lacking limestone (Matuszkiewicz 2006). The most interesting psammophilous grasslands are situated in Błędów Desert, which is sometimes called the Polish Sahara (Szczypek *et al.* 2001). All plots were located within the boundaries of Upper Silesia. Each of the study plots was visited four times per year. All specimens were collected by carefully combing through the host plants, turf and the surface layers of the soil by hand. The insects were preserved in 70% ethanol and mounted according to the method described by Williams, Kosztarab (1972) and further modified by Łagowska (1996).

Results and Discussion

Many of the scale insects species collected in Upper Silesia had been either previously only known from a few localities in Poland or had been recorded from many localities but not for over 50 years (e.g. *Porphyrophora polonica* (Linnaeus, 1758)).

One rare species in Poland (*Planchonia arabidis* Signoret, 1877) was reported from Upper Silesia for the first time, seven rare species were found in new localities (*Puto superbus* (Leonardi, 1907), 1907, *Balanococcus singularis* (Schmutterer, 1952), *Metadenopus festucae* Šulc, 1933, *Rhodania porifera* Goux, 1935, *Trionymus hamberdi* (Borchsenius, 1949), *Volvicoccus stipae* (Borchsenius, 1949), *Eriococcus agropyri* (Borchsenius, 1949)) and two species were confirmed in previously known localities between 2011-2013 (*Trionymus isfarensis* (Borchsenius, 1949) and *Coccura comari* (Künow, 1880)).

Two rare species were collected in the urban parks in Upper Silesia: *Puto superbus* (Putoidae) and *Planchonia arabidis* (Asterolecaniidae). *Puto superbus* was previously reported from Masovian Lowland as new to Poland (Łagowska 2000). *Puto superbus* was collected from the leaves of *Arrhenatherum elatius* (Poaceae) in a second locality in Katowice Forest Park (Simon *et al.* 2011). It was found each year during this study. *Puto superbus* was found in a humid meadow in parkland and more recently in two further localities in psammophilous grasslands (06.06.2013 in Dąbrowa Górnicza Trzebiesławice, 29.07.2013 in Twardowice), suggesting that this species can tolerate a wide range of environments. Observations on it's biology showed that adult females were found from May till September, while the wingless males emerged in the second half of June and lived for three or four days in the field. Mating was observed in the last 10 days of June of each year for the past four years. Adult females and males were also raised under laboratory conditions on their host plants. Both sexes appeared to live much longer in the laboratory than in the field: females for about eight months and males for about a week. *P. superbus* is ovoviviparous and the crawlers emerged in the laboratory in July. First-instar nymphs were not observed in the field. Our data on the biology of *P. superbus* are slightly different from those in central Italy (Marotta 1992), where the adult females were present only from May to July and adult males in May and July. Adult females in our study occurred from May to September, and adult males only in the second half of June. The other interesting species in Katowice Forest Park was *Planchonia arabidis*, which was recorded for the first time in Upper Silesia (20.08. 2011) on *Hieracium pilosella* in the ruderal plant community. *Planchonia arabidis* was previously only known from a few regions of Poland (Łagowska, Koteja 1996; Golan *et al*. 2001).

Most species reported from urban parks in Katowice are polyphagous and cosmopolitan, which agrees with the observations of previous authors who did research in urban environments in different regions in Poland (e.g., Łagowska 1987).

As scale insects prefer dry habitats (Koteja 1996), it was expected that interesting species would be found in both xerothermic and psammophilous grasslands, including the pseudococcids *Volvicoccus stipae, Balanococcus singularis* and *T. hamberdi* and, indeed, these species were found. One of the most interesting was *V. stipae*, which had been reported previously only from Armenia, Bulgaria, Hungary, Turkey and Ukraine until 2008 (Ben –Dov *et al.* 2013). It has since also been found in Upper Silesia, initially in two localities in psammophilous

grasslands (Kalandyk, Węgierek 2010; Kalandyk-Kołodziejczyk, Simon 2011) but more recently (08.08.2012) it was found on a hillside covered in a xerothermic *Festuco – Brometea* community in Klucze near Błędów Desert. This is only the third known locality in Poland for this species and all previous records were also from within the boundaries of Upper Silesia.

Another species known to occur in both types of grasslands is *Metadenopus festucae* (Pseudococcidae). Females were collected from the leaf sheaths of several species of grasses. New localities for this species were found in Bukowno (16.06.2012, 25.06.2012) and in Dąbrowa Górnicza Trzebiesławice (09.07.2013). In addition, *Porphyrophora polonica*, a very rare margarodid species, has been collected previously in both xerothermic and psammophilous grasslands in two localities in Upper Silesia, but its presence has not been confirmed recently and we did not find it in those sites between 2011 and 2013. Two further species previously recorded from both types of grasslands but not found in our surveys are the mealybugs: *Phenacoccus bicerarius* Borchsenius, 1949 and *P. hordei* (Lindeman, 1886). *Trionymus isfarensis*, which is considered to be rare in Poland, occurs only in psammophilous grasslands in Upper Silesia and three localities were confirmed in 2012. *Trionymus isfarensis* had been reported previously only from few localities in Poland (Koteja 1984, Kawecki 1985, Koteja, Żak-Ogaza 1989, Łagowska, Koteja 1996, Kalandyk, Węgierek 2010). Another interesting species occurring most often in psammophilous grasslands in this region is *Balanococcus singularis*, which was reported for the first time from Upper Silesia by Simon, Herczek (2010) and which was rediscovered in *Koelerio – Corynephoretea* communities in Nowa Wieś in 2012. New locality of this species was discovered in Dąbrowa Górnicza Trzebiesławice (20.09.2013). *Rhodania porifera* (Pseudococcidae), another rare species, recorded mostly in psammophilous grasslands in Upper Silesia, was found between 2012 and 2013 in several new sites: in Bukowno (01.08.2013, 15.08.2013), Dąbrowa Górnicza Sikorka (10.10.2012, 01.11.2012), Nowa Wieś (20.09.2012, 10.07.2013), Twardowice (09.06.2012, 13.07.2013). Both adult females and nymphal *R. porifera* were recorded in the litter at one site (Dąbrowa Górnicza Sikorka) and on the roots of *Festuca ovina* (Poaceae) at other sites. In addition, *Eriococcus agropyri* (Eriococcidae), which has been considered rare in Poland, was also found in many sites, mainly in psammophilous grasslands. New localities of this species were Bukowno (01.08.2013) and Dąbrowa Górnicza Trzebiesławice (09.07.2013). The occurrence of other rare species previously collected in psammophilous communities in Upper Silesia were not confirmed during our surveys, e.g., the pseudococcids *Fonscolombia tomlinii* (Newstead, 1892), *Heliococcus sulcii* Goux, 1934, *Longicoccus psammophilus* (Koteja, 1971) and *Phenacoccus phenacoccoides* (Kiritchenko, 1932). *Ortheziola vejdovskyi* Šulc, 1895 (Ortheziidae) has been only recorded previously in 2008 in xerothermic grassland (*Festuco – Brometea* grasslands) in Upper Silesia (Kalandyk, Węgierek 2010) but its presence has not been confirmed recently. The majority of the Coccoidea species occurring in the xerophilous *Festuco – Brometea* communities was observed also in other habitats including non-xerophilous communities, e.g., *Trionymus hamberdi* and *Coccura comari* (Pseudococcidae). These two species have been reported from Upper Silesia previously (Simon & Herczek 2010, Kalandyk & Węgierek 2010, Simon & Kalandyk-Kołodziejczyk 2011). *Trionymus hamberdi* is very rare in Poland, occurring in grasslands, moorlands and young woodlands in Upper Silesia. However, several individuals have been collected every year since 2006. New localities of this species were found in Dąbrowa Górnicza Sikorka (13.06.2012, 15.06. 2013) and Nowa Wieś (09.09.2012). *Coccura comari* has been collected in diverse plant communities except grasslands in Upper Silesia e.g., forests and young woodlands. Adult females and immature stages were observed every year.

Systematic faunistic investigations in Upper Silesia have been conducted since 2005. These surveys recorded species considered as rare in Poland, although some are considered to be relatively widespread in the Palaearctic but others, e.g., *Balanococcus singularis* are local.

In conclusion, Upper Silesia is considered to be one of the most polluted regions in Poland but, nonetheless, has quite large areas of natural and semi-natural plant communities. Owing to intensive faunistic studies in 2005-2013, the number of species recorded in this region has increased from 51 to 86. It was found that several species of scale insects believed to be rare in Poland occurred in the urban parks and/or in xerophilous plant communities, including:

Ortheziola vejdovskyi, Porphyrophora polonica, Puto superbus, Balanococcus singularis, Coccura comari, Fonscolombia tomlinii, Heliococcus sulcii, Longicoccus psammophilus, Metadenopus festucae, Phenacoccus bicerarius, P. hordei, P. phenacoccoides, Rhodania porifera, Trionymus hamberdi, T. isfarensis, Volvicoccus stipae, Eriococcus agropyri, Planchonia arabidis. *Puto superbus,* first recorded in Poland by Łagowska, occurs in large populations in Upper Silesia. Due to our observations, new information of biology of this species is given.

These surveys make Upper Silesia one of the four best studied regions for Coccoidea in Poland.

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