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Marcin Walczak, Wacław Wojciechowski, Łukasz Depa

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Marcin Walczak[1*], Wacław Wojciechowski[1], Łukasz Depa[1]

The communities of Planthoppers and Leafhoppers (Hemiptera: Fulgoromorpha et Cicadomorpha) inhabiting selected plant associations in Częstochowa city and its buffer zone

The Monograph

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Abstract: The study presents information on the species and communities of planthoppers and leafhoppers (Fulgoromorpha Evans, 1946 and Cicadomorpha Evans, 1946), which belong to a group of phytophages with piercing-sucking mouthparts within the order Hemiptera. The material was collected within the administrative boundaries of Częstochowa with the usage of quantitative and qualitative methods in the urban and suburban areas. Quantitative data were intended to supplement information on the seasonal dynamics of abundance, the structure of dominance and the degree of association of individual planthopper and leafhopper species to particular plant communities. The study was carried out between 2005 and 2010 on 35 plots containing the following plant associations: *Echio-Melilotetum*, *Urtico-Aegopodietum podagrariae*, *Sparganio-Glycerietum fluitantis*, *Phalaridetum arundinaceae*, *Spergulo vernalis-Corynephoretum*, *Diantho-Armerietum elongatae*, *Lolio-Polygonetum arenastri*, *Valeriano-Filipenduletum*, *Cirsietum rivularis*, *Scirpetum silvatici*, *Alopecuretum pratensis*, *Arrhenatheretum elatioris*, *Festucetum pallentis*, *Sileno-Phleetum*, *Adonido-Brachypodietum pinnati* and *Tilio cordatae-Carpinetum betuli* and in the following plant communities which proved impossible to be classified as associations: *Achillea millefolium-Taraxacum officinale*, *Dactylis glomerata*, *Alno-Ulmion* and *Quercus robur-Pinus sylvestris*. Qualitative research was conducted between 2005 and 2012 on the remaining areas of the town. It was aimed at enriching the planthopper and leafhopper fauna there with interesting and rare species.

A total of 266 species were collected, which were represented by 60 thousand specimens. As many as 55 species reached higher classes of abundance (from superdominant to subdominant ones). The highest abundance was recorded for the following four species: *Macrosteles laevis* (approx. one third of all the collected specimens), *Stenocranus major*, *Cicadula quadrinotata* and *Arthaldeus pascuellus*. There proved to be 8 differential and 42 characteristic species of particular plant communities. The results revealed the occurrence of 11 species which had not been previously recorded from Poland including *Idiocerus vicinus* Melichar, 1898, *Acericerus ribauti* Nickel & Remane, 2002, *Eupteryx lelievrei* (Lethierry, 1874), *Zyginidia pullula* (Boheman, 1845), *Zygina griseombra* Remane, 1994, *Zygina schneideri* (Günthart, 1974), *Macrosteles sardus* Ribaut, 1948, *Balclutha saltuella* (Kirschbaum, 1868), *Endria nebulosa* (Ball, 1900), *Metalimnus steini* (Fieber, 1869) and *Calamotettix taeniatus* (Horváth, 1911). Some of them had already been reported in earlier publications. Additionally, 17 species were classified as new to Krakowsko-Wieluńska Upland.

The results were complemented by chorological, ecological and zoocenological analyses of the collected material. Detailed information is presented in Tables and Figures throughout the study as well as in annexes.

Key words: Hemiptera, Fulgoromorpha, Cicadomorpha, insects communities, zoocenological analyses, dominant species, seasonal dynamics of abundance, ecology, distribution, synanthropy

1. Introduction

Planthoppers and leafhoppers (Fulgoromorpha EVANS, 1946 and Cicadomorpha EVANS, 1946) are a group of insects which possess piercing-sucking type of mouthparts. Numerous species belonging here are included into the order of Hemiptera (DIETRICH 2009). They play an important role in the food chain (NICKEL 2003) and occur in most terrestrial ecosystems worldwide. They are also found in anthropogenic habitats provided their host plants grow there (NICKEL & HILDEBRANDT 2003). Juvenile developmental stages and imagines inhabit all layers of vegetation, from herbaceous plants up to the highest tree branches. Having very strict connections with their host plant species, planthoppers and leafhoppers are characteristically associated with particular types of biocoenoses (CHUDZICKA 1981, NICKEL 2003). Most communities show a defined species composition and seasonal dynamics of their abundance (KLIMASZEWSKI et al. 1980a, 1980b, GĘBICKI 1983, NICKEL & HILDEBRANDT 2003).

In the past both groups were considered to be a single taxonomic unit – Auchenorrhyncha DUMÉRIL, 1806. Presently most authors believe that they constitute two separate, paraphyletic but closely related suborders: Fulgoromorpha and Cicadomorpha within the order Hemiptera (CAMPBELL et al. 1995, 1996, SORENSEN et al. 1995, VONDOHLEN & MORAN 1995, BOURGOIN & CAMPBELL 2002). This general opinion is strongly supported by research on fossil materials (BOURGOIN et al. 2004, SZWEDO et al. 2004). Some studies shift Fulgoromorpha even closer to Heteroptera (BOURGOIN et al. 1997). Although most authors agree on this classification, analyses based on the reduction of sclerites at the bases of the first pair of wings seem to indicate a close relationship between the two suborders (YOSHIZAWA & SAIGUSA 2001). Most recent studies of the oogenesis and the ovary structure in both groups also indicate their close relationship or monophyly (SZKLARZEWICZ et al. 2007).

Morphologically, both suborders differ from other Hemiptera in the presence of three-segmented tarsi, the structure of three-segmented antennae (with last antennomere transformed into bristle-like flagellum), the presence of tympanal organ comprising first three abdominal sternites and the location of the labium base which is moved aside from the prothoracic sternite (DIETRICH 2009).

For the purpose of zoocoenological research, planthoppers and leafhoppers should be treated as a single group. Hence, in this study the term “planthopper community” refers to both groups co-occurring in a single habitat following RAMENSKY (1952), ŁUCZAK & WIERZBOWSKA (1981) and PAWLIKOWSKI (1985).

Two main ecological parameters which characterise the community are the number of species and their abundance in the studied population. They were widely applied by many authors in the descriptive studies of planthoppers communities (ANDRZEJEWSKA 1965, GĘBICKI et al. 1977, GĘBICKI 1979, GĘBICKI et al. 2013, KLIMASZEWSKI et al. 1980a, 1980b, GYÖRFFY & KÖRMÖCZI 1987, BROWN et al. 1992, CHUDZICKA 1995, SZWEDO et al. 1998, NEMEC 2003, Gaj et al. 2009, ŚWIERCZEWSKI & WOJCIECHOWSKI 2009). The definition of a community and related terminology are presented in details in chapter 4.1.

Approximately 2080 planthopper species are reported from Europe, with about 900 species in Central Europe (HOLZINGER et al. 1997, HOCH 2010) and 547 species in Poland (ŚWIERCZEWSKI & GĘBICKI 2003b, CHUDZICKA 2004, SIMON & SZWEDO 2005, TRILAR et al. 2006, GAJ et al. 2009, ŚWIERCZEWSKI & STROIŃSKI 2011a, 2011b, ŚWIERCZEWSKI & WALCZAK 2011a, 2011b, WALCZAK et al. 2012, 2013, GĘBICKI et al. 2013, MUSIK et al. 2013, LUBIARZ & MUSIK 2015, TASZAKOWSKI & WALCZAK 2015a, 2015b, WALCZAK & JEZIOROWSKA 2015). By comparison, there are over 620 species known from Germany (NICKEL & REMANE 2002), 572 species from the Czech Republic (Malenovský & Lauterer 2010) and 331 species from Belarus (Borodin 2004). It is worth highlighting, that there have been 362 planthopper species reported so far from Krakowsko-Wieluńska Upland, which constitutes 67% of their Polish fauna (Nast 1976b, Szwedo 1992, 2001, Gębicki 2003, Świerczewski 2004, Świerczewski & Gębicki 2003b, 2004, Walczak 2008a, 2008b, 2011, Świerczewski & Wojciechowski 2009, Świerczewski & Walczak 2011b). Accordingly, this is one of the areas where planthopper species composition is best recognized in Poland.

The abundance structure of the insect fauna (including planthoppers and other representatives of Hemiptera) in the urban environment has not been satisfactorily studied. Anthropogenic character of urban habitats poses a problem while describing insect communities, even when we deal with phytophagous groups, which are strictly connected with their host plants. Nonetheless, some authors investigated insect communities in urban habitats, including planthoppers (Chudzicka 1979, 1981, 1986, Walczak 2005), other hemipterans (Kalandyk & Herczek 2008) and some other insect taxa, e. g. bees (Banaszak 2008) or butterflies (Nowak 2008). Also, there have been a few ecological studies on competition or mechanisms of self-control within the urban communities of insects (Chudzicka & Skibińska 1998a, 1998b). Additionally, a few case-studies on the planthopper communities in industrially transformed areas are available (Gębicki et al. 1977, Gębicki 1979, Klimaszewski et al. 1980a, 1980b).

Despite many anthropogenic transformations resulting from the development of industry, trade and transportation (Wielgomas 1981), Częstochowa has still retained a significant diversity of natural environment and the landscape (Hereźniak et al. 1970, Zygmunt et al. data unpublished). The town encompasses two protected areas which are parts of the European Ecological Network Natura 2000 (Parusel 2002). Moreover, parts of the town are planned to join the area around the future Jura National Park (Hereźniak 1996, 2004). A lot of natural habitats have survived here, including eutrophic fens, moist meadows, xerothermic grasslands together with riparian woodlands and oak-hornbeam forests, some of which are natural reserves (Hereźniak 2000). Valuable landmarks are constituted by moraine hills and rocky outcrops of Częstochowa Upland, oxbow lakes of Popławski Dół, a part of Mirowski Gorge of the Warta river (Cabała et al. 2007), and other valleys of the Stradomka and Konopki streams (Szczypek 1986, Lewandowski 1996). All these interesting environmental features have made Częstochowa and the adjacent areas of Krakowsko-Wieluńska Upland attractive for entomological research (Chłond & Gorczyca 2006, 2009, Gorczyca 1994, Hałaj & Wojciechowski 1996, Nowak 2008, Szwedo 1992, Świerczewski & Wojciechowski 2009, Walczak 2011).

The diversity of habitats and richness of vegetation encouraged also the present authors to undertake the research on the planthopper and leafhopper communities in the area of the town.

The main objectives of the present research were the following:

- recognising the species composition of the chosen habitats of Częstochowa – within the town and on its outskirts
- distinguishing the communities connected with particular types of habitats of the town and determining their structure of abundance and the degree of their specificity in a respective habitat
- determining the seasonal dynamics of abundance of dominant species in particular communities of both, urban and suburban areas of high biological diversity

- conducting chorological and ecological analyses of the collected species
- comparing the results with the studies on planthopper communities of similar habitats in other regions of Poland

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1.1. The history of studies on planthoppers and leafhoppers with reference to their communities in urban habitats

First historical notes on planthoppers (concerning cicadas) are known from the ancient records from China (17th century BC) (Chou 1987) and Greece (4th century BC) (Aristoteles [1992]). First faunistic data from Poland were recorded 200 years ago and reported the presence of 19 species in the territory of Silesia (Weigel 1806). Further scarce and fragmentary information is comprised in a few works from the second half of 19th and the beginning of the 20th centuries (Siebold 1839, Waga 1854, 1857, Nowicki 1868, 1870, Letzner 1871, Wocke 1874, Łomnicki 1884, Stobiecki 1886, Smreczyński 1906, 1910a, 1910b). First reports on the occurrence of 5 species of planthoppers on the territory of Krakowsko-Wieluńska Upland (including towns: Olsztyn and Złoty Potok near Częstochowa) were presented by Waga (1854, 1857). Nowadays the pertinent Polish literature comprises almost 300 papers providing data on the planthoppers on the territory of Poland. The Catalogue of Polish Fauna (Nast 1976b) seems to be the most informative one. Other papers focus mainly on the faunistic issues (Szulczewski 1931, Nast 1936, 1938a, 1938b, 1955, 1958, 1973, 1976a, 1979), taxonomy (Dworakowska 1968a, 1968b, 1970a, 1970b, 1970c, 1976, Gębicki & Szwedo 1991, Trilar et al. 2006, Walczak 2008b) and plant protection against these insects (Nowacka 1977, 1982, Soika & Kamińska 2000, Klejdysz & Wałkowski 2008). There are also accounts on the occurrence of rare species in the Polish fauna (Świerczewski & Gębicki 2003a).

The studies of insect communities in particular plant associations constituted an important trend in ecological research of these insects. They were first conducted by Kuntze (1937). In Germany such studies included the meadows belonging to the class *Molinio-*

Arrhenatheretea (Doskočil & Hůrka 1962, Kuntze 1937, Schiemenz 1976, 1977, Hiebsch et al. 1978), xerothermic and psammophilous grasslands (Musil 1958, Schiemenz 1969, 1971, 1973, Witsack 1997, 1999) and forests (Kuntze 1937). In Ukraine, this sort of studies encompassed territory of Ukrainian Carpathians, Transcarpathia and Polesie (Logvinenko 1961, 1964). In Northern Europe, planthopper communities were studied in forests and shrub vegetation of Estonia (Vilbaste 1979) and Finland (Linnavuori 1952). In the USA much attention was paid to the studies on planthoppers inhabiting prairies (Nemec 2003, Nemec & Bragg 2008).

The attempt was also undertaken to characterize the planthopper communities in unstable habitats e. g. in Hungary, where a meadow developed on sand was studied (Györffy 1982, Györffy & Körmöczi 1987) or in the Czech Republic where the vegetation in drained pond was researched (Klimeš et al. 1991). Some attention was also directed to planthoppers connected with crops e. g. in former Yugoslavia (Tanasijevic 1962 after: Nowacka 1965) or in the USA (De Long 1938). The influence of agricultural management on planthoppers was also a subject of much research (Morris 1973, 1981a, 1981b, 1990a, 1990b, Waloff & Salomon 1973, Morris & Lakhami 1979).

In Poland, the research on planthopper communities began in the mid 50s of the 20th century (Andrzejewska 1959). The authors concentrated on the spatial density of individuals and their abundance in managed meadows (Andrzejewska 1961, 1971, 1999) and also their distribution in altitudinal zones of vegetation (Andrzejewska 1964, 1965, 1966). It was attempted to determine the abundance and biomass of planthoppers in fertilized meadows (Andrzejewska 1976, 1979a, 1979b, 1991, Chudzicka 1989). Moreover, the populations of single species were studied especially when it concerned their occurrence in crops of lucerne (*Medicago sativa*) (Nowacka 1965, Łuczak 1978), sunflower (*Helianthus annus*) (Nowacka & Bielejewski 1978), potatoes (*Solanum tuberosum*) (Gromadzka 1970, Bilewicz-Pawińska & Grabarczyk 1991), cereals (Poaceae) (Nowacka 1968, 1973, 1977, 1982), ornamental plants (Soika & Kamińska 2000) and various wicker willows (*Salix* spp.) (Czerniakowski 2005, Sądej & Waleryś 2006).

Further studies focused on planthopper communities in particular types of habitat in various geographical regions of Poland. These included bogs, moist meadows and reed beds of the Basin of Biebrza River, the Basin of Nowy Targ, the Bieszczady Mountains, Upper Silesia and the Beskid Mountains, Sudety Mountains (Gębicki et al. 1982, Szwedo 1992, 2000, Szwedo et al. 1998, Gaj et al. 2009, Taszakowski et al. 2015), various forest types of the Biebrza River, Pińczów, Ojców, Białowieża, Beskid Mountains and the Stołowe Mountains (Gębicki 1983, Gębicki et al. 1982, Szwedo 1992, Chudzicka 1995, Gaj et al. 2009, Pilarczyk et al. 2014) and only recently the psammophilous and xerothermic grasslands Gębicki 1987, Świerczewski 2004, Świerczewski & Wojciechowski 2009). The present research deals mainly with the habitats of urban greenery.

Simultaneously with zoocoenological studies on the planthoppers of Poland, the communities of other hemipteran taxa were examined as well. This refers especially to Aphidoidea (Hałaj & Wojciechowski 1996, 1998, Depa & Wojciechowski 2009, Trela & Herczek 2014) and Heteroptera (Chłond & Gorczyca 2004, Herczek 1983, 1987, Lis 1991, Gorczyca 1994). Also the communities of other insects were studied e. g. thrips (Thysanoptera) (Sierka 2008), beetles (Coleoptera) belonging to families Staphylinidae (Smoleński 2000), Cerambycidae (Starzyk 1979) and Chrysomelidae (Wąsowska 1996) or bees (Apidae) from the order Hymenoptera (Pawlikowski 1985, 1990, 1992). The studies on the species composition and community structure have been carried out all over the world with the most interesting ones on Heteroptera (Das & Gupta 2010), Thysanoptera (Andjus 2005), Orthoptera (Nemec & Bragg 2008, Krämer et al. 2010), Hymenoptera (Formicidae) (Markó et al. 2004) and Coleoptera (Chrysomelidae) (Şen & Gök 2009).

1.2. The planthopper communities of urban greenery

Planthoppers are a very useful and even a model group for the purpose of studying urban habitats (Nickel & Hildebrandt 2003). In urban areas the ubiquitous species, such as *Dicranotropis hamata*, *Macrosteles laevis*, *Doratura stylata*, *Psammotettix confinis* and *Errastunus ocellaris* (Pisarski & Trojan 1976, Chudzicka 1986, Bokłak unpubl.) are important bioindicators which help to evaluate anthropogenic impact on various habitats (Chudzicka 1979, 1981). Detailed knowledge of the long-term changes in the structure of insect communities facilitates the recognition of characteristics and rate of alternations in urban habitats (Gębicki 1979). Such communities react to anthropogenic factors; the closer to the urban agglomeration, the greater impact has been observed (Chudzicka & Skibińska 1998a, 1998b).

First publications on population dynamics and species composition of planthopper communities in urban greenery and trees of urban landscape appeared in Poland at the turn of 70s and 80s of the 20th century (Chudzicka 1979, 1981). In one such study it was even attempted to forecast the changes in community structure after a vast housing estate has been built (Chudzicka 1981). The most important Polish study in this field deals with the planthopper community of the herbaceous ground cover of the urban parks, urban greenery and tree canopy of Warsaw (Chudzicka 1986). A similar study was also conducted in the town of Sosnowiec (Walczak 2005). Many additional data on the urban fauna of planthoppers is comprised in the Theses of students who conducted their research in the urban zoocoenoses of Upper Silesia (Department of Zoology, the University of Silesia; Bokłak, Cebo, Furman, Jedynowicz, Mokrzycka, Sztokinger – data unpublished). Fragmentary data on the planthoppers in urban faunas are also scattered over many faunistic papers (Bokłak et al. 2003, Gaj & Pilarczyk 2003, Musik 2011, Świerczewski & Walczak 2011a, 2011b, Walczak & Musik 2012).

It should be noted that during late 1970s some studies were conducted in the vicinity of "Katowice" Steelworks. They concentrated on the hemipteran communities (including planthoppers) of the semi-natural ecosystems endangered by degradation through nearby industrial infrastructure emissions (Gębicki et al. 1977, Gębicki 1979, Klimaszewski et al. 1980a, 1980b). These studies helped to recognize what happens in zoocoenoses of industrial regions with heavy emission of various gaseous pollutants and industrial ashes.

The community structure and dynamics of abundance of planthopper fauna were also analysed in extremely transformed borrow pits after sand exploitation in the regions of Jaworzno-Szczakowa and Bukowno (Szwedo data unpublished) and in spoil tips after mining and smelting in Ruda Śląska, Mikołów, Rybnik and Wodzisław Śląski (Simon & Szwedo 2005, Taszakowska, Zimoń – data unpublished).

2. Characteristics of the natural environment of Częstochowa

The study comprised the area within the administrative borders of Częstochowa – the town with the status of a county, located in southern Poland, upon the upper course of the Warta River. In regard to the surface area, Częstochowa holds a twelfth position in the country, with the total area of 159.7 km2. Since the administrative reform of 1999, it has belonged to Silesian Voivodship, being located in its northern part, between 19°00'42" and 19°14'11" E as well as 50°44'04" and 50°53'10" N (Konieczny et al. 2004). It borders on 9 municipalities, including two towns: Blachownia and Kłobuck. Its population came to 234 472 (2011), which makes it the thirteenth in the country with respect to the number of inhabitants (Rocznik Statystyczny 2012).

2.1. Physiogeographical location of Częstochowa

In terms of physiogeographical division of Poland made by Kondracki (2002), the study area is situated in the province of Polish Uplands, subprovince of Śląsko-Krakowska Upland (341), in place where two macroregions and three mesoregions border on each other:

- macroregion of Woźnicko-Wieluńska Upland (341.2) – mesoregions: Wieluńska Upland (341.21) and the Valley of the Upper Warta River (341.25);
- macroregion of Krakowsko-Częstochowska Upland (341.3) – mesoregion: Częstochowska Upland (341.31).

The northern part of the town is located within the borders of Wieluńska Upland (districts: Kiedrzyn, Północ, Wyczerpy-Aniołów, Tysiąclecie and part of Grabówka). The central and south-western parts are located in the Upper Warta Valley (districts: Błeszno, Dźbów, Gnaszyn-Kawodrza, Lisiniec, Raków, Stare Miasto, Stradom, Śródmieście and the southern fragment of Wyczerpy-Aniołów). The rest of the town, mainly its eastern part, is located within Częstochowska Upland (districts: Zawodzie-Dąbie and Mirów) (Czeppe 1972, Konieczny et al. 2004). Basing on the geomorphological regionalization (Gilewska 1972), the south-western part of Częstochowa may be included into the geomorphological region of Silesian Upland (the Valley of the Upper Warta) and the remaining area of the town into Krakowska Upland.

According to the zoogeographical division of Poland (Nast 1976b, Tykarski 2011), the territory of the town is located in the middle part of Krakowsko-Wieluńska Upland. On the basis of the Universal Transverse Mercator system (UTM) it is located in the UTM squares: CB62, CB63, CB72 and CB73 (Fig. 1).

2.2. The outline of geological structure

The area of Częstochowa is located in the northern part of the Śląsko-Krakowska monocline (Pożaryski 1974). The geological profile of this area comprises three principal structural levels – the folded structures of the Palaeozoic substrate, the sedimentary plate formed by Mesozoic rocks and the cover of the Cenozoic substratum (Kleczkowski 1972).

The Palaeozoic element consists of the so-called Małopolski block, which is built of metamorphic rocks originating from the territory of the modern Black Sea (Tyc 2001). The Palaeozoic substratum is represented here by strongly folded rocks from the Silurian, Devonian, Carboniferous and Permian periods of the Variscan Orogeny (Hereźniak 2000), which in the vicinity of Częstochowa were encountered during metal ore prospecting (Wielgomas 1981).

The oldest Mesozoic sediments in Częstochowa originate from the Lower Triassic (Głazek et al. 1992). The sediments of the Lower and Middle Jurassic do not occur as commonly as the sediments from the Upper Jurassic, which build the outcrops of Wieluńska Upland: Złota Góra, Góra Kamyk, Góra Prędziszów, Góra Ossona and Góra Kokocówka. Sediments of the Upper Jurassic are the dominant element of the geologic structure of the eastern parts of the town, and their thickness reaches 180 meters (Dłużyński 1952, Heliasz et al. 1987, Heliasz 1990, Głazek & Wierzbowski 1972, Kiełkowski & Kiełkowska 1997, Różycki 1953, 1960a, Słowicki 1974, Wielgomas 1981). In the southern part of the town (in the vicinity of Błeszno) as well as in the east - in the karst structures of Góra Pędziszów, rocks originating from the Cretaceous period are found (Głazek et al. 1992).

Cenozoic structures on the territory of the town do not constitute a continuous cover, but in many places they envelop the irregularities of the Mesozoic substrate. The sediments of the cold stage of the Odra glaciation are most broadly distributed (Różycki 1960b, Szczypek 1986, Lewandowski 1994).

2.3. The terrain relief

Three geomorphologically different mesoregions meet on the territory of Częstochowa: Częstochowska Upland, Wieluńska Upland and the Upper Warta Valley, which contributes to the diversity of the forms of the land surface (Cabała et al. 2007).

The range of altitudes within the administrative borders of the town varies from 236 to 316.7 m above sea level. The highest peaks of the town are two denudative monadnocks located within the Upper Jurassic ridge: Góra Ossona (316.7 m a. s. l.) and Góra Kokocówka (301 m a. s. l.). In the north of the town there are moraine hills and lateral sandy moraines of the glacial origin (Różycki 1972, Lewandowski 1996). An important element of the landscape of the town is constituted by the Canyon of the Warta in Mirów stretching almost from the town centre up to Mstów, which is a border between Wieluńska and Częstochowska Uplands (Cabała et al. 2007). The town centre is elevated about 250-255 m a. s. l. and lies in a shallow valley. The original landscape of the studied area is significantly disturbed by urbanization (Konieczny et al. 2004).

2.4. The soils

According to the typology of soils, Częstochowa has podzols, brown-earths, hydrogenic and carbonate soils (Hereźniak et al. 1970, Michalik 1974) as well as anthropogenic soils typical of the urban environment (Szponar 2003). The dominant soil type in the whole county of Częstochowa is the podsol, developed on sandy sediments, clays and loess (Michalik 1974, Słowicki 1974). Also the carbonate rendzinas are typical of Częstochowa, which developed on eroded rocks of limestone from Upper Jurassic, but also on Pleistocene clays and carbonate-rich sands, covering the Upper Jurassic limestone (Hereźniak et al. 1970, Michalik 1974). Moreover brown-earths and podzols developed on glacial tills as well as on sands covering clay or loam (Słowicki 1978). Anthropogenic soils occur typically in housing estates and industrial areas (Konieczny et al. 2004).

The valley bottoms of the Warta, Stradomka and Konopka are covered by sandy, alluvial soils and riverine sands, as well as patches of chernozemic soils, reaching from the town centre to the vicinity of Złoty Potok (Hereźniak et al. 1970, Michalik 1974). These soils undergo constant mixing and rinsing by river waters (Klimek 1961). In constantly moist areas with lessened drainage, the hydrogenic sludge soils or histosoils characteristic of peat-bogs occur (Słowicki 1978).

2.5. The climate

According to the climatological division of Poland (Romer 1949), the town of Częstochowa lies in the climatic zone of "Middle Uplands" in the Śląsko-Krakowska zone. According to the agro-climatic regionalization by Gumiński (1948), it is located in the Częstochowa-Kielce climatic district. The most recent climatic regionalization puts the studied area in the Middle-Polish region, bordering on the region of western Małopolska (Woś 1999).

According to the data of the Institute of Meteorology and Water Management, the mean annual temperature in Częstochowa, in the second half of the 20th century was about 7-8° C. There are about 260-270 days with above 0° C temperatures and the growing season lasts for about 200-210 days. Winter lasts about 100-110 days and the snow cover persists for about 60-80 days (with ca. 20-40 ice days – with the maximum temperature below 0° C) (Schmuck 1959, Hereźniak et al. 1970). The average monthly temperature in January ranges between -2 and -3° C and in July between 17 and 18° C (Hereźniak & Skalski 1974).

The mean annual precipitation is about 680 mm, and most of it is held down by the Jurassic Ridge. July is the rainiest month, with mean monthly precipitation of about 104 mm (Słowicki 1974). Mean annual wind velocity in the vicinity of Częstochowa is about 2.4 m/s, but weak winds (with the velocity up to 2 m/s) prevail (35 % of days in a year). During winter, westerly and south-westerly winds prevail, while in summer westerly and south-westerly winds dominate (Słowicki 1974).

During the windless weather in the Warta valley near Częstochowa, thermal inversion often occurs (Michalik 1974, Słowicki 1978, Niedźwiedź & Obrębska-Stalklowa 1991).

2.6. Hydrology of the studied area

According to the hydrogeological division of Poland (Mapa Hydrogeologiczna Polski 1: 200 000, 1986), the study area lies within the XVIIth region – the region of Wieluń-Kraków. In respect of hydrology, the area of Częstochowa lies within the Odra basin and waters run off through the Warta River and its inflows (Słowicki 1978). The hydrographic net of Częstochowa is constituted by the geological structure and terrain relief (Kleczkowski 1972).

The main river of Częstochowa is the Warta – the third longest river in Poland. Within the town the Warta flows down the distance of 15.35 km and is managed along its entire course (Kleczkowski 1972). Along its right bank the processes of seepage prevail over the surface runoff, which is associated with permeability of the limestone ground. As a result, the left bank area is twice as large because it is also fed by waters of the Stradomka and Konopka inflows, while at the right bank there are no inflows (Słowicki 1974, 1978, Gospodarek 2010). Spring floods of the Warta once contributed to the fertility of local meadows but currently the waters are polluted with sewer (Hereźniak et al. 1970).

There is also a whole system of anthropogenic water reservoirs with total area of ca. 18.3 ha (Cabała et al. 2009a). Moreover, the groundwater is present, and the supply from the ground, karst drainage, constitutes up to about 60-70% of the total water supply of the town (Dynowska 1971, 1991).

2.7. Environmental transformations and valuable nature areas of Częstochowa

The primordial landscape of what is now the area of the town was once dominated by deciduous forests. However, due to the settlement, industry and communicational routes, the total area of forest significantly diminished (Czyżewska 1997, Cabała et al. 2007). After the Warsaw-Vienna railway had been constructed in 1846, the industry in Częstochowa started to grow intensely. In the 60s of the 19th century the Warta flow was regulated thoroughly for the first time – a channel was built, through which the water was directed to water-wheels of local factories. During the period of the People's Republic of Poland, with the more and more intense development of industry, a significant degradation of natural environment took place. It was connected with infrastructural extensions of Częstochowa steel-works, then bearing the name of Bolesław Bierut. During the 60s of the 20th century another vast melioration was conducted, which destroyed the natural environment and the natural landscape of the Warta Valley. It was manifested dramatically in the part of the valley down the town, full of backwaters and oxbow lakes (Hereźniak et al. 1970, Cabała et al. 2007, 2009a).

Despite the transformation of natural environment in the area of Częstochowa, there still exist many valuable landmarks, both natural and historic, and the picturesque character of the town is highlighted by rocky outcrops as well as the ruins of old castles (Marzec et al. 1986, Tyc 2001). The environment of the town is influenced by vast sylvan complexes, especially the „Eagle nests Landscape Park" („Park Krajobrazowy Orlich Gniazd) and the Landscape Park of Forests upon the Upper Liswarta river (Park Krajobrazowy „Lasy nad Górną Liswartą"). The buffer zone of the first park comprises eastern edges of the town, together with the „Canyon of Warta in Mirów" („Mirowski Przełom Warty") (Hereźniak 2000), and the second park borders on the western part of the town (Hereźniak 2000). Moreover, the natural habitats of the town create an ecological corridor of the Warta, which is of the country-scale importance (Burchard unpublished).

At present, 4 natural reserves are planned to be founded: „Błeszno", „Trzęślicowa łąka pod Walaszczykami", „Gąszczyk" and „Góra Kokocówka" (Hereźniak 1992, 2000). In the 30s of the 20th century it was also planned to create a geological reserve on the hill of Jasna Góra (currently destroyed) (Różycki 1938 after: Hermański 2001). Between 2008 and 2009 there were 63 valuable nature sites delineated, including 27 destined for protection (Cabała et al. 2009a). Two sites, „Walaszczyki in Częstochowa" („Walaszczyki pod Częstochową) and „the Warta Gorge near Mstów" („Przełom Warty k. Mstowa"), were involved in the program Natura 2000 (Konieczny et al. 2004).

2.8. Vegetation and fauna

The vegetation of Częstochowa belongs to two geobotanical regions: Silesian Upland and Wieluńska Upland, both being parts of the belt of Middle Uplands. The flora consists of Holarctic elements, with the Euro-Siberian and middle-European ones dominating (Czyżewska 1997). The flora of the Warta River Canyon in Mirów and of Częstochowa Valley are best studied, while the remaining areas have been treated only marginally (Hereźniak et al. 1970, 1973, Hereźniak & Skalski 1974). In total, more than a 1000 species of vascular plants were recorded in this area, including 35 species under protection (Cabała et al. 2009b, 2009c, 2009d, 2009e, 2009f).

At present, at the area of Częstochowa there occur semi-natural and natural plant associations: moist meadows and other moist habitats, xerothermic and psammophilous grasslands and 8 types of sylvan habitats (Hereźniak 2000, Konieczny et al. 2004). The total area of forests in Częstochowa is only 568 ha, and most of them were planted. However, the species typical of Central European deciduous forests are also found here (Czyżewska 1997).

The area of Częstochowa comprises 314.75 ha of anthropogenic urban greenery, including 11 urban parks (the total of 147.54 ha) and 25 green squares (45.48 ha); additionally, there are allotment gardens (ca. 260 ha), orchards (71.49 ha) and cemeteries (34.9 ha). The belts of greenery along the streets of Częstochowa comprise 121.73 ha. Further urban greenery includes: promenades, riverine boulevards, the greenery associated with the municipal and public buildings and also the vegetation of railway subgrades, spoil tips and barrens. Mostly, they are of a typically urbicoenoses character and maintained thanks to systematic management (Gębicki & Zygmunt data unpublished). Additionally, in the suburban area there are about 7200 ha of farm land, comprising meadows, pastures and arable land (Burchard data unpublished, Konieczny et al. 2004).

Faunistic research conducted so far has concentrated mainly on vertebrates. There were about a dozen of mammal species found in Częstochowa, including bats sporadically flying to the town from adjacent Krakowsko-Częstochowska Upland (Hereźniak & Skalski 1974, Cabała et al. 2009c). The occurrence of 125 species of birds was confirmed (Czyż 2008); 4 species of reptiles (Cabała et al. 2009c), 9 species of amphibians (Cabała et al. 2009d, 2009e) and at least 14 species of fish, both native and of foreign origin, were reported (Konieczny et al. 2004, Cabała et al. 2009b, 2009d).

Molluscs represent the best studied invertebrates (Hereźniak & Skalski 1974). The macrofauna of anthropogenic water reservoirs (Jatulewicz 2007), terrestrial isopods, centipedes (Chilopoda) and a few taxa of insects, especially the dragonflies (Hereźniak & Skalski 1974) and daily butterflies (Nowak 2008) have been described. The studies concerning the planthoppers and leafhoppers of the town are scarce and inform only about single species (Gębicki 2003, Świerczewski & Gębicki 2004, Świerczewski & Walczak 2011b, Walczak 2011).

3. Characteristics of the study plots

For quantitative research there were 35 study plots assigned, localized within the administrative borders of Częstochowa (Fig. 1): the town centre delimited by the zone of dense built-up comprised 10 plots: 2, 3, 9, 10, 11, 12, 13, 21, 24 and 25; a buffer zone with suburbs housed 25 plots: 1, 4, 5, 6, 7, 8, 14, 15, 16, 17, 18, 19, 20, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 43 and 35. Taking into account the geomorphological regionalization: the Upper Warta Lowland comprised 18 plots: 1, 2, 3, 4, 6, 10, 11, 12, 14, 16, 18, 19, 21, 22, 25, 26, 30 and 35; Częstochowska Upland 9 plots: 7, 8, 23, 27, 28, 29, 32, 33 and 34; Wieluńska Upland 8 plots: 5, 9, 13, 15, 17, 20, 24 and 31 (Fig. 1).

The material for the study was collected within the patches of vegetation belonging to six phytosociological classes: *Artemisietea vulgaris*, *Phragmitetea*, *Koelerio glaucae-Corynephoretea canescentis*, *Molinio-Arrhenatheretea* (including: *Plantaginetalia majoris*, *Molinietalia caerulae* and *Arrhenatheretalia elatioris*), *Festuco-Brometea* and *Querco-Fagetea* (Fig. 1). Each plot measured ca. 5000 m^2 (100 m x 50 m), with 5 plots being belt-shaped (500 m x 10 m) as they were situated along the streets (plots 2 and 25) or river banks (plots 3, 4 and 5).

The taxonomic affiliation of the studied plant communities was determined basing on the species composition and the share of particular plant species (Wysocki & Sikorski 2002) following the typology of phytosociological units and systematics of communities presented by Matuszkiewicz (2008) and the nomenclature of the vascular plants species by Mirek et al. (2002). Most phytocoenoses were classified to the rank of association, and when it was impossible, the rank was attributed with regard of the dominant plant species (plots 25, 26, 30, 34 and 35). Each plot was assigned to a particular mesoregion, further referred to as: UWR – the Upper Warta Lowland (Obniżenie Górnej Warty), CzU – Częstochowska Upland (Wyżyna Częstochowska) and WU – Wieluńska Upland (Wyżyna Wieluńska). Furthermore, the plots were assigned to the district of the town and their geographical coordinates together with the UTM (Universal Transverse Mercator) square were determined.

Fig. 1. Distribution of examined plots within Częstochowa city.

3.1. Plots within the synanthropic communities of the class *Artemisietea vulgaris*

Within the class *Artemisietea vulgaris* the research was carried out in the following plant associations: *Echio-Melilotetum* – variant with *Calamagrostis epigejos* and *Urtico-Aegopodietum podagrariae.* Phytosociological systematics:

- Cl. *Artemisietea vulgaris* LOHM., PREISING & R. TX. in R. TX. 1950
  - O. *Onopordetalia acanthii* BR.-BL. & R. TX. 1943 em. GÖRS 1966
    - All. *Onopordion acanthii* BR.-BL. 1926
      - Ass. ***Echio-Melilotetum* R. Tx. 1947 – variant with *Calamagrostis epigejos***
  - O. *Glechometalia hederaceae* R. TX. in R. TX. & BRUN-HOOL 1975
    - All. *Aegopodion podagrariae* R. TX. 1967
      - Ass. ***Urtico-Aegopodietum podagrariae* (TX. 1963 N. N.) em. DIERSCHKE 1974**

association *Echio-Melilotetum* – plots 1 and 2

Plot 1. Localization: UWR: N50°46’11”, E19°04’00”; UTM: CB62; the south-western part of town, Dźbów district, a spoil tip of the iron-ore mine “Barbara” – the biggest object of this sort in Częstochowa, with the total volume of 4608 thousand m^3, the area of 14.5 ha and altitude of 45-47 m (ADAMSKI 1994, RATAJCZAK 1998). The study was carried out in a dry and strongly sunlit valley in the plant community with the majority of *Calamagrostis epigejos* and *Solidago canadensis* and a significant share of *Melilotus albus*, *Artemisia vulgaris* and *Tanacetum vulgare*. The vegetation of this plot at the end of August was already withering and it did not undergo any management.

Plot 2. Localization: UWR: N50°47’58”, E19°05’25”; UTM: CB62; the town centre area, Stradom district, Podkolejowa Street. The study was carried out in a dry and strongly sunlit plant community overgrowing the railway subgrade. The most abundant plant species in this community comprised *Calamagrostis epigejos*, *Erigeron annuus*, *Solidago canadensis*, *Cichorium intybus*, *Tanacetum vulgare* and *Artemisia vulgaris*, but also *Sisymbrium loeselii*, *Convolvulus arvensis*, *Fallopia convolvulus*, *Chenopodium album*, *Melilotus albus*, *Hypericum perforatum*. Locally *Echium vulgare*, *Berteroa incana* and *Verbascum densiflorum* were quite abundant. The vegetation of this plot at the end of August was already withering and it did not undergo any management.

association *Urtico-Aegopodietum podagrariae* – plots 3 and 4

Plot 3. Localization: UWR: N50°49’01”, E19°08’14”; UTM: CB63; the town centre area Zawodzie district, north of G. Narutowicza Park. The plot was assigned on the right bank of the Warta, in periodically flooded phytocoenosis, with dominant abundance of Aegopodium podagraria, *Urtica dioica*, *Lamium album*, *Glyceria maxima* and *Lolium perenne* and significant abundance of *Chenopodium album*, *Artemisia vulgaris*, *Myosoton aquaticum*, *Geranium pusillum*, *Lycopus europaeus* and *Dactylis glomerata*. Also some patches of *Phalaris arundinacea* were present at the river bank. This association was mowed during the summer.

Plot 4. Localization: UWR: N50°49’11”, E19°12’04”; UTM: CB73; the north-eastern part town, Wyczerpy-Aniołów district, the vicinity of Zawodziańska Street. The plot was assigned on the left bank of the Warta, in periodically flooded phytocoenosis with the domination of *Aegopodium podagraria*, *Urtica dioica*, *Lamium album* and *Calystegia sepium*. In addition, also *Galium aparine*, *Heracleum sphondylium*, *Artemisia vulgaris* and on *Glyceria maxima* with *Phalaris arundinacea* occurred on the bank. This plant association did not undergo any management.

3.2. Plots within the reed beds associations of the class *Phragmitetea*

Two plots were assigned: one in association *Sparganio-Glycerietum fluitantis* and the other in *Phalaridetum arundinaceae* (Matuszkiewicz 2008). Phytosociological systematics:

- Cl. *Phragmitetea* R.Tx. et Prsg. 1942
  - O. *Phragmitetalia* Koch 1926
    - All. *Sparganio-Glycerion fluitantis* Br.-Bl. et Siss. in Boer 1942
      - Ass. ***Sparganio-Glycerietum fluitantis* Br.-Bl. 1925 n.n.**
    - All. *Magnocaricion* Koch 1926
      - Ass. ***Phalaridetum arundinaceae* (Koch 1926 n.n.) Libb. 1931**

association *Sparganio-Glycerietum fluitantis* – plot 5

Plot 5. Localization: WU: N50°51’25”, E19°03’50”; UTM: CB63; the north-western part of town, Grabówka – Żabiniec district, the vicinity of Ikara Street. The plot was assigned in the vegetation zone on the bank of the Białka River (Kocinka) and was regularly flooded in spring. The group of dominant plant species comprised *Glyceria notata* and *G. maxima*. *Berula erecta*. Shrubs of *Bidens frondosa* were also abundant. Other common plant species included *Pastinaca sativa*, *Aegopodium podagraria*, *Polygonum bistorta* and *Galium palustre*. In some places dense clumps of *Alnus glutinosa* were present. In all study seasons this association was mowed during the summer.

association *Phalaridetum arundinaceae* – plot 6

Plot 6. Localization: UWR: N50°49’42”, E19°10’40”; UTM: CB73; the eastern part of town, Zawodzie district, upon the Warta, at the northern end of Filtrowa Street. The plot was assigned in a complex of oxbow lakes arranged along the Warta, bearing the name of Popławski Dół. In some seasons this area was temporarily flooded. The plant association was poor in plant species, with predomination of *Phalaris arundinacea* and a small amount of *Juncus conglomeratus*, *Carex rostrata* and *Carex acuta*. There was no management in this plot.

3.3. Psammophilous grasslands of the class *Koelerio glaucae-Corynephoretea canescentis*

Within this class the study was carried out in two plant associations *Spergulo vernalis-Corynephoretum* and *Diantho-Armerietum elongatae* (Matuszkiewicz 2008). Phytosociological systematics:

- Cl. *Koelerio glaucae-Corynephoretea canescentis* Klika in Klika & Novák 1941
  - O. *Corynephoretalia canescentis* R. Tx. 1937
    - All. *Corynephorion canescentis* Klika 1934
      - Ass. ***Spergulo vernalis-Corynephoretum* (R. Tx. 1928) Libb. 1933**

- All. *Vicio lathyroidis-Potentillion argenteae* Brzeg in Brzeg & M.Wojt. 1996
  - Ass. ***Diantho-Armerietum elongatae* Krausch 1959**

association *Spergulo vernalis-Corynephoretum* – plots 7 and 8

Plot 7. Localization: CzU: N50°48'00", E19°12'50"; UTM: CB73; the eastern part of town, Mirów district, about 1 km east of Góra Ossona, the vicinity of Bursztynowa Street. The plot was assigned at a sandy area, in a dry and strongly sunlit plant community, with the dominance of *Corynephorus canescens*, *Anthoxanthum odoratum*, *Carex hirta*, *Sedum acre* and *Hieracium pilosella* and a smaller share of *Rumex acetosella*, *Euphorbia cyparissias*, *Hypericum perforatum*, *Artemisia campestris*, *Potentilla argentea*, *Trifolium arvense* and *Festuca* sp. Some individuals of *Pinus sylvestris*, *Prunus serotina* and seedlings of *Betula pendula* were also present. The density of vegetation in this plot did not exceed 40-50%. This area was not managed during the study period.

Plot 8. Localization: CzU: N50°49'17", E19°09'30"; UTM: CB73; the eastern edge of Zawodzie district, at Srebrna Street. The study plot was located at a sandy area, in a dry, strongly sunlit plant community, with the dominance of *Corynephorus canescens*, *Anthoxanthum odoratum*, *Carex hirta*, *Sedum acre*, *Hieracium pilosella* and *Armeria maritima*, and insignificant abundance of *Medicago lupulina*, *Dianthus deltoides* and *Anchusa officinalis*. The edge of the community was overgrown by *Calamagrostis epigejos*, *Melilotus officinalis, Euphorbia cyparissias*, *Artemisia vulgaris*, *A. campestris*, *Centaurea maculosa*, *Erigeron acris*, *Festuca* sp. and *Poa* sp. The density of vegetation here was higher than that on a previous plot, reaching almost 90%, but this area was not managed either.

association *Diantho-Armerietum elongatae* – plot 9

Plot 9. Localization: WU: N50°50'54", E19°08'12"; UTM: CB63; the northern part of the town, Tysiąclecie district. The plot was located in the barren at Generała S. Sosabowskiego Street, at a dry, sunlit site, with the dominance of *Agrostis capillaris*, *Cerastium arvense*, *Dianthus deltoides*, *Thymus serpyllum*, *Anthoxanthum odoratum*, *Festuca pratensis*, *Luzula campestris*, *Plantago lanceolata*, *Potentilla argentea* and *Hypericum perforatum* and smaller abundance of *Medicago lupulina*, *Trifolium pratense*, *Lotus corniculatus*, *Hieracium pilosella*, *Senecio jacobaea*, *Tanacetum vulgare*, *Artemisia campestris*, *Poa pratensis*, *Bromus mollis*, *Holcus lanatus* and *Calamagrostis epigejos*. This plant community was not managed during the study.

3.4. Anthropogenic and semi-natural meadows of the class *Molinio-Arrhenatheretea*

Within the phytocoenoses of the class *Molinio-Arrhenatheretea*, the research was carried out on 17 study plots, comprising the plant communities belonging to 3 orders: the anthropogenic grasslands of *Plantaginetalia majoris*, semi-natural meadow communities, permanently or temporarily moist meadows of *Molinietalia caeruleae* and semi-natural, moderately moist meadows of *Arrhenatheretalia elatioris* (Matuszkiewicz 2008). Phytosociological systematics:

- Cl. *Molinio-Arrhenatheretea* R. Tx. 1937
  - O. *Plantaginetalia majoris* R. Tx. (1943) 1950
    - All. *Polygonion avicularis* Br.- Bl. 1931 ex Aich. 1933
      - Ass. ***Lolio-Polygonetum arenastri* Br.-Bl. 1930 em. Lohm. 1975**

- O. *Molinietalia caerulae* W. Koch 1926
  - All. *Filipendulion ulmariae* Segal 1966
    - Ass. ***Valeriano-Filipenduletum* Siss. in Westh. et al. 1946**

  - All. *Calthion palustris* R. Tx. 1936 em. Oberd. 1957
    - Ass. ***Cirsietum rivularis* Nowiński 1927**
    - Ass. *Scirpetum silvatici* Ralski 1931

  - All. *Alopecurion pratensis* Pass. 1964
    - Ass. ***Alopecuretum pratensis* (Regel 1925) Steffen 1931**

- O. *Arrhenatheretalia elatioris* Pawł. 1928
  - All. *Arrhenatherion elatioris* (Br.-Bl. 1925) Koch 1926
    - Ass. ***Arrhenatheretum elatioris* (Br.-Bl.) ex Scherr. 1925**

    - other plant communities: ***Achillea millefolium-Taraxacum officinale*** and ***Dactylis glomerata***

3.4.1. Anthropogenic plant communities of the order *Plantaginetalia majoris*

association *Lolio-Polygonetum arenastri* – plots 10, 11, 12 and 13

Plot 10. Localization: UWR: N50°48'26", E19°04'50"; UTM: CB63; the western part of town, Recreational Park "Lisiniec", at the corner of A. Kordeckiego Street and adjacent to the town centre Świętej Jadwigi Street. The plot was allocated on a strongly sunlit, intensely mowed lawn, with the dominance of *Lolium perenne*, *Plantago major*, *Trifolium pratense* and *T. repens*, and significant abundance of *Dactylis glomerata*, *Holcus lanatus* and *Festuca pratensis*.

Plot 11. Localization: UWR: N50°49'00", E19°07'08"; UTM: CB63; Śródmieście district, the crossroads of Jana Pawła II and Tadeusza Kościuszki Avenues. The study plot was assigned on a sunlit, intensely mowed lawn adjacent to the street, with the dominance of *Lolium perenne*, *Polygonum aviculare*, *Trifolium repens*, and the presence of *Capsella bursa-pastoris*, *Geranium pusillum*, *Medicago lupulina*, *Carex hirta*, *Dactylis glomerata*, *Festuca pratensis* and *Bromus mollis*.

Plot 12. Localization: UWR: N50°48'43", E19°08'04"; UTM: CB62; the town centre, the vicinity of Stare Miasto, Wojska Polskiego Avenue and G. Narutowicza Park. The plot was allocated on a mown lawn, in its sunlit part, with the dominance of *Plantago lanceolata*, *Trifolium pratense*, *Arrhenatherum elatius* and *Bromus hordeaceus*, where also *Lolium multiflorum*, *Achillea millefolium*, *Erigeron annuus*, *Capsella bursa pastoris*, *Berteroa incana*, *Taraxacum officinale* were present and some planted trees of *Salix alba* occurred.

Plot 13. Localization: WU: N50°50'02", E19°07'09"; UTM: CB63; the town centre, Tysiąclecie district, a park lawn at Czesława Niemena Promenade. The plot was allocated on a sunlit, intensely mown lawn, with the dominance of *Poa annua* and *P. pratensis* and significant abundance of *Plantago lanceolata*, *Capsella bursa-pastoris*, *Trifolium pratense*, *Lolium perenne*, *Deschampsia caespitosa* and *Lolium multiflorum*.

3.4.2. Moist meadows of the order *Molinietalia caeruleae*

association *Valeriano-Filipenduletum* – plot 14

Plot 14. Localization: UWR: N50°45’45”, E19°01’12”; UTM: CB62; the south-western part of town, Dźbów district, Leśna Street. The plot was assigned in the buffer-zone of the projected forest-peat bog reserve “Trzęślicowa łąka pod Walaszczykami” in not mowed, moist plant community with the dominance of *Valeriana officinalis*, *Lysimachia vulgaris*, *Stachys palustris*, *Betonica officinalis*, *Serratula tinctoria* and *Filipendula ulmaria* and smaller abundance of perennial plants, such as *Selinum carvifolia* and *Centaurea jacea*. Other abundant plant species were *Ranunculus acris*, *R. repens*, *Inula conyza*, *Cardamine pratensis*, *Alliaria petiolata*, *Glechoma hederacea*, *Lychnis flos-cuculi*, *Moehringia trinervia*, *Symphytum officinale*, *Erodium cicutarium*, *Galium verum*, *Gallium mollugo* and *Lathyrus pratensis*, with additional presence of grasses: *Alopecurus pratensis*, *Deschampsia caespitosa*, *Festuca pratensis*, *Dactylis glomerata* and *Phleum pratense*.

association *Cirsietum rivularis* – plots 15 and 16

Plot 15. Localization: WU: N50°49’59”, E19°04’01”; UTM: CB63; the north-western part of town, Grabówka district, between Krzemienna and Luba Streets. The plot was assigned in the moist plant community of natural character, developed on peat bog soil, with significant abundance of *Cirsium rivulare*, *Galium uliginosum*, *Epilobium hirsutum*, *Lotus uliginosus*, *Caltha palustris* and *Dactylorhiza majalis* and scarce abundance of *Ranunculus acris*, *Lychnis flos-cuculi* and *Festuca pratensis* and also some undetermined species of the genus *Carex*. The northern edge of the plot was overgrown by *Salix cinerea*, *Typha latifolia* and *Scirpus sylvaticus*. This plot was not managed during the study.

Plot 16. Localization: UWR: N50°46’06”, E19°09’27”; UTM: CB62; the southern part of town, Błeszno district at Długa Street. The plot was localized along the borders of the projected ecological site: “Młaka in Błesznie”. Until recently, the complex of moist meadows was relatively well preserved, but after melioration it deteriorated (Cabała et al. 2009e). On the study plot *Cirsium rivulare* and *Dactylorhiza majalis* were very frequent but also others, such as *Calamagrostis epigejos*, *Briza media* and *Solidago canadensis* were present, which indicated the progressive degradation of this habitat (Cabała et al. 2009e). Moreover, the occurrence of *Rhinanthus minor*, *Vicia sepium*, *Lathyrus pratensis*, *Potentilla anserina*, *Ranunculus acris*, *Knautia arvensis*, *Trifolium pratense*, *Taraxacum officinale*, *Galium verum*, *Alopecurus pratensis*, *Poa pratensis*, *Dactylis glomerata* and *Anthoxanthum odoratum* was noted.

association *Scirpetum silvatici* – plots 17 and 18

Plot 17. Localization: WU: N50°49’57”, E19°04’07”; UTM: CB63; the north-western part of town, Grabówka district, between Krzemienna and Luba Streets. The plot was assigned in the moist, sometimes partly flooded plant community with the dominance of *Scirpus sylvaticus* and less abundant *Lysimachia vulgaris*, *Polygonum persicaria* and undetermined species of the genus *Carex*. In the northern part of this plot the shrubs of *Salix cinerea* were present, while from the south some barren-type vegetation (e.g. *Urtica dioica* or *Artemisia vulgaris*) was advancing. The area was not managed during the study.

Plot 18. Localization: UWR: N50°45’49”, E19°01’19”; UTM: CB62; the south-western part of town, district Dźbów, the vicinity of Leśna Street. The plot was assigned in the buffer zone of the projected forest-peat bog reserve "Trzęślicowa łąka pod Walaszczykami", in a short distance from a small water reservoir. The study area was periodically partly flooded. The dominant species here was *Scirpus sylvaticus*, and also *Lythrum salicaria*, *Juncus effusus* and *Carex vulpina* were present. The area was never managed.

association *Alopecuretum pratensis* – plots 19 and 20

Plot 19. Localization: UWR: N50°45'56", E19°01'37"; UTM: CB62; the south-western part of town, Dźbów district, the vicinity of Leśna Street. The plot was located in the buffer zone of the projected forest-peat bog reserve "Trzęślicowa łąka pod Walaszczykami", in the moist habitat, with the dominance of *Alopecurus pratensis*, *Festuca pratensis*, *Holcus lanatus*, *Deschampsia caespitosa*, *Dactylis glomerata* and *Phleum pratense*. This area was mowed during the summer.

Plot 20. Localization: WU: N50°51'20", E19°03'52"; UTM: CB63; the north-western part of town, Grabówka – Żabieniec district, at Ikara Street. The plot was located on a moist, intensely mowed meadow with the dominance of *Holcus lanatus*, *Alopecurus pratensis*, *Poa pratensis* and *Deschampsia caespitosa*, and also with some other perennial species present, e.g.: *Ranunculus acris*, *Galium palustre*, *Lychnis flos-cuculi*, *Rumex acetosa*, *Carex acuta*, *Anthoxanthum odoratum* and *Agrostis stolonifera*.

3.4.3. Meadows of the order *Arrhenatheretalia elatioris*

association *Arrhenatheretum elatioris* – plots 21, 22, 23 and 24

Plot 21. Localization: UWR: N50°49'01", E19°08'11"; UTM: CB63; the town centre, Zawodzie district, the vicinity of Jana Pawła II Avenue, closely to the left bank of the Warta, in a fecund, temporarily flooded river valley. The dominant species here included *Arrhenatherum elatius* and *Dactylis glomerata* and the group of less abundant ones comprised *Trifolium pratense*, *T. repens*, *Achillea millefolium*, *Heracleum sphondylium*, *Phleum pratense*, *Lolium perenne*, *Holcus lanatus*, *Festuca* sp., *Convolvulus arvensis*, *Cardaminopsis arenosa*, *Melandrium album*, *Rumex obtusifolius*, *Artemisia vulgaris* and *Tanacetum vulgare*. This area was mowed during the summer.

Plot 22. Localization: UWR: N50°49'11", E19°12'00"; UTM: CB73; the north-eastern part of town, Wyczerpy-Aniołów district, the vicinity of Zawodziańska Street. The study was conducted on the intensely mowed meadow, situated in the fecund river valley, closely to the left bank of the Warta. The most abundant species in this plant community included *Arrhenatherum elatius*, *Dactylis glomerata* and *Phleum pretense*, with admixture of *Potentilla reptans*, *Achillea millefolium*, *Taraxacum officinale*, *Plantago lanceolata*, *Trifolium pratense*, *Festuca rubra*, *Poa angustifolia*, *Carex hirta* and *Juncus tenuis*.

Plot 23. Localization: CzU: N50°49'02", E19°09'07"; UTM: CB63; the eastern part of town, Zawodzie district, the vicinity of the lime kiln "Saturn" at Jurajska Street. The plot was assigned on a strongly sunlit, mowed meadow, with the dominance of *Arrhenatherum elatius*, *Dactylis glomerata* and *Galium mollugo*. Some forage species might have been sown in this community as indicated by the significant presence of such species as Trifolium pretense, *Medicago falcata*, *M. lupulina* and *M.* ×*varia*. Other perennial plants present here included *Rumex acetosa*, *Arenaria serpyllifolia*, *Cerastium arvense*, *Coronilla varia*, *Vicia cracca*, *Convolvulus arvensis*, *Papaver rhoeas*, *Plantago lanceolata*, *Knautia arvensis*, *Erigeron annuus*, *Achillea millefolium*, *Artemisia vulgaris*, *Senecio jacobaea*, *Tragopogon pratensis* and grasses: *Festuca rubra*, *Lolium perenne* and *Holcus lanatus*.

Plot 24. Localization: WU: N50°49'56", E19°08'11"; UTM: CB63; the town centre, Tysiąclecie district, in the vicinity of Kule cemetery, at Gen. A. Fieldorfa-Nila Street. The plot was assigned in a mowed city barren, with the dominance of *Arrhenatherum elatius*, *Dactylis glomerata*, *Galium aparine*, *Galium mollugo*, *Equisetum arvense* and *Rumex thyrsiflorus*. Additionally, such perennials as *Convolvulus arvensis*, *Potentilla argentea*, *Potentilla reptans*, *Hypericum perforatum*, *Daucus carota* and grasses (*Anthoxanthum odoratum*, *Agrostis tenuis*, *Festuca* sp.) were also present.

association *Achillea millefolium-Taraxacum officinale* – plot 25

Plot 25. Localization: UWR: N50°49'01", E19°07'36"; UTM: CB63; Śródmieście district, Jana Pawła II Avenue. The plot was assigned between two lanes. It was strongly sunlit and warmed and its humidity strongly depended on the rate of precipitation. It was also strongly salinized after road de-icing in winter. Hence, the presence of a halophilous species, *Puccinellia distans*. The whole area was regularly and intensely mowed. The dominant species were *Lolium perenne*, *Berteroa incana*, *Achillea millefolium* and *Taraxacum officinale*; other perennial plants included *Trifolium pratense*, *Polygonum aviculare*, *Capsella bursa-pastoris* and *Geranium pusillum*.

association with *Dactylis glomerata* – plot 26

Plot 26. Localization: UWR: N50°49'21", E19°12'02"; UTM: CB73; the north-eastern part of town, Wyczerpy-Aniołów district, the vicinity of Zawodziańska Street, beyond the levee on the Warta. The plot was located on the barren, which was a post-arable field, where no management was conducted. The plant community was dominated by *Dactylis glomerata*, *Achillea millefolium*, *Artemisia vulgaris*, *Hypericum perforatum* and *Urtica dioica*, with significant abundance of *Cerastium holosteoides*, *Melandrium album*, *Potentilla erecta*, *P. reptans*, *Sisymbrium altissimum*, *Viola tricolor*, *Myosotis arvensis*, *Galium mollugo*, *Scrophularia nodosa*, *Verbascum densiflorum*, *Veronica agrostis* and J*asione montana*. In a few places single clumps of *Lolium perenne*, *Sieglingia decumbens*, *Anthoxanthum odoratum*, *Phleum pratense*, *Alopecurus pratensis*, *Holcus lanatus*, *Calamagrostis epigejos* and *Agrostis gigantea* were present.

3.5. Xerothermic grasslands of the class *Festuco-Brometea*

Within the class *Festuco-Brometea* the planthoppers were collected in three alliances: *Festucetum pallentis*, *Sileno-Phleetum* and *Adonido-Brachypodietum pinnati* (Matuszkiewicz 2008). Phytosociological systematics:

- Cl. *Festuco-Brometea* Br.-Bl. et R. Tx. 1943
  - O. *Festucetalia valesiaceae* Br.-Bl. et R. Tx.1943
    - All. *Seslerio-Festucion duriusculae* Klika (1931) 1948
      - Ass. ***Festucetum pallentis* (Kozł. 1928) Kornaś 1950**

    - All. *Phleion boehmeri* Głowacki 1972
      - Ass. ***Sileno-Phleetum* Głowacki 1972**

- All. *Cirsio-Brachypodion pinnati* Hadač et Klika 1944 em. Krausch 1961
  - Ass. ***Adonido-Brachypodietum pinnati* (Libb. 1933) Krausch 1960**

association *Festucetum pallentis* – plot 27

Plot 27. Localization: CzU: N50°47'59", E19°12'14"; UTM: CB72; the eastern part of town, Mirów district. The plot was located at the highest point of the town – at the peak of Góra Ossona (316.7 m a. s. l.) (Hereźniak et al. 1970, 1973, Cabała et al. 2009c), in a strongly sunlit, dry plant community, with the dominance of *Festuca pratensis*, *Bromus secalinus, Anthoxanthum odoratum*, *Agrostis capillaris*, *Phleum phleoides* and *Allium* sp. Other abundant plant species included: *Euphorbia cyparissias*, *Thymus pulegioides*, *Centaurea scabiosa*, *Dianthus carthusianorum* and *Fragaria viridis*. In a few places, there were dense clumps of *Vincetoxicum hirundinaria*, *Scabiosa ochroleuca*, *Gallium verum* and *Briza media*, and the perennials of scarce occurrence were represented by *Medicago falcata*, *M. sativa*, *Anthyllis vulneraria*, *Jasione montana*, *Hypericum perforatum*, *Verbascum nigrum*, *Trifolium arvense*, *Coronilla varia*, *Veronica spicata*, *Sanguisorba minor*, *Filipendula vulgaris*, *Helianthemum nummularium*, *Echium vulgare*, *Silene vulgaris*, *Carlina vulgaris* and *Thalictrum minus* spp. This area was not managed.

association *Sileno-Phleetum* – plot 28

Plot 28. Localization: CzU: N50°47'26", E19°11'59"; UTM: CB72; the eastern part of town, Zawodzie district. The plot was assigned on the Jurassic outcrop Góra Prędziszów – one of the highest peaks of Częstochowa (298.2 m a. s. l.) (Hereźniak et al. 1970, 1973, Cabała et al. 2009c), in the strongly sunlit, dry plant community with the dominance of *Phleum phleoides* and significant abundance of *Poa compressa*, *Thymus pulegioides*, *Galium mollugo*, *Fragaria viridis*, *Trifolium arvense*, *Euphorbia cyparissias*, *Centaurea scabiosa*, *Scabiosa ochroleuca* and *Anemone sylvestris*. The group of less abundant perennials comprised *Rumex acetosa*, *Silene vulgaris*, *Melandrium album*, *Hypericum perforatum*, *Agrimonia eupatoria*, *Sanguisorba minor*, *Potentilla argentea*, *Silene nutans*, *Trifolium arvense*, *Veronica spicata*, *Verbascum lychnitis*, *Knautia arvensis*, *Linaria vulgaris*, *Achillea millefolium*, *Senecio jacobaea*, *Artemisia vulgaris*, *A. campestris*, *Tanacetum vulgare*, *Senecio jacobaea*, *Cirsium arvense* and *Poa pratensis*. Expansive and invasive species – *Arrhenaterum elatius*, *Calamagrostis epigejos*, *Elymus repens* and *Solidago canadensis* respectively, advanced into this community and also shrubs of *Crathaegus monogyna*, *Rosa canina* and *Prunus spinosa* were present. This area was not managed during the research.

association *Adonido-Brachypodietum pinnati* – plot 29

Plot 29. Localization: CzU: N50°47'54", E19°12'22"; UTM: CB72; the eastern part of town, Mirów district. The plot was assigned on the southern, dry and strongly sunlit slope of the hill Góra Ossona, in the plant community with the dominance of *Brachypodium pinnatum* and *Anthericum liliago*. Other plants were most abundantly represented by *Vincetoxicum hirundinaria*, *Anthericum ramosum*, *Dianthus carthusianorum*, *Centaurea scabiosa*, *Scabiosa ochroleuca*, *Thymus pulegioides*, *Anthoxanthum odoratum*, *Phleum phleoides* and *Festuca pratensis*, while such species as *Sanguisorba minor*, *Pimpinella saxifraga*, *Peucedanum oreoselinum*, *Anthyllis vulneraria*, *Medicago falcata*, *Lotus corniculatus*, *Echium vulgare*, *Helianthemum nummularium* ssp. *obscurum*, *Knautia arvensis*, *Hypericum* *perforatum*, *Carlina acaulis*, *C. vulgaris*, *Hieracium pilosella*, *Achillea collina* and *Bromus inermis* were rare. The edge of this area was overgrown by shrubs of *Crataegus monogyna* and *Prunus spinosa*. This area was not managed during the research.

3.6. Forest associations of the class *Querco-Fagetea*

The class *Querco-Fagetea* comprises forest communities classified as the association *Tilio cordatae-Carpinetum betuli*, associations of the alliance *Alno-Ulmion* and associations of the alliance *Quercus robur-Pinus sylvestris*. Phytosociological systematics:

- Cl. *Querco-Fagetea* Br.-Bl. et Vlieg. 1937
    - O. *Fagetalia sylvaticae* Pawł. in Pawł., Sokoł. et Wall. 1928
        - All. *Alno-Ulmion* Br.-Bl. et R. Tx. 1943 (**association of the alliance *Alno-Ulmion***)
        - All. *Carpinion betuli* Issl. 1931 em. Oberd. 1953
            - Ass. ***Tilio cordatae-Carpinetum betuli* Tracz. 1962**
                - **association: *Quercus robur-Pinus sylvestris***

association of the alliance *Alno-Ulmion* – plot 30

Plot 30. Localization: UWR: N50°48'36", E19°04'34"; UTM: CB63; the western part of town, Lisiniec district, Recreational Park "Lisiniec", the vicinity of Inowrocławska Street. The park was established by planting poplar hybrids and seedlings of other tree species (Cabała et al. 2009f). The plot was located in the southern part of park, at a shaded and humid site. In the community structure, a few layers could be easily distinguished: the groundcover with the dominance of *Lysimachia vulgaris*, *Deschampsia caespitosa*, *Dactylis glomerata* and *Carex flacca* and lesser abundance of *Molinia caerulea*, *Alopecurus pratensis* and *Luzula campestris*; the understory comprising *Prunus serotina*, *Populus tremula* and *Betula pendula* and the canopy, built up by *Fraxinus excelsior*, *Alnus glutinosa* and planted trees of *Populus* spp. and *Salix alba*. This plot was not managed during the study period.

association *Tilio cordatae-Carpinetum betuli* – plots 31, 32 and 33

Plot 31. Localization: WU: N50°50'37", E19°08'43"; UTM: CB63; the northern part of town, Wyczerpy-Aniołów district, "Lasek Aniołowski" Park. It is a town park with forest vegetation of a near continental hornbeam-oak forest type (Cabała et al. 2009a). The plot was assigned in its western part at a shaded and partly humid site. In the groundcover, the dominant species included *Hedera helix*, *Ranunculus acris*, *Plantago major* and *Dactylis glomerata*, with the addition of a few dense shrubs of *Urtica dioica* and *Rubus idaeus*. The understory consisted of *Sambucus nigra* and *Frangula alnus*. The tree canopy was built up by *Carpinus betulus*, *Tilia cordata*, *Acer pseudoplatanus* and *Betula pendula*, with also alien species present: *Quercus rubra* and *Robinia pseudoacacia*. During the summer, the groundcover in the park was mowed.

Plot 32. Localization: CzU: N50°49'20", E19°13'43"; UTM: CB73; the eastern part of town, Mirów district, the vicinity of Wodociągowa Street. The plot was assigned on the calcareous hill in the projected forest reserve "Gąszczyk" (Hereźniak 2000, Zygmunt data unpublished). In the over-shaded groundcover the monocotyledonous species were dominant: *Melica nutans*, *Deschampsia flexuosa*, and locally also *Alopecurus pratensis*, *Deschampsia caespitosa*, *Luzula pilosa* as well as *Convallaria majalis* and *Maianthemum bifolium*, which grew in the dense agglomerations. The group of less abundant comprised *Mercurialis perennis*, *Campanula persicifolia*, *Phyteuma spicatum*, *Hieracium murorum*, *Sanguisorba officinalis*, *Filipendula ulmaria*, *Genista tinctoria*, *Daucus carota*, *Melampyrum nemorosum*, *Campanula rapunculoides*, *Mycelis muralis* and *Pteridium aquilinum*. In the understory, the following species were present: *Frangula alnus*, *Lonicera xylosteum*, *Corylus avellana*, *Sorbus aucuparia*, *Crataegus monogyna* and the seedlings of *Carpinus betulus*. The tree layer consisted mainly of *Carpinus betulus*, *Tilia cordata*, *Quercus robur*, *Acer platanoides*, *Betula pendula* and *Populus tremula*. This plot was not managed during the study period.

Plot 33. Localization: CzU: N50°48'28", E19°13'14"; UTM: CB73; the eastern part of town, Mirów district, the vicinity of Bursztynowa Street. The plot was assigned on the calcareous hill (301 m a. s. l.) in the projected forest reserve "Góra Kokocówka", overgrown by the near continental hornbeam-oak forest in the initial stage, of natural character (Hereźniak 2000, Cabała et al. 2009a, 2009c). In the over-shaded groundcover the dominant species comprised *Aegopodium podagraria*, *Melittis melissophyllum*, *Campanula persicifolia*, *Convallaria majalis*, *Melica nutans* and *Brachypodium sylvaticum*. Additionally, such spectacular species were present as: *Stellaria nemorum*, *Ranunculus repens*, *Thalictrum aquilegifolium*, *Fragaria vesca*, *Geum urbanum*, *Geranium sanguineum*, *Veronica chamaedrys*, *Melampyrum nemorosum*, *Leucanthemum vulgare* and *Lathyrus vernus*. Other species present in the understory included: *Frangula alnus* and at the edges: *Euonymus verrucosa*, *Cornus sanguinea*, *Crataegus monogyna* and seedlings of *Malus domestica*. The tree layer was built of *Betula pendula* and *Populus tremula*. This plot was not managed during the study period.

association *Quercus robur-Pinus sylvestris* – plot 34 and 35

Plot 34. Localization: CzU: N50°48'08", E19°13'17"; UTM: CB73; at the eastern town border, Mirów district, the vicinity of Bursztynowa Street. The plot was assigned at a partly shaded site. The groundcover was abundantly overgrown by *Pteridium aquilinum* and *Vaccinium myrtillus*, associated by assemblages of *Rubus idaeus* and *Rubus* sp. The understory had the abundance of *Frangula alnus* and seedlings of *Quercus robur*. The tree layer was built of *Pinus sylvestris* and *Quercus robur*. During the research the area was not managed, however, in 2011 the trees were cut down at an extensive area and the plot ceased to exist.

Plot 35. Localization: UWR: N50°45'49", E19°00'55"; UTM: CB62; at the western border of the town, between Dźbów district and Walaszczyki village. The plot was assigned in the partly shaded groundcover with the dominance of grasses *Deschampsia* sp., *Molinia caerulea* and *Calamagrostis canescens* and a significant amount of *Pteridium aquilinum*, *Vaccinium myrtillus*, *Rubus idaeus* and *Rubus* sp. In the undercover *Frangula alnus* and seedlings of *Quercus robur* were abundant. The tree layer was built of *Pinus sylvestris* with small admixture of *Quercus robur*. This forest was not managed during the research.

4. Material and methods

Planthoppers and leafhoppers are insects with specialized trophic affiliations as most of them are monophagous or oligophagous on various seed plants (Ossiannilsson 1978). It was confirmed by Nickel (2003) during the research in Germany that 59% of species in this country are monophagous while 24% are oligophagous. Furthermore, it was demonstrated that 2/3 of the planthopper species in Germany were associated with only 6 families of plants: Poaceae, Cyperaceae, Fagaceae, Betulaceae, Salicaceae and Rosaceae, with Poaceae being a host family for at least 210 species i.e. 34% of the planthopper fauna of Germany (Nickel 2003). There are also many species of Fulgoromorpha connected with fungi, mosses and various horsetails (Equisetaceae) and ferns (Wheeler 2003, Wilson 2005).

The studied insects are important vectors of viruses and bacteria, including phytoplasmas (Nowacka & Hoppe 1969, Raatikainen 1970, Nielson 1979, Kamińska et al. 2001, Mizell et al. 2003, Battle et al. 2008) and mycoplasmas (Kochman & Książek 1964, Kochman & Węgorek 1997, Kamińska & Soika 2001, Klejdysz & Wałkowski 2008), and also pathogen fungi (Nickel 2003) responsible for various plant diseases. Thus, indirectly, they cause plant growth disturbances and decrease the productivity of crops (Andrzejewska 1962, Łuczak 1978). Moreover, the species which are not vectors of pathogens may contribute to losses through intense feeding (Wilson 2005).

Alien species of planthoppers may pose a serious problem for local faunas as well. Among twelve species alien to European fauna (Arzone et al. 1986, Seljak 2002, Mifsud et al. 2010, Świerczewski & Stroiński 2011a), three have been recorded in Poland so far: *Stictocephala bisonia* Kopp & Yonke, 1977 (Świerczewski & Stroiński 2011a), *Graphocephala fennahi* Young, 1977 (Soika & Łabanowski 2000) and *Japananus hyalinus* (Osborn, 1900) (Walczak et al. 2012). All of them originate from Nearctic (Osborn 1900, Seljak 2002), and some of them are invasive (Lauterer et al. 2011).

4.1 Planthoppers communities – review of terminology

The attempts to define communities of living organisms were first undertaken about 100 years ago. At that time the term **synusium** was used (Gams 1918 after: Szujecki 1983), which denoted an ecological assemblage present at a particular area whose components depended more on themselves than on others of this biocoenosis. Synusium was further given various names, such as: stratocoenosis, choriocoenosis, connecs, merocoenosis and cariocoenosis (Szujecki 1983).

The term **community, applied in this study**, was introduced by Ramensky (1952), and further developed by Łuczak and Wierzbowska (1981), who defined it as all species co-occurring in a particular habitat or in its particular layer, belonging to a particular systematic group. Such a group is studied by a zoologist-specialist who concentrates on its own structural features such as the number of species and their abundance. Pawlikowski (1985) developed a very similar concept in his study devoted to bee communities (Hymenoptera, Apoidea). He defined a community as a group of species constantly present in the habitat (by direct relationship) and occurring temporarily (through migration or host alternation) with weakly recognized internal interrelationships. Other definition describes the community as an assemblage of plants and (or) animals occurring together and showing relationships of various constancy (Smith 1955 after: Smoleński 2000). Accordingly, in reference to planthoppers community the terms: assemblage (Eyre et al. 2001), zoom and guild (Jürisoo 1964) were applied.

The term **community** is used in **zoocoenology** and it is opposite to the term **association**, which is applied in **phytosociology, and in this meaning it is applied in this work**. Nonetheless, the term association may be used for describing the species composition and the abundance of planthoppers and may be alternatively used with the term community (Klimaszewski et al. 1980a, 1980b). Planthopper communities were sometimes also described under the term alliance (Gębicki et al. 1977). This ecological unit is characterized by the fact that ecological niches of the co-occurring species overlap; thus the composition and abundance of particular species depend on competition within the alliance (Łuczak 1953 after: Trojan 1992). The term association was used to describe communities of planktonic crustaceans (Lityński 1938), and also to describe communities of planthoppers by Gębicki (1987). Chodorowski (1960) proposed the term **taxocen** as an alternative to association while describing the results of quantitative faunistic research. The term was later applied also by Hutchinson (1967). It is defined as a group of related organisms belonging to at least two different species occurring in a particular habitat and having a similar structure of abundance in consecutive seasons.

Other terms applied in zoogeography are: a **faunistic group** and a **faunistic complex**, referring to communities of species with a similar geographical distribution (Ševčenko 1961 after: Trojan 1992, Violovich 1968 after: Trojan 1992). Also the term: a **competitive community** can be used, referring to a community of species living in the same area and having similar trophic requirements (e.g. the same source of food) and common enemies (Łuczak & Prot 1967 after: Trojan 1992). Another term is zoocoenosis, which refers to the group of organisms, having a defined set of species, and the intrinsic relations between its components may be established by such parameters as: species composition, their abundance and connection with the abiotic environment (Łuczak & Wierzbowska 1981).

Some attempts were also made to link studied communities to phytosociological taxa of a higher rank, creating so called **circles of communities** (Gębicki 1983, Herczek 1987, Gaj et al. 2009, Świerczewski & Wojciechowski 2009). Such clusters of similar communities connected with particular phytosociological units are often supported by cluster analysis or Principal Component Analysis and result from the presence of common species in communities.

The above presented review indicates how difficult it is to study the actual structure of insect communities as variable and dynamic systems of interdependent elements (Pawlikowski 1992).

4.2 Collection and identification of material

To collect the material a standard entomological sweep-net was applied (Ø = 0.35 m), which is a very useful device for quantitative research allowing to observe the changes in abundance of insects throughout the season (Gray & Treloar 1933, Łuczak & Wierzbowska 1959, Andrzejewska 1962, Andrzejewska & Kajak 1966, Gębicki et al. 1977, Gębicki 1979, Klimaszewski et al. 1980a, 1980b, Chudzicka 1986, Stewart 2002). The seasonal dynamics of planthopper community abundance changes under the influence of secondary succession and anthropogenic factors. The latter include mowing, sowing and planting of ornamental plant species, using mineral fertilizers, applying pesticides (Andrzejewska 1976, 1979a, 1979b, 1991, Chudzicka 1989) and grazing (Morris 1973, 1981a, 1981b, 1990a, 1990b). These factors cause changes in the abundance and total biomass of planthoppers in the community.

The quantitative research was conducted on the above described 35 study plots, including 29 with grassy and herbaceous associations and 6 comprising the forest groundcover. On each plot the material was collected during three growing seasons, in about 2 week long intervals between May and October. On most plots the studies were carried out between 2005 and 2007 or 2006 and 2008 (but sometimes there were gap in the course of studies), plots

14, 15, 17 and 18 were examined between 2008 and 2010 (Tables 2-36). From the surface of each plot during a single day 4 samples were taken, where a single sample consisted of 25 hits with a sweep-net (100 hits in total on a given plot). Thus, during the research a total of 132 samples was collected from each plot, consisting of 3300 hits with a sweep-net (11 collections, 44 samples and 1100 hits in a single year of study). This came to a total of 4620 samples from all plots. During unfavourable weather conditions the time of sampling was postponed, choosing only dry, sunny days with slight or no wind at all. The specimens of planthoppers were extracted from the sweep-net with the application of pooter, transferred to glass tubes or bigger containers labelled with the date and study plot number, and finally, the insects were put down with ethyl acetate ($CH_3COOC_2H_5$). The identification of the specimens was based mainly on the structure of the genital apparatus, sometimes also on the stridulatory apparatus of males. Structures were extracted from the body and mounted using 10% solution of KOH, according to the procedure developed by Knight (1965). The collected specimens are deposited in the collection of the Department of Zoology, Faculty of Biology and Environmental Protection of the University of Silesia in Katowice. Data of all species collected in Częstochowa will be presented in Walczak et al. (2015).

It was intended to enrich the number of collected species with rare and rarely found ones. Thus, simultaneously with the quantitative research, the material was collected using qualitative methods on the whole territory of Częstochowa. In order to do that, sweep-netting was also applied to deliberately chosen trees, shrubs and clumps of herbaceous plants occurring beyond the study plots in meadow and forest associations. This was also performed in hedgerows of built-up areas, tree avenues and flower gardens. In forest associations the canopy was sweep-netted up to the height of ca. 6 m, using a sweep-net with long, telescopic stick. Furthermore, the Moericke's traps and light traps were applied. Sometimes, also single, accidently found specimens were collected with a pooter, contributing to our understanding of the trophic relations of species with their host plants. The material for qualitative research was collected between 2005 and 2012, providing the total of 476 samples.

Most of the collected material was identified with the following keys: Dlabola 1954, Logvinenko 1975, Ossiannilsson (1978, 1981, 1983), Holzinger et al. (2003) and Biedermann & Niedringhaus (2004). In some cases, specialised papers on particular genera were applied: *Muellerianella* Wagner, 1963 (Booij 1981), *Ribautodelphax* Wagner, 1963 (Bieman 1987), *Utecha* Emeljanov 1996 (Gębicki 2003), *Aphrodes* Curtis, 1833 (Tišečkin 1998), *Alebra* Fieber, 1872 (Gillham 1991), *Forcipata* DeLong & Caldwell, 1936 (Gniezdilov 2000), *Kybos* Fieber, 1866 (Dworakowska 1976, Mühlethalter et al. 2009), *Eupteryx* Curtis, 1833 (Le Quesne 1974), *Zyginidia* Haupt, 1929 (Dworakowska 1970c), *Zygina* Fieber, 1866 (Dworakowska 1970a), *Arboridia* Zachvatkin, 1946 (Dworakowska 1970b), *Balclutha* Kirkaldy, 1900 (Knight 1987), *Macrosteles* Fieber, 1866 (Gajewski 1961), *Doratura* J. Sahlberg, 1871 (Dworakowska 1968b), *Fieberiella* Signoret, 1880 (Dlabola 1965), *Rhopalopyx* Ribaut, 1939 (Dmitriev 1999), *Elymana* DeLong, 1936 (Dworakowska 1968a) and *Arthaldeus* Ribaut, 1947 (Remane 1960).

The correctness of identification of some specimens was confirmed by Dr. Cezary Gębicki from the Department of Zoology and Ecology of Animals of the Institute of Chemistry, Environmental Protection and Biotechnology of Jan Długosz University in Częstochowa. This is indicated with the species descriptions. The nomenclature of species and their systematic arrangement were applied following Nickel & Remane (2002), which is presented in Table 1.

Data on the ecology of species were taken from papers concerning local faunas (Szwedo 1999, Pilarczyk & Szwedo 2005, Simon & Szwedo 2005, Świerczewski 2007, Świerczewski & Wojciechowski 2009). The chorological and ecological data which were not available for the species recorded in Poland for the first time, were implemented basing on the observations made in Germany (Nickel & Remane 2002, Nickel 2003) and by other authors (Ossiannilsson 1978, 1981, 1983, Giustina della & Remane 1991, Lauterer 1995). In some cases the ecological data were based on unpublished database of the Department of Zoology and Ecology of Animals of the Jan Długosz Academy in Częstochowa.

4.3 Methods of data analysis

4.3.1. Chorological analysis

The aim of chorological analysis was to indicate the share of particular zoogeographical elements in the whole planthopper fauna of the studied region. The zoogeographical element is understood here as the centre of dispersion of the species – a region where the species occurs most frequently because of its ecological requirements (Nickel & Remane 2002). This sort of analysis helps determine the degree of habitat distortion because insect communities under anthropogenic pressures tend to comprise more species of a broad geographical range e.g. cosmopolitic or Palaearctic. Thanks to the understanding of their geographical ranges, it also provides information on the course and direction of species migration. Geographical ranges of most species change slowly and they constitute a fairly stable factor for distinguishing the zoogeographical regions of various levels (Udvardy 1978, Kostrowicki 1999). The typology of zoogeographical elements was applied after Nickel and Remane (2002) and it comprises the following chorological elements:

- **cosmopolitic** – with the species widely distributed all over the world, occurring far beyond the Holarctic, often in a few zoogeographic ecozones;
- **holarctic** – with the species co-occurring in both Palaearctic and Nearctic, reaching the tropic of Cancer;
- **transpalaearctic** – with the species inhabiting most of Palaearctic, also amphipalaearctic species – the ones settled in two opposite regions of Palaearctic;
- **western Palaearctic** – with the species inhabiting the western and south-western parts of Palaearctic;
- **Siberian** – with the species inhabiting the region of Siberian taiga; where they reach Central Europe, they are usually connected with cool or shaded habitats;
- **Euro-Siberian** – with the species inhabiting the zone of deciduous and coniferous forests of Siberia and Europe (although sometimes such sites may be of relic character);
- **European** – with the species inhabiting at least significant parts of the geographic borders of Europe, whose occurrence is limited only to this region (as opposed to the western palaearctic elements);
- **West European** – with the species inhabiting the shores of Western Europe and usually the heathlands in Central Europe;
- **North European** – with the species whose range is limited to the habitats of swamps, taiga and tundra of Northern Europe;

- **South European** – with the species inhabiting Southern Europe, with the northern range limited to the central part of the continent and overlapping the European zone of temperate, deciduous forests;
- **Mediterranean** – with the species inhabiting the macchia type of vegetation, occurring on the shores of the Mediterranean Sea, sometimes also present on dispersed sites across continental Europe;
- **exclusively Mediterranean** – with the species limited only to the zone of shores of the Mediterranean Sea;
- **Kazakh** – with the species inhabiting the zone of steppes of western and central Asia, which in Central Europe inhabit dry and strongly sunlit sites.

4.3.2. Ecological analysis

The aim of ecological analysis was to indicate the share of particular ecological elements in the planthopper fauna of the studied region. Various environmental factors induce the changes in animal communities and constantly modify them (Trojan 1992). The planthoppers and leafhoppers are a group which reflects the interrelationships within a biocoenosis in an astonishing way (Nickel 2003). The research on such relations in various insect taxa helped to explain how ecosystems function, what processes maintain the homeostasis and what factors trigger the response to stress (Szujecki 1998). In the ecological analysis the following factors were taken into account: humidity, insolation, trophic relations, the overwintering stages, the number of generations and life strategy (environmental connections).

In terms of humidity requirements and insolation, the criteria proposed by Czechowski and Mikołajczyk (1981) were taken into account and the following division of ecological elements was accepted:

Humidity of the environment:

higrophilous species – with preference for wet and humid habitats;

mesohigrophilous species – with preference for moderately humid habitats;

xerophilous species – with preference for dry and sunlit habitats.

Insolation of the environment:

heliophilous species – preferring open habitats with full and intense insolation;

mesoheliophilous species – preferring moderate insolation;

skiophilous species – preferring shaded, poorly sunlit habitats.

Information on the trophic requirements and relations with their host plants follows Nickel and Remane (2002), Nickel (2003) and Świerczewski (2007) and is presented as follows:

1-degree monophagous – (abbreviated **m1**), feeding on one plant species;

2-degree monophagous – (abb. **m2**), feeding on one genus of plants;

1-degree oligophagous – (abb. **o1**), feeding on one plant family;

2-degree oligophagous – (abb. **o2**), feeding on plants from more than one family;

polyphagous – (abb. **po**), feeding on many plant species, without connection to any specialized host plant taxa;

unknown – (abb. **un**), only a single species – *Macrosteles sardus* was classified here, as its host plant remains unknown.

The overwintering stage was applied according to the criteria presented by Nickel and Remane (2002):

Egg – overwintering in the egg stage;

Nym – overwintering in the nymphal stage;

Ad – overwintering in the adult stage.

The number of generations during the year was accepted after Nickel and Remane (2002):

- species with one generation during a year were marked with **1**;

- species with two generations during a year were marked **2**.

The strength of relationship of a species with its habitat follows Achtzinger and Nickel (1997) and Nickel and Hildebrandt (2003):

eurytopic species – the element including species inhabiting various types of both open and forest communities, showing no distinct preferences with respect to any biotope (usually oligophagous, mostly double-generation species);

oligotopic species – including species inhabiting grassland communities, but preferring strictly specified abiotic conditions such as humidity, food supply or the height of the herb layer (mainly single-generation species with weak capacity for flying);

stenotopic species – including species tightly associated with a specific biotope and, in addition, trophically associated with a single plant species or genus (mainly short-winged and single-generation species).

4.3.3. Zoocoenological analysis

The zoocoenological analysis of the material allows drawing conclusions about the degree of distortion of the studied communities. In order to analyse the abundance of species in particular study plots various analytic and synthetic indices were applied: the dominance, constancy, frequency, species diversity, evenness within the community and similarity of the communities. The methods of analysis were slightly modified and applied after: Witkowski (1969), Trojan (1977, 1992 and 1994), Kasprzak and Niedbała (1981) and Krebs (1996). The calculations were done with licensed software (MS EXCEL, Multi Variate Statistical Package) of the Faculty of Biology and Environmental Protection of the University of Silesia.

4.3.3.1. Dominance *D*

The dominance index (*D*) specifies the percentage of particular insect species among all individuals collected over a specific area. The dominance index is expressed by the following equation (Kasprzak & Niedbała 1981):

$$D = \frac{n}{N} \times 100$$

where:
n – the number of individuals of a given species collected over a given study plot;
N – the number of all individuals collected over a given study plot.

Based on the values received by applying the dominance index equation the following five classes of dominance have been distinguished:

dominant species:

1. **superdominants (SD)** – more than 40% of all collected individuals;
2. **eudominants (ED)** – more than 30% but less than 40%;
3. **dominants (D)** – from 20.01% to 30.00%;
4. **subdominants (sD)** – from 7.51% to 20.00%;

accessory species:

5. **recedents (R)** – from 2.51% to 7.50%;
6. **subrecedents (sR)** – less than 2.51%.

4.3.3.2. Constancy *C*

The constancy of occurrence (*C*) specifies the ratio of the number of samplings in which a given species occurred to the number of samplings collected from a given area, expressed by the following equation (Górny & Grüm 1981):

$$C = \frac{N_a}{N} \times 100\%$$

where:
$N\,a$ – the number of samplings containing a given species, where a indicates the species;
N – the number of all samplings collected from a given area.

Based on the values received by applying the above equation the following four classes of constancy of occurrence have been distinguished:

1. **1st class** – from 75.01% to 100%;
2. **2nd class** – from 50.01% to 75.00%;
3. **3nd class** – from 25% to 50.00%;
4. **4nd class** – less than 25%.

4.3.3.3. The synthetic index *Q*

In order to facilitate the interpretation of the dominance structure, the synthetic index was also calculated. It is denoted by *Q*, often applied in ecological and zoocoenological studies and combines the *C* (constancy of occurrence) and *D* (dominance) indices into their geometric mean (Kasprzak & Niedbała 1981), highlightening the ecological importance of the species:

$$Q = \sqrt{C \times D}$$

4.3.3.4. The fidelity index *W*

In order to analyse the degree of association of various species of the planthoppers and leafhoppers with investigated plant communities and to identify the species typical of particular communities, the fidelity coefficient (*W*) was utilized. It is calculated by the following equation (Kasprzak & Niedbała 1981):

$$W = \frac{a}{b} \times 100\%$$

where:
a – the number of individuals belonging to a particular species recorded in a given plant community;
b – the number of individuals belonging to a particular species recorded on the whole investigation area.

Five fidelity classes were distinguished:

1. **differential species** – (*W* from 95.01% to 100.00%) – species encountered in only one type of plant community, strongly associated with their habitat and usually trophically associated with characteristic or differential plant species; before including a species into this class also the *C* value and the presence of the host plant of a species on a study plot were considered; hence, many differential species are dominant ones on some study plots. Species collected too rarely were not included into this class;
2. **characteristic species** – (*W* from 50.01% to 95.00%) – species usually, but not necessarily encountered in a given type of plant community. Their representatives can also be found regularly and in large number in other phytocoenoses but at the same time show a clear association with a group of similar communities; before including a species into this class also the *C* value and the presence of the host plant of a species on a study plot were considered; hence, many differential species are dominant ones on some study plots. Species collected only as single specimens were not included;
3. **probably characteristic species** – (*W* from 50.01% to 95.00%) – species usually, but not necessarily encountered in a given type of plant community. Their representatives can also be found regularly and in large numbers in other phytocoenoses but at the same time show a clear association with a group of similar communities; species with high values of fidelity and dominance, but whose host plant relations could not be determined due to their polyphagous character;
4. **accompanying species** – (*W* below 50%) – species which can be encountered in various types of plant communities, usually not in large numbers, showing no strong association with specific types of habitats. Most frequently they are either polyphagous species or species associated with plants widely distributed across the ecological spectrum;
5. **accidental species** – species only accidentally encountered in a given plant community, showing no strong association with it.

The above mentioned indices and coefficients are widely applied in zoocoenological analyses and useful in describing the structure of insect communities. The species which exhibit particularly high values in some of the applied ecological indices (or sometimes in all of them) are often regarded to be the "core" of a community (Schiemenz 1969, Gaj et al. 2009, Świerczewski & Wojciechowski 2009).

4.4.4. Species diversity

In order to determine the species diversity of the studied planthopper communities the following coefficients were applied: Shannon-Weaver's *H'* coefficient (Shannon & Weaver 1949 after: Trojan 1992), Pileou's *J* evenness index (Pielou 1969 after: Trojan 1994), Brillouin's $\hat{H}$ coefficient (Brillouin 1962 after: Trojan 1992) and Simpson's *I* coefficient (Simpson 1949 after: Trojan 1992).

4.4.4.1. Shannon-Weaver's coefficient *H'*

It is an effective coefficient in zoocoenology which measures a wide spectre of changes taking place in animal communities under human influence. It has already been used in research concerning planthopper communities (Chudzicka 1981, Chudzicka & Skibińska 1998a, 1998b) but also in studies of fresh water fauna (Czerniawska-Kusza & Szoszkiewicz 2007).

$$H' = -\sum_{i=1}^{S} p_i \log p_i$$

where:
pi – the proportion of individuals of a given species "*i*" (*ni*) to the total number of individuals in a given community (*N*), where *S* is the number of species in the community.

4.4.4.2. Pielou's evenness coefficient *J'*

$$J' = \frac{100H'}{H_{\max}} [\%]$$

where:
H' – the actual species diversity $H' = -\sum_{i=1}^{S} p_i \log p_i$

pi – the proportion of individuals of a given species "*i*" (*ni*) to the total number of individuals in a given community (*N*), where *S* is the number of species in the community
with:
H_{max} – the maximum species diversity $(H_{\max} = \log_2 S)$

4.4.4.3. Brillouin's index of species diversity

Pielou (1974) indicates, that Shannon-Weaver's index *H'* is inappropriate for the research concerning faunistic samples which comprise a limited number of species and thus, are finite sets of data. That is why a formula proposed by Brillouin seems more suitable here:

$$\hat{H} = \frac{1}{N}\log\left(\frac{N!}{n_1!\,n_2!\,n_3!\ldots n_s!}\right)$$

where:
N – the number of individuals in the investigated sample;
n_S – the number of individuals of a given species in the investigated sample.

4.4.4.4. The Simpson's index of species diversity

In order to compute the Simpson's diversity index, we applied the Pielou's diversity index (PIELOU 1975 after TROJAN 1992):

$$I' = 1 - \sum_{i=1}^{S} \left[\frac{n_i(n_i - 1)}{N(N-1)} \right]$$

where:
n_i – the number of individuals of the i-th species in the sample;
N – the total number of individuals in the sample.

In order to estimate the maximum species diversity in a sample (i.e. potential diversity) in a given community the following formula was applied (TROJAN 1992):

$$I_p = 1 - \frac{S\{\overline{n_i}(\overline{n_i} - 1)\}}{N(N-1)} \approx 1 - \frac{1}{S}$$

where:
n_i – the number of individuals of the i-th species in the sample;
N – the total number of individuals in the sample.

In order to calculate the disparity between the actual and potential species diversity in a given community, the following equation was employed (TROJAN 1992):

$$dI = \frac{I'}{I_p} 100\%$$

where:
I' – the sampling-related diversity index;
Ip – the potential diversity index.

Thus, the value of disparity between the actual and potential species diversity in each community was computed (expressed as a percentage).

4.5.5. Similarity of communities

4.5.5.1. Cluster analysis

Cluster analysis presents the planthopper communities in form of a hierarchic dendrogram. The clusters the rates of distance between the objects are applied for formatting. In this study, the SØRENSEN'S coefficient was used, which compares similarities between two samples, according to the following equation:

$$O(x,y) = \{\Sigma_i (x_i - y_i)^2\}^1$$

where:
O(x,y) – the x, y distance

The estimation of distance between the clusters was based on the WARD'S method. It employs the analysis of variance in order to minimalize the sum of squares of deviations of two random clusters which may be formed during each stage.

4.5.5.2. Principal Component Analysis (PCA)

The general aim of Principal Components Analysis (PCA) is to transform the original variables into a smaller number of uncorrelated variables which are called principal components. This method mainly consists in finding straight lines (i.e. component axes) which best fit the clouds of data points in vector dimension, in accordance with the criterion of the least squares. The graphic representation of the analysis is a component plane generated by a chosen pair of axes, upon which the points from the vector dimension are projected.

5. Results

During the study period of 2005-2012, in the area of Częstochowa a total of 266 species of planthoppers and leafhoppers was recorded (Tab. 1 and 44). This work reports on 2 species recorded in Poland for the first time – *Idiocerus vicinus* Melichar, 1898, *Zygina griseombra* Remane, 1994 (Tab. 44). Reports on 9 other species new for Poland recorded in Częstochowa during the same study – *Acericerus ribauti* Nickel & Remane, 2002, *Eupteryx lelievrei* (Lethierry, 1874), *Zyginidia pullula* (Boheman, 1845), *Zygina schneideri* (Günthart, 1974), *Macrosteles sardus* Ribaut, 1948, *Balclutha saltuella* (Kirschbaum, 1868), *Endria nebulosa* (Ball, 1900), *Metalimnus steini* (Fieber, 1869) and *Calamotettix taeniatus* Horváth, 1911 – were presented elsewhere (Walczak 2008b, Świerczewski & Walczak 2011a and 2011b, Walczak et al. 2013, Walczak & Jeziorowska 2015). Moreover, 14 species new for Krakowsko-Wieluńska Upland were recorded: *Cixius simplex* (Herrich-Schaffer, 1835), *Stenocranus fuscovittatus* (Stål, 1858), *Balcanocerus larvatus* (Herrich-Schäffer, 1835), *Kybos calyculus* (Cerutti, 1939), *Eupteryx adspersa* (Herrich-Schäffer, 1838), *Eupteryx thoulessi* Edwards, 1926, *Zygina suavis* Rey, 1891, *Japananus hyalinus* (Osborn, 1900), *Platymetopius major* Kirschbaum, 1868, *Allygus modestus* Scott, 1876, *Cicadula frontalis* (Herrich-Schäffer, 1835), *Paralimnus phragmitis* (Boheman, 1847), *Metalimnus marmoratus* (Flor, 1861) and *Cosmotettix costalis* (Fallén, 1826) (Tab. 44), and other 3 species: *Delphax pulchellus* (Curtis, 1833), *Chloriona glaucescens* Fieber, 1866 and *Paraliburnia adela* (Flor, 1861) were presented in another paper (Walczak, 2014).

By means of qualitative and quantitative methods, on 10 study plots localized within the strictly urban area of Częstochowa, 148 species were recorded (27% of Polish fauna). On the remaining 25 study plots, located across the suburban area within the administrative borders of the town (including the buffer zone), a total of 242 species was recorded (44% of Polish planthopper fauna) (Tab. 1).

Some differences in species composition were also observed in regard to geographical mesoregions of Częstochowa. Thus, 190, 147 and 167 species were recorded in the Upper Warta Valley, Częstochowska Upland and Wieluńska Upland respectively (Tab. 1).

5.1. Quantitative analysis of the planthopper communities on the study plots

Totally, 60 311 specimens of planthoppers belonging to 210 species were recorded by means of quantitative methods from all 35 study plots between 2005 and 2010 (Tab. 37). Among them, 55 species scored the highest values of abundance (from superdominance to subdominance), with 13 species reaching the position of superdominant species: *Macrosteles laevis* (plots: 3, 10, 11, 12, 13, 19, 20, 21, 22, 23, 24 and 25), *Balclutha calamagrostis* (plot 1 and 2), *Eupteryx atropunctata* (plot 3), E. cyclops (plot 4), *Stenocranus major* (plot 6), *Psammotettix excisus* (plot 7), *Ribautodelphax collinus* (plot 9), *Psammotettix cephalotes*

Table 1. Systematic list of species composition of the Fulgoromorpha and Cicadomorpha collected in the years 2005-2012 in particular plots and other zones, such as: lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU), white circle (○) marked species collected only in 1 year, grey circle (◍) marked species collected in 2 years, black circle (●) marked species collected in 3 years, j – species collected in qualitative research on plots 1-35, J – species collected in qualitative research in the rest of the area of Częstochowa except 1-35, symbol (◙) marked insects collected using quantitative and qualitative methods

Lp.	SPECIES	PLOTS																																			city centre	buffer zone	UWR	CzU	WU
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35					
FULGOROMORPHA																																									
Cixiidae																																									
1	*Cixius nervosus*					○												○													○	○						+	+		+
2	*Cixius simplex*														○																							+	+		
3	*Tachycixius pilosus*																														○							+	+		
Delphacidae																																									
4	*Kelisia confusa*														○		○			○	○																	+	+		+
5	*Kelisia monoceros*												◍																								+		+		
6	*Kelisia praecox*														◍		○	●	●																			+	+		+
7	*Kelisia punctulum*															◍		◍	○												○							+	+		+
8	*Kelisia vittipennis*																																					J	J		
9	*Anakelisia perspicillata*																											○		○								+		+	
10	*Stenocranus fuscovittatus*														●	◍		●	●	○																		+	+		+

WU	+	+	+	+	+	+	+			+			+	+	+	+
CzU	+	+	+	+	+		+							+	+	
UWR	+	+	+	+	+	+	+	+	+		+	+	+	+	+	
buffer zone	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
city centre	+	+	+	+	+	+	+							+	+	
35	•	○			●			○								
34															○	
33															○	
32	•			○												
31		○													●	
30	•	•			●			●							•	
29		●														
28	•						●								•	
27	○	•			○										●	
26	•						●							○	•	
25	○	•													●	
24	●	•			•	○	•							○	●	
23	○		○											●	●	
22	●	●	•				•							○	●	
21	●	•	○											○	●	
20	●			•	•		○			•				○	●	○
19	●	○		○	•	○	○	○							●	
18	○			•	●								○		•	
17		○											○		○	
16	●	●					•								●	
15	•	•		○	•										○	
14	●	●			●						○	○				
13	●	○		○		○								○	●	
12	•	•	○			•									●	
11	•	○	○											○	●	
10	●	○	○		•	○									●	
9	●	○	○			○	●							○	●	
8	●		○											○	●	
7	•														○	
6	●			○									○	○	•	
5	●			○	•	•									•	
4	●					○									•	
3	•	○			○										•	
2	●				○	○								○	•	
1		•			○				○						•	
SPECIES	*Stenocranus major*	*Stenocranus minutus*	*Jassidaeus lugubris*	*Megamelus notula*	*Conomelus anceps*	*Eurysula lurida*	*Eurybregma nigrolineata*	*Stiroma affinis*	*Stiroma bicarinata*	*Euconomelus lepidus*	*Delphax pulchellus*	*Chloriona glaucescens*	*Chloriona smaragdula*	*Megadelphax sordidulus*	*Laodelphax striatellus*	*Paraliburnia adela*
Lp.	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

WU	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
CzU	+			+		+		+	+		+			+	+	
UWR	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+
buffer zone	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
city centre	+	+	+	+	+	+	+	+	+		+		+	+	+	+
35	●		○	●	○			•								
34				○				○	○						○	
33				○				○								
32	○			•												
31	○			●	•			○	●							●
30	○	○		●	○			○	●				●		•	
29															○	
28							○		○		○				○	
27						•		●	•							
26					○	○			•					○		
25				○												
24			○					●	●				○	●		
23														•		
22		○				•	○	○	●			○			○	
21				•				•	●							
20			•	●	●		○	•	○			○			○	○
19		•	○	●	○		○	○	•						○	
18		○	•	○	•			○								
17				○	○			○				○				
16		•							•							
15		○		●	○			●	•			○				
14		•	•	○	●			○	•							
13			●	●	○			●	●				•	●	•	○
12				○				○	●							•
11		○				○	○	•	●		○					
10		○	•	○	•			●	●					•		
9						●		○	•		●		○			
8				○		○					●					
7						•					○					
6							○		•							
5				•	•			•	○	○		●				
4									●			○			○	
3									•							
2		●						○						•		
1		●														
SPECIES	***Hyledelphax elegantulus***	***Mirabella albifrons***	***Delphacodes venosus***	***Muellerianella brevipennis***	***Muellerianella fairmairei***	***Muirodelphax aubei***	***Acanthodelphax denticauda***	***Acanthodelphax spinosus***	***Dicranotropis hamata***	***Florodelphax leptosoma***	***Kosswigianella exigua***	***Struebingianella lugubrina***	***Xanthodelphax flaveolus***	***Xanthodelphax stramineus***	***Criomorphus albomarginatus***	***Javesella dubia***
Lp.	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
43	***Javesella obscurella***			○		○															●																+	+	+		+
44	***Javesella pellucida***		○	◍	◍	●	●	○		●	●	●	●	●	●	●		●	●	●	●	●	●	◍	◍	○	◍	◍	◍	○	●	●			●	●	+	+	+	+	+
45	***Ribautodelphax albostriatus***		◍		◍	○				●	●	●	●	●	●	○					○	○	●	●	●	●	◍		◍			○					+	+	+	+	+
46	***Ribautodelphax angulosus***							○	○											○					○												+	+	+	+	+
47	***Ribautodelphax collinus***							●	◍	●	◍	○	◍	◍			●					○	◍	◍	●		◍	○		●		○					+	+	+	+	+
	Tettigometridae																																								
48	***Tettigometra impressopunctata***									○																		○									+	+		+	+
	CICADOMORPHA																																								
	Cercopidae																																								
49	***Cercopis sanguinolenta***		●		◍		○			○							●			◍			○	●	○				○	◍							+	+	+	+	+
50	***Cercopis vulnerata***						○								●				○	●																		+	+		
51	***Neophilaenus campestris***							○																					○						○			+		+	
52	***Neophilaenus exclamationis***							○																														+		+	
53	***Neophilaenus lineatus***	○	●					◍	◍						●		●		◍	○									○		○						+	+	+	+	
54	***Neophilaenus minor***							●	●																													+		+	
55	***Aphrophora alni***			○						●	○		◍		●	○	●			○			○				○			○	◍	●	●	●	◍	●	+	+	+	+	+
56	***Aphrophora pectoralis***																																					J	J		

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
57	***Aphrophora salicina***														○																							+	+		
58	***Philaenus spumarius***	•	●	○	●	●	•	•	•	○	•	•			●	●	●	•	●	●	●	•	•			•	•	○	○		●		•	○	•	•	+	+	+	+	+
Membracidae																																									
59	***Gargara genistae***	●																																				+	+		
60	***Centrotus cornutus***																																•	●	•	○		+	+	+	
Cicadellidae																																									
Ulopinae																																									
61	***Ulopa reticulata***																																			j		j	j		
62	***Utecha lugens***									○		•	○															○									+	+	+	+	+
63	***Utecha trivia***									●	○		●	○											●	●								○			+	+	+	+	+
Megophtalminae																																									
64	***Megophthalmus scanicus***			•	•		○		○				•		○				○	○			○	○		○	●		○								+	+	+	+	
Ledrinae																																									
65	***Ledra aurita***																																○					+		+	
Macropsinae																																									
66	***Oncopsis alni***					○																																+			+
67	***Oncopsis appendiculata***														j																							j	j		

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
68	***Oncopsis carpini***													j																							j				j
69	***Oncopsis flavicollis***						○							○			○			•									○			•	•	•			+	+	+	+	+
70	***Oncopsis tristis***														j																							j	j		
71	***Pediopsis tiliae***													j																							j				j
72	***Macropsis fuscula***																																			•		+	+		
73	***Macropsis infuscata***																																					J	J		
74	***Macropsis vicina***										j																										j		j		
75	***Hephathus nanus***							•		●													○			○											+	+	+	+	+
	Agalliinae																																								
76	***Agallia brachyptera***					○									•						•										●				○			+	+	+	+
77	***Agallia consobrina***			•									○	○		•										○					○	●	●		○		+	+	+	+	+
78	***Anaceratagallia ribauti***		●		•	•		•		●	•	●	●	•							●	●	●	●	•	●	●	●			○						+	+	+	+	+
79	***Anaceratagallia venosa***							○	•																													+		+	
	Idiocerinae																																								
80	***Rhytidodus decimusquartus***																																				J		J		
81	***Idiocerus stigmaticalis***				○								○														○				•						+	+	+		

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
82	***Idiocerus lituratus?***																																					J	J		
83	***Idiocerus herrichi***																																					J	J		
84	***Idiocerus vicinus***																																					J	J		
85	***Viridicerus ustulatus***																																				J		J		
86	***Tremulicerus distinguendus***										j																										j		j		
87	***Tremulicerus tremulae***																															j						j			j
88	***Populicerus albicans***										j																										j		j		
89	***Populicerus confusus***																																	○				+		+	
90	***Populicerus populi***																																•					+		+	
91	***Acericerus ribauti***																							j									j					j		j	
92	***Balcanocerus larvatus***																											j						j				j		j	
Iassinae																																									
93	***Iassus lanio***																																	○				+		+	
Dorycephalinae																																									
94	***Eupelix cuspidata***								•	●		○		○			•						○		●			●	○	•					○		+	+	+	+	+
Aphrodinae																																									
95	***Aphrodes bicinctus***		•							•			●		○								•		•		•		○		○						+	+	+	+	+

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
96	***Aphrodes makarovi***			•	●								○	○	•	●		•		•		•			○						•	●	○				+	+	+	+	+
97	***Planaphrodes trifasciata***								○																													+		+	
98	***Anoscopus albifrons***												•																								+		+		
99	***Anoscopus flavostriatus***																																			•		+	+		
100	***Anoscopus serratulae***																				○																	+			+
101	***Stroggylocephalus agrestis***					○													○	○																		+	+		+
Cicadellinae																																									
102	***Evacanthus interruptus***			○											○																						+	+	+		
103	***Cicadellala siocarpae***																																					J	J		
104	***Cicadella viridis***		●	○		●				○	●	○	○		●	●	●	•	●	●	●	○	○	○							●			○		○	+			+	+
Typhlocybinae																																									
105	***Alebra albostriella***													j																			•	•			+			+	j
106	***Alebra neglecta***													j																							j				j
107	***Alebra wahlbergi***					j								j																			j				j	j		j	j
108	***Erythria aureola***							○																				●	○									+		+	
109	***Emelianoviana mollicula***							●				○	○	○								○	•	•			●	●	•	●					○		+	+	+	+	+

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
110	***Dikraneura variata***					○	○	○														○									●				•		+	+	+	+	+
111	***Micantulina stigmatipennis***		○					○															○				○	•									+	+	+	+	
112	***Forcipata citrinella***				○	•		○		○	•	○	•		●	○	●	○	●	●	●		○								•						+	+	+	+	+
113	***Forcipata forcipata***																														●	●	●	○	●	●		+	+	+	+
114	***Notus flavipennis***					●	●				○				●	●	○	●	●	●	●		○												○		+	+	+	+	+
115	***Kybos abstrusus***								j																													j		j	
116	***Kybos butleri***															j																						j			j
117	***Kybos calyculus***																															○						+			+
118	***Kybos lindbergi***																																					J		J	
119	***Kybos populi***																															○						+			+
120	***Kybos smaragdulus***					○					○	○	○			○						•									○	○					+	+	+		+
121	***Kybos virgator***											j																									j	J	j		J
122	***Empoasca affinis***		•							○					○				○															○	○		+	+	+	+	+
123	***Empoasca decipiens***					○								○						○		○										•	•				+	+	+	+	+
124	***Empoasca pteridis***		●	●	●	●	•			●	•	●	●	•	●	●		○	●	●	●	○	●	●	●	•	●	●	●	●	●	●	●	●	●	○	+	+	+	+	+
125	***Empoasca vitis***	○		○							○					○		○		○										○	●	●	○		•	●	+	+	+	+	+

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
126	*Chlorita paolii*							●	●	●	•	●	●	○			•			•		•	•	●	●	●	●	●	●	•							+	+	+	+	+
127	*Fagocyba carri*													j																			j				j	j		j	j
128	*Fagocyba cruenta*		•			j								j															○		•		•	•			◙	j	+	+	j
129	*Ossiannilssonola callosa*													j																							j				j
130	*Edwardsiana ampliata*													j																			•				j	+		+	j
131 131a	*Edwardsiana crataegi* *Edwardsiana crataegi v. froggatti*										j																										j		j		
132	*Edwardsiana flavescens*													j																							j				j
133	*Edwardsiana geometrica*																																						J		
134	*Edwardsiana gratiosa*					j																																j			j
135	*Edwardsiana plebeja*																															j						j			j
136	*Edwardsiana prunicola*																																							J	
137	*Edwardsiana rosae*					○								j																			j				j	j		j	◙
138	*Edwardsiana salicicola*																																						J		
139	*Edwardsiana soror*					○																																+	J		+
140	*Edwardsiana spinigera*																																j					j		j	

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
141	***Edwardsiana stehliki***															j																						j			j
142	***Edwardsiana ulmiphagus***					j								j							j												j				j	j		j	j
143	***Eupterycyba jucunda***					j																																j			j
144	***Linnavuoriana sexmaculata***														○					○											○							+	+		
145	***Ribautiana ognevi***																																					J			J
146	***Ribautiana tenerrima***																																	○	•			+		+	
147	***Typhlocyba quercus***													j																			j				j	j		j	
148	***Zonocyba bifasciata***																																○					+		+	
149	***Eurhadina concinna***													j																			○	○			j	+		+	j
150	***Eurhadina pulchella***					j								j																				○	○		j	◙		+	j
151	***Eupteryx adspersa***		•		○																		○										○				+	+	+	+	
152	***Eupteryx atropunctata***		○	●	●	○	○								•	○		○		•	○	•	○			○	○		○	○	○			○			+	+	+	+	+
153	***Eupteryx aurata***			○	●	○				○				○				○			○										○	●		○			+	+	+	+	+
154	***Eupteryx calcarata***			●	●	○							○	○				•			•		○					○				•	○	•	•		+	+	+	+	+
155	***Eupteryx curtisii***													j																							j				j
156	***Eupteryx cyclops***			●	●	•	○			○					○	○		●					○											○	○		+	+	+	+	+

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
157	***Eupteryx florida***																															•	●	○	○			+		+	+
158	***Eupteryx lelievrei***														●					○																		+	+		
159	***Eupteryx thoulessi***																								○												+				+
160	***Eupteryx notata***					○	○	●	•	●	•	○	•	●								○	○	•	○		•	•						○			+	+	+	+	+
161	***Eupteryx tenella***																			○															○			+	+	+	
162	***Eupteryx urticae***																															•						+			+
163	***Eupteryx vittata***					○																										●			○			+		+	+
164	***Wagneripteryx germari***													○																						•	+	+	+		+
165	***Aguriahana stellulata***													j																			j				j	j		j	j
166	***Alnetoidia alneti***					j								j																		•			•	○	j	◙	+	+	◙
167	***Zyginidia pullula***			○	○			○	•	•	○	○		○	•		•			•		●	○	○	○	•											+	+	+	+	+
168	***Zygina angusta***													j																•				•	○	•	j	+	+	+	j
169	***Zygina flammigera***										○																				○	○	○	●	•			+	+	+	+
170	***Zygina griseombra***																															j						j			j
171	***Zygina hyperici***	○						•		○															○		•	●	○					○	○		+	+	+	+	+
172	***Zygina ordinaria***																																					J	J		

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
173	***Zygina schneideri***																												j									j		j	
174	***Zygina suavis***					○								j																			j				j	◙		j	◙
175	***Zygina tiliae***																																				J		J		
176	***Arboridia velata***													j																	○		○		○	○	j	+	+	+	j
Deltocephalinae																																									
177	***Fieberiella septentrionalis***														○			○										●	○	•		•		•				+	+	+	+
178	***Grypotes puncticollis***																																		○	○		+	+	+	
179	***Japananus hyalinus***																															j						j			j
180	***Neoaliturus fenestratus***							•	●																			○										+		+	
181	***Neoaliturus guttulatus***							●	●																			●										+		+	
182	***Balclutha calamagrostis***	●	●	○		○	●	●	●	●	●	●	●	●	●	•	●	•	•	●	•	●	●	●	●	●	●	●	●	●	•		•	○	•	●	+	+	+	+	+
183	***Balclutha punctata***		○			○	○	○		○				•	○										○						●	●	●	•	●	●	+	+	+	+	+
184	***Balclutha rhenana***			○	●																																+	+	+		
185	***Balclutha saltuella***										○									○																	+	+	+		
186	***Macrosteles cristatus***										○	○		○																							+		+		+
187	***Macrosteles frontalis***		○																																		+		+		

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
188	***Macrosteles laevis***	●	●	●	●	●	●	●	●	●	●	●	●	●	•	●	●	●	●	●	●	●	●	●	●	●	●	●	•		●	●			○	○	+	+	+	+	+
189	***Macrosteles ossiannilssoni***					●															●										•							+	+		+
190	***Macrosteles maculosus***																							j														j		j	
191	***Macrosteles sardus***															•		○																				+			+
192	***Macrosteles septemnotatus***														○																							+	+		
193	***Macrosteles sexnotatus***			•	○	●														○	•																+	+	+		+
194	***Macrosteles variatus***			●	●													•				○										•					+	+	+		+
195	***Macrosteles viridigriseus***					●										○					●																	+			+
196	***Deltocephalus pulicaris***		•			●					●	●	●	●						○	●			•	●	•	•				○	○			○		+	+	+	+	+
197	***Recilia coronifera***																			○											●	○	○			○		+	+	+	+
198	***Endria nebulosa***																								○												+				+
199	***Doratura exilis***							•	•																	○											+	+	+	+	
200	***Doratura homophyla***								○		○	○	●												○	●											+	+	+	+	+
201	***Doratura impudica***							•																				○										+		+	
202	***Doratura stylata***				○			•	●	●	●	●	●	●		○	●			○	●	•	●	●	●	●	●	●	●						○		+	+	+	+	+
203	***Platymetopius major***																																j					j		j	

WU		+	+		+			+	+	+	+		+	+	+	+
CzU	j		+	+	+	+	+			+	+		+			+
UWR	j			+	+		+	+	+	+	+	+	+	+	+	+
buffer zone	j	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
city centre					+		+	+	+	+	+		+	+		+
35	j			•	○							●	○			
34							•						•			
33				•									○			
32	j		○	•									•			
31			○										●			
30				•									●			○
29							○			•			●			
28					●					○			○			
27							•				●		●			
26					●								●			
25					•						•					
24					●			○	•	○	○		●			●
23					•						●		•			•
22					•					•	●		●			
21					○								●			●
20													●	○		
19					○			○		○			●			
18													○	○	●	
17								○					○	●	•	
16					●								●			
15													•	•		
14								●	○				●	○		•
13										○			○			○
12					○		○			●			●			
11										○	○		•			
10					○					○	○		●	○		●
9					○				●		●		○			
8					○	•	○				●		•			
7					•		•				•		•			
6					○									●		
5		○								○			•	●		
4													•	○		○
3																○
2					○								●			
1					○								●			
SPECIES	***Allygus communis***	***Allygus modestus***	***Allygus mixtus***	***Allygidius commutatus***	***Graphocraerus ventralis***	***Rhytistylus proceps***	***Hardya tenuis***	***Paluda flaveola***	***Rhopalopyx adumbrata***	***Rhopalopyx preyssleri***	***Rhopalopyx vitripennis***	***Elymana kozhevnikovi***	***Elymana sulphurella***	***Cicadula flori***	***Cicadula frontalis***	***Cicadula persimilis***
Lp.	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219

Lp.	SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	city centre	buffer zone	UWR	CzU	WU
220	***Cicadula quadrinotata***		•	●		●	●	•	•	•	●	○	○	●	●	●	●	●	●	●	●	•	●	○	○	●		●	●		●				•		+	+	+	+	+
221	***Cicadula saturata***		○												○	•		•																			+	+	+		+
222	***Mocydiopsis attenuata***																														•						+	+	+		
223	***Mocydiopsis parvicauda***		○		○			○		•				•									○		•			○										+	+	+	+
224	***Speudotettix subfusculus***																														●	•	•	○	●	●		+	+	+	+
225	***Hesium domino***																												j									j		j	
226	***Thamnotettix confinis***																														○			○		•		+	+	+	
227	***Pithyotettix abietinus***																														j							j	j		
228	***Macustus grisescens***	○		○											•	•			○	○																	+	+	+		+
229	***Doliotettix lunulatus***						○								●				●	•											○							+	+		
230	***Athysanus argentarius***		●	○	•	○	•				•	•		○	•	●	●	•	•	●	•	•	●	○	●	○	•		○	•							+	+	+	+	+
231	***Athysanus quadrum***																	○																				+			+
232	***Ophiola decumana***		○																																		+		+		
233	***Limotettix striola***				○																○																	+	+		+
234	***Laburrus impictifrons***							●	●															○														+		+	+
235	***Euscelidius schenckii***		○										○																								+		+		

WU	+		+			+		+			+	+	+		+	
CzU		+	+							+	+	+	+	+	+	+
UWR	+		+	+	+	+	j	+	J	+	+	+	+	+	+	
buffer zone	+	+	+	+		+	j	+	J	+	+	+	+	+	+	+
city centre	+		+	+	+	+		+		+	+	+	+	+	+	
35													○			
34												○	○			
33													●			
32			○										○			
31			○			●							•			
30							j								○	
29												○				
28			•							•	○		●	•	•	
27			•								●		•		●	
26			●										•		●	
25			●								•		•		●	
24			●								●		●		●	
23			●								●		●		●	
22			●									○	●		•	
21	○		•	•				○			●		●		●	
20	●		●			●							•		●	
19	●		○	○		○							●		•	
18	●												•			
17	•												○			
16	•		●										●	●	○	
15	●		○					○					●			
14	●												○		○	
13			●			○							●		●	
12			●	○							•		●		●	
11			●	○						○	●		●	○	●	
10			●		○						●	○	•		●	
9			●										●		●	
8			●										●		●	●
7		•									•	○	●	○	●	●
6			•			○		●					●		○	
5			●			•							○			
4			●										○			
3			•					○					•			
2			•							○	•	○	●		○	
1																
SPECIES	***Conosanus obsoletus***	***Euscelis distinguendus***	***Euscelis incisus***	***Streptanus aemulans***	***Streptanus confinis***	***Streptanus sordidus***	***Paralimnus phragmitis***	***Metalimnus formosus***	***Metalimnus marmoratus***	***Metalimnus steini***	***Arocephalus languidus***	***Arocephalus longiceps***	***Psammotettix alienus***	***Psammotettix cephalotes***	***Psammotettix confinis***	***Psammotettix excisus***
Lp.	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251

WU			+	+	+	+			+	+	+	+		+	+
CzU	+	+	+	+	+	+	+		+					+	+
UWR			+	+	+	+	+	+	+	+	+	+	j	+	+
buffer zone	+	+	+	+	+	+	+	+	+	+	+	+	j	+	+
city centre			+	+	+		+	+	+	+				+	+
35			•			○			●						
34			○			○			•						
33		●	•	○		○									○
32						○									
31			○						○						●
30			•		○				●				j		•
29		●		●	○		•							●	
28		○	●	●	○		●							●	
27			○	●		○	●							○	
26			●	●	○									●	
25			●	●	●				○					●	
24			●	●	●				•						
23			○	●	○									●	
22			●	●	○				●					●	
21			●		○		○		●						
20			•		○				●	•	○				
19			●				●		●	●					○
18									○	●	○				
17									•	●					
16			●				●	○	●						
15			○			○			●	●		○			
14			●				●		●	●	○	○			
13			●		●				●						
12			●	○					●					●	
11			●	●	○				•					•	
10			●	•	•				●						○
9			●	●	●				•	○				•	
8			○	●											
7	•		•	●	•	○	•								
6			●						•			○			●
5			○						●	○					
4			●						○	○					○
3			●						●						○
2			●					●	○						
1			●					○							
SPECIES	***Psammotettix nodosus***	***Adarrus multinotatus***	***Errastunus ocellaris***	***Turrutus socialis***	***Jassargus pseudocellaris***	***Jassargus flori***	***Verdanus abdominalis***	***Arthaldeus arenarius***	***Arthaldeus pascuellus***	***Sorhoanus assimilis***	***Cosmotettix caudatus***	***Cosmotettix costalis***	***Calamotetti taeniatus***	***Mocuellus collinus***	***Erzaleus metrius***
Lp.	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266

(plot 16), *Notus flavipennis* (plot 17), *Cicadula quadrinotata* (plot 18), *Chlorita paolii* (plot 25), *Adarrus multinotatus* (plot 29) and *Balclutha punctata* (plot 35) (Tabs 2-36).

In the collected material the following 4 species proved most abundant: *Macrosteles laevis* (20162 specimens – 33.43% of collected material), *Stenocranus major* (2842 – 4.71%), *Cicadula quadrinotata* (2833 – 4.70%) and *Arthaldeus pascuellus* (2490 – 4.13%). Fairly high abundance, between 1000 and 2000 specimens, was reached by 7 species: *Chlorita paolii* (1966 specimens), *Deltocephalus pulicaris* (1927), *Notus flavipennis* (1729), *Errastunus ocellaris* (1695), *Javesella pellucida* (1511), *Psammotettix confinis* (1411), *Turrutus socialis* (1388) and *Balclutha calamagrostis* (1377). However, 78 species collected with quantitative methods (37.14% of the species collected in this way) were represented by 10 specimens or less and among them 26 species were represented only by single specimens (12.38% of species). The highest numbers of species, 67 and 61, were caught on plot 19 (plant association *Alopecuretum pratensis*) (Tab. 20) and plot 14 (*Valeriano-Filipenduletum*) (Tab. 15) respectively. The smallest number of species, 17, were found on plot 1 (*Echio-Melilotetum*) (Tab. 2). The highest number of specimens was collected on plot 20 (*Alopecuretum pratensis*) – 5958 specimens (Tab. 21), and on plot 13 (*Lolio-Polygonetum arenastri*) – 5573 specimens (Tab. 14), while the lowest number on plot 33 (*Tilio cordatae–Carpinetum*) – 163 specimens (Tab. 34).

Detailed results in particular plant associations and study plots are presented below. All data are given in tables (Tabs 2-36) and figures (Figs 2-36) as the appendix.

5.1.1. Planthopper communities connected with the synanthropic associations of the class *Artemisietea vulgaris*

Community of the association *Echio-Melilotetum* – variant with *Calamagrostis epigejos*

Study plot 1

A total of 511 specimens/17 species collected: 2006 – 71/11 species, 2008 – 146/9 species, 2010 – 294/12 species (Tab. 2).

Highest classes of abundance (3 species): *Balclutha calamagrostis* (SD – 2006, 2008 and 2010: 63.38%, 80.82% & 84.35%), *Errastunus ocellaris* (sD – 2006: 8.45%), *Arthaldeus arenarius* (sD – 2006: 8.45%) (Tab. 2).

Constancy: *Balclutha calamagrostis* (1st class – 2010: 77.27%, 2nd class – 2006 and 2008: 52.27 & 68.18%). The highest value of Q index: *Balclutha calamagrostis* (2006, 2008, 2010: 57.56, 74.23 & 80.73) (Tab. 2).

On this plot the seasonal dynamics of abundance of planthoppers was shaped by the population of *Balclutha calamagrostis*, whose abundance was rising from the turn of May and June to reach its maximum in second half of July (2008 and 2010) or in August (2006). Then, its abundance decreased sharply. Other species only insignificantly influenced the seasonal dynamics of abundance of the community (Fig. 2).

Remarks: the highest share of eurytopic species (64.71%) and the lowest of oligotopic (17,65%) among all studied plots (Tab. 43a); only on this plot *Stiroma bicarinata* and *Gargara genistae* were collected (Tab. 1).

Table 2. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 1 (*Echio-Melilotetum*).

	Species	Year											
		2006				2008				2010			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus minutus***	-	-	-	-	1.37	4.55	4	2.50	1.02	6.82	4	2.64
2.	***Conomelus anceps***	-	-	-	-	-	-	-	-	0.34	2.27	4	0.88
3.	***Stiroma bicarinata***	-	-	-	-	-	-	-	-	0.34	2.27	4	0.88
4.	***Laodelphax striatellus***	-	-	-	-	0.68	2.27	4	1.24	0.68	4.55	4	1.76
5.	***Mirabella albifrons***	2.82	6.82	4	4.39	2.74	4.55	4	3.53	3.06	6.82	4	4.57
6.	***Neophilaenus lineatus***	7.04	9.09	4	8.00	-	-	-	-	-	-	-	-
7.	***Philaenus spumarius***	2.82	2.27	4	2.53	1.37	4.55	4	2.50	-	-	-	-
8.	***Gargara genistae***	1.41	2.27	4	1.79	2.74	6.82	4	4.32	1.02	2.27	4	1.52
9.	***Empoasca vitis***	1.41	2.27	4	1.79	-	-	-	-	-	-	-	-
10.	***Zygina hyperici***	-	-	-	-	-	-	-	-	0.34	2.27	4	0.88
11.	***Balclutha calamagrostis***	63.38	52.27	2	57.56	80.82	68.18	2	74.23	84.35	77.27	1	80.73
12.	***Macrosteles laevis***	1.41	2.27	4	1.79	2.05	6.82	4	3.74	1.02	4.55	4	2.15
13.	***Graphocraerus ventralis***	-	-	-	-	-	-	-	-	0.34	2.27	4	0.88
14.	***Elymana sulphurella***	1.41	2.27	4	1.79	2.05	6.82	4	3.74	1.36	9.09	4	3.52
15.	***Macustus grisescens***	1.41	2.27	4	1.79	-	-	-	-	-	-	-	-
16.	***Errastunus ocellaris***	8.45	11.36	4	9.80	6.16	20.45	4	11.22	6.12	27.27	3	12.92
17.	***Arthaldeus arenarius***	8.45	9.09	4	8.76	-	-	-	-	-	-	-	-

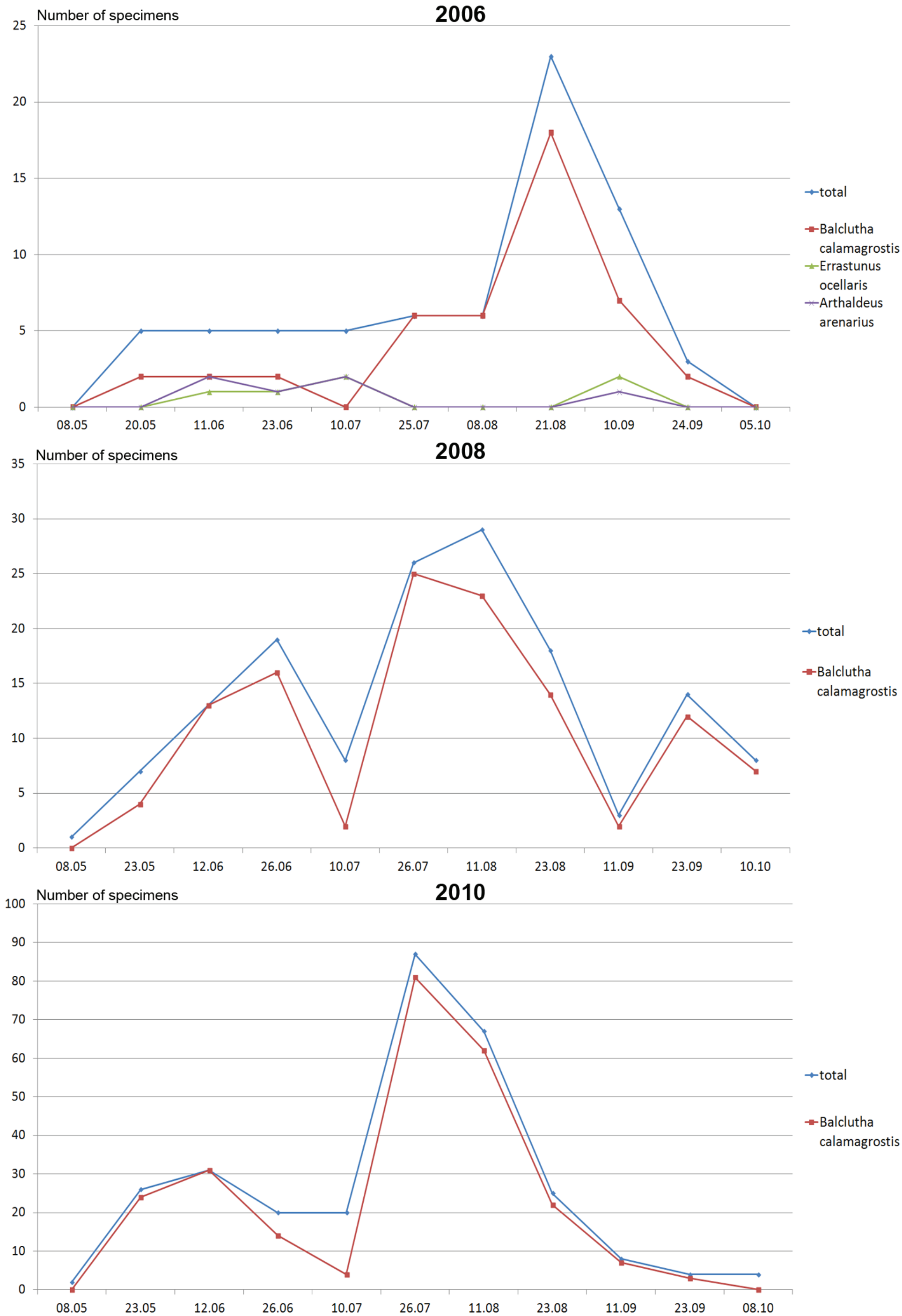

Fig. 2. The dynamics of species abundance among the species dominating in the Plot 1 (*Echio-Melilotetum*).

Study plot 2

A total of 737 specimens/44 species collected: 2007 – 268/26 species, 2008 – 305/34 species, 2009 – 164/26 species (Tab. 3).

Highest classes of abundance (3 species): *Balclutha calamagrostis* (SD – 2009: 40.85%, ED – 2007 and 2008: 38.06% & 38.36%), *Errastunus ocellaris* (sD – 2007-2009: 12.31%, 7.87% and 12.80%), *Stenocranus major* (sD – 2007: 15.30%) (Tab. 3).

Constancy: *Balclutha calamagrostis* (2nd class – 2008 and 2009: 56.82% & 54.55%), *Errastunus ocellaris* (2nd class – 2007: 52.27%). the highest value of Q index: *Balclutha calamagrostis* (2007-2009: 38.35, 46.69 & 47.21) (Tab. 3).

On this plot the seasonal dynamics of abundance of planthoppers was shaped by the population of *Balclutha calamagrostis*, whose abundance reached its maximum at the end of July (2008) or at the beginning of August (2007 and 2009). Among other species, only *Stenocranus major* increased its abundance in 2007, contributing to the general community dynamics. It reached its maximum in the second half of September (Fig. 3).

Remarks: only on this plot *Macrosteles frontalis* and *Ophiola decumana* were collected (Tab. 1).

Characteristics of the community

In the community comprising plots 1 and 2, a total of 1248 specimens were collected during the three study seasons. They represented 50 species (18% of all the collected species) (Tabs 2 and 3), among which 11 (22%) were common to both plots (Tab. 1).

In respect of species abundance, the core of the community was constituted by *Balclutha calamagrostis* (with the mean share of 57.64% of all specimens in all three seasons) and *Errastunus ocellaris* (the mean share of 8.95%), which together made up 66.59% of all the collected specimens in this community. *Stenocranus major* and *Arthaldeus arenarius* were less abundant (Tabs 2 and 3).

Stiroma bicarinata, *Gargara genistae*, *Macrosteles frontalis* and *Ophiola decumana* are worth noticing here. They scored the highest values of the fidelity index (W=100) and occurred exclusively in association *Echio-Melilotetum* (Tab. 37). Other species that occurred here, but with lower values of the fidelity index, included: *Arthaldeus arenarius* (W=81,25), *Mirabella albifrons* (W=68,75), *Eupteryx adspersa* (W=72,73) and *Balclutha calamagrostis* (W=50,62) (Tab. 37). The seasonal dynamics of abundance was shaped by superdominant *Balclutha calamagrostis*, which reached its peak in July and August (Figs 2 and 3).

Community of the association *Urtico-Aegopodietum podagrariae*

Study plot 3

A total of 1285 specimens/36 species collected: 2006 – 200/17 species, 2007 – 816/21 species, 2008 – 269/26 species (Tab. 4).

Highest classes of abundance (4 species): *Macrosteles laevis* (SD – 2007: 67.40%, D – 2006 and 2008: 25.00% & 20.82%), *Eupteryx atropunctata* (SD – 2006 and 2008: 43.50% & 47.21%, sD – 2007: 9.19%), *Eupteryx cyclops* (sD – 2006: 8,00%) and *Macrosteles variatus* (sD –2007: 11.40%) (Tab. 4).

Constancy: *Balclutha calamagrostis* (2nd class – 2006-2008: 61.36%, 56.82% & 72.73%),

Table 3. List of domination (D) [%], constancy (C) [%] and Q index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 2 (*Echio-Melilotetum*).

	Species	Year											
		2007				2008				2009			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	15.30	29.55	3	21.26	5.90	22.73	4	11.58	6.10	20.45	4	11.17
2.	***Conomelus anceps***	-	-	-	-	0.33	2.27	4	0.87	-	-	-	-
3.	***Eurysula lurida***	0.75	2.27	4	1.30	-	-	-	-	-	-	-	-
4.	***Megadelphax sordidulus***	-	-	-	-	2.62	13.64	4	5.98	-	-	-	-
5.	***Laodelphax striatellus***	0.75	4.55	4	1.85	1.97	6.82	4	3.67	-	-	-	-
6.	***Mirabella albifrons***	3.73	11.36	4	6.51	1.31	9.09	4	3.45	2.44	6.82	4	4.08
7.	***Acanthodelphax spinosus***	-	-	-	-	0.33	2.27	4	0.87	0.61	2.27	4	1.18
8.	***Xanthodelphax stramineus***	0.37	2.27	4	0.92	-	-	-	-	0.61	2.27	4	1.18
9.	***Javesella pellucida***	-	-	-	-	3.93	18.18	4	8.45	-	-	-	-
10.	***Ribautodelphax albostriatus***	1.12	4.55	4	2.26	-	-	-	-	1.83	4.55	4	2.89
11.	***Cercopis sanguinolenta***	1.49	4.55	4	2.60	1.64	11.36	4	4.32	2.44	6.82	4	4.08
12.	***Neophilaenus lineatus***	0.75	4.55	4	1.85	1.31	4.55	4	2.44	1.22	4.55	4	2.36
13.	***Philaenus spumarius***	1.87	6.82	4	3.57	2.95	18.18	4	7.32	0.61	2.27	4	1.18
14.	***Anaceratagallia ribauti***	4.10	13.64	4	7.48	1.64	9.09	4	3.86	1.83	6.82	4	3.53
15.	***Aphrodes bicinctus***	-	-	-	-	0.33	2.27	4	0.87	0.61	2.27	4	1.18
16.	***Cicadella viridis***	1.12	11.36	4	3.57	1.97	13.64	4	5.18	1.83	4.55	4	2.89
17.	***Micantulina stigmatipennis***	0.37	2.27	4	0.92	-	-	-	-	-	-	-	-

	Species	Year											
		2007				2008				2009			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Empoasca affinis***	-	-	-	-	0.33	2.27	4	0.87	0.61	2.27	4	1.18
19.	***Empoasca pteridis***	3.36	15.91	4	7.31	4.59	22.73	4	10.21	2.44	6.82	4	4.08
20.	***Fagocyba cruenta***	0.75	4.55	4	1.85	-	-	-	-	1.22	4.55	4	2.36
21.	***Eupteryx adspersa***	-	-	-	-	1.97	9.09	4	4.23	1.22	4.55	4	2.36
22.	***Eupteryx atropunctata***	-	-	-	-	3.61	11.36	4	6.40	-	-	-	-
23.	***Balclutha calamagrostis***	38.06	38.64	3	38.35	38.36	56.82	2	46.69	40.85	54.55	2	47.21
24.	***Balclutha punctata***	-	-	-	-	0.33	2.27	4	0.87	-	-	-	-
25.	***Macrosteles frontalis***	-	-	-	-	0.33	2.27	4	0.87	-	-	-	-
26.	***Macrosteles laevis***	4.85	22.73	4	10.50	4.26	18.18	4	8.80	5.49	15.91	4	9.35
27.	***Deltocephalus pulicaris***	0.37	2.27	4	0.92	-	-	-	-	0.61	2.27	4	1.18
28.	***Graphocraerus ventralis***	-	-	-	-	0.66	4.55	4	1.73	-	-	-	-
29.	***Elymana sulphurella***	1.87	13.64	4	5.05	4.26	20.45	4	9.33	1.22	11.36	4	3.72
30.	***Cicadula quadrinotata***	-	-	-	-	2.95	18.18	4	7.32	3.05	6.82	4	4.56
31.	***Cicadula saturata***	0.37	4.55	4	1.30	-	-	-	-	-	-	-	-
32.	***Mocydiopsis parvicauda***	-	-	-	-	0.33	2.27	4	0.87	-	-	-	-
33.	***Athysanus argentarius***	0.37	2.27	4	0.92	0.33	2.27	4	0.87	0.61	2.27	4	1.18
34.	***Ophiola decumana***	-	-	-	-	0.33	2.27	4	0.87	-	-	-	-
35.	***Euscelidius schenckii***	0.37	2.27	4	0.92	-	-	-	-	-	-	-	-
36.	***Euscelis incisus***	0.75	4.55	4	1.85	-	-	-	-	1.22	4.55	4	2.36

	Species	Year											
		2007				2008				2009			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Metalimnus steini***	-	-	-	-	0.98	4.55	4	2.11	-	-	-	-
38.	***Arocephalus languidus***	-	-	-	-	0.33	2.27	4	0.87	2.44	6.82	4	4.08
39.	***Arocephalus longiceps***	0.37	2.27	4	0.92	-	-	-	-	-	-	-	-
40.	***Psammotettix alienus***	3.73	29.55	3	10.50	0.66	4.55	4	1.73	3.05	9.09	4	5.27
41.	***Psammotettix confinis***	-	-	-	-	0.33	2.27	4	0.87	-	-	-	-
42.	***Errastunus ocellaris***	12.31	52.27	2	25.37	7.87	34.09	3	16.38	12.80	40.09	3	22.65
43.	***Arthaldeus arenarius***	0.75	4.55	4	1.85	0.98	6.82	4	2.59	1.22	4.55	4	2.36
44.	***Arthaldeus pascuellus***	-	-	-	-	0.33	2.27	4	0.87	-	-	-	-

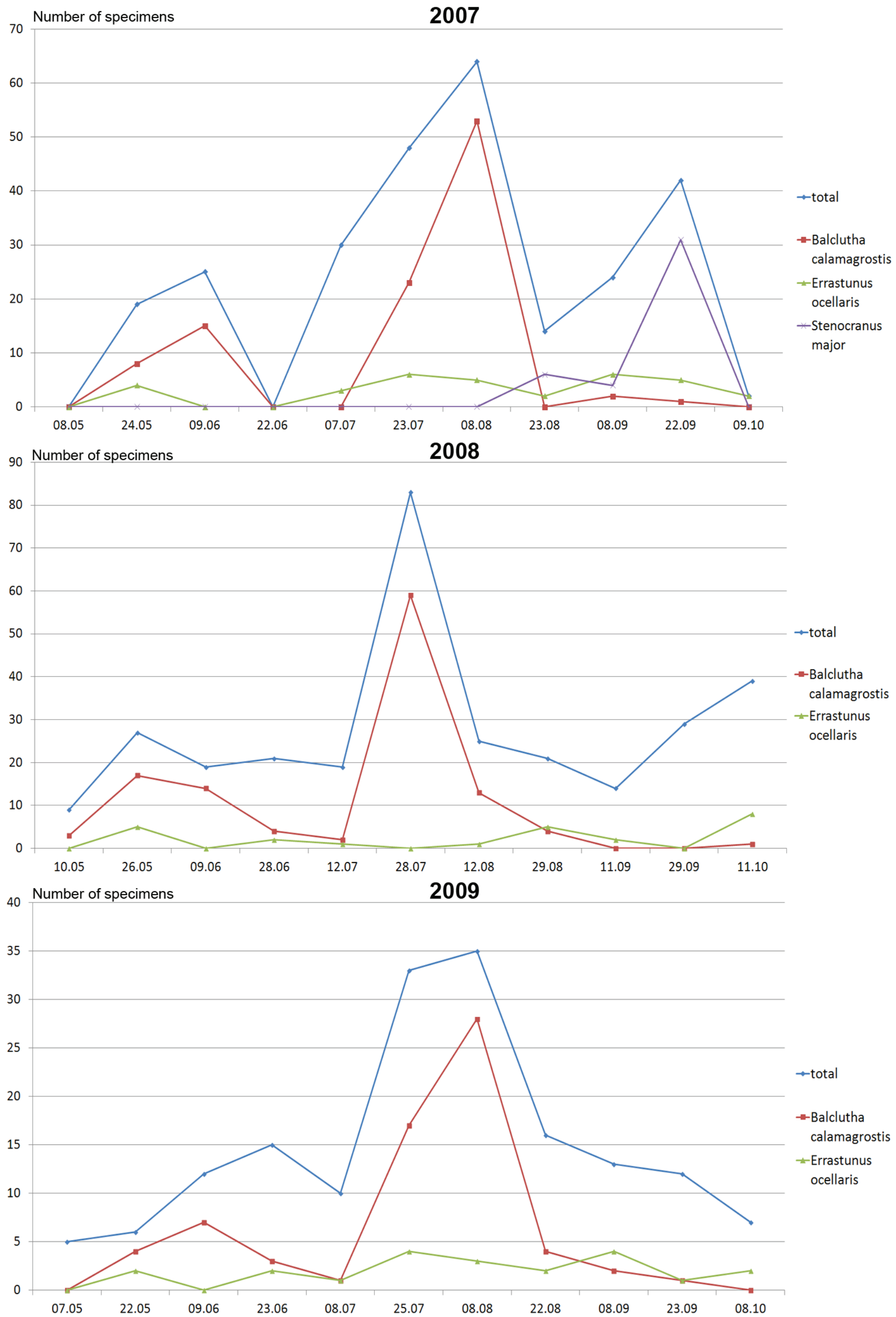

Fig. 3. The dynamics of species abundance among the species dominating in the Plot 2 (*Echio-Melilotetum*).

Table 4. List of domination (*D)* [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 3 (*Urtico-Aegopodietum podagrariae*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	3.00	13.64	4	6.40	-	-	-	-	1.12	6.82	4	2.76
2.	***Stenocranus minutus***	-	-	-	-	-	-	-	-	0.37	2.27	4	0.92
3.	***Conomelus anceps***	-	-	-	-	-	-	-	-	0.37	2.27	4	0.92
4.	***Laodelphax striatellus***	-	-	-	-	0.86	11.36	4	3.13	1.49	6.82	4	3.19
5.	***Dicranotropis hamata***	-	-	-	-	0.49	9.09	4	2.11	2.60	15.91	4	6.43
6.	***Javesella obscurella***	-	-	-	-	0.12	2.27	4	0.52	-	-	-	-
7.	***Javesella pellucida***	3.50	11.36	4	6.31	-	-	-	-	2.60	13.64	4	5.96
8.	***Aphrophora alni***	1.50	4.55	4	2.61	-	-	-	-	-	-	-	-
9.	***Philaenus spumarius***	0	0	0	0	-	-	-	-	0.37	2.27	4	0.92
10.	***Megophthalmus scanicus***	0.50	2.27	4	1.07	0.12	2.27	4	0.52	-	-	-	-
11.	***Agallia consobrina***	1.00	4.55	4	2.13	-	-	-	-	0.37	2.27	4	0.92
12.	***Aphrodes makarovi***	-	-	-	-	0.37	6.82	4	1.59	2.60	15.91	4	6.43
13.	***Evacanthus interruptus***	0.50	2.27	4	1.07	-	-	-	-	-	-	-	-
14.	***Cicadella viridis***	-	-	-	-	-	-	-	-	0.37	2.27	4	0.92
15.	***Empoasca pteridis***	2.00	4.55	4	3.02	0.74	13.64	4	3.18	1.12	6.82	4	2.76
16.	***Empoasca vitis***	-	-	-	-	-	-	-	-	0.37	2.27	4	0.92
17.	***Eupteryx atropunctata***	43.50	61.36	2	51.66	9.19	56.82	2	22.85	47.21	72.73	2	58.60

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Eupteryx aurata***	-	-	-	-	0.25	4.55	4	1.07	-	-	-	-
19.	***Eupteryx calcarata***	6.50	18.18	4	10.87	3.43	38.64	3	11.51	2.23	11.36	4	5.03
20.	***Eupteryx cyclops***	8.00	20.45	4	12.79	1.84	25.00	4	6.78	0.74	4.55	4	1.83
21.	***Zyginidia pullula***	-	-	-	-	-	-	-	-	0.37	2.27	4	0.92
22.	***Balclutha calamagrostis***	-	-	-	-	-	-	-	-	0.37	2.27	4	0.92
23.	***Balclutha rhenana***	-	-	-	-	0.25	4.55	4	1.07	-	-	-	-
24.	***Macrosteles laevis***	25.00	36.36	3	30.15	67.40	72.73	2	70.01	20.82	47.73	3	31.52
25.	***Macrosteles sexnotatus***	0.50	2.27	4	1.07	0.12	2.27	4	0.52	-	-	-	-
26.	***Macrosteles variatus***	2.00	6.82	4	3.69	11.40	29.55	3	18.35	1.49	9.09	4	3.68
27.	***Cicadula persimilis***	-	-	-	-	-	-	-	-	1.86	9.09	4	4.11
28.	***Cicadula quadrinotata***	0.50	2.27	4	1.07	0.12	2.27	4	0.52	2.23	9.09	4	4.50
29.	***Macustus grisescens***	0.50	2.27	4	1.07	-	-	-	-	-	-	-	-
30.	***Athysanus argentarius***	-	-	-	-	0.12	2.27	4	0.52	-	-	-	-
31.	***Euscelis incisus***	-	-	-	-	0.98	15.91	4	3.95	0.74	4.55	4	1.83
32.	***Metalimnus formosus***	-	-	-	-	-	-	-	-	0.37	2.27	4	0.92
33.	***Psammotettix alienus***	-	-	-	-	0.86	15.91	4	3.70	0.37	2.27	4	0.92
34.	***Errastunus ocellaris***	0.50	2.27	4	1.07	0.86	15.91	4	3.70	4.09	18.18	4	8.62
35.	***Arthaldeus pascuellus***	1.00	2.27	4	1.51	0.37	6.82	4	1.59	3.35	13.64	4	6.76
36.	***Erzaleus metrius***	-	-	-	-	0.12	2.27	4	0.52	-	-	-	-

Fig. 4. The dynamics of species abundance among the species dominating in the Plot 3 (*Urtico-Aegopodietum podagrariae*).

Macrosteles laevis (2nd class – 2007: 72.73%). The highest value of Q index: *Macrosteles laevis* (2006-2008: 30.15, 70.01 & 31.52), *Errastunus ocellaris* (2006-2008: 51.66, 22.85 & 58.60) (Tab. 4).

Populations of *Eupteryx atropunctata* and *Macrosteles laevis* were most significant in the seasonal dynamics of abundance on this plot. The first one reached its peak of abundance in 2006 at the beginning of July, in 2007 its abundance was on a similar level throughout the season and in 2008 it was most numerous in October. The other, *Macrosteles laevis*, reached the maximum of abundance in July 2006 while in 2007 and 2008 in August. Other two species, *Eupteryx cyclops* and *Macrosteles variatus*, influenced the seasonal dynamics of community only in a limited degree (Fig. 4).

Study plot 4

A total of 1338 specimens/39 species collected: 2006 – 375/27 species, 2007 – 462/26 species, 2008 – 501/22 species (Tab. 5).

Highest classes of abundance (5 species): *Eupteryx cyclops* (SD – 2007 and 2008: 42.64% & 49.30%, ED – 2006: 34.93%), *Eupteryx calcarata* (sD – 2006-2008: 12.53%, 17.32% & 10.98%), *Stenocranus major* (D – 2006: 22.67%, sD – 2008: 8.98%), *Macrosteles laevis* (sD – 2007: 11.90%), *Eupteryx atropunctata* (sD – 2008: 7.98%) (Tab. 5).

Constancy: *Eupteryx cyclops* (1st class – 2007 and 2008: 84.09% & 79.55%, 2nd class – 2006: 72.73%), *Eupteryx atropunctata* (2nd class – 2007 and 2008: 52.27% & 52.27%), *Eupteryx calcarata* (2nd class – 2007 and 2008: 61.36% & 52.27%). The highest value of Q index: *Eupteryx cyclops* (2006-2008: 50.40, 59.88 & 62.62) (Tab. 5).

Populations of *Eupteryx calcarata* and *Eupteryx cyclops* were most significant in the seasonal dynamics of abundance on this plot. Both reached their peaks simultaneously in 2007 – at the beginning of June, and in 2008 at the beginning of July. In 2006 *Eupteryx calcarata* reached its maximum abundance at the beginning of June, while *Eupteryx cyclops* at the beginning of July. The contribution of other species to the seasonal dynamics is marginal, except for *Stenocranus major* in autumn of 2006 (Fig. 5).

Characteristics of the community

In the community comprising plots 3 and 4, a total of 2623 specimens were collected during the three study seasons. They represented 51 species (19% of all the collected species) (Tabs 4 and 5), among which 24 (48%) were common to both plots (Tab. 1).

With regard to abundance, the community core was constituted by three superdominant, highly constant species: *Macrosteles laevis* (the mean share 22.95 % of the collected specimens), *Eupteryx cyclops* (22.91 %) and *E. atropunctata* (the mean share 20.00 %), which together made up 65.86 % of all the collected specimens in this community (Tab. 39). Other dominant and subdominant species, *Stenocranus major*, *Eupteryx calcarata* and *Macrosteles variatus* were less important (Tab. 3 and 4). *Eupteryx calcarata* (83.27) and *Eupteryx aurata* (61.54) reached the highest values of fidelity index in this community (Tab. 37).

The seasonal dynamics of abundance was mostly shaped by *Eupteryx atropunctata*, *E. cyclops* and *E. calcarata*, which were highly abundant throughout the season in all three years of the study (Figs 4 and 5).

Table 5. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 4 (*Urtico-Aegopodietum podagrariae*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	22.67	47.73	3	32.89	2.60	22.73	4	7.69	8.98	43.18	3	19.69
2.	***Eurysula lurida***	-	-	-	-	0.22	2.27	4	0.71	-	-	-	-
3.	***Laodelphax striatellus***	0.27	2.27	4	0.78	0.22	2.27	4	0.71	-	-	-	-
4.	***Dicranotropis hamata***	1.87	11.36	4	4.61	0.43	4.55	4	1.40	0.80	9.09	4	2.70
5.	***Struebingianella lugubrina***	-	-	-	-	-	-	-	-	0.40	4.55	4	1.35
6.	***Criomorphus albomarginatus***	0.53	2.27	4	1.10	-	-	-	-	-	-	-	-
7.	***Javesella pellucida***	0.53	2.27	4	1.10	-	-	-	-	0.40	2.27	4	0.95
8.	***Ribautodelphax albostriatus***	0.53	4.55	4	1.55	0.22	2.27	4	0.71	-	-	-	-
9.	***Cercopis sanguinolenta***	-	-	-	-	0.43	2.27	4	0.99	0.20	2.27	4	0.67
10.	***Philaenus spumarius***	2.67	13.64	4	6.03	1.30	11.36	4	3.84	0.80	9.09	4	2.70
11.	***Megophthalmus scanicus***	-	-	-	-	1.30	9.09	4	3.44	2.00	4.55	4	3.02
12.	***Anaceratagallia ribauti***	0.53	2.27	4	1.10	0.22	2.27	4	0.71	-	-	-	-
13.	***Idiocerus stigmaticalis***	-	-	-	-	-	-	-	-	0.40	4.55	4	1.35
14.	***Aphrodes makarovi***	0.27	2.27	4	0.78	0.22	2.27	4	0.71	0.80	6.82	4	2.34
15.	***Forcipata citrinella***	-	-	-	-	0.22	2.27	4	0.71	-	-	-	-
16.	***Empoasca pteridis***	0.27	2.27	4	0.78	3.68	22.73	4	9.15	0.20	2.27	4	0.67
17.	***Eupteryx adspersa***	0.27	2.27	4	0.78	-	-	-	-	-	-	-	-
18.	***Eupteryx atropunctata***	5.60	40.09	3	14.98	6.49	52.27	2	18.42	7.98	52.27	2	20.42

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
19.	***Eupteryx aurata***	1.07	4.55	4	2.21	1.30	13.64	4	4.21	2.40	25.00	4	7.75
20.	***Eupteryx calcarata***	12.53	47.73	3	24.46	17.32	61.36	2	32.60	10.98	52.27	2	23.96
21.	***Eupteryx cyclops***	34.93	72.73	2	50.40	42.64	84.09	1	59.88	49.30	79.55	1	62.62
22.	***Zyginidia pullula***	0.27	2.27	4	0.78	-	-	-	-	-	-	-	-
23.	***Balclutha rhenana***	0.80	4.55	4	1.91	3.03	15.91	4	6.94	0.80	9.09	4	2.70
24.	***Macrosteles laevis***	6.40	22.73	4	12.06	11.90	47.73	3	23.83	6.19	22.73	4	11.86
25.	***Macrosteles sexnotatus***	-	-	-	-	0.22	2.27	4	0.71	-	-	-	-
26.	***Macrosteles variatus***	1.07	6.82	4	2.70	3.46	22.73	4	8.87	5.99	27.27	3	12.78
27.	***Doratura stylata***	0.27	2.27	4	0.78	-	-	-	-	-	-	-	-
28.	***Elymana sulphurella***	0.27	2.27	4	0.78	0.43	4.55	4	1.40	-	-	-	-
29.	***Cicadula flori***	0.27	2.27	4	0.78	-	-	-	-	-	-	-	-
30.	***Cicadula persimilis***	-	-	-	-	0.22	2.27	4	0.71	-	-	-	-
31.	***Mocydiopsis parvicauda***	-	-	-	-	-	-	-	-	0.20	2.27	4	0.67
32.	***Athysanus argentarius***	0.27	2.27	4	0.78	0.43	4.55	4	1.40	-	-	-	-
33.	***Limotettix striola***	-	-	-	-	0.22	2.27	4	0.71	-	-	-	-
34.	***Euscelis incisus***	0.27	2.27	4	0.78	0.65	2.27	4	1.21	0.40	4.55	4	1.35
35.	***Psammotettix alienus***	-	-	-	-	-	-	-	-	0.20	2.27	4	0.67
36.	***Errastunus ocellaris***	4.00	22.73	4	9.54	0.65	6.82	4	2.11	0.40	4.55	4	1.35
37.	***Arthaldeus pascuellus***	1.33	9.09	4	3.48	-	-	-	-	-	-	-	-
38.	***Sorhoanus assimilis***	0.27	2.27	4	0.78	-	-	-	-	-	-	-	-
39.	***Erzaleus metrius***	-	-	-	-	-	-	-	-	0.20	2.27	4	0.67

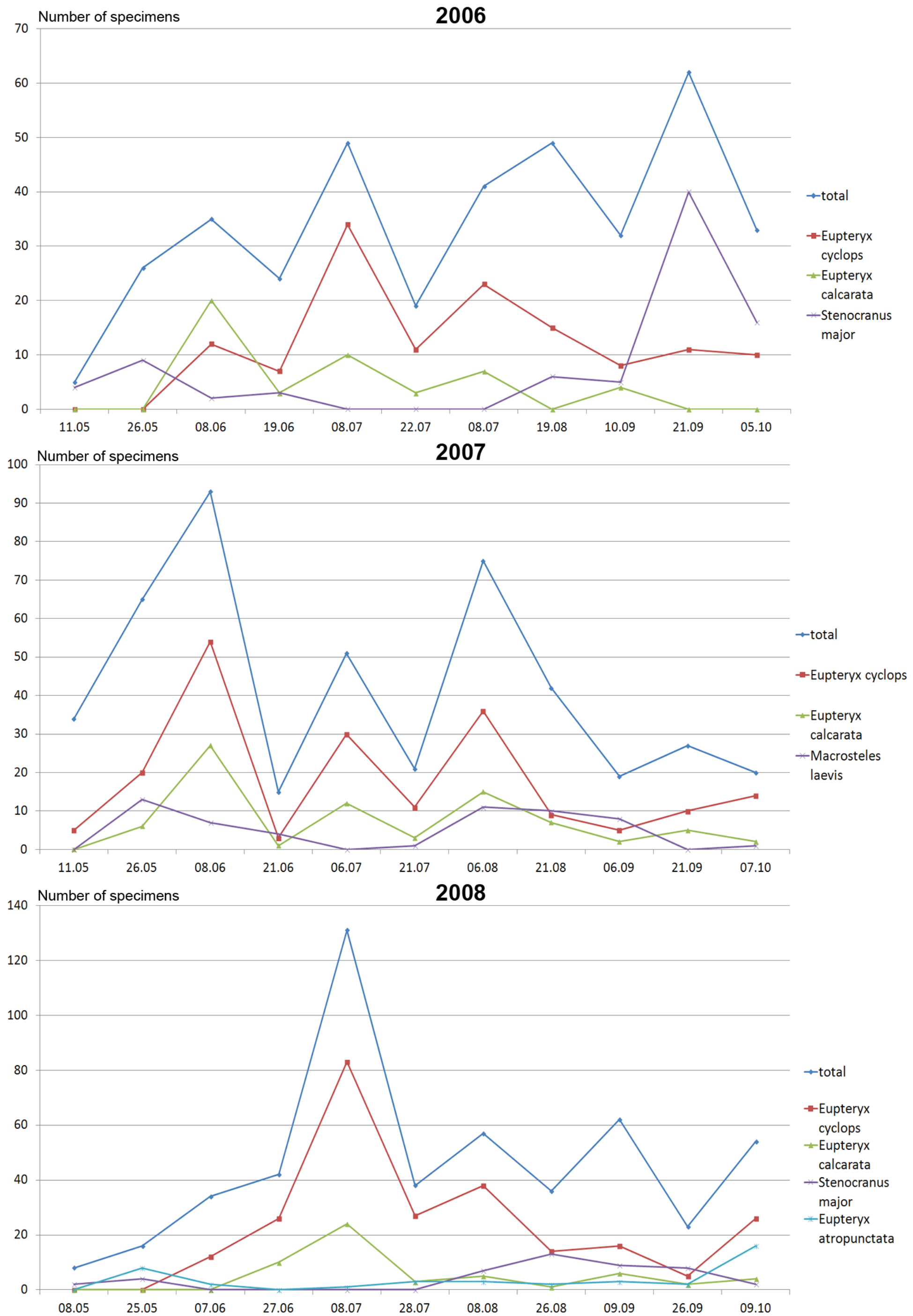

Fig. 5. The dynamics of species abundance among the species dominating in the Plot 4 (*Urtico-Aegopodietum podagrariae*).

5.1.2. Planthopper communities connected with the reed bed associations of the class *Phragmitetea*

Community of the association *Sparganio-Glycerietum fluitantis*

Study plot 5

A total of 1578 specimens/55 species collected: 2005 – 342/26 species, 2007 – 331/23 species, 2008 – 905/48 species (Tab. 6).

Highest classes of abundance (6 species): *Arthaldeus pascuellus* (ED – 2005 and 2008: 35.38% & 40.00%, sD – 2007: 8.16%), *Stenocranus major* (sD – 2005, 2007 and 2008: 8.19%, 13.60% & 16.02), *Struebingianella lugubrina* (sD – 2005, 2007 and 2008: 7.60%, 16.92% & 7.51%), *Cicadula quadrinotata* (sD – 2005: 11.40%), *Macrosteles laevis* (sD – 2007: 16.92%), *M. sexnotatus* (sD – 2007: 15.11%) (Tab. 6).

Constancy: *Arthaldeus pascuellus* (2nd class – 2005 and 2008: 68.18% & 75.00%), *Philaenus spumarius* (2nd class – 2008: 52.27%). The highest value of Q index: *Arthaldeus pascuellus* (2005, 2007 and 2008: 49.11, 16.68 & 54.77) (Tab. 6).

On this study plot the seasonal dynamics of abundance of planthoppers was shaped by the population of *Arthaldeus pascuellus*, whose abundance reached its maximum in the second half of August (2007) or in September (2005 and 2008) (Fig. 6). *Stenocranus major,* which also contributed to the community dynamics, reached the highest abundance at the end of September or in October in all three seasons. The abundance of *Struebingianella lugubrina* in the second half of July in 2007 and of *Macrosteles laevis* at the turn of August and September of the same year was very high, which is worth noticing. Also *Macrosteles sexnotatus* and *Cicadula quadrinotata* contributed slightly to the seasonal dynamics, with the first being most abundant in the second half of August in 2007 and the second at the end of September in 2005 (Fig. 6).

Remarks: the following species were collected only on this plot: *Florodelphax leptosoma*, *Oncopsis alni*, *Edwardsiana rosae*, *E. soror*, *Zygina suavis* and *Allygus modestus* (Tab. 1).

Characteristics of the community

This community was studied only on plot 5 (Fig. 1) because there was no other area within the town with a comparable habitat type. The amount of material collected on this plot comprised 20.5 % of all the collected specimens (Tab. 1). The core of the community comprised *Arthaldeus pascuellus* (the mean share of 27.85%) with a high fidelity index and Stenocranus major (12.60%). The total share of these two species was 40.45% (Tab. 39). Other species with significant abundance included: *Struebingianella lugubrina*, *Macrosteles laevis*, *M. sexnotatus* and *Cicadula quadrinotata*. The species *Struebingianella lugubrina* was usually most abundant in spring (May), and it was then the most numerous species in the community (Fig. 6).

The following species were characteristic, with the highest values of fidelity index: *Oncopsis alni* and *Zygina suavis*, with the fidelity index value W=100 and also *Struebingianella lugubrina* (W=92.02) and *Macrosteles sexnotatus* (W=53.54) (Tab. 37).

Table 6. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 5 (*Sparganio-Glycerietum fluitantis*).

	Species	Year											
		2005				2007				2008			
		D	C		Q	D	C		Q	D	C		Q
1.	***Cixius nervosus***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
2.	***Stenocranus major***	8.19	22.73	4	13.64	13.60	31.82	3	20.80	16.02	34.09	3	23.37
3.	***Megamelus notula***	-	-	-	-	0.30	2.27	4	0.83	-	-	-	-
4.	***Conomelus anceps***	-	-	-	-	0.30	2.27	4	0.83	0.22	4.55	4	1.00
5.	***Eurysula lurida***	-	-	-	-	0.30	2.27	4	0.83	0.22	4.55	4	1.00
6.	***Laodelphax striatellus***	-	-	-	-	0.91	4.55	4	2.03	0.11	2.27	4	0.50
7.	***Muellerianella brevipennis***	-	-	-	-	0.91	6.82	4	2.49	1.22	22.73	4	5.27
8.	***Muellerianella fairmairei***	0.29	2.27	4	0.81	-	-	-	-	1.22	15.91	4	4.41
9.	***Acanthodelphax spinosus***	-	-	-	-	0.30	2.27	4	0.83	0.55	9.09	4	2.24
10.	***Dicranotropis hamata***	-	-	-	-	-	-	-	-	0.77	13.64	4	3.24
11.	***Florodelphax leptosoma***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
12.	***Struebingianella lugubrina***	7.60	40.09	3	17.46	16.92	34.09	3	24.02	7.51	34.09	3	16.00
13.	***Javesella obscurella***	-	-	-	-	-	-	-	-	0.44	9.09	4	2.00
14.	***Javesella pellucida***	6.73	25.00	4	12.97	1.81	9.09	4	4.06	4.09	34.09	3	11.81
15.	***Ribautodelphax albostriatus***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
16.	***Philaenus spumarius***	2.34	9.09	4	4.61	6.04	27.27	3	12.83	5.41	52.27	2	16.82
17.	***Oncopsis alni***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50

	Species	Year											
		2005				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Agallia brachyptera***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
19.	***Anaceratagallia ribauti***	3.51	13.64	4	6.92	-	-	-	-	0.11	2.27	4	0.50
20.	***Stroggylocephalus agrestis***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-
21.	***Cicadella viridis***	2.92	15.91	4	6.82	1.81	11.36	4	4.53	1.88	25.00	4	6.86
22.	***Dikraneura variata***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
23.	***Forcipata citrinella***	0.29	2.27	4	0.81	-	-	-	-	0.22	4.55	4	1.00
24.	***Notus flavipennis***	4.39	25.00	4	10.48	5.44	18.18	4	9.94	1.22	15.91	4	4.41
25.	***Kybos smaragdulus***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
26.	***Empoasca decipiens***	-	-	-	-	0.30	2.27	4	0.83	-	-	-	-
27.	***Empoasca pteridis***	1.75	9.09	4	3.99	0.60	4.55	4	1.65	0.22	4.55	4	1.00
28.	***Edwardsiana rosae***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
29.	***Edwardsiana soror***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-
30.	***Eupteryx atropunctata***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
31.	***Eupteryx aurata***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
32.	***Eupteryx calcarata***	-	-	-	-	-	-	-	-	0.44	6.82	4	1.73
33.	***Eupteryx cyclops***	1.46	9.09	4	3.64	-	-	-	-	0.77	9.09	4	2.65
34.	***Eupteryx notata***	-	-	-	-	-	-	-	-	0.22	2.27	4	0.71
35.	***Eupteryx vittata***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
36.	***Zygina suavis***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50

	Species	Year											
		2005				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
37.	***Balclutha calamagrostis***	-	-	-	-	-	-	-	-	0.33	6.82	4	1.50
38.	***Balclutha punctata***	-	-	-	-	-	-	-	-	0.22	4.55	4	1.00
39.	***Macrosteles laevis***	4.97	18.18	4	9.51	16.92	40.09	3	26.04	2.32	22.73	4	7.26
40.	***Macrosteles ossiannilssoni***	0.29	2.27	4	0.81	5.74	22.73	4	11.42	1.10	6.82	4	2.74
41.	***Macrosteles sexnotatus***	0.58	4.55	4	1.62	15.11	47.73	3	26.86	5.97	34.09	3	14.27
42.	***Macrosteles viridigriseus***	0.29	2.27	4	0.81	-	-	-	-	0.11	2.27	4	0.50
43.	***Deltocephalus pulicaris***	0.29	2.27	4	0.81	0.91	4.55	4	2.03	0.33	4.55	4	1.23
44.	***Allygus modestus***	-	-	-	-	-	-	-	-	0.22	4.55	4	1.00
45.	***Rhopalopyx preyssleri***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
46.	***Elymana sulphurella***	0.29	2.27	4	0.81	-	-	-	-	0.44	4.55	4	1.41
47.	***Cicadula flori***	4.09	9.09	4	6.10	0.30	2.27	4	0.83	0.11	2.27	4	0.50
48.	***Cicadula quadrinotata***	11.40	40.09	3	21.38	2.11	13.64	4	5.36	3.87	34.09	3	11.49
49.	***Athysanus argentarius***	0.88	4.55	4	2.00	-	-	-	-	-	-	-	-
50.	***Euscelis incisus***	0.58	4.55	4	1.62	0.30	2.27	4	0.83	0.33	4.55	4	1.23
51.	***Streptanus sordidus***	-	-	-	-	0.91	4.55	4	2.03	0.11	2.27	4	0.50
52.	***Psammotettix alienus***	-	-	-	-	-	-	-	-	0.22	4.55	4	1.00
53.	***Errastunus ocellaris***	0.58	4.55	4	1.62	-	-	-	-	-	-	-	-
54.	***Arthaldeus pascuellus***	35.38	68.18	2	49.11	8.16	34.09	3	16.68	40.00	75.00	2	54.77
55.	***Sorhoanus assimilis***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-

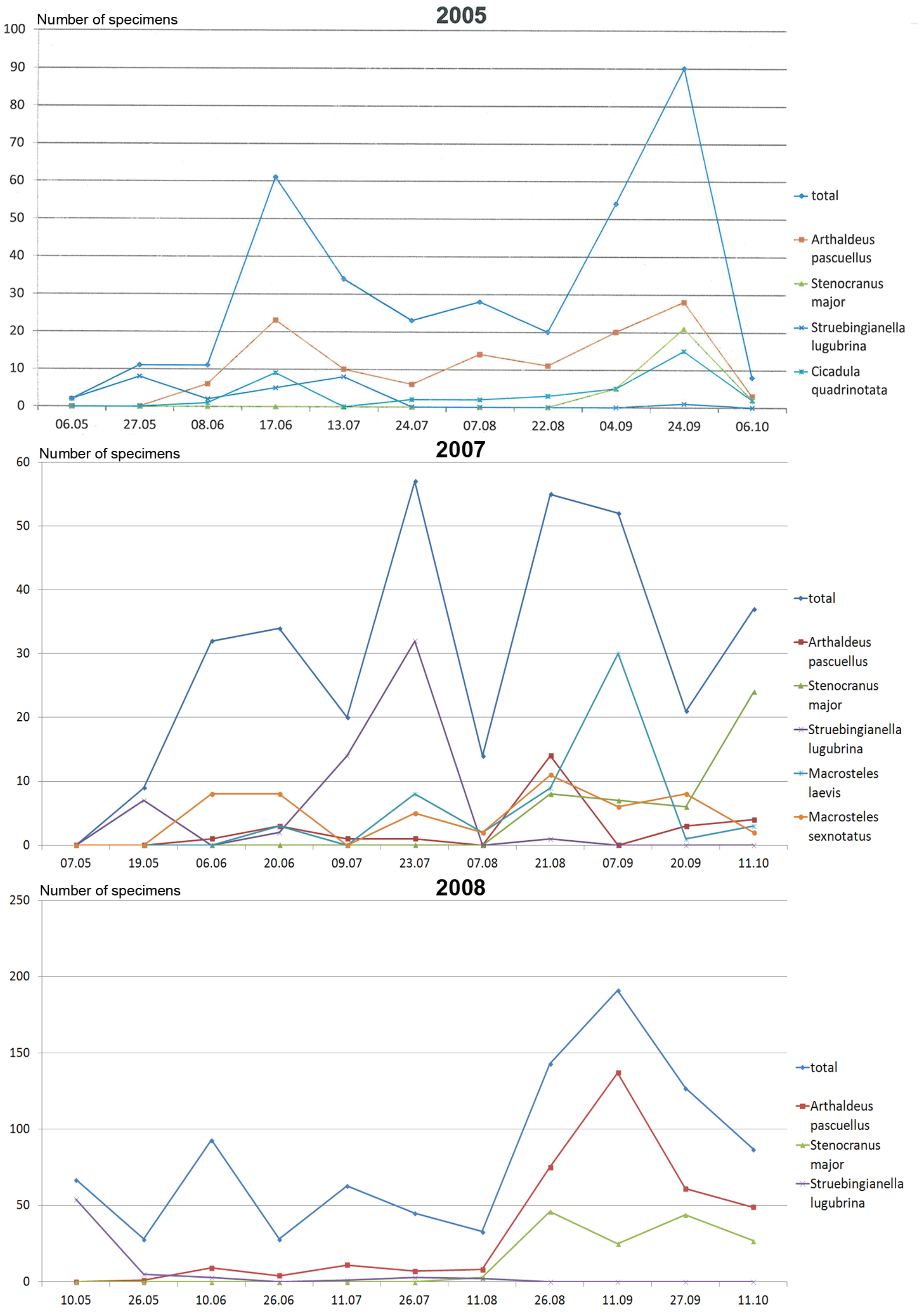

Fig. 6. The dynamics of species abundance among the species dominating in the Plot 5 (*Sparganio-Glycerietum fluitantis*).

Community of the association *Phalaridetum arundinaceae*

Study plot 6

A total of 2401 specimens/36 species collected: 2005 – 723/19 species, 2006 – 322/20 species, 2008 – 1356/26 species (Tab. 7).

Highest classes of abundance (5 species): *Stenocranus major* (SD – 2005 and 2008: 69.29% & 54.04%, ED – 2006: 33.54%), *Notus flavipennis* (D – 2008: 23.38%, sD – 2006: 12.73%), *Macrosteles laevis* (sD – 2006: 19.57%), *Erzaleus metrius* (sD – 2005: 7.61%) and *Cicadula quadrinotata* (sD – 2008: 7.52%) (Tab. 7).

Constancy: *Stenocranus major* (2nd class – 2005 and 2008: 59.09% & 68.18%), *Notus flavipennis* (2nd class – 2008: 75.00% and *Erzaleus metrius* (2nd class – 2008: 52.27%). The highest value of Q index: *Stenocranus major* (2006-2008: 63.99, 36.00 & 60.71) (Tab. 7).

The population of *Stenocranus major* had the most significant impact on the seasonal dynamics of the community on this plot. It was most abundant at the end of summer in 2005 and in early autumn in 2006 and 2008. In 2006 and 2008, it was also significantly abundant in spring – at the beginning of May. *Macrosteles laevis* was most abundant in the second half of July 2006 and *Notus flavipennis* at the turn of August and September 2008. Among other species, *Cicadula quadrinotata* increased slightly its abundance at the end of summer 2008 and *Erzaleus metrius* at the end of summer 2005 (Fig. 7).

Characteristics of the community

This community was studied only on plot 6 (Fig. 1) because there was no other area within the town with a comparable habitat type. The amount of material collected on this plot comprised 13.5% of all the collected specimens (Tab. 1). The core of the community comprised superdominant *Stenocranus major* (the mean share of 52.30%) and dominant *Notus flavipennis* (13.70%). Both species shared 66.00% of the specimens in this community (Tab. 39). Other relatively abundant species included *Macrosteles laevis*, *Cicadula quadrinotata* and *Erzaleus metrius* (Tab. 7).

The following species were characteristic of this community, with high values of fidelity index: *Erzaleus metrius* (W=92.67), *Metalimnus formosus* (W=76.92) and *Cicadula flori* (W=63.04) (Tab. 37).

5.1.3. Planthopper communities connected with the psammophilous grasslands of the class *Koelerio glaucae-Corynephoretea canescentis*

Community of the association *Spergulo vernalis-Corynephoretum*

Study plot 7

A total of 1124 specimens/52 species collected: 2006 – 273/25 species, 2008 – 348/38 species, 2009 – 503/37 species (Tab. 8).

Highest classes of abundance (3 species): *Psammotettix excisus* (SD – 2006 and 2009: 48.72% & 42.74%, ED – 2008: 33.62%), *Neophilaenus minor* (sD – 2006, 2008 and 2009: 19.05%, 17.82% & 8.75%), *Neoaliturus fenestratus* (sD – 2009: 8.62%) (Tab. 8).

Constancy: *Psammotettix excisus* (2nd class – 2006, 2008 and 2009: 70.45%, 61.36% & 63.64%), *Neophilaenus minor* (2nd class – 2006: 56.82%). The highest value of Q index: *Psammotettix excisus* (2006, 2008 and 2009: 58.59, 45.42 & 52.15) (Tab. 8).

Table 7. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 6 (*Phalaridetum arundinaceae*).

	Species	Year											
		2005				2006				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Stenocranus major***	69.29	59.09	2	63.99	33.54	38.64	3	36.00	54.06	68.18	2	60.71
2.	***Megamelus notula***	-	-	-	-	-	-	-	-	0.07	2.27	4	0.40
3.	***Chloriona smaragdula***	0.14	2.27	4	0.56	-	-	-	-	-	-	-	-
4.	***Megadelphax sordidulus***	-	-	-	-	-	-	-	-	0.15	4.55	4	0.83
5.	***Laodelphax striatellus***	0.14	2.27	4	0.56	0.62	4.55	4	1.68	-	-	-	-
6.	***Acanthodelphax denticauda***	-	-	-	-	-	-	-	-	0.59	6.82	4	2.01
7.	***Dicranotropis hamata***	0.14	2.27	4	0.56	-	-	-	-	0.07	2.27	4	0.40
8.	***Javesella pellucida***	0.14	2.27	4	0.56	3.11	11.36	4	5.94	0.37	9.09	4	1.83
9.	***Cercopis sanguinolenta***	-	-	-	-	-	-	-	-	0.07	2.27	4	0.40
10.	***Cercopis vulnerata***	-	-	-	-	0.62	4.55	4	1.68	-	-	-	-
11.	***Philaenus spumarius***	0.14	2.27	4	0.56	-	-	-	-	0.07	2.27	4	0.40
12.	***Megophthalmus scanicus***	-	-	-	-	-	-	-	-	0.37	9.09	4	1.83
13.	***Oncopsis flavicollis***	-	-	-	-	0.62	2.27	4	1.19	-	-	-	-
14.	***Dikraneura variata***	-	-	-	-	0.31	2.27	4	0.84	-	-	-	-
15.	***Notus flavipennis***	4.98	36.36	3	13.46	12.73	40.09	3	22.59	23.38	75.00	2	41.87
16.	***Empoasca pteridis***	0.69	4.55	4	1.77	0.31	2.27	4	0.84	-	-	-	-
17.	***Eupteryx atropunctata***	0.14	2.27	4	0.56	-	-	-	-	-	-	-	-

	Species	Year											
		2005				2006				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Eupteryx cyclops***	-	-	-	-	-	-	-	-	0.15	4.55	4	0.83
19.	***Eupteryx notata***	-	-	-	-	-	-	-	-	0.07	2.27	4	0.40
20.	***Balclutha calamagrostis***	0.55	6.82	4	1.94	6.83	29.55	3	14.21	0.52	6.82	4	1.88
21.	***Balclutha punctata***	-	-	-	-	-	-	-	-	0.07	2.27	4	0.40
22.	***Macrosteles laevis***	3.32	22.73	4	8.69	19.57	34.09	3	25.83	0.15	4.55	4	0.83
23.	***Graphocraerus ventralis***	-	-	-	-	-	-	-	-	0.07	2.27	4	0.40
24.	***Cicadula flori***	0.14	2.27	4	0.56	2.17	11.36	4	4.96	5.83	50.00	3	17.07
25.	***Cicadula quadrinotata***	3.60	20.45	4	8.58	4.04	18.18	4	8.57	7.52	47.73	3	18.95
26.	***Doliotettix lunulatus***	-	-	-	-	0.31	2.27	4	0.84	-	-	-	-
27.	***Athysanus argentarius***	-	-	-	-	0.31	2.27	4	0.84	0.22	6.82	4	1.22
28.	***Euscelis incisus***	-	-	-	-	0.31	2.27	4	0.84	0.07	2.27	4	0.40
29.	***Streptanus sordidus***	-	-	-	-	-	-	-	-	0.07	2.27	4	0.40
30.	***Metalimnus formosus***	0.28	4.55	4	1.13	1.86	11.36	4	4.60	0.15	4.55	4	0.83
31.	***Psammotettix alienus***	0.97	9.09	4	2.97	4.35	18.18	4	8.89	0.07	2.27	4	0.40
32.	***Psammotettix confinis***	0.14	2.27	4	0.56	-	-	-	-	-	-	-	-
33.	***Errastunus ocellaris***	6.50	36.36	3	15.37	4.35	18.18	4	8.89	0.37	4.55	4	1.30
34.	***Arthaldeus pascuellus***	1.11	15.91	4	4.20	0.62	2.27	4	1.19	-	-	-	-
35.	***Erzaleus metrius***	7.61	38.64	3	17.15	3.42	20.45	4	8.36	5.38	52.27	2	16.77
36.	***Cosmotettix costalis***	-	-	-	-	-	-	-	-	0.07	2.27	4	0.40

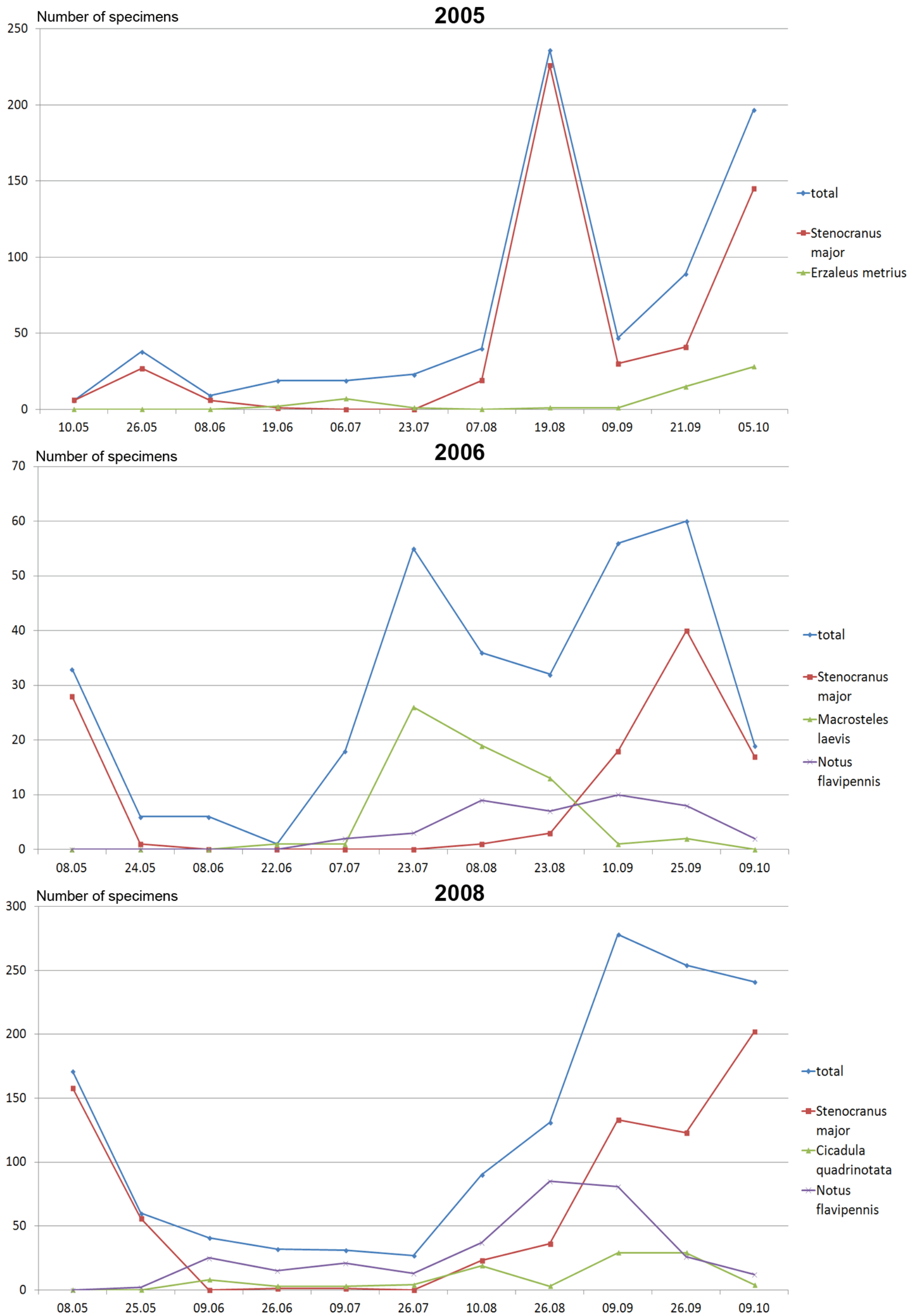

Fig. 7. The dynamics of species abundance among the species dominating in the Plot 6 (*Phalaridetum arundinaceae*).

Table 8. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 7 (*Spergulo vernalis-Corynephoretum*).

Species		Year											
		2006				2008				2009			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	0.73	4.55	4	1.82	0.29	2.27	4	0.81	-	-	-	-
2.	***Laodelphax striatellus***	-	-	-	-	0.86	4.55	4	1.98	-	-	-	-
3.	***Muirodelphax aubei***	-	-	-	-	1.15	4.55	4	2.29	0.40	4.55	4	1.35
4.	***Kosswigianella exigua***	-	-	-	-	0.86	2.27	4	1.40	-	-	-	-
5.	***Javesella pellucida***	0.37	2.27	4	0.92	-	-	-	-	-	-	-	-
6.	***Ribautodelphax angulosus***	-	-	-	-	0.86	6.82	4	2.42	-	-	-	-
7.	***Ribautodelphax collinus***	1.47	6.82	4	3.17	2.87	6.82	4	4.42	1.19	11.36	4	3.68
8.	***Neophilaenus campestris***	-	-	-	-	0.29	2.27	4	0.81	-	-	-	-
9.	***Neophilaenus exclamationis***	-	-	-	-	0.29	2.27	4	0.81	-	-	-	-
10.	***Neophilaenus lineatus***	0.73	4.55	4	1.82	1.72	4.55	4	2.80	-	-	-	-
11.	***Neophilaenus minor***	19.05	56.82	2	32.90	17.82	50.00	3	29.85	8.75	45.45	3	19.94
12.	***Philaenus spumarius***	1.10	6.82	4	2.74	0.57	4.55	4	1.61	-	-	-	-
13.	***Hephathus nanus***	-	-	-	-	0.29	2.27	4	0.81	0.20	2.27	4	0.67
14.	***Anaceratagallia ribauti***	0.73	4.55	4	1.82	-	-	-	-	0.20	2.27	4	0.67
15.	***Anaceratagallia venosa***	-	-	-	-	-	-	-	-	0.80	6.82	4	0.74
16.	***Erythria aureola***	-	-	-	-	-	-	-	-	0.40	4.55	4	1.35
17.	***Emelianoviana mollicula***	1.10	6.82	4	2.74	0.57	4.55	4	1.61	0.60	2.27	4	1.17

	Species	Year											
		2006				2008				2009			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Dikraneura variata***	-	-	-	-	0.57	4.55	4	1.61	-	-	-	-
19.	***Micantulina stigmatipennis***	-	-	-	-	0.57	4.55	4	1.61	-	-	-	-
20.	***Forcipata citrinella***	-	-	-	-	-	-	-	-	0.20	2.27	4	0.67
21.	***Chlorita paolii***	4.40	20.45	4	9.49	4.02	27.27	3	10.47	4.17	22.73	4	9.74
22.	***Eupteryx notata***	0.37	2.27	4	0.92	0.86	6.82	4	2.42	0.20	2.27	4	0.67
23.	***Zyginidia pullula***	-	-	-	-	0.57	4.55	4	1.61	-	-	-	-
24.	***Zygina hyperici***	0.73	2.27	4	1.29	-	-	-	-	0.40	4.55	4	1.35
25.	***Neoaliturus fenestratus***	-	-	-	-	8.62	31.82	3	16.56	0.80	6.82	4	2.34
26.	***Neoaliturus guttulatus***	0.37	2.27	4	0.92	0.86	6.82	4	2.42	0.99	11.36	4	3.35
27.	***Balclutha calamagrostis***	2.93	11.36	4	5.77	2.30	13.64	4	5.60	4.17	25.00	4	10.21
28.	***Balclutha punctata***	-	-	-	-	0.29	2.27	4	0.81	-	-	-	-
29.	***Macrosteles laevis***	6.59	22.73	4	12.24	2.30	13.64	4	5.60	6.36	36.36	3	15.21
30.	***Doratura exilis***	-	-	-	-	0.29	2.27	4	0.81	0.20	2.27	4	0.67
31.	***Doratura impudica***	-	-	-	-	0.57	2.27	4	1.14	0.60	6.82	4	2.02
32.	***Doratura stylata***	0.37	2.27	4	0.92	0.86	4.55	4	1.98	-	-	-	-
33.	***Graphocraerus ventralis***	0.37	2.27	4	0.92	-	-	-	-	0.20	2.27	4	0.67
34.	***Hardya tenuis***	-	-	-	-	0.29	2.27	4	0.81	0.80	6.82	4	2.34
35.	***Rhopalopyx vitripennis***	0.37	2.27	4	0.92	0.57	2.27	4	1.14	-	-	-	-
36.	***Elymana sulphurella***	-	-	-	-	1.72	9.09	4	3.95	0.40	4.55	4	1.35

	Species	Year														
		2006				2008				2009						
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*			
37.	***Cicadula quadrinotata***	0.37	2.27	4	0.92	-	-	-	-	0.20	2.27	4	0.67			
38.	***Mocydiopsis parvicauda***	-	-	-	-	-	-	-	-	0.20	2.27	4	0.67			
39.	***Laburrus impictifrons***	0.37	2.27	4	0.92	4.31	20.45	4	9.39	4.57	25.00	4	10.69			
40.	***Euscelis distinguendus***	-	-	-	-	0.29	2.27	4	0.81	0.60	4.55	4	1.65			
41.	***Arocephalus languidus***	-	-	-	-	1.44	6.82	4	3.13	1.59	9.09	4	3.80			
42.	***Arocephalus longiceps***	-	-	-	-	-	-	-	-	1.59	13.64	4	4.66			
43.	***Psammotettix alienus***	1.47	6.82	4	3.17	1.72	13.64	4	4.84	4.37	25.00	4	10.45			
44.	***Psammotettix cephalotes***	-	-	-	-	-	-	-	-	0.99	4.55	4	2.12			
45.	***Psammotettix confinis***	0.73	4.55	4	1.82	2.30	18.18	4	6.47	6.76	40.09	3	16.46			
46.	***Psammotettix excisus***	48.72	70.45	2	58.59	33.62	61.36	2	45.42	42.74	63.64	2	52.15			
47.	***Psammotettix nodosus***	-	-	-	-	0.86	6.82	4	2.42	0.60	4.55	4	1.65			
48.	***Errastunus ocellaris***	2.56	11.36	4	5.39	-	-	-	-	0.20	2.27	4	0.67			
49.	***Turrutus socialis***	3.30	18.18	4	7.75	0.57	4.55	4	1.61	2.78	20.45	4	7.54			
50.	***Jassargus pseudocellaris***	0.37	2.27	4	0.92	1.15	2.27	4	1.62	-	-	-	-			
51.	***Jassargus flori***	-	-	-	-	-	-	-	-	0.40	4.55	4	1.35			
52.	***Verdanus abdominalis***	0.37	2.27	4	0.92	-	-	-	-	0.20	2.27	4	0.67			

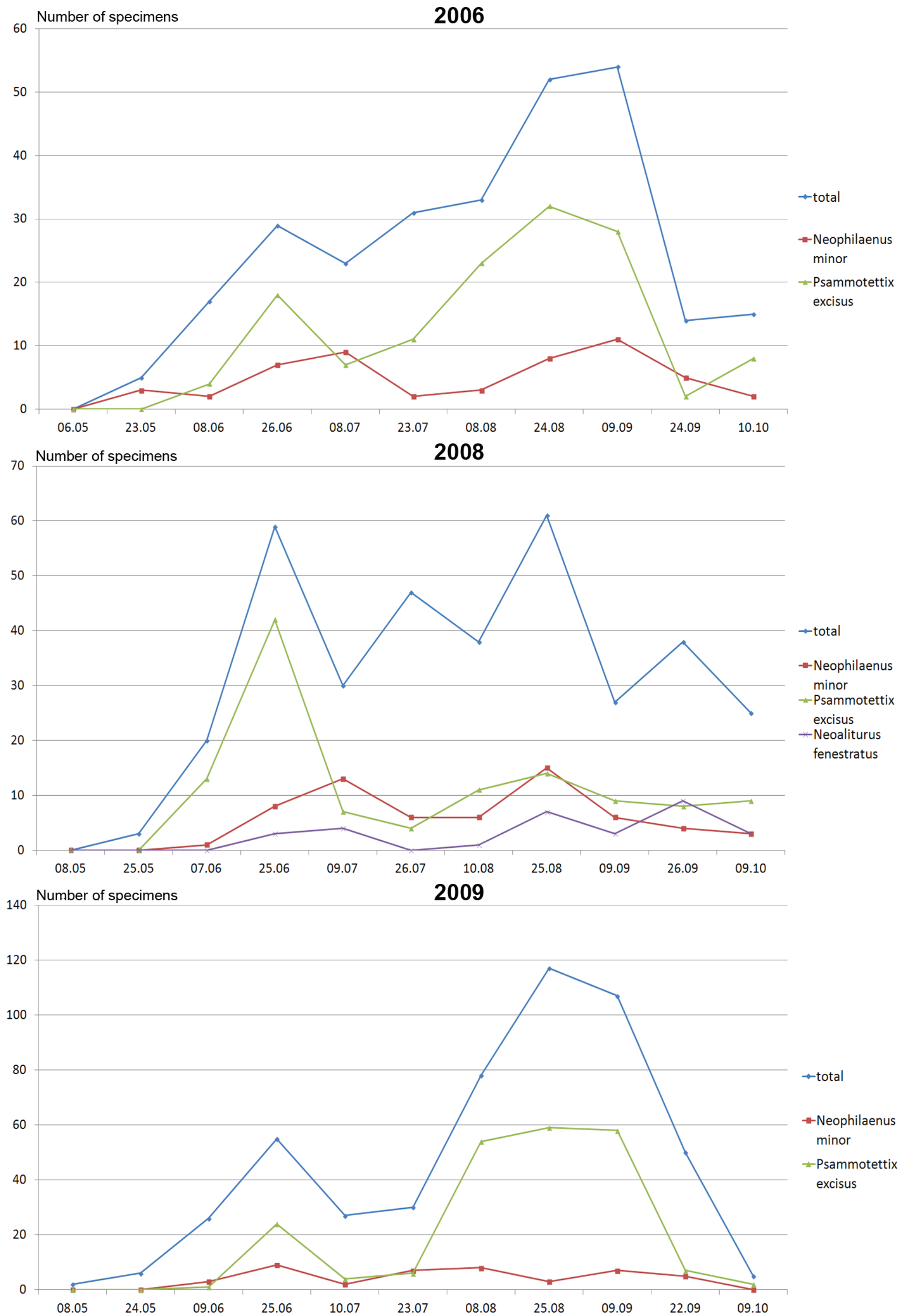

Fig. 8. The dynamics of species abundance among the species dominating in the Plot 7 (*Spergulo vernalis-Corynephoretum*).

The seasonal dynamics of the community was mostly shaped by the abundance of *Psammotettix excisus*, which exhibited two peaks of abundance each year: at the beginning and at the end of summer, with highest values in the second half of June in 2008 and in the second half of August in 2006 and 2009. The abundance of *Neophilaenus minor* was at a relatively low level throughout the season without significant peaks. *Neoaliturus fenestratus* showed a similar tendency in 2008 (Fig. 8).

Remarks: only on this plot *Neophilaenus exclamationis*, *Euscelis distinguendus* and *Psammotettix nodosus* were collected (Tab. 1); this plot was characterized by the highest share of 1st-degree monophagous (28.85%) and stenotopic species (34.62%), and also the lowest number of eurytopic species (30.77%) (Tab. 43a).

Study plot 8

A total of 1062 specimens/39 species collected: 2006 – 240/24 species, 2007 – 501/28 species, 2008 – 321/32 species (Tab. 9).

Highest classes of abundance (7 species): *Neophilaenus minor* (sD – 2006-2008: 12.08%, 10.78% and 12.77%), *Psammotettix confinis* (D – 2008: 22.74%, sD – 2006: 15.42%, 2007: 10.18%), *Chlorita paolii* (D – 2007: 22.16%, sD – 2006: 15.00%), *Turrutus socialis* (sD – 2006: 18.75%, 2007: 11.78%), *Kosswigianella exigua* (sD – 2007: 7.78%), *Rhopalopyx vittipennis* (sD – 2007: 10.98%) and *Stenocranus major* (sD – 2008: 9.35%) (Tab. 9).

Constancy: *Neophilaenus minor* (2nd class – 2007: 63.64%), *Chlorita paolii* (2nd class – 2007: 65.91%). The highest value of Q index: *Chlorita paolii* (2007: 38.22), *Psammotettix confinis* (2008: 30.19) and *Turrutus socialis* (2006: 29.92) (Tab. 9).

In all seasons there was a peak of abundance of *Psammotettix confinis* at the turn of August and September. In two seasons there was a significant abundance of *Chlorita paolii*, which underwent some fluctuations with its maximum at the beginning of June 2006 and in the second half of August 2007. It is worth noting that the highest abundance of *Rhopalopyx vitripennis* and *Turrutus socialis* occurred at the turn of May and June in seasons 2006 and 2007 and a slight rise in abundance of *Stenocranus major* took place at the end of September 2008. The population of *Neophilaenus minor* was at a low, stable level throughout the season whereas *Kossawigianella exigua* insignificantly increased its abundance only once – in June 2007 (Fig. 9).

The unique features of the plot include the occurrence of *Planaphrodes trifasciata* and *Rhytistylus proces* (Tab. 1), the highest share of xerophilous (53.85%) and heliophilous species (66.67%) and the lowest share of mesoheliophilous species (33.33%) (Tab. 43a).

Characteristics of the community

During the three seasons a total of 2186 specimens were collected on plots 7 and 8, comprising 61 species (23% of all the collected species), among which 30 species (49%) were common to both plots (Tab. 1).

The community was characterized by 9 very abundant species, among which *Psammotettix excisus* reached the class of a superdominant on one plot (Tab. 7), while other species, *Psammotettix confinis* and *Turrutus socialis*, reached the class of dominant or subdominant species (Tabs 8 and 9). The highest share in the number of collected specimens in this community was reached by: *Psammotettix excisus* – 21.56% of the collected material,

Table 9. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 8 (*Spergulo vernalis-Corynephoretum*).

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Stenocranus major***	1.67	6.82	4	3.37	0.40	2.27	4	0.95	9.35	20.45	4	13.83
2.	***Jassidaeus lugubris***	-	-	-	-	0.60	6.82	4	2.02	-	-	-	-
3.	***Megadelphax sordidulus***	-	-	-	-	-	-	-	-	0.31	2.27	4	0.84
4.	***Laodelphax striatellus***	0.42	2.27	4	0.98	0.40	4.55	4	1.35	0.31	2.27	4	0.84
5.	***Muellerianella brevipennis***	-	-	-	-	0.20	2.27	4	0.67	-	-	-	-
6.	***Muirodelphax aubei***	-	-	-	-	-	-	-	-	4.67	18.18	4	9.21
7.	***Kosswigianella exigua***	5.83	27.27	3	12.61	7.78	36.36	3	16.82	4.05	20.45	4	9.10
8.	***Ribautodelphax angulosus***	-	-	-	-	0.20	2.27	4	0.67	-	-	-	-
9.	***Ribautodelphax collinus***	2.50	6.82	4	4.13	-	-	-	-	2.80	9.09	4	5.04
10.	***Neophilaenus lineatus***	0.42	2.27	4	0.98	-	-	-	-	2.80	9.09	4	5.04
11.	***Neophilaenus minor***	12.08	45.45	3	23.43	10.78	63.64	2	26.19	12.77	43.18	3	23.48
12.	***Philaenus spumarius***	1.67	6.82	4	3.37	-	-	-	-	0.62	4.55	4	1.68
13.	***Megophthalmus scanicus***	-	-	-	-	-	-	-	-	0.31	2.27	4	0.84
14.	***Anaceratagallia venosa***	-	-	-	-	2.79	25.00	4	8.35	0.31	2.27	4	0.84
15.	***Eupelix cuspidata***	0.42	2.27	4	0.98	0.20	2.27	4	0.67	-	-	-	-
16.	***Planaphrodes trifasciata***	-	-	-	-	-	-	-	-	0.31	2.27	4	0.84
17.	***Chlorita paolii***	15.00	43.18	3	25.45	22.16	65.91	2	38.22	4.36	20.45	4	9.44
18.	***Eupteryx notata***	0.42	2.27	4	0.98	0.40	4.55	4	1.35	-	-	-	-

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
19.	***Zyginidia pullula***	-	-	-	-	0.20	2.27	4	0.67	0.31	2.27	4	0.84
20.	***Neoaliturus fenestratus***	1.67	6.82	4	3.37	2.00	13.64	4	5.22	0.62	4.55	4	1.68
21.	***Neoaliturus guttulatus***	0.42	2.27	4	0.98	2.59	15.91	4	6.42	2.18	11.36	4	4.98
22.	***Balclutha calamagrostis***	2.92	11.36	4	5.76	0.40	4.55	4	1.35	2.49	11.36	4	5.32
23.	***Macrosteles laevis***	5.42	20.45	4	10.53	6.99	47.73	3	18.27	5.92	22.73	3	11.60
24.	***Doratura exilis***	-	-	-	-	0.20	2.27	4	0.67	1.25	6.82	4	2.92
25.	***Doratura homophyla***	-	-	-	-	0.20	2.27	4	0.67	-	-	-	-
26.	***Doratura stylata***	1.67	9.09	4	3.90	1.60	15.91	4	5.05	2.49	15.91	4	6.29
27.	***Graphocraerus ventralis***	-	-	-	-	0.20	2.27	4	0.67	-	-	-	-
28.	***Rhytistylus proceps***	-	-	-	-	0.40	2.27	4	0.95	0.62	4.55	4	1.68
29.	***Hardya tenuis***	-	-	-	-	-	-	-	-	0.62	2.27	4	1.19
30.	***Rhopalopyx vitripennis***	5.42	22.73	3	11.10	10.98	27.27	3	17.30	4.36	18.18	4	8.90
31.	***Elymana sulphurella***	0.83	2.27	4	1.37	-	-	-	-	0.31	2.27	4	0.84
32.	***Cicadula quadrinotata***	0.42	2.27	4	0.98	-	-	-	-	0.62	4.55	4	1.68
33.	***Laburrus impictifrons***	2.08	9.09	4	4.35	3.19	20.45	4	8.08	1.56	4.55	4	2.66
34.	***Euscelis incisus***	1.25	6.82	4	2.92	1.20	9.09	4	3.30	0.31	2.27	4	0.84
35.	***Psammotettix alienus***	1.67	6.82	4	3.37	1.60	13.64	4	4.67	2.80	13.64	4	6.18
36.	***Psammotettix confinis***	15.42	43.18	3	25.80	10.18	31.82	3	18.00	22.74	40.09	3	30.19
37.	***Psammotettix excisus***	1.67	9.09	4	3.90	0.40	2.27	4	0.95	2.18	11.36	4	4.98
38.	***Errastunus ocellaris***	-	-	-	-	-	-	-	-	0.31	2.27	4	0.84
39.	***Turrutus socialis***	18.75	47.73	3	29.92	11.78	38.64	3	21.33	5.30	27.27	3	12.02

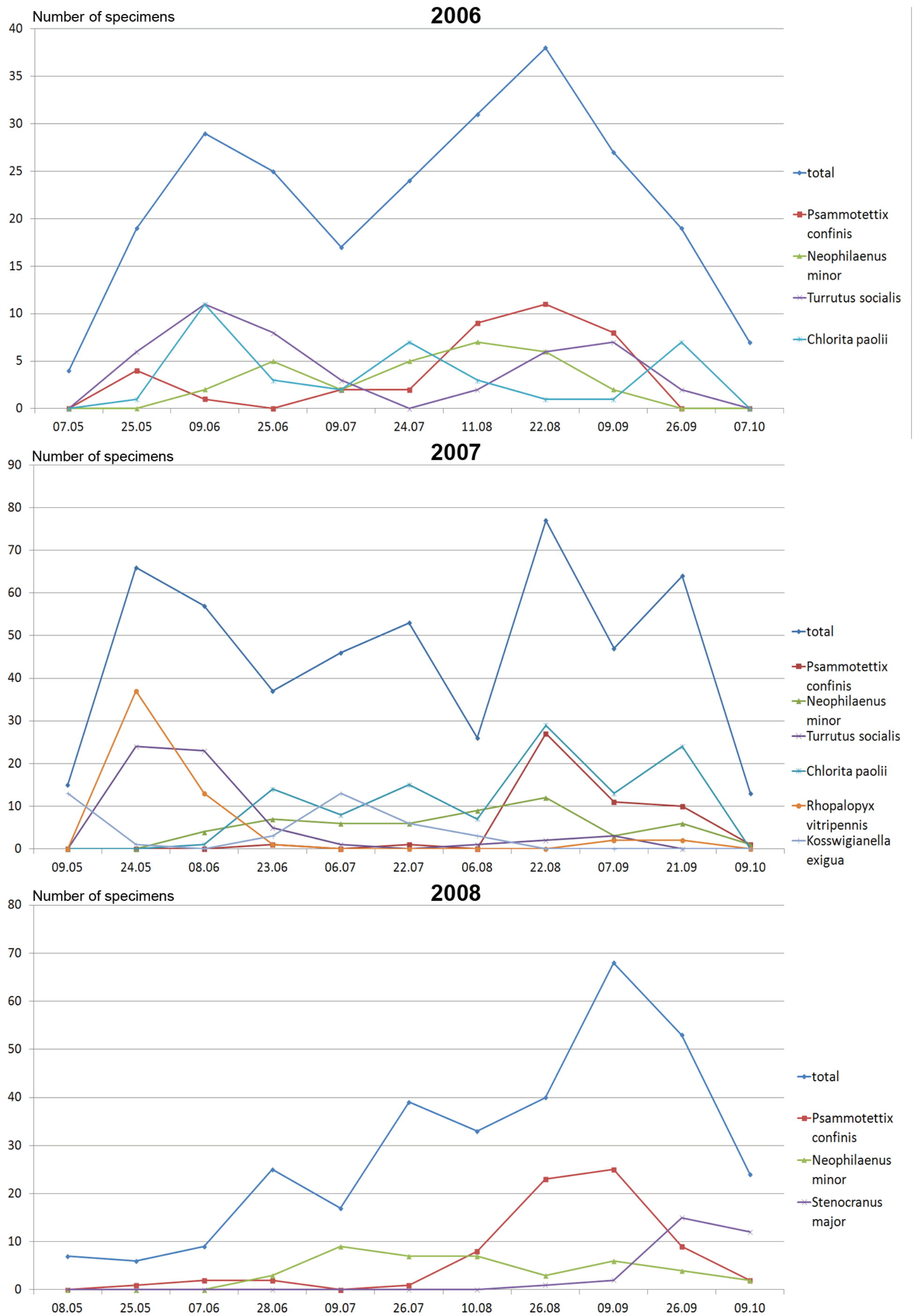

Fig. 9. The dynamics of species abundance among the species dominating in the Plot 8 (*Spergulo vernalis-Corynephoretum*).

Neophilaenus minor – 13.54% and *Psammotettix confinis* – 9.69%. The mean share of these three species in the whole community was 44.79% (Tab. 39).

The highest value of fidelity index (W=100) was scored by *Psammotettix nodosus* and *Rhytistylus proces*, while *Muirodelphax aubei* (W=51.22) and *Kosswigianella exigua* (W=50.36) showed lower values (Tab. 37).

The seasonal dynamics of abundance in the community connected with the association *Spergulo vernalis-Corynephoretum* was shaped predominately by populations of *Psammotettix excisus* (Fig. 8) and *P. confinis* (Fig. 9). The role of *Neophilaenus minor* cannot be underestimated as it occurred regularly in all seasons and with significant abundance (Figs 8 and 9).

Community of the association *Diantho-Armerietum elongatae*

Study plot 9

A total of 1760 specimens/54 species collected: 2006 – 421/28 species, 2007 – 497/40 species, 2008 – 842/47 species (Tab. 10).

Highest classes of abundance (7 species): *Ribautodelphax collinus* (showed unstable abundance; SD – 2008: 51.19%, sD – 2006: 13.06%, R – 2007: 3.02%), *Macrosteles laevis* (sD – 2006 and 2007: 14.73% & 9.26%), *Turrutus socialis* (sD – 2006 and 2007: 19.71% & 10.26%), *Chlorita paolii* (sD – 2007: 13.28%), *Psammotettix confinis* (sD – 2007: 13.28%), *Errastunus ocellaris* (sD – 2007: 9.05%) and *Jassargus pseudocellaris* (sD – 2007: 11.67%) (Tab. 10).

Constancy: *Turrutus socialis* (2nd class – 2006: 68.18%, 2007: 52.27%), *Chlorita paolii* (2nd class – 2007: 70.45%), *Psammotettix confinis* (2nd class – 2007: 52.27%) and *Jassargus pseudocellaris* (2nd class – 2008: 63.64%). The highest value of Q index: *Ribautodelphax collinus* (2008: 48.23), *Turrutus socialis* (2006: 36.66) and *Psammotettix confinis* (2007: 26.35) (Tab. 10).

The population of *Ribautodelphax collinus* on this plot reached various levels of dominance: from a superdominant position in July 2008, through a subdominant one in 2006 to the level of accessory species in 2007. The phenomenon is further referred to in Discussion. The fluctuations of abundance were sometimes observed for such species as: *Turrutus socialis* (2006 and 2007), *Macrosteles laevis* (2006 and 2007), *Chlorita paolii* (2007). Small peaks of abundance were noted for *Psammotettix confinis* (in June 2007) and *Errastunus ocellaris* (in October 2007). However, the contribution of the latter two species into the whole community was small and the peaks of their abundance only slightly increased the general curve of abundance in the second half of May 2007 (Fig. 10).

Remarks: on this plot there was the highest percentage of species overwintering as adults (24.07%) and the lowest number of species overwintering in the stage of egg (50.00%) (Tab. 43a).

Characteristics of the community

The community connected with plant association *Diantho-Armerietum elongatae* was studied only on plot 9 (Fig. 1) because there was no other area within the town with a comparable habitat type. The amount of specimens collected in this community comprised 20% of all the collected material (Tab. 1). Quantitatively, the core of this community

Table 10. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 9 (*Diantho-Armerietum elongatae*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1	***Stenocranus major***	1.66	9.09	4	3.88	0.60	4.55	4	1.65	0.48	4.55	4	1.48
2	***Stenocranus minutus***	-	-	-	-	-	-	-	-	0.48	6.82	4	1.81
3	***Jassidaeus lugubris***	-	-	-	-	0.20	2.27	4	0.67	-	-	-	-
4	***Eurysula lurida***	-	-	-	-	-	-	-	-	0.12	2.27	4	0.52
5	***Eurybregma nigrolineata***	4.28	15.91	4	8.25	1.61	11.36	4	4.28	0.24	2.27	4	0.74
6	***Megadelphax sordidulus***	-	-	-	-	-	-	-	-	0.24	2.27	4	0.74
7	***Laodelphax striatellus***	0.71	6.82	4	2.20	1.21	13.64	4	4.06	0.12	2.27	4	0.52
8	***Muirodelphax aubei***	0.48	2.27	4	1.04	0.40	4.55	4	1.35	0.12	2.27	4	0.52
9	***Acanthodelphax spinosus***	-	-	-	-	-	-	-	-	2.26	18.18	4	6.41
10	***Dicranotropis hamata***	-	-	-	-	0.20	2.27	4	0.67	0.48	9.09	4	2.09
11	***Kosswigianella exigua***	0.24	2.27	4	0.74	0.80	9.09	4	2.70	7.13	27.27	3	13.94
12	***Xanthodelphax flaveolus***	-	-	-	-	-	-	-	-	0.71	9.09	4	2.54
13	***Javesella pellucida***	2.14	6.82	4	3.82	0.20	2.27	4	0.67	3.44	13.64	4	6.85
14	***Ribautodelphax albostriatus***	1.66	9.09	4	3.88	0.60	6.82	4	2.02	2.42	15.91	4	6.21
15	***Ribautodelphax collinus***	13.06	45.45	3	24.36	3.02	18.18	4	7.41	51.19	45.45	3	48.23
16	***Tettigometra impressopunctata***	-	-	-	-	-	-	-	-	0.12	2.27	4	0.52
17	***Cercopis sanguinolenta***	-	-	-	-	0.20	2.27	4	0.67	-	-	-	-

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18	***Aphrophora alni***	0.48	4.55	4	1.48	0.20	2.27	4	0.67	0.12	2.27	4	0.52
19	***Philaenus spumarius***	-	-	-	-	-	-	-	-	1.19	2.27	4	1.64
20	***Utecha lugens***	-	-	-	-	1.21	13.64	4	4.06	-	-	-	-
21	***Utecha trivia***	0.48	4.55	4	1.48	0.40	4.55	4	1.35	0.71	9.09	4	2.54
22	***Hephathus nanus***	0.24	2.27	4	0.74	0.40	4.55	4	1.35	0.24	4.55	4	1.04
23	***Anaceratagallia ribauti***	0.14	4.55	4	0.80	0.20	2.27	4	0.67	0.12	2.27	4	0.52
24	***Eupelix cuspidata***	1.19	4.55	4	2.33	0.80	6.82	4	2.34	0.24	4.55	4	1.04
25	***Aphrodes bicinctus***	-	-	-	-	0.20	2.27	4	0.67	0.56	6.82	4	1.95
26	***Cicadella viridis***	-	-	-	-	0.20	2.27	4	0.67	-	-	-	-
27	***Forcipata citrinella***	-	-	-	-	-	-	-	-	0.12	2.27	4	0.52
28	***Empoasca affinis***	-	-	-	-	-	-	-	-	0.12	2.27	4	0.52
29	***Empoasca pteridis***	1.19	9.09	4	3.29	1.01	6.82	4	2.62	0.36	9.09	4	1.81
30	***Chlorita paolii***	6.65	34.09	3	15.06	13.28	70.45	2	30.59	0.95	15.91	4	3.89
31	***Eupteryx aurata***	-	-	-	-	0	0	0	0	0.12	2.27	4	0.52
32	***Eupteryx cyclops***	-	-	-	-	0.20	2.27	4	0.67	-	-	-	-
33	***Eupteryx notata***	0.48	4.55	4	1.48	0.20	2.27	4	0.67	0.48	9.09	4	2.09
34	***Zyginidia pullula***	-	-	-	-	0.20	2.27	4	0.67	0.12	2.27	4	0.52
35	***Zygina hyperici***	-	-	-	-	-	-	-	-	0.24	2.27	4	0.74
36	***Balclutha calamagrostis***	3.80	18.18	4	8.31	0.60	4.55	4	1.65	0.71	9.09	4	2.54

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
37	***Balclutha punctata***	-	-	-	-	-	-	-	-	0.12	2.27	4	0.52
38	***Macrosteles laevis***	14.73	47.73	3	26.52	9.26	45.45	3	20.52	1.54	25.00	4	6.20
39	***Doratura stylata***	1.66	13.64	4	4.76	3.62	20.45	4	8.60	3.68	25.00	4	9.59
40	***Graphocraerus ventralis***	-	-	-	-	1.41	6.82	4	3.10	-	-	-	-
41	***Rhopalopyx adumbrata***	0.24	2.27	4	0.74	1.61	15.91	4	5.06	0.48	9.09	4	2.09
42	***Rhopalopyx vitripennis***	3.33	20.45	4	8.25	2.62	20.45	4	7.32	0.36	6.82	4	1.57
43	***Elymana sulphurella***	-	-	-	-	-	-	-	-	0.59	6.82	4	2.01
44	***Cicadula quadrinotata***	-	-	-	-	0.40	4.55	4	1.35	0.24	4.55	4	1.04
45	***Mocydiopsis parvicauda***	-	-	-	-	0.80	9.09	4	2.70	1.54	29.55	3	6.75
46	***Euscelis incisus***	1.19	6.82	4	2.85	4.23	27.27	3	10.74	1.31	25.00	4	5.72
47	***Psammotettix alienus***	2.14	15.91	4	5.84	3.02	27.27	3	9.07	0.48	9.09	4	2.09
48	***Psammotettix confinis***	4.99	31.82	3	12.60	13.28	52.27	2	26.35	0.48	6.82	4	1.81
49	***Errastunus ocellaris***	5.70	40.09	3	15.12	9.05	34.09	3	17.56	1.43	22.73	4	5.70
50	***Turrutus socialis***	19.71	68.18	2	36.66	10.26	52.27	2	23.16	5.82	40.09	3	15.27
51	***Jassargus pseudocellaris***	6.89	50.00	3	18.56	11.67	45.45	3	23.03	5.46	63.64	2	18.64
52	***Arthaldeus pascuellus***	-	-	-	-	0.40	4.55	4	1.35	0.36	4.55	4	1.28
53	***Sorhoanus assimilis***	-	-	-	-	-	-	-	-	0.12	2.27	4	0.52
54	***Mocuellus collinus***	0.24	2.27	4	0.74	0.20	2.27	4	0.67	-	-	-	-

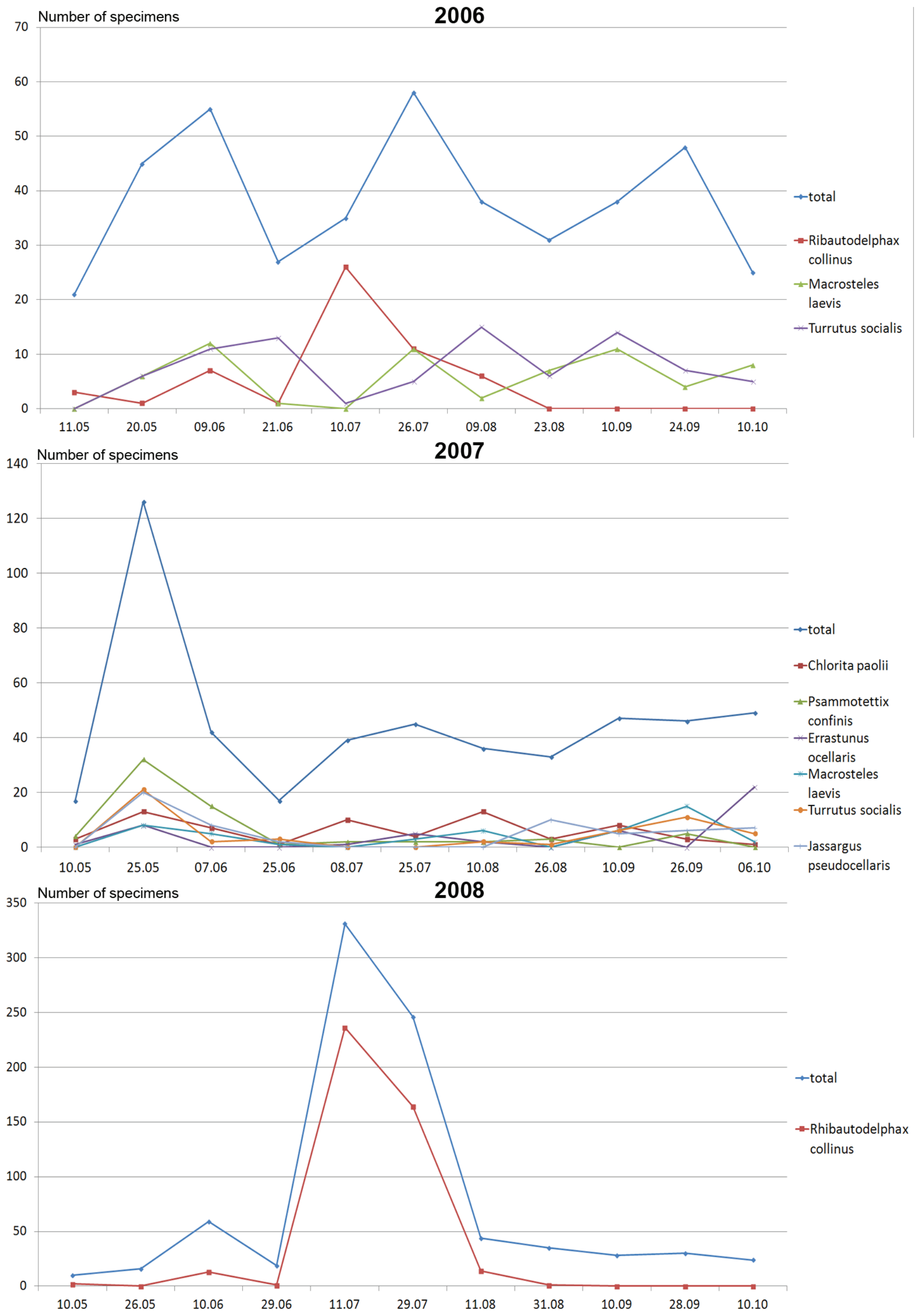

Fig. 10. The dynamics of species abundance among the species dominating in the Plot 9 (*Diantho-Armerietum elongatae*).

consisted of *Ribautodelphax collinus* (the mean share of 22.42% of specimens collected in this community) and *Turrutus socialis* (11.93%). Together they made up 34.35% of the collected specimens. *Chlorita paolii*, *Macrosteles laevis*, *Psammotettix confinis*, *Errastunus ocellaris* and *Jassargus pseudocellaris* were less abundant (Tab. 39). High fidelity index values were reached by *Utecha lugens* (W=54.55) and *Ribautodelphax collinus* (W=51.97) (Tab. 37).

5.1.4. Planthopper communities connected with the anthropogenic and semi-natural meadow associations of the class *Molinio-Arrhenatheretea*

Community of the association *Lolio-Polygonetum arenastri*

Study plot 10

A total of 4264 specimens/56 species collected: 2006 – 748/27 species, 2007 – 2551/38 species, 2008 – 965/44 species (Tab. 11).

Highest classes of abundance (3 species): *Macrosteles laevis* (SD – 2006 and 2007: 50.67% & 51.43%, ED – 2008: 30.36%). *Deltocephalus pulicaris* (D – 2006-2008: 25.80%, 27.75% & 25.18%), *Javesella pellucida* (sD – 2008: 8.91%) (Tab. 11).

Constancy: *Macrosteles laevis* (1st class – 2006-2008: 88.64%, 97.73% & 84.09%), and *Deltocephalus pulicaris* (1st class – 2008: 77.27%). The highest value of Q index: *Macrosteles laevis* (2006-2008: 67.02, 70.90 & 50.53) (Tab. 11).

The populations of two species, *Macrosteles laevis* and *Deltocephalus pulicaris*, had the greatest contribution to the overall dynamics of abundance on this plot. The former showed the highest abundance from August to the second half of September, sometimes peaking also in June (2006 and 2007), and the latter during August (in 2006 and 2007) or at the beginning of June (in 2008). The species *Javesella pellucida* exhibited the peak of abundance only in 2008, in the second half of July (Fig. 11).

Remarks: only on this plot *Streptanus confinis* was collected (Tab. 1).

Study plot 11

A total of 1384 specimens/49 species collected: 2006 – 334/25 species, 2007 – 721/26 species, 2008 – 329/40 species (Tab. 12).

Highest classes of abundance (4 species): *Macrosteles laevis* (SD – 2006 and 2007: 49.40% and 69.35%, D – 2008: 22.49%), *Doratura stylata* (sD – 2006 and 2008: 11.08% & 8.21%), *Euscelis incisus* (sD – 2006 and 2008: 8.98% & 12.46%), *Javesella pellucida* (sD – 2008: 7.90%) (Tab. 12).

Constancy: *Macrosteles laevis* (1st class – 2006 and 2007: 86.36% & 81,82%, 2nd class – 2008: 59.09%). The highest value of Q index: *Macrosteles laevis* (2006-2008: 65.32, 75.33 & 36.45) (Tab. 12).

In the community on this study plot, *Macrosteles laevis* had the dominant contribution to the overall abundance and seasonal dynamics in 2006 and 2007, when the peak of its abundance occurred at the turn of July and August. In 2008 it was less abundant, with only a weak maximum at the end of June. Two species, *Doratura stylata* and *Euscelis incisus*, reached their highest abundance in July 2006 and 2008, while *Javesella pellucida* peaked only once, in the second half of July 2008 (Fig. 12).

Table 11. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 10 (*Lolio-Polygonetum arenastri*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1	***Stenocranus major***	0.27	4.55	4	1.11	0.04	2.27	4	0.30	0.10	2.27	4	0.48
2	***Stenocranus minutus***	-	-	-	-	0.08	4.45	4	0.60	-	-	-	-
3	***Jassidaeus lugubris***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
4	***Conomelus anceps***	0.67	9.09	4	2.47	-	-	-	-	0.21	4.55	4	0.98
5	***Eurysula lurida***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
6	***Laodelphax striatellus***	0.27	4.55	4	1.11	4.23	52.27	2	14.87	2.69	15.91	4	6.54
7	***Mirabella albifrons***	-	-	-	-	0.08	4.45	4	0.60	-	-	-	-
8	***Delphacodes venosus***	-	-	-	-	0.08	4.45	4	0.60	0.21	4.45	4	0.97
9	***Muellerianella brevipennis***	-	-	-	-	-	-	-	-	0.41	9.09	4	1.93
10	***Muellerianella fairmairei***	-	-	-	-	0.27	13.64	4	1.92	0.21	2.27	4	0.69
11	***Acanthodelphax spinosus***	0.40	6.82	4	1.65	0.08	4.45	4	0.60	0.41	6.82	4	1.67
12	***Dicranotropis hamata***	0.53	9.09	4	2.19	0.12	6.82	4	0.90	0.62	11.36	4	2.65
13	***Xanthodelphax stramineus***	0.13	2.27	4	0.54	0.04	2.27	4	0.30	-	-	-	-
14	***Javesella pellucida***	5.61	34.09	3	13.83	2.04	40.09	3	9.04	8.91	36.36	3	18.00
15	***Ribautodelphax albostriatus***	0.27	4.55	4	1.11	0.24	13.64	4	1.81	0.62	13.64	4	2.91
16	***Ribautodelphax collinus***	-	-	-	-	0.04	2.27	4	0.30	1.14	15.91	4	4.26
17	***Aphrophora alni***	0.13	2.27	4	0.54	-	-	-	-	-	-	-	-

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Philaenus spumarius***	1.07	11.36	4	3.49	-	-	-	-	0.10	2.27	4	0.48
19.	***Utecha trivia***	-	-	-	-	0.04	2.27	4	0.30	-	-	-	-
20.	***Anaceratagallia ribauti***	0.13	2.27	4	0.54	-	-	-	-	0.10	2.27	4	0.48
21.	***Cicadella viridis***	1.74	22.73	4	6.29	0.12	6.82	4	0.90	0.10	2.27	4	0.48
22.	***Forcipata citrinella***	-	-	-	-	0.08	4.45	4	0.60	0.41	9.09	4	1.93
23.	***Notus flavipennis***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
24.	***Kybos smaragdulus***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
25.	***Empoasca pteridis***	0.94	11.36	4	3.27	-	-	-	-	0.10	2.27	4	0.48
26.	***Empoasca vitis***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
27.	***Chlorita paolii***	-	-	-	-	0.67	18.18	4	3.49	0.52	4.45	4	1.52
28.	***Eupteryx notata***	0.13	2.27	4	0.54	-	-	-	-	0.10	2.27	4	0.48
29.	***Zyginidia pullula***	-	-	-	-	0.27	11.36	4	1.75	-	-	-	-
30.	***Zygina flammigera***	-	-	-	-	0.04	2.27	4	0.30	-	-	-	-
31.	***Balclutha calamagrostis***	0.27	2.27	4	0.78	0.67	36.36	3	4.94	0.21	4.55	4	0.98
32.	***Balclutha saltuella***	-	-	-	-	0.04	2.27	4	0.30	-	-	-	-
33.	***Macrosteles cristatus***	-	-	-	-	0.04	2.27	4	0.30	-	-	-	-
34.	***Macrosteles laevis***	50.67	88.64	1	67.02	51.43	97.73	1	70.90	30.36	84.09	1	50.53
35.	***Deltocephalus pulicaris***	25.80	72.73	2	43.32	27.75	63.64	2	42.02	25.18	77.27	1	44.11
36.	***Doratura homophyla***	-	-	-	-	0.04	2.27	4	0.30	-	-	-	-

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Doratura stylata***	0.13	2.27	4	0.54	0.08	4.45	4	0.60	1.45	18.18	4	5.13
38.	***Graphocraerus ventralis***	-	-	-	-	-	-	-	-	0.21	4.45	4	0.97
39.	***Rhopalopyx preyssleri***	-	-	-	-	0.04	2.27	4	0.30	-	-	-	-
40.	***Rhopalopyx vitripennis***	-	-	-	-	0.04	2.27	4	0.30	-	-	-	-
41.	***Elymana sulphurella***	2.27	22.73	4	7.18	0.86	18.18	4	3.95	1.14	20.45	4	4.83
42.	***Cicadula flori***	-	-	-	-	-	-	-	-	0.21	2.27	4	0.69
43.	***Cicadula persimilis***	0.80	11.36	4	3.01	0.35	20.45	4	2.68	1.45	18.18	4	5.13
44.	***Cicadula quadrinotata***	0.40	6.82	4	1.65	0.08	2.27	4	0.43	0.21	4.45	4	0.97
45.	***Athysanus argentarius***	-	-	-	-	0.04	2.27	4	0.30	0.21	4.45	4	0.97
46.	***Euscelis incisus***	0.27	4.55	4	1.11	3.49	38.64	3	11.61	6.47	47.73	3	17.57
47.	***Streptanus confinis***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
48.	***Arocephalus languidus***	0.40	4.55	4	1.35	0.67	22.73	4	3.90	0.73	13.64	4	3.16
49.	***Arocephalus longiceps***	-	-	-	-	-	-	-	-	0.31	6.82	4	1.45
50.	***Psammotettix alienus***	-	-	-	-	0.04	2.27	4	0.30	0.52	9.09	4	2.17
51.	***Psammotettix confinis***	1.87	27.27	3	7.14	5.17	63.64	2	18.14	7.46	47.73	3	18.87
52.	***Errastunus ocellaris***	1.74	15.91	4	5.26	0.20	11.36	4	1.51	2.69	36.36	3	9.89
53.	***Turrutus socialis***	0.13	2.27	4	0.54	-	-	-	-	0.10	2.27	4	0.48
54.	***Jassargus pseudocellaris***	-	-	-	-	0.08	4.45	4	0.60	0.62	11.36	4	2.65
55.	***Arthaldeus pascuellus***	2.94	27.27	3	8.95	0.35	15.91	4	2.36	2.49	27.27	3	8.24
56.	***Erzaleus metrius***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48

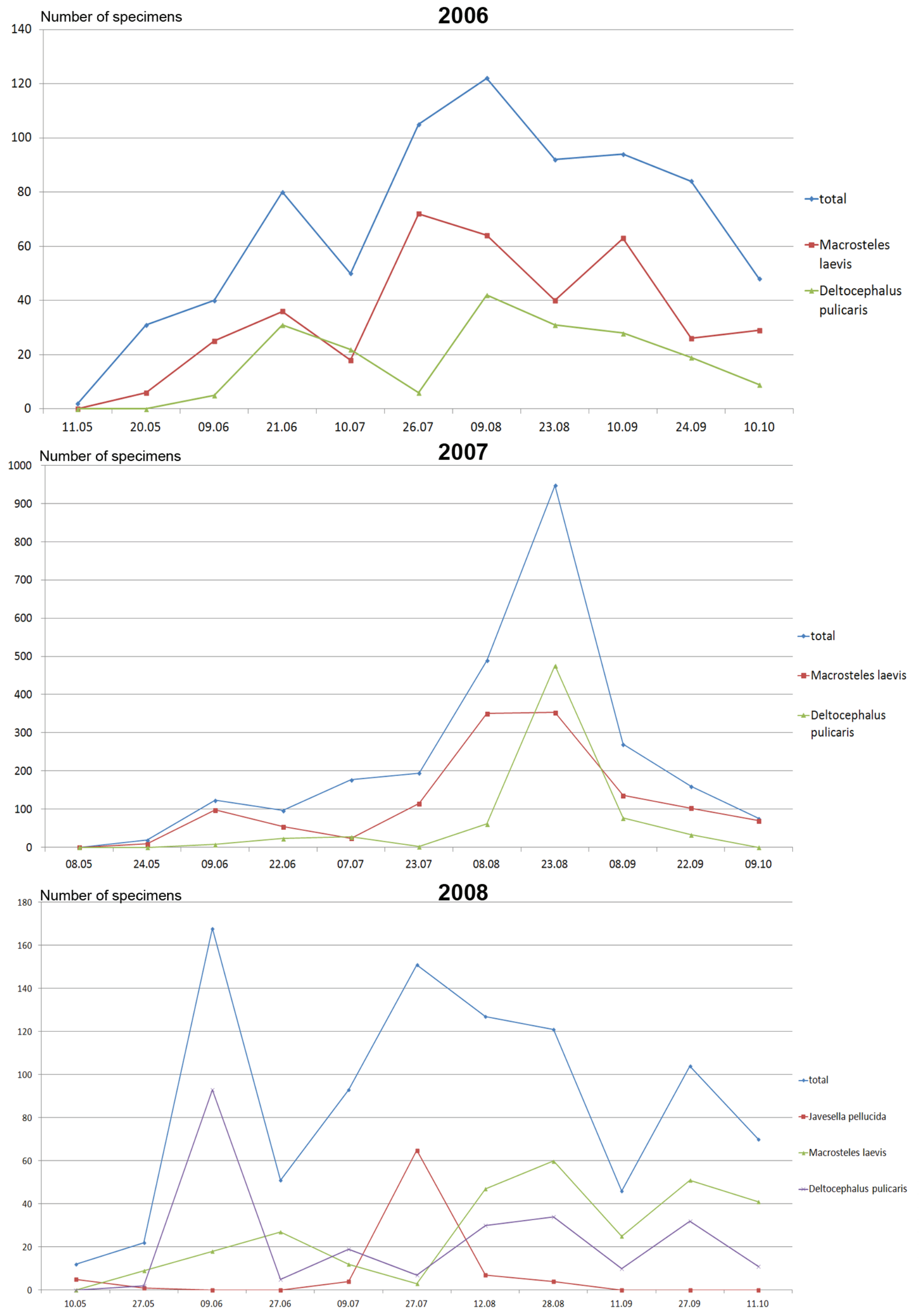

Fig. 11. The dynamics of species abundance among the species dominating in the Plot 10 (*Lolio-Polygonetum arenastri*).

Table 12. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 11 (*Lolio-Polygonetum arenastri*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	0.30	2.27	4	0.83	0.14	2.27	4	0.56	-	-	-	-
2.	***Stenocranus minutus***	-	-	-	-	-	-	-	-	0.61	4.55	4	1.67
3.	***Jassidaeus lugubris***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
4.	***Megadelphax sordidulus***	-	-	-	-	-	-	-	-	0.91	2.27	4	1.44
5.	***Laodelphax striatellus***	5.09	22.73	4	10.76	4.72	25.00	4	10.86	4.86	18.18	4	9.40
6.	***Mirabella albifrons***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
7.	***Muirodelphax aubei***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
8.	***Acanthodelphax denticauda***	-	-	-	-	-	-	-	-	0.61	4.55	4	1.67
9.	***Acanthodelphax spinosus***	0.60	4.55	4	1.65	-	-	-	-	0.61	4.55	4	1.67
10.	***Dicranotropis hamata***	0.90	6.82	4	2.48	0.28	4.55	4	1.13	2.13	15.91	4	5.82
11.	***Kosswigianella exigua***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
12.	***Javesella pellucida***	2.10	13.64	4	5.35	0.28	4.55	4	1.13	7.90	27.27	3	14.68
13.	***Ribautodelphax albostriatus***	0.60	4.55	4	1.65	0.42	4.55	4	1.38	0.30	2.27	4	0.83
14.	***Ribautodelphax collinus***	-	-	-	-	-	-	-	-	1.52	6.82	4	3.22
15.	***Philaenus spumarius***	0.30	2.27	4	0.83	-	-	-	-	1.82	9.09	4	4.07
16.	***Utecha lugens***	0.30	2.27	4	0.83	-	-	-	-	0.30	2.27	4	0.83
17.	***Anaceratagallia ribauti***	1.20	9.09	4	3.30	0.83	13.64	4	3.36	1.22	4.55	4	2.36

	Species	2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Eupelix cuspidata***	-	-	-	-	0.14	2.27	4	0.56	-	-	-	-
19.	***Cicadella viridis***	-	-	-	-	0.14	2.27	4	0.56	-	-	-	-
20.	***Emelianoviana mollicula***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
21.	***Forcipata citrinella***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
22.	***Kybos smaragdulus***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
23.	***Empoasca pteridis***	0.60	4.55	4	1.65	0.28	4.55	4	1.13	0.91	6.82	4	2.49
24.	***Chlorita paolii***	4.79	22.73	4	10.43	6.93	47.73	3	18.19	5.47	27.27	3	12.21
25.	***Eupteryx notata***	-	-	-	-	0.14	2.27	4	0.56	-	-	-	-
26.	***Zyginidia pullula***	-	-	-	-	0.42	6.82	4	1.69	-	-	-	-
27.	***Balclutha calamagrostis***	1.50	9.09	4	3.69	0.69	9.09	4	2.50	1.82	11.36	4	4.55
28.	***Macrosteles cristatus***	-	-	-	-	0.42	6.82	4	1.69	-	-	-	-
29.	***Macrosteles laevis***	49.40	86.36	1	65.32	69.35	81.82	1	75.33	22.49	59.09	2	36.45
30.	***Deltocephalus pulicaris***	1.50	9.09	4	3.69	1.53	20.45	4	5.59	0.91	6.82	4	2.49
31.	***Doratura homophyla***	-	-	-	-	0.14	2.27	4	0.56	-	-	-	-
32.	***Doratura stylata***	11.08	29.55	3	18.09	1.66	20.45	4	5.83	8.21	18.18	4	12.22
33.	***Rhopalopyx preyssleri***	-	-	-	-	0.14	2.27	4	0.56	-	-	-	-
34.	***Rhopalopyx vitripennis***	-	-	-	-	0.14	4.55	4	0.80	-	-	-	-
35.	***Elymana sulphurella***	0.30	2.27	4	0.83	-	-	-	-	1.22	6.82	4	2.88
36.	***Cicadula quadrinotata***	-	-	-	-	-	-	-	-	1.82	13.64	4	4.98

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Athysanus argentarius***	0.30	2.27	4	0.83	-	-	-	-	1.52	4.55	4	2.63
38.	***Euscelis incisus***	8.98	38.64	3	18.63	2.77	20.45	4	7.53	12.46	43.18	3	23.20
39.	***Streptanus aemulans***	-	-	-	-	-	-	-	-	0.61	4.55	4	1.67
40.	***Metalimnus steini***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
41.	***Arocephalus languidus***	0.90	6.82	4	2.48	0.83	13.64	4	3.36	2.74	9.09	4	4.99
42.	***Psammotettix alienus***	0.90	6.82	4	2.48	4.02	43.18	3	13.18	1.82	13.64	4	4.98
43.	***Psammotettix cephalotes***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
44.	***Psammotettix confinis***	6.29	38.64	3	15.59	3.19	29.55	3	9.71	6.69	27.27	3	13.51
45.	***Errastunus ocellaris***	0.60	2.27	4	1.17	0.28	4.55	4	1.13	2.43	11.36	4	5.25
46.	***Turrutus socialis***	0.60	2.27	4	1.17	0.14	2.27	4	0.56	1.82	11.36	4	4.55
47.	***Jassargus pseudocellaris***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
48.	***Arthaldeus pascuellus***	0.60	4.55	4	1.65	-	-	-	-	0.91	4.55	4	2.03
49.	***Mocuellus collinus***	0.30	2.27	4	0.83	-	-	-	-	0.30	2.27	4	0.83

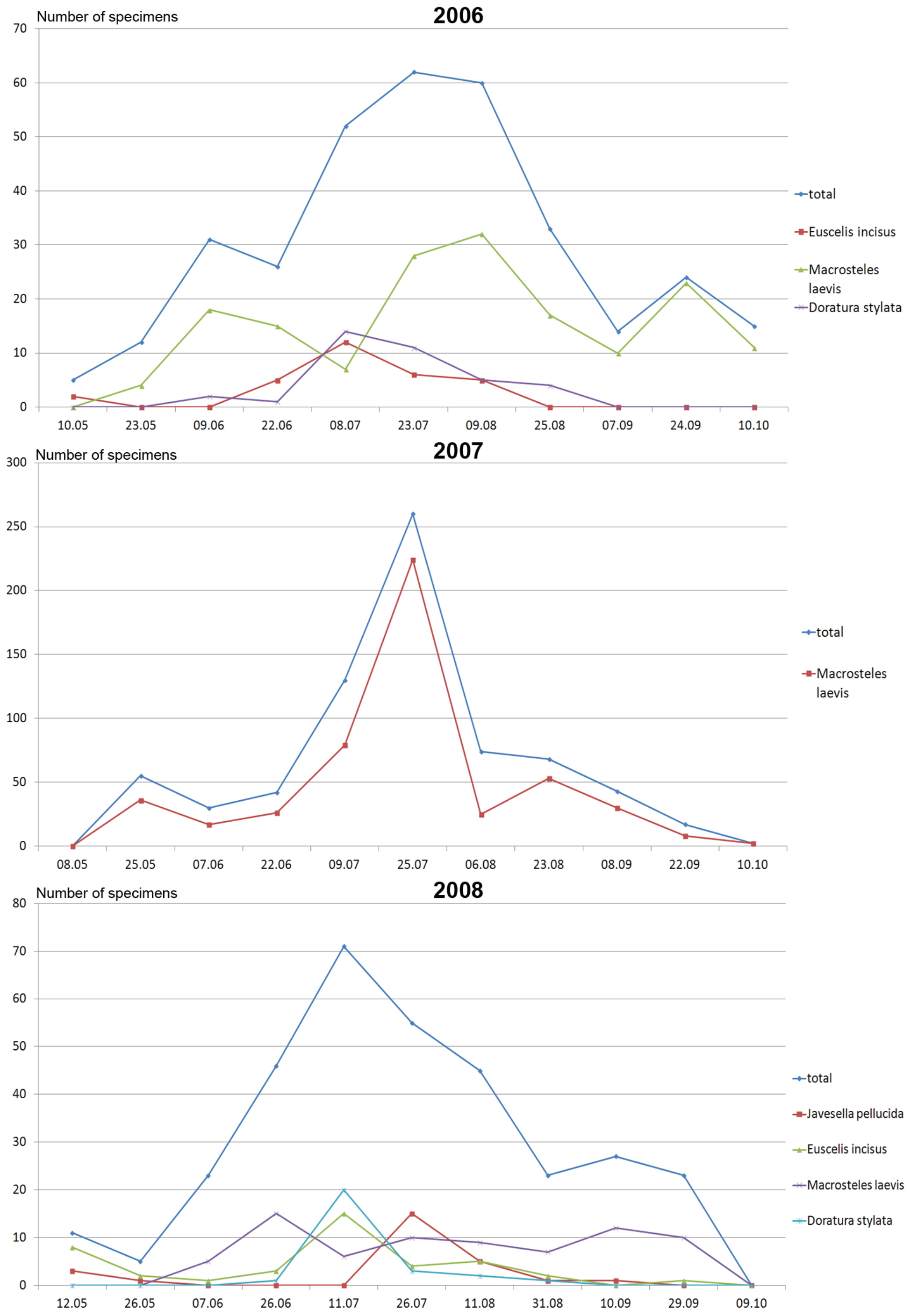

Fig. 12. The dynamics of species abundance among the species dominating in the Plot 11 (*Lolio-Polygonetum arenastri*).

Remarks: this plot was characterized by the highest number of species having two generations during the season (71.43%) and the lowest number of species having a single generation during the season (28.57%) (Tab. 43b).

Study plot 12

A total of 2484 specimens/51 species collected: 2006 – 593/34 species, 2007 – 1365/45 species, 2008 – 526/29 species (Tab. 13).

Highest classes of abundance: *Macrosteles laevis* (SD – 2006-2008: 48.23%, 72.09% & 61.98%) (Tab. 13).

Constancy: *Macrosteles laevis* (1st class – 2007: 97.73%, 2nd class – 2006 and 2008: 56.82% & 70.45%). The highest value of Q index: *Macrosteles laevis* (2006-2008: 52.35, 83.94 & 66.08) (Tab. 13).

The population of *Macrosteles laevis* had the dominant contribution to the overall abundance and seasonal dynamics on this plot. It was very numerous in all seasons increasing its abundance from the second half of July to reach the maximum in September. Secondary peaks occurred in some seasons e.g. in July 2007 and 2008 or at the beginning of August in 2006 and 2007 (Fig. 13).

Remarks: only on this plot *Kelisia monoceros* and *Anoscopus albifrons* were collected (Tab. 1).

Study plot 13

A total of 5573 specimens/52 species collected: 2006 – 708/35 species, 2007 – 3025/32 species, 2008 – 1840/34 species (Tab. 14).

Highest classes of abundance (4 species): *Macrosteles laevis* (SD – 2006-2008: 70.34%, 92.17% & 55.27%), *Deltocephalus pulicaris* (sD – 2006 and 2008: 8.19% & 11.09%), *Javesella pellucida* (sD – 2008: 9.95%), *Psammotettix confinis* (sD – 2008: 7.61%) (Tab. 14).

Constancy: *Macrosteles laevis* (1st class – 2008: 79.55%, 2nd class: 2006 and 2007: 70.45% & 72.73%) and *Deltocephalus pulicaris* (2nd class: 2006 and 2008: 52.27% & 68.18%). The highest value of Q index: *Macrosteles laevis* (2006-2008: 70.39, 81.88 & 66.31) (Tab. 14).

On this plot *Macrosteles laevis* had the most significant contribution to the overall structure of community. It was most abundant in August and September. Subdominant species reached a significantly lower abundance on a stable level throughout the season, except for *Javesella pellucida*, which was most abundant in the second half of July and *Deltocephalus pulicaris* with its maximum at the beginning of September 2008 (Fig. 14).

Characteristics of the community

The plant association of *Lolio-Polygonetum arenastri* is very common across the town and its patches are relatively large and numerous. Accordingly, it was possible to conduct studies on the planthopper community connected with this habitat on four study plots (10, 11, 12, 13) (Fig. 1).

During the three seasons of study a total of 13705 specimens were collected, representing 88 species of planthoppers (33% of all the collected species) (Tabs 11, 12, 13 and 14). Among them 24 species (27%) were common to all plots (Tab. 1).

Table 13. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 12 (*Lolio-Polygonetum arenastri*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Kelisia monoceros***	0.67	6.82	4	2.14	0.29	4.55	4	1.15	-	-	-	-
2.	***Stenocranus major***	0.34	4.55	4	1.24	-	-	-	-	0.38	4.55	4	1.31
3.	***Stenocranus minutus***	0.17	2.27	4	0.62	0.22	6.82	4	1.22	-	-	-	-
4.	***Jassidaeus lugubris***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
5.	***Eurysula lurida***	0.17	2.27	4	0.62	0.15	4.55	4	0.83	-	-	-	-
6.	***Laodelphax striatellus***	0.34	2.27	4	0.88	1.32	27.27	3	6.00	0.57	6.82	4	1.97
7.	***Muellerianella brevipennis***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
8.	***Acanthodelphax spinosus***	0.67	6.82	4	2.14	-	-	-	-	0.38	4.55	4	1.31
9.	***Dicranotropis hamata***	2.02	18.18	4	6.06	0.66	13.64	4	3.00	0.95	9.09	4	2.94
10.	***Javesella dubia***	0.17	2.27	4	0.62	0.07	2.27	4	0.40	-	-	-	-
11.	***Javesella pellucida***	1.52	9.09	4	3.72	0.07	2.27	4	0.40	1.14	9.09	4	3.22
12.	***Ribautodelphax albostriatus***	2.19	9.09	4	4.46	0.22	6.82	4	1.22	1.33	11.36	4	3.89
13.	***Ribautodelphax collinus***	0.51	6.82	4	1.86	-	-	-	-	0.57	4.55	4	1.61
14.	***Aphrophora alni***	0.34	4.55	4	1.24	-	-	-	-	0.38	4.55	4	1.31
15.	***Utecha lugens***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
16.	***Utecha trivia***	3.37	11.36	4	6.19	0.07	2.27	4	0.40	076	4.55	4	18.60
17.	***Megophthalmus scanicus***	-	-	-	-	0.15	2.27	4	0.58	0.19	2.27	4	0.66

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Agallia consobrina***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
19.	***Anaceratagallia ribauti***	4.55	34.09	3	12.45	2.05	29.55	3	7.78	2.47	22.73	4	7.49
20.	***Idiocerus stigmaticalis***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
21.	***Aphrodes bicinctus***	0.84	6.82	4	2.39	0.22	2.27	4	0.71	0.19	2.27	4	0.66
22.	***Aphrodes makarovi***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
23.	***Anoscopus albifrons***	0.17	2.27	4	0.62	0.44	4.55	4	1.41	-	-	-	-
24.	***Cicadella viridis***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
25.	***Emelianoviana mollicula***	0.17	2.27	4	0.62	-	-	-	-	-	-	-	-
26.	***Forcipata citrinella***	0.51	6.82	4	1.86	0.07	2.27	4	0.40	-	-	-	-
27.	***Kybos smaragdulus***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
28.	***Empoasca pteridis***	0.84	11.36	4	3.09	0.15	4.55	4	0.83	1.33	11.36	4	3.89
29.	***Chlorita paolii***	6.41	29.55	3	13.76	6.08	50.00	3	17.44	4.75	47.73	3	15.06
30.	***Eupteryx calcarata***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
31.	***Eupteryx notata***	0.17	2.27	4	0.62	-	-	-	-	0.19	2.27	4	0.66
32.	***Balclutha calamagrostis***	0.34	4.55	4	1.24	0.22	6.82	4	1.22	0.95	9.09	4	2.94
33.	***Macrosteles laevis***	48.23	56.82	2	52.35	72.09	97.73	1	83.94	61.98	70.45	2	66.08
34.	***Deltocephalus pulicaris***	1.85	20.45	4	6.15	1.68	29.55	3	7.05	1.33	13.64	4	4.26
35.	***Doratura homophyla***	2.87	20.45	4	7.66	0.07	2.27	4	0.40	2.66	27.27	3	8.52
36.	***Doratura stylata***	2.53	13.64	4	5.87	0.44	9.09	4	2.00	0.95	9.09	4	2.94

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Graphocraerus ventralis***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
38.	***Hardya tenuis***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
39.	***Rhopalopyx preyssleri***	0.17	2.27	4	0.62	0.07	2.27	4	0.40	0.19	2.27	4	0.66
40.	***Elymana sulphurella***	0.51	6.82	4	1.86	0.07	2.27	4	0.40	0.38	4.55	4	1.31
41.	***Cicadula quadrinotata***	-	-	-	-	0.22	6.82	4	1.22	-	-	-	-
42.	***Euscelidius schenckii***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
43.	***Euscelis incisus***	2.87	27.27	3	8.85	2.49	34.09	3	9.21	4.18	29.55	3	11.11
44.	***Streptanus aemulans***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
45.	***Arocephalus languidus***	-	-	-	-	0.73	13.64	4	3.16	0.19	2.27	4	0.66
46.	***Psammotettix alienus***	2.87	15.91	4	6.76	0.22	4.55	4	1.00	0.95	9.09	4	2.94
47.	***Psammotettix confinis***	2.87	27.27	3	8.85	1.17	29.55	3	5.88	2.47	27.27	3	8.21
48.	***Errastunus ocellaris***	6.75	45.45	3	17.52	4.69	56.82	2	16.32	6.46	56.82	2	19.16
49.	***Turrutus socialis***	-	-	-	-	0.59	13.64	4	2.84	-	-	-	-
50.	***Arthaldeus pascuellus***	1.01	11.36	4	3.39	0.22	4.55	4	1.00	0.57	6.82	4	1.97
51.	***Mocuellus collinus***	1.01	11.36	4	3.39	1.83	25.00	4	6.76	1.14	11.36	4	3.60

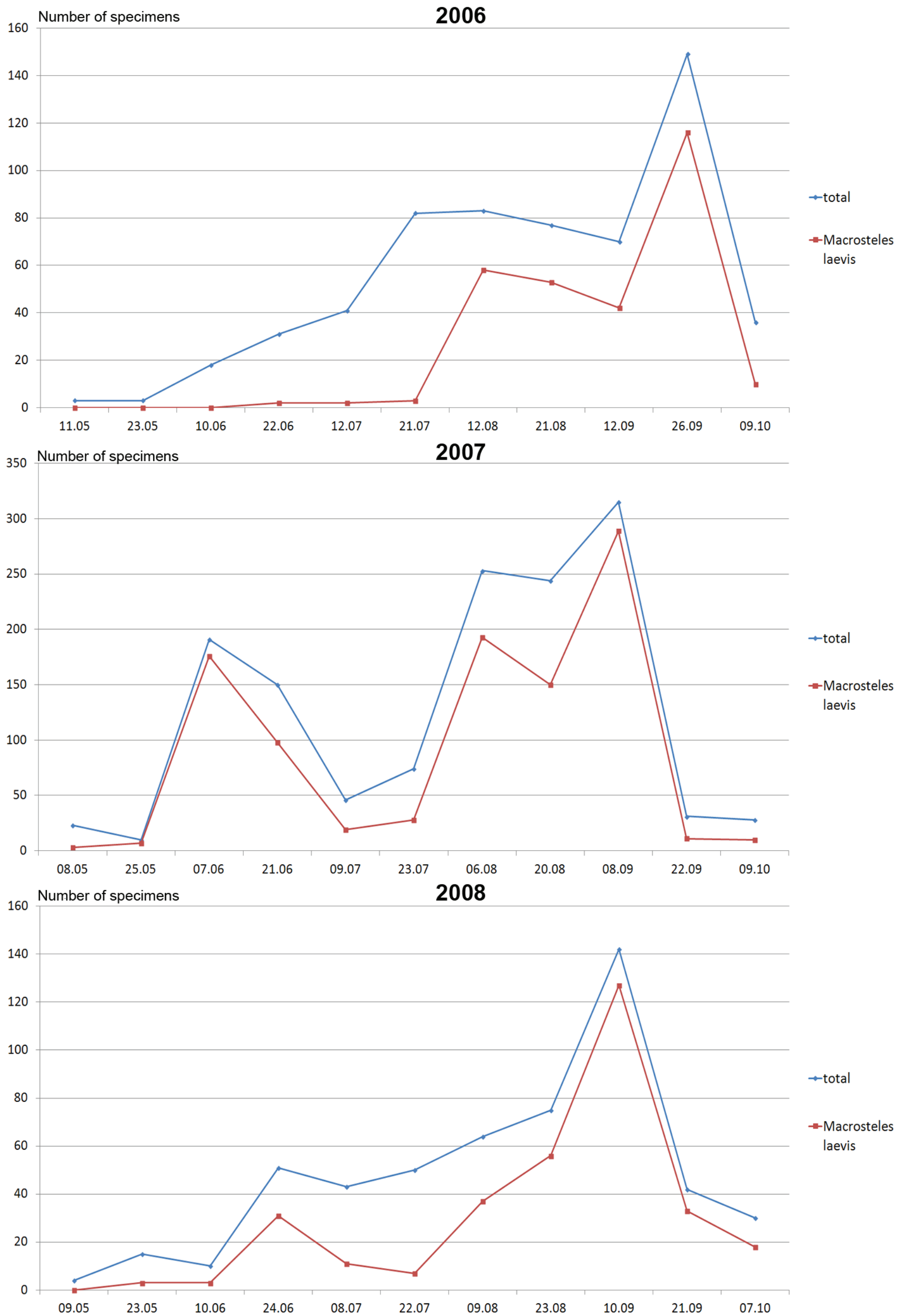

Fig. 13. The dynamics of species abundance among the species dominating in the Plot 12 (*Lolio-Polygonetum arenastri*).

Table 14. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 13 (*Lolio-Polygonetum arenastri*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	0.28	4.55	4	1.13	0.07	2.27	4	0.40	0.33	6.82	4	1.50
2.	***Stenocranus minutus***	-	-	-	-	0.10	2.27	4	0.48	-	-	-	-
3.	***Megamelus notula***	-	-	-	-	0.03	2.27	4	0.26	-	-	-	-
4.	***Eurysula lurida***	-	-	-	-	-	-	-	-	0.16	4.55	4	0.85
5.	***Megadelphax sordidulus***	-	-	-	-	0.03	2.27	4	0.26	-	-	-	-
6.	***Laodelphax striatellus***	0.28	4.55	4	1.13	1.32	40.09	3	7.27	4.46	43.18	3	13.88
7.	***Delphacodes venosus***	0.28	4.55	4	1.13	0.10	6.82	4	0.83	0.11	4.55	4	0.71
8.	***Muellerianella brevipennis***	0.14	2.27	4	0.56	0.03	2.27	4	0.26	0.27	9.09	4	1.57
9.	***Muellerianella fairmairei***	-	-	-	-	-	-	-	-	0.49	13.64	4	2.59
10.	***Acanthodelphax spinosus***	0.71	4.55	4	1.80	0.23	9.09	4	1.45	0.38	13.64	4	2.28
11.	***Dicranotropis hamata***	1.41	15.91	4	4.74	0.07	2.27	4	0.40	0.11	4.55	4	0.71
12.	***Xanthodelphax flaveolus***	0.28	4.55	4	1.13	-	-	-	-	0.33	9.09	4	1.73
13.	***Xanthodelphax stramineus***	0.28	4.55	4	1.13	0.03	2.27	4	0.26	0.60	11.36	4	2.61
14.	***Criomorphus albomarginatus***	-	-	-	-	0.03	2.27	4	0.26	0.05	2.27	4	0.34
15.	***Javesella dubia***	0.28	2.27	4	0.80	-	-	-	-	-	-	-	-
16.	***Javesella pellucida***	4.66	36.36	3	13.02	0.63	22.73	4	3.78	9.95	59.09	2	24.25
17.	***Ribautodelphax albostriatus***	0.14	2.27	4	0.56	0.07	2.27	4	0.40	0.16	6.82	4	1.04

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Ribautodelphax collinus***	1.41	11.36	4	4.00	-	-	-	-	3.37	20.45	4	8.30
19.	***Utecha trivia***	0.28	2.27	4	0.80	-	-	-	-	-	-	-	-
20.	***Oncopsis flavicollis***	0.14	2.27	4	0.56	-	-	-	-	-	-	-	-
21.	***Agallia consobrina***	-	-	-	-	0.03	2.27	4	0.26	-	-	-	-
22.	***Anaceratagallia ribauti***	-	-	-	-	0.03	2.27	4	0.26	0.11	4.55	4	0.71
23.	***Eupelix cuspidata***	-	-	-	-	0.03	2.27	4	0.26	-	-	-	-
24.	***Aphrodes makarovi***	0.14	2.27	4	0.56	-	-	-	-	-	-	-	-
25.	***Emelianoviana mollicula***	0.14	2.27	4	0.56	-	-	-	-	-	-	-	-
26.	***Empoasca decipiens***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
27.	***Empoasca pteridis***	0.42	4.55	4	1.38	0.03	2.27	4	0.26	-	-	-	-
28.	***Chlorita paolii***	-	-	-	-	0.07	4.55	4	0.56	-	-	-	-
29.	***Eupteryx aurata***	-	-	-	-	-	-	-	-	0.05	2.27	4	0.34
30.	***Eupteryx calcarata***	0.71	6.82	4	2.20	-	-	-	-	-	-	-	-
31.	***Eupteryx notata***	0.42	6.82	4	1.69	0.03	2.27	4	0.26	0.05	2.27	4	0.34
32.	***Wagneripteryx germari***	-	-	-	-	-	-	-	-	0.05	2.27	4	0.34
33.	***Zyginidia pullula***	-	-	-	-	-	-	-	-	0.05	2.27	4	0.34
34.	***Balclutha calamagrostis***	0.14	2.27	4	0.56	0.13	6.82	4	0.94	0.27	11.36	4	1.75
35.	***Balclutha punctata***	0.71	9.09	4	2.54	0.03	2.27	4	0.26	-	-	-	-
36.	***Macrosteles cristatus***	0.28	4.55	4	1.13	-	-	-	-	-	-	-	-

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Macrosteles laevis***	70.34	70.45	2	70.39	92.17	72.73	2	81.88	55.27	79.55	1	66.31
38.	***Deltocephalus pulicaris***	8.19	52.27	2	20.69	1.06	38.64	3	6.40	11.09	68.18	2	27.50
39.	***Doratura stylata***	0.14	2.27	4	0.56	0.03	2.27	4	0.26	0.43	11.36	4	2.21
40.	***Rhopalopyx preyssleri***	-	-	-	-	-	-	-	-	0.05	2.27	4	0.34
41.	***Elymana sulphurella***	0.28	4.55	4	1.13	-	-	-	-	-	-	-	-
42.	***Cicadula persimilis***	-	-	-	-	-	-	-	-	0.11	2.27	4	0.50
43.	***Cicadula quadrinotata***	0.14	2.27	4	0.56	0.07	4.55	4	0.56	0.33	6.82	4	1.50
44.	***Mocydiopsis parvicauda***	0.28	2.27	4	0.80	-	-	-	-	0.16	4.55	4	0.85
45.	***Athysanus argentarius***	-	-	-	-	0.03	2.27	4	0.26	-	-	-	-
46.	***Euscelis incisus***	1.27	11.36	4	3.80	0.79	31.82	3	5.01	0.92	27.27	3	5.01
47.	***Streptanus sordidus***	0.14	2.27	4	0.56	-	-	-	-	-	-	-	-
48.	***Psammotettix alienus***	0.42	6.82	4	1.69	0.10	6.82	4	0.83	0.33	9.09	4	1.73
49.	***Psammotettix confinis***	2.12	27.27	3	7.60	2.25	47.73	3	10.36	7.61	70.45	2	23.15
50.	***Errastunus ocellaris***	0.28	4.55	4	1.13	0.03	2.27	4	0.26	0.05	2.27	4	0.34
51.	***Jassargus pseudocellaris***	0.42	6.82	4	1.69	0.10	6.82	4	0.83	0.54	18.18	4	3.13
52.	***Arthaldeus pascuellus***	2.40	27.27	3	8.09	0.23	15.91	4	1.91	1.47	38.64	3	7.54

Fig. 14. The dynamics of species abundance among the species dominating in the Plot 13 (*Lolio-Polygonetum arenastri*).

Macrosteles laevis was the species common to all four plots, which reached the rank of a superdominant species (the mean share of 56.15% of all the collected specimens). *Deltocephalus pulicaris* had the second rank with the share of 8.99%. These two species constituted 65.14% of all the specimens collected in this community (Tab. 39). *Javesella pellucida*, *Doratura stylata*, *Euscelis incisus* and *Psammotettix confinis* were among the remaining species with high abundance (Tabs 11, 12, 13 and 14). The highest value of fidelity index W=100 was reached by *Anoscopus albifrons*, *Kelisia monoceros*, *Macrosteles cristatus* and *Streptanus confinis*, while slightly lower values were assessed for *Utecha trivia* (W=92.37) and *Deltocephalus pulicaris* (W=77.74) (Tab. 37).

In this community the seasonal dynamics of abundance was predominately shaped by the second generation of *Macrosteles laevis*, which was very numerous at the end of summer (August-September) (Figs 11, 12, 13 and 14).

Community of the association *Valeriano-Filipenduletum*

Study plot 14

A total of 1771 specimens/61 species collected: 2008 – 581/43 species, 2009 – 909/41 species, 2010 – 281/39 species (Tab. 15).

Highest classes of abundance (4 species): *Cicadella viridis* (D – 2009: 28.71%, sD – 2008 and 2010: 17.73% & 8.90%), *Cicadula quadrinotata* (sD – 2008-2010: 15.66%, 13.75% & 14.59%), *Arthaldeus pascuellus* (sD – 2008-2010: 11.02%, 12.65% & 14.59%), *Athysanus argentarius* (sD – 2008: 9.81%) (Tab. 15).

Constancy: *Cicadella viridis* (2^{nd} class – 2009: 52,27%), *Cicadula quadrinotata* (2^{nd} class – 2008: 54.55%) and *Arthaldeus pascuellus* (2^{nd} class – 2009: 52.27%). The highest value of Q index: *Cicadella viridis* (2009: 38.74) (Tab. 15).

The seasonal dynamics of abundance on this plot was mostly shaped by *Cicadella viridis*, with its maximum abundance in July, and by *Cicadula quadrinotata* and *Arthaldeus pascuellus*, with their peaks of abundance in September in all seasons. Among other species only *Athysanus argentarius* had a significant peak of abundance at the beginning of July 2008 (Fig. 15).

Remarks: only on this plot *Cixius simplex*, *Delphax pulchellus*, *Chloriona glaucescens*, *Aphrophora salicina* and *Macrosteles septemnotatus* were collected (Tab. 1).

Characteristics of the community

The community connected with plant association *Valeriano-Filipenduletum* was studied only on plot 14 (Fig. 1) because there was no other area within the town with a comparable habitat type.

During the research the number of collected specimens constituted about 23% of all the collected species (Tab. 1). *Cicadella viridis* and *Cicadula quadrinotata* were the most numerous species here. The former came to 18.45% and the latter 14.67% of the collected specimens, making up 33.12% of all specimens – one of the lowest values among the core-of-community species of Częstochowa (Tab. 39). Other species with notable abundance included *Athysanus argentarius* and *Arthaldeus pascuellus*.

Delphax pulchellus and *Macrosteles septemnotatus* reached the highest values of fidelity index (W=100), while *Cicadella viridis* scored a lower value of W=53.88 (Tab. 37).

Table 15. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 14 (*Valeriano-Filipenduletum*).

	Species	Year											
		2008				2009				2010			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Cixius simplex***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
2.	***Kelisia praecox***	0.34	4.55	4	1.24	0.33	6.82	4	1.50	-	-	-	-
3.	***Kelisia confusa***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
4.	***Stenocranus fuscovittatus***	4.30	29.55	3	11.27	2.31	20.45	4	6.87	2.85	11.36	4	5.69
5.	***Stenocranus major***	0.52	4.55	4	1.54	0.66	11.36	4	2.74	0.71	2.27	4	1.27
6.	***Stenocranus minutus***	0.34	2.27	4	0.88	0.55	9.09	4	2.24	1.78	6.82	4	3.48
7.	***Conomelus anceps***	0.69	9.09	4	2.50	0.88	9.09	4	2.83	0.71	4.55	4	1.80
8.	***Delphax pulchellus***	0.52	6.82	4	1.88	-	-	-	-	-	-	-	-
9.	***Chloriona glaucescens***	-	-	-	-	-	-	-	-	0.71	2.27	4	1.27
10.	***Mirabella albifrons***	0.17	2.27	4	0.62	0.11	2.27	4	0.50	-	-	-	-
11.	***Delphacodes venosus***	0.17	2.27	4	0.62	-	-	-	-	1.42	6.82	4	3.11
12.	***Muellerianella brevipennis***	0.69	6.82	4	2.17	-	-	-	-	-	-	-	-
13.	***Muellerianella fairmairei***	0.69	9.09	4	2.50	0.33	6.82	4	1.50	1.07	6.82	4	2.70
14.	***Acanthodelphax spinosus***	-	-	-	-	-	-	-	-	0.71	4.55	4	1.80
15.	***Dicranotropis hamata***	0.17	2.27	4	0.62	0.33	6.82	4	1.50	-	-	-	-
16.	***Javesella pellucida***	0.69	9.09	4	2.50	0.77	15.91	4	3.50	2.49	9.09	4	4.76
17.	***Ribautodelphax albostriatus***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
18.	***Cercopis vulnerata***	2.75	13.64	4	6.12	2.53	18.18	4	6.78	7.12	18.18	4	11.38
19.	***Neophilaenus lineatus***	1,03	6,82	4	2,65	0,11	2,27	4	0,50	0,36	2,27	4	0,90

	Species	Year											
		2008				2009				2010			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
20.	***Aphrophora alni***	0,69	9,09	4	2,50	0,88	18,18	4	4,00	2,85	13,64	4	6,23
21.	***Aphrophora salicina***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
22.	***Philaenus spumarius***	2.24	20.45	4	6.77	1.98	31.82	3	7.94	6.41	25.00	4	12.66
23.	***Megophthalmus scanicus***	0.17	2.27	4	0.62	-	-	-	-	-	-	-	-
24.	***Agallia brachyptera***	0.34	4.55	4	1.24	0.22	4.55	4	1.00	-	-	-	-
25.	***Aphrodes bicinctus***	-	-	-	-	-	-	-	-	1.78	9.09	4	4.02
26.	***Aphrodes makarovi***	0.52	4.55	4	1.54	0.33	6.82	4	1.50	-	-	-	-
27.	***Evacanthus interruptus***	0.17	2.27	4	0.62	-	-	-	-	-	-	-	-
28.	***Cicadella viridis***	17.73	45.45	3	28.39	28.71	52.27	2	38.74	8.90	20.45	4	13.49
29.	***Forcipata citrinella***	4.48	29.55	3	11.51	5.94	27.27	3	12.73	4.63	20.45	4	9.73
30.	***Notus flavipennis***	3.10	15.91	4	7.02	1.43	18.18	4	5.10	1.07	4.55	4	2.21
31.	***Empoasca affinis***	0.17	2.27	4	0.62	-	-	-	-	-	-	-	-
32.	***Empoasca pteridis***	0.52	6.82	4	1.88	3.19	27.27	3	9.33	2.14	13.64	4	5.40
33.	***Linnavuoriana sexmaculata***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
34.	***Eupteryx atropunctata***	0.34	4.55	4	1.24	0.33	6.82	4	1.50	-	-	-	-
35.	***Eupteryx cyclops***	-	-	-	-	0.22	4.55	4	1.00	-	-	-	-
36.	***Eupteryx lelievrei***	0.52	6.82	4	1.88	0.11	2.27	4	0.50	0.71	4.55	4	1.80
37.	***Zyginidia pullula***	-	-	-	-	0.11	2.27	4	0.50	0.36	2.27	4	0.90
38.	***Fieberiella septentrionalis***	-	-	-	-	-	-	-	-	0.71	4.55	4	1.80
39.	***Balclutha calamagrostis***	1.89	15.91	4	5.48	1.32	20.45	4	5.20	1.42	9.09	4	3.59
40.	***Balclutha punctata***	-	-	-	-	-	-	-	-	0.71	4.55	4	1.80

	Species	Year											
		2008				2009				2010			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
41.	***Macrosteles laevis***	0.86	9.09	4	2.80	3.08	29.55	3	9.54	-	-	-	-
42.	***Macrosteles septemnotatus***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
43.	***Paluda flaveola***	0.17	2.27	4	0.62	1.76	13.64	4	4.90	1.78	11.36	4	4.50
44.	***Rhopalopyx adumbrata***	0.17	2.27	4	0.62	-	-	-	-	-	-	-	-
45.	***Elymana sulphurella***	3.10	25.00	4	8.80	3.30	34.09	3	10.61	4.27	18.18	4	8.81
46.	***Cicadula flori***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
47.	***Cicadula persimilis***	-	-	-	-	0.11	2.27	4	0.50	0.36	2.27	4	0.90
48.	***Cicadula quadrinotata***	15.66	54.55	2	29.23	13.75	43.18	3	24.37	14.59	40.09	3	24.18
49.	***Cicadula saturata***	0.34	4.55	4	1.24	-	-	-	-	-	-	-	-
50.	***Macustus grisescens***	-	-	-	-	0.11	2.27	4	0.50	0.36	2.27	4	0.90
51.	***Doliotettix lunulatus***	0.34	4.55	4	1.24	0.33	6.82	4	1.50	3.56	13.64	4	6.97
52.	***Athysanus argentarius***	9.81	34.09	3	18.29	1.87	25.00	4	6.84	-	-	-	-
53.	***Conosanus obsoletus***	0.86	9.09	4	2.80	0.88	13.64	4	3.46	2.49	15.91	4	6.29
54.	***Psammotettix alienus***	-	-	-	-	1.32	22.73	4	5.48	-	-	-	-
55.	***Psammotettix confinis***	0.17	2.27	4	0.62	-	-	-	-	-	-	-	-
56.	***Errastunus ocellaris***	4.30	34.09	3	12.11	2.64	38.64	3	10.10	1.07	4.55	4	2.21
57.	***Verdanus abdominalis***	1.20	11.36	4	3.69	1.98	27.27	3	7.35	2.49	11.36	4	5.32
58.	***Arthaldeus pascuellus***	11.02	38.64	3	20.64	12.65	52.27	2	25.71	14.59	34.09	3	22.30
59.	***Sorhoanus assimilis***	5.85	36.36	3	14.58	2.20	29.55	3	8.06	1.07	6.82	4	2.70
60.	***Cosmotettix caudatus***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
61.	***Cosmotettix costalis***	0.17	2.27	4	0.62	-	-	-	-	-	-	-	-

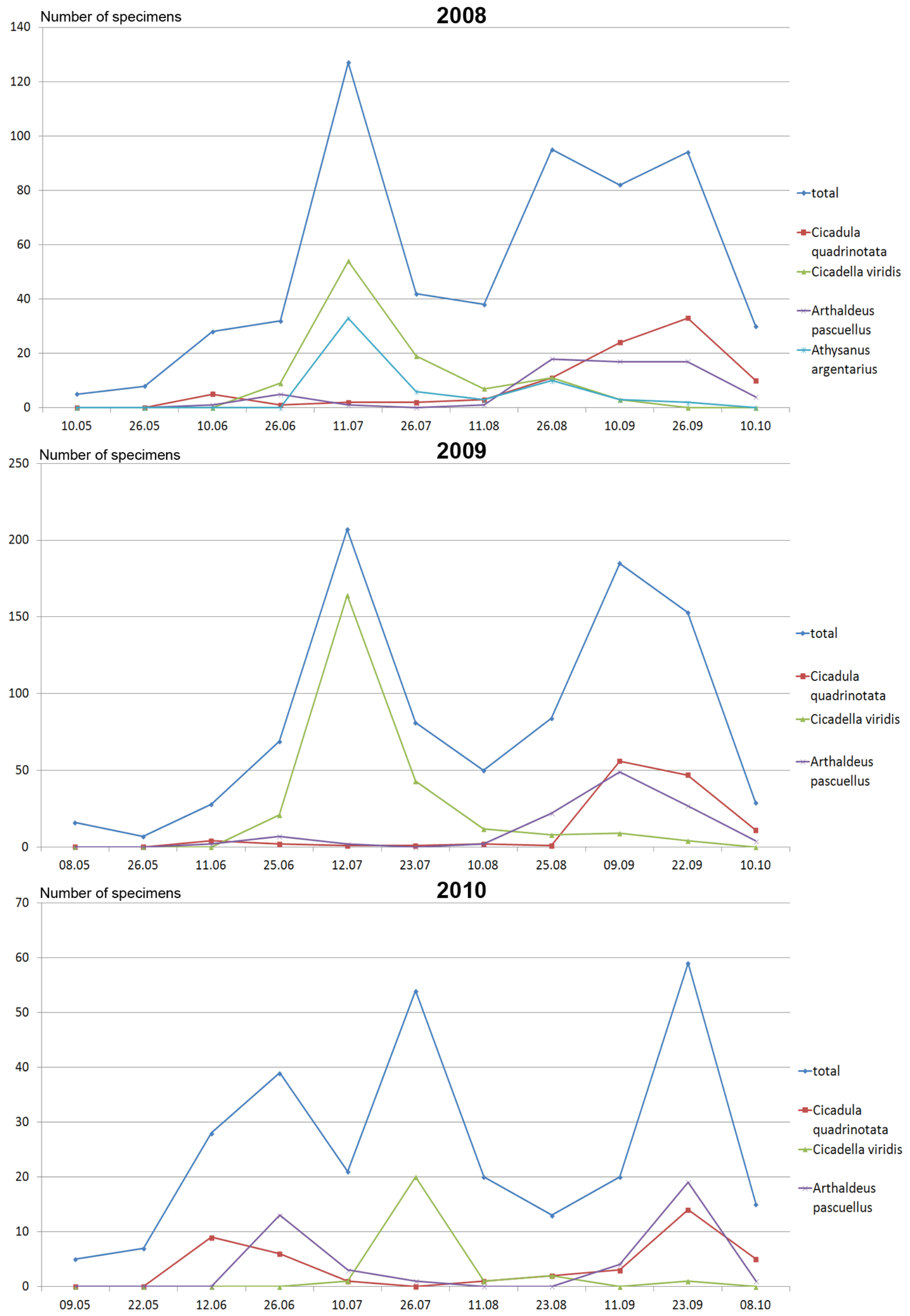

Fig. 15. The dynamics of species abundance among the species dominating in the Plot 14 (*Valeriano-Filipenduletum*).

Community of the association *Cirsietum rivularis*

Study plot 15

A total of 1272 specimens/47 species collected: 2008 – 543/34 species, 2009 – 393/30 species, 2010 – 336/26 species (Tab. 16).

Highest classes of abundance (6 species): *Cicadula quadrinotata* (ED – 2008: 38.49%, D – 2009 and 2010: 20.10% & 28.57%), *Notus flavipennis* (D – 2008 and 2009: 27.26% & 25.19%, sD – 2010: 17.56%), *Arthaldeus pascuellus* (sD – 2009 and 2010: 8.91% & 8.04%), *Macrosteles laevis* (sD – 2009: 12.21%), *Sorhoanus assimilis* (sD – 2009: 8.65%), *Javesella pellucida* (sD – 2010: 18.15%) (Tab. 16).

Constancy: *Notus flavipennis* (2nd class – 2008: 68.18% & 2009: 56.82%) and *Cicadula quadrinotata* (2nd class – 2008: 68.18% & 2010: 54.55%). The highest value of Q index: *Cicadula quadrinotata* (2008: 51.23 & 2010: 39.48), *Notus flavipennis* (2008: 43.11) (Tab. 16).

The seasonal dynamics of abundance on this plot was shaped mainly by populations of *Notus flavipennis* and *Cicadula quadrinotata*. The first species reached its highest abundance in July, while the other at the beginning of June and in September. In some years, also other species contributed to the overall dynamics of community. These included *Sorhoanus assimilis* in July 2009, *Javesella pellucida* in July 2010 and *Arthaldeus pascuellus* in September 2009 and 2010 (Fig. 16).

Remarks: on this plot the highest number of 2nd-degree oligophagous species was recorded (12.77%) (Tab. 43b).

Study plot 16

A total of 1118 specimens/36 species collected: 2006 – 435/35 species, 2007 – 353/27 species, 2008 – 330/28 species (Tab. 17).

Highest classes of abundance: *Psammotettix cephalotes* (SD – 2006-2008: 75.17%, 58.76% & 60.30%) (Tab. 17).

Constancy: *Psammotettix cephalotes* (1st class – 2007 and 2008: 77.27% & 84.09%, 2nd class – 2006: 75.00%). The highest value of Q index: *Psammotettix cephalotes* (2006-2008: 75.08, 67.38 & 71.21) (Tab. 17).

The seasonal dynamics of abundance on this plot was shaped only by a single species – *Psammotettix cephalotes*, which in all three seasons exhibited two peaks of abundance: the first one in May and the second one in August (Fig. 17).

Characteristics of the community

During the study period, from the surface of both plots (15 and 16), a total of 2390 specimens from 62 species was collected, representing 32% of all the collected species. Among them, 20 species (32%) were common to both plots (Tab. 1).

There was a single superdominant species in this community, *Psammotettix cephalotes*, with the mean share of 32.37% of all the specimens collected in this community. However, the species occurred only on plot 16. This plot was characterized by distorted hydrology, which must have influenced the process of succession, and affected the abundance of *P. cephalotes*. *Cicadula quadrinotata* – 15.19% and *Notus flavipennis* – 11.74%. They were

Table 16. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 15 (*Cirsietum rivularis*).

	Species	Year											
		2008				2009				2010			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Kelisia punctulum***	-	-	-	-	1.02	6.82	4	2.64	0.30	2.27	4	0.83
2.	***Stenocranus fuscovittatus***	1.84	9.09	4	4.09	-	-	-	-	0.30	2.27	4	0.83
3.	***Stenocranus major***	0.55	6.82	4	1.94	-	-	-	-	0.60	4.55	4	1.65
4.	***Stenocranus minutus***	-	-	-	-	0.25	2.27	4	0.75	0.30	2.27	4	0.83
5.	***Megamelus notula***	0.37	2.27	4	0.92	-	-	-	-	-	-	-	-
6.	***Conomelus anceps***	0.18	2.27	4	0.64	-	-	-	-	0.60	4.55	4	1.65
7.	***Laodelphax striatellus***	-	-	-	-	0.51	4.55	4	1.52	-	-	-	-
8.	***Mirabella albifrons***	-	-	-	-	0.25	2.27	4	0.75	-	-	-	-
9.	***Muellerianella brevipennis***	1.29	11.36	4	3.83	0.51	4.55	4	1.52	0.30	2.27	4	0.83
10.	***Muellerianella fairmairei***	-	-	-	-	-	-	-	-	1.19	9.09	4	3.29
11.	***Acanthodelphax spinosus***	0.18	2.27	4	0.64	1.02	9.09	4	3.04	3.57	18.18	4	8.06
12.	***Dicranotropis hamata***	0.18	2.27	4	0.64	0.76	6.82	4	2.28	-	-	-	-
13.	***Struebingianella lugubrina***	0.18	2.27	4	0.64	-	-	-	-	-	-	-	-
14.	***Javesella pellucida***	2.95	18.18	4	7.32	5.34	27.27	3	12.07	18.15	34.09	3	24.87
15.	***Ribautodelphax albostriatus***	0.18	2.27	4	0.64	-	-	-	-	-	-	-	-
16.	***Aphrophora alni***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
17.	***Philaenus spumarius***	2.39	25.00	4	7.73	3.31	25.00	4	9.10	5.95	36.36	3	14.71

Species		Year											
		2008				2009				2010			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Agallia consobrina***	0.37	4.55	4	1.30	0.25	2.27	4	0.75	-	-	-	-
19.	***Aphrodes makarovi***	0.37	4.55	4	1.30	0.51	4.55	4	1.52	2.68	20.45	4	7.40
20.	***Cicadella viridis***	0.74	9.09	4	2.59	1.27	11.36	4	3.80	0.89	6.82	4	2.46
21.	***Forcipata citrinella***	0.37	4.55	4	1.30	-	-	-	-	-	-	-	-
22.	***Notus flavipennis***	27.26	68.18	2	43.11	25.19	56.82	2	37.83	17.56	34.09	3	24.47
23.	***Kybos smaragdulus***	-	-	-	-	0.25	2.27	4	0.75	-	-	-	-
24.	***Empoasca pteridis***	0.92	9.09	4	2.89	0.25	2.27	4	0.75	0.89	6.82	4	2.46
25.	***Empoasca vitis***	-	-	-	-	0.76	2.27	4	1.31	-	-	-	-
26.	***Eupteryx atropunctata***	-	-	-	-	0.25	2.27	4	0.75	-	-	-	-
27.	***Eupteryx cyclops***	-	-	-	-	0.76	4.55	4	1.86	-	-	-	-
28.	***Balclutha calamagrostis***	0.18	2.27	4	0.64	0.76	6.82	4	2.28	-	-	-	-
29.	***Macrosteles laevis***	3.31	27.27	3	9.50	12.21	50.00	3	24.71	2.98	15.91	4	6.89
30.	***Macrosteles sardus***	0.18	2.27	4	0.64	-	-	-	-	0.60	4.55	4	1.65
31.	***Macrosteles viridigriseus***	0.18	2.27	4	0.64	-	-	-	-	-	-	-	-
32.	***Doratura stylata***	-	-	-	-	-	-	-	-	0.30	2.27	4	0.83
33.	***Elymana sulphurella***	0.74	6.82	4	2.25	1.02	6.82	4	2.64	-	-	-	-
34.	***Cicadula flori***	1.47	13.64	4	4.48	-	-	-	-	0.60	4.55	4	1.65
35.	***Cicadula quadrinotata***	38.49	68.18	2	51.23	20.10	40.09	3	28.39	28.57	54.55	2	39.48
36.	***Cicadula saturata***	0.55	6.82	4	1.94	0.25	2.27	4	0.75	-	-	-	-

	Species	Year											
		2008				2009				2010			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Macustus grisescens***	0.18	2.27	4	0.64	-	-	-	-	0.30	2.27	4	0.83
38.	***Athysanus argentarius***	0.92	9.09	4	2.89	3.05	18.18	4	7.45	0.30	2.27	4	0.83
39.	***Conosanus obsoletus***	1.84	13.64	4	5.01	1.53	13.64	4	4.57	0.89	6.82	4	2.46
40.	***Euscelis incisus***	0.37	4.55	4	1.30	-	-	-	-	-	-	-	-
41.	***Metalimnus formosus***	-	-	-	-	0.25	2.27	4	0.75	-	-	-	-
42.	***Psammotettix alienus***	0.18	2.27	4	0.64	0.51	4.55	4	1.52	0.30	2.27	4	0.83
43.	***Errastunus ocellaris***	0.18	2.27	4	0.64	-	-	-	-	-	-	-	-
44.	***Jassargus flori***	-	-	-	-	0.25	2.27	4	0.75	-	-	-	-
45.	***Arthaldeus pascuellus***	4.79	27.27	3	11.43	8.91	29.55	3	16.23	8.04	25.00	4	14.18
46.	***Cosmotettix costalis***	0.37	4.55	4	1.30	-	-	-	-	-	-	-	-
47.	***Sorhoanus assimilis***	5.71	38.64	3	14.85	8.65	25.00	4	14.71	3.57	20.45	4	8.54

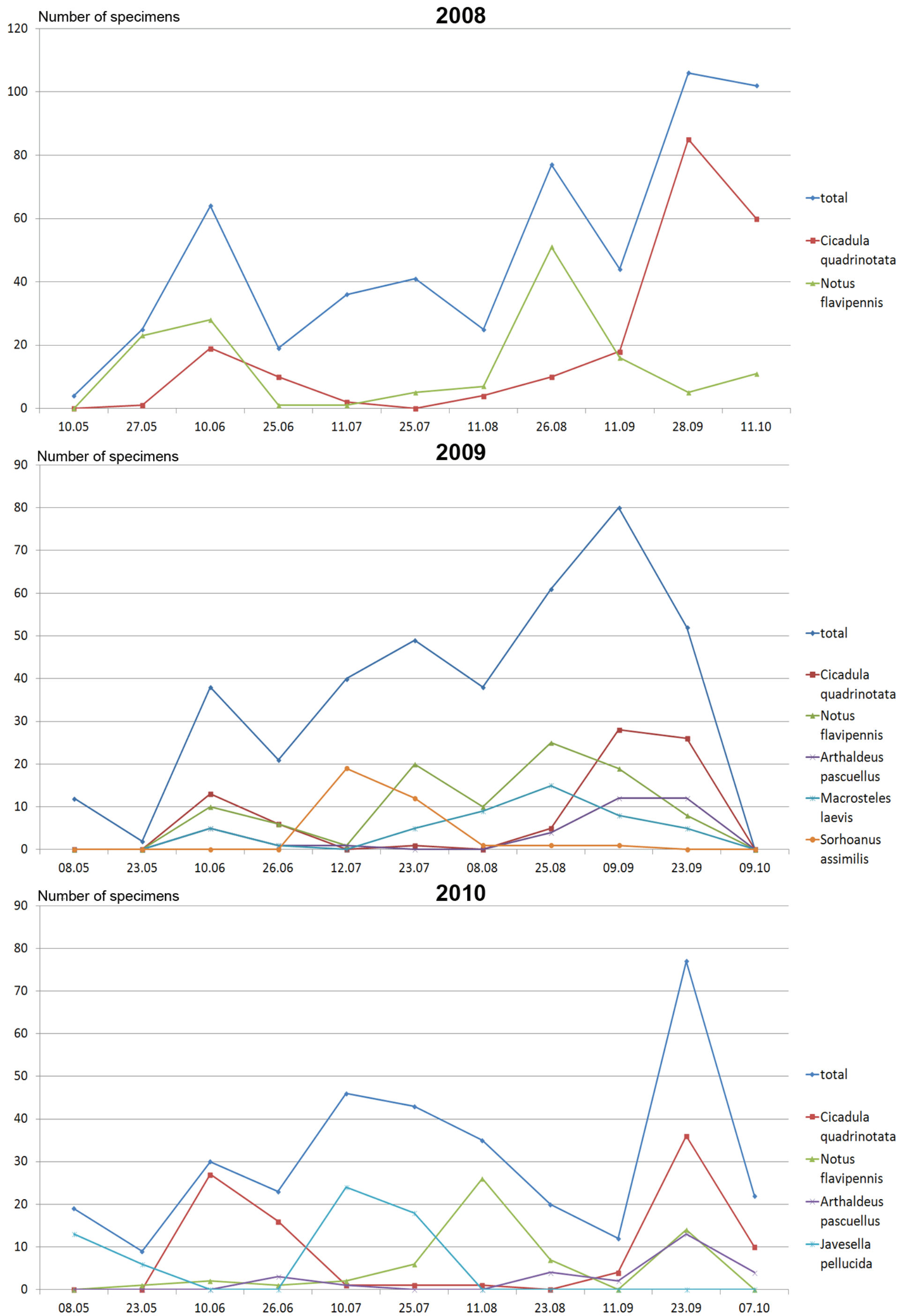

Fig. 16. The dynamics of species abundance among the species dominating in the Plot 15 (*Cirsietum rivularis*).

Table 17. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 16 (deteriorated *Cirsietum rivularis*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Kelisia praecox***	0.46	4.55	4	1.45	-	-	-	-	-	-	-	-
2.	***Kelisia confusa***	0.46	2.27	4	1.02	-	-	-	-	-	-	-	-
3.	***Stenocranus major***	0.92	9.09	4	2.89	3.11	20.45	4	7.97	0.91	6.82	4	2.49
4.	***Stenocranus minutus***	0.23	2.27	4	0.72	1.13	6.82	4	2.78	0.61	2.27	4	1.18
5.	***Eurybregma nigrolineata***	0.23	2.27	4	0.72	0.56	4.55	4	1.60	-	-	-	-
6.	***Laodelphax striatellus***	0.23	2.27	4	0.72	0.28	2.27	4	0.80	0.61	4.55	4	1.67
7.	***Mirabella albifrons***	0.23	2.27	4	0.72	-	-	-	-	0.30	2.27	4	0.83
8.	***Dicranotropis hamata***	0.46	4.55	4	1.45	-	-	-	-	1.82	11.36	4	4.55
9.	***Ribautodelphax collinus***	0.69	6.82	4	2.17	1.41	9.09	4	3.58	1.21	9.09	4	3.32
10.	***Cercopis sanguinolenta***	0.69	4.55	4	1.77	1.13	6.82	4	2.78	1.21	6.82	4	2.87
11.	***Neophilaenus lineatus***	0.46	4.55	4	1.45	0.28	2.27	4	0.80	1.21	9.09	4	3.32
12.	***Aphrophora alni***	1.84	9.09	4	4.09	0.85	6.82	4	2.41	0.91	6.82	4	2.49
13.	***Philaenus spumarius***	0.46	2.27	4	1.02	0.56	2.27	4	1.13	1.52	9.09	4	3.72
14.	***Oncopsis flavicollis***	0.23	2.27	4	0.72	-	-	-	-	-	-	-	-
15.	***Eupelix cuspidata***	0.23	2.27	4	0.72	-	-	-	-	0.30	2.27	4	0.83
16.	***Cicadella viridis***	0.92	9.09	4	2.89	1.98	13.64	4	5.20	2.42	18.18	4	6.63
17.	***Forcipata citrinella***	1.61	11.36	4	4.28	2.82	22.73	4	8.01	4.24	22.73	4	9.82

Species		Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Notus flavipennis***	0.23	2.27	4	0.72	-	-	-	-	-	-	-	-
19.	***Chlorita paolii***	0.23	2.27	4	0.72	-	-	-	-	1.82	11.36	4	4.55
20.	***Zyginidia pullula***	0.23	2.27	4	0.72	-	-	-	-	0.30	2.27	4	0.83
21.	***Balclutha calamagrostis***	1.15	11.36	4	3.61	3.67	20.45	4	8.66	3.03	18.18	4	7.42
22.	***Macrosteles laevis***	0.69	4.55	4	1.77	5.65	22.73	4	11.33	2.73	15.91	4	6.59
23.	***Doratura stylata***	0.69	6.82	4	2.17	2.54	11.36	4	5.37	1.52	9.09	4	3.72
24.	***Graphocraerus ventralis***	0.46	4.55	4	1.45	0.85	6.82	4	2.41	1.21	9.09	4	3.32
25.	***Elymana sulphurella***	1.84	18.18	4	5.78	0.56	2.27	4	1.13	0.61	4.55	4	1.67
26.	***Cicadula quadrinotata***	0.23	2.27	4	0.72	2.54	15.91	4	6.36	1.21	9.09	4	3.32
27.	***Athysanus argentarius***	1.84	9.09	4	4.09	0.28	2.27	4	0.80	1.21	9.09	4	3.32
28.	***Conosanus obsoletus***	0.23	2.27	4	0.72	0.28	2.27	4	0.80	-	-	-	-
29.	***Euscelis incisus***	0.46	2.27	4	1.02	0.85	4.55	4	1.97	0.61	4.55	4	1.67
30.	***Psammotettix alienus***	1.61	15.91	4	5.06	1.69	11.36	4	4.38	1.82	11.36	4	4.55
31.	***Psammotettix cephalotes***	75.17	75.00	2	75.08	58.76	77.27	1	67.38	60.30	84.09	1	71.21
32.	***Psammotettix confinis***	-	-	-	-	1.98	13.64	4	5.20	-	-	-	-
33.	***Errastunus ocellaris***	2.76	13.64	4	6.14	2.82	20.45	4	7.59	2.12	13.64	4	5.38
34.	***Verdanus abdominalis***	0.46	6.82	4	1.77	1.98	11.36	4	4.74	2.12	15.91	4	5.81
35.	***Arthaldeus arenarius***	0.69	4.55	4	1.77	-	-	-	-	-	-	-	-
36.	***Arthaldeus pascuellus***	0.69	6.82	4	2.17	1.41	9.09	4	3.58	2.12	15.91	4	5.81

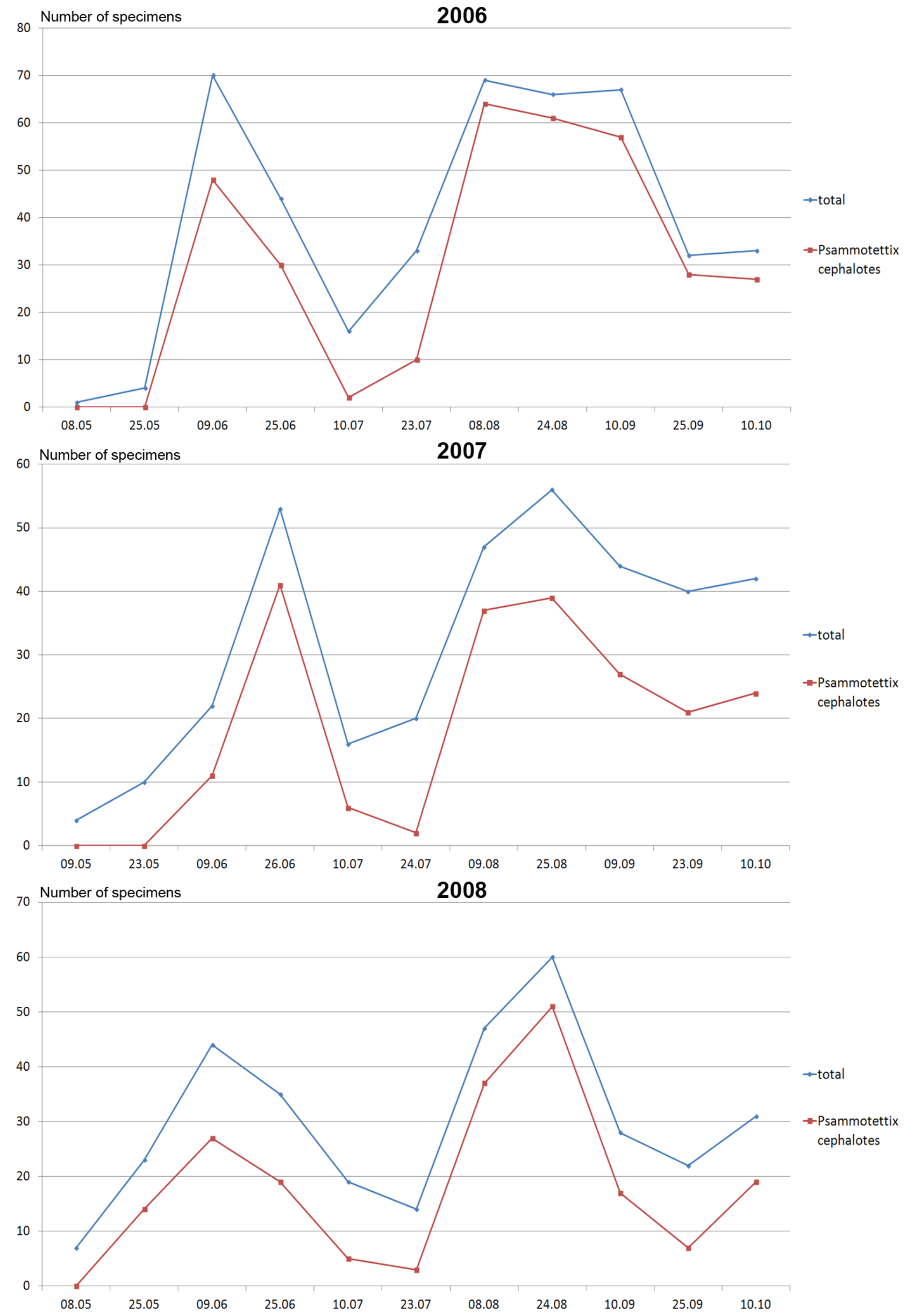

Fig. 17. The dynamics of species abundance among the species dominating in the Plot 16 (deteriorated *Cirsietum rivularis*).

other species with significant abundance. All three species together constituted 59.30% of all specimens in this community (Tab. 39).

Other dominant species included *Javesella pellucida*, *Macrosteles laevis*, *Arthaldeus pascuellus* and *Sorhoanus assimilis* but they were less abundant. Either plot differed significantly in the seasonal dynamics of abundance despite similarity of plant associations there (Figs 16 and 17). Three species scored very high values of fidelity index: *Psammotettix cephalotes* (W=98.66), *Macrosteles sardus* (W=75.00) and *Sorhoanus assimilis* (W=50.01) (Tab. 37) but none of them was common to both plots.

Community of the association *Scirpetum silvatici*

Study plot 17

A total of 1045 specimens/40 species collected: 2008 – 393/22 species, 2009 – 433/24 species, 2010 – 219/24 species (Tab. 18).

Highest classes of abundance (5 species): *Notus flavipennis* (SD – 2009: 40.42%, ED – 2008 and 2010: 37.15% & 33.33%), *Cicadula quadrinotata* (ED – 2008-2010: 38.93%, 37.64% & 34.25%), *Stenocranus fuscovittatus* (sD – 2008: 7.89%), *Macrosteles laevis* (sD – 2009: 7.85%), *Javesella pellucida* (sD – 2010: 9.13%) (Tab. 18).

Constancy: *Notus flavipennis* (1^{st} class – 2009: 81.82%, 2^{nd} class – 2008: 72.73% & 2010: 63.64%), *Cicadula quadrinotata* (2^{nd} class – 2008-2010: 68.18%, 61.36% & 52.27%). The highest value of Q index: *Notus flavipennis* (2008: 51.98, 2009: 57.51), *Cicadula quadrinotata* (2008: 51.52) (Tab. 18).

Only on this plot the occurrence of *Athysanus quadrum* was recorded (Tab. 1). *Notus flavipennis* and *Cicadula quadrinotata* had the most significant contribution to the overall seasonal dynamics of abundance on this plot. The first reached its maximum of abundance in August in all seasons, while the second in September. Moreover, both species were significantly abundant from the beginning of the season, usually as early as in May or June. Among other species, only *Javesella pellucida* contributed slightly to the seasonal dynamics, with its significant peak in July 2010 (Fig. 18).

Remarks: only on this plot *Athysanus quadrum* was collected (Tab. 1).

Study plot 18

A total of 2355 specimens/38 species collected: 2008 – 831/25 species, 2009 – 1095/28 species, 2010 – 429/23 species (Tab. 19).

Highest classes of abundance (4 species): *Cicadula quadrinotata* (SD – 2008-2010: 42.60%, 55.16% & 50.12%), *Notus flavipennis* (D – 2008: 24.43%, sD – 2009 and 2010: 18.36% & 15.85%), *Stenocranus fuscovittatus* (sD – 2008-2010: 12.88%, 9.13% & 9.56%), *Kelisia praecox* (sD – 2010: 8.16%) (Tab. 19).

Constancy: *Notus flavipennis* (2^{nd} class – 2008-2010: 63.64%, 68.18% & 54.55%), *Cicadula quadrinotata* (2^{nd} class – 2008-2010: 65.91%, 70.45% & 68.18%). The highest value of Q index: *Cicadula quadrinotata* (2008-2010: 52.99, 62.34 & 58.46) (Tab. 19).

Species with the most significant contribution to the seasonal dynamics of abundance on this plot included *Notus flavipennis* and *Cicadula quadrinotata*. The first reached a single but very clear peak of abundance in August in each season, while the second exhibited two peaks each year: at first, a smaller peak at the beginning of June and later, a higher peak at the end

Table 18. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 17 (*Scirpetum silvatici*).

	Species	Year											
		2008				2009				2010			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Cixius nervosus***	-	-	-	-	0.23	2.27	4	0.72	-	-	-	-
2.	***Kelisia praecox***	0.76	6.82	4	2.28	0.46	2.27	4	1.02	0.46	2.27	4	1.02
3.	***Kelisia punctulum***	2.04	6.82	4	3.73	-	-	-	-	0.91	4.55	4	2.03
4.	***Stenocranus fuscovittatus***	7.89	29.55	3	15.27	5.31	22.73	4	10.99	1.37	4.55	4	2.50
5.	***Stenocranus minutus***	-	-	-	-	-	-	-	-	0.46	2.27	4	1.02
6.	***Chloriona smaragdula***	-	-	-	-	0.23	2.27	4	0.72	-	-	-	-
7.	***Laodelphax striatellus***	-	-	-	-	0.23	2.27	4	0.72	-	-	-	-
8.	***Muellerianella brevipennis***	-	-	-	-	0.23	2.27	4	0.72	-	-	-	-
9.	***Muellerianella fairmairei***	0.25	2.27	4	0.75	-	-	-	-	-	-	-	-
10.	***Acanthodelphax spinosus***	-	-	-	-	-	-	-	-	0.46	2.27	4	1.02
11.	***Struebingianella lugubrina***	0.25	2.27	4	0.75	-	-	-	-	-	-	-	-
12.	***Javesella pellucida***	1.02	6.82	4	2.64	0.92	9.09	4	2.89	9.13	22.73	4	14.41
13.	***Philaenus spumarius***	-	-	-	-	0.92	9.09	4	2.89	1.37	4.55	4	2.50
14.	***Aphrodes makarovi***	0.25	2.27	4	0.75	0.23	2.27	4	0.72	-	-	-	-
15.	***Cicadella viridis***	-	-	-	-	0.23	2.27	4	0.72	0.91	4.55	4	2.03
16.	***Forcipata citrinella***	0.25	2.27	4	0.75	-	-	-	-	-	-	-	-
17.	***Notus flavipennis***	37.15	72.73	2	51.98	40.42	81.82	1	57.51	33.33	63.64	2	46.06
18.	***Empoasca pteridis***	0.25	2.27	4	0.75	-	-	-	-	-	-	-	-
19.	***Empoasca vitis***	0.25	2.27	4	0.75	-	-	-	-	-	-	-	-

	Species	Year											
		2008				2009				2010			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
20.	***Eupteryx atropunctata***	-	-	-	-	-	-	-	-	0.46	2.27	4	1.02
21.	***Eupteryx aurata***	-	-	-	-	0.23	2.27	4	0.72	-	-	-	-
22.	***Eupteryx calcarata***	0.51	4.55	4	1.52	0.23	2.27	4	0.72	-	-	-	-
23.	***Eupteryx cyclops***	0.51	4.55	4	1.52	0.69	4.55	4	1.77	1.83	9.09	4	4.08
24.	***Fieberiella septentrionalis***	-	-	-	-	-	-	-	-	0.46	2.27	4	1.02
25.	***Balclutha calamagrostis***	-	-	-	-	0.46	4.55	4	1.45	0.46	2.27	4	1.02
26.	***Macrosteles laevis***	2.80	18.18	4	7.13	7.85	38.64	3	17.42	6.85	20.45	4	11.84
27.	***Macrosteles sardus***	-	-	-	-	-	-	-	-	0.46	2.27	4	1.02
28.	***Macrosteles variatus***	0.25	2.27	4	0.75	-	-	-	-	0.46	2.27	4	1.02
29.	***Paluda flaveola***	-	-	-	-	-	-	-	-	0.46	2.27	4	1.02
30.	***Elymana sulphurella***	-	-	-	-	-	-	-	-	0.46	2.27	4	1.02
31.	***Cicadula flori***	2.54	15.91	4	6.36	1.39	11.36	4	3.97	1.37	4.55	4	2.50
32.	***Cicadula frontalis***	0.51	4.55	4	1.52	0.23	2.27	4	0.72	-	-	-	-
33.	***Cicadula quadrinotata***	38.93	68.18	2	51.52	37.64	61.36	2	48.06	34.25	52.27	2	42.31
34.	***Cicadula saturata***	1.53	11.36	4	4.17	0.69	4.55	4	1.77	-	-	-	-
35.	***Athysanus argentarius***	0.25	2.27	4	0.75	0.23	2.27	4	0.72	-	-	-	-
36.	***Athysanus quadrum***	-	-	-	-	-	-	-	-	0.46	2.27	4	1.02
37.	***Conosanus obsoletus***	1.27	6.82	4	2.94	-	-	-	-	1.37	6.82	4	3.06
38.	***Psammotettix alienus***	-	-	-	-	0.46	4.55	4	1.45	-	-	-	-
39.	***Arthaldeus pascuellus***	-	-	-	-	0.23	2.27	4	0.72	1.37	6.82	4	3.06
40.	***Sorhoanus assimilis***	0.25	2.27	4	0.75	0.23	2.27	4	0.72	0.91	4.55	4	2.03

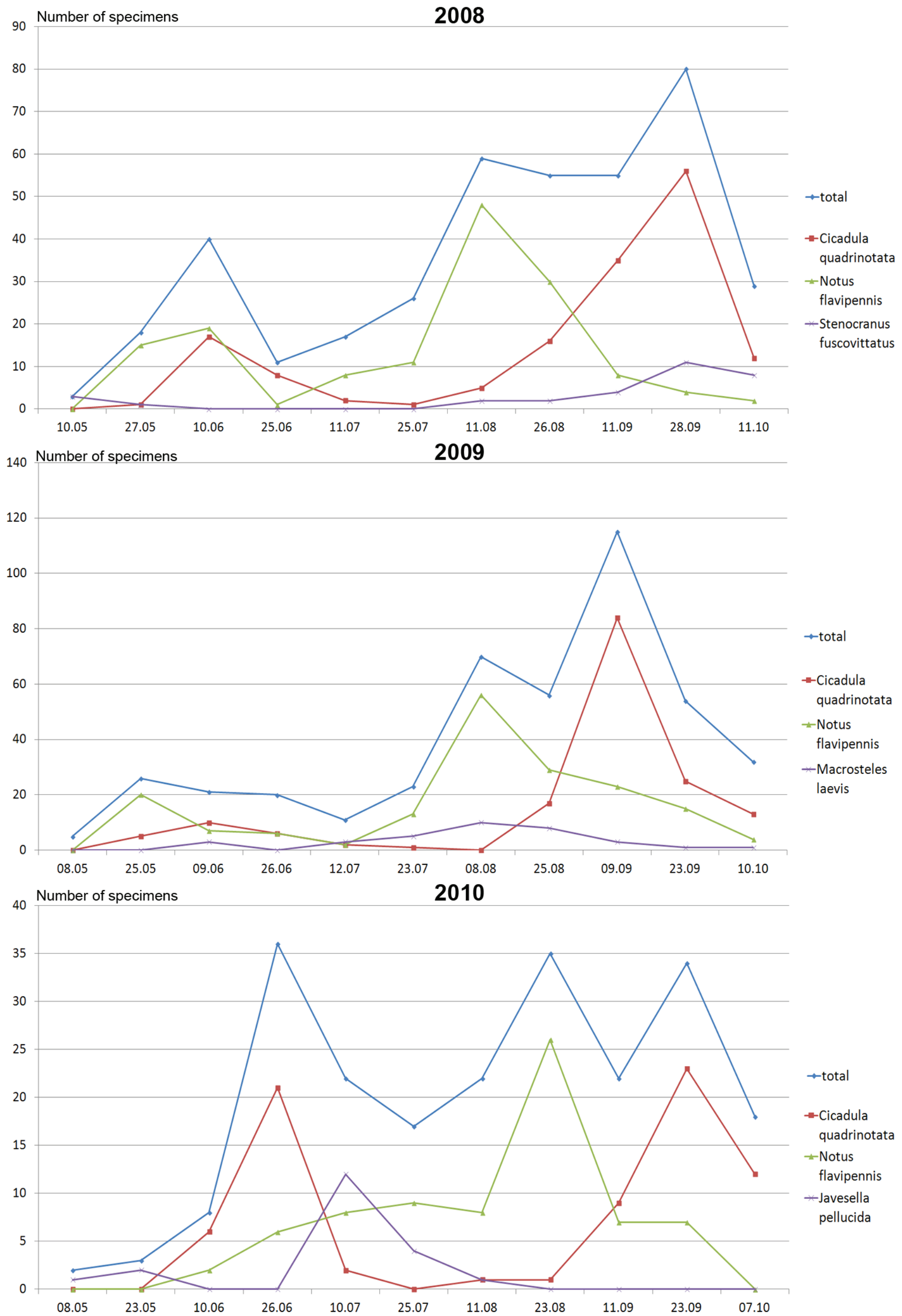

Fig. 18. The dynamics of species abundance among the species dominating in the Plot 17 (*Scirpetum silvatici*).

Table 19. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 18 (*Scirpetum silvatici*).

	Species	**Year**											
		2008				**2009**				**2010**			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Kelisia praecox***	3.01	27.27	3	9.06	1.74	27.27	3	6.89	8.16	20.45	4	12.92
2.	***Kelisia punctulum***	0.24	2.27	4	0.74	-	-	-	-	-	-	-	-
3.	***Stenocranus fuscovittatus***	12.88	43.18	3	23.58	9.13	40.09	3	19.13	9.56	36.36	3	18.64
4.	***Stenocranus major***	-	-	-	-	-	-	-	-	0.23	2.27	4	0.72
5.	***Megamelus notula***	0.12	2.27	4	0.52	-	-	-	-	0.23	2.27	4	0.72
6.	***Conomelus anceps***	0.48	9.09	4	2.09	0.27	6.82	4	1.36	3.03	13.64	4	6.43
7.	***Chloriona smaragdula***	0.12	2.27	4	0.52	0	0	0	0	-	-	-	-
8.	***Laodelphax striatellus***	0.12	2.27	4	0.52	0.09	2.27	4	0.45	-	-	-	-
9.	***Mirabella albifrons***	-	-	-	-	0.18	4.55	4	0.90	-	-	-	-
10.	***Delphacodes venosus***	-	-	-	-	0.27	6.82	4	1.36	0.47	4.55	4	1.46
11.	***Muellerianella brevipennis***	-	-	-	-	-	-	-	-	0.23	2.27	4	0.72
12.	***Muellerianella fairmairei***	0.12	2.27	4	0.52	0.09	2.27	4	0.45	-	-	-	-
13.	***Acanthodelphax spinosus***	-	-	-	-	0.37	9.09	4	1.83	-	-	-	-
14.	***Javesella pellucida***	0.36	6.82	4	1.57	0.27	6.82	4	1.36	2.80	11.36	4	5.64
15.	***Cercopis vulnerata***	-	-	-	-	0.18	4.55	4	0.90	-	-	-	-
16.	***Neophilaenus lineatus***	0.12	2.27	4	0.52	0.09	2.27	4	0.45	-	-	-	-
17.	***Philaenus spumarius***	0.24	4.55	4	1.04	0.18	4.55	4	0.90	0.47	4.55	4	1.46
18.	***Megophthalmus scanicus***	-	-	-	-	-	-	-	-	0.23	2.27	4	0.72

	Species	Year											
		2008				2009				2010			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
19.	***Stroggylocephalus agrestis***	-	-	-	-	-	-	-	-	0.47	4.55	4	1.46
20.	***Cicadella viridis***	4.69	31.82	3	12.22	6.58	27.27	3	13.40	1.86	13.64	4	5.04
21.	***Forcipata citrinella***	0.84	6.82	4	2.39	0.27	6.82	4	1.36	1.17	11.36	4	3.65
22.	***Notus flavipennis***	24.43	63.64	2	39.43	18.36	68.18	2	35.38	15.85	54.55	2	29.40
23.	***Empoasca affinis***	-	-	-	-	0.09	2.27	4	0.45	-	-	-	-
24.	***Empoasca pteridis***	0.24	4.55	4	1.04	1.28	15.91	4	4.51	0.70	6.82	4	2.18
25.	***Balclutha calamagrostis***	-	-	-	-	0.18	4.55	4	0.90	0.47	2.27	4	1.03
26.	***Macrosteles laevis***	0.36	2.27	4	0.90	1.19	13.64	4	4.03	0.93	9.09	4	2.91
27.	***Elymana sulphurella***	0.12	2.27	4	0.52	-	-	-	-	-	-	-	-
28.	***Cicadula flori***	0.12	2.27	4	0.52	-	-	-	-	-	-	-	-
29.	***Cicadula frontalis***	4.33	34.09	3	12.15	0.73	11.36	4	2.88	1.17	9.09	4	3.26
30.	***Cicadula quadrinotata***	42.60	65.91	2	52.99	55.16	70.45	2	62.34	50.12	68.18	2	58.46
31.	***Macustus grisescens***	-	-	-	-	-	-	-	-	1.17	4.55	4	2.31
32.	***Doliotettix lunulatus***	0.72	6.82	4	2.22	0.64	9.09	4	2.41	0.23	2.27	4	0.72
33.	***Athysanus argentarius***	0.36	6.82	4	1.57	0.37	9.09	4	1.83	-	-	-	-
34.	***Conosanus obsoletus***	3.01	27.27	3	9.06	1.00	11.36	4	3.37	0.23	2.27	4	0.72
35.	***Psammotettix alienus***	0.12	2.27	4	0.52	0.82	15.91	4	3.61	-	-	-	-
36.	***Arthaldeus pascuellus***	-	-	-	-	0.09	2.27	4	0.45	-	-	-	-
37.	***Sorhoanus assimilis***	0.24	4.55	4	1.04	0.18	4.55	4	0.90	0.23	2.27	4	0.72
38.	***Cosmotettix caudatus***	-	-	-	-	0.18	4.55	4	0.90	-	-	-	-

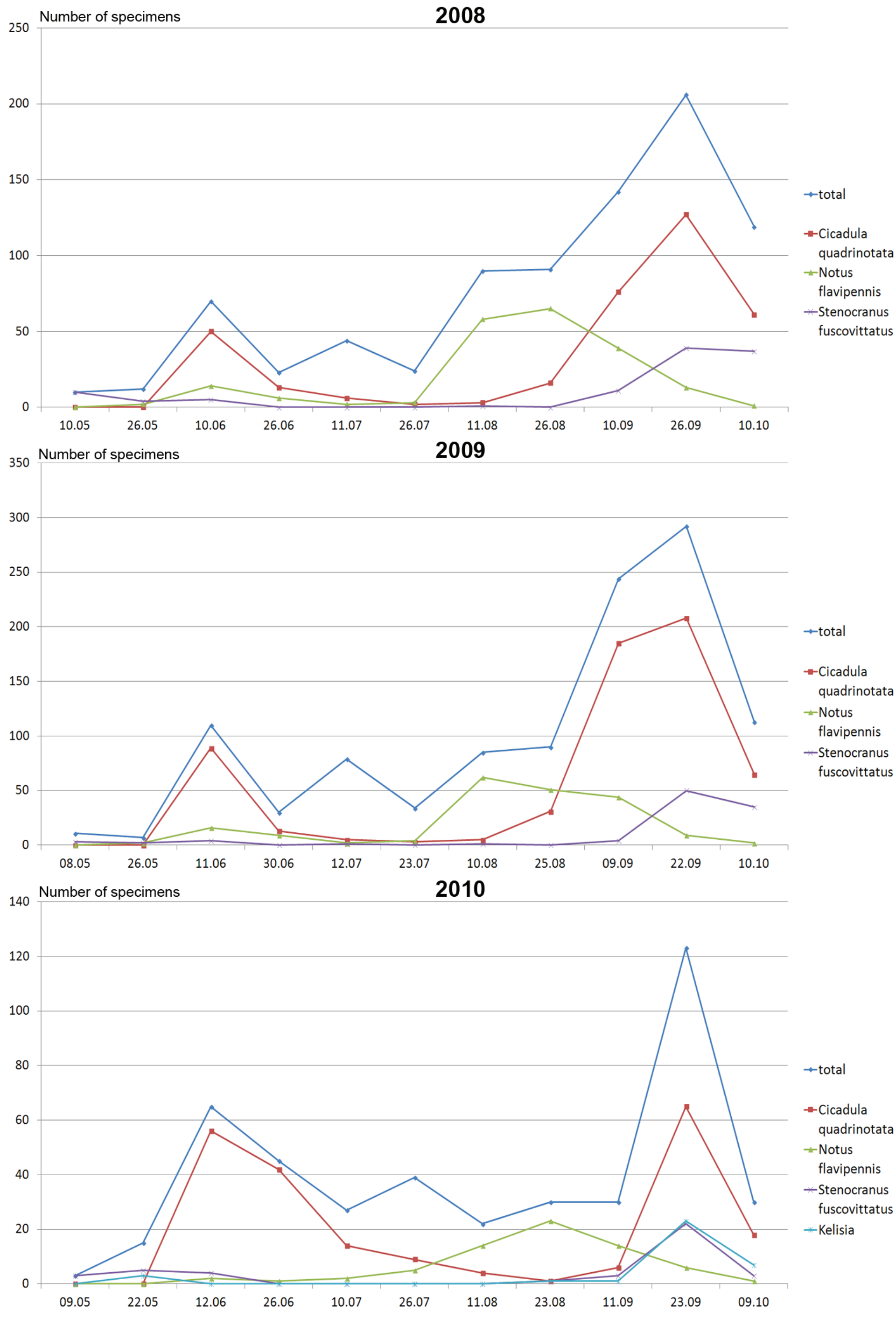

Fig. 19. The dynamics of species abundance among the species dominating in the Plot 18 (*Scirpetum silvatici*).

of September. Furthermore, each year a stable rise in abundance of *Stenocranus fuscovittatus* was observed, which peaked in September. In 2010 also *Kelisia praecox* exhibited a rise in abundance at about the same time (Fig. 19).

Remarks: on this plot the highest percentage of higrophilous (47.37%) and 2nd-degree monophagous species (34.21%) was recorded (Tab. 43b).

Characteristics of the community

During the study period, on both plots (17 and 18) a total of 3400 specimens from 53 species was collected, representing 20% of all the collected species. Among them 27 species (51%) were common to both plots (Tab. 1).

The core of this community was constituted by: *Cicadula quadrinotata* and *Notus flavipennis* with the total share of 71.38% of all specimens in this community (43.12% and 28.26% respectively) (Tab. 39). Other species with lower but significant abundance included: *Kelisia praecox*, *Stenocranus fuscovittatus*, *Javesella pellucida* and *Macrosteles laevis* (Tab. 18 and 19). *C. quadrinotata* (W=55.21) and *Notus flavipennis* (W=50.09) scored high values of fidelity index (Tab. 37)

The populations of *Cicadula quadrinotata* and *Notus flavipennis* contributed to the overall dynamics of abundance in this community to a comparable extent (Figs 18 and 19). The first generation of *Cicadula quadrinotata* occurred in early summer (June) and the second at the turn of summer and autumn. *Notus flavipennis* was abundant only in late summer (August).

Community of the association *Alopecuretum pratensis*

Study plot 19

A total 2032 specimens/67 species collected: 2005 – 343/34 species, 2006 – 667/35 species, 2007 – 1022/50 species (Tab. 20).

Highest classes of abundance (4 species): *Macrosteles laevis* (SD – 2006: 58.32%, ED – 2005 and 2007: 32.26% & 30.43%), *Arthaldeus pascuellus* (sD – 2005-2007: 19.35%, 12.29% & 9.35%), *Errastunus ocellaris* (sD – 2005 and 2007: 12.02% & 9.69%), *Chlorita paolii* (sD – 2007: 8.41%) (Tab. 20).

Constancy: *Macrosteles laevis* (1st class – 2006: 81.82%, 2nd class – 2005 and 2007: 52.27% & 68.18%), *Arthaldeus pascuellus* (2nd class – 2005-2007: 56.82%, 56.82%, 59.09%), *Elymana sulphurella* (2nd class – 2006: 56.82%), *Errastunus ocellaris* (2nd class – 2007: 70.45%). The highest value of Q index: *Macrosteles laevis* (2005-2007: 41.06 & 69.08, 45.55) (Tab. 20).

The seasonal dynamics of abundance on this plot was most significantly influenced by *Macrosteles laevis* and *Arthaldeus pascuellus*. The first species reached its maximum abundance in the second half of August 2005 and 2006 and in 2007 it was most abundant from the beginning of August to September. *Arthaldeus pascuellus* reached its maximum in the second half of June 2005 and 2006, while in 2007 it was not abundant. *Chlorita paolii* exhibited a small peak of abundance in August 2007, while *Errastunus ocellaris* was most abundant in September and October 2005 and 2007 (Fig. 20).

Study plot 20

A total of 5958 specimens/54 species collected: 2006 – 3149/37 species, 2007 – 1680/44 species, 2008 – 1129/35 species (Tab. 21).

Table 20. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 19 (*Alopecuretum pratensis*).

	Species	Year											
		2005				2006				2007			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Kelisia confusa***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
2.	***Stenocranus fuscovittatus***	-	-	-	-	0.90	11.36	4	3.20	-	-	-	-
3.	***Stenocranus major***	3.23	20.45	4	8.13	0.15	2.27	4	0.58	0.59	11.36	4	2.59
4.	***Stenocranus minutus***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
5.	***Megamelus notula***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-
6.	***Conomelus anceps***	0.59	2.27	4	1.16	-	-	-	-	0.10	2.27	4	0.48
7.	***Eurysula lurida***	-	-	-	-	0.30	4.55	4	1.17	-	-	-	-
8.	***Eurybregma nigrolineata***	-	-	-	-	0.30	2.27	4	0.83	-	-	-	-
9.	***Stiroma affinis***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
10.	***Laodelphax striatellus***	0.29	2.27	4	0.81	1.95	18.18	4	5.95	2.05	29.55	3	7.78
11.	***Mirabella albifrons***	-	-	-	-	0.30	4.55	4	1.17	0.10	2.27	4	0.48
12.	***Delphacodes venosus***	-	-	-	-	0.15	2.27	4	0.58	-	-	-	-
13.	***Muellerianella brevipennis***	0.29	4.55	4	1.15	0.15	2.27	4	0.58	0.20	4.55	4	0.95
14.	***Muellerianella fairmairei***	-	-	-	-	-	-	-	-	0.59	11.36	4	2.59
15.	***Acanthodelphax denticauda***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
16.	***Acanthodelphax spinosus***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
17.	***Dicranotropis hamata***	-	-	-	-	0.15	2.27	4	0.58	0.20	4.55	4	0.95

	Species	Year											
		2005				2006				2007			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Criomorphus albomarginatus***	-	-	-	-	-	-	-	-	0.20	4.55	4	0.95
19.	***Javesella pellucida***	1.17	9.09	4	3.26	1.65	20.45	4	5.81	5.58	20.45	4	10.68
20.	***Ribautodelphax angulosus***		0	0	0	-	-	-	-	0.10	2.27	4	0.48
21.	***Cercopis sanguinolenta***	0.29	2.27	4	0.81	-	-	-	-	0.10	2.27	4	0.48
22.	***Cercopis vulnerata***	2.05	9.09	4	4.32	0.90	11.36	4	3.20	-	-	-	-
23.	***Neophilaenus lineatus***	-	-	-	-	-	-	-	-	0.39	6.82	4	1.63
24.	***Aphrophora alni***	-	-	-	-	0.30	4.55	4	1.17	-	-	-	-
25.	***Philaenus spumarius***	2.05	13.64	4	5.29	1.50	20.45	4	5.54	1.17	20.45	4	4.89
26.	***Megophthalmus scanicus***	-	-	-	-	-	-	-	-	0.20	4.55	4	0.95
27.	***Oncopsis flavicollis***	0.29	2.27	4	0.81	0.15	2.27	4	0.58	-	-	-	-
28.	***Aphrodes makarovi***	0.29	2.27	4	0.81	-	-	-	-	0.10	2.27	4	0.48
29.	***Stroggylocephalus agrestis***	-	-	-	-	0.15	2.27	4	0.58	-	-	-	-
30.	***Cicadella viridis***	1.17	6.82	4	2.82	0.90	13.64	4	3.50	3.42	25.00	4	9.25
31.	***Forcipata citrinella***	2.35	13.64	4	5.66	1.65	11.36	4	4.33	1.27	25.00	4	5.63
32.	***Notus flavipennis***	0.88	6.82	4	2.45	0.60	9.09	4	2.34	0.10	2.27	4	0.48
33.	***Empoasca decipiens***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
34.	***Empoasca pteridis***	1.47	6.82	4	3.17	0.45	6.82	4	1.75	2.45	29.55	3	8.51
35.	***Empoasca vitis***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-
36.	***Chlorita paolii***	1.17	6.82	4	2.82	-	-	-	-	8.41	31.82	3	16.36

	Species	Year											
		2005				2006				2007			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Linnavuoriana sexmaculata***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-
38.	***Eupteryx atropunctata***	0.29	2.27	4	0.81	-	-	-	-	0.20	4.55	4	0.95
39.	***Eupteryx lelievrei***	-	-	-	-	-	-	-	-	0.20	4.55	4	0.95
40.	***Eupteryx tenella***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
41.	***Zyginidia pullula***	-	-	-	-	0.45	4.55	4	1.43	0.10	18.18	4	1.35
42.	***Balclutha calamagrostis***	4.69	11.36	4	7.30	1.65	13.64	4	4.74	3.82	38.64	3	12.15
43.	***Balclutha saltuella***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
44.	***Macrosteles laevis***	32.26	52.27	2	41.06	58.32	81.82	1	69.08	30.43	68.18	2	45.55
45.	***Macrosteles sexnotatus***	-	-	-	-	0.30	4.55	4	1.17	-	-	-	-
46.	***Deltocephalus pulicaris***	-	-	-	-	0.30	4.55	4	1.17	-	-	-	-
47.	***Recilia coronifera***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
48.	***Doratura stylata***	-	-	-	-	-	-	-	-	0.68	11.36	4	2.78
49.	***Graphocraerus ventralis***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-
50.	***Paluda flaveola***	-	-	-	-	-	-	-	-	1.17	18.18	4	4.61
51.	***Rhopalopyx preyssleri***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
52.	***Elymana sulphurella***	0.29	2.27	4	0.81	2.70	56.82	2	12.39	6.26	47.73	3	17.29
53.	***Cicadula quadrinotata***	7.04	25.00	4	13.27	1.05	15.91	4	4.09	2.94	38.64	3	10.66
54.	***Macustus grisescens***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-
55.	***Doliotettix lunulatus***	-	-	-	-	0.30	4.55	4	1.17	0.20	2.27	4	0.67

	Species	Year											
		2005				2006				2007			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
56.	***Athysanus argentarius***	0.88	6.82	4	2.45	0.45	4.55	4	1.43	1.86	29.55	3	7.41
57.	***Conosanus obsoletus***	0.29	4.55	4	1.15	0.15	2.27	4	0.58	0.39	4.55	4	1.33
58.	***Euscelis incisus***	-	-	-	-	-	-	-	-	0.88	18.18	4	4.00
59.	***Streptanus aemulans***	-	-	-	-	-	-	-	-	0.10	2.27	4	0.48
60.	***Streptanus sordidus***	0.29	2.27	4	0.81	-	-	-	-	-	-	-	-
61.	***Psammotettix alienus***	0.59	4.55	4	1.64	4.20	15.91	4	8.17	0.78	13.64	4	3.26
62.	***Psammotettix confinis***	-	-	-	-	0.15	2.27	4	0.58	0.29	6.82	4	1.41
63.	***Errastunus ocellaris***	12.02	47.73	3	23.95	4.20	38.64	3	12.74	9.69	70.45	2	26.13
64.	***Verdanus abdominalis***	1.47	6.82	4	3.17	0.60	9.09	4	2.34	2.15	25.00	4	7.33
65.	***Arthaldeus pascuellus***	19.35	56.82	2	33.16	12.29	56.82	2	26.43	9.39	59.09	2	23.56
66.	***Sorhoanus assimilis***	0.59	2.27	4	1.16	0.30	6.82	4	1.43	0.20	4.55	4	0.95
67.	***Erzaleus metrius***	0.88	4.55	4	2.00	-	-	-	-	-	-	-	-

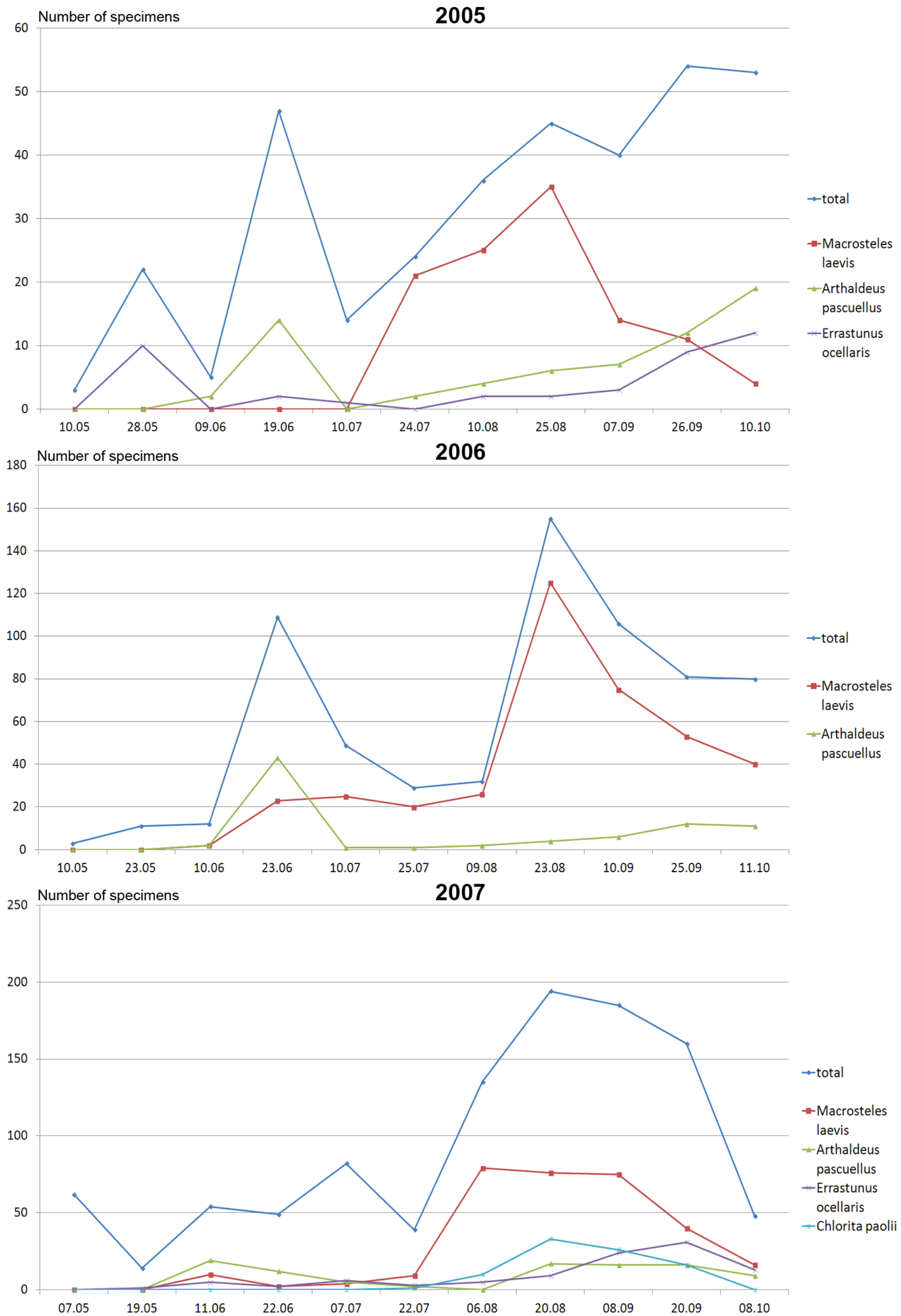

Fig. 20. The dynamics of species abundance among the species dominating in the Plot 19 (*Alopecuretum pratensis*).

Highest classes of abundance (4 species): *Macrosteles laevis* (SD – 2006 and 2008: 68.05% & 40.21, ED – 2007: 38.27%), *Arthaldeus pascuellus* (D – 2008: 20.37%, sD – 2006 and 2007: 17.59% & 13.51%), *Javesella pellucida* (sD – 2007: 10.65%), *Deltocephalus pulicaris* (sD – 2007: 7.62%) (Tab. 21).

Constancy: *Macrosteles laevis* (1^{st} class – 2007: 90.91%, 2^{nd} class – 2006 and 2008: 72.73% & 56.82%). *Deltocephalus pulicaris* (2^{nd} class – 2006-2008: 68.18%, 56.82% & 59.09%), *Arthaldeus pascuellus* (2^{nd} class – 2006-2008: 70.45%, 59.09% & 75.00%), *Javesella pellucida* (2^{nd} class – 2007: 52.27%). The highest value of Q index: *Macrosteles laevis* (2006-2008: 70.35, 58.98 & 47.80) (Tab. 21).

The seasonal dynamics of abundance on this plot was mostly shaped by *Macrosteles laevis*, which reached the highest abundance at the end of July 2006, in the second half of August 2007 and at the end of September 2008. *Arthaldeus pascuellus* reached the highest abundance at the beginning of June in 2006, and in 2007 and 2008 in the second half of August. Among other species only *Javesella pellucida* reached the peak of abundance once, at the beginning of July 2007 (Fig. 21).

Remarks: only on this plot *Euconomelus lepidus*, *Paraliburnia adela* and *Anoscopus serratulae* were collected (Tab. 1).

Characteristics of the community

During the study period, on both plots (19 and 20) a total of 7990 specimens from 85 species (Tab. 19 and 20) were collected, representing 32% of all the collected species. Among them 36 species (42%) were common to both plots (Tab. 1).

Macrosteles laevis (the mean share of 44.59% of all specimens) and *Arthaldeus pascuellus* (15.42%) were the most numerous species in this community, making up 60.01% of the collected specimens (Tab. 39). Other fairly abundant species included *Javesella pellucida*, *Chlorita paolii*, *Deltocephalus pulicaris* and *Errastunus ocellaris* (Tab. 20 and 21).

Anoscopus serratulae, *Euconomelus lepidus* and *Paraliburnia adela* scored the highest value of fidelity index (W=100). Other species with significant values of this index included *Muellerianella fairmairei* (W=51.64) and *Arthaldeus pascuellus* (W=50.40) (Tab. 37).

This community was among the most abundant and richest in species. On study plot 19 as many as 67 species were recorded, which is the highest number of all the plots. Likewise, on plot 20 the highest number of specimens was collected – 5958 (Tab. 19 and 20).

The seasonal dynamics of abundance in this community was mostly shaped by the populations of *Macrosteles laevis* and *Arthaldeus pascuellus*. Both species have two generations a year and were most abundant in spring (June) and in late summer (August-September) (Figs 20 and 21).

Community of the association *Arrhenatheretum elatioris*

Study plot 21

A total of 2500 specimens/44 species collected: 2006 – 821/18 species, 2007 – 1131/33 species, 2008 – 548/36 species (Tab. 22).

Highest classes of abundance (5 species): *Macrosteles laevis* (SD – 2006 and 2007: 85.75% & 58.09%, D – 2008: 26.36%), *Cicadula persimilis*: (sD – 2007 and 2008: 8.75% &

Table 21. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 20 (*Alopecuretum pratensis*).

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Kelisia confusa***	-	-	-	-	0.06	2.27	4	0.37	-	-	-	-
2.	***Stenocranus major***	0.38	15.91	4	2.46	2.98	22.73	4	8.23	3.19	27.27	3	9.33
3.	***Megamelus notula***	0.06	4.55	4	0.52	-	-	-	-	0.09	2.27	4	0.45
4.	***Conomelus anceps***	0.51	11.36	4	2.41	-	-	-	-	0.62	11.36	4	2.65
5.	***Eurybregma nigrolineata***	-	-	-	-	0.06	2.27	4	0.37	-	-	-	-
6.	***Euconomelus lepidus***	0.32	13.64	4	2.09	0.12	4.55	4	0.74	-	-	-	-
7.	***Megadelphax sordidulus***	-	-	-	-	0.12	2.27	4	0.52	-	-	-	-
8.	***Laodelphax striatellus***	0.10	4.55	4	0.67	3.57	43.18	3	12.42	0.18	4.55	4	0.90
9.	***Paraliburnia adela***	-	-	-	-	0.06	2.27	4	0.37	-	-	-	-
10.	***Delphacodes venosus***	-	-	-	-	0.06	2.27	4	0.37	0.09	2.27	4	0.45
11.	***Muellerianella brevipennis***	0.48	22.73	4	3.30	0.77	13.64	4	3.24	1.24	22.73	4	5.31
12.	***Muellerianella fairmairei***	0.22	6.82	4	1.22	1.85	27.27	3	7.10	1.68	29.55	3	7.05
13.	***Acanthodelphax denticauda***	-	-	-	-	0.24	6.82	4	1.28	-	-	-	-
14.	***Acanthodelphax spinosus***	-	-	-	-	0.42	9.09	4	1.95	0.62	11.36	4	2.65
15.	***Dicranotropis hamata***	-	-	-	-	0.18	4.55	4	0.90	-	-	-	-
16.	***Struebingianella lugubrina***	0.25	11.36	4	1.69	-	-	-	-	-	-	-	-
17.	***Criomorphus albomarginatus***	0.03	2.27	4	0.26	-	-	-	-	-	-	-	-

	Species	Year											
		2006				**2007**				**2008**			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Javesella dubia***	0.06	2.27	4	0.37	-	-	-	-	-	-	-	-
19.	***Javesella obscurella***	0.06	2.27	4	0.37	0.24	4.55	4	1.04	0.18	2.27	4	0.64
20.	***Javesella pellucida***	1.65	38.64	3	7.98	10.65	52.27	2	23.59	5.67	45.45	3	16.05
21.	***Ribautodelphax albostriatus***	-	-	-	-	0.18	6.82	4	1.11	-	-	-	-
22.	***Philaenus spumarius***	0.51	20.45	4	3.23	0.54	15.91	4	2.93	0.09	6.82	4	0.78
23.	***Agallia brachyptera***	0.03	2.27	4	0.26	-	-	-	-	0.09	2.27	4	0.45
24.	***Anaceratagallia ribauti***	0.10	4.55	4	0.67	0.42	13.64	4	2.39	0.18	2.27	4	0.64
25.	***Anoscopus serratulae***	0.03	2.27	4	0.26	-	-	-	-	-	-	-	-
26.	***Cicadella viridis***	0.38	15.91	4	2.46	0.60	18.18	4	3.30	0.53	11.36	4	2.45
27.	***Forcipata citrinella***	0.03	2.27	4	0.26	0.06	2.27	4	0.37	0.18	4.55	4	0.90
28.	***Notus flavipennis***	0.86	43.18	3	6.09	1.01	20.45	4	4.54	2.57	38.64	3	9.97
29.	***Empoasca pteridis***	0.06	4.55	4	0.52	0.24	6.82	4	1.28	0.09	2.27	4	0.45
30.	***Eupteryx atropunctata***	-	-	-	-	0.06	2.27	4	0.37	-	-	-	-
31.	***Eupteryx aurata***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
32.	***Eupteryx calcarata***	-	-	-	-	0.06	2.27	4	0.37	0.09	2.27	4	0.45
33.	***Balclutha calamagrostis***	0.06	2.27	4	0.37	0.36	11.36	4	2.02	-	-	-	-
34.	***Macrosteles laevis***	68.05	72.73	2	70.35	38.27	90.91	1	58.98	40.21	56.82	3	47.80
35.	***Macrosteles ossiannilssoni***	0.35	13.64	4	2.18	3.63	38.64	3	11.84	4.78	36.36	3	13.18
36.	***Macrosteles sexnotatus***	-	-	-	-	3.10	50.00	3	12.45	3.10	52.27	2	12.73

Species		Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Macrosteles viridigriseus***	0.06	2.27	4	0.37	0.48	11.36	4	2.34	0.53	11.36	4	2.45
38.	***Deltocephalus pulicaris***	4.89	68.18	2	18.26	7.62	56.82	2	20.81	7.26	59.09	2	20.71
39.	***Doratura stylata***	0.13	9.09	4	1.09	0.24	4.55	4	1.04	0.27	9.09	4	1.57
40.	***Elymana sulphurella***	0.10	4.55	4	0.67	0.18	4.55	4	0.90	0.35	6.82	4	1.54
41.	***Cicadula flori***	0.03	2.27	4	0.26	-	-	-	-	-	-	-	-
42.	***Cicadula quadrinotata***	1.62	38.64	3	7.91	3.69	31.82	3	10.84	3.45	38.64	3	11.55
43.	***Athysanus argentarius***	-	-	-	-	0.12	4.55	4	0.74	0.09	2.27	4	0.45
44.	***Limotettix striola***	-	-	-	-	0.12	2.27	4	0.52	-	-	-	-
45.	***Conosanus obsoletus***	0.03	2.27	4	0.26	0.06	2.27	4	0.37	0.27	6.82	4	1.36
46.	***Euscelis incisus***	0.19	11.36	4	1.47	1.96	36.36	3	8.44	1.24	22.73	4	5.31
47.	***Streptanus sordidus***	0.16	11.36	4	1.35	0.36	9.09	4	1.81	0.09	2.27	4	0.45
48.	***Psammotettix alienus***	0.22	11.36	4	1.58	0.36	9.09	4	1.81	-	-	-	-
49.	***Psammotettix confinis***	0.32	13.64	4	2.09	0.60	15.91	4	3.09	0.18	2.27	4	0.64
50.	***Errastunus ocellaris***	-	-	-	-	0.24	6.82	4	1.28	0.27	2.27	4	0.78
51.	***Jassargus pseudocellaris***	-	-	-	-	0.60	15.91	4	3.09	-	-	-	-
52.	***Arthaldeus pascuellus***	17.59	70.45	2	35.20	13.51	59.09	2	28.25	20.37	75.00	2	39.09
53.	***Sorhoanus assimilis***	0.03	2.27	4	0.26	-	-	-	-	0.09	2.27	4	0.45
54.	***Cosmotettix caudatus***	0.03	2.27	4	0.26	-	-	-	-	-	-	-	-

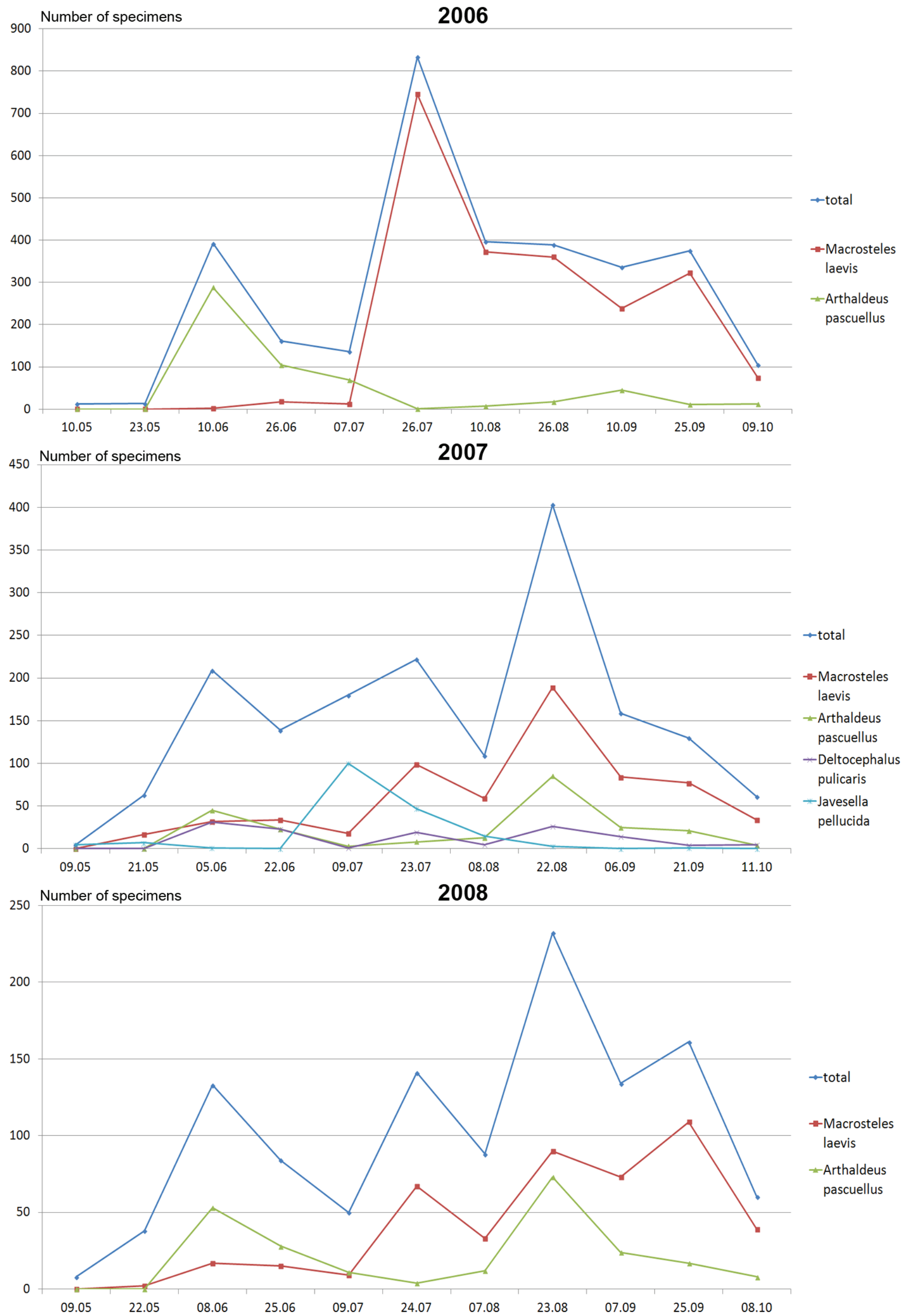

Fig. 21. The dynamics of species abundance among the species dominating in the Plot 20 (*Alopecuretum pratensis*).

8.91%), *Arthaldeus pascuellus* (sD – 2007 and 2008: 8.66% & 12.18%), *Errastunus ocellaris* (sD – 2006 and 2008: 7.55% & 8.00%), *Javesella pellucida* (sD – 2008: 7.82%) (Tab. 22).

Constancy: *Macrosteles laevis* (1st class – 2007: 86.36%, 2nd class – 2006 and 2008: 68.18% & 72.73%), *Cicadula persimilis* (2nd class – 2007: 56.82%), *Arthaldeus pascuellus* (2nd class – 2007: 54.55%). The highest value of the Q index: *Macrosteles laevis* (2006-2008: 76.46, 70.83 & 43.79) (Tab. 22).

The seasonal dynamics of abundance on this plot was mostly influenced by the population of *Macrosteles laevis*, which reached the peak of its abundance at the beginning of August 2006; in 2007 it was abundant from June to the beginning of September, with a small break in July and in 2008 at the turn of August and September. *Arthaldeus pascuellus* reached its peak in the second half of August in 2007 while *Javesella pellucida* at the end of July in 2008. Other species did not contribute to the seasonal dynamics of abundance here (Fig. 22).

Study plot 22

A total of 2138 specimens/56 species collected: 2005 – 291/28 species, 2007 – 783/34 species, 2008 – 1064/48 species (Tab. 23).

Highest classes of abundance (4 species): *Macrosteles laevis* – species with very unstable abundance: SD – 2007: 48.53%, ED – 2005: 38.83%, R – 2008: 6.95%), *Stenocranus major* (ED – 2008: 36.65%, sD – 2006 and 2007: 12.71% & 8.81%), *Errastunus ocellaris* (sD – 2005, 2007 and 2008: 16.49%, 15.96% & 14.66%), *Javesella pellucida* (sD – 2008: 9.59%) (Tab. 23).

Constancy: *Errastunus ocellaris* (1st class – 2007: 86.36%, 2nd class – 2005 and 2008: 52.27% & 68.18%), *Macrosteles laevis* (2nd class – 2005, 2007 and 2008: 72.73%, 70.45% & 59.09%). The highest value of the Q index: *Macrosteles laevis* (2007: 58.47, 2005: 53.14), *Errastunus ocellaris* (2007: 37.13) (Tab. 23).

The seasonal dynamics of abundance on this plot between 2005 and 2007 was mostly shaped by *Macrosteles laevis*, which reached its maximum in August or September, but in 2008 it was merely a receding species. *Stenocranus major* reached its maximum only in a single season – in October 2008, while in earlier seasons it rose only insignificantly in abundance in that period. A similar situation was described for *Errastunus ocellaris*, whose abundance each year rose slightly at the end of summer and in autumn. *Javesella pellucida* reached its maximum only in 2008, in the second half of July (Fig. 23).

Remarks: on this plot the highest percentage of species overwintering in the larval stage was observed (28.57%) (Tab. 43c).

Study plot 23

A total of 1992 specimens/36 species collected: 2006 – 531/24 species, 2007 – 848/30 species, 2008 – 613/25 species (Tab. 24).

Highest classes of abundance (4 species): *Macrosteles laevis* (SD – 2006-2008: 42.18%, 43.40% & 51.06%), *Turrutus socialis* (sD – 2006-2008: 15.82%, 12.50% & 17.78%), *Megadelphax sordidulus* (sD – 2006 and 2007: 15.07% & 10.14%), *Euscelis incisus* (sD – 2007: 8.25%) (Tab. 24).

Constancy: *Macrosteles laevis* (1st class – 2007 and 2008: 79.55% & 81.82%, 2nd class – 2006: 65.91%), *Turrutus socialis* (2nd class – 2006 and 2008: 59.09%, 70.45% & 70.45%),

Table 22. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 21 (*Arrhenatheretum elatioris*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	0.49	6.82	4	1.83	0.18	4.55	4	0.90	2.36	20.45	4	6.95
2.	***Stenocranus minutus***	-	-	-	-	0.44	11.36	4	2.24	0.36	4.55	4	1.28
3.	***Jassidaeus lugubris***	-	-	-	-	-	-	-	-	0.18	2.27	4	0.64
4.	***Megadelphax sordidulus***	-	-	-	-	0.09	2.27	4	0.45	-	-	-	-
5.	***Laodelphax striatellus***	0.12	2.27	4	0.52	2.74	38.64	3	10.29	1.64	18.18	4	5.46
6.	***Muellerianella brevipennis***	-	-	-	-	0.09	2.27	4	0.45	0.18	2.27	4	0.64
7.	***Acanthodelphax spinosus***	-	-	-	-	0.18	4.55	4	0.90	0.55	4.55	4	1.58
8.	***Dicranotropis hamata***	1.83	15.91	4	5.40	6.01	47.73	3	16.94	4.18	36.36	3	12.33
9.	***Javesella pellucida***	0.12	2.27	4	0.52	0.35	9.09	4	1.78	7.82	25.00	4	13.98
10.	***Ribautodelphax albostriatus***	-	-	-	-	-	-	-	-	0.18	2.27	4	0.64
11.	***Ribautodelphax collinus***	-	-	-	-	-	-	-	-	0.18	2.27	4	0.64
12.	***Philaenus spumarius***	0.24	4.55	4	1.04	0.53	6.82	4	1.90	-	-	-	-
13.	***Anaceratagallia ribauti***	0.12	2.27	4	0.52	0.18	4.55	4	0.90	0.36	4.55	4	1.28
14.	***Aphrodes makarovi***	-	-	-	-	1.06	15.91	4	4.11	0.73	9.09	4	2.58
15.	***Cicadella viridis***	-	-	-	-	0.09	2.27	4	0.45	-	-	-	-
16.	***Emelianoviana mollicula***	-	-	-	-	-	-	-	-	0.55	2.27	4	1.12
17.	***Dikraneura variata***	-	-	-	-	-	-	-	-	0.18	2.27	4	0.64

Species		Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Kybos smaragdulus***	-	-	-	-	0.09	2.27	4	0.45	0.18	2.27	4	0.64
19.	***Empoasca decipiens***	-	-	-	-	-	-	-	-	0.18	2.27	4	0.64
20.	***Empoasca pteridis***	-	-	-	-	0.27	6.82	4	1.36	-	-	-	-
21.	***Chlorita paolii***	-	-	-	-	0.27	6.82	4	1.36	1.64	15.91	4	5.11
22.	***Eupteryx atropunctata***	0.12	2.27	4	0.52	-	-	-	-	1.09	11.36	4	3.52
23.	***Eupteryx notata***	0.12	2.27	4	0.52	-	-	-	-	-	-	-	-
24.	***Zyginidia pullula***	0.12	2.27	4	0.52	0.44	9.09	4	2.00	0.91	11.36	4	3.22
25.	***Balclutha calamagrostis***	0.49	6.82	4	1.83	0.88	15.91	4	3.74	2.36	11.36	4	5.18
26.	***Macrosteles laevis***	85.75	68.18	2	76.46	58.09	86.36	1	70.83	26.36	72.73	2	43.79
27.	***Macrosteles variatus***	-	-	-	-	0.09	2.27	4	0.45	-	-	-	-
28.	***Doratura stylata***	-	-	-	-	0.35	4.55	4	1.26	1.82	11.36	4	4.55
29.	***Graphocraerus ventralis***	-	-	-	-	-	-	-	-	0.55	6.82	4	1.94
30.	***Elymana sulphurella***	0.37	6.82	4	1.59	0.97	18.18	4	4.20	1.82	15.91	4	5.38
31.	***Cicadula persimilis***	0.24	4.55	4	1.04	8.75	56.82	2	22.30	8.91	45.45	3	20.12
32.	***Cicadula quadrinotata***	-	-	-	-	0.71	4.55	4	1.80	0.55	4.55	4	1.58
33.	***Athysanus argentarius***	-	-	-	-	0.97	15.91	4	3.93	0.55	6.82	4	1.94
34.	***Conosanus obsoletus***	-	-	-	-	-	-	-	-	0.18	2.27	4	0.64
35.	***Euscelis incisus***	-	-	-	-	1.68	31.82	3	7.31	2.00	22.73	4	6.74
36.	***Streptanus aemulans***	-	-	-	-	0.18	2.27	4	0.64	0.18	2.27	4	0.64

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Metalimnus formosus***	-	-	-	-	0.09	2.27	4	0.45	-	-	-	-
38.	***Arocephalus languidus***	0.24	2.27	4	0.74	1.50	13.64	4	4.52	9.64	22.73	4	14.80
39.	***Psammotettix alienus***	0.85	11.36	4	3.11	0.88	20.45	4	4.24	0.91	9.09	4	2.88
40.	***Psammotettix confinis***	0.24	4.55	4	1.04	0.18	4.55	4	0.90	0.18	2.27	4	0.64
41.	***Errastunus ocellaris***	7.55	47.73	3	18.98	2.92	40.09	3	10.82	8.00	43.18	3	18.59
42.	***Jassargus pseudocellaris***	-	-	-	-	0.09	2.27	4	0.45	-	-	-	-
43.	***Verdanus abdominalis***	-	-	-	-	-	-	-	-	0.18	2.27	4	0.64
44.	***Arthaldeus pascuellus***	0.97	18.18	4	4.20	8.66	54.55	2	21.73	12.18	40.09	3	22.10

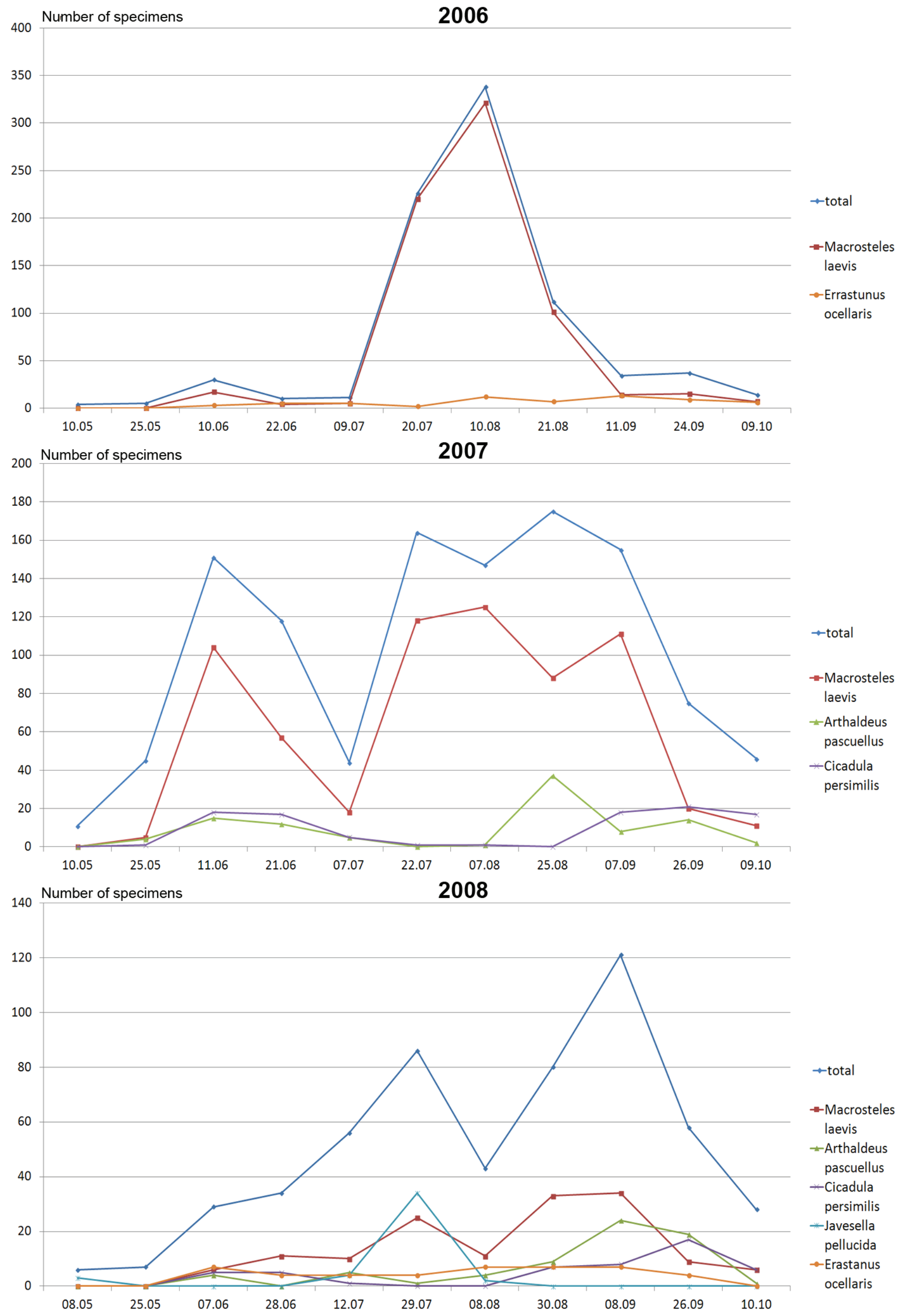

Fig. 22. The dynamics of species abundance among the species dominating in the Plot 21 (*Arrhenatheretum elatioris*).

Table 23. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 22 (*Arrhenatheretum elatioris*).

	Species	Year											
		2005				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Stenocranus major***	12.71	43.18	3	23.43	8.81	34.09	3	17.33	36.65	36.36	3	36.50
2.	***Stenocranus minutus***	0.34	2.27	4	0.88	0.13	2.27	4	0.54	0.19	4.55	4	0.93
3.	***Jassidaeus lugubris***	-	-	-	-	0.13	2.27	4	0.54	0.09	2.27	4	0.45
4.	***Eurybregma nigrolineata***	-	-	-	-	0.89	13.64	4	3.48	0.38	4.55	4	1.31
5.	***Megadelphax sordidulus***	-	-	-	-	-	-	-	-	0.19	4.55	4	0.93
6.	***Laodelphax striatellus***	1.37	9.09	4	3.53	4.21	36.36	3	12.37	0.56	9.09	4	2.26
7.	***Mirabella albifrons***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
8.	***Muirodelphax aubei***	-	-	-	-	0.77	11.36	4	2.96	0.19	4.55	4	0.93
9.	***Acanthodelphax denticauda***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
10.	***Acanthodelphax spinosus***	-	-	-	-	-	-	-	-	0.28	6.82	4	1.38
11.	***Dicranotropis hamata***	2.41	13.64	4	5.73	0.64	9.09	4	2.41	0.85	13.64	4	3.40
12.	***Struebingianella lugubrina***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
13.	***Criomorphus albomarginatus***	-	-	-	-	0.13	2.27	4	0.54	-	-	-	-
14.	***Javesella pellucida***	1.37	6.82	4	3.06	1.15	11.36	4	3.61	9.59	36.36	3	18.67
15.	***Ribautodelphax albostriatus***	0.34	2.27	4	0.88	0.77	6.82	4	2.29	3.29	31.82	3	10.23
16.	***Ribautodelphax collinus***	0.69	2.27	4	1.25	-	-	-	-	0.19	2.27	4	0.66
17.	***Cercopis sanguinolenta***	-	-	-	-	0.13	2.27	4	0.54	-	-	-	-

	Species	Year											
		2005				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Aphrophora alni***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
19.	***Philaenus spumarius***	3.09	13.64	4	6.49	0.13	2.27	4	0.54	0.09	2.27	4	0.45
20.	***Megophthalmus scanicus***	-	-	-	-	0.38	6.82	4	1.61	-	-	-	-
21.	***Hephathus nanus***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
22.	***Anaceratagallia ribauti***	0.69	4.55	4	1.77	0.51	9.09	4	2.15	0.47	6.82	4	1.79
23.	***Eupelix cuspidata***	-	-	-	-	0.26	4.55	4	1.09	-	-	-	-
24.	***Aphrodes bicinctus***	-	-	-	-	0.26	2.27	4	0.77	0.09	2.27	4	0.45
25.	***Cicadella viridis***	-	-	-	-	-	-	-	-	0.28	6.82	4	1.38
26.	***Emelianoviana mollicula***	0.34	2.27	4	0.88	-	-	-	-	0.28	6.82	4	1.38
27.	***Micantulina stigmatipennis***	-	-	-	-	-	-	-	-	0.19	4.55	4	0.93
28.	***Forcipata citrinella***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
29.	***Notus flavipennis***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
30.	***Empoasca pteridis***	0.34	2.27	4	0.88	0.89	15.91	4	3.76	0.09	2.27	4	0.45
31.	***Chlorita paolii***	2.75	13.64	4	6.12	-	-	-	-	0.56	11.36	4	2.52
32.	***Eupteryx adspersa***	0.34	2.27	4	0.88	-	-	-	-	-	-	-	-
33.	***Eupteryx atropunctata***	-	-	-	-	-	-	-	-	0.19	2.27	4	0.66
34.	***Eupteryx calcarata***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
35.	***Eupteryx cyclops***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
36.	***Eupteryx notata***	0.34	2.27	4	0.88	-	-	-	-	-	-	-	-

	Species	Year											
		2005				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Zyginidia pullula***	-	-	-	-	2.30	22.73	4	7.23	-	-	-	-
38.	***Balclutha calamagrostis***	1.03	6.82	4	2.65	1.15	11.36	4	3.61	1.41	15.91	4	4.74
39.	***Macrosteles laevis***	38.83	72.73	2	53.14	48.53	70.45	2	58.47	6.95	59.09	2	20.27
40.	***Doratura stylata***	2.75	13.64	4	6.12	2.17	20.45	4	6.66	5.08	34.09	3	13.16
41.	***Graphocraerus ventralis***	-	-	-	-	2.55	27.27	3	8.34	2.54	13.64	4	5.89
42.	***Rhopalopyx preyssleri***	-	-	-	-	0.13	2.27	4	0.54	0.09	2.27	4	0.45
43.	***Rhopalopyx vitripennis***	0.69	4.55	4	1.77	0.13	2.27	4	0.54	0.28	4.55	4	1.13
44.	***Elymana sulphurella***	0.34	2.27	4	0.88	0.51	9.09	4	2.15	1.22	20.45	4	4.99
45.	***Cicadula quadrinotata***	1.72	6.82	4	3.42	0.89	13.64	4	3.48	2.82	18.18	4	7.16
46.	***Mocydiopsis parvicauda***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
47.	***Athysanus argentarius***	1.03	6.82	4	2.65	0.13	2.27	4	0.54	0.66	11.36	4	2.74
48.	***Euscelis incisus***	1.37	6.82	4	3.06	0.64	11.36	4	2.70	0.66	9.09	4	2.45
49.	***Arocephalus longiceps***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
50.	***Psammotettix alienus***	0.34	2.27	4	0.88	0.89	11.36	4	3.18	0.47	6.82	4	1.79
51.	***Psammotettix confinis***	1.03	4.55	4	2.16	0.64	11.36	4	2.70	-	-	-	-
52.	***Errastunus ocellaris***	16.49	52.27	2	29.36	15.96	86.36	1	37.13	14.66	68.18	2	31.62
53.	***Turrutus socialis***	3.44	15.91	4	7.40	0.51	6.82	4	1.86	0.75	11.36	4	2.92
54.	***Jassargus pseudocellaris***	-	-	-	-	-	-	-	-	0.09	2.27	4	0.45
55.	***Arthaldeus pascuellus***	1.03	6.82	4	2.65	0.38	6.82	4	1.61	0.09	2.27	4	0.45
56.	***Mocuellus collinus***	2.75	15.91	4	6.61	2.30	15.91	4	6.05	6.48	40.09	3	16.12

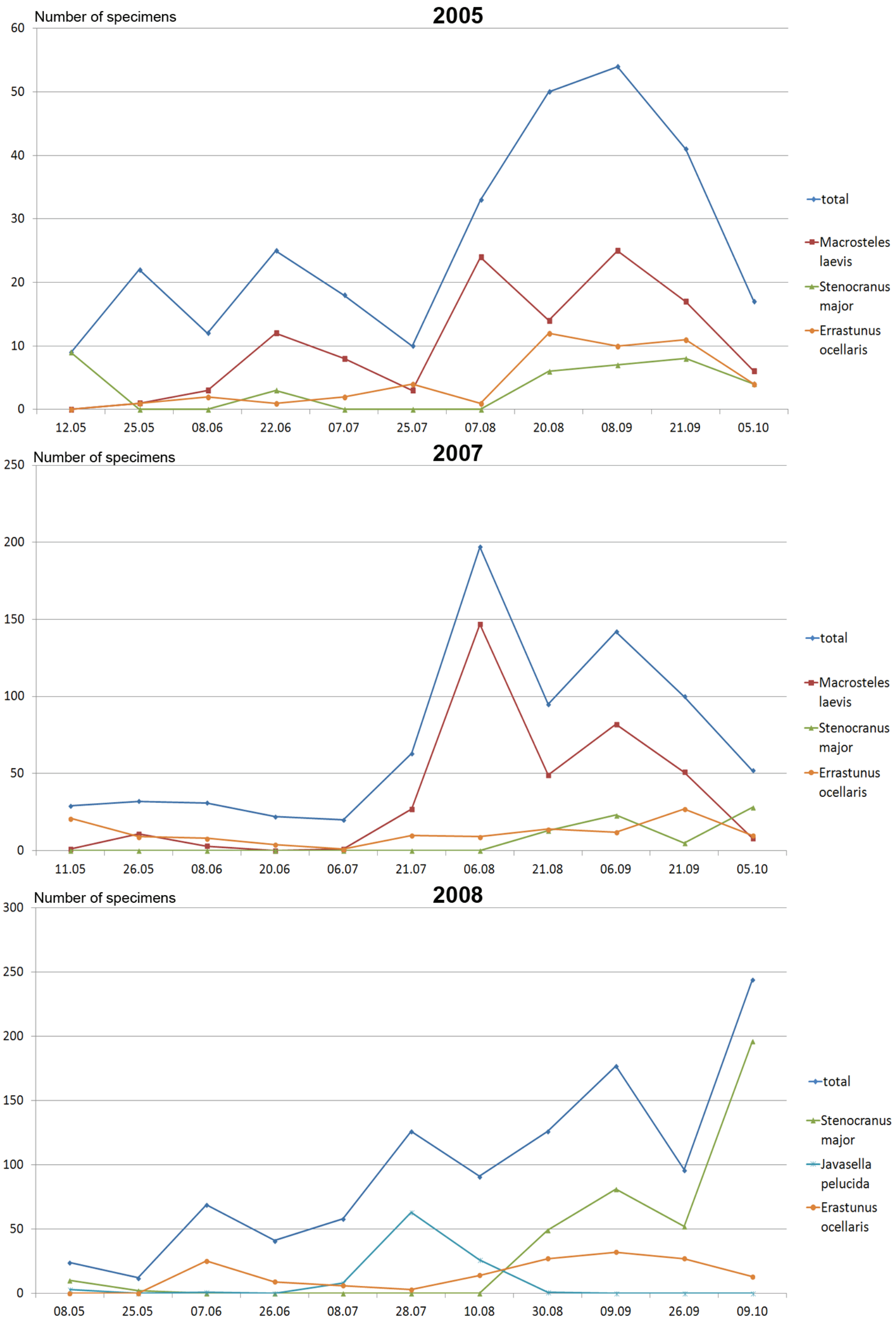

Fig. 23. The dynamics of species abundance among the species dominating in the Plot 22 (*Arrhenatheretum elatioris*).

Arocephalus languidus (2nd class – 2007: 56.82%). The highest value of the Q index: *Macrosteles laevis* (2006-2008: 52.73, 58.76 & 64.64) (Tab. 24).

On this plot the seasonal dynamics of abundance was mostly shaped by the population of *Macrosteles laevis*, which rose in abundance from July to its maximum at the beginning of September. Among other species, *Turrutus socialis* reached its maximum of abundance at the end of August (2006) and at the beginning of June (2007); *Megadelphax sordidulus* reached its highest abundance at the beginning of May and in the second half of July 2006 and 2007; *Euscelis incisus* was more abundant only in one season – in July 2007 (Fig. 24.)

Study plot 24

A total of 2352 specimens/53 species collected: 2006 – 786/40 species, 2007 – 942/45 species, 2008 – 624/29 species (Tab. 25).

Highest classes of abundance (4 species): *Macrosteles laevis* (SD – 2008: 49.52%, ED – 2006 and 2007: 30.03% & 35.56%), *Ribautodelphax collinus* (2006-2008: 13.61%, 7.54% & 10.10%), *Jassargus pseudocellaris* (sD – 2007 and 2008: 18.05% & 12.02%), *Doratura stylata* (sD – 2006: 13.49%) (Tab. 25).

Constancy: *Macrosteles laevis* (1st class – 2007 and 2008: 77.27% & 79.55%, 3rd class in 2006), *Ribautodelphax collinus* (2nd class – 2007 and 2008: 56.82% & 54.55%), *Jassargus pseudocellaris* (2nd class – 2007 and 2008: 75.00% & 65.91%).The highest value of Q index: *Macrosteles laevis* (2006-2008: 38.75, 52.42 & 62.76) (Tab. 25).

On this plot the seasonal dynamics of abundance was mostly shaped by the population of *Macrosteles laevis*. Each year it reached a single peak of abundance: in the second half of July 2006 and in September 2007 and 2008. Two species: *Ribautodelphax collinus* and *Doratura stylata* reached their maximum abundance only in 2006, both in the second half of July. In other years their contribution to the overall seasonal dynamics of the community was negligible. Also the abundance of *Jassargus pseudocellaris* was of minor importance (Fig. 25).

Remarks: only on this plot *Eupteryx thoulessi* and *Endria nebulosa* were recorded (Tab. 1).

Characteristics of the community

The community connected with plant association *Arrhenatheretum elatioris* was studied on four study plots (21, 22, 23 and 24) (Fig. 1) because this association is widespread on the territory of Częstochowa. During three study seasons a total of 8982 specimens were collected, representing 84 species, which is about 31.5 % of all the collected species (Tabs 22, 23, 24 and 25). Among them, 17 species (20%) were common to all four study plots (Tab. 1).

The core of this community was built by two most numerous species – *Macrosteles laevis*, which occurred with superdominant abundance (the mean share from all three seasons was 43.02%) and *Errastunus ocellaris* (6.05%). Both species taken together came to 49.07% of the collected material (Tab. 39). *Jassargus pseudocellaris* and *Arthaldeus pascuellus* reached high classes of abundance as well (Tabs 22, 23, 24 and 25). The highest value of fidelity index (W=100) was reached by *Endria nebulosa* and *Eupteryx thoulessi*, while *Arocephalus languidus* (W=58.08) and *Graphocraerus ventralis* (W=56.27) scored lower values (Tab. 37).

Table 24. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 23 (*Arrhenatheretum elatioris*).

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Stenocranus major***	0.38	4.55	4	1.31	-	-	-	-	-	-	-	-
2.	***Jassidaeus lugubris***	-	-	-	-	0.12	2.27	4	0.52	-	-	-	-
3.	***Megadelphax sordidulus***	15.07	47.73	3	26.82	10.14	45.45	3	21.47	6.85	43.18	3	17.20
4.	***Laodelphax striatellus***	1.13	11.36	4	3.58	4.25	43.18	3	13.55	0.33	4.55	4	1.23
5.	***Xanthodelphax stramineus***	-	-	-	-	0.12	2.27	4	0.52	0.16	2.27	4	0.60
6.	***Javesella pellucida***	-	-	-	-	0.71	6.82	4	2.20	1.79	13.64	4	4.94
7.	***Ribautodelphax albostriatus***	0.56	6.82	4	1.95	0.71	13.64	4	3.11	1.79	20.45	4	6.05
8.	***Ribautodelphax collinus***	0.19	2.27	4	0.66	0.12	2.27	4	0.52	-	-	-	-
9.	***Cercopis sanguinolenta***	0.19	2.27	4	0.66	0.24	4.55	4	1.04	0.16	2.27	4	0.60
10.	***Megophthalmus scanicus***	-	-	-	-	0.12	2.27	4	0.52	-	-	-	-
11.	***Anaceratagallia ribauti***	1.51	11.36	4	4.14	0.94	13.64	4	3.58	1.47	15.91	4	4.84
12.	***Cicadella viridis***	0.19	2.27	4	0.66	-	-	-	-	-	-	-	-
13.	***Emelianoviana mollicula***	-	-	-	-	0.12	2.27	4	0.52	0.33	4.55	4	1.23
14.	***Empoasca pteridis***	1.32	11.36	4	3.87	0.83	11.36	4	3.07	0.16	2.27	4	0.60
15.	***Chlorita paolii***	0.38	4.55	4	1.31	0.59	11.36	4	2.59	1.47	15.91	4	4.84
16.	***Eupteryx notata***	-	-	-	-	0.12	2.27	4	0.52	0.16	2.27	4	0.60
17.	***Zyginidia pullula***	-	-	-	-	1.30	20.45	4	5.16	-	-	-	-

Species		Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Balclutha calamagrostis***	6.40	27.27	3	13.21	5.66	31.82	3	13.42	1.47	15.91	4	4.84
19.	***Macrosteles laevis***	42.18	65.91	2	52.73	43.40	79.55	1	58.76	51.06	81.82	1	64.64
20.	***Deltocephalus pulicaris***	-	-	-	-	0.12	2.27	4	0.52	0.33	4.55	4	1.23
21.	***Doratura stylata***	0.38	4.55	4	1.31	1.65	15.91	4	5.12	1.14	13.64	4	3.94
22.	***Graphocraerus ventralis***	-	-	-	-	0.35	4.55	4	1.26	1.79	13.64	4	4.94
23.	***Rhopalopyx vitripennis***	0.19	2.27	4	0.66	0.24	2.27	4	0.74	0.33	4.55	4	1.23
24.	***Elymana sulphurella***	0.56	4.55	4	1.60	0.24	4.55	4	1.04	-	-	-	-
25.	***Cicadula persimilis***	1.32	13.64	4	4.24	0.83	11.36	4	3.07	-	-	-	-
26.	***Cicadula quadrinotata***	-	-	-	-	-	-	-	-	1.14	11.36	4	3.60
27.	***Athysanus argentarius***	0.56	4.55	4	1.60	-	-	-	-	-	-	-	-
28.	***Laburrus impictifrons***	-	-	-	-	0.12	2.27	4	0.52	-	-	-	-
29.	***Euscelis incisus***	6.21	31.82	3	14.06	8.25	47.73	3	19.84	2.77	15.91	4	6.64
30.	***Arocephalus languidus***	3.58	22.73	4	9.02	4.60	56.82	2	16.17	2.94	38.64	3	10.66
31.	***Psammotettix alienus***	0.19	2.27	4	0.66	0.71	11.36	4	2.84	0.82	9.09	4	2.73
32.	***Psammotettix confinis***	1.13	13.64	4	3.93	0.71	11.36	4	2.84	0.98	11.36	4	3.34
33.	***Errastunus ocellaris***	-	-	-	-	-	-	-	-	1.47	15.91	4	4.84
34.	***Turrutus socialis***	15.82	59.09	2	30.57	12.50	70.45	2	29.68	17.78	70.45	2	35.39
35.	***Jassargus pseudocellaris***	0.19	2.27	4	0.66	-	-	-	-	-	-	-	-
36.	***Mocuellus collinus***	0.38	4.55	4	1.31	0.24	4.55	4	1.04	1.31	11.36	4	3.86

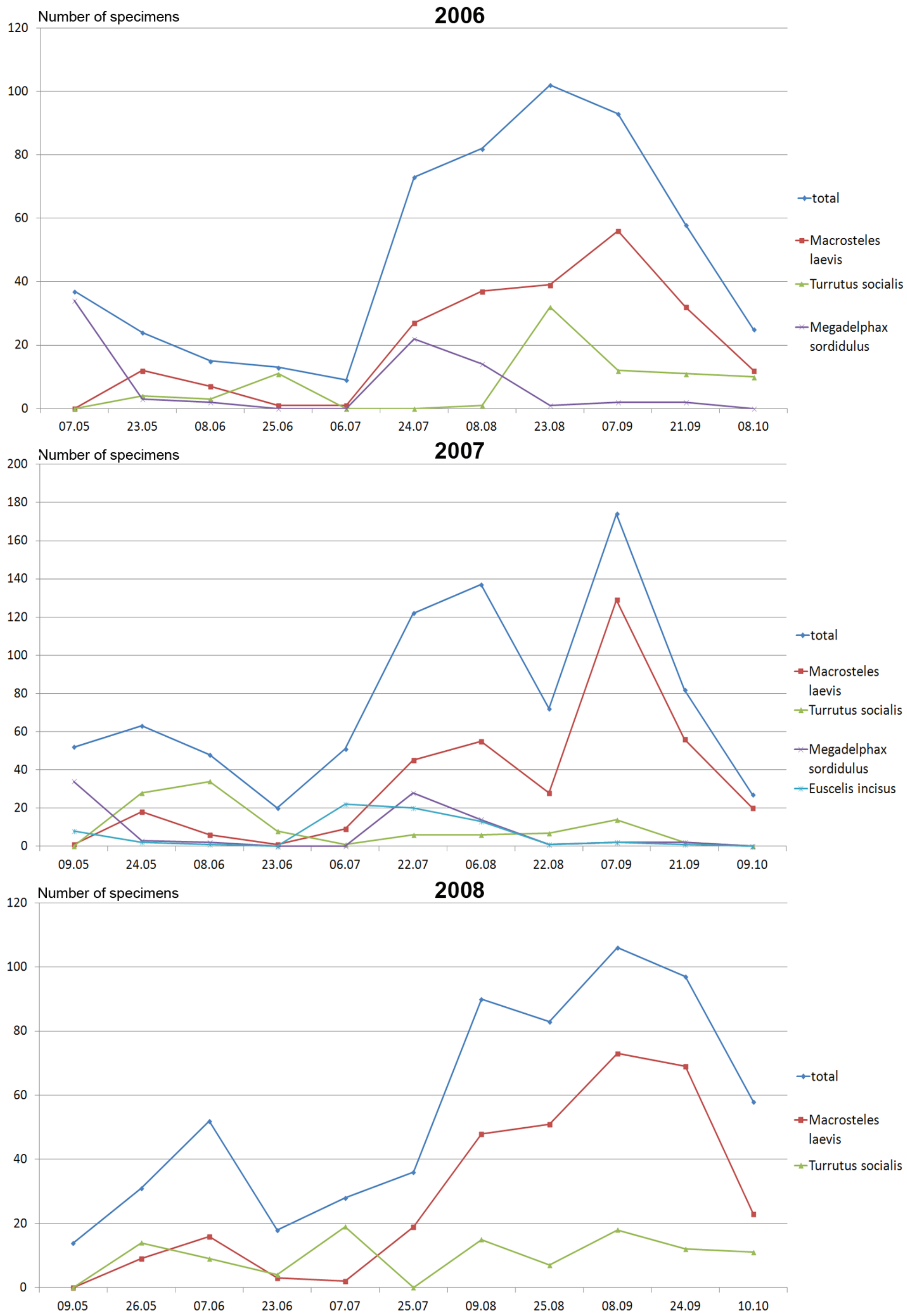

Fig. 24. The dynamics of species abundance among the species dominating in the Plot 23 (*Arrhenatheretum elatioris*).

Table 25. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 24 (*Arrhenatheretum elatioris*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1	***Stenocranus major***	0.38	6.82	4	1.61	0.11	2.27	4	0.50	0.48	4.55	4	1.48
2	***Stenocranus minutus***	0.25	4.55	4	1.07	0.53	11.36	4	2.45	-	-	-	-
3	***Conomelus anceps***	-	-	-	-	0.11	2.27	4	0.50	0.16	2.27	4	0.60
4	***Eurysula lurida***	0.13	2.27	4	0.54	-	-	-	-	-	-	-	-
5	***Eurybregma nigrolineata***	0.25	4.55	4	1.07	0.21	4.55	4	0.98	-	-	-	-
6	***Megadelphax sordidulus***	-	-	-	-	0.21	4.55	4	0.98	-	-	-	-
7	***Laodelphax striatellus***	0.38	4.55	4	1.31	1.38	22.73	4	5.60	0.16	2.27	4	0.60
8	***Delphacodes venosus***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
9	***Acanthodelphax spinosus***	0.51	6.82	4	1.86	0.21	4.55	4	0.98	0.32	4.55	4	1.21
10	***Dicranotropis hamata***	0.51	9.09	4	2.15	0.11	2.27	4	0.50	0.80	9.09	4	2.70
11	***Xanthodelphax flaveolus***	0.13	2.27	4	0.54	-	-	-	-	-	-	-	-
12	***Xanthodelphax stramineus***	0.89	11.36	4	3.18	0.32	4.55	4	1.21	0.32	2.27	4	0.85
13	***Javesella pellucida***	0.13	2.27	4	0.54	0.64	9.09	4	2.41	0	0	0	0
14	***Ribautodelphax albostriatus***	5.22	56.82	2	17.22	2.76	54.55	2	12.27	0.80	9.09	4	2.70
15	***Ribautodelphax angulosus***	1.40	6.82	4	3.09	-	-	-	-	-	-	-	-
16	***Ribautodelphax collinus***	13.61	31.82	3	20.81	7.54	56.82	2	20.70	10.10	54.55	2	23.47
17	***Cercopis sanguinolenta***	-	-	-	-	0.21	4.55	4	0.98	-	-	-	-

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18	***Utecha trivia***	0.38	4.55	4	1.31	0.11	4.55	4	0.71	0.32	4.55	4	1.21
19	***Anaceratagallia ribauti***	-	-	-	-	0.11	2.27	4	0.50	0.32	4.55	4	1.21
20	***Eupelix cuspidata***	1.40	13.64	4	4.37	0.85	18.18	4	3.93	0.32	4.55	4	1.21
21	***Aphrodes bicinctus***	0.38	6.82	4	1.61	-	-	-	-	0.16	2.27	4	0.60
22	***Aphrodes makarovi***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
23	***Empoasca pteridis***	0.25	4.55	4	1.07	0.53	11.36	4	2.45	0.48	4.55	4	1.48
24	***Chlorita paolii***	0.13	2.27	4	0.54	0.11	2.27	4	0.50	0.48	6.82	4	1.81
25	***Eupteryx thoulessi***	0.13	2.27	4	0.54	-	-	-	-	-	-	-	-
26	***Eupteryx notata***	-	-	-	-	0.21	4.55	4	0.98	-	-	-	-
27	***Zyginidia pullula***	-	-	-	-	0.85	11.36	4	3.11	-	-	-	-
28	***Zygina hyperici***	0.13	2.27	4	0.54	-	-	-	-	-	-	-	-
29	***Balclutha calamagrostis***	0.89	11.36	4	3.18	0.74	13.64	4	3.18	0.48	4.55	4	1.48
30	***Balclutha punctata***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
31	***Macrosteles laevis***	30.03	50.00	3	38.75	35.56	77.27	1	52.42	49.52	79.55	1	62.76
32	***Deltocephalus pulicaris***	0.13	2.27	4	0.54	0.21	4.55	4	0.98	0.48	4.55	4	1.48
33	***Endria nebulosa***	0.13	2.27	4	0.54	-	-	-	-	-	-	-	-
34	***Doratura homophyla***	0.25	4.55	4	1.07	-	-	-	-	-	-	-	-
35	***Doratura stylata***	13.49	34.09	3	21.44	5.84	38.64	3	15.02	6.57	29.55	3	13.93
36	***Graphocraerus ventralis***	4.58	27.27	3	11.18	4.03	34.09	3	11.72	4.49	27.27	3	11.07

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
37	***Paluda flaveola***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
38	***Rhopalopyx adumbrata***	0.51	4.55	4	1.52	0.42	9.09	4	1.95	-	-	-	-
39	***Rhopalopyx preyssleri***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
40	***Rhopalopyx vitripennis***	-	-	-	-	1.27	22.73	4	5.37	-	-	-	-
41	***Elymana sulphurella***	0.13	2.27	4	0.54	0.42	6.82	4	1.69	0.48	4.55	4	1.48
42	***Cicadula persimilis***	0.13	2.27	4	0.54	1.06	18.18	4	4.39	0.32	4.55	4	1.21
43	***Cicadula quadrinotata***	-	-	-	-	0.11	2.27	4	0.50	-	-	-	-
44	***Mocydiopsis parvicauda***	0.13	2.27	4	0.54	0.47	15.91	4	2.73	-	-	-	-
45	***Athysanus argentarius***	0.51	6.82	4	1.86	1.38	18.18	4	5.01	0.16	2.27	4	0.60
46	***Euscelis incisus***	2.67	31.82	3	9.22	3.61	29.55	3	10.33	2.24	20.45	4	6.77
47	***Arocephalus languidus***	3.82	36.36	3	11.79	2.87	36.36	3	10.22	1.12	13.64	4	3.91
48	***Psammotettix alienus***	3.05	27.27	3	9.12	0.53	4.55	4	1.55	0.80	9.09	4	2.70
49	***Psammotettix confinis***	3.94	34.09	3	11.59	2.87	40.09	3	10.73	3.37	34.09	3	10.72
50	***Errastunus ocellaris***	1.78	15.91	4	5.32	1.70	15.91	4	5.20	2.08	22.73	4	6.88
51	***Turrutus socialis***	0.25	2.27	4	0.75	0.74	15.91	4	3.43	0.64	6.82	4	2.09
52	***Jassargus pseudocellaris***	6.74	45.45	3	17.50	18.05	75.00	2	36.79	12.02	65.91	2	28.15
53	***Arthaldeus pascuellus***	0.25	4.55	4	1.07	0.11	2.27	4	0.50	-	-	-	-

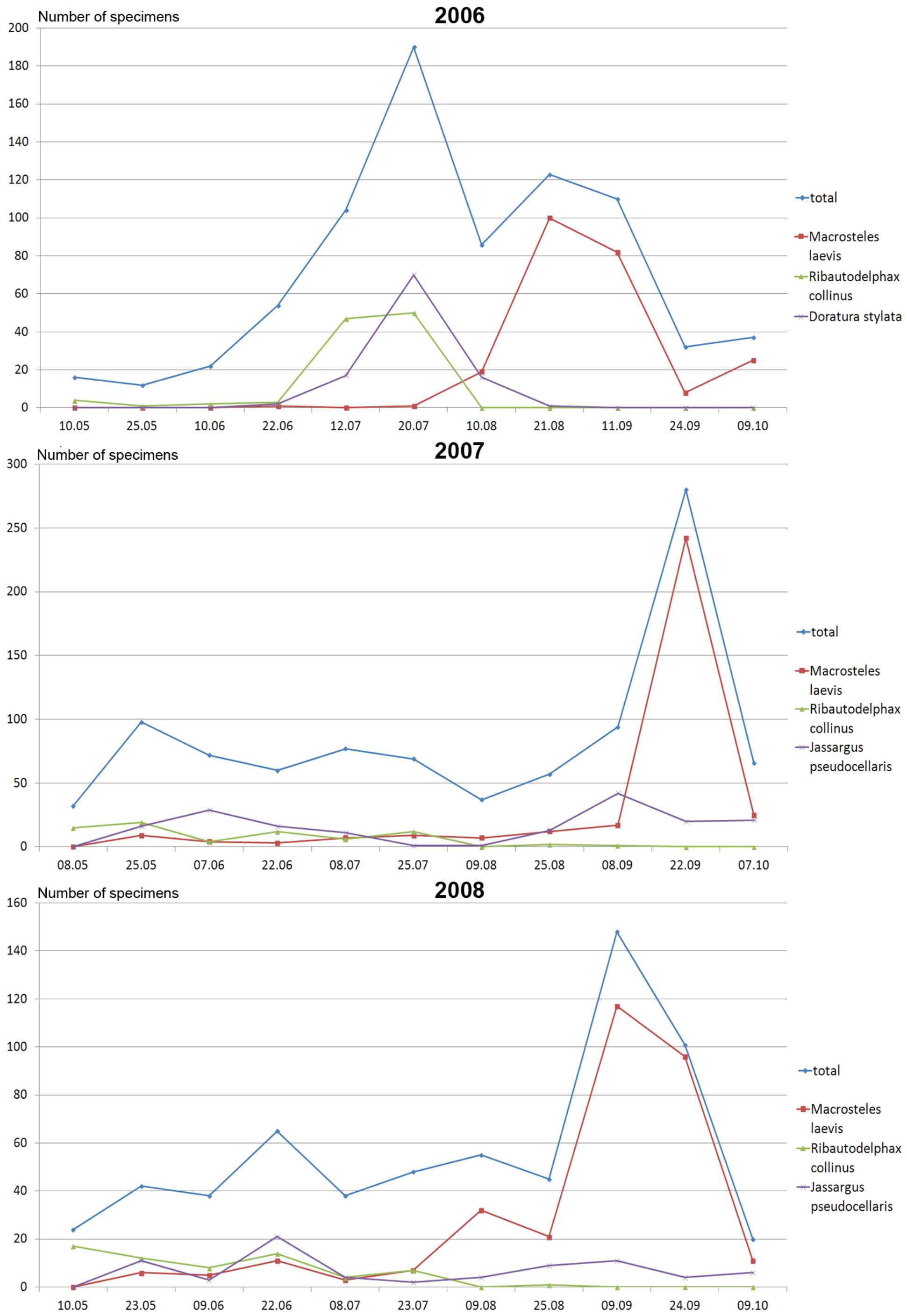

Fig. 25. The dynamics of species abundance among the species dominating in the Plot 24 (*Arrhenatheretum elatioris*).

The seasonal dynamics of abundance in all four plots was predominately influenced by vast populations of *Macrosteles laevis* (Figs 22, 23, 24 and 25).

Community of the association *Achillea millefolium-Taraxacum officinale*

Study plot 25

A total of 4017 specimens/35 species collected: 2006 –1460/18 species, 2007 – 1503/35 species, 2008 – 1054/23 species (Tab. 26).

Highest classes of abundance (4 species): *Macrosteles laevis* (SD – 2006 and 2008: 70.62% & 45.54%, D – 2007: 22.16%), *Chlorita paolii* – with a very unstable abundance during the study (SD – 2007: 41.25%, D – 2008: 22.96%, sD – 2006: 8.42%), *Psammotettix confinis* (sD – 2007 and 2008: 10.51% & 9.30%), *Turrutus socialis* (sD – 2007: 8.45%) (Tab. 26).

Constancy: *Chlorita paolii* (1st class – 2007 and 2008: 77.37% & 79.55%, 2nd class – 2006: 70.45%), *Macrosteles laevis* (1st class – 2007 and 2008: 79.55% & 86.36%, 2nd class – 2006: 61.36%), *Psammotettix confinis* (1st class – 2007 and 2008: 81.82% & 77.27%, 2nd class – 2006: 65.91%), *Turrutus socialis* (2nd class – 2007 and 2008: 70.45% & 56.82%), *Mocuellus collinus* (2nd class – 2007: 54.55%). The highest value of Q index: *Macrosteles laevis* (2006: 65.83, 2008: 62.71), *Chlorita paolii* (2007: 56.49) (Tab. 26).

The seasonal dynamics of abundance on this plot was mostly influenced by the population of *Macrosteles laevis*. In 2006 it reached two maxima of abundance: a smaller one at the beginning of August and a bigger one at the end of September. In 2007 it was not very numerous, with fluctuating abundance but in 2008 it peaked significantly in abundance during September. *Chlorita paolii* as another significant species here, which, although not very abundant in 2006, reached two peaks of abundance in 2007: at the beginning of August and at the end of September. It was also very abundant in the second half of August 2008. Other species, such as *Turrutus socialis* and *Psammotettix confinis*, although noticeably abundant, did not influence the overall dynamics on this plot (Fig. 26).

Remarks: the highest share of 1st-degree oligophagous species was observed on this plot (48.57%) (Tab. 43c).

Characteristics of the community

The community connected with plant association *Achillea millefolium-Taraxacum officinale* was studied only on plot 25 (Fig. 1) because there was no other area within the town with a comparable habitat type.

During the research the presence of 13% of all the collected species was recorded here (Tab. 1). Most numerous species included *Macrosteles laevis* (the mean share from all three seasons was 46.11%) and *Chlorita paolii* (24.21%), which together constituted 70.32% of all collected specimens on this plot (Tab. 39). *Turrutus socialis* and *Psammotettix confinis* were noticeably abundant.

Two species: *Doratura homophyla* (W=80.83) and *Chlorita paolii* (W=50.51) reached a high value of the fidelity index (Tab. 37).

Table 26. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 25 (*Achillea millefolium-Taraxacum officinale*).

	Species	Year											
		2006				2007				2008			
		D	**C**		**Q**	**D**	**C**		**Q**	**D**	**C**		**Q**
1.	***Stenocranus major***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
2.	***Stenocranus minutus***	-	-	-	-	0.07	2.27	4	0.40	0.28	4.55	4	1.13
3.	***Laodelphax striatellus***	0.07	2.27	4	0.40	0.67	15.91	4	3.26	0.57	9.09	4	2.28
4.	***Muellerianella brevipennis***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
5.	***Javesella pellucida***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
6.	***Ribautodelphax albostriatus***	0.14	4.55	4	0.80	0.47	11.36	4	2.31	0.19	2.27	4	0.66
7.	***Philaenus spumarius***	-	-	-	-	0.07	2.27	4	0.40	0.09	2.27	4	0.45
8.	***Utecha trivia***	0.89	11.36	4	3.18	0.07	2.27	4	0.40	0.28	4.55	4	1.13
9.	***Megophthalmus scanicus***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
10	***Hephathus nanus***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
11.	***Agallia consobrina***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
12	***Anaceratagallia ribauti***	0.41	11.36	4	2.16	0.86	18.18	4	3.95	1.33	20.45	4	5.22
13.	***Empoasca pteridis***	0	0	0	0	0.07	2.27	4	0.40	0.28	4.55	4	1.13
14.	***Chlorita paolii***	8.42	70.45	2	24.36	41.25	77.37	1	56.49	22.96	79.55	1	42.74
15.	***Eupteryx atropunctata***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
16.	***Zyginidia pullula***	0.07	2.27	4	0.40	0.27	0.09	4	0.16	-	-	-	-
17.	***Balclutha calamagrostis***	0.07	2.27	4	0.40	0.07	2.27	4	0.40	0.38	6.82	4	1.61

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Macrosteles laevis***	70.62	61.36	2	65.83	22.16	79.55	1	41.99	45.54	86.36	1	62.71
19.	***Deltocephalus pulicaris***	-	-	-	-	1.86	31.82	3	7.69	1.04	22.73	4	4.86
20.	***Doratura exilis***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
21.	***Doratura homophyla***	2.47	38.64	3	9.77	5.59	38.64	3	14.70	3.32	31.82	3	10.28
22.	***Doratura stylata***	1.10	20.45	4	4.74	0.60	13.64	4	2.86	0.76	13.64	4	3.22
23.	***Graphocraerus ventralis***	-	-	-	-	0.07	2.27	4	0.40	0.28	4.55	4	1.13
24.	***Rhopalopyx vitripennis***	-	-	-	-	0.07	2.27	4	0.40	0.09	2.27	4	0.45
25.	***Cicadula quadrinotata***	0.34	9.09	4	1.76	0.47	13.64	4	2.53	0.57	11.36	4	2.54
26.	***Athysanus argentarius***	-	-	-	-	0.07	2.27	4	0.40	-	-	-	-
27.	***Euscelis incisus***	0.07	2.27	4	0.40	1.46	29.55	3	6.57	0.09	2.27	4	0.45
28.	***Arocephalus languidus***	-	-	-	-	0.07	2.27	4	0.40	0.28	4.55	4	1.13
29.	***Psammotettix alienus***	3.84	47.73	3	13.54	0.47	2.27	4	1.03	-	-	-	-
30.	***Psammotettix confinis***	5.68	65.91	2	19.35	10.51	81.82	1	29.32	9.30	77.27	1	26.81
31.	***Errastunus ocellaris***	0.48	11.36	4	2.34	0.73	20.45	4	3.86	1.33	22.73	4	5.50
32.	***Turrutus socialis***	2.67	38.64	3	10.16	8.45	70.45	2	24.40	7.12	56.82	2	20.11
33.	***Jassargus pseudocellaris***	0.07	2.27	4	0.40	0.07	2.27	4	0.40	0.19	2.27	4	0.66
34.	***Arthaldeus pascuellus***	-	-	-	-	0.13	4.55	4	0.77	-	-	-	-
35.	***Mocuellus collinus***	2.60	43.18	3	10.60	2.86	54.55	2	12.49	3.70	36.36	3	11.60

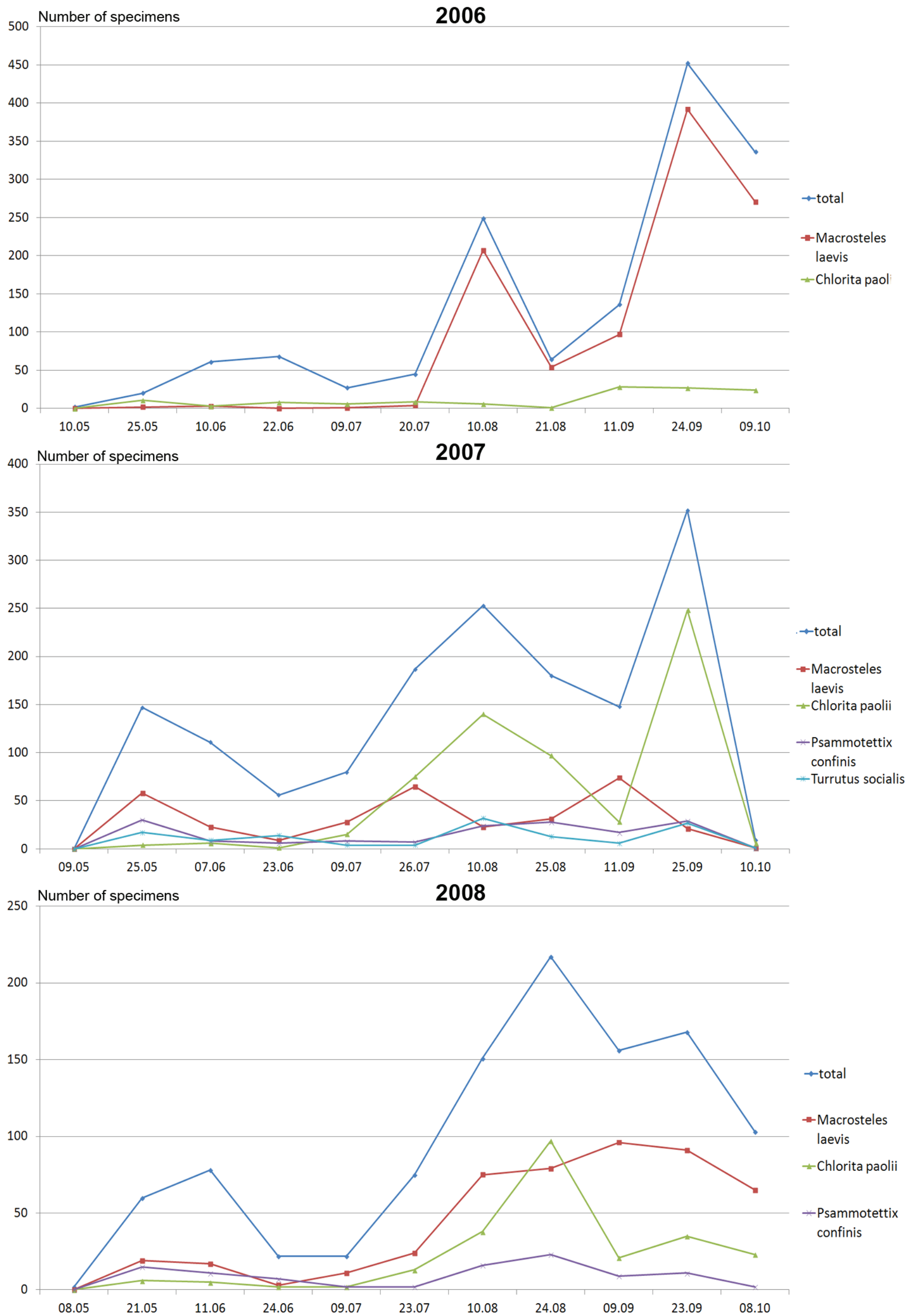

Fig. 26. The dynamics of species abundance among the species dominating in the Plot 25 (*Achillea millefolium-T. officinale*).

Community of the association with *Dactylis glomerata*

Study plot 26

A total of 1355 specimens/38 species collected: 2006 – 156/18 species, 2007 – 408/30 species, 2008 – 791/36 species (Tab. 27).

Highest classes of abundance (5 species): *Macrosteles laevis* – its population was very unstable during the research (ED – 2006: 39.10%, D – 2007: 25.49%, sD – 2008: 10.62%), *Stenocranus major* (population was very unstable: ED – 2008: 31.61%, sD – 2007: 10.05%, R – 2006: 0,64), *Chlorita paolii* (sD – 2006-2008: 14.10%, 19.85% & 11.00%), *Empoasca pteridis* (sD – 2006: 18.59%), *Javesella pellucida* (sD – 2008: 10.75%) (Tab. 27).

Constancy: *Chlorita paolii* (2nd class – 2007 and 2008: 56.82% & 52.27%), *Macrosteles laevis* (2nd class – 2006 and 2007: 63.64% & 68.18%), *Euscelis incisus* (2nd class – 2008: 59.09%). The highest value of Q index: *Macrosteles laevis* (2006: 49.88, 2007: 41.69), *Stenocranus major* (2008: 33.90) (Tab. 27).

Macrosteles laevis and *Chlorita paolii* exerted most significant influence on the seasonal dynamics of abundance on this plot. The first reached its peak of abundance at the end of September in 2006, and at the end of August 2007. Moreover, it was quite abundant at the turn of May and June each year. In 2008 it reached a small maximum at the beginning of September, but its overall abundance that year was quite low. The contribution of *Chlorita paolii* into the overall dynamics in 2006 and 2008 was small, except in 2007 when this species was abundant, especially at the beginning of August and the beginning of October, reaching two peaks of abundance. Among other species contributing to the dynamics of the community, *Empoasca pteridis* reached the peak of abundance in the middle of May 2006, *Stenocranus major* in September 2007 and at the beginning of October 2008, while *Javesella pellucida* at the end of July 2008 (Fig. 27).

Characteristics of the community

The community connected with plant association with *Dactylis glomerata* was studied only on plot 26 (Fig. 1) because there was no other area within the town with a comparable habitat type.

During the research the presence of about 14% of all the collected species was recorded here (Tab. 1). Most numerous species included *Macrosteles laevis* (the mean share from all three seasons was 25.07%) and *Chlorita paolii* (14.98%), which together constituted 40.05% of all the collected specimens on this plot (Tab. 39). Other species, *Stenocranus major*, *Empoasca pteridis* and *Javesella pellucida* were noticeably abundant.

In this community none of the recorded species reached a high value of fidelity index, and the highest was W=28.00 of *Zygina hyperici* (Tab. 37).

5.1.5. Planthopper communities connected with the xerothermic grasslands of the class *Festuco-Brometea*

Community of the association *Festucetum pallentis*

Study plot 27

A total of 838 specimens/44 species collected: 2006 – 248/28 species, 2007 – 310/29 species, 2008 – 280/38 species (Tab. 28).

Table 27. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 26 (*Dactylis glomerata*).

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Stenocranus major***	0.64	2.27	4	1.21	10.05	27.27	3	16.55	31.61	36.36	3	33.90
2.	***Eurybregma nigrolineata***	0.64	2.27	4	1.21	0.25	2.27	4	0.75	0.38	6.82	4	1.61
3.	***Megadelphax sordidulus***	-	-	-	-	-	-	-	-	0.13	2.27	4	0.54
4.	***Laodelphax striatellus***	-	-	-	-	0.74	6.82	4	2.25	0.88	6.82	4	2.45
5.	***Muellerianella fairmairei***	-	-	-	-	-	-	-	-	0.13	2.27	4	0.54
6.	***Muirodelphax aubei***	0.64	2.27	4	1.21	-	-	-	-	-	-	-	-
7.	***Dicranotropis hamata***	-	-	-	-	0.98	9.09	4	2.98	1.14	6.82	4	2.79
8.	***Xanthodelphax stramineus***	-	-	-	-	-	-	-	-	0.13	2.27	4	0.54
9.	***Javesella pellucida***	-	-	-	-	1.72	13.64	4	4.84	10.75	20.45	4	14.83
10.	***Ribautodelphax albostriatus***	-	-	-	-	1.72	15.91	4	5.23	1.01	9.09	4	3.03
11.	***Ribautodelphax collinus***	-	-	-	-	0.49	4.55	4	1.49	1.52	11.36	4	4.16
12.	***Aphrophora alni***	-	-	-	-	0.49	4.55	4	1.49	-	-	-	-
13.	***Philaenus spumarius***	-	-	-	-	0.74	6.82	4	2.25	0.13	2.27	4	0.54
14.	***Megophthalmus scanicus***	3.85	6.82	4	5.12	0.74	6.82	4	2.25	0.63	6.82	4	2.07
15.	***Anaceratagallia ribauti***	1.92	4.55	4	2.96	0.98	6.82	4	2.59	1.39	18.18	4	5.03
16.	***Idiocerus stigmaticalis***	-	-	-	-	-	-	-	-	0.13	2.27	4	0.54
17.	***Aphrodes bicinctus***	-	-	-	-	0.25	2.27	4	0.75	0.63	6.82	4	2.07
18.	***Emelianoviana mollicula***	3.85	11.36	4	6.61	0.98	6.82	4	2.59	2.28	22.73	4	7.20

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
19.	***Micantulina stigmatipennis***	-	-	-	-	-	-	-	-	0.25	2.27	4	0.75
20.	***Empoasca pteridis***	18.59	36.36	3	26.00	1.47	38.64	3	7.54	0.63	9.09	4	2.39
21.	***Chlorita paolii***	14.10	43.18	3	24.67	19.85	56.82	2	33.58	11.00	52.27	2	23.98
22.	***Eupteryx atropunctata***	-	-	-	-	-	-	-	-	0.76	6.82	4	2.28
23.	***Eupteryx notata***	-	-	-	-	0.25	2.27	4	0.75	0.25	4.55	4	1.07
24.	***Zygina hyperici***	-	-	-	-	0.49	4.55	4	1.49	0.63	4.55	4	1.69
25.	***Balclutha calamagrostis***	1.92	6.82	4	3.62	1.72	9.09	4	3.95	0.88	13.64	4	3.46
26.	***Macrosteles laevis***	39.10	63.64	2	49.88	25.49	68.18	2	41.69	10.62	45.45	3	21.97
27.	***Deltocephalus pulicaris***	-	-	-	-	0.25	2.27	4	0.75	0.13	2.27	4	0.54
28.	***Doratura stylata***	1.28	4.55	4	2.41	1.47	11.36	4	4.09	1.14	9.09	4	3.22
29.	***Graphocraerus ventralis***	3.85	6.82	4	5.12	2.70	13.64	4	6.07	0.76	13.64	4	3.22
30.	***Elymana sulphurella***	0.64	2.27	4	1.21	0.74	6.82	4	2.25	1.14	13.64	4	3.94
31.	***Athysanus argentarius***	-	-	-	-	0.49	4.55	4	1.49	0.13	2.27	4	0.54
32.	***Euscelis incisus***	5.13	20.45	4	10.24	6.62	36.36	3	15.51	5.94	59.09	2	18.73
33.	***Psammotettix alienus***	-	-	-	-	0.25	2.27	4	0.75	0.76	9.09	4	2.63
34.	***Psammotettix confinis***	0.64	2.27	4	1.21	4.90	22.73	4	10.55	2.53	18.18	4	6.78
35.	***Errastunus ocellaris***	1.92	6.82	4	3.62	6.86	27.27	3	13.68	6.45	22.73	4	12.11
36.	***Turrutus socialis***	0.64	2.27	4	1.21	6.13	22.73	4	11.80	0.13	2.27	4	0.54
37.	***Jassargus pseudocellaris***	-	-	-	-	-	-	-	-	0.25	2.27	4	0.75
38.	***Mocuellus collinus***	1.28	4.55	4	2.41	0.25	4.55	4	1.07	2.78	25.00	4	8.34

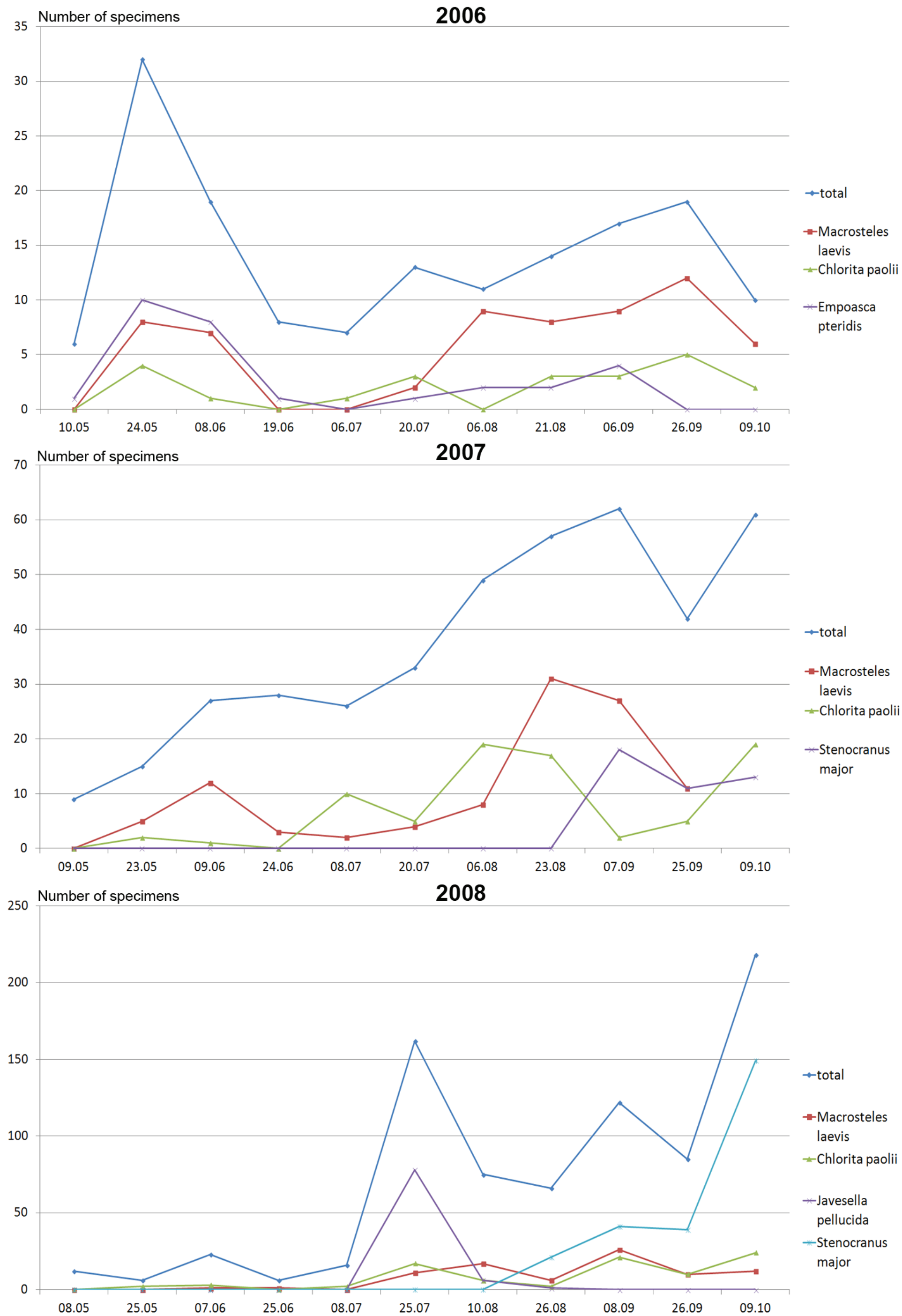

Fig. 27. The dynamics of species abundance among the species dominating in the Plot 26 (*Dactylis glomerata*).

Highest classes of abundance (4 species): *Turrutus socialis* (ED – 2007 and 2008: 30.32% & 33.93%, D – 2006: 27,82%), *Emelianoviana mollicula* (sD – 2006-2008: 14.11%, 11.61% & 11.07%), *Arocephalus languidus* (sD – 2007 and 2008: 10.97% & 7.86%), *Erythria aureola* (sD – 2007: 7.74%) (Tab. 28).

Constancy (C): *Turrutus socialis* (2nd class – 2006-2008: 65.91%, 72.73% & 54.55%). The highest value of Q index: *Turrutus socialis* (2006-2008: 42.82, 46.96 & 43.02) (Tab. 28).

The seasonal dynamics of abundance was mostly shaped by the population of *Turrutus socialis*, which reached two peaks of abundance in each season: a smaller one at the end of May (2007) or in June (2006, 2008) and a higher one in the second half of August (2006, 2007) or at the beginning of September (2008). *Emelianoviana mollicula* was another abundant species, which had one peak of abundance at the beginning of May (2006, 2007) and two small maxima at the beginning of June and in September 2008. *Arocephalus languidus* indicated a small peak of abundance in the second half of August (2007, 2008) while *Erythria aureola* peaked in the second half of May in 2007 (Fig. 28).

Characteristics of the community

The community connected with plant association with *Festucetum pallentis* was studied only on plot 27 (Fig. 1) because there was no other area within the town with a comparable habitat type.

During the research the presence of about 16.5% of all the collected species was recorded here (Tab. 1). Most numerous species comprised *Turrutus socialis* (the mean share from all three seasons was 30.69%) and *Emelianoviana mollicula* (12.26%), which together constituted 42.95% of all the collected specimens on this plot (Tab. 39).

Three species scored significant values of fidelity index: *Erythria aureola* (W=94.55), *Emelianoviana mollicula* (W=59.30) and *Fieberiella septentrionalis* (W=55.88) (Tab. 37).

Community of the association *Sileno-Phleetum*

Study plot 28

A total of 1206 specimens/45 species collected: 2005 – 253/24 species, 2006 – 249/20 species, 2007 – 704/35 species (Tab. 29).

Highest classes of abundance (6 species): *Errastunus ocellaris* (ED – 2005: 34.39%, D – 2006 and 2007: 22.09% & 20.31%), *Mocuellus collinus* (D – 2007: 22.44%, sD – 2005 and 2006: 10.28% & 14.06%), *Eurybregma nigrolineata* (sD – 2005-2007: 17.79%, 11.24%, 10.80%), *Verdanus abdominalis* (sD – 2005-2007: 9.49%, 11.24%, 7.95%), *Turrutus socialis* (sD – 2006 and 2007: 12.05% & 12.07%), *Graphocraerus ventralis* (sD – 2006: 13.65%) (Tab. 29).

Constancy: *Errastunus ocellaris* (1st class – 2007: 79.55%, 2nd class – 2005 and 2006: 65.91% & 59.09%). *Mocuellus collinus* (2nd class – 2007: 72.73%).

The highest value of Q index: *Errastunus ocellaris* (2007: 40.20, 2005: 47.61), *Mocuellus collinus* (2007: 40.40) (Tab. 29).

The following species had a significant contribution to the overall seasonal dynamics of abundance on this plot: *Eurybregma nigrolineata* and *Verdanus abdominalis* in the springtime and *Errastunus ocellaris*, *Turrutus socialis* with *Mocuellus collinus* in late summer. *Eurybregma nigrolineata* reached its maximum in May or at the beginning of June

Table 28. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 27 (*Festucetum pallentis*).

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Anakelisia perspicilata***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
2.	***Stenocranus major***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
3.	***Stenocranus minutus***	2.02	6.82	4	3.71	-	-	-	-	1.07	6.82	4	2.70
4.	***Conomelus anceps***	0	0	0	0	-	-	-	-	0.36	2.27	4	0.90
5.	***Laodelphax striatellus***	0.81	2.27	4	1.36	2.58	11.36	4	5.41	1.43	9.09	4	3.61
6.	***Muirodelphax aubei***	0.40	2.27	4	0.95	1.29	9.09	4	3.42	-	-	-	-
7.	***Acanthodelphax spinosus***	0.40	2.27	4	0.95	0.65	4.55	4	1.72	0.71	4.55	4	1.80
8.	***Dicranotropis hamata***	1.21	6.82	4	2.87	0	0	0	0	0.71	4.55	4	1.80
9.	***Javesella pellucida***	-	-	-	-	0.32	2.27	4	0.85	0.71	4.55	4	1.80
10.	***Ribautodelphax collinus***	-	-	-	-	-	-	-	-	5.00	9.09	4	6.74
11.	***Tettigometra impressopunctata***	-	-	-	-	0.32	2.27	4	0.85	-	-	-	-
12.	***Philaenus spumarius***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
13.	***Utecha lugens***	-	-	-	-	0.65	2.27	4	1.21	0	0	0	0
14.	***Anaceratagallia ribauti***	2.02	9.09	4	4.29	1.94	9.09	4	4.20	1.07	6.82	4	2.70
15.	***Eupelix cuspidata***	2.02	9.09	4	4.29	0.65	4.55	4	1.72	0.36	2.27	4	0.90
16.	***Erythria aureola***	6.85	27.27	3	13.67	7.74	27.27	3	14.53	3.93	13.64	4	7.32
17.	***Emelianoviana mollicula***	14.11	40.09	3	23.78	11.61	36.36	3	20.55	11.07	36.36	3	20.06

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Micantulina stigmatipennis***	-	-	-	-	1.29	6.82	4	2.97	0.36	2.27	4	0.90
19.	***Empoasca pteridis***	4.44	18.18	4	8.98	6.13	29.55	3	13.46	1.79	9.09	4	4.03
20.	***Chlorita paolii***	4.03	11.36	4	6.77	2.26	11.36	4	5.07	0.71	2.27	4	1.27
21.	***Eupteryx calcarata***	-	-	-	-	0.65	4.55	4	1.72	-	-	-	-
22.	***Eupteryx notata***	1.21	4.55	4	2.35	-	-	-	-	0.36	2.27	4	0.90
23.	***Zygina hyperici***	0.81	4.55	4	1.92	0.32	2.27	4	0.85	0.71	4.55	4	1.80
24.	***Fieberiella septentrionalis***	3.23	13.64	4	6.64	0.65	4.55	4	1.72	3.21	13.64	4	6.62
25.	***Neoaliturus fenestratus***	0	0	0	0	1.29	9.09	4	3.42	-	-	-	-
26.	***Neoaliturus guttulatus***	0.81	4.55	4	1.92	0.65	4.55	4	1.72	0.36	2.27	4	0.90
27.	***Balclutha calamagrostis***	4.44	18.18	4	8.98	3.87	15.91	4	7.85	3.57	11.36	4	6.37
28.	***Macrosteles laevis***	4.44	20.45	4	9.53	5.16	25.00	4	11.36	3.57	18.18	4	8.06
29.	***Doratura impudica***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
30.	***Doratura stylata***	3.23	13.64	4	6.64	1.61	11.36	4	4.28	2.50	11.36	4	5.33
31.	***Hardya tenuis***	0.40	2.27	4	0.95	-	-	-	-	0.36	2.27	4	0.90
32.	***Rhopalopyx vitripennis***	0.81	4.55	4	1.92	2.26	13.64	4	5.55	0.71	4.55	4	1.80
33.	***Elymana sulphurella***	1.21	4.55	4	2.35	0.32	2.27	4	0.85	0.71	4.55	4	1.80
34.	***Cicadula quadrinotata***	1.21	4.55	4	2.35	0.65	4.55	4	1.72	0.36	2.27	4	0.90
35.	***Mocydiopsis parvicauda***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90
36.	***Euscelis incisus***	2.42	9.09	4	4.69	-	-	-	-	2.50	13.64	4	5.84

		Year											
	Species	2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Arocephalus languidus***	6.45	27.27	3	13.26	10.97	47.73	3	22.88	7.86	25.00	4	14.02
38.	***Psammotettix alienus***	0.40	2.27	4	0.95	0	0	0	0	0.71	4.55	4	1.80
39.	***Psammotettix confinis***	2.42	11.36	4	5.24	2.58	13.64	4	5.93	6.07	22.73	4	11.75
40.	***Errastunus ocellaris***	-	-	-	-	0.32	2.27	4	0.85	-	-	-	-
41.	***Turrutus socialis***	27.82	65.91	2	42.82	30.32	72.73	2	46.96	33.93	54.55	2	43.02
42.	***Jassargus flori***	-	-	-	-	-	-	-	-	0.71	2.27	4	1.27
43.	***Verdanus abdominalis***	0.40	2.27	4	0.95	0.97	6.82	4	2.57	0.36	2.27	4	0.90
44.	***Mocuellus collinus***	-	-	-	-	-	-	-	-	0.36	2.27	4	0.90

Fig. 28. The dynamics of species abundance among the species dominating in the Plot 27 (*Festucetum pallentis*).

Table 29. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 28 (*Sileno-Phleetum*).

	Species	Year											
		2005				2006				2007			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	0.40	2.27	4	0.95	0.40	2.27	4	0.95	-	-	-	-
2.	***Eurybregma nigrolineata***	17.79	9.09	4	12.72	11.24	27.27	3	17.51	10.80	31.82	3	18.54
3.	***Laodelphax striatellus***	0.40	2.27	4	0.95	-	-	-	-	0.14	2.27	4	0.56
4.	***Acanthodelphax denticauda***	-	-	-	-	-	-	-	-	0.43	2.27	4	0.99
5.	***Dicranotropis hamata***	-	-	-	-	0.40	2.27	4	0.95	-	-	-	-
6.	***Kosswigianella exigua***	-	-	-	-	-	-	-	-	0.28	2.27	4	0.80
7.	***Criomorphus albomarginatus***	-	-	-	-	-	-	-	-	0.57	6.82	4	1.97
8.	***Javesella pellucida***	1.19	6.82	4	2.85	-	-	-	-	0.57	6.82	4	1.97
9.	***Ribautodelphax albostriatus***	-	-	-	-	0.40	2.27	4	0.95	0.57	6.82	4	1.97
10.	***Cercopis sanguinolenta***	-	-	-	-	-	-	-	-	0.14	2.27	4	0.56
11.	***Neophilaenus campestris***	0.40	2.27	4	0.95	-	-	-	-	-	-	-	-
12.	***Neophilaenus lineatus***	-	-	-	-	0.40	2.27	4	0.95	-	-	-	-
13.	***Philaenus spumarius***	0.40	2.27	4	0.95	-	-	-	-	-	-	-	-
14.	***Megophthalmus scanicus***	0.40	2.27	4	0.95	-	-	-	-	-	-	-	-
15.	***Oncopsis flavicollis***	-	-	-	-	-	-	-	-	0.14	2.27	4	0.56
16.	***Eupelix cuspidata***	-	-	-	-	-	-	-	-	0.71	9.09	4	2.54
17.	***Aphrodes bicinctus***	1.19	4.55	4	2.33	-	-	-	-	-	-	-	-

	Species	Year											
		2005				2006				2007			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Erythria aureola***	0.40	2.27	4	0.95	-	-	-	-	-	-	-	-
19.	***Emelianoviana mollicula***	1.19	6.82	4	2.85	-	-	-	-	0.14	2.27	4	0.56
20.	***Empoasca pteridis***	1.98	6.82	4	3.67	1.20	6.82	4	2.86	1.42	9.09	4	3.59
21.	***Chlorita paolii***	2.37	11.36	4	5.19	2.01	9.09	4	4.27	5.82	50.00	3	17.06
22.	***Fagocyba cruenta***	-	-	-	-	-	-	-	-	0.14	2.27	4	0.56
23.	***Eupteryx atropunctata***	-	-	-	-	-	-	-	-	0.14	2.27	4	0.56
24.	***Zygina hyperici***	-	-	-	-	-	-	-	-	0.28	2.27	4	0.80
25.	***Fieberiella septentrionalis***	1.58	6.82	4	3.28	-	-	-	-	-	-	-	-
26.	***Balclutha calamagrostis***	5.93	15.91	4	9.71	1.20	6.82	4	2.86	1.42	11.36	4	4.02
27.	***Macrosteles laevis***	-	-	-	-	0.40	2.27	4	0.95	0.71	11.36	4	2.84
28.	***Doratura stylata***	1.19	4.55	4	2.33	6.43	20.45	4	11.47	4.12	34.09	3	11.85
29.	***Graphocraerus ventralis***	2.77	11.36	4	5.61	13.65	29.55	3	20.08	4.69	31.82	3	12.22
30.	***Rhopalopyx preyssleri***	-	-	-	-	-	-	-	-	0.85	6.82	4	2.41
31.	***Elymana sulphurella***	-	-	-	-	-	-	-	-	0.43	6.82	4	1.71
32.	***Cicadula quadrinotata***	0.40	2.27	4	0.95	0.40	2.27	4	0.95	0.71	6.82	4	2.20
33.	***Athysanus argentarius***	-	-	-	-	-	-	-	-	0.43	4.55	4	1.40
34.	***Euscelis incisus***	0.40	2.27	4	0.95	-	-	-	-	0.28	4.55	4	1.13
35.	***Metalimnus steini***	-	-	-	-	0.40	2.27	4	0.95	0.28	4.55	4	1.13
36.	***Arocephalus languidus***	-	-	-	-	1.20	4.55	4	2.34	-	-	-	-

	Species	Year											
		2005				**2006**				**2007**			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
37.	***Psammotettix alienus***	0.40	2.27	4	0.95	0.40	2.27	4	0.95	0.14	2.27	4	0.56
38.	***Psammotettix cephalotes***	0.40	2.27	4	0.95	-	-	-	-	0.43	4.55	4	1.40
39.	***Psammotettix confinis***	-	-	-	-	0.40	2.27	4	0.95	0.14	2.27	4	0.56
40.	***Adarrus multinotatus***	-	-	-	-	-	-	-	-	0.14	2.27	4	0.56
41.	***Errastunus ocellaris***	34.39	65.91	2	47.61	22.09	59.09	2	36.13	20.31	79.55	1	40.20
42.	***Turrutus socialis***	4.74	13.64	4	8.04	12.05	43.18	3	22.81	12.07	45.45	3	23.42
43.	***Jassargus pseudocellaris***	-	-	-	-	-	-	-	-	0.14	2.27	4	0.56
44.	***Verdanus abdominalis***	9.49	4.55	4	6.57	11.24	22.73	4	15.98	7.95	40.09	3	17.85
45.	***Mocuellus collinus***	10.28	29.55	3	17.43	14.06	43.18	3	24.64	22.44	72.73	2	40.40

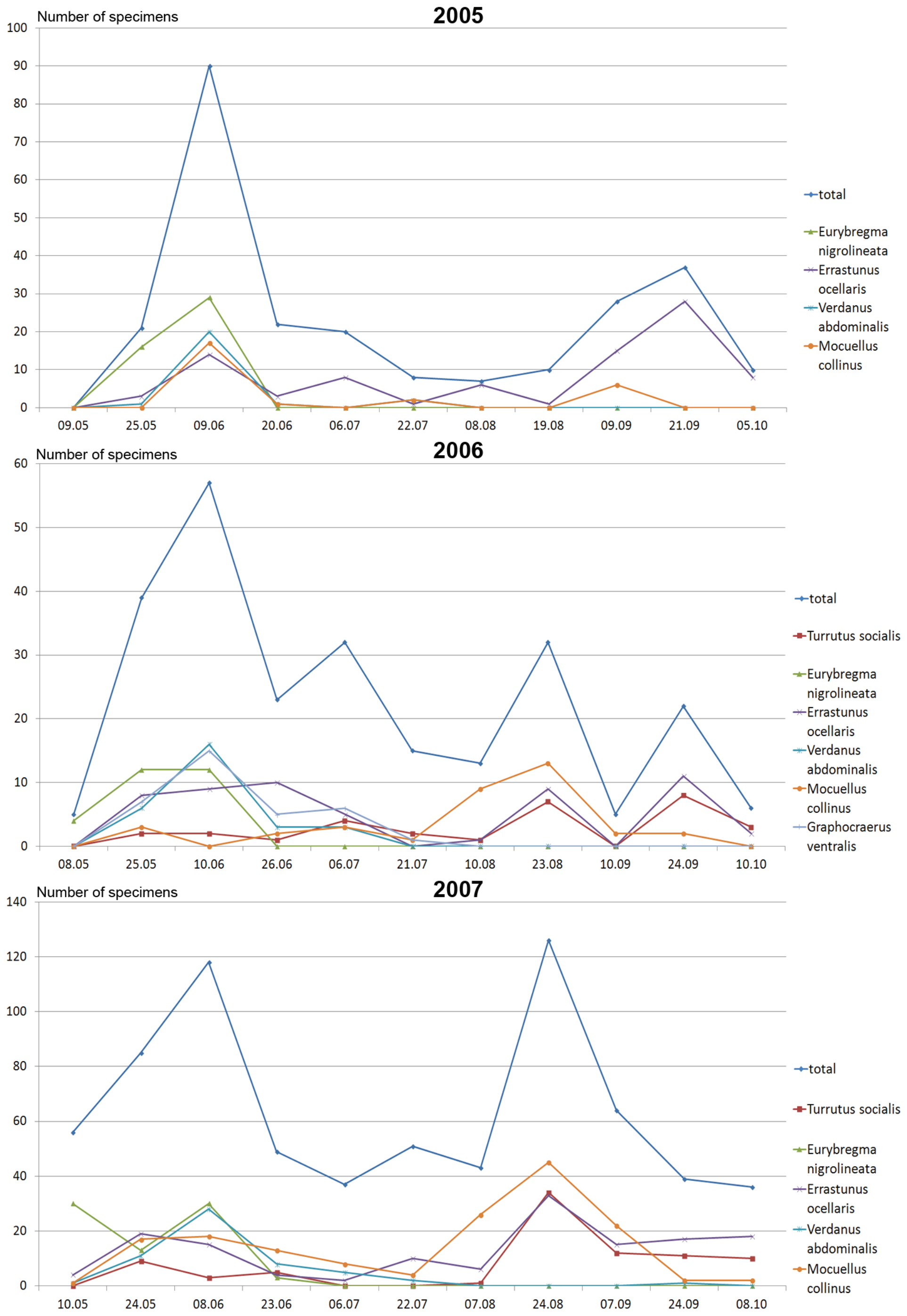

Fig. 29. The dynamics of species abundance among the species dominating in the Plot 28 (*Sileno-Phleetum*).

each year, while *Verdanus officinalis* peaked in the first half of June. *Errastunus ocellaris*, *Turrutus socialis* and *Mocuellus collinus* reached the peak of their abundance in the second half of August in 2006 and 2007, but in 2005 only *Errastunus ocellaris* peaked clearly in the second half of September. *Graphocraerus ventralis* only slightly contributed to the overall dynamics of abundance and only in 2006 reached its maximum at the beginning of June (Fig. 29).

Characteristics of the community

The community connected with plant association *Sileno-Phleetum* was studied only on plot 28 (Fig. 1) because there was no other area within the town with a comparable habitat type and having a comparable surface.

During the research the presence of about 17% of all the collected species was recorded here (Tab. 1). Most numerous species included eudominant *Errastunus ocellaris* (the mean share from all three seasons was 25.60%) and dominant *Mocuellus collinus* (15.59%), which together constituted 41.19% of all the collected specimens on this plot (Tab. 39). Other abundant species were only of minor importance for this community (Tab. 28).

The only species which reached a high value of fidelity index was *Eurybregma nigrolineata* (W=73.40) (Tab. 37).

Community of the association *Adonido-Brachypodietum pinnati*

Study plot 29

A total of 610 specimens/26 species collected: 2005 – 227/22 species, 2006 – 191/17 species, 2007 – 192/14 species (Tab. 30).

Highest classes of abundance (4 species): *Adarrus multinotatus* (SD – 2006 and 2007: 48.17% & 43.75%, ED – 2005: 37.00%), *Mocuellus collinus* (D – 2005: 21.59%, sD – 2006 and 2007: 13.09% & 14.06%), *Turrutus socialis* (sD – 2006 and 2007: 10.47% & 9.38%), *Balclutha calamagrostis* (sD – 2007: 10.42%) (Tab. 30).

Constancy: *Adarrus multinotatus* (2^{nd} class – 2005-2007: 54.55%, 68.18% & 52.27%), *Mocuellus collinus* (2^{nd} class – 2005: 52.27%). The highest value of Q index: *Adarrus multinotatus* (2005-2007: 44.82, 57.31 & 47.82) (Tab. 30).

Adarrus multinotatus and *Mocuellus collinus* were the species with the most significant influence on the seasonal dynamics of abundance on this plot. The former reached two peaks of abundance in all three seasons. The first peak was variable in time: at the beginning of July (2006), in the second half May (2007) or in the middle of June (2005). The second peak was in the second half of September in all seasons. *Mocuellus collinus* during 2005 and 2007 reached the maximum abundance in the second half of June in 2005 and 2007, but in 2006 it was not very numerous and peaked only slightly at the beginning of June. Other species, such as *Balclutha calamagrostis* and *Turrutus socialis* contributed slightly to the overall dynamics only at the turn of summer and autumn 2007 (Fig. 30).

Characteristics of the community

The community connected with plant association *Adonido-Brachypodietum pinnati* was studied only on plot 29 (Fig. 1) because there was no other area within the town with a comparable habitat type.

Table 30. List of domination (D) [%], constancy (C) [%] and Q index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 29 (*Adonido-Brachypodietum pinnati*).

	Species	Year											
		2005				2006				2007			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Anakelisia perspicillata***	-	-	-	-	0.52	2.27	4	1.09	-	-	-	-
2.	***Stenocranus minutus***	1.76	6.82	4	3.46	3.14	9.09	4	5.34	1.56	4.55	4	2.66
3.	***Criomorphus albomarginatus***	0.88	4.55	4	2.00	-	-	-	-	-	-	-	-
4.	***Javesella pellucida***	-	-	-	-	-	-	-	-	2.08	4.55	4	3.08
5.	***Ribautodelphax collinus***	5.29	11.36	4	7.75	6.28	18.18	4	10.69	6.77	15.91	4	10.38
6.	***Cercopis sanguinolenta***	0.44	2.27	4	1.00	0.52	2.27	4	1.09	-	-	-	-
7.	***Aphrophora alni***	2.64	9.09	4	4.90	-	-	-	-	-	-	-	-
8.	***Eupelix cuspidata***	0.88	2.27	4	1.41	0.52	2.27	4	1.09	-	-	-	-
9.	***Emelianoviana mollicula***	5.29	11.36	4	7.75	1.57	4.55	4	2.67	0.52	2.27	4	1.09
10.	***Empoasca pteridis***	0.44	2.27	4	1.00	0.52	2.27	4	1.09	2.08	6.82	4	3.77
11.	***Empoasca vitis***	0.44	2.27	4	1.00	-	-	-	-	-	-	-	-
12.	***Chlorita paolii***	1.32	4.55	4	2.45	0.52	2.27	4	1.09	-	-	-	-
13.	***Eupteryx atropunctata***	0.44	2.27	4	1.00	-	-	-	-	-	-	-	-
14.	***Zygina angusta***	0.44	2.27	4	1.00	-	-	-	-	0.52	2.27	4	1.09
15.	***Fieberiella septentrionalis***	0.44	2.27	4	1.00	0.52	2.27	4	1.09	-	-	-	-
16.	***Balclutha calamagrostis***	6.61	15.91	4	10.26	5.76	18.18	4	10.23	10.42	22.73	4	15.39
17.	***Hardya tenuis***	-	-	-	-	-	-	-	-	2.08	4.55	4	3.08

	Species	Year											
		2005				2006				2007			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Rhopalopyx preyssleri***	0.44	2.27	4	1.00	1.05	4.55	4	2.19	-	-	-	-
19.	***Elymana sulphurella***	0.44	2.27	4	1.00	0.52	2.27	4	1.09	4.17	9.09	4	6.16
20.	***Athysanus argentarius***	0.44	2.27	4	1.00	0.52	2.27	4	1.09	-	-	-	-
21.	***Arocephalus longiceps***	-	-	-	-	-	-	-	-	2.08	6.82	4	3.77
22.	***Adarrus multinotatus***	37.00	54.55	2	44.93	48.17	68.18	2	57.31	43.75	52.27	2	47.82
23.	***Turrutus socialis***	5.29	13.64	4	8.49	10.47	38.64	3	20.11	9.38	27.27	3	15.99
24.	***Jassargus pseudocellaris***	0.44	2.27	4	1.00	-	-	-	-	-	-	-	-
25.	***Verdanus abdominalis***	7.05	15.91	4	10.59	6.81	18.18	4	11.13	-	-	-	-
26.	***Mocuellus collinus***	21.59	52.27	2	33.59	13.09	40.09	3	22.91	14.06	27.27	3	19.58

Fig. 30. The dynamics of species abundance among the species dominating in the Plot 29 (*Adonido-Brachypodietum pinnati*).

During the research the presence of about 10% of all the collected species was recorded here (Tab. 1). Most numerous species included superdominant *Adarrus multinotatus* (the mean share from all three seasons was 42.97%) and dominant *Mocuellus collinus* (16.25%), which together constituted 59.22% of all the collected specimens on this plot (Tab. 39).

The superdominant species – *Adarrus multinotatus* – also reached the highest value of fidelity index (W=87.54) (Tab. 37).

5.1.6. Planthopper communities connected with the forest associations of the class *Querco-Fagetea*

Community of the association *Alno-Ulmion*

Study plot 30

A total of 637 specimens/58 species collected: 2006 – 154/31 species, 2007 – 290/44 species, 2008 – 193/38 species (Tab. 31).

Highest classes of abundance (4 species): *Balclutha punctata* (D – 2006: 21.43%, sD – 2007 and 2008: 7.59% & 16.58%), *Muellerianella brevipennis* (sD – 2006-2008: 13.64%, 11.72% & 15.54%), *Elymana surphurella* (sD – 2006 and 2007: 9.74% & 10.00%), *Forcipata forcipata* (sD – 2007: 15.52%) (Tab. 31).

There was no species of the first or second classes of constancy. The highest value of Q index: *Balclutha punctata* (2006: 31.21, 2008: 26.76 – 2008), *Forcipata forcipata* (2007: 24.94) (Tab. 31).

The seasonal dynamics of abundance was shaped here predominately by the population of *Balclutha punctata*, with its peak of abundance in the first half of August in all seasons. The species *Muellerianella brevipennis* reached its maximum in the second half of June (2006), first half of July (2008), in September (2007 and 2008) or at the beginning of October (2006). *Elymana surphurella* reached a single peak of abundance in the second half of July in 2006 and 2007, while *Forcipata forcipata* was very abundant in the second half of August 2007 (Fig. 31).

Remarks: on this plot the highest share of mesoheliophilous species (84.48%) and the lowest share of heliofilous species (12.07%) were recorded (Tab. 43c). Only on this plot *Tachycixius pilosus* and *Mocydiopsis attenuata* were collected (Tab. 1).

Characteristics of the community

The community connected with plant association *Alno-Ulmion* was studied only on plot 30 (Fig. 1) because there was no other area within the town with a comparable habitat type.

During the research the presence of 58 species, which is about 22% of all the collected species were recorded here (Tab. 1). Most numerous species included *Balclutha punctata* (the mean share from all three seasons was 15.20%) and *Muellerianella brevipennis* (13.63%), which together constituted 28.83% of all the collected specimens on this plot (Tab. 39).

Three species reached high values of fidelity index: *Mocydiopsis attenuata* (W=100), *Tachycixius pilosus* (W=100) and *Recilia coronifera* (W=56.25) (Tab. 37).

Table 31. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 30 (*Alno-Ulmion*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Cixius nervosus***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
2.	***Tachycixius pilosus***	-	-	-	-	0.69	4.55	4	1.77	-	-	-	-
3.	***Kelisia punctulum***	-	-	-	-	-	-	-	-	1.04	4.55	4	2.18
4.	***Stenocranus major***	0.65	2.27	4	1.21	-	-	-	-	0.52	2.27	4	1.09
5.	***Stenocranus minutus***	-	-	-	-	2.76	15.91	4	6.63	3.11	11.36	4	5.94
6.	***Conomelus anceps***	4.55	13.64	4	7.88	3.10	13.64	4	6.50	3.63	9.09	4	5.74
7.	***Stiroma affinis***	0.65	2.27	4	1.21	0.34	2.27	4	0.88	2.07	4.55	4	3.07
8.	***Laodelphax striatellus***	1.30	4.55	4	2.43	2.41	11.36	4	5.23	-	-	-	-
9.	***Hyledelphax elegantulus***	-	-	-	-	0.69	4.55	4	1.77	-	-	-	-
10.	***Mirabella albifrons***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
11.	***Muellerianella brevipennis***	13.64	34.09	3	21.56	11.72	36.36	3	20.64	15.54	25.00	4	19.71
12.	***Muellerianella fairmairei***	-	-	-	-	-	-	-	-	1.04	4.55	4	2.18
13.	***Acanthodelphax spinosus***	-	-	-	-	-	-	-	-	1.04	4.55	4	2.18
14.	***Dicranotropis hamata***	1.30	4.55	4	2.43	2.07	13.64	4	5.31	3.63	11.36	4	6.42
15.	***Xanthodelphax flaveolus***	0.65	2.27	4	1.21	0.69	4.55	4	1.77	1.55	6.82	4	3.25
16.	***Criomorphus albomarginatus***	0.65	2.27	4	1.21	-	-	-	-	0.52	2.27	4	1.09
17.	***Javesella pellucida***	1.95	4.55	4	2.98	1.72	6.82	4	3.42	1.04	2.27	4	1.54
18.	***Neophilaenus lineatus***	-	-	-	-	-	-	-	-	0.52	2.27	4	1.09

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
19.	***Aphrophora alni***	2.60	6.82	4	4.21	-	-	-	-	0.52	2.27	4	1.09
20.	***Philaenus spumarius***	2.60	6.82	4	4.21	1.03	6.82	4	2.65	3.63	15.91	4	7.60
21.	***Agallia brachyptera***	0.65	2.27	4	1.21	0.34	2.27	4	0.88	0.52	2.27	4	1.09
22.	***Agallia consobrina***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
23.	***Anaceratagallia ribauti***	-	-	-	-	0.69	4.55	4	1.77	-	-	-	-
24.	***Idiocerus stigmaticalis***	0.65	2.27	4	1.21	0.34	2.27	4	0.88	-	-	-	-
25.	***Aphrodes bicinctus***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
26.	***Aphrodes makarovi***	1.30	4.55	4	2.43	-	-	-	-	4.15	11.36	4	6.87
27.	***Cicadella viridis***	0.65	2.27	4	1.21	7.24	34.09	3	15.71	4.15	6.82	4	5.32
28.	***Dikraneura variata***	0.65	2.27	4	1.21	1.03	6.82	4	2.65	1.04	4.55	4	2.18
29.	***Forcipata citrinella***	-	-	-	-	0.34	2.27	4	0.88	2.59	9.09	4	4.85
30.	***Forcipata forcipata***	6.49	15.91	4	10.16	15.52	40.09	3	24.94	2.59	9.09	4	4.85
31.	***Kybos smaragdulus***	-	-	-	-	0.34	4.55	4	1.24	-	-	-	-
32.	***Empoasca pteridis***	5.84	15.91	4	9.64	5.52	20.45	4	10.62	3.63	6.82	4	4.98
33.	***Empoasca vitis***	3.25	9.09	4	5.44	0.69	4.55	4	1.77	1.55	6.82	4	3.25
34.	***Fagocyba cruenta***	0.65	2.27	4	1.21	-	-	-	-	0.52	2.27	4	1.09
35.	***Linnavuoriana sexmaculata***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
36.	***Eupteryx atropunctata***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
37.	***Eupteryx aurata***	-	-	-	-	-	-	-	-	0.52	2.27	4	1.09
38.	***Zygina flammigera***	-	-	-	-	-	-	-	-	1.55	6.82	4	3.25

	Species	2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
39.	***Arboridia velata***	-	-	-	-	-	-	-	-	0.52	2.27	4	1.09
40.	***Balclutha calamagrostis***	0.65	2.27	4	1.21	-	-	-	-	3.63	9.09	4	5.74
41.	***Balclutha punctata***	21.43	45.45	3	31.21	7.59	27.27	3	14.39	16.58	43.18	3	26.76
42.	***Macrosteles laevis***	3.25	9.09	4	5.44	2.07	11.36	4	4.85	1.04	4.55	4	2.18
43.	***Macrosteles ossiannilssoni***	0.65	2.27	4	1.21	0.34	2.27	4	0.88	-	-	-	-
44.	***Deltocephalus pulicaris***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
45.	***Recilia coronifera***	0.65	2.27	4	1.21	2.07	11.36	4	4.85	1.04	2.27	4	1.54
46.	***Allygidius commutatus***	-	-	-	-	1.03	6.82	4	2.65	0.52	2.27	4	1.09
47.	***Elymana sulphurella***	9.74	29.55	3	16.97	10.00	38.64	3	19.66	6.22	15.91	4	9.95
48.	***Cicadula persimilis***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
49.	***Cicadula quadrinotata***	5.19	13.64	4	8.41	5.52	25.00	4	11.75	2.07	6.82	4	3.76
50.	***Mocydiopsis attenuata***	-	-	-	-	1.72	11.36	4	4.42	1.04	4.55	4	2.18
51.	***Speudotettix subfusculus***	0.65	2.27	4	1.21	1.03	6.82	4	2.65	1.55	4.55	4	2.66
52.	***Thamnotettix confinis***	-	-	-	-	-	-	-	-	0.52	4.55	4	1.54
53.	***Doliotettix lunulatus***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
54.	***Psammotettix confinis***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
55.	***Errastunus ocellaris***	1.30	4.55	4	2.43	0.69	4.55	4	1.77	-	-	-	-
56.	***Jassargus pseudocellaris***	-	-	-	-	0.34	2.27	4	0.88	-	-	-	-
57.	***Arthaldeus pascuellus***	5.19	15.91	4	9.09	4.48	27.27	3	11.05	3.11	11.36	4	5.94
58.	***Erzaleus metrius***	0.65	2.27	4	1.21	0.34	2.27	4	0.88	-	-	-	-

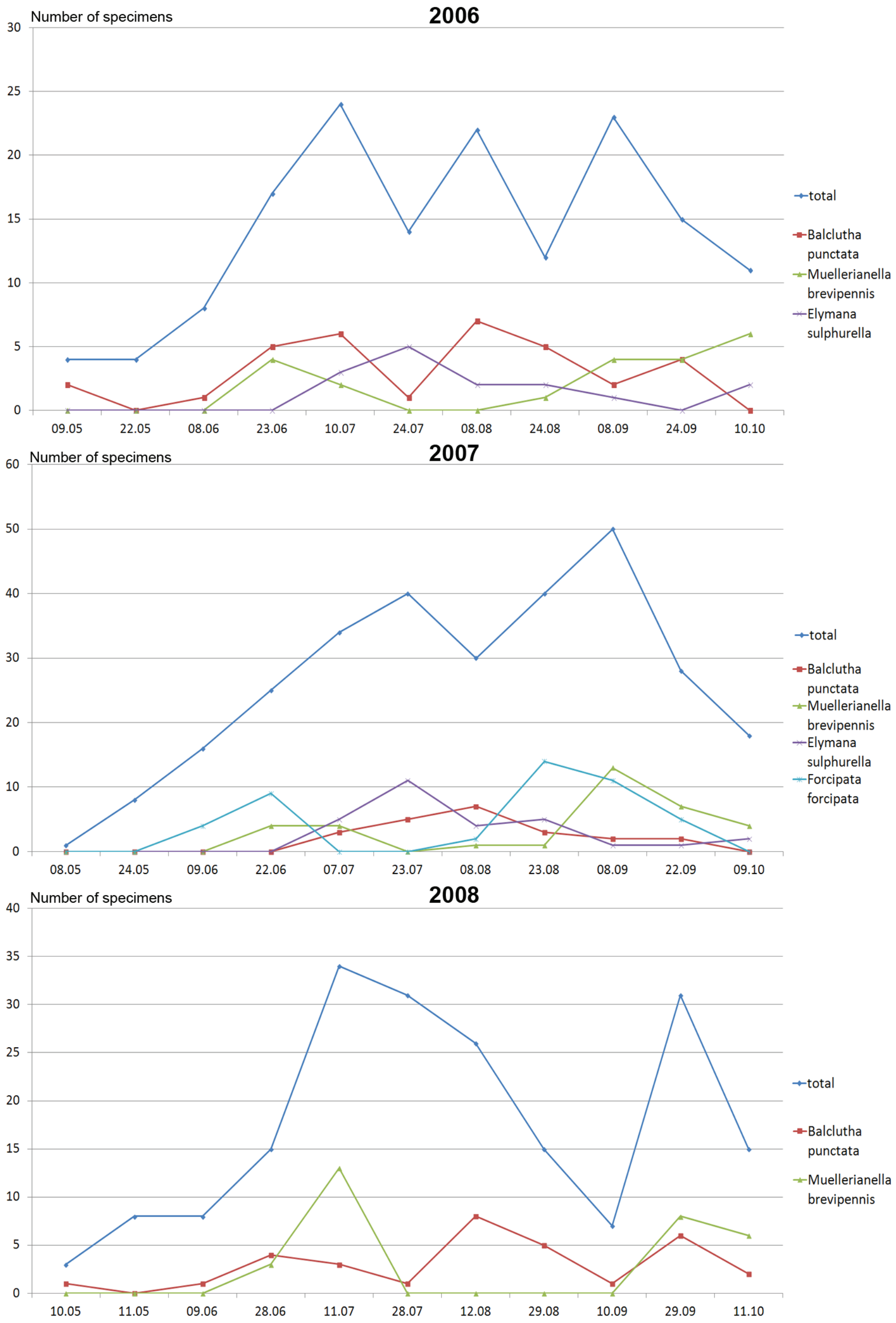

Fig. 31. The dynamics of species abundance among the species dominating in the Plot 30 (*Alno-Ulmion*).

Community of the association *Tilio cordatae-Carpinetum betuli*

Study plot 31

A total of 380 specimens/45 species collected: 2006 – 111/26 species, 2007 – 115/30 species, 2008 – 154/34 species (Tab. 32).

Highest classes of abundance (6 species): *Balclutha punctata* (sD – 2006 and 2008: 14.41% & 10.39%), *Muellerianella brevipennis* (sD – 2007 and 2008: 12.17% & 7.79%), *Javesella pellucida* (sD – 2006 and 2008: 9.91% & 9.09%), *Empoasca pteridis* (sD – 2007: 13.04%), *Empoasca vitis* (sD – 2007: 9.57%), *Forcipata forcipata* (sD – 2006: 9.91%) (Tab. 32).

There was no species of the first or second classes of constancy. The highest value of Q index: *Balclutha punctata* (2006: 20.64, 2008: 18.82 – 2008), *Empoasca pteridis* (2007: 16.33) (Tab. 32).

The seasonal dynamics of abundance on this plot was shaped by several species. *Balclutha punctata* was most abundant in the second half of September in 2006, in the second half of May in 2008 while in 2007 it was not numerous, reaching only the class of an accessory species. *Javesella pellucida* was most numerous at the turn of July and August in 2006 and 2008. *Empoasca pteridis* peaked in abundance in the middle of August 2007, *Forcipata forcipata* peaked in the second half of August 2006 and *Muellerianella brevipennis* peaked twice in early July 2008 and in September 2007 (Fig. 32).

Remarks: on this plot the highest share of skiophilous species (8.89%) was recorded (Tab. 43d). Only from here *Kybos calyculus*, *K. populi* and *Eupteryx urticae* were recorded (Tab. 1).

Study plot 32

A total of 216 specimens/36 species collected: 2005 – 83/17 species, 2006 – 45/19 species, 2007 – 88/24 species (Tab. 33).

Highest classes of abundance (4 species): *Empoasca pteridis* (D – 2005 and 2008: 26.51% & 23.86%, sD – 2006: 13.33%), *Balclutha punctata* (D – 2005: 22.89%, sD – 2006 and 2007: 17.78% & 13.64), *Eupteryx calcarata* (sD – 2006: 17.78%), *Empoasca decipiens* (sD – 2007: 11.36%) (Tab. 33).

There was no species of the first or second classes of constancy. The highest value of Q index: *Empoasca pteridis* (2007: 26.55, 2008: 27.99), *Balclutha punctata* (2005: 27.93) (Tab. 33).

Because of a low number of the collected specimens, it was difficult to describe the seasonal dynamics of abundance of the community on this plot. Although some species were dominant, their abundance was not high enough to describe any particular peaks. The only recurrent feature was a higher abundance of *Empoasca pteridis* in August of all three seasons (Fig. 33).

Remarks: on this plot the highest share of mesohigrophilous species (88.88%) was recorded (Tab. 43d). Only on this plot *Ledra aurita*, *Populicerus populi*, *Edwardsiana ampliata* and *Zonocyba bifasciata* were collected (Tab. 1).

Study plot 33

A total of 163 specimens/41 species collected: 2005 – 51/20 species, 2006 – 47/17 species, 2007 – 65/25 species (Tab. 34).

Table 32. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 31 (*Tilio cordatae-Carpinetum betuli*).

	Species	Year											
		2006				2007				2008			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Cixius nervosus***	-	-	-	-	-	-	-	-	1.95	6.82	4	3.65
2.	***Stenocranus minutus***	-	-	-	-	-	-	-	-	1.30	4.55	4	2.43
3.	***Laodelphax striatellus***	2.70	4.55	4	3.50	2.61	6.82	4	4.22	0.65	2.27	4	1.21
4.	***Hyledelphax elegantulus***	-	-	-	-	-	-	-	-	0.65	2.27	4	1.21
5.	***Muellerianella brevipennis***	7.21	11.36	4	9.05	12.17	9.09	4	10.52	7.79	18.18	4	11.90
6.	***Muellerianella fairmairei***	3.60	6.82	4	4.95	-	-	-	-	2.60	6.82	4	4.21
7.	***Acanthodelphax spinosus***	-	-	-	-	-	-	-	-	1.95	2.27	4	2.10
8.	***Dicranotropis hamata***	0.90	2.27	4	1.43	1.74	2.27	4	1.99	3.90	11.36	4	6.66
9.	***Javesella dubia***	3.60	6.82	4	4.95	6.09	6.82	4	6.44	5.84	15.91	4	9.64
10.	***Javesella pellucida***	9.91	15.91	4	12.56	0.87	2.27	4	1.41	9.09	15.91	4	12.03
11.	***Ribautodelphax albostriatus***	-	-	-	-	-	-	-	-	1.30	6.82	4	2.98
12.	***Ribautodelphax collinus***	-	-	-	-	-	-	-	-	5.19	9.09	4	6.87
13.	***Aphrophora alni***	0.90	2.27	4	1.43	0.87	2.27	4	1.41	1.30	4.55	4	2.43
14.	***Oncopsis flavicollis***	1.80	4.55	4	2.86	4.35	6.82	4	5.45	-	-	-	-
15.	***Agallia consobrina***	1.80	4.55	4	2.86	3.48	9.09	4	5.62	3.25	6.82	4	4.71
16.	***Aphrodes makarovi***	4.50	9.09	4	6.40	4.35	11.36	4	7.03	1.30	4.55	4	2.43
17.	***Forcipata forcipata***	9.91	20.45	4	14.24	1.74	4.55	4	2.81	5.84	15.91	4	9.64

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Kybos calyculus***	-	-	-	-	-	-	-	-	0.65	2.27	4	1.21
19.	***Kybos populi***	-	-	-	-	1.74	4.55	4	2.81	-	-	-	-
20.	***Kybos smaragdulus***	-	-	-	-	-	-	-	-	0.65	2.27	4	1.21
21.	***Empoasca decipiens***	-	-	-	-	6.09	9.09	4	7.44	3.95	13.64	4	7.34
22.	***Empoasca pteridis***	1.80	4.55	4	2.86	13.04	20.45	4	16.33	4.55	13.64	4	7.88
23.	***Empoasca vitis***	5.41	11.36	4	7.84	9.57	22.73	4	14.75	0.65	2.27	4	1.21
24.	***Eupteryx aurata***	3.61	11.36	4	6.40	0.87	2.27	4	1.41	1.95	6.82	4	3.65
25.	***Eupteryx calcarata***	-	-	-	-	6.96	13.64	4	9.74	3.25	6.82	4	4.71
26.	***Eupteryx florida***	3.60	6.82	4	4.95	3.48	4.55	4	3.98	-	-	-	-
27.	***Eupteryx urticae***	2.70	6.82	4	4.29	-	-	-	-	2.60	4.55	4	3.44
28.	***Eupteryx vittata***	6.31	13.64	4	9.28	0.87	2.27	4	1.41	3.90	9.09	4	5.95
29.	***Alnetoidia alneti***	0.90	2.27	4	1.43	-	-	-	-	1.95	6.82	4	3.65
30.	***Zygina flammigera***	-	-	-	-	0.87	2.27	4	1.41	-	-	-	-
31.	***Fieberiella septentrionalis***	-	-	-	-	0.87	2.27	4	1.41	1.95	6.82	4	3.65
32.	***Balclutha punctata***	14.41	29.55	3	20.64	2.61	6.82	4	4.22	10.39	34.09	3	18.82
33.	***Macrosteles laevis***	5.41	11.36	4	7.84	6.96	15.91	4	10.52	1.95	4.55	4	2.98
34.	***Macrosteles variatus***	0.90	2.27	4	1.43	0.87	2.27	4	1.41	-	-	-	-
35.	***Deltocephalus pulicaris***	-	-	-	-	-	-	-	-	0.65	2.27	4	1.21
36.	***Recilia coronifera***	-	-	-	-	-	-	-	-	0.65	2.27	4	1.21

	Species	Year											
		2006				2007				2008			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
37.	***Allygus mixtus***	-	-	-	-	0.87	2.27	4	1.41	-	-	-	-
38.	***Elymana sulphurella***	1.80	2.27	4	2.02	0.87	2.27	4	1.41	1.95	6.82	4	3.65
39.	***Speudotettix subfusculus***	0.90	2.27	4	1.43	-	-	-	-	2.60	6.82	4	4.21
40.	***Euscelis incisus***	-	-	-	-	0.87	2.27	4	1.41	0	0	0	0
41.	***Streptanus sordidus***	0.90	2.27	4	1.43	0.87	2.27	4	1.41	0.65	2.27	4	1.21
42.	***Psammotettix alienus***	0.90	2.27	4	1.43	1.74	4.55	4	2.81	-	-	-	-
43.	***Errastunus ocellaris***	-	-	-	-	0.87	2.27	4	1.41	-	-	-	-
44.	***Arthaldeus pascuellus***	-	-	-	-	-	-	-	-	0.65	2.27	4	1.21
45.	***Erzaleus metrius***	0.90	2.27	4	1.43	0.87	2.27	4	1.41	-	-	-	-

Fig. 32. The dynamics of species abundance among the species dominating in the Plot 31 (*Tilio cordatae-Carpinetum betuli*).

Table 33. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 32 (*Tilio cordatae-Carpinetum betuli*).

	Species	Year											
		2005				2006				2007			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	7.23	6.82	4	7.02	-	-	-	-	4.55	6.82	4	5.57
2.	***Megamelus notula***	-	-	-	-	-	-	-	-	1.14	2.27	4	1.61
3.	***Hyledelphax elegantulus***	-	-	-	-	-	-	-	-	2.27	4.55	4	3.21
4.	***Muellerianella brevipennis***	6.02	9.09	4	7.40	-	-	-	-	6.82	11.36	4	8.80
5.	***Aphrophora alni***	4.82	6.82	4	5.73	2.22	2.27	4	2.24	3.41	4.55	4	3.94
6.	***Philaenus spumarius***	1.20	2.27	4	1.65	-	-	-	-	1.14	2.27	4	1.61
7.	***Centrotus cornutus***	4.82	6.82	4	5.73	-	-	-	-	2.27	4.55	4	3.21
8.	***Ledra aurita***	-	-	-	-	-	-	-	-	1.14	2.27	4	1.61
9.	***Oncopsis flavicollis***	2.41	4.55	4	3.31	4.44	4.55	4	4.49	-	-	-	-
10.	***Agallia consobrina***	1.20	2.27	4	1.65	2.22	2.27	4	2.24	2.27	4.55	4	3.21
11.	***Populicerus populi***	1.20	2.27	4	1.65	4.44	4.55	4	4.49	-	-	-	-
12.	***Aphrodes makarovi***	-	-	-	-	2.22	2.27	4	2.24	-	-	-	-
13.	***Alebra albostriella***	-	-	-	-	2.22	2.27	4	2.24	1.14	2.27	4	1.61
14.	***Forcipata forcipata***	4.82	9.09	4	6.62	2.22	2.27	4	2.24	3.41	4.55	4	3.94
15.	***Empoasca decipiens***	-	-	-	-	2.22	2.27	4	2.24	11.36	11.36	4	11.36
16.	***Empoasca pteridis***	26.51	29.55	3	27.99	13.33	9.09	4	11.01	23.86	29.55	3	26.55
17.	***Empoasca vitis***	-	-	-	-	4.44	4.55	4	4.49	-	-	-	-

	Species	Year											
		2005				2006				2007			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
18.	***Fagocyba cruenta***	3.61	4.55	4	4.05	-	-	-	-	5.68	6.82	4	6.22
19.	***Edwardsiana ampliata***	-	-	-	-	2.22	2.27	4	2.24	1.14	2.27	4	1.61
20.	***Zonocyba bifasciata***	-	-	-	-	-	-	-	-	1.14	2.27	4	1.61
21.	***Eurhadina concinna***	-	-	-	-	-	-	-	-	2.27	2.27	4	2.27
22.	***Eupteryx adspersa***	-	-	-	-	-	-	-	-	1.14	2.27	4	1.61
23.	***Eupteryx calcarata***	-	-	-	-	17.78	15.91	4	16.82	-	-	-	-
24.	***Eupteryx florida***	7.23	11.36	4	9.06	6.67	6.82	4	6.74	4.55	9.09	4	6.43
25.	***Zygina flammigera***	-	-	-	-	2.22	2.27	4	2.24	-	-	-	-
26.	***Arboridia velata***	-	-	-	-	2.22	2.27	4	2.24	-	-	-	-
27.	***Balclutha calamagrostis***	1.20	2.27	4	1.65	-	-	-	-	1.14	2.27	4	1.61
28.	***Balclutha punctata***	22.89	34.09	3	27.93	17.78	15.91	4	16.82	13.64	27.27	3	19.29
29.	***Recilia coronifera***	-	-	-	-	-	-	-	-	1.14	2.27	4	1.61
30.	***Allygus mixtus***	-	-	-	-	-	-	-	-	1.14	2.27	4	1.61
31.	***Allygidius commutatus***	1.20	2.27	4	1.65	2.22	2.27	4	2.24	-	-	-	-
32.	***Elymana sulphurella***	1.20	2.27	4	1.65	4.44	4.55	4	4.49	-	-	-	-
33.	***Speudotettix subfusculus***	1.20	2.27	4	1.65	2.22	2.27	4	2.24	-	-	-	-
34.	***Euscelis incisus***	-	-	-	-	-	-	-	-	1.14	2.27	4	1.61
35.	***Psammotettix alienus***	-	-	-	-	2.22	2.27	4	2.24	-	-	-	-
36.	***Jassargus flori***	-	-	-	-	-	-	-	-	1.14	2.27	4	1.61

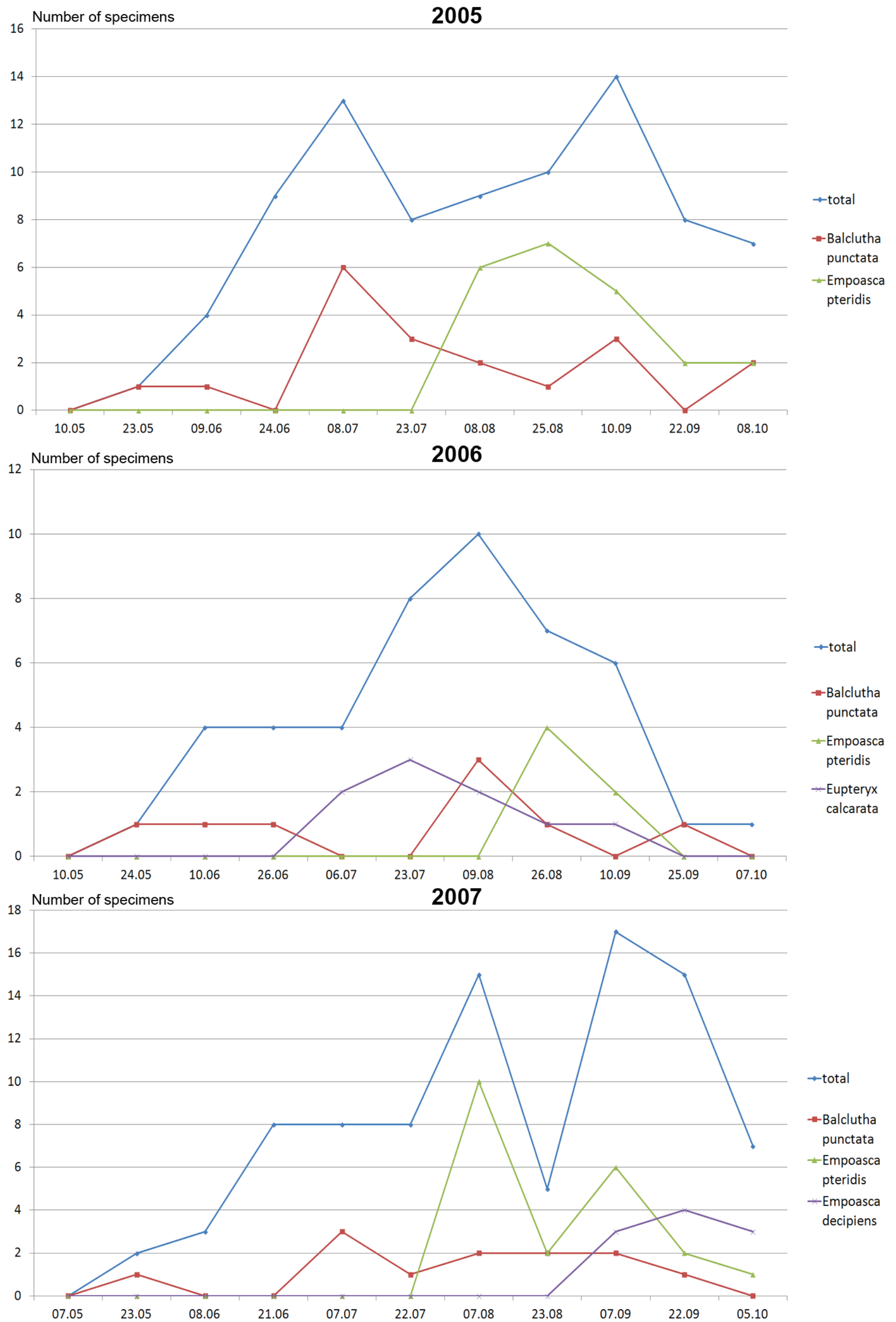

Fig. 33. The dynamics of species abundance among the species dominating in the Plot 32 (*Tilio cordatae-Carpinetum betuli*).

Highest classes of abundance (4 species): *Adarrus multinotatus* (D – 2005-2007: 21.57%, 23.40% & 21.54%), *Empoasca pteridis* (D – 2007: 23.08%, sD – 2005 and 2006: 15.69% & 14.89%), *Centrotus cornutus* (sD – 2005 and 2006: 11.76% & 8.51%), *Alebra albostriella* (sD – 2007: 10.77%) (Tab. 34).

There was no species of the first or second classes of constancy. The highest value of Q index: *Empoasca pteridis* (2007: 25.09), *Adarrus multinotatus* (2005: 23.22, 2007: 20.99) (Tab. 34).

Because of a low number of the collected specimens, it was difficult to describe the seasonal dynamics of abundance of the community on this plot (Fig. 34). Only *Adarrus multinotatus* reached noticeable peaks of abundance in the second half of July together with *Empoasca pteridis*, which peaked at the turn of summer and autumn each season. The presence of *Centrotus cornutus* was noticeable in June and July (especially: 2005 and 2006) (Fig. 34).

Remarks: on this plot the highest shares of poliphagous (36.59%), oligotopic (53.66%) species and those overwintering in the stage of egg (73.17%) were recorded (Tab. 43d). Only on this plot *Populicerus confusus* and *Iassus lanio* were collected (Tab. 1).

Characteristics of the community

The community was studied on three plots: 31, 32 and 33 (Fig. 1). During the research a total of 759 specimens (Tabs 32, 33 and 34) from 76 species were collected, which is about 28.5% of all the collected species (Tab. 1).

Empoasca pteridis and *Balclutha punctata*, with the mean shares of 15.19 % and 9.90% of all the collected specimens respectively, were most numerous, reaching the class of dominant species. Their mean share in the community constituted 25.09% of all the collected specimens (Tab. 39). Other species were either not very abundant or collected irregularly e.g. *Adarrus multinotatus* (Tabs 32, 33 and 34).

Populicerus confusus and *Zonocyba bifasciata* reached the highest value of fidelity index W=100, while lower values were reached by *Agallia consobrina* (W=55.56) and *Cixius nervosus* (W=50.02) (Tab. 37).

The specimens of all the species recorded in the planthopper community of *Tilio cordatae-Carpinetum betuli* were few in number, so the peaks of abundance consisted mainly of at most a few dozen of specimens.

Community of the association *Quercus robur-Pinus sylvestris*

Study plot 34

A total number of 369 specimens/47 species collected: 2006 – 210/39 species, 2008 – 83/16 species, 2009 – 76/17 species (Tab. 35).

Highest classes of abundance (6 species): *Balclutha punctata* – its population was very unstable during the research (ED – 2008: 36.14%, D – 2009: 22.37%, sD – 2006: 14.29%), *Empoasca vitis* (D – 2009: 26.32% and sD – 2008: 14.46%, in 2006 it was not collected!), *Forcipata forcipata* (sD – 2006, 2008 and 2009: 7.62%, 12.05% & 11.84%), *Aphrophora alni* (sD – 2009: 11.84%), *Arthaldeus pascuellus* (sD – 2006: 9.05%), *Empoasca pteridis* (sD – 2009: 7.89%) (Tab. 35).

Table 34. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 33 (*Tilio cordatae-Carpinetum betuli*).

	Species	Year											
		2005				2006				2007			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
1.	***Laodelphax striatellus***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
2.	***Muellerianella brevipennis***	-	-	-	-	-	-	-	-	3.08	2.27	4	2.64
3.	***Acanthodelphax spinosus***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
4.	***Aphrophora alni***	5.88	6.82	4	6.33	4.26	4.55	4	4.40	1.54	2.27	4	1.87
5.	***Philaenus spumarius***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
6.	***Centrotus cornutus***	11.76	9.09	4	10.34	8.51	9.09	4	8.80	3.08	4.55	4	3.74
7.	***Utecha trivia***	-	-	-	-	-	-	-	-	3.08	4.55	4	3.74
8.	***Oncopsis flavicollis***	1.96	2.27	4	2.11	4.26	4.55	4	4.40	-	-	-	-
9.	***Populicerus confusus***	1.96	2.27	4	2.11	-	-	-	-	-	-	-	-
10.	***Iassus lanio***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
11.	***Cicadella viridis***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
12.	***Alebra albostriella***	-	-	-	-	4.26	4.55	4	4.40	10.77	13.64	4	12.12
13.	***Forcipata forcipata***	-	-	-	-	2.13	2.27	4	2.20	-	-	-	-
14.	***Empoasca affinis***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
15.	***Empoasca pteridis***	15.69	15.91	4	15.80	14.89	11.36	4	13.01	23.08	27.27	3	25.09
16.	***Fagocyba cruenta***	1.96	2.27	4	2.11	-	-	-	-	1.54	2.27	4	1.87
17.	***Ribautiana tenerrima***	3.92	4.55	4	4.22	-	-	-	-	-	-	-	-
18.	***Eurhadina concinna***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
19.	***Eurhadina pulchella***	1.96	2.27	4	2.11	-	-	-	-	-	-	-	-

	Species	Year											
		2005				2006				2007			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
20.	***Eupteryx atropunctata***	1.96	2.27	4	2.11	-	-	-	-	-	-	-	-
21.	***Eupteryx aurata***	1.96	2.27	4	2.11	-	-	-	-	-	-	-	-
22.	***Eupteryx calcarata***	1.96	2.27	4	2.11	2.13	2.27	4	2.20	-	-	-	-
23.	***Eupteryx cyclops***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
24.	***Eupteryx florida***	-	-	-	-	-	-	-	-	6.15	6.82	4	6.48
25.	***Eupteryx notata***	3.92	4.55	4	4.22	-	-	-	-	-	-	-	-
26.	***Zygina angusta***	-	-	-	-	6.38	4.55	4	5.39	1.54	2.27	4	1.87
27.	***Zygina flammigera***	1.96	2.27	4	2.11	8.51	9.09	4	8.80	1.54	2.27	4	1.87
28.	***Zygina hyperici***	-	-	-	-	4.26	4.55	4	4.40	-	-	-	-
29.	***Fieberiella septentrionalis***	1.96	2.27	4	2.11	-	-	-	-	1.54	2.27	4	1.87
30.	***Balclutha calamagrostis***	-	-	-	-	2.13	2.27	4	2.20	-	-	-	-
31.	***Balclutha punctata***	-	-	-	-	4.26	4.55	4	4.40	3.08	4.55	4	3.74
32.	***Allygidius commutatus***	-	-	-	-	4.26	4.55	4	4.40	1.54	2.27	4	1.87
33.	***Elymana sulphurella***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
34.	***Speudotettix subfusculus***	1.96	2.27	4	2.11	-	-	-	-	-	-	-	-
35.	***Thamnotettix confinis***	5.88	4.55	4	5.17	-	-	-	-	-	-	-	-
36.	***Psammotettix alienus***	5.88	4.55	4	5.17	2.13	4.55	4	3.11	1.54	2.27	4	1.87
37.	***Adarrus multinotatus***	21.57	25.00	4	23.22	23.40	15.91	4	19.29	21.54	20.45	4	20.99
38.	***Errastunus ocellaris***	3.92	2.27	4	2.98	2.13	2.27	4	2.20	-	-	-	-
39.	***Turrutus socialis***	-	-	-	-	-	-	-	-	1.54	2.27	4	1.87
40.	***Jassargus flori***	-	-	-	-	2.13	2.27	4	2.20	-	-	-	-
41.	***Erzaleus metrius***	1.96	2.27	4	2.11	-	-	-	-	-	-	-	-

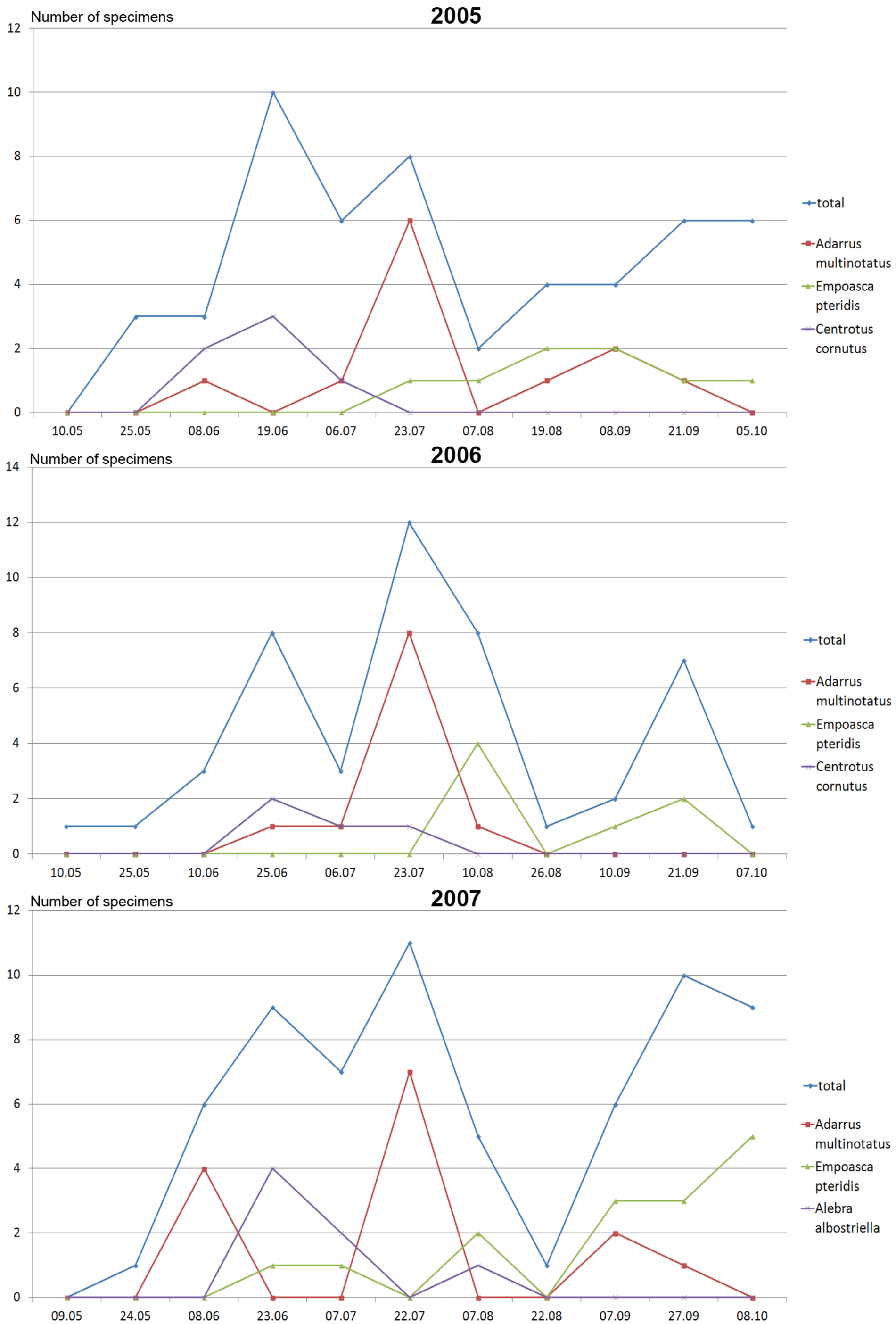

Fig. 34. The dynamics of species abundance among the species dominating in the Plot 33 (*Tilio cordatae-Carpinetum betuli*).

There was no species of the first or second classes of constancy. The highest value of Q index: *Balclutha punctata* (2008: 37.37, 2009: 22.55), *Empoasca vitis* (2009: 25.65) (Tab. 35).

The seasonal dynamics of abundance was shaped here predominately by the population of *Balclutha punctata* (Fig. 35), with its peak of abundance in the first half of August 2006 and the second half of August 2008. In 2009 it was not very numerous. Among other species, *Empoasca vitis* reached highest abundance in the second half of July in 2009, while *Arthaldeus pascuellus* in the first half of July 2006. Other species were not significantly abundant and it proved impossible to record their peaks (Fig. 35).

Study plot 35

A total of 486 specimens/38 species collected: 2008 – 136/16 species, 2009 – 169/30 species, 2010 – 181/26 species (Tab. 36).

Highest classes of abundance (5 species): *Balclutha punctata* (SD – 2008: 55.88%, ED – 2010: 34.25%, D – 2009: 20.71%), *Balclutha calamagrostis* (D – 2010: 22.44%, sD – 2008: 11.03%), *Forcipata forcipata* (sD – 2008 and 2009: 9.56% & 7.69%), *Empoasca vitis* (sD – 2009: 14.79%), *Elymana kozhevnikovi* (sD – 2009: 17.16%) (Tab. 36).

There was no species of the first or second classes of constancy. The highest value of Q index: *Balclutha punctata* (2008-2010: 51.64, 28.81, 36.38) (Tab. 36).

The seasonal dynamics of abundance was shaped predominately by the population of *Balclutha punctata* (Fig. 36), with its peak of abundance in the first half of September in 2009 and the second half of September in 2008 and 2010. Also *Balclutha calamagrostis* peaked in abundance in the second half of August in 2008 and in the middle of September in 2010. The abundance of other species was of minor importance for the overall seasonal dynamics on this plot (Fig. 36).

Remarks: on this plot the highest share of species with a single generation during the season (71.05%) and the lowest share of species with two generations during the season (28.95%) were recorded (Tab. 43d). Only on this plot *Macropsis fuscula*, *Anoscopus flavostriatus* and *Elymana kozhevnikovi* were recorded (Tab. 1).

Characteristics of the community

During the research of the community connected with association *Quercus robur-Pinus sylvestris* a total of 855 specimens (Tabs 35 and 36) from 63 species was collected, which is about 24% of all the collected species (Tab. 1). Only 22 species (35%) were common to both plots (Tab. 1).

The core of the community consisted mainly of *Balclutha punctata*, with the mean share of 30.6%, and also *Empoasca viridis* (9.66%), which together constituted 40.26% of all the collected specimens in this community (Tab. 39). Other abundant, but less numerous species included: *Balclutha calamagrostis*, *Aphrophora alni*, *Forcipata forcipata*, *Empoasca pteridis*, *Elymana kozhevnikovi* and *Arthaldeus pascuellus*.

The highest value of fidelity index (W=100) was reached by *Anoscopus flavostriatus*, *Elymana kozhevnikovi*, *Grypotes puncticollis* and *Macropsis fuscula*. *Dikraneura variata* (W=59.26) and *Balclutha punctata* (W=58.14) were other species with high values of fidelity index (Tab. 37). The latter was also most significant in the overall dynamics of abundance in this community (Figs 35 and 36).

Table 35. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 34 (*Quercus robur-Pinus sylvestris*).

	Species	Year											
		2006				2008				2009			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Laodelphax striatellus***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
2.	***Muellerianella brevipennis***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
3.	***Acanthodelphax spinosus***	1.90	6.82	4	3.60	-	-	-	-	-	-	-	-
4.	***Dicranotropis hamata***	1.43	6.82	4	3.12	-	-	-	-	-	-	-	-
5.	***Criomorphus albomarginatus***	4.76	13.64	4	8.06	-	-	-	-	-	-	-	-
6.	***Javesella pellucida***	4.29	11.36	4	6.98	4.82	6.82	4	5.73	1.32	2.27	4	1.73
7.	***Neophilaenus campestris***	0.95	2.27	4	1.47	-	-	-	-	-	-	-	-
8.	***Aphrophora alni***	-	-	-	-	4.82	6.82	4	5.73	11.84	18.18	4	14.67
9.	***Philaenus spumarius***	-	-	-	-	2.41	4.55	4	3.31	1.32	2.27	4	1.73
10.	***Centrotus cornutus***	-	-	-	-	2.41	4.55	4	3.31	2.63	4.55	4	3.46
11.	***Agallia brachyptera***	1.43	6.82	4	3.12	-	-	-	-	-	-	-	-
12.	***Agallia consobrina***	0.95	4.55	4	2.08	-	-	-	-	-	-	-	-
13.	***Eupelix cuspidata***	1.90	9.09	4	4.16	-	-	-	-	-	-	-	-
14.	***Emelianoviana mollicula***	-	-	-	-	-	-	-	-	1.32	2.27	4	1.73
15.	***Dikraneura variata***	7.14	25.00	4	13.36	1.20	2.27	4	1.65	-	-	-	-
16.	***Forcipata forcipata***	7.62	20.45	4	12.48	12.05	18.18	4	14.80	11.84	13.64	4	12.71
17.	***Notus flavipennis***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-

	Species	Year											
		2006				2008				2009			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
18.	***Empoasca affinis***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
19.	***Empoasca pteridis***	2.38	9.09	4	4.65	4.82	6.82	4	5.73	7.89	11.36	4	9.47
20.	***Empoasca vitis***	-	-	-	-	14.46	15.91	4	15.17	26.32	25.00	4	25.65
21.	***Ribautiana tenerrima***	6.19	13.64	4	9.19	2.41	4.55	4	3.31	1.32	2.27	4	1.73
22.	***Eurhadina pulchella***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
23.	***Eupteryx calcarata***	1.90	4.55	4	2.94	-	-	-	-	1.32	2.27	4	1.73
24.	***Eupteryx cyclops***	0.95	4.55	4	2.08	-	-	-	-	-	-	-	-
25.	***Eupteryx florida***	-	-	-	-	-	-	-	-	1.32	2.27	4	1.73
26.	***Eupteryx tenella***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
27.	***Eupteryx vittata***	3.33	15.91	4	7.28	-	-	-	-	-	-	-	-
28.	***Alnetoidia alneti***	0.48	2.27	4	1.04	1.20	2.27	4	1.65	-	-	-	-
29.	***Zygina angusta***	4.76	11.36	4	7.35	-	-	-	-	-	-	-	-
30.	***Zygina flammigera***	4.29	11.36	4	6.98	-	-	-	-	1.32	2.27	4	1.73
31.	***Zygina hyperici***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
32.	***Arboridia velata***	-	-	-	-	-	-	-	-	2.63	4.55	4	3.46
33.	***Grypotes puncticollis***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
34.	***Balclutha calamagrostis***	0.95	4.55	4	2.08	-	-	-	-	1.32	2.27	4	1.73
35.	***Balclutha punctata***	14.29	34.09	3	22.07	36.14	38.64	3	37.37	22.37	22.73	4	22.55
36.	***Macrosteles laevis***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-

Species		Year											
		2006				2008				2009			
		D	*C*		*Q*	*D*	*C*		*Q*	*D*	*C*		*Q*
37.	***Deltocephalus pulicaris***	0.95	4.55	4	2.08	-	-	-	-	-	-	-	-
38.	***Doratura stylata***	3.81	9.09	4	5.88	-	-	-	-	-	-	-	-
39.	***Hardya tenuis***	-	-	-	-	1.20	2.27	4	1.65	2.63	4.55	4	3.46
40.	***Elymana sulphurella***	2.38	6.82	4	4.03	2.41	4.55	4	3.31	-	-	-	-
41.	***Cicadula quadrinotata***	0.95	4.55	4	2.08	1.20	2.27	4	1.65	-	-	-	-
42.	***Speudotettix subfusculus***	0.48	2.27	4	1.04	3.61	4.55	4	4.05	1.32	2.27	4	1.73
43.	***Arocephalus longiceps***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
44.	***Psammotettix alienus***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
45.	***Errastunus ocellaris***	0.48	2.27	4	1.04	-	-	-	-	-	-	-	-
46.	***Jassargus flori***	4.76	15.91	4	8.70	-	-	-	-	-	-	-	-
47.	***Arthaldeus pascuellus***	9.05	25.00	4	15.04	4.82	9.09	4	6.62	-	-	-	-

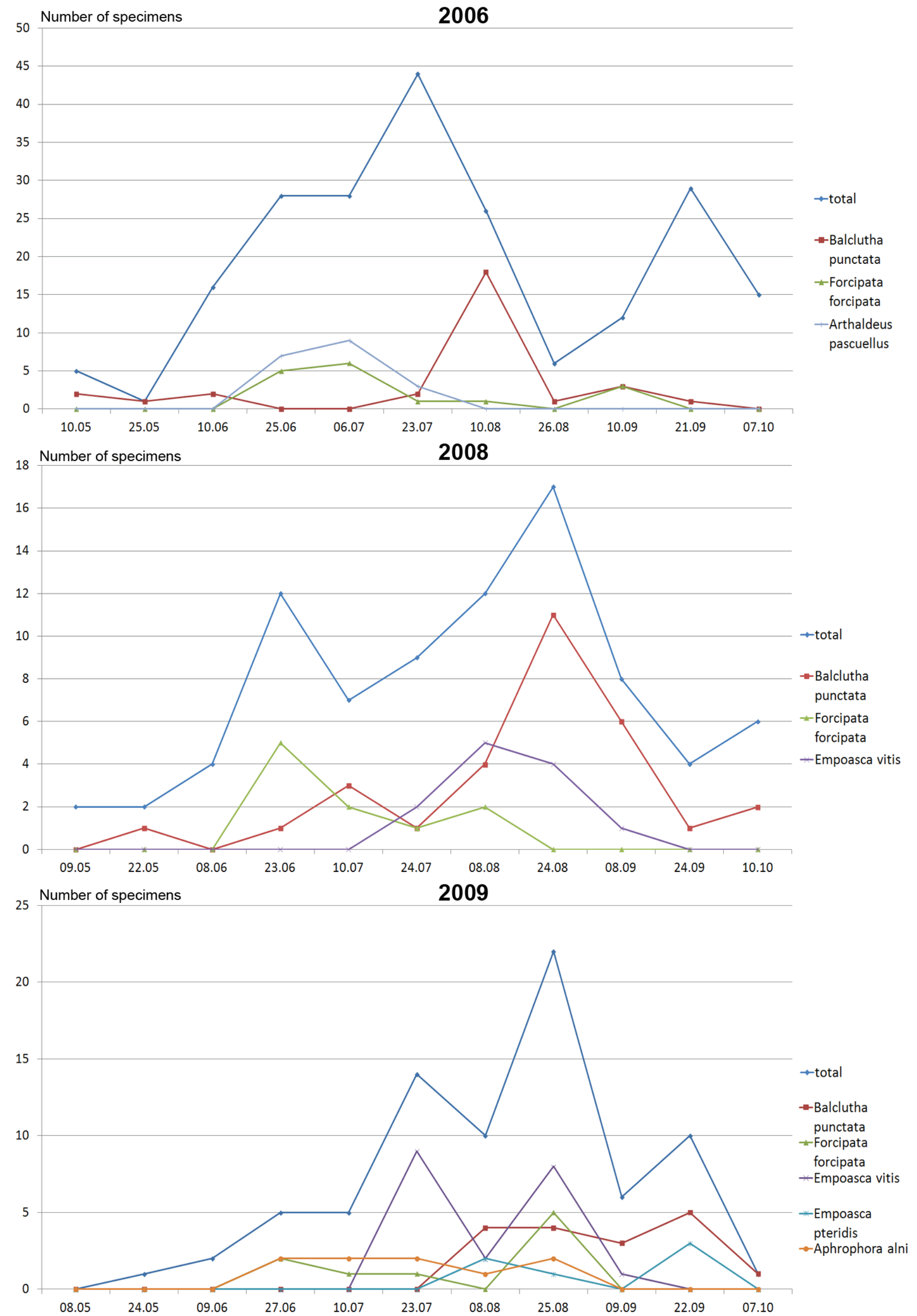

Fig. 35. The dynamics of species abundance among the species dominating in the Plot 34 (*Quercus robur-Pinus sylvestris*).

Table 36. List of domination (*D*) [%], constancy (*C*) [%] and *Q* index for particular species of the Fulgoromorpha and Cicadomorpha collected by sweep netting method for the purpose of quantitative research in Plot 35 (*Quercus robur-Pinus sylvestris*).

	Species	Year											
		2008				2009				2010			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
1.	***Stenocranus major***	3.68	6.82	4	5.01	-	-	-	-	0.55	2.27	4	1.12
2.	***Stenocranus minutus***	-	-	-	-	-	-	-	-	1.10	4.55	4	2.24
3.	***Conomelus anceps***	2.21	4.55	4	3.17	1.18	4.55	4	2.32	0.55	2.27	4	1.12
4.	***Stiroma affinis***	-	-	-	-	6.51	9.09	4	7.69	-	-	-	-
5.	***Hyledelphax elegantulus***	2.21	4.55	4	3.17	4.73	13.64	4	8.03	6.63	22.73	4	12.28
6.	***Delphacodes venosus***	-	-	-	-	-	-	-	-	0.55	2.27	4	1.12
7.	***Muellerianella brevipennis***	0.74	2.27	4	1.30	0.59	2.27	4	1.16	0.55	2.27	4	1.12
8.	***Muellerianella fairmairei***	-	-	-	-	-	-	-	-	0.55	2.27	4	1.12
9.	***Acanthodelphax spinosus***	0.74	2.27	4	1.30	0.59	2.27	4	1.16	-	-	-	-
10.	***Javesella pellucida***	5.88	11.36	4	8.17	1.18	4.55	4	2.32	5.52	11.36	4	7.92
11.	***Aphrophora alni***	1.47	4.55	4	2.59	2.37	9.09	4	4.64	4.97	15.91	4	8.89
12.	***Philaenus spumarius***	0.74	2.27	4	1.30	0.59	2.27	4	1.16	-	-	-	-
13.	***Centrotus cornutus***	-	-	-	-	0.59	2.27	4	1.16	-	-	-	-
14.	***Macropsis fuscula***	-	-	-	-	1.18	4.55	4	2.32	0.55	2.27	4	1.12
15.	***Anoscopus flavostriatus***	-	-	-	-	0.59	2.27	4	1.16	0.55	2.27	4	1.12
16.	***Cicadella viridis***	-	-	-	-	2.96	6.82	4	4.49	-	-	-	-
17.	***Forcipata forcipata***	9.56	22.73	4	14.74	7.69	20.45	4	12.54	6.63	25.00	4	12.87
18.	***Empoasca pteridis***	-	-	-	-	0.59	2.27	4	1.16	-	-	-	-

	Species	Year											
		2008				**2009**				**2010**			
		D	***C***		***Q***	***D***	***C***		***Q***	***D***	***C***		***Q***
19.	***Empoasca vitis***	0.74	2.27	4	1.30	14.79	29.55	3	20.91	1.66	4.55	4	2.75
20.	***Wagneripteryx germari***	-	-	-	-	0.59	2.27	4	1.16	1.66	6.82	4	3.36
21.	***Alnetoidia alneti***	-	-	-	-	0.59	2.27	4	1.16	-	-	-	-
22.	***Zygina angusta***	-	-	-	-	2.96	11.36	4	5.80	1.66	4.55	4	2.75
23.	***Arboridia velata***	-	-	-	-	-	-	-	-	1.10	4.55	4	2.24
24.	***Grypotes puncticollis***	-	-	-	-	-	-	-	-	0.55	2.27	4	1.12
25.	***Balclutha calamagrostis***	11.03	20.45	4	15.02	2.96	9.09	4	5.19	22.44	34.09	3	27.66
26.	***Balclutha punctata***	55.88	47.73	3	51.64	20.71	40.09	3	28.81	34.25	38.64	3	36.38
27.	***Macrosteles laevis***	-	-	-	-	-	-	-	-	0.55	2.27	4	1.12
28.	***Recilia coronifera***	-	-	-	-	2.37	4.55	4	3.28	-	-	-	-
29.	***Allygidius commutatus***	-	-	-	-	0.59	2.27	4	1.16	0.55	2.27	4	1.12
30.	***Graphocraerus ventralis***	-	-	-	-	0.59	2.27	4	1.16	-	-	-	-
31.	***Elymana kozhevnikovi***	1.47	4.55	4	2.59	17.16	27.27	3	21.63	6.63	18.18	4	10.98
32.	***Elymana sulphurella***	-	-	-	-	1.18	2.27	4	1.64	-	-	-	-
33.	***Speudotettix subfusculus***	1.47	4.55	4	2.59	1.18	4.55	4	2.32	0.55	2.27	4	1.12
34.	***Thamnotettix confinis***	-	-	-	-	1.18	4.55	4	2.32	0.55	2.27	4	1.12
35.	***Psammotettix alienus***	-	-	-	-	0.59	2.27	4	1.16	-	-	-	-
36.	***Errastunus ocellaris***	1.47	4.55	4	2.59	-	-	-	-	0.55	2.27	4	1.12
37.	***Jassargus flori***	-	-	-	-	0.59	2.27	4	1.16	-	-	-	-
38.	***Arthaldeus pascuellus***	0.74	2.27	4	1.30	0.59	2.27	4	1.16	0.55	2.27	4	1.12

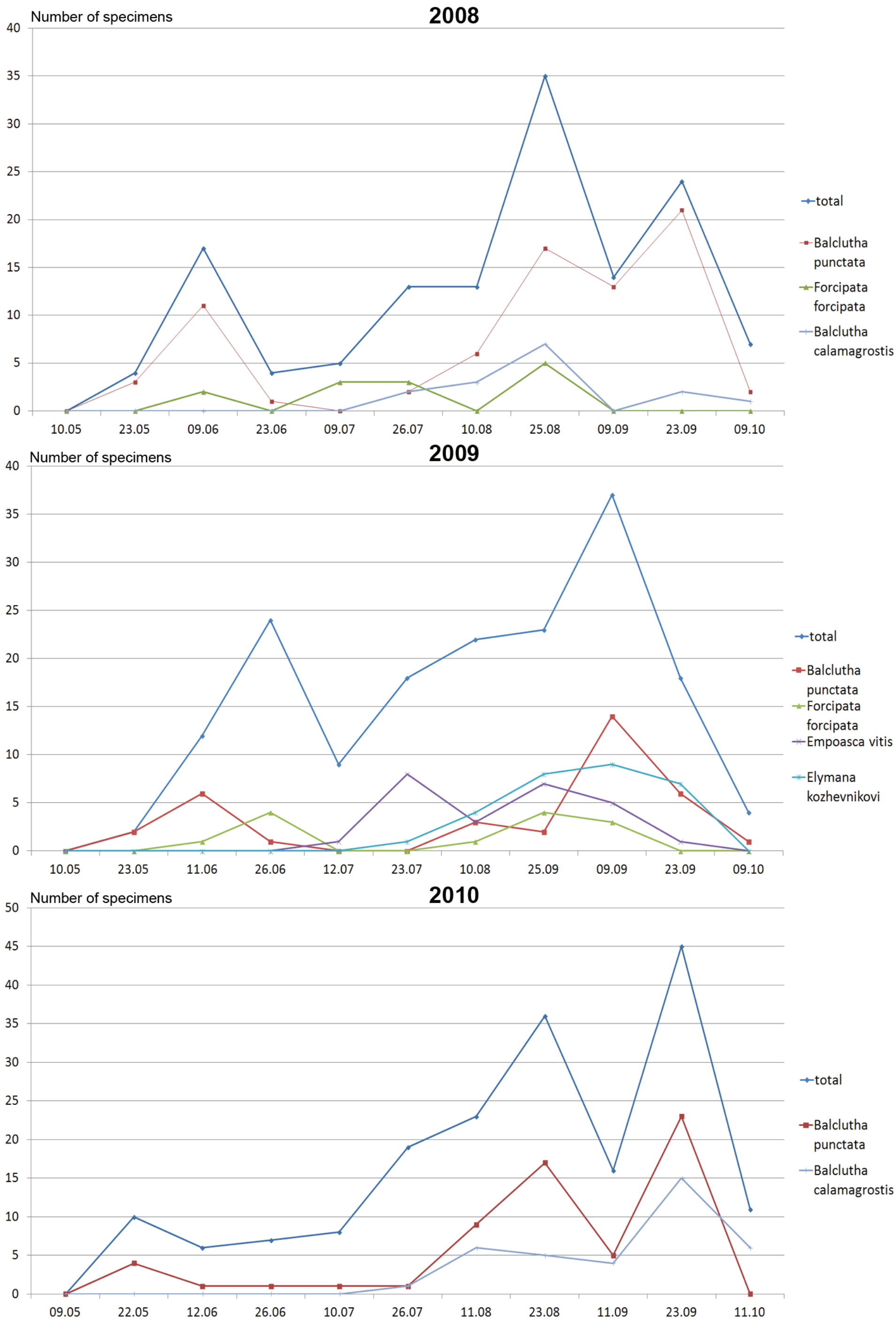

Fig. 36. The dynamics of species abundance among the species dominating in the Plot 35 (*Quercus robur-Pinus sylvestris*).

5.2 Indices of species diversity and evenness

The value of Shannon-Weaver's species diversity index *H'* on the plots ranged between 0.929 and 3.334. It reached the lowest values (0.929 and 1.103 respectively) in communities connected with anthropogenic plant associations: on plot 1 (*Echio-Melilotetum*) and plot 13 (*Lolio-Polygonetum arenastri*). The highest values of this index were obtained in communities connected with forest associations, on plot 31 – 3.334 (*Tilio cordatae-Carpinetum betuli*) and plot 30 – 3.175 (*Alno-Ulmion*), and on the meadow with plot 14 – 2.903 (moist meadow *Valeriano-Filipenduletum*) (Tab. 38).

The lowest values of Pielou's evenness index *J'* were obtained on plot 13 - 19.35% (*Lolio-Polygonetum arenastri*) and on plot 1 – 22.73% (*Echio-Melilotetum*). The highest values were noted on plot 31 – 60.71% (*Tilio cordatae-Carpinetum betuli*) and on plot 34 – 55.76% (*Quercus robur-Pinus sylvestris*) (Tab. 38).

The Brillouin's diversity index $\hat{H}$ reached the lowest values on plot 1 – 0.880 (*Echio-Melilotetum*) and plot 13 – 1.087 (*Lolio-Polygonetum arenastri*). It reached the highest values in forests associations, on plot 31 – 3.138 (*Tilio cordatae-Carpinetum betuli*) and plot 30 – 3.029 (*Alno-Ulmion*), and on the meadow with plot 14 – 2.839 (*Valeriano-Filipenduletum*) (Tab. 38).

The value of Simpson's species diversity index *I'* ranged between 0.347 and 0.953. It reached the lowest values on plot 1 – 0.347 (*Echio-Melilotetum*) and plot 13 – 0.396 (*Lolio-Polygonetum arenastri*). The highest values were obtained on plot 31 – 0.953 (*Tilio cordatae-Carpinetum betuli*) and plot 30 – 0.933 (*Alno-Ulmion*). Slightly lower, but still significant values were assessed on plot 8 – 0.909 (psammophilous grassland *Spergulo vernalis-Corynephoretum*) and plot 14 – 0.902 (*Valeriano-Filipenduletum*) (Tab. 38).

The index of potential species diversity *Ip* reached the lowest value on plot 1 – 0.941 (*Echio-Melilotetum*) and the highest one on plot 19 – 0.985 (moist meadow *Alopecuretum pratensis*) (Tab. 38).

The standard deviation of the Brillouin's index *(sd($\hat{H}$))* was the lowest on plot 33 – 0.043 (*Tilio cordatae-Carpinetum betuli*) and plot 27 – 0.044 (*Festucetum pallentis*), and the highest on plot 21 – 0.928 (*Arrhenatheretum elatioris*) (Tab. 38).

Similar values of standard deviation were assessed when computing Shannon-Weaver's *(sd(H'))* coefficient with the lowest values on plot 33 – 0.044 (*Tilio cordatae-Carpinetum betuli*) and plot 27 – 0.059 (*Festucetum pallentis*), and the highest on plot 21 – 0.965 (*Arrhenatheretum elatioris*) (Tab. 38).

In case of Simpson's *(sd(I'))* coefficient, the value of standard deviation was the lowest on plot 33 – 0.008 (*Tilio cordatae-Carpinetum betuli*) and the highest on plot 21 – 0.314 (*Arrhenatheretum elatioris*) (Tab. 38).

Values of the Brillouin's index and Shannon-Weaver's coefficient correlated with each other significantly on all studied plots, as may be seen in Fig. 40.

The degree of disparity of the observed structure of community from the potential *(dI)* was the highest in the community on plot 1 – 36.87% (*Echio-Melilotetum*) and the lowest on plot 31 – 97.47% (*Tilio cordatae-Carpinetum betuli*) (Tab. 38).

5.3 Similarity of studied communities

Cluster analysis with application of Ward's method allowed to evaluate the similarity between the planthopper communities on the studied plots both, on the basis of the number of all collected specimens (Fig. 38) and the number of specimens of the most abundant species (dominant and subdominant ones) (Fig. 39). Three clusters of communities could be distinguished: the first one comprising communities of forest associations, the second one comprising communities of humid associations and the third one comprising both, grasslands as well as urban greenery and meadows (Fig. 38 and 39).

5.3.1. Similarity based on all collected specimens

Taking into account the total number of all the collected specimens of all species occurring on a particular study plot, with application of WARD's method the following clusters of communities could be delineated (Fig. 38):

- a group of planthopper communities connected with forest associations of *Alno-Ulmion*, *Tilio cordatae-Carpinetum betuli* and *Quercus robur-Pinus sylvestris* from the class *Querco-Fagetea* (plots: 30, 31, 32, 33, 34 and 35);
- a group of planthopper communities connected with moist and humid plant associations *Urtico-Aegopodietum podagrariae* from class *Artemisietea vulgaris* (plots 3 and 4), *Sparganio-Glycerietum fluitantis* and *Phalaridetum arundinaceae* from class *Phragmitetea* (5 and 6) and *Valeriano-Filipenduletum*, *Cirsietum rivularis*, *Scirpetum silvatici* with *Alopecuretum pratensis* within the order *Molinietalia caeruleae* from class *Molinio-Arrhenatheretea* (14, 15, 17, 18, 19 and 20). The dendrogram revealed two subgroups here: one comprising most communities connected with class *Molinio-Arrhenatheretea* (14, 15, 17, 18, 19, 20) together with a community inhabiting the association *Sparganio-Glycerietum fluitantis* (5), the other subgroup containing communities inhabiting associations of *Urtico-Aegopodietum podagrariae* (3, 4) and *Phalaridetum arundinaceae* (6);
- the third group comprised a variety of communities connected with: plant association *Echio-Melilotetum* (plot 2) of the class *Artemisietea vulgaris*, psammophilous grasslands *Spergulo vernalis-Corynephoretum* and *Diantho-Armerietum elongatae* of the class *Koelerio glaucae-Corynephoretea canescentis* (7, 8 and 9), some of the xerothermic grasslands: *Festucetum pallentis* and *Sileno-Phleetum* of the class *Festuco-Brometea* (27 and 28) and finally communities connected with associations under a significant human influence: *Lolio-Polygonetum arenastri* (10, 11, 12, 13), *Arrhenatheretum elatioris* (21, 22, 23, 24), *Achillea millefolium-Taraxacum officinale* (25), *Dactylis glomerata* (26) with strongly deteriorated *Cirsietum rivularis* (16) of the class *Molinio-Arrhenatheretea*.

Within this group three subclusters could be distinguished: the first one comprising communities connected with *Spergulo vernalis-Corynephoretum* (7 and 8) and *Festucetum pallentis* (27); the second one comprising communities connected with *Diantho-Armerietum elongatae* (9), *Lolio-Polygonetum arenastri* (10, 11, 12, 13), *Cirsietum rivularis* (16), *Arrhenatheretum elatioris* (21, 22, 23, 24), *Achillea millefolium-Taraxacum officinale* (25), *Dactylis glomerata* (26) and *Sileno-Phleetum* (28); and the third one was a single community connected with association *Echio-Melilotetum* (2) on the railway subgrade.

Taking into account the number of specimens of dominant and subdominant species occurring on a particular study plot, with the application of WARD's method, three groups of communities could likewise be distinguished (Fig. 39):

- the first group comprised communities connected with the forest associations of the class *Querco-Fagetea* (plots 30, 31, 32, 33, 34 and 35);
- the second group comprised communities connected with psammophilous grasslands (7, 8 and 9), some of the xerothermic grasslands (27 and 28) and typical urban plant associations under significant human pressure (10, 11, 12, 13, 16, 21, 22, 23, 24, 25, 26). Three subclusters could be marked out here (Fig. 39): the first one comprising communities connected with habitats in the town centre and moist meadows (9, 10, 11, 12, 13, 21, 22, 23, 24, 25 and 26); the second one comprising some grasslands (7, 27 and 28) and the third, a significantly distinct one, comprising associations connected with grassland *Spergulo vernalis-Corynephoretum* (8) and deteriorated *Cirsietum rivularis* (16);
- the third group comprised communities connected with plant associations of the classes: *Artemisietea vulgaris* (2, 3 and 4), *Phragmitetea* (5 and 6) and *Molinio-Arrhenatheretea* of the order *Molinietalia caeruleae* (14, 15, 17, 18, 19 and 20). Also here three subclusters could be differentiated: the first one, comprising all communities connected with moist associations of the class *Molinio-Arrhenatheretea* (14, 15, 17, 18, 19 and 20) and a single of the class *Phragmitetea* (5); the second one comprising communities of the class *Artemisietea vulgaris* (3 and 4) and the third one comprising two communities of *Echio-Melilotetum* (2) and *Phalaridetum arundinaceae* (6).

Within the above mentioned groups of communities, some circles of communities can be outlined. The first, a highly homogenous circle consists of communities occurring in forest habitats (Fig. 37, 38, 39). Within the next group, consisting of communities in moist and humid habitats, there is a very distinctive circle of communities connected with associations of the order *Molinietalia caeruleae* (class *Molinio-Arrhenatheretea*). Further analysis shows, that the communities connected with associations of the class *Phragmitetea* (*Sparganio-Glycerietum fluitantis* and *Phalaridetum arundinaceae*) are closely related. Moereover, the communities connected with association *Urtico-Aegopodietum podagrariae* of the class *Artemisietea vulgaris* are only slightly less similar (a longer distance of the node in dendrogram) (Fig. 38 and 39).

Within the group comprising communities connected with psammophilous and xerothermic grasslands and with urban habitats, it is possible to single out the circle with most of urban habitats (*Lolio-Polygonetum arenastri*) and most of associations of the order *Arrhenatheretalia elatioris*. Also psammophilous (class *Koelerio glaucae-Corynephoretea canescentis*) and xerothermic grasslands (class *Festuco-Brometea*) were included into this group, although they had longer distances between the nodes. Moreover, the group comprising grasslands is closely related to some of the communities connected with the class *Arrhenatheretalia elatioris* (Figs 38 and 39).

The dendrograms constructed on the basis of abundance of all species (Fig. 38) and dominant species (Fig. 39), both revealed a similar pattern of clustering, showing three main groups of communities. The only discrepancy was a different classification of plot 2 – a community connected with *Echio-Melilotetum* – which fell into two distinct groups. When the abundance of all species was taken to computations, it was classified with humid associations (Fig. 38), but on the basis of the abundance of dominant species it shared a group with urban associations and grasslands (Fig. 39).

Cluster analysis allowed to distinguish the following communities: plot 1 (*Echio-Melilotetum*) and plot 29 (*Adonido-Brachypodietum pinnati*), excluding them from the remaining three groups of communities, which is confirmed by both dendrograms (Figs 38 and 39).

The Principal Component Analysis (PCA) confirmed the results of cluster analysis (Fig. 37) indicating the presence of three groups of communities alike. The first is connected with forest associations, the second with humid associations and the third comprises psammophilous and xerothermic grasslands, meadows and urban associations in the town centre.

5.4. Qualitative analysis

The qualitative research included the material consisting of 476 samples from trees, shrubs and single species clumps of herbaceous plants, collected beyond the study plots or in their vicinity, usually up to 100 m from study plots. During the research a total of 56 species were recorded. Moreover, 11 species were collected by means of qualitative and quantitative methods (Tab. 1).

Beyond the study plots 19 species were recorded – *Kelisia vittipennis*, *Aphrophora pectoralis*, *Macropsis infuscata*, *Rhytidodus decimusquartus*, *Idiocerus lituratus*, *I. herrichi*, *I. vicinus*, *Viridicerus ustulatus*, *Cicadella lasiocarpae*, *Kybos lindbergi*, *K. virgator*, *Edwardsiana geometrica*, *E. prunicola*, *E. salicicola*, *E. soror*, *Ribautiana ognevi*, *Zygina ordinaria*, *Z. tiliae* and *Metalimnus marmoratus*. Whilst in the study plots by qualitative methods 42 species were collected – *Alebra wahlbergi*, *Fagocyba cruenta*, *Edwardsiana gratiosa*, *E. ulmiphagus*, *Eupterycyba jucunda*, *Eurhadina pulchella*, *Alnetoidia alneti* (plot 5), *Kybos abstrusus* (plot 8), *Macropsis vicina*, *Tremulicerus distinguendus*, *Populicerus albicans*, *Edwardsiana crataegi* (plot 10), *Kybos virgator* (plot 11), *Oncopsis carpin*i, *Pediopsis tiliae*, *Alebra albostriella*, *A. neglecta*, *A. wahlbergi*, *Fagocyba carri*, *F. cruenta*, *Ossiannilssonola callosa*, *Edwardsiana ampliata*, *E. flavescens*, *E. rosae*, *E. ulmiphagus*, *Typhlocyba quercus*, *Eurhadina concinna*, *E. pulchella*, *Eupteryx curtisi*, *Aguriahana stellulata*, *Alnetoidia alneti*, *Zygina angusta*, *Z. suavis*, *Arboridia velata* (plot 13), *Oncopsis appendiculata*, *O. tristis* (plot 14), *Kybos butleri* (plot 15), *Edwardsiana ulmiphagus* (plot 20), *Acericerus ribauti*, *Macrosteles maculosus* (plot 23), *Balcanocerus larvatus* (plot 27), *Zygina schneideri*, *Hesium domino* (plot 28), *Pithyotettix abietinus*, *Paralimnus phragmitis*, *Calamotettix taeniatus* (plot 30), *Tremulicerus tremulae*, *Edwardsiana plebeja*, *Zygina griseombra*, *Japananus hyalinus* (plot 31), *Acericerus ribauti*, *Alebra wahlbergi*, *Fagocyba carri*, *Edwardsiana rosae*, *E. spinigera*, *E. ulmiphagus*, *Typhlocyba quercus*, *Aguriahana stellulata*, *Zygina suavis*, *Platymetopius major*, *Allygus communis* (plot 32), *Balcanocerus larvatus* (plot 33), *Ulopa reticulata* and *Allygus communis* (plot 35).

Many species were collected on trees, especially on three species: on oak (*Quercus robur*) – 20 taxa: *Aphrophora alni*, *Iassus lanio*, *Alebra albostriella*, *A. neglecta*, *Empoasca decipiens*, *E. vitis*, *Fagocyba carri*, *F. cruenta*, *Edwardsiana rosae*, *E. spinigera*, *Ribautiana tenerrima*, *Typhlocyba quercus*, *Eurhadina concinna*, *E. pulchella*, *Zygina angusta*, *Z. flammigera*, *Z. suavis*, *Arboridia velata*, *Allygus communis* and *Speudotettix subfusculus*, on lime (*Tilia cordata*) – 14 taxa: *Aphrophora alni*, *Pediopsis tiliae*, *Alebra neglecta*, *A. wahlbergi*, *Empoasca pteridis*, *E. vitis*, *Edwardsiana ampliata*, *E. rosae*, *E. ulmiphagus*, *Aguriahana stellulata*, *Alnetoidia alneti*, *Arboridia velata*, *Fieberiella septentrionalis* and *Platymetopius major* and on alder (*Alnus glutinosa*) – 8: *Oncopsis alni*, *Alebra wahlbergi*, *Fagocyba cruenta*, *Edwardsiana gratiosa*, *E. ulmiphagus*, *Eupterycyba jucunda*, *Eurhadina pulchella* and *Alnetoidia alneti*.

Japananus hyalinus proves a particularly interesting species recorded on maple trees (*Acer* spp.) in the vicinity of plot 31 (Tab. 1). It is an alien species, quickly dispersing in Europe and other continents and occurring most often in urban habitats under strong human pressure, as shown by NICKEL's research (2003).

5.5. Chorological analysis (Tabs 40, 41a-41d)

The collected material includes 13 chorological elements (Tabs 40, 41a-41d, Fig. 42). The European element is most numerous, represented by 74 species – 27.82% of all the collected species. Other significant elements include: the Euro-Siberian – 63 species, 23.68%; the western-palaearctic – 32 species, 12.03% and the transpalaearctic – 30 species, 11.28% ones. The following elements are least numerous: the cosmopolitan – 1 species, 0.38%; the North and West European – 3 species, 1.13% and the exclusively Mediterranean – 4 species, 1.5% ones (Tab. 40). The shares of particular chorological elements collected exclusively in quantitative research on all 35 study plots are presented in Tables: 41a, 41b, 41c and 41d. Furthermore, Tab. 41d shows the share of chorological elements in the town centre (M), suburbs (buffer zone – O) and in mesoregions: UWR – the Upper Warta Lowland (Obniżenie Górnej Warty), CzU – Częstochowska Upland and WU – Wieluńska Upland. Both, in the town centre and in suburbs, two elements were the most numerous: the European (26.03% and 22.30% respectively) the Euro-Siberian (24.38% and 21.62% respectively) ones. The least numerous elements in the town centre included the cosmopolitan (0.41%) as well as the North European, West European and exclusively Mediterranean (1.24% each) ones. In the suburban zone, the cosmopolitan and West European (0.68% each) and also the North and South European ones (1.35% each) were least numerous.

In the Upper Warta Lowland, the Euro-Siberian element was most abundant (25.79%), in Częstochowska Upland, the European element (26.35%) and in Wieluńska Upland, the European and Euro-Siberian elements (24.55% each) were most numerous (Tab. 41d).

In the Upper Warta Lowland, the cosmopolitan and West European elements were the least abundant (0.53% each); in Częstochowska Upland, the North European, West European and exclusively Mediterranean elements proved fewest (1.36% each), while in Wieluńska Upland the least numerous elements included the West European and South European ones (0.60% and 1.20% respectively).

In the quantitative material collected on study plots, the transpalaearctic element was most numerous. It is the most abundant on 22 plots: 1, 2, 3, 4, 7, 8, 9, 11, 12, 13, 16, 20, 21, 23, 25, 26, 27, 28, 31, 32, 33 and 34. The Euro-Siberian element was most numerous on 15 plots: 2, 5, 6, 10, 13, 17, 12, 17, 18, 19, 22, 24, 29, 30 and 35; the West palaearctic element was most numerous on 4 plots: 13, 21, 26 and 29 while the European element was most abundant only on two plots: 7 and 32 (Tabs 41a-41d).

In associations of the classes: *Artemisietea vulgaris*, *Koelerio glaucae-Corynephoretea canescentis*, *Festuco-Brometea* and *Querco-Fagetea* and orders *Plantaginetalia majoris* and *Arrhenatheretalia elatioris* in class *Molinio-Arrhenatheretea*, the transpalaearctic element was the most numerous, whereas in associations of moist meadows of the class *Phragmitetea* and of order *Molinietalia caeruleae* in class *Molinio-Arrhenatheretea*, the Euro-Siberian element proved most abundant.

In the studied plant associations, the species belonging to the following chorological elements were least abundant (Tabs 41a-41d):

- in *Artemisietea vulgaris* the West European element represented by *Conomelus anceps* (plots 1, 2 and 3) and the North European one represented by *Balclutha calamagrostis* (plots 1, 2 and 3);
- in *Phragmitetea* the Kazakh element represented by *Eupteryx notata* (plots 5 and 6);
- in *Koelerio glaucae-Corynephoretea canesecentis* the South European element represented by *Jassidaeus lugubris* (plots 8 and 9), and the Mediterranean element represented by *Neophilaenus campestris* (plot 7) and *Megophthalmus scanicus* (plot 8);
- in *Plantaginetalia majoris* the South European element represented by *Jassidaeus lugubris* (plots 10, 11 and 12);
- in *Molinietalia caeruleae* the North European element represented by *Balclutha calamagrostis* (plots 14, 15, 16, 17, 18, 19 and 20) and the exclusively Mediterranean element represented by *Conosanus obsoletus* (plots 14, 15, 16, 17, 18 and 19);
- in *Arrhenatheretalia elatioris* the exclusively Mediterranean element represented by *Conosanus obsoletus* (plot 21), *Hephathus nanus* (plot 22) and *Eupteryx thoulessi* (plot 24);
- in *Festuco-Brometea* the North European element represented by *Balclutha calamagrostis* (plots 27 and 29) and *Jassargus pseudocellaris calamagrostis* (plots 28 and 29), and the Mediterranean element represented by *Utecha lugens* (plot 27) and *Cercopis sanguinolenta* (plot 29);
- in *Querco-Fagetea* the North European element represented by *Balclutha calamagrostis* (plots 32, 33, 34 and 35) and South European by *Arboridia velata* (plots 30, 32, 34 and 35).

5.6. Ecological analysis

In relation to the humidity of habitat, the mesohigrophilous species were most numerous (56.77% – 151 species) in all the collected material. The higrophilous and xerophilous species constituted 24.81% and 18.42% of the collected material with 66 and 49 species respectively (Tab. 42, Fig. 43). When the locality of the collected material is considered, mesohigriophilous species were most numerous in the town centre and suburbs (62.84% and 54.13%) and also in mesoregions: the Upper Warta Lowland, Częstochowska Upland and Wieluńska Upland (55.79%, 59.86% and 58.68% respectively) (Tab. 43d). In the town centre (plots 2, 3, 9, 10, 11, 12, 13, 21, 24, 25 and in qualitative analysis) and also in parts of mesoregions in the town area (Częstochowska Upland) (plots: 7, 8, 23, 27, 28, 29, 32, 33, 34 and qualitative analysis), the xerophilous species prevailed over the higrophilous ones (city: 20.95% and 16.22%, CzU: 31.29% and 8.84% respectively). In the buffer zone of the town (plots 1, 4, 5, 6, 7, 8, 14, 15, 16, 17, 18, 19, 20, 22, 23, 26, 27, 28, 29, 30 31, 32, 33, 43, 35 and qualitative analysis), the Upper Warta Lowland (plots 1, 2, 3, 4, 6, 10, 11, 12, 14, 16, 18, 19, 21, 22, 25, 26, 30, 35 and qualitative analysis) and Wieluńska Upland (plots 5, 9, 13, 15, 17, 20, 24, 31 and qualitative analysis), the xerophilous species were less abundant than the higrophilous ones (19.42% and 26.45%, 16.84% and 27.37%, 14.37% and 26.95% respectively) (Tab. 43d, Fig. 43).

In respect of insolation, in all the collected material the mesoheliophilous species were most abundant (67.67% – 180 species), the heliophilous ones were fewer in number (30.07% – 80 species) and the skiophilous ones least abundant (2.26% – 6 species) (Tab. 42, Fig. 44). The mesoheliophilous species prevailed also in the town centre and the buffer zone (63.51 % and 66.53% respectively) and in mesoregions (UWR: 66.32%, CzU: 55.10% and WU: 70.06%). The heliophilous species were more dominant in the town centre than in the buffer zone (33.78% and 30.99% respectively). The analysis of the species composition in the material collected in Częstochowska Upland indicated a higher proportion of heliophilous species (42.85%) than that in other mesoregions, while the highest number of skiophilous species was collected in Wieluńska Upland (2.99%) (Tab. 43d, Fig. 44).

With regard to trophic relationships in the study area, 1st-degree monophagous species were most abundant (28.95% of the collected material – 77 species) and 2nd-degree monophagous ones slightly fewer in number (25.19%, 67 species). 1st-degree oligophagous species constituted 21.05% of the collected fauna (56 species) while 2nd-degree oligophagous ones totalled 9.02% (24 species). In overall numbers the species came to 144 (54.14%), 80 (30.07%) and 41 (15.41%) for monophagous, oligophagous and poliphagous ones respectively. A single species (0.38%) was of uncertain trophic relationships – *Macrosteles sardus* (Nickel & Remane 2002) (Tab. 42, Fig. 45). In the town centre the species classified as 1st-degree oligophagous constituted the most abundant group (27.70%) while in the buffer zone 1st-degree monophagous were most abundant (28.51%). In reference to mesoregions, in the Upper Warta Lowland 1st-degree monophagous species were present in the highest number (27.89%); in Częstochowska Upland 1st-degree oligophagous (26.53%) and in Wieluńska Upland 2nd-degree monophagous (25.15%) ones were most numerous (Tab. 43d, Fig. 45).

Also the relationships of planthoppers with host plants were analysed. Most species – 104 were connected with Poaceae (39.10%); 34 species were connected with Cyperaceae (12.78%), 26 species with Betulaceae (9.77%) and 24 with Rosaceae (9.02%). Over 50% of species were connected with various monocotyledons (Tab. 44).

With respect to the degree of connection with the type of habitat, the oligotopic species prevailed in the collected material (50% – 133 species). In the group of the remaining species, the stenotopic (28.2% – 75 species) slightly prevailed over the eurytopic ones (21.8% – 58 species) (Tab. 42, Fig. 46). The oligotopic species prevailed in the town centre, in the buffer zone, and also in all three mesoregions. The eurytopic species outnumbered the stenotopic ones in the town centre while in the buffer zone the proportions were reversed. Also in both uplands the eurytopic species were more numerous than the stenotopic ones, but the reverse was noted in the the Upper Warta Lowland (Tab. 43d, Fig. 46).

Among the recorded species, 188 (70.68%) overwintered in the stage of egg, while 42 species (15.79%) in the stage of larva and 36 species (13.53%) as adults (Tab. 42, Fig. 47). Also in both town zones and in mesoregions, the species overwintering as an egg prevailed. Species overwintering as adults prevailed over the ones overwintering in larval stages in the town centre and in Częstochowska Upland. Reversed proportions were recorded in the buffer zone, in the Upper Warta Lowland and in Wieluńska Upland (Tab. 43d, Fig. 47).

When the number of generations per year is considered, the species with a single generation yearly were more numerous (147 species, 55.26%) than those with two generations (119, 44.74%) (Tab. 42, Fig. 48). A similar pattern was recognized in both town zones and in three mesoregions (Tabs 43d, Fig. 48). However, detailed analysis of the seasonal dynamics of abundance of some species indicated the possibility of occurrence of three generations per year in some of the species e.g. *Macrosteles laevis* and *Chlorita paolii*.

6. Discussion

There are various concepts of conducting a precise analysis of the structure of planthopper communities, or the communities of other insect taxa. Some particularly valuable criteria, such as dominance (*D*), constancy (*C*) or fidelity of species (*W*) (distinctive or characteristic species) were detailed in chapter 4. Schiemenz (1969) regarded the dominant species with high values of fidelity index to be most useful for characterizing the communities of planthoppers and leafhoppers. However, it is not always sufficient for a proper recognition of characteristic and distinctive species to rely exclusively on the numeral values or ranges of values of these indices. Moreover, it may distort the correct interpretation of the role of other species in the community. This problem has been discussed by Świerczewski and Wojciechowski (2009) in their work devoted to the planthopper communities in grasslands of Częstochowska Upland. After analysing the data, both authors concluded that the presence of a host plant in the association constitutes a useful criterion confirming the relation of a particular species with its plant association. They also noted the regularity of occurrence of particular species in particular plant associations.

In present work the comparisons of the collected species were conducted between plots of similar plant associations. In this chapter, when particular communities are discussed (especially distinctive and characteristic species), attention is drawn to the constancy and the presence of host plant species. Accordingly, the species with first and second classes of constancy which occurred on all plots with the same type of plant association were taken into account in most cases. Those with the third class of constancy were included sporadically. The same method was already applied in characterizing planthopper communities both, in Poland (Klimaszewski et al. 1980a, 1980b, Chudzicka 1981, 1986, Gębicki 1983, Walczak 2005, Gaj et al. 2009, Świerczewski & Wojciechowski 2009), and abroad e.g. in Germany (Schiemenz 1969, Witsack 1997) or in Finland (Huusela-Veistola & Vasarainen 2000).

The obtained results allowed to distinguish planthopper and leafhopper communities connected with various classes of plant associations e.g. *Artemisietea vulgaris*, *Phragmitetea*, *Koelerio glaucae-Corynephoretea canescentis*, *Molinio-Arrhenatheretea* (three orders: *Plantaginetalia majoris*, *Molinietalia caeruleae* and *Arrhenatheretalia elatioris*), *Festuco-Brometea* and *Querco-Fagetea*.

Within the synanthropic plant associations of the **class *Artemisietea*** two distinct planthopper communities were distinguished:

1. In the planthopper community connected with association ***Echio-Melilotetum***, the presence of 17-44 species was recorded (Tabs 2 and 3). The seasonal dynamics was most significantly influenced by *Balclutha calamagrostis*, *Stenocranus major*, *Errastunus ocellaris* and *Arthaldeus arenarius* (Tabs 2, 3 and 37). No differential species for this community could be distinguished, and characteristic species included: *Arthaldeus arenarius* (W=81.25), *Balclutha calamagrostis* (W=68.75) and *Mirabella albifrons* (W=50.62) (Tabs 37 and 38). All of them are monophagous, connected with *Calamagrostis epigejos* and very abundant in this association (Nickel & Remane 2002). What is more, all three species were encountered on both plots (Tabs 1 and 2). A high value of fidelity index was also reached by *Eupteryx adspersa* (W=72.73) but, due to a very low abundance and occurrence only on one plot (Tab. 3), it was not classified as characteristic of this community (Tab. 37).

Among the species with their occurrence limited only to *Echio-Melilotetum* plant association (Tab. 37), *Macrosteles frontalis* is worth noticing. In Germany it was reported from a railway substrate (Nickel 2003) and its presence on plot 2 (railway substrate) may indicate a significant relationship with this sort of anthropogenic habitats. Also the presence of *Metalimnus steini* in the community of *Echio-Melilotetum* is interesting because this species was for the first time recorded in Poland only two years ago (Świerczewski & Walczak 2011b). The fact that more species were recorded on plot 2 than on plot 1 throughout the research is interesting as well (Tabs 2 and 3). It is most probably related to a higher number of host plant species on plot 2.

A similar species composition was observed in the planthopper communities connected with anthropogenic ecosystems of coal and zinc bingsteads, and other anthropogenic and ruderal or deteriorated habitats of Upper Silesia overgrown with associations with the presence of *C. epigejos* (Taszakowska, Zimoń – unpublished, Simon & Szwedo 2005). It is manifested by the presence of the same dominant species – *Errastunus ocellaris* and *Balclutha calamagrostis* as well as other common species, such as *Neophilaenus lineatus* or *Elymana sulphurella*. Some similarities were also traced in the seasonal dynamics of abundance, especially in associations with *C. epigejos* on bingsteads in Ruda Śląska and Mikołów, where *B. calamagrostis* was most abundant as well. Higher abundance of this species in summer significantly influenced the dynamics of that community (Simon & Szwedo 2005) – alike Częstochowa. Also the number of recorded species was similar: 20-32 (Taszakowska, Zimoń – data unpublished, Simon & Szwedo 2005).

2. In the planthopper community connected with the association ***Urtico-Aegopodietum podagrariae***, 36-39 species were recorded (Tabs 4 and 5). The most significant species here included: *Eupteryx atropunctata*, *E. aurata*, *E. cyclops*, *E. calcarata*, *Balclutha rhenana*, *Macrosteles laevis* and *M. variatus* (Tabs 4, 5 and 37). *Balclutha rhenana* (W=100), being monophagous on *Phalaris arundinacea* and *Macrosteles variatus* (W=96.79) feeding on *Urtica dioica* (Nickel & Remane 2002) were the differential species for this community with highest values of fidelity index (Tab. 37 and Tab. 39). These species were characterized by low constancy, but occurred on both plots (Tab. 1) where their host plants species were also present (Tab. 44). The characteristic species of this community included *Eupteryx cyclops* (W=94.85) and *E. calcarata* (W=83.27) (Tab. 37) – both monophagous connected with *Urtica dioica* (Nickel & Remane 2002) (Tab. 44). Two polyphagous species: *Eupteryx atropunctata* (W=89.41) and *E. aurata* (W=61.54) may probably be regarded as characteristic (Tab. 37). Their clear connection with this plant association may be supported by high values of fidelity index (Tab. 37) and an exceptionally high abundance of their host plant species belonging to the family Lamiaceae, on both plots (Nickel 2003).

There was a peculiar pattern in the abundance of two main species of this community: *Eupteryx atropunctata* and *E. cyclops*. The first species significantly outnumbered the second in the town centre, in the regularly mowed plant association (plot 3), while the reverse occurred in not mowed herbaceous association in the buffer zone (plot 4). It may be explained by a higher tolerance of *E. atropunctata* to management activities applied in urban greenery (Chudzicka 1981, Nickel 2003).

While analysing the seasonal structure of abundance of planthoppers in this community, increased abundance of *Stenocranus major* in autumn 2006 on plot 4 (Fig. 5) and of *Macrosteles laevis* in summer 2007 on plot 3 (Fig. 4) is striking. It might have been caused by very intense mowing procedures during that periods because they decreased the abundance of populations of oligotopic species such as *Eupteryx atropunctata*, *E. cyclops* and *E. calcarata* (Nickel 2003). It significantly affected the dynamics in other seasons (Figs 4 and 5).The management may have also decreased their abundance through cutting and further removal of plant stems where they feed. Simultaneously, it allowed more efficient collection of *S. major* and *M. laevis* by sweep-netting of the stubble. Thus, it is possible that the observed fluctuations in abundance of *E. atropunctata* are only due to management activities.

The planthopper communities connected to the plant association *Urtico-Aegopodietum podagrariae* have not been subjected to any zoocoenological studies so far. However, at this point it seems to be evident that there exists some similarity in the species composition and structure of abundance to riparian forests of Białołęka Dworska in Warsaw (Chudzicka 1981) and Ojców National Park (Szwedo 1992). It is indicated by high abundance of such species as *Eupteryx calcarata* and *E. urticae* and also by the occurrence of other, less abundant species such as *Megophtalmus scanicus*, *Aphrodes bicinctus* and *Evacanthus interruptus*.

When the communities of two associations from the class *Artemisietea vulgaris* are compared (*Echio-Melilotetum* and *Urtico-Aegopodietum podagrariae*), some differences in both their dominant and accessory species may be found. *Laodelphax striatellus*, *Philaenus spumarius*, *Macrosteles laevis* and *Errastunus ocellaris*, which are polytopic, belonged to a few common species. In *Echio-Melilotetum* there were fewer hygrophilous species (4.55%, 11.76%) than in *Urtico-Aegopodietum podagrariae* (19.44%, 25.64%) (Tab. 43a). A different character of these communities was also supported by dendrograms, which clearly indicated that the community of *Urtico-Aegopodietum podagrariae* contained species common in humid associations such as *Sparganio-Glycerietum fluitantis*, *Phalaridetum arundinaceae* and *Molinietalia caeruleae*, whereas in the community of *Echio-Melilotetum* there were more taxa common in anthropogenic habitats and grasslands (Figs 38 and 39).

Within the reed bed associations of the **class *Phragmitetea*** two distinct though similar planthopper communities were distinguished:

1. In the community connected with the plant association ***Sparganio-Glycerietum fluitantis*** the presence of 55 species was confirmed. The group of most significant species included: *Arthaldeus pascuellus*, *Stenocranus major*, *Struebingianella lugubrina*, *Macrosteles laevis*, *M. sexnotatus* and *Cicadula quadrinotata* (Tabs 6 and 37). No differential species were differentiated here, only a characteristic one, which was *Struebingianella lugubrina*. It scored a high value of fidelity index (W=92.02 – Tab. 37), and furthermore its host plant species, *Glyceria maxima*, was very abundant in this association (Ossiannilsson 1978, Nickel & Remane 2002). *S. lugubrina* reached only the third class of constancy; nonetheless its increased abundance was observed periodically in all study seasons (Tab. 6). A high fidelity value (W=53.54) (Tab. 37 and 39) was also scored by *Macrosteles sexnotatus*, which occurred in all study seasons. However, it is a polyphagous taxon (Nickel & Remane 2002) (Tab. 44) and its connection with the association of *Sparganio-Glycerietum fluitantis* is uncertain. Thus it may be considered as a probably characteristic species (Tab. 37). Additional qualitative research revealed also the presence of 7 species which were monophagous on alder (*Alnus glutinosa*) (Tab. 1).

Taking into account the fact that the community was studied only on one plot, the presented data should be treated only as a preliminary result. The community connected with *Sparganio-Glycerietum fluitantis* has been studied insufficiently so far. The results from Ojców National Park (Szwedo 1992) reported only the presence of six species, so they cannot be perfectly accurate. Similarly developed planthopper communities were observed in associations with *Phragmites australis* in the vicinity of Bukowno (Szwedo data unpublished) and Ruda Śląska (Simon & Szwedo 2005). They indicated high abundance of *Arthaldeus pascuellus*, *Philaenus spumarius* and *Stenocranus major*, which were also abundant in this plant association in Częstochowa. Fragmentary data on the planthopper fauna of similar plant associations come from the Czech Republic (Dlabola 1954), Finland (Ossiannilsson 1978, 1981, 1983) and Germany (Nickel 2003). In their studies on reed bed associations with *Glyceria* spp., the authors noted abundant populations of such species as *Stenocranus major*, *Struebingianella lugubrina*, *Cicadula quadrinotata* and *Arthaldeus pascuellus*. However, in none of these papers can information be found on the influence of *Struebingianella lugubrina* population on of the seasonal dynamics of abundance in early spring (Fig. 6). Thus, further detailed studies of this community need to be conducted.

2. In the community connected with the plant association ***Phalaridetum arundinaceae***, the presence of 36 species was confirmed. The most significant species here included: *Stenocranus major, Notus flavipennis*, *Macrosteles laevis*, *Cicadula flori*, *Cicadula quadrinotata*, *Metalimnus formosus* and *Erzaleus metrius* (Tab. 7). *Erzaleus metrius* (W=92.67), *Metalimnus formosus* (W=76.92) and *Cicadula flori* (W=63.04) were characteristic of this community (Tabs 37 and 39). All the species are hygrophilous and monophagous (Tab. 44) – the former connected with *Phalaris arundinacea*, and the latter two with *Carex acuta*. *Metalimnus formosus* and *Cicadula flori* occurred scarcely and with a low constancy (Tab. 7). However, they were recorded in all study seasons, which indicates their strong relation to the association *Phalaridetum arundinaceae*. The presented data on the community of *Phalaridetum arundinaceae* should be treated only as preliminary results as the study was carried out only on a single plot.

The community connected with *Phalaridetum arundinaceae* has not been studied either in Poland or in other countries so far. Roughly comparable results were obtained in the Biebrza Valley (Gębicki et al. 1982), the vicinity of Ojców (Szwedo 1992), Bukowno (Szwedo data unpublished) and Ruda Śląska (Simon & Szwedo 2005). The reports included many species which also occurred in Częstochowa but not among the dominant ones. Moreover, some similarities in the seasonal dynamics of abundance were observed. The highest abundance of *Stenocranus major* in late summer and early autumn was noted in the results from Bukowno and Ruda Śląska (Szwedo data unpublished, Simon & Szwedo 2005). However, it needs further confirmation.

When two communities of planthoppers connected with class *Phragmitetea* were compared, there occurred some similarities in shares of ecological elements (Tab. 43a) and species composition, although only 23 species (34%) were common (Tab. 1). The group of most important species common to both associations included *Stenocranus major*, *Javesella pellucida*, *Notus flavipennis*, *Cicadula flori* and *C. quadrinotata* (Tab. 1). It is worhwhile to note the lack of *Struebingianella lugubrina* and *Macrosteles sexnotatus* from the community of *Phalaridetum arundinaceae* and absence of *Erzaleus metrius* from the community of *Sparganio-Glycerietum fluitantis* (Tab. 37). The differences between the communities connected with the associations of the class *Phragmitetea* were confirmed by cluster analysis, which separated them by high distances between nodes (Figs 38 and 39). However, dendrograms show a significant similarity of the community of *Sparganio-Glycerietum fluitantis* (plot 5) to some communities connected with humid meadows of *Molinietalia caeruleae* (Fig. 38 and 39). Similarly, the community of *Phalaridetum arundinaceae* (plot 6) was clustered closely to the community of the class *Artemisietea: Urtico-Aegopodietum* *podagrariae* (Fig. 38) and even with *Echio-Melilotetum* (Fig. 39). Nonetheless, the PCA analysis clustered the communities of the class *Phragmitetea* closely to the communities connected with moist associations of the order *Molinietalia caeruleae* (Fig. 37).

Within the psammophilous grasslands of the **class *Koelerio glaucae-Corynephoretea canescentis*** two planthopper communities were distinguished:

1. In the community connected with the plant association ***Spergulo vernalis-Corynephoretum*** the presence of 39-52 species was confirmed. The group of most significant species comprised: *Psammotettix excisus*, *Stenocranus major*, *Kosswigianella exigua*, *Muirodelphax aubei*, *Neophilaenus minor*, *Chlorita paolii*, *Neoaliturus guttulatus*, *Neoaliturus fenestratus*, *Doratura exilis*, *Rhopalopyx vitripennis*, *Laburrus impictifrons*, *Psammotettix confinis* and *Turrutus socialis* (Tabs 8, 9 and 37). A very high number of differential and characteristic species was distinguished (Tab. 37). The differential species included: *Neophilaenus minor* (W=100), *Psammotettix excisus* (W=100) and *Laburrus impictifrons* (W=98.46). *Neophilaenus minor* is trophically connected with *Artemisia campestris* and two other species with *Corynephorus canescens* (Nickel 2003, Świerczewski 2007). Besides high fidelity, they also scored high constancy and were present on all plots in all three seasons (Tabs 8 and 9). The group of characteristic species comprised: *Neoaliturus fenestratus* (W=92.59), *Doratura exilis* (W=87.50), *Neoaliturus guttulatus* (W=85.71), *Muirodelphax aubei* (W=51.22) and *Kosswigianella exigua* (W=50.36) (Tab. 37 and 39). Despite quite low constancy, they were collected on all study plots where their host plant species grew (Nickel 2003, Świerczewski 2007). All of them are xerophilous and either monophagous or oligophagous (Tab. 44) and have been already reported from sandy habitats (Schiemenz 1969, Witsack 1997, Nickel 2003, Świerczewski 2004). In psammophilous habitats also *Doratura impudica* (W=83.33) occurred (Tab. 37). It is however connected with expansive plants such as *C. epigejos* and *Elymus* spp., which intrude upon psammophilous grasslands (Nickel & Remane 2002), so this species cannot be included into the list of characteristic species. Besides, *D. impudica* was not abundant and scored a low value of constancy index (Tabs 37 and 39). The remaining species of this community were classified as accessory species, with two interesting xerophilous species: *Rhytistylus proces* and *Psammotettix nodosus* (Tab. 44). Their connection with this habitat is not accidental as their occurrence in similar plant associations of central and northern Europe is widely documented (Ossiannilsson 1981, 1983, Świerczewski & Wojciechowski 2009, Malenovský & Lauterer 2010). However, at this point of research it is difficult to evaluate the degree of their relationship with this plant associations because very few specimens were actually found (Tab. 8 and 9).

Similarly developed planthopper communities of the psammophilous grasslands are reported in Poland from the vicinity of Wodzisław Śląski (Marszałek data unpublished), the Błędowska Desert (Jasińska 1980), Janów Lubelski (Bednarczyk & Gębicki 1998), Szczakowa and Bukowno (Szwedo data unpublished) and Olsztyn (Świerczewski & Wojciechowski 2009). They are also reported from Germany (Schiemenz 1969, Witsack 1997). It seems that the community from Częstochowa is the richest in species (61 species totally) when compared to other communities: Marszałek (data unpublished) – 28 species, Jasińska (1980) – 91, Bednarczyk and Gębicki (1998) – 41, Szwedo (data unpublished) – 24, Świerczewski and Wojciechowski (2009) – 46 and Witsack (1997) – 25. The data suggest that only the Błędowska Desert was richer in species, but the research (Jasińska 1980) was carried out on more than a dozen plots. The communities of psammophilous grasslands of Poland and

Germany share many common species, especially among the dominant ones; these include *Neophilaenus minor* and *Psammotettix excisus*, both being trophically connected with grass *Corynephorus canescens* – the main component of flora in central European psammophilous grasslands. *Psammotettix excisus* was earlier considered to be characteristic of grasslands of deteriorated areas in Jaworzno-Szczakowa and Bukowno (Szwedo data unpublished), but also of natural associations in the vicinity of Olsztyn (Świerczewski & Wojciechowski 2009). The importance of *Neophilaenus minor* and *Psammotettix excisus* in the seasonal dynamics of abundance should be highlighted, as it is confirmed by studies in Jaworzno-Szczakowa, Bukowno and Olsztyn (Szwedo data unpublished, Świerczewski & Wojciechowski 2009), where it was as significant as on the study plots of Częstochowa. During his studies in Germany in 1969, Chinamen regarded *Neophilaenus minor* and *Psammotettix excisus* to be characteristic of plant association *Spergulo vernalis-Corynephoretum*. But the study of the same plant association in Janów Lubelski (Bednarczyk & Gębicki 1998) yielded contrary results, indicating highly abundant *Ribautodelphax pallens* and *Doratura exilis* to be characteristic. However, the former was not collected in Częstochowa and the latter was very rare.

2. In the planthopper community connected with the association ***Diantho-Armerietum elongatae*** a total of 54 species was recorded, among which the most important ones were represented by *Ribautodelphax collinus*, *Chlorita paolii*, *Macrosteles laevis*, *Mocydiopsis parvicauda*, *Rhopalopyx adumbrata*, *Psammotettix confinis*, *Errastunus ocellaris*, *Turrutus socialis* and *Jassargus pseudocellaris* (Tabs 10 and 37). The population of *Ribautodelphax collinus* fluctuated over the years from a subdominant position in 2006, to accessory in 2007 and superdominant one in 2008 (Fig. 10). It must be noted that in 2007 all dominant species decreased in abundance, which could have been influenced by weather conditions. However, there are some similarities in the seasonal abundance of the main dominant species in 2006 and 2008; they are presented in Fig. 10. It is probable that *Ribautodelphax collinus* may sometimes compete for food with oligophagous species such as *Psammotettix confinis* or *Turrutus socialis*. Similar tendencies for dominant species to occur in large numbers in a single season in the community of association *Diantho-Armerietum elongatae* were already observed by Świerczewski and Wojciechowski (2009). Irregularities in occurrence of some dominant species may indicate instability of the community structure triggered by processes of natural succession or anthropogenic factors.

No differential species for this community could be distinguished. *Ribautodelphax collinus* (W=51.97) was classified as a characteristic species, and *Mocydiopsis parvicauda* (W=56.67) and *Rhopalopyx adumbrata* (W=59.09) as probably characteristic ones (Tabs 37 and 39). The first two species feed on *Agrostis capillaris* while the third on *Festuca* spp. (Nickel & Remane 2002, Świerczewski 2007) (Tab. 44). Although *Mocydiopsis parvicauda* and *Rhopalopyx adumbrata* were collected only in small numbers, they occurred quite regularly and on the study plots with the species of their host plants. High values of fidelity index were scored by *Hephathus nanus* (W=55.56) and *Utecha lugens* (W=54.55), but resulting from their scarce abundance and lack of clear trophic connections, they were not classified as characteristic (Tab. 10, 37 and 39). Other species were classified as accessory species. Among them, the following are interesting due to their rarity: *Eurybregma nigrolineata*, *Tettigometra impressopunctata* and *Zyginidia pullula* (Gaj & Drożdż-Gaj 2005, Świerczewski & Wojciechowski 2009, Świerczewski & Walczak 2011b).

This community was studied only on a single plot so the presented data need implementation by further research. The community connected with *Diantho-Armerietum* *elongatae* has been poorly studied and was described for the first time from the vicinity of Olsztyn by Świerczewski and Wojciechowski as recently as in 2009. The authors reported the occurrence of 69 species. Even in Germany it was neglected during research, as only two publications dealt with it – Schiemenz (1969) and Nickel and Hildebrandt (2003). The former author conducted research in eastern Germany and reported as many as 30 species, while the latter in northern Germany and reported only 23 species. After comparing the communities of Częstochowa with those in northern Germany (Nickel & Hildebrandt 2003), only a single common dominant species can be indicated – *Psammotettix confinis*. The comparison with eastern Germany results (Schiemenz 1969) showed two common dominants – *Chlorita paolii* and *Turrutus socialis*. The communities of Olsztyn and Częstochowa had the highest number of common dominant species – 4: *Ribautodelphax collinus*, *Chlorita paolii*, *Macrosteles laevis* and *Turrutus socialis*. Both these psammophilous grasslands also shared the highest number of common species among other classes of dominance – 36, which is probably connected with a similar degree of development of these closely located grasslands.

The planthopper communities connected with the class *Koelerio glaucae-Corynephoretea canescentis* featured a high number of xerophilous (31.48-53.85%) and heliophilous (50.00-66.67%) species, which was earlier observed by many authors (Witsack 1997, Nickel & Hildebrandt 2003, Świerczewski & Wojciechowski 2009). After comparing the species composition of communities in both phytocoenoses, *Spergulo vernalis-Corynephoretum* and *Diantho-Armerietum elongatae*, a high number of common species was recorded – 49% (Tab. 1), which is reflected in dendrograms made by cluster analysis. The first dendrogram (Fig. 38), based on the abundance of all species, clustered both communities in a single clade but with long distances. The second dendrogram (Fig. 39) based on the abundance of dominant species, similarly clustered these communities in distant clades with long distances. However, PCA analysis clustered them very close to each other (Fig. 37). The analysis showed similarities of both communities in accessory species but differences in dominant species. It also indicated a very close relationship of the community of *Diantho-Armerietum elongatae* (plot 9) to communities of anthropogenic associations *Lolio-Polygonetum arenastri* and *Arrhenatheretum elatioris*.

Within the grassy associations of the **class *Molinio-Arrhenatheretea***, eight planthopper communities were distinguished:

1. In the community connected with the association ***Lolio-Polygonetum arenastri,*** the presence of 49-56 species was confirmed. *Dicranotropis hamata*, *Macrosteles laevis*, *Doratura stylata*, *Psammotettix confinis* and *Errastunus ocellaris* were very abundant in all seasons – representing the group of ubiquitous species, whose high abundance indicates a disturbed balance in the community and the plant association (Andrzejewska 1962, Pisarski & Trojan 1976, Gębicki et al. 1977, Chudzicka 1986, Walczak 2005). Most important species here comprised *Macrosteles laevis*, *Javesella pellucida*, *Deltocephalus pulicaris*, *Doratura stylata*, *Euscelis incisus* and *Psammotettix confinis* (Tabs 11, 12, 13, 14 and 37). From six species with the highest values of fidelity (Tab. 37) only *Deltocephalus pulicaris* can be regarded characteristic of this community (Tab. 39). Moreover, the research conducted in Częstochowa revealed high preference of this species to inhabit town lawns, industrial areas, barrens and other habitats under a strong human impact. It was present on 9 of 13 such plots (plots: 2 – *Echio-Melilotetum*; 10, 11, 12 and 13 – *Lolio-Polygonetum arenastri*;

23 and 24 – *Arrhenatheretum elatioris*, 25 – *Achillea millefolium-Taraxacum officinale*, 26 – *Dactylis glomerata*, Tab. 1). The connection of *D. pulicaris* with the above mentioned associations seems to be even more significant in the light of the fact that it is almost absent from other plots (except for plots: 5, 19, 20, 30, 31, and 34 where only single specimens were collected). Summarising, *D. pulicaris* proved to be an even better indicator of human pressure in urban environment than *M. laevis* – so far a standard species in environmental monitoring (Andrzejewska 1962, Walczak 2005). Other taxa showed low abundance and constancy and their occurrence was limited only to single plots.

In regard to its species composition, the studied community strongly resembles other planthopper communities described in urban greenery of Warsaw (Chudzicka 1986, Kubicka et al. 1986) and Sosnowiec (Walczak 2005). It is especially clear, when we take into account the dominant species which are common to all urban communities; the group consists of *Javesella pellucida*, *Macrosteles laevis*, *Deltocephalus pulicaris*, *Psammotettix confinis* and *Arthaldeus pascuellus*. Also a set of results from the Theses conducted on the planthoppers in urban greenery of Katowice (Bokłak, Cebo data unpublished), Będzin (Furman data unpublished) and Zabrze (Mokrzycka data unpublished.) supports these data. As in Częstochowa, the same single species in a class of superdominant was most numerous in the planthopper communities presented in those works. It is well illustrated in the figures of seasonal abundance dynamics (Fig. 11, 12, 13 and 14), which are similar to seasonal abundance of *M. laevis* in Warsaw (Chudzicka 1986), Katowice (Bokłak data unpublished) and Zabrze (Mokrzycka data unpublished). It is also consistent with earlier conclusions of Chudzicka (1981), who observed that planthoppers react to human-induced changes in environment by altering the abundance of particular species in their community. The existence of the superdominant species indicates strong anthropogenic pressure, disrupting so far balanced ecosystems (Andrzejewska 1962).

The planthopper community connected with plant association *Lolio-Polygonetum arenastri* in Częstochowa is rather homogenous, which is proven by cluster analysis; it grouped communities on plots 10-13 into common or near clusters (Fig. 38, 39). Despite low values of species diversity and evenness in these communities (Tab. 38), it must be highlighted that in total, a third part of all species was collected in this plant association. The number may get even higher by including 26 species collected with qualitative methods in the areas neighbouring these plots (Tab. 1). The planthopper faunas occurring on particular plots exhibit significant similarities in shares of some ecological elements, especially mesohigrophilous (61.22-71.15%) and mesoheliophilous (44.90%-65.38%) species. The community connected with *Lolio-Polygonetum arenastri* also featured high shares of heliophilous and eurytopic elements (30.77-55.10% and 37.25-48.08%: Tab. 43a and 43b, respectively), which was earlier indicated by other authors (Bokłak, Cebo data unpublished, Chudzicka 1986, Kubicka et al. 1986).

2. In the community connected with the plant association ***Valeriano-Filipenduletum***, the presence of 61 species was recorded. The group of most important ones comprised *Cercopis vulnerata*, *Cicadella viridis*, *Eupteryx lelievrei*, *Cicadula quadrinotata*, *Athysanus argentarius* and *Arthaldeus pascuellus* (Tabs 15 and 37). *Eupteryx lelievrei* (W=75.00) (Tab. 37 and 39) was classified as a characteristic species. It is monophagous on *Betonica officinalis*. Two species, *Cercopis vulnerata* and *Cicadella viridis*, were classified as probably characteristic because it was difficult to establish their relationship to particular host plant species despite high fidelity (W=77.63 and W=53.88, respectively) (Tab. 37 and 39) and significant abundance in all study seasons (Tab. 15). Non-abundant species were classified

as accessory, with a single species worth noticing – *Macrosteles septemnotatus*. It feeds on *Filipendula ulmaria* – an important species in this plant association (Nickel & Remane 2002). Species such as *Aphrophora salicina* and *Chloriona glaucescens*, which were present in this community, probably migrated from the nearby reed bed association and willow shrubs, where they are typically encountered (Logvinenko 1975, Nickel 2003, Söderman 2007).

The presented data on the planthopper community connected with plant association *Valeriano-Filipenduletum* are far from being complete, as it was studied only on a single plot. Thus, subsequent research seems necessary to confirm the observations. The plant association *Valeriano-Filipenduletum* is one of the richest in species (Matuszkiewicz 2008) and a suitable habitat for numerous monophagous species of planthoppers and leafhoppers typical of wet habitats.

Similarly developed communities connected with the plant association *Filipendulion ulmariae* were studied in the Biebrza Valley (Gębicki et al. 1982) and in the Stołowe Mts (Gaj et al. 2009), with such common species as *Neophilaenus lineatus*, *Aphrophora alni*, *Aphrodes makarowi*, *Notus flavipennis*, *Macrosteles septemnotatus* and *Verdanus abdominalis*. However, it is noticeable that there was high abundance of *Cicadella viridis*, *Cicadula quadrinotata* and *Arthaldeus pascuellus* in the community of Częstochowa. Hence, there are significant differences in the seasonal dynamics of abundance between the community in Częstochowa and those studied in the Biebrza Valley and the Stołowe Mts (Gębicki et al. 1982, Gaj et al. 2009). The community of Częstochowa was also characterized by a higher number of species (Tab. 15) – in comparison the Stołowe Mts with 27 species (Gaj et al. 2009), the Biebrza Valley with only 10 (Gębicki et al. 1982).

3. In the community connected with the plant association ***Cirsietum rivularis***, the presence of 36-47 species was recorded. The group of most important ones comprised: *Psammotettix cephalotes*, *Cicadula quadrinotata*, *Javesella pellucida*, *Notus flavipennis*, *Macrosteles laevis*, *Arthaldeus pascuellus* and *Sorhoanus assimilis*. However, it must be noted, that there was a low percentage of common species (32%) on two plots, both in dominant species as well as in accessory species (Tab. 1). There were also some discrepancies in the seasonal dynamics of abundance between the plots (Figs 16 and 17), which may be explained be different successional stages of plant associations there. It probably influenced the species composition and the abundance of dominant and accessory species.

Among the species collected on plot 15, one, *Sorhoanus assimilis* was classified as characteristic (W=50.01) of the variety of *Cirsietum rivulare* with natural character (Tab. 37 and 39). A few factors were decisive for such an interpretation including the regularity of its occurrence in all study seasons (Tab. 1), the presence of its host plant species (*Carex* spp.) (Nickel 2003) (Tab. 44) and high constancy (third class in one of the seasons) (Tab. 16). Basing on a high fidelity value (W=98.66) (Tab. 37) and also on high abundance and constancy (Tab. 16), the species *Psammotettix cephalotes* was classified as differential for the community connected with a degraded variety of association *Cirsietum rivulare*, which overgrew plot 16. In this association its host plant species – *Briza media* (Nickel & Remane 2002) – also occurred, which confirmed its strong relationship with this plant association. It is worth noticing that *Psammotettix cephalotes* was earlier considered to be a characteristic species of grasslands *Nardo-Callunetea* (Gaj et al. 2009) and *Festuco-Brometea* (Szwedo 1992). It is possible that this species reaches high abundance and constancy also in other plant associations of the open character but with disturbed water supply if its host plant species is present in the association. High abundance of this species may result from increased human pressure there. It is interesting that on plot 15 *P. cephalotes* was not collected, but other species such as: *Notus flavipennis*, *Cicadula quadrinotata* and *Sorhoanus assimilis* were very abundant. It is possible that on this plot *P. cephalotes* has been replaced by other species, whose number decreases as a result of human activity.

Due to significant differences between the communities of both these plots, they should be treated as separate types of community: the first one connected with a natural variety of *Cirsietum rivulare* (plot 15) and the second connected with a degraded variety of the same plant association (plot 16). Also cluster analysis confirmed such a conclusion, separating either plot by quite long distances (Figs 38 and 39). However, PCA analysis placed both plots very close to each other, in a single cluster (Fig. 37).

The planthopper communities connected with plant association *Cirsietum rivularis* have already been the subject of a few studies: in the vicinity of steel works "Katowice" (Klimaszewski et al. 1980a), the vicinity of Olsztyn (Szwedo 1992) and in the Stołowe Mts (Gaj et al. 2009). The planthopper communities in the Stołowe Mts comprised 15-23 species (Gaj et al. 2009), in the vicinity of steel works "Katowice" 30-41 species (Klimaszewski et al. 1980a), while in the vicinity of Ojców 27 species (Szwedo 1992). In comparison to other planthopper communities, these in Częstochowa seem to be richer in species (Tab. 15 and 16). The community on plot 15 resembles in its species composition the faunas of natural habitats in national parks (Szwedo 1992, Gaj et al. 2009), which is confirmed by the occurrence of common dominant species: *Notus flavipennis*, *Sorhoanus assimilis* and *Arthaldeus pascuellus*. Some of them abundantly occurred in the area of steel works "Katowice" in a habitat similar to *Cirsietum rivularis* and under a strong impact from human activities (Klimaszewski et al. 1980a). The degree of similarity between a plot-15 community and the ones in the presented literature seems to be greater than that between the communities in plots 15 and 16 in Częstochowa. It is clearly evident when accessory species are regarded and leads to a conclusion that the impact of human activity and the degree of habitat distortion are more important for the species composition and community structure than a purely phytosociological similarity. It also shows planthopper communities as sensitive bioindicators of changes in habitat under human pressure (Andrzejwska 1965, Klimaszewski et al. 1980a and 1980b, Nickel 2003).

4. In the community connected with plant association ***Scirpetum silvatici***, a total of 38-40 species was recorded, among which the following were most important: *Notus flavipennis*, *Cicadula frontalis*, *C. quadrinotata*, *Kelisia praecox*, *Stenocranus fuscovittatus*, *Javesella pellucida* and *Macrosteles laevis* (Tab. 18, 19 and 37). One of them – *Cicadula frontalis* should be considered a differential species due to its high fidelity (W=100) and the occurrence on both study plots (Tab. 37 and 39). It is also supported by the presence of its host plants (*Carex* spp.) in the association. The group of characteristic species comprises: *Kelisia praecox* (W=92.39), *Stenocranus fuscovittatus* (W=81.12), *Notus flavipennis* (W=50.09) and *Cicadula quadrinotata* (W=55.21) (Tab. 37). Such a classification is supported by their high constancy (second or third classes), the occurrence on both plots in all study seasons (Tabs 18 and 19) and the presence of their host plant species (*Carex* spp.) in the association. High fidelity was also reached by *Cicadula saturata* (W=56.25) (Tabs 37 and 39) but due to its low abundance, low constancy and the presence on a single plot only, it was difficult to consider it characteristic of this community.

The presented data are the first report on the planthopper community connected with association *Scirpetum silvatici*. Roughly similar results were obtained in studies concerning plant associations with *Holcus lanatus* in the Stołowe Mts (Gaj et al. 2009) and in wet meadows with *Carex* in northern Germany (Nickel & Hildebrandt 2003). In all those communities the common species included the dominant ones: *Notus flavipennis* and *Cicadula quadrinotata*. However, they were characterised by a lower number of species: 34-35 in the Stołowe Mts and only 13 in Germany. Also, in the Stołowe Mts fewer hygrophilous species were recorded than in Częstochowa. At this point, the study on the planthopper community of the plant association from the related alliance *Calthion conducted* in the Biebrza Valley (Gębicki et al. 1982) should be mentioned. There were 28 species recorded there, but the dominant species included *Florodelphax leptosoma*, *Limotettix striola*, *Streptanus confinis* and *Arthaldeus striifrons*, which have not been recorded in Częstochowa.

5. In the community connected with plant association ***Alopecuretum pratensis***, a total of 55-67 species were recorded, among which the following ones were most important: *Macrosteles laevis*, *Chlorita paolii*, *Arthaldeus pascuellus*, *Muellerianella fairmairei*, *Javesella pellucida*, *Deltocephalus pulicaris* and *Errastunus ocellaris* (Tabs 20, 21 and 37). The differential species could not be established although three species, *Euconomelus lepidus*, *Paraliburnia adela* and *Anoscopus serratulae*, were encountered only in this plant association (W=100) (Tab. 37). However, they were found only on a single study plot and only sporadically (Tabs 20 and 21). One characteristic species could be distinguished, *Muellerianella fairmairei* (W=51.64) (Tabs 37 and 39), which feeds on *Holcus lanatus*. One species may be considered as probably characteristic – a polyphagous *Arthaldeus pascuellus* (W=50.40) (Tabs 37 and 39). It was classified into the second class of constancy on both plots and also occurred in all study seasons (Tabs 20 and 21). High fidelity was also reached by *Macrosteles viridigriseus* (W=84.21), *M. ossiannilssoni* (W=79.75), *Limotettix striola* (W=66.67), *Javesella obscurella* (W=61.54) and *Streptanus sordidus* (W=56.52) (Tab. 37) but due to their low abundance, usually limited to a only single study plot and low constancy, they were not included into the set of characteristic species. It is worth noting that most of these species are higrophilous (except for *M. ossiannilssonii*) (Tab. 44), which indicates a medium connection to this plant association.

In Poland the planthopper community connected with *Alopecuretum pratensis* was already studied only in the Stołowe Mts (Gaj et al. 2009), and in northern Germany in the Łaba River Valley (Nickel & Hildebrandt 2003). Those communities shared common features with the one in Częstochowa in respect of the abundance of dominant species as well as in the species composition. It is reflected in the dominance of such species as: *Arthaldeus pascuellus*, *Deltocephalus pulicaris* and *Errastunus ocellaris*. A clear difference refers to the abundance of *Macrosteles laevis*, which in Częstochowa was a superdominant species, while in the latter communities was a merely accessory one. The community connected with *Alopecuretum pratensis* in Częstochowa was strikingly rich in the collected species (Tab. 20 and 21), especially if we compare it with numbers of species recorded in other papers: the Stołowe Mts 23-26 species (Gaj et al. 2009) and Germany 14-21 species (Nickel & Hildebrandt 2003).

The above described four communities were connected with the moist associations of the class *Molinio-Arrhenatheretea* of the order *Molinietalia caeruleae* and deserve a separate comparison. Among them the highest number of species was reached by the community connected with *Alopecuretum pratensis* while the lowest by the community of *Scirpetum silvatici* (Tab. 1). Many similarities have been revealed in respect of the seasonal dynamics of abundance. The group of main species in the communities connected with the order Molinietalia caeruleae (in all plots) comprised *Macrosteles laevis*, *Arthaldeus pascuellus*, *Notus flavipennis* and *Cicadula quadrinotata* (Tab. 1). The accessory taxa included *Cicadella viridis*, *Forcipata citrinella* and *Athysanus argentarius* as more significant species because they clearly preferred this type of plant associations and occurred abundantly and with high regularity (Nickel 2003).

Dendrograms revealed the separateness of a degraded variety of association *Cirsietum rivularis* (plot 16), which in respect of the species composition clearly resembled communities developed in anthropogenic phytocoenoses of the orders *Plantaginetalia majoris* and *Arrhenatheretalia elatioris* (Figs 38 and 39). The analysis of ecological elements revealed the rarity of hygrophilous species on this plot – their share constituted merely 13.89%, which is a level similar to that in *Lolio-Polygonetum arenastri* (Tabs 43a and 43b). On other plots the share of hygrophilous species ranged between 25.37-47.37% (Tab. 43b). The planthopper faunas on plots 14, 15, 17, 18, 19 and 20 showed significant similarities in the species composition, hence they may be considered homogenous. Also the communities connected with other moist associations, *Urtico-Aegopodietum podagrariae*, *Sparganio-Glycerietum fluitantis* and *Phalaridetum arundinaceae*, which belong to other phytosociological classes (Figs 38 and 39), were somewhat similar. Their similarity to communities from Molinietalia caeruleae was explicitly indicated in the PCA analysis (Fig. 37). But these similarities need to be confirmed by studies focused on communities developed at various stages of natural succession in particular phytocoenoses.

Among other communities connected with the class *Molinio-Arrhenatheretea*, the following could be distinguished:

6. The community connected with the association ***Arrhenatheretum elatioris***, where a total of 36-56 species was recorded, and the main species comprised *Macrosteles laevis*, *Stenocranus major*, *Megadelphax sordidulus*, *Ribautodelphax collinus*, *Javesella pellucida*, *Cicadula persimilis*, *Doratura stylata*, *Euscelis incisus*, *Errastunus ocellaris*, *Turrutus socialis*, *Jassargus pseudocellaris* and *Arthaldeus pascuellus* (Tabs 22, 23, 24 and 25).

It was impossible to distinguish the characteristic or differential species of this community despite high values of fidelity reached by several species, e.g. *Eupteryx thoulessi* and *Endria nebulosa*, both scored W=100 (Tab. 37). None of the species with high fidelity indices was abundant and they occurred with low constancy (Tabs 22, 23, 24 and 25). Thus, they could not be regarded as either characteristic or differential. Among the accessory species, *Eurybregma nigrolineata*, *Jassidaeus lugubris*, *Micantulina stigmatipennis*, *Eupteryx thoulessi*, *Zyginidia pullula* and *Endria nebulosa* were notable. They represent a group of rarely collected species or are new to Polish fauna (Chudzicka 2004, Świerczewski 2004, Gaj & Drożdż-Gaj 2005, Świerczewski & Walczak 2011b, Walczak 2011). This, however, indicates a high biological diversity in the studied region.

The most important research on the planthopper fauna of meadows in Poland was conducted in the area of Mazowiecka Lowland, where the presence of 74 species was recorded (Chudzicka 1989). The dominant species, common to the communities of Częstochowa included *Macrosteles laevis*, *Javesella pellucida* and *Arthaldeus pascuellus*. Also in the regions of steel works "Katowice" (Gębicki et al. 1977, Gębicki 1979), the Stołowe Mts (Gaj et al. 2009) and the vicinity of Oświęcim (Jedynowicz data unpublished) the studies on planthopper communities in meadows of the order *Arrhenatheretalia elatioris* were conducted. However, the communities there typically contained a lower number of species: Chudzicka (1989) reported the presence of 32-46 species, Gębicki (1979): 20-26, Gaj et al. (2009): 18-35 and Jedynowicz (data unpublished): 32-48. All those communities were characterized by significant dominance of *Macrosteles laevis* and the presence of such common species as *Macrosteles laevis*, *Megadelphax sordidulus*, *Arthaldeus pascuellus* and *Javesella pellucida* (Chudzicka 1989, Gębicki 1979, Gaj et al. 2009 and Jedynowicz data unpublished). Also the seasonal dynamics of abundance in the cited studies was similar to that in Częstochowa. In the Stołowe Mts no characteristic or differential species of this community could be distinguished either (Gaj et al. 2009) and similar shares of mesoheliophilous, mesohigrophilous and oligophagous species were observed (Tab. 43c).

Andrzejewska (1976) conducted interesting studies on the influence of fertilizers applied in meadows on the abundance of planthoppers in the community. Beyond Poland, the most significant research concerning the fauna of planthoppers in association *Arrhenatheretum elatioris* was conducted in Great Britain (Morris 1981a, 1981b) and in the Czech Republic (Doskočil & Hůrka 1962). The results from Częstochowa support those presented by Morris (1981a, 1981b) and indicate that the representatives of Auchenorrhyncha in this community reach the highest abundance in late summer (July-September) when adult individuals predominate. The community in Great Britain was also characterized by high abundance of such species as: *Macrosteles laevis, Euscelis incisus*, *Errastunus ocellaris* and *Arthaldeus pascuellus*. A very similar species composition and structure of abundance were presented for the communities in the Czech Republic (Doskočil & Hůrka 1962), where the dominant species comprised *Javesella pellucida* and *Arthaldeus pascuellus*.

7. The community connected with the association ***Achillea millefolium-Taraxacum officinale***, where a total of 35 species was recorded, and the main species included *Macrosteles laevis*, *Chlorita paolii*, *Doratura homophyla*, *Psammotettix confinis* and *Turrutus socialis* (Tabs 26 and 37). Differential species could not be distinguished but a single characteristic one was recognized, which was *Chlorita paolii* (Tab. 39). It is an oligophagous species, feeding on *Achillea millefolium*; it reached high values of constancy (the first and second classes) and fidelity (W=50.51) (Tab. 37). There is also one probably characteristic species, polyphagous *Doratura homophyla* (Tab. 39), which was very abundant and reached a high value of fidelity (W=80.83) and the third class of constancy (Tabs 26 and 37). In this community there were very high shares of heliophilous and eurytopic species (54.29% and 45.71%, respectively) (Tab. 43c), which is similar to their shares in the community of *Lolio-Polygonetum arenastri* (Tabs 43a and 43b).

The communities connected with lane greenery were already studied by several authors (Bokłak, Cebo data unpublished, Chudzicka 1986), who showed that such communities may be quite species-rich e.g. Chudzicka (1986) collected 61 species of planthoppers in Warsaw while Bokłak (data unpublished) collected 40 species at the main roundabout in Katowice. They were characterized mainly by vast occurrence of ubiquitous species, such as *Macrosteles laevis*, *Doratura stylata* and *Psammotettix confinis*, which were also very abundant in Częstochowa. Moreover, there were some similarities in the seasonal dynamics of abundance. Alike Częstochowa (Fig. 26), the most significant species included *Macrosteles laevis* and *Chlorita paolii*. The vast occurrence of *Doratura homophyla* on plot 25 should be highlighted, which is similar to observations in Warsaw (Chudzicka 1986). According to Dr. Edyta Sierka, who consulted the phytosociological character of the studied plots, this particular plot was extremely affected by intense traffic and polluted with salt applied for road de-icing. It seems that the increased abundance of *Doratura homophyla* may serve as a useful indicator of salinization of habitats near urban roads. However, it needs to be determined in further research.

8. In the community connected with the association ***Dactylis glomerata***, the number of 38 species was recorded. The group of most important species comprised *Macrosteles laevis*, *Stenocranus major*, *Javesella pellucida*, *Empoasca pteridis*, and *Chlorita paolii* (Tab. 27). No characteristic or differential species could be distinguished (Tab. 39) and all species showed low values of fidelity index (Tab. 37).

The fauna of planthoppers connected with the plant association with *Dactylis glomerata* was studied only in the Stołowe Mts (Gaj et al. 2009), where 26 species were recorded. It is fewer than in Częstochowa (Tab. 27). The compared communities did not show many similarities, except for the presence of common, ubiquitous species: *Laodelphax striatellus*, *Philaenus spumarius* and *Elymana sulphurella*. Besides, many differences were found, especially among the species with higher classes of abundance, which in the Stołowe Mts included *Cicadula persimilis* and *Elymana sulphurella*. Also the seasonal dynamics of abundance was different due to other dominant species. This community is poorly studied, but its structure clearly indicates its relation the community connected with *Arrhenatheretum elatioris* (Fig. 38 and 39) e.g. by the occurrence of such common species as *Stenocranus major*, *Ribautodelphax collinus*, J*avesella pellucida*, *Macrosteles laevis*, *Elymana sulphurella*, *Doratura stylata*, *Euscelis incisus*, *Errastunus ocellaris* and *Turrutus socialis*, which were very abundant in these two communities in Częstochowa.

Among the discussed communities connected with the plant associations of the class <u>*Molinio-Arrhenatheretea*</u>, the last three communities are connected with meadows of the order <u>*Arrhenatheretalia elatioris*</u>. They deserve a more detailed comparison due to their close relationship and many similarities, especially in common species and ecological elements. Cluster analysis indicated their close relationship suggesting they should be placed in a single circle of communities (study plots: 21, 22, 23, 24, 25 and 26) (Figs 38 and 39). On all plots belonging to order *Arrhenatheretalia elatioris* the heliophilous and eurytopic taxa were very abundant (38.64-54.29% and 41.07-50.00%, respectively) (Tab. 43c). All communities connected with order *Arrhenatheretalia elatioris* were characterized by significant abundance of a single species, *Macrosteles laevis*, which reached a class of either superdominant or eudominant species (Tab. 22-27).

The planthopper fauna of managed meadows is well studied, both in Poland and in the adjacent countries (Doskočil & Hůrka 1962, Gębicki et al. 1977, Gębicki 1979, Morris 1981a, 1981b Chudzicka 1989, Gaj et al. 2009). In Poland, the communities connected with plant association *Arrhenatheretum elatioris* (Andrzejewska 1976, Chudzicka 1989) have been well studied. However, the communities connected with associations with *Dactylis glomerata* and *Achillea millefolium-Taraxacum officinale* have not been adequately examined and require further research.

The studies conducted in Częstochowa allowed to distinguish 8 communities connected with class <u>*Molinio-Arrhenatheretea*</u>, including a single one connected with *Plantaginetalia majoris*, four with *Molinietalia caeruleae* and three with *Arrhenatheretalia elatioris* (Tab. 37). A high degree of diversity of planthopper fauna, confirmed by high values of Brillouin's, Shannon-Weaver's and Simpson's indices was reached on plots 14 and 19, whereas the value was low on plot 16 (Tab. 38). The cluster analysis indicated the presence of two circles of communities: one connected with moist association of *Molinietalia caeruleae* (except for a degraded variety of *Cirsietum rivularis*) and the other comprising communities of anthropogenic associations *Plantaginetalia majoris* and *Arrhenatheretalia elatioris* (Figs 38 and 39). In respect of species composition, the latter is also closely clustered with grassland communities – *Koelerio glaucae-Corynephoretea canescentis* and *Festuco-Brometea* and community of the degraded variety of *Cirsietum rivularis* (Figs 38 and 39).

Within the xerothermic grasslands of the **class *Festuco-Brometea***, three planthopper communities were distinguished:

1. In the community connected with the association ***Festucetum pallentis***, 44 species were recorded. The group of most important species comprised *Turrutus socialis*, *Erythria aureola*, *Emelianoviana mollicula*, *Fieberiella septentrionalis* and *Arocephalus languidus* (Tabs 28 and 37). No differential taxa could be distinguished and only two characteristic species were identified: *Erythria aureola* (W=94.55) and *Emelianoviana mollicula* (W=59.3) (Tabs 37 and 39). Both reached the third class of constancy (Tab. 28) and were trophically connected with plants occurring in the studied phytocoenoses. The first is an oligophagous species connected, among others, with *Thymus pulegioides* and the second is poliphagous, in this community connected mainly with various species in the family Lamiaceae. *Fieberiella septentrionalis* (W=55.88) (Tab. 37) may be regarded as a probably characteristic species, which had the lowest class of constancy but occurred in all seasons (Tab. 28). In xerothermic grasslands this species feeds mainly on *Vincetoxicum hirundinaria* (Świerczewski 2007) – the perennial vastly overgrowing plot 27. Other species were classified as accessory species, and among them there were many species still poorly studied in Poland: *Anakelisia perspicillata*, *Utecha lugens* and *Micantulina stigmatipennis* (Gębicki 2003, Świerczewski 2004, Walczak & Musik 2012).

The communities connected with association *Festucetum pallentis* in the vicinity of Olsztyn in Częstochowska Upland were similarly structured (Świerczewski & Wojciechowski 2009). As in Częstochowa, the authors found that the dominant species in this community included *Erythria aureola*, *Emelianoviana mollicula*, *Turrutus socialis* and *Arocephalus languidus* and the characteristic ones: *Erythria aureola*, *Emelianoviana mollicula* as *Fieberiella septentrionalis*. There were many common accessory species, such as xerophilous *Micantulina stigmatipennis* and *Rhopalopyx vitripennis*. The communities in the vicinity of Olsztyn showed similar shares of xerophilous and heliophilous species (61.90% and 76.19%, respectively). In comparison, the community connected with *Festucetum pallentis* in Częstochowa contained 50% of xerophilous and 59.09% of heliophilous species. The community in the vicinity of Olsztyn was also similar in respect of the number of recorded species: 36-42 and 57 in total (Świerczewski & Wojciechowski 2009). Moreover, the seasonal dynamics of abundance was similar in both compared communities. The community connected with *Festucetum pallentis* was studied also in the vicinity of Ojców (Szwedo 1992) but due to a low number of species, only 7, and the lack of differential and characteristic taxa, these data cannot be compared. In Germany, this community was studied in the region Unstrut-Triasland (Witsack 1999) and the results were comparable. There were two common dominant species: *Erythria aureola* and *Emelianoviana mollicula*; moreover, the communities indicated the presence of many other common species and similar shares of cero- and heliophilous species.

2. In the community connected with ***Sileno-Phleetum***, the presence of 45 species

was recorded. The group of most important ones comprised *Errastunus ocellaris*, *Mocuellus collinus*, *Eurybregma nigrolineata*, *Verdanus abdominalis*, *Turrutus socialis* and *Graphocraerus ventralis*. *Eurybregma nigrolineata* occurred with high fidelity (W=73.40) (Tab. 37) and the third class of constancy (Tab. 29) however, due to its relation with expansive species such as *Elymus repens* or *Arrhenatherum elatius* (Nickel 2003), it may be treated only as a probably characteristic species. The differential species could not be distinguished. Among the accessory species, *Metalimnus steini* is worth noting, as it is known only from two sites in Poland (Świerczewski & Stroiński 2011b).

The community connected with association *Sileno-Phleetum* was studied only in the vicinity of Olsztyn (Świerczewski & Wojciechowski 2009). When compared to Częstochowa, many similarities may be revealed: the occurrence of a common dominant species – *Turrutus socialis*, the presence of many other common species such as: *Acanthodelphax spinosus*, *Erythria aureola*, *Doratura stylata*, *Arocephalus languidus* and also similar shares of heliophilous species (Olsztyn: 61.29%, Częstochowa: 53.33%). The community in the vicinity of Olsztyn showed a similar species diversity, Świerczewski and Wojciechowski (2009) recorded the presence of 42-46 species (62 species in total), and a resembling seasonal dynamics of abundance. A group of characteristic species, which in the study by Świerczewski and Wojciechowski (2009) comprised *Acanthodelphax spinosus* and *Kosswigianella exigua*, constituted the most significant difference.

Both the similarities and differences reported between various communities connected with *Sileno-Phleetum*, may result from various stages of natural succession in the studied phytocoenoses and their plant species composition e.g. the presence of expansive plant species in Częstochowa.

3. In the community connected with xerothermic grassland ***Adonido-Brachypodietum pinnati***, the presence of 26 species was recorded. *Adarrus multinotatus*, *Mocuellus collinus*, *Turrutus socialis* and *Balclutha calamagrostis* were the most important ones (Tab. 30). The most numerous species in the community, *Adarrus multinotatus*, was also a characteristic species, with high fidelity (W=87.54) (Tabs 37 and 39), the second class of constancy (Tab. 30) and trophic relationships with *Brachypodium pinnatum*, vastly overgrowing plot 29. No differential species could be distinguished and among the accessory species *Anakelisia perspicillata* is worth mentioning as a species rarely collected in Poland (Nast 1976b, Walczak & Musik 2012).

Similar communities connected with *Adonido-Brachypodietum pinnati* were studied in Częstochowska Upland in Mstów (Świerczewski & Wojciechowski 2009) and in Germany (Schiemenz 1969). In both cases *Adarrus multinotatus* was the dominant species (similar to Częstochowa), but in Mstów it was also differential. Moreover, the seasonal dynamics of abundance in Częstochowa (Fig. 30) had a similar pattern to that in Mstów (Świerczewski & Wojciechowski 2009). There were many common species such as: *Anakelisia perspicillata*, *Emelianoviana mollicula*, *Chlorita paolii*, *Rhopalopyx preyssleri* and *Arocephalus languidus*. In addition, Świerczewski and Wojciechowski (2009) observed a similar share of heliophilous species (Mstów: 52.17%, Częstochowa: 42.31%, Tab. 43c). However, the community in Mstów comprised more species: 35-49 (61 totally). Likewise, the community connected with association *Thalictro-Salvietum pratensis*, studied in Pińczów by Gębicki (1987), showed similar main species: *Adarrus multinotatus* and *Turrutus socialis*. On the contrary, Witsack (1997) recorded different species from those in Częstochowa and only an accessory share of *Adarrus multinotatus*.

During the research, in the communities connected with class *Festuco-Brometea* a total of 67 species was recorded (Tab. 1). The group of the dominant species comprised: *Emelianoviana mollicula*, *Errastunus ocellaris*, *Turrutus socialis* and *Mocuellus collinus*. However, cluster analysis clearly indicated separateness of the community connected with *Adonido-Brachypodietum pinnati* from other communities in this class (Figs 38 and 39) and partly showed a closer relationship of *Festucetum pallentis* and *Sileno-Phleetum*.

The cluster analysis based on all species in the community revealed some similarity between the community in *Sileno-Phleetum* (plot 28) and anthropogenic phytocoenoses of *Lolio-Polygonetum arenastri* and *Arrhenatheretum elatioris* (Fig. 38). Also, the community in *Festucetum pallentis* is clustered closely to *Spergulo vernalis-Corynephoretum* (plots 7 and 8) from the class *Koelerio glaucae-Corynephoretea*. The cluster analysis based on dominant species indicated the similarity of communities in *Festucetum pallentis*, *Sileno-Phleetum* and *Spergulo vernalis-Corynephoretum* (Fig. 39). This may be connected with the co-occurrence of a set of oligophagous and poliphagous species common to associations of the classes *Festuco-Brometea* and *Koelerio glaucae-Corynephoretea canescentis*, Insolation and low humidity seem of higher importance for them than plant species composition.

<u>Within the forest associations of the **class *Querco-Fagetea***, three planthopper communities were distinguished:</u>

1. In the community connected with riparian forest of the association ***Alno-Ulmion***, the presence of 58 species was recorded. The group of most important ones comprised *Balclutha punctata*, *Muellerianella brevipennis*, *Elymana surphurella*, *Forcipata forcipat*a and *Recilia coronifera* (Tab. 31). The latter was characterized by high fidelity (W=56.25 – Tab. 37) and also occurred in all seasons (Tab. 30). Due to the fact that *Recilia coronifera* is oligophagous feeding on *Molinia caerulea*, and taking into account its relatively low abundance and constancy, it may be considered to be only a probably characteristic species (Tabs 37 and 39). High fidelity was also assessed for *Tachycixius pilosus* and *Mocydiopsis attenuata* (W=100), but attempts to establish their trophic relations with *Alno-Ulmion* failed. Due to their low abundance it was not possible to connect these taxa with this plant association. Among accessory species of this community, the presence of *Kelisia punctulum*, *Arboridia velata* and *Doliotettix lunulatus* is worth noticing as these species are rarely collected in Poland (Walczak 2005, Świerczewski & Błaszczyk 2010, Świerczewski & Stroiński 2011b, Świerczewski et al. 2012).

The planthopper communities in similar plant associations were so far studied in Białołęka Dworska (Chudzicka 1981), upon the Biebrza River (Gębicki et al. 1982), near Zawiercie (Smentek data unpublished), in the vicinity of Ruda Śląska (Simon & Szwedo 2005) and in the Stołowe Mts (Gaj et al. 2009). The communities connected with *Alno-Ulmion* in the Stołowe Mts were most similar (Gaj et al. 2009), with many common and abundant species, such as: *Balclutha punctata*, *Speudotettix subfusculus*, *Arthaldeus pascuellus* or hygrophilous species *Agallia brachyptera*. Other communities presented in cited works differed significantly from the community on plot 30 in composition of both, dominant and accessory species (Chudzicka 1981, Gębicki et al. 1982, Simon & Szwedo 2005).

2. In the community connected with the association ***Tilio cordatae-Carpinetum betul***i, the presence of 36-45 species was recorded. The group of most important species in this community comprised *Empoasca pteridis*, *Balclutha punctata*, *Adarrus multinotatus*, *Muellerianella brevipennis*, *Javesella pellucida*, *Centrotus cornutus*, *Alebra albostriella*,

Empoasca decipiens, *Empoasca vitis*, *Forcipata forcipata*, *Eupteryx calcarata* and *E. florida* (Tabs 32, 33, 34 and 37). Among them, *Eupteryx florida* (W=96.15) is regarded to be a differential species thanks to its presence on all plots with the association *Tilio cordatae-Carpinetum betuli* (Tabs 37 and 39) and despite its low constancy. Its connection with this phytocoenosis is confirmed also by the presence of its host plant species belonging to the family Lamiaceae. The presence of 11 species with a high fidelity index (W=100) was recorded (Tab. 37), all of which are dendrophilous, mainly connected with oaks (*Quercus* spp.) but also with birches (*Betula* spp.), poplars (*Populus* spp.) and alders (*Alnus* spp.) (Ossiannilsson 1981, 1983, Nickel 2003, Biedermann & Niedringhaus 2004). They all occurred scarcely and only on some study plots. Without any recognisable relations with the association *Tilio cordatae-Carpinetum betuli*, they cannot be classified as differential species. For similar reasons, many other species with high values of fidelity index (ranging from W=50.02 to W=82.76) (Tab. 37) cannot be regarded as characteristic. Only *Oncopsis flavicollis* (W=66.67) (Tab. 37), a monophagous species connected with birches (*Betula* spp.), collected regularly and occurring on all plots in this association could be classified as characteristic (Tabs 37 and 39).

The communities of planthoppers connected with *Tilio cordatae-Carpinetum betuli* studied in the vicinity of Pińczów (Gębicki 1983) were similar. There were many common species including dominant: *Empoasca pteridis* and *Balclutha punctate* and accessory ones: *Edwardsiana ampliata*, *Alnetoidia alneti*, *Fagocyba cruenta* and *Eupteryx vittata*. Also the seasonal dynamics of abundance was similar. Yet, the communities in Pińczów contained fewer species (13 to 20). The planthopper community connected with the association *Tilio cordatae-Carpinetum betuli*, studied in Warsaw (Chudzicka 1981), was different because other species were dominant there: *Hyledelphax elegantulus*, *Eurysa lineata* and *Dikraneura variata*. Moreover, there occurred few common accessory species.

3. In the community connected with association ***Quercus robur-Pinus sylvestris***, the presence of 38-47 species was recorded. The group of most important ones comprised *Balclutha punctata*, *Empoasca vitis*, *Balclutha calamagrostis*, *Aphrophora alni*, *Forcipata forcipata*, *Empoasca pteridis*, *Elymana kozhevnikovi* and *Arthaldeus pascuellus* (Tabs 35 and 36). Differential species could not be distinguished – all species with high values of fidelity index (W=100) (Tab. 37) were collected in low numbers and mostly on single plots (Tab. 1). However, some of them: *Empoasca vitis*, *Aphrophora alni*, *Forcipata forcipata* or *Elymana kozhevnikovi* have been already reported from similar forest associations (Kuntze 1937, Linnavuori 1952, Klimaszewski et al. 1980b, Gębicki 1983, Szwedo 1992). Two species were classified as characteristic for this community: *Empoasca vitis* and *Balclutha punctate*, which reached high values of fidelity index (W=61.00 and W=58.14, respectively) (Tabs37 and 39) and quite a high, third class of constancy. Moreover, they were collected in all seasons on both study plots (Tabs 35 and 36). Other species with a high index of fidelity included: *Ribautiana tenerrima*, *Hyledelphax elegantulus*, *Wagneripteryx germari*, *Zygina angusta*, *Arboridia velata*, *Stiroma affinis*, *Jassargus flori* and *Dikraneura variata*. However, due to their low abundance and undetermined trophic relationships, they cannot be regarded as characteristic of this community (Tab. 37).

In respect of the species composition the studied community resembles the fauna connected with coniferous and mixed forests *Dicrano-Pinion* and *Pino-Quercion* in the vicinity of Pińczów. It is shown by such common species as *Thamnotettix confinis*, *Elymana kozhevnikovi*, *Ulopa reticulata*, *Dicraneura variata* and *Jassargus flori*. Gębicki (1983) regarded them to be characteristic of this sort of plant associations. Also studies in the forests of Pilica (Lis data unpublished) indicated a special connection of *Thamnotettix confinis* and *Balclutha punctate*, and also of many other species, with a similar type of forests. It holds good for the species collected in Częstochowa as well. The dominance of *Balclutha punctata* was observed also in the forests of *Dicrano-Pinion* near the steel-works „Katowice" (Klimaszewski et al. 1980b). It seems that this species predominates in pine forests planted on soils earlier overgrown by deciduous forests (Klimaszewski et al. 1980b, Gębicki 1983). The studies in Częstochowa support this observation.

In the planthopper communities connected with the forests of the class *Querco-Fagetea*, 112 species were collected by means of quantitative and additional 19 species with the usage of qualitative methods. All plots were characterized by low number of specimens, and simultaneously by high biological diversity, confirmed by high values of Brillouin's, Shannon-Weaver's and Simpson's indices of species diversity – the highest on plots 30 and 31 and lowest on plot 35 (Tab. 37). Cluster analysis and PCA also proved their close similarity (Figs 37, 38 and 39).

As can be seen from the analyses presented above, the studies carried out in Częstochowa confirmed the presence of communities of planthoppers and leafhoppers in particular plant associations. The application of zoocoenological indices allowed to determine the structure of communities and their connection with particular phytocoenoses. It was possible to distinguish twenty types of communities connected with plant associations of Częstochowa (Tab. 39). The existence of a single superdominant species (e.g. in phytocoenoses *Echio-Melilotetum*, *Lolio-Polygonetum arenastri* and *Cirsietum rivularis*) indicated the early successional stages of these associations or disturbances in water flow. In such communities the planthopper species with a broad spectre of ecological tolerance (eurytopic) predominated, which are also mesohigrophilous, heliophilous and xerophilous (Tabs 43a-43c) It confirmed previous conclusions by Denno and Roderick (1991). It is also interesting that research on the anthropogenic habitats of Częstochowa did not confirm the dominance of species overwintering in the nymph or adult stages in such habitats, as previously suggested (Waloff 1980, Hollier et al. 1994). Thus, the observed dominance of species overwintering in the stage of egg (Tabs 43a-43c) needs further investigation.

As it was mentioned before, Pielou (1974) stated that Shannon-Weaver's index *H'* is inappropriate for faunistic samples, which are limited sets of data and suggested that Brillouin's diversity index $\hat{H}$ is more appropriate for faunistic research. The correlation between both indices, presented in Fig. 40, indicates that either of them may be applied in zoocoenological studies of planthopper communities.

Basing on the Simpson's species diversity index *I*, the potential maximum diversity *Ip* and the degree of disparity between the potential and observed diversities *dI* was calculated (Tab. 38, Fig. 41). The lowest value of dI was observed on plot 1 (36.87%), where only 17 species were collected. On this plot, it was difficult to examine the lowest level of the habitat because of the presence of tall perennial plants. It could have affected the number and the abundance of collected species, which was reflected in a low value of Simpson's index. A low value of dI was also noted on plot 13 (40.38%), which reflected high abundance of the superdominant species *Macrosteles laevis* and low abundance of other species. Such results indicate the applicability of these indices in zoocoenological studies of the habitats under strong influences from human activity.

The basic tool for collecting insects in this study was a sweep-net. The effectiveness of this method is still subjected to discussion and requires a commentary. The most common critical remarks on this method concern the observational error. It results from some difficulties in collecting planthoppers of the families Agallinae and Aphrodinae (or other insect taxa) living close to the ground (Nowotný 1992) because sweep-netting embraces mainly upper part of vegetation. Thus, an additional method of soil traps is required (Nowotný 1992). Such errors are avoided by using a biocenometer and a modified suction-trap, which allows to collect the insects from all levels of vegetation, especially those close to the ground (Wilson et al. 1993). However, it is difficult and time consuming to apply such methods in quantitative research. Furthermore, sweep-netting has been vastly applied in quantitative studies for a few decades and its application allows to compare the obtained results with rich literature. Finally, the simplicity of this device makes it possible to collect samples from many sites in a relatively short time (Andrzejewska & Kajak 1966, Stewart 2002) and yields the repetitive and testable sets of data (Andrzejewska & Kajak 1966, Gromadzka & Trojan 1967). It was proven, that the best results were received in studied areas in afternoon hours, when planthoppers occur most numerously (Schiemenz 1969). Taking into account the presented advantages, sweep-netting may be considered the best method for manifesting the quantitative changes during the season. The fact that the collection of 132 samples, with 3300 hits with a sweep-net was required to obtain our results ,should also be commented on. Kamitani and Urano (2000) regarded 700 hits with sweep-net as a sufficient number for collecting the taxa in numbers approximating their actual abundance in the studied habitat. Other authors applied higher number of hits with sweep-net in both natural as well as degraded habitats (Gębicki et al. 1977, Klimaszewski et al. 1980a, 1980b, Gaj et al. 2009, Świerczewski & Wojciechowski 2009). Thus, the number applied in this study seemed to be sufficient.

The presented data highlight the significance of planthoppers and leafhoppers as valuable bioindicators. Hence, they should be considered to be as important as other invertebrate taxa for the purpose of monitoring the natural environment similarly to beetles (Coleoptera – Carabidae) or spiders (Araneae) (Jones & Leather 2012). The study confirmed the previous conclusion by Nickel and Hildebrandt (2003), that planthoppers may be regarded as a model group for monitoring changes (their direction and dynamics) taking place in urban habitats.

The collection of nine species recorded on the territory of Poland for the first time, increased the overall number of planthopper species of Poland to 548. The total number of planthoppers in Krakowsko-Wieluńska Upland increased by 14 species and currently comes to 388 species, which is almost 71% of Polish fauna of planthoppers. Other papers – Walczak 2008b, Świerczewski & Walczak 2011a and 2011b, Walczak at al. 2013, Walczak & Jeziorowska 2014 – reported on nine species present in Częstochowa and then new for Polish fauna: *Acericerus ribauti*, *Eupteryx lelievrei*, *Zyginidia pullula*, *Zygia schneideri*, *Balclutha saltuella*, *Macrosteles sardus*, *Endria nebulosa*, *Metalimnus steini* and *Calamotettix taeniatus*. Thus, during the research, the overall number of species new for Poland increased to 11.

The presented results, although extensive, are far from being complete. Urban faunas and insect communities in urban greenery definitely need further research. It seems that very specific abiotic conditions i.e. modified climate (so called "urban heat island") and varied trophic base i.e. food sources alternative to natural ones, may serve as an important refugium for some autochthonous species with very specific environmental requirements and, unfortunately, for invasive alien species as well (Arzone et al. 1986, Chudzicka 1986, Nickel 2003, Nickel & Hildebrandt 2003).

7. Summary and conclusions

During the research conducted in Częstochowa between 2006 and 2012 , a total of 266 species of planthoppers and leafhoppers was recorded. This number constitutes 48.5% of Polish fauna (including taxa found in Częstochowa). In the town centre the presence of 148 species (27% of Polish fauna) was recorded while in the buffer zone 242 species (44%) were found. In the studied plant associations 210 species were collected by means of quantitative methods (39.03% of Polish fauna) while qualitative methods yielded 67 (11 species were collected by both methods).

The structure of 20 communities of planthoppers was analysed, among which 17 were connected with herbaceous associations and 3 with forest associations. The group of most important taxa comprised 55 species from the highest classes of abundance, including 13 superdominant species: *Macrosteles laevis*, *Balclutha calamagrostis*, *Stenocranus major, Ribautodelphax collinus*, *Notus flavipennis*, *Chlorita paolii*, *Eupteryx atropunctata*, *Eupteryx cyclops*, *Balclutha punctata*, *Cicadula quadrinotata*, *Psammotettix cephalotes*, *Psammotettix excisus* and *Adarrus multinotatus*. Macrosteles laevis was the most often collected species in Częstochowa – its specimens constituted the third part of all the collected specimens. It was a superdominant species in 5 of the studied plant associations: *Urtico-Aegopodietum podagrariae*, *Lolio-Polygonetum arenastri*, *Alopecuretum pratensis*, *Arrhenatheretum elatioris* and *Achillea millefolium-Taraxacum officinale*, all of which were of anthropogenic origin. In studied communities 8 differential species were distinguished: *Balclutha rhenana*, *Macrosteles variatus* (*Urtico-Aegopodietum podagrariae*), *Neophilaenus minor*, *Laburrus impictifrons*, *Psammotettix excisus* (*Spergulo vernalis-Corynephoretum*), *Psammotettix cephalotes* (*Cirsietum rivularis*), *Cicadula frontalis* (*Scirpetum silvatici*) and *Eupteryx florida* (*Tilio cordatae-Carpinetum betuli*). Moreover, 29 characteristic and 13 probably characteristic species were determined (Tab. 39).

Three circles of communities were delineated: the first connected with forests, the second with moist meadows and riparian associations and third comprising communities connected with deformed urban plant associations in the town centre, barrens and some of the grasslands (Fig. 38 and 39).

Balclutha punctata was the most numerous species on the plots of the class *Querco-Fagetea*. In the humid habitats, the most numerous species included *Cicadula quadrinotata*, *Arthaldeus pascuellus*, *Notus flavipennis* and *Javesella pellucida*. In grasslands, *Turrutus socialis* was the most numerous species while in urban habitats and in meadows *Macrosteles laevis*, *Balclutha calamagrostis*, *Deltocephalus pulicaris*, *Errastunus ocellaris* and *Psammotettix confinis* (Tabs 2-36) were most abundant.

During the research in Czestochowa, as high a number as 11 species were recorded on the territory of Poland for the first time, however 9 of them were reported in other papers (Walczak 2008b, Świerczewski & Walczak 2011a and 2011b, Walczak et al. 2013, Walczak & Jeziorowska 2014). Thus the number of planthoppers recorded in Poland was increased to 547, which constitutes 26% of European fauna. 14 species new for the region of Krakowsko-Wieluńska Upland were also recorded (information about 3 other species – *Delphax pulchellus*, *Chloriona glaucescens* and *Paraliburnia adela* – was already presented by Walczak 2014) (Tab. 44). Accordingly, the research in Częstochowa significantly broadened our knowledge on the species diversity of planthoppers and leafhoppers in Krakowsko-Wieluńska Upland. A few species are particularly interesting as they were either not recorded in Poland beyond Krakowsko-Wieluńska Upland (*Edwardsiana stehliki*) or known only from single sites (*Edwardsiana soror*, *Ribautiana ognevi*, *Allygus communis* and *Arthaldeus arenarius*) (Świerczewski & Gębicki 2004, Świerczewski & Wojciechowski 2009, Świerczewski & Gruca 2010, Walczak 2011). It is noteworthy that many rare species occurred in habitats under strong influence from human activity, such as *Kelisia monoceros*, *Jassidaeus lugubris*, *Delphacodes venosus* or *Zyginidia pullula* (Świerczewski & Walczak 2011b, Walczak 2011, Walczak & Musik 2012). Even species new in Polish fauna – *Balclutha saltuella* and *Endria nebulosa* – occurred in degraded habitats of urban greenery (Tabs 1 and 37). It seems that e.g. *Jassidaeus lugubris* and *Zyginidia pullula* preferred urban greenery (Tab. 1) while *Japananus hyalinus* and *Zygina griseombra* were collected in the town park and *Eupteryx curtisii* in the flower bed with ornamental plants (Tab. 1).

Conclusions

1. Three groups of communities were distinguished:
   a. the communities connected with forest associations of the class *Querco-Fagetea*;
   b. the communities connected with moist associations, including: the circle of communities connected with moist meadows of the order *Molinietalia* and the circle of related communities of humid associations: *Urtico-Aegopodietum podagrariae*, *Sparganio-Glycerietum fluitantis* and *Phalaridetum arundinaceae* from various phytosociological classes;
   c. the communities connected with urban greenery, barrens, managed meadows and most of grasslands: the circle of communities connected with class *Molinio-Arrhenatheretea*, associations of orders *Plantaginetalia majoris* and *Arrhenatheretalia elatioris*; some communities connected with the classes *Koelerio glaucae-Corynephoretea canescentis* and *Festuco-Brometea*, which share some common species;

   The communities of *Echio-Melilotetum* and *Adonido-Brachypodietum pinnati* were excluded from the above mentioned groups of communities.
2. The existence of these three groups of communities was supported by Principal Component Analysis based on the number of specimens of all the collected species.
3. The most important species in the studied communities included dominant, differential and characteristic ones. Among 55 most abundant species, 13 reached the abundance of superdominant species. There were 8 differential species connected with 5 types of plant associations. There were 42 species regarded to be characteristic or probably characteristic. In the plant association *Spergulo vernalis-Corynephoretum* there were as many as 3 differential and 5 characteristic species, while in associations *Arrhenatheretum elatioris* and *Dactylis glomerata* none could be distinguished.
4. The analysis of the Shannon-Weaver's *H'* and Brillouin's $\hat{H}$ indices of species diversity revealed that the communities with highest species diversity developed in forests of the class *Querco-Fagetea*. Among the herbaceous associations, the communities connected with *Valeriano-Filipenduletum* were most diverse. The highest values of Simpson's diversity index *I'* was reached by communities connected with forests of the class *Querco-Fagetea* and by communities connected with associations *Valeriano-Filipenduletum* and *Spergulo vernalis-Corynephoretum*. The Pielou's index of evenness *J'* reached the highest value also in the forest associations of *Querco-Fagetea*.
5. *Deltocephalus pulicaris*, *Doratura homophyla* and *Psammotettix cephalotess* may be regarded as most useful for monitoring of the degree of habitat distortion.

6. A high number of rare and very rare species collected from urban greenery indicates that such ecosystems serve as important habitats for interesting species and should be under constant monitoring.
7. Some changes in phenology of planthoppers and leafhoppers have been observed. The maximum abundance of population was observed in the second half of August and in September, but in this period the number of collected species in the community lowered. The greatest contribution to the peaks of abundance was made by *Macrosteles laevis* and *Deltocephalus pulicaris* in the town centre, *Neophilaenus minor* in psammophilous grasslands, *Turutus socialis* in xerothermic grasslands, *Cicadula quadrinotata* with *Notus flavipennis* in moist meadows and by *Balclutha punctata* in forests.
8. A chorological analysis indicated that European and Euro-siberian species were most numerous in Częstochowa. European species dominated in the town centre and in the buffer zone. Euro-siberian species dominated on the Upper Warta Lowland whereas European ones in Częstochowska Upland; in Wieluńska Upland both European and Euro-siberian species had equal shares.
9. An ecological analysis indicated that in Częstochowa the group of most abundant species comprised mesohigrophilous, mesoheliophilous and oligotopic ones which overwinter in the stage of egg and have one generation during the season. 1st-degree monophagous species predominated and they were mainly connected with Poaceae.

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STRESZCZENIE

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Zgrupowania piewików (Hemiptera: Fulgoromorpha et Cicadomorpha) wybranych zbiorowisk roślinnych Częstochowy (miasta i otuliny)

Monografia

Piewiki (Fulgoromorpha Evans, 1946 i Cicadomorpha Evans, 1946) to grupy fitofagicznych owadów o kłująco-ssącym aparacie gębowym, należące do rzędu pluskwiaków (Hemiptera). Fauna europejska Fulgoromorpha i Cicadomorpha obejmuje około 2080 gatunków piewików, w tym ponad 900 wykazanych z Europy Środkowej, a z obszaru Polski (uwzględniając gatunki wymienione w tej pracy oraz inne opublikowane w 2015r.) 547. Są one ważnym elementem łańcuchów pokarmowych; zasiedlają wszystkie piętra roślinności i występują na całym świecie w większości ekosystemów lądowych i tworzą ścisłe związki z roślinami żywicielskimi. Część z nich to gatunki troficznie wyspecjalizowane – mono- i oligofagiczne, co w konsekwencji przywiązuje je do określonych biocenoz. Wiele z nich w zbiorowiskach roślinnych tworzy wielogatunkowe zgrupowania, posiadające takie cechy charakterystyczne jak struktura liczebności populacji oraz liczba gatunków współwystępujących w danym środowisku.

Badania zgrupowań piewików w Polsce prowadzono w Kotlinie Biebrzy, Kotlinie Nowotarskiej, Bieszczadach, Górnym Śląsku i Sudetach w zbiorowiskach trzęsawisk, łąk wilgotnych, zbiorowisk zaroślowych i szuwarowych oraz zbiorowisk leśnych i borowych. W ostatnich latach znaczną uwagę poświęcono zgrupowaniom piewików muraw kserofilnych okolic Pińczowa oraz Wyżyny Częstochowskiej natomiast zdecydowanie mniej zgrupowaniom piewików zieleni miejskiej (Warszawy, Sosnowca).

Obszar Częstochowy cechuje się dużym zróżnicowaniem świata przyrodniczego oraz form krajobrazu, co związane jest z położeniem miasta na obszarze monokliny śląsko-krakowskiej, w strefie granicznej 3 mezoregionów fizjogeograficznych: Wyżyny Wieluńskiej, Wyżyny Częstochowskiej i Obniżenia Górnej Warty. Wszystkie regiony cechuje odmienna charakterystyka i stopień przekształcenia środowiska przyrodniczego. Pomimo intensywnych przemian antropogenicznych związanych z intensywnym wydobyciem surowców mineralnych w granicach administracyjnych tego miasta zachowały się fragmenty eutroficznych torfowisk niskich, wilgotnych i zabagnionych łąk, muraw kserotermicznych, grądów, łęgów i olsów oraz wiele innych interesujących obiektów przyrodniczych, wśród których kilka przewidzianych jest do ochrony rezerwatowej. Do obszarów najcenniejszych pod względem krajobrazowym i przyrodniczym należą tu: wychodnie jurajskie Wyżyny Częstochowskiej, starorzecza Popławskiego Dołu, Mirowski Przełom Warty, doliny rzeczne Stradomki i Konopki oraz pagóry morenowe. Przedstawione zróżnicowanie siedlisk związane z bogactwem szaty roślinnej wpłynęło na podjęcie badań nad zgrupowaniami

piewików związanymi z określonymi zbiorowiskami roślinnymi. Dla prezentowanego projektu przewidziano następujące cele:

- poznanie składu gatunkowego piewików wybranych siedlisk Częstochowy – w strefie miasta i otuliny,
- wyróżnienie zgrupowań piewików związanych z wybranymi zbiorowiskami roślinnymi na terenie miasta oraz określenie ich struktury dominacji i stopnia powiązania z tymi zbiorowiskami,
- zbadanie dynamiki sezonowych zmian liczebności tych owadów zwłaszcza dominantów i subdominantów, zarówno w typowych urbicenozach zlokalizowanych w centrum miasta, jak również w ekosystemach o szczególnej wartości przyrodniczej usytuowanych w suburbium,
- przeprowadzenie analizy chorologicznej i ekologicznej badanej grupy owadów,
- porównanie wyników projektowanych badań z danymi wcześniej opublikowanymi odnoszącymi się do zgrupowań piewików w podobnych typach zbiorowisk roślinnych.

Badania prowadzono w granicach administracyjnych Częstochowy (woj. śląskie) w okresie od 2005 do 2012 r. (Fig. 1). Owady zbierano przy pomocy czerpaka entomologicznego, a szczególny nacisk położono na badania ilościowe, które prowadzono w latach 2005-2010 na 35 powierzchniach reprezentujących zbiorowiska roślinne z 6 klas: *Artemisietea vulgaris*, *Phragmitetea*, *Koelerio glaucae-Corynephoretea canescentis*, *Molinio-Arrhenatheretea*, *Festuco-Brometea* i *Querco-Fagetaea* (Fig. 1). Na każdej powierzchni owady gromadzono w okresie trzech sezonów wegetacyjnych – od maja do października, w odstępie średnio 2 tygodni (w większości przypadków w latach 2005-2007 lub 2006-2008, choć na niektórych stanowiskach badania prowadzono nawet do 2010 r.). Na każdej powierzchni badawczej pobrano 132 próby, na które przypadło 3300 uderzeń czerpakiem w ciągu trzech lat (11 zbiorów, 44 próby i 1100 uderzeń czerpakiem w jednym sezonie wegetacyjnym), ze wszystkich powierzchni uzyskując łącznie 4620 prób. W celu uzupełniania badań o gatunki występujące poza wyznaczonymi powierzchniami prowadzono również badania jakościowe.

Materiał oznaczono w oparciu o specjalistyczne piśmiennictwo, zarówno opracowania o charakterze monograficznym, jak również artykuły odnoszące się do poszczególnych rodzajów badanej grupy owadów. Oznaczenie większości gatunków wykonano przy użyciu glicerynowych preparatów mikroskopowych (elementy bloku genitalnego, a niekiedy aparat dźwiękowy samców). Jednocześnie na wszystkich powierzchniach określono przynależność syntaksonomiczną zbiorowisk roślinnych, większość fitocenoz klasyfikując do rangi zespołu. W prezentowanej pracy przyjęto aktualną systematykę i nazewnictwo roślin naczyniowych, które zbierano równocześnie z owadami.

W prezentowanej pracy przedstawiono analizę zoocenologiczną zebranego materiału, którą przeprowadzono w oparciu o wskaźniki analityczne i syntetyczne, takie jak: dominacja osobnicza *D*, stałość występowania *C*, wskaźnik *Q* oraz współczynnik wierności *W*. Wyniki badań uzupełniono o dane wskaźnika ogólnej różnorodności Shannona-Weavera *H'*, wskaźnika równomierności Pileou *J'*, wskaźnika różnorodności gatunkowej Brillouina $\hat{H}$ oraz wskaźnika różnorodności gatunkowej Simpsona *I*. Dla uporządkowania badanych zgrupowań piewików posłużono się także analizą głównych składowych PCA. Przedstawiono również procentowy udział poszczególnych elementów zasięgowych w faunie piewików oraz procentowy udział elementów ekologicznych.

Wyniki badań ilościowych

Spośród zebranych na obszarze Częstochowy 266 gatunków piewików metodami ilościowymi odłowiono 210 gatunków (60311 okazów) (Tab. 37). Wyższe klasy liczebności (od superdominanta do subdominanta) osiągnęło 55 gatunków, a najliczniejszymi były: *Macrosteles laevis* (20162 odłowionych okazów – udział w całości zebranego materiału 33,43%), *Stenocranus major* (2842 – 4,71%), *Cicadula quadrinotata* (2833 – 4,70%) i *Arthaldeus pascuellus* (2490 – 4,13%). Bardzo wysoką liczebność w przedziale 1-2 tys. odłowionych osobników uzyskały ponadto: *Chlorita paolii*, *Deltocephalus pulicaris*, *Notus flavipennis*, *Errastunus ocellaris*, *Javesella pellucida*, *Psammotettix confinis*, *Turrutus socialis* i *Balclutha calamagrostis*. Z drugiej strony w materiale ilościowym, aż 78 gatunków reprezentowanych było przez nie więcej niż 10 osobników (37,14%), a 26 spośród nich tylko przez 1 okaz (12,38%). Najwięcej gatunków odłowiono na powierzchni 19-stej (*Alopecuretum pratensis*) – 67 (Tab. 20) i na 14-stej (*Valeriano-Filipenduletum*) – 61 (Tab. 15), a najmniej na 1-szej (*Echio-Melilotetum*) – 17 gatunków (Tab. 18). Najwięcej osobników zebrano natomiast na powierzchni 20-stej (*Alopecuretum pratensis*) – 5958 okazów (Tab. 21) oraz 13-stej (*Lolio-Polygonetum arenastri*) – 5573 okazy (Tab. 14), a najmniej na 33-ciej (*Tilio cordatae-Carpinetum*) – zaledwie 163 okazy (Tab. 34).

Badania wykazały obecność 8 gatunków wyróżniających oraz 42 gatunków charakterystycznych lub prawdopodobnie charakterystycznych (Tab. 39). Zebrano także wiele gatunków nowych dla obszaru Polski oraz dla regionu Wyżyny Krakowsko-Wieluńskiej. Na 10-ciu powierzchniach położonych w centrum miasta, stwierdzono występowanie 148 gatunków (27% krajowej fauny piewików). Na pozostałych 25-ciu powierzchniach położonych na obszarze rozciągającym się od terenów podmiejskich po granice administracyjne miasta (w otulinie) wykazano 242 gatunki (44% krajowej fauny piewików) (Tab. 1). Dla Obniżenia Górnej Warty wykazano 190 gatunków piewików, dla Wyżyny Częstochowskiej 147, a dla Wyżyny Wieluńskiej 167.

Kręgi zgrupowań

W pracy przedstawiono strukturę zgrupowań i ich dynamikę liczebności sezonowej, co w oparciu o metodę Warda (Fig. 38 i 39) pozwoliło na wyodrębnienie 3 grup zgrupowań (tzw. kręgów). Na podstawie liczebności osobników wszystkich zebranych gatunków (Fig. 38), uzyskano następujące trzy grupy:

- **grupa pierwsza** – utworzona przez zgrupowania piewików związane ze zbiorowiskami leśnymi *Alno-Ulmion*, *Tilio cordatae-Carpinetum betuli* i *Quercus robur-Pinus sylvestris* z klasy *Querco-Fagetea* (powierzchnie 30, 31, 32, 33, 34 i 35);
- **grupa druga** – utworzona przez zgrupowania piewików związane ze zbiorowiskami wilgotnymi z zespołu *Urtico-Aegopodietum* podagrariae z klasy *Artemisietea vulgaris* (3 i 4), *Sparganio-Glycerietum fluitantis* i *Phalaridetum arundinaceae* z klasy *Phragmitetea* (5 i 6) oraz *Valeriano-Filipenduletum*, *Cirsietum rivularis*, *Scirpetum silvatici* i *Alopecuretum pratensis* w obrębie rzędu *Molinietalia caerulae* z klasy *Molinio-Arrhenatheretea* (14, 15, 17, 18, 19 i 20). Analiza dendrogramu ujawniła tutaj 2 podgrupy, umieszczając w pierwszej większość zgrupowań związanych z klasą *Molinio-Arrhenatheretea* (14, 15, 17, 18, 19, 20) oraz zgrupowanie zasiedlające *Sparganio-Glycerietum fluitantis* (5), a w drugiej wspólnymi wiązaniami połączyła zgrupowania związane z fitocenozami: *Urtico-Aegopodietum podagrariae* (3 i 4) oraz *Phalaridetum arundinaceae* (6);

- **grupa trzecia** – utworzona przez zgrupowania związane ze zbiorowiskiem *Echio-Melilotetum* z klasy *Artemisietea vulgaris* (2), murawami psammofilnymi *Spergulo vernalis-Corynephoretum* i *Diantho-Armerietum elongatae* z klasy *Koelerio glaucae-Corynephoretea canescentis* (7, 8 i 9), niektórymi murawami kserotermicznymi, tj. *Festucetum pallentis* i *Sileno-Phleetum* z klasy *Festuco-Brometea* (27 i 28) oraz zbiorowiskami znajdującymi się pod szczególnie silnym oddziaływaniem antropopresji, tj: *Lolio-Polygonetum arenastri* (10, 11, 12, 13), *Arrhenatheretum elatioris* (21, 22, 23, 24), *Achillea millefolium-Taraxacum officinale (25), Dactylis glomerata* (26) oraz mocno zdegradowanym *Cirsietum rivularis* (16) z klasy *Molinio-Arrhenatheretea*. Zastosowanie metody aglomeracyjnej ujawniło 3 podgrupy: pierwszą obejmującą zgrupowania związane ze *Spergulo vernalis-Corynephoretum* (7 i 8) i *Festucetum pallentis* (27), drugą obejmującą zgrupowania związane z *Diantho-Armerietum elongatae* (9), *Lolio-Polygonetum arenastri* (10, 11, 12, 13), *Cirsietum rivularis* (16), *Arrhenatheretum elatioris* (21, 22, 23, 24), *Achillea millefolium-Taraxacum officinale* (25), *Dactylis glomerata* (26) i *Sileno-Phleetum* (28) oraz trzecią podgrupę, obejmującą pojedyncze i wyraźnie odrębne od pozostałych zgrupowanie piewików związane z urbicenozą *Echio-Melilotetum* zasiedlające nasyp kolejowy (2).

<u>Niemal identyczne wyniki uzyskano w oparciu o metodę Warda obliczoną na podstawie udziału gatunków z wyższych klas liczebności (Fig. 39):</u>

- **grupa pierwsza** – utworzona przez (jak wcześniej) zgrupowania piewików związane ze zbiorowiskami leśnymi (powierzchnie 30, 31, 32, 33, 34 i 35);
- **grupa druga** – utworzona przez zgrupowania piewików związane ze zbiorowiskami wilgotnymi i jest zbliżona do wyniku uzyskanego na podstawie liczebności osobników wszystkich zebranych gatunków (Fig. 38). W odróżnieniu do poprzednio uzyskanego wyniku wyróżniono tu jednak 3 podgrupy: pierwszą identyczną jak w poprzedniej metodzie i obejmującą fauny piewików powierzchni: 5, 14, 15, 17, 18, 19 i 20, drugą skupiającą faunę piewików powierzchni: 3 i 4 oraz trzecią włączającą do wspólnego skupienia faunę powierzchni 2 i 6. Różnice są więc niewielkie i dotyczą odległości wiązań dla fauny piewików stwierdzonej na powierzchni 6 oraz włączenia do prezentowanej grupy fauny piewików powierzchni 2, którą w metodzie opartej na liczebności wszystkich osobników zaliczono do grupy trzeciej (tj. razem z murawami, łąkami kośnymi i zielenią miejską);
- **grupa trzecia** – utworzona przez zgrupowania piewików związane z murawami oraz urbicenozami miejskimi i zbliżona do obrazu uzyskanego na podstawie liczebności osobników wszystkich zebranych gatunków (Fig. 38). Także tutaj wykazano 3 podgrupy zgrupowań (Fig. 39): pierwszą obejmującą faunę piewików niektórych muraw (7, 27 i 28), drugą skupiającą faunę urbicenoz miejskich oraz łąk kośnych (9, 10, 11, 12, 13, 21, 22, 23, 24, 25 i 26), oraz trzecią, wyraźnie odrębną, obejmującą faunę piewików związaną z murawą powierzchni 8 i zdegradowane zbiorowisko wilgotne (16); Różnice są więc niewielkie i dotyczą odległości wiązań dla fauny piewików stwierdzonej na powierzchni 8, 16 i 28.

W obydwu przypadkach metodą aglomeracyjną Warda wykazano odrębność fauny piewików na powierzchni 1 (zespół *Echio-Melilotetum – Artemisietea vulgaris*) i 29 (*Adonido-Brachypodietum pinnati – Festuco-Brometea*), wyłączając je poza obręb trzech wyróżnionych grup faunistycznych. Potwierdzają to obydwa dendrogramy (Fig. 38 i 39).

Wyniki oparte na metodzie aglomeracyjnej zostały potwierdzone analizą głównych składowych PCA (Fig. 37). Dzięki zastosowaniu tej metody uzyskano obraz obejmujący również trzy główne kręgi zgrupowań. Jeden z nich tworzą zgrupowania piewików związane ze zbiorowiskami leśnymi, następny – z wilgotnymi, a ostatni – obejmuje jednocześnie zgrupowania muraw psammofilnych oraz kserotermicznych a także łąk świeżych oraz najsilniej odkształconych urbicenoz występujących w centrum miasta.

Analiza chorologiczna

Zebrany materiał reprezentowany jest przez 13 elementów chorologicznych. W całości zebranego materiału największy udział ma element europejski (27,82% – 72 gatunki) oraz elementy o szerokim rozprzestrzenieniu, takie jak: eurosyberyjski (23,68 – 63 gatunki), zachodniopalearktyczny (12,03% – 32 gatunki) i transpalearktyczny (11,28% – 30 gatunków). Najniższy udział – poniżej 2% w ogólnym materiale mają następujące elementy: kosmopolityczny (0,38% – 1 gatunek), północnoeuropejski i zachodnioeuropejski (1,13% – 3 gatunki) oraz wokółśródziemnomorski (1,5% – 4 gatunki) (Tab. 40).

Najliczniejszą grupę w materiale ilościowym zebranym na powierzchniach badawczych stanowią gatunki zaliczone do elementu transpalearktyczego, które dominują na 22 powierzchniach: 1, 2, 3, 4, 7, 8, 9, 11, 12, 13, 16, 20, 21, 23, 25, 26, 27, 28, 31, 32, 33 i 34. Element eurosyberyjski dominuje na 15 powierzchniach: 2, 5, 6, 10, 13, 17, 12, 17, 18, 19, 22, 24, 29, 30 i 35, zachodniopalearktyczny na czterech: 13, 21, 26 i 29 a europejski na dwóch: 7 i 32. W zbiorowiskach z klasy *Artemisietea vulgaris*, *Koelerio glaucae-Corynephoretea canescentis*, *Festuco-Brometea* i *Querco-Fagetea* i rzędów: *Plantaginetalia majoris* oraz *Arrhenatheretalia elatioris* w obrębie klasy *Molinio-Arrhenatheretea*, najliczniejszą grupę stanowią gatunki transpalearktyczne, natomiast w zbiorowiskach łąk wilgotnych z klasy *Phragmitetea* i rzędu *Molinietalia caerulae* w obrębie klasy *Molinio-Arrhenatheretea* gatunki euro syberyjskie (Tab. 41a-41d).

Analiza ekologiczna

W całości zebranego materiału badawczego, w odniesieniu do wilgotności środowiska, największy udział mają gatunki mezohigrofline (56,77% – 151 gatunków). Gatunki higrofilne mają udział 24,81% (66 gat.), a kserofilne 18,42% (49 gat.) (Tab. 42, Fig. 43).

W odniesieniu do nasłonecznienia w całości zebranego materiału dominują gatunki mezoheliofilne (67,67% – 180 gat.), mniej liczne są heliofile (30,07% – 80 gat.) a najmniej liczne skiofilne (2,26% – 6 gat.) (Tab. 42, Fig. 44).

W odniesieniu do powiązań troficznych dominują monofagi 1-go stopnia 28,95% (77 gat.), dość liczne są również monofagi 2-go stopnia – 25,19% (67 gat.). Oligofagi 1-go stopnia stanowią 21,05% (56 gat.), a oligofagi 2-go stopnia 9,02% (24 gat.). Łącznie wykazano 144 gatunki monofagiczne (54,14%), 80 oligofagicznych (30,07%), 41 polifagicznych (15,41%) oraz jeden (*Macrosteles sardus* – 0,38%) o nieznanych powiązaniach troficznych (Tab. 42, Fig. 45). Dokonano również analizy powiązań piewików z roślinami żywicielskimi. Najwięcej gatunków – 104 powiązanych było z Poaceae (39,10%), 34 gatunki z Cyperaceae (12,78%), 26 gatunków z Betulaceae (9,77%), 24 z Rosaceae (9,02%). Łącznie z jednoliściennymi powiązanych było ponad 50% gatunków (Tab. 44).

W odniesieniu do powiązań z roślinami żywicielskimi w zebranym materiale dominują gatunki oligotopowe (50% – 133 gat.), gatunki stenotopowe mają udział 28,2 % (75 gat.), a eurytopowe 21,8% (58 gat.) (Tab. 41, Fig. 46). Spośród zebranych gatunków w stadium jaja zimuje 70,68% (188 gatunków), w stadium larwy 15,79% (42 gat.), a w stadium imago 13,53% (36 gat.) (Tab. 42, Fig. 47).

Analizując zebrany materiał pod względem liczby pokoleń występujących w ciągu jednego sezonu stwierdzono, że gatunki uniwoltynne są liczniejsze (55,26% – 147 gat.) od biwoltynnych (44,74% – 119 gat.) (Tab. 42, Fig. 48). Należy jednak nadmienić, że analiza struktury dominacyjnej nie wyklucza, iż w niektórych latach gatunki *Macrosteles laevis* i *Chlorita paolii* mogą mieć trzy generacje.

Badania jakościowe

Materiał zebrany metodami jakościowymi obejmuje 476 prób (zbieranych głównie z drzew, krzewów lub jednogatunkowych kęp roślin i pozyskany poza powierzchniami badawczymi lub w ich sąsiedztwie, zwykle 50-100 m od granic powierzchni) i jest reprezentowany przez 67 gatunków piewików. Spośród nich 56 wykazano wyłącznie przy użyciu tej metody, a 11 gatunków odłowiono zarówno w badaniach jakościowych, jak i ilościowych. Poza powierzchniami badawczymi odłowiono 19 gatunków, a najciekawszymi z nich były bardzo rzadko występujące gatunki, takie jak: *Idiocerus vicinus*, *Viridicerus ustulatus*, *Cicadella lasiocarpae*, *Edwardsiana soror*, *Ribautiana ognevi* i *Metalimnus marmoratus* (Tab. 1).

Gatunki rzadkie i nowe w faunie Polski

Podczas realizacji projektu wykazano łącznie 11 gatunków piewików nie odnotowanych wcześniej dla fauny Polski, przy czym informacja o dwóch, tj. *Idiocerus vicinus* Melichar, 1898 i *Zygina griseombra* Remane, 1994, podawana jest tutaj po raz pierwszy, natomiast dane odnoszące się do pozostałych 9 gatunków (*Acericerus ribauti* Nickel & Remane, 2002, *Eupteryx lelievrei* (Lethierry, 1874), *Zyginidia pullula* (Boheman, 1845), *Zygina schneideri* (Günthart, 1974), *Macrosteles sardus* Ribaut, 1948, *Balclutha saltuella* (Kirschbaum, 1868), *Endria nebulosa* (Ball, 1900), *Metalimnus steini* (Fieber, 1869) i *Calamotettix taeniatus* Horváth, 1911) zostały już opublikowane w oddzielnych pracach lub znajdują się w druku. W pracy podano również informacje o 17 gatunkach nowych dla regionu Wyżyny Krakowsko-Wieluńskiej (informacje o trzech spośród nich opublikowano w ostatnim czasie).

Podsumowanie wyników badań i wnioski

Wykazano trzy grupy zgrupowań piewików. Pierwszą związaną ze zbiorowiskami leśnymi, drugą ze zbiorowiskami nadrzecznymi oraz łąkami wilgotnymi oraz trzecią utworzoną przez zgrupowania związane z najsilniej odkształconymi urbicenozami w centrum miasta, nieużytkami oraz niektórymi murawami (Ryc. 38 i 39).

Gatunkiem dominującym w zbiorowiskach leśnych z klasy *Querco-Fagetea* był *Balclutha punctata*, a w zbiorowiskach wilgotnych: *Stenocranus major*, *Cicadula quadrinotata* i *Arthaldeus pascuellus*. Najliczniej na murawach występował *Turrutus socialis*, a na łąkach użytkowych i zieleni miejskiej: *Macrosteles laevis*, *Balclutha calamagrostis*, *Deltocephalus pulicaris*, *Errastunus ocellaris* i *Psammotettix confinis* (Tab. 2-36).

Badania znacznie poszerzyły stan wiedzy o różnorodności gatunkowej piewików

Wyżyny Krakowsko-Wieluńskiej, przy czym na uwagę zasługują nie tylko gatunki nowe dla fauny Polski i regionu, ale znane z pojedynczych stanowisk w kraju, takie jak: *Edwardsiana stehliki*, *Edwardsiana soror*, *Ribautiana ognevi*, *Allygus communis* i *Arthaldeus arenarius*. Interesujące jest występowanie w centrum miasta wielu rzadkich gatunków, takich jak: *Kelisia monoceros*, *Jassidaeus lugubris*, *Delphacodes venosus*, *Zyginidia pullula*, *Balclutha saltuella* i *Endria nebulosa*, wydaje się nawet, iż np.: *Jassidaeus lugubris* i *Zyginidia pullula* preferowały zieleń miejską (Tab. 36 i 44). Do grupy tej można zaliczyć odłowione w parkach miejskich *Japananus hyalinus* i *Zygina griseombra*, a także *Eupteryx curtisii*, stwierdzony tylko na klombach z roślinami ozdobnymi (Tab. 1).

Analiza zgromadzonego piśmiennictwa wskazuje na celowość dalszych badań również w zbiorowiskach naturalnych – zwłaszcza na obszarach turzycowisk, szuwarów oraz torfowisk, bowiem obraz związanych z nimi zgrupowań piewików (oraz pozostałych Hemiptera) nadal jest niepełny.

Wnioski

1. Na podstawie kryteriów takich, jak: dominacja, stałość występowania i wierność, a także analizy ekologicznej i chorologicznej, przeprowadzono szczegółową analizę 20 zgrupowań piewików związanych ze zbiorowiskami roślinnymi z 6 klas, tj.: *Artemisietea vulgaris*, *Phragmitetea*, *Koelerio glaucae-Corynephoretea canescentis*, *Molinio-Arrhenatheretea*, *Festuco-Brometea* i *Querco-Fagetea*.
2. Zastosowanie metody dendrytów umożliwiło wyłonienie trzech grup zgrupowań. Pierwszą i bardzo jednolitą grupę tworzyły zgrupowania piewików związane ze zbiorowiskami leśnymi z klasy *Querco-Fagetea*. Drugą grupę tworzyły zgrupowania piewików związane z łąkami wilgotnymi z rzędu *Molinietalia* z klasy *Molinio-Arrhenatheretea* oraz fitocenozami obszarów podmokłych z innych klas fitosocjologicznych tj.: *Urtico-Aegopodietum podagrariae*, *Sparganio-Glycerietum fluitantis* i *Phalaridetum arundinaceae*. Trzecią grupę utworzyły zgrupowania związane z rzędami *Plantaginetalia majoris* i *Arrhenatheretalia elatioris* z klasy *Molinio-Arrhenatheretea* oraz murawami z klasy *Koelerio glaucae-Corynephoretea canescentis* i *Festuco-Brometea*. Metoda dendrytów wyłączyła poza kręgi faunę piewików powierzchni 1 (*Echio-Melilotetum*) i powierzchni 29 (*Adonido-Brachypodietum pinnati*).
3. Obecność trzech grup zgrupowań została potwierdzona analizą głównych składowych PCA opartą na liczebności osobników wszystkich zebranych gatunków.
4. Najważniejszymi gatunkami dla zgrupowań, były: dominanty, taksony wyróżniające i charakterystyczne. Spośród 55 gatunków z wyższych klas liczebności, 13 osiągnęło liczebność superdominanta. Do taksonów wyróżniających zaliczono 8 gatunków, związanych z 5-cioma typami zbiorowisk roślinnych. Wykazano także dość liczną grupę gatunków charakterystycznych i prawdopodobnie charakterystycznych, obejmującą łącznie 42 taksony. W zbiorowisku *Spergulo vernalis-Corynephoretum* było ich najwięcej – aż 3 gatunki wyróżniające i 5 gatunków charakterystycznych, a np. w zbiorowisku *Arrhenatheretum elatioris* i *Dactylis glomerata* nie było ich.
5. Analiza współczynników Shannona-Weavera *H'* i Brillouina $\hat{H}$ wykazała, iż zgrupowania piewików o najwyższej różnorodności gatunkowej występują w zbiorowiskach leśnych z klasy *Querco-Fagetea*. Spośród zbiorowisk nieleśnych

najwyższą różnorodność gatunkową wykazano dla zgrupowania związanego z zespołem *Valeriano-Filipenduletum*. Najwyższa wartość wskaźnika różnorodności Simpsona *I'* charakteryzowała zgrupowania związane ze zbiorowiskami z klasy *Querco-Fagetea*, a spośród nieleśnych z fitocenozami *Valeriano-Filipenduletum* i *Spergulo vernalis-Corynephoretum*. Wskaźnik równomierności Pielou *J'* osiągnął najwyższą wartość również w zbiorowisku leśnym z klasy *Querco-Fagetea*.

6. Analizy oparte na przyjętych w tej pracy kryteriach wykazały, iż gatunkami niezwykle przydatnymi w bioindykacji stanu środowiska są: *Deltocephalus pulicaris*, *Doratura homophyla* i *Psammotettix cephalotes* (Tab. 36).
7. Przeprowadzone badania dowodzą, iż urbicenozy są interesującymi obiektami badań, które dostarczyły zarówno ważnych bioindykatorów na potrzeby przyszłych badań, a niespodziewanie także rzadkich i nowych dla fauny Polski gatunków piewików. Powyższe względy wskazują, iż urbicenozy wymagają kontroli i powinny podlegać stałym badaniom monitoringowym.
8. Zaobserwowano zmiany w zarysie fenologicznym fauny piewików. Maksima liczebności populacji piewików obserwowano w drugiej połowie sierpnia oraz we wrześniu, jednocześnie okres ten charakteryzowało zmniejszenie liczby gatunków tych owadów. Na powierzchniach położonych w centrum miasta najwyższą liczebność osiągnęły *Macrosteles laevis* i *Deltocephalus pulicaris*, w zbiorowiskach: muraw psammofilnych *Neophilaenus minor*, muraw kserotermicznych – *Turutus socialis*, łąk wilgotnych – *Cicadula quadrinotata* i *Notus flavipennis* oraz w zbiorowiskach leśnych – *Balclutha punctata*.
9. Wyniki analizy chorologicznej pokazują, że na obszarze Częstochowy najliczniejszy jest element europejski i eurosyberyjski. Element europejski dominował w obu strefach, w mieście oraz otulinie. W Obniżeniu Górnej Warty dominuje element eurosyberyjski, a na Wyżynie Częstochowskiej europejski, natomiast na Wyżynie Wieluńskiej elementy europejski i eurosyberyjski, mają jednakowy udział.
10. Wyniki analizy ekologicznej wykazały, iż na obszarze Częstochowy największy udział mają gatunki mezohigrofline, mezoheliofilne, oligotopowe, zimujące w stadium jaja i uniwoltynne. Pod względem powiązań troficznych dominowały monofagi, a zwłaszcza monofagi 1-go stopnia, przy czym większość z nich powiązanych było z Poaceae.

Annexes

Table 37. Fidelity values (W) for Fulgoromorpha nad Cicadomorpha species recorded in investigated plant assemblages, differential species marked dark grey, characteristic species and probably characteristic species marked light grey. A plant associations in descriptions referred to the following abbreviations: *Echio-Melilotetum* (E-M), *Urtico-Aegopodietum podagrariae* (U-Ap), *Sparganio-Glycerietum fluitantis* (S-Gf), *Phalaridetum arundinaceae* (Pa), *Spergulo vernalis-Corynephoretum* (Sv-C), *Diantho-Armerietum elongatae* (D-Ae), *Plantaginetalia majoris* (Plant.major.), *Lolio-Polygonetum arenastri* (L-Pa), *Valeriano-Filipenduletum* (V-F), *Cirsietum rivularis* (Cr), *Scirpetum silvatici* (Ss), *Alopecuretum pratensis* (Ap), *Arrhenatheretum elatioris* (Arr), *Achillea millefolium-Taraxacum officinale* (A-T), *Dactylis glomerata* (Dg), *Festucetum pallentis* (Fp), *Sileno-Phleetum* (S-P), *Adonido-Brachypodietum pinnati* (A-Bp), *Alno-Ulmion* (A-U), *Tilio cordatae-Carpinetum betuli* (Tc-C), *Quercus robur-Pinus sylvestris* (Q-P).

	Species	Plant associations																			
		Artemisietea vulgaris		*Phragmitetea*		*Koelerio glaucae--Coryneph. canescentis*		*Molinio-Arrhenatheretea*								*Festuco-Brometea*			*Querco-Fagetea*		
								Plant. major	*Molinietalia caerulae*				*Arrhenatheretalia*								
		E-M	**U-Ap**	**S-Gf**	**Pa**	**Sv-C**	**D-Ae**	**L-Pa**	**V-F**	**Cr**	**Ss**	**Ap**	**Arr**	**A-T**	**Dg**	**Fp**	**S-P**	**A-Bp**	**A-U**	**Tc-C**	**Q-P**
1	***Acanthodelphax denticauda***	-	-	-	50.00	-	-	12.50	-	-	-	31.25	6.25	-	-	-	-	-	-	-	-
2	***Acanthodelphax spinosus***	1.43	-	4.29	-	-	13.57	27.14	1.43	12.14	3.57	10.71	11.43	-	-	3.57	2.14	-	1.43	2.86	4.29
3	***Adarrus multinotatus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.34	87.54	-	12.12	-
4	***Agallia brachyptera***	-	-	7.69	-	-	-	-	30.77	-	-	15.38	-	-	-	-	-	-	23.08	-	23.08
5	***Agallia consobrina***	-	11.11	-	-	-	-	7.41	-	11.11	-	-	-	3.70	-	-	-	-	3.70	55.56	7.41
6	***Alebra albostriella***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
7	***Allygidius commutatus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36.36	45.45	18.18
8	***Allygus mixtus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
9	***Allygus modestus***	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	***Alnetoidia alneti***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57.14	42.86
11	***Anaceratagallia ribauti***	7.57	1.20	5.18	-	1.20	1.20	34.66	-	-	-	4.78	17.53	13.15	7.17	5.58	-	-	0.80	-	-
12	***Anaceratagallia venosa***	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	***Anakelisia perspicilata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50.00	-	50.00	-	-	-
14	***Anoscopus albifrons***	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
15	***Anoscopus flavostriatus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100
16	***Anoscopus serratulae***	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-

	Species	E-M	U-Ap	S-Gf	Pa	Sv-C	D-Ae	L-Pa	V-F	Cr	Ss	Ap	Arr	A-T	Dg	Fp	S-P	A-Bp	A-U	Tc-C	Q-P
17	***Aphrodes bicinctus***	5.13	-	-	-	-	15.38	23.08	12.82	-	-	-	17.95	-	15.38	-	7.69	-	2.56	-	-
18	***Aphrodes makarovi***	-	19.75	-	-	-	-	2.47	7.41	16.05	2.47	2.47	20.99	-	-	-	-	-	12.35	16.05	-
19	***Aphrophora alni***	-	2.75	-	-	-	3.67	4.59	18.35	13.76	-	1.83	0.92	-	1.83	-	-	5.50	4.59	16.51	25.69
20	***Aphrophora salicina***	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-
21	***Arboridia velata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.67	16.67	66.67
22	***Arocephalus languidus***	1.37	-	-	-	3.56	-	15.34	-	-	-	-	58.08	1.10	-	19.73	0.82	-	-	-	-
23	***Arocephalus longiceps***	5.56	-	-	-	44.44	-	16.67	-	-	-	-	5.56	-	-	-	-	22.22	-	-	5.56
24	***Arthaldeus arenarius***	81.25	-	-	-	-	-	-	-	18.75	-	-	-	-	-	-	-	-	-	-	-
25	***Arthaldeus pascuellus***	0.04	0.76	20.48	0.40	-	0.20	4.94	8.84	4.14	0.20	50.40	7.35	0.08	-	-	-	-	1.08	0.04	1.04
26	***Athysanus argentarius***	1.36	1.81	1.36	1.81	-	-	4.52	33.48	14.03	4.07	12.67	20.81	0.45	1.36	-	1.36	0.90	-	-	-
27	***Athysanus quadrum***	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
28	***Balclutha calamagrostis***	50.62	0.07	0.22	2.40	3.92	1.82	4.14	1.96	2.32	0.51	5.37	11.76	0.44	1.23	2.40	2.03	3.34	0.58	0.22	4.65
29	***Balclutha punctata***	0.23	-	0.47	0.23	0.23	0.23	1.40	0.47	-	-	-	0.23	-	-	-	-	-	20.23	18.14	58.14
30	***Balclutha rhenana***	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	***Balclutha saltuella***	-	-	-	-	-	-	50.00	-	-	-	50.00	-	-	-	-	-	-	-	-	-
32	***Centrotus cornutus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78.26	21.74
33	***Cercopis sanguinolenta***	31.71	7.32	-	2.44	-	2.44	-	-	26.83	-	4.88	17.07	-	-	-	2.44	4.88	-	-	-
34	***Cercopis vulnerata***	-	-	-	2.63	-	-	-	77.63	-	2.63	17.11	-	-	-	-	-	-	-	-	-
35	***Chloriona glaucescens***	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-
36	***Chloriona smaragdula***	-	-	-	33.33	-	-	-	-	-	66.67	-	-	-	-	-	-	-	-	-	-
37	***Chlorita paolii***	-	-	-	-	10.58	5.19	12.92	-	0.36	-	4.58	2.39	50.51	9.66	0.97	2.64	0.20	-	-	-
38	***Cicadella viridis***	1.66	0.14	4.57	-	-	0.14	2.63	53.88	4.29	16.90	10.11	0.69	-	-	-	-	-	4.16	0.14	0.69
39	***Cicadula flori***	-	0.72	11.59	63.04	-	-	1.45	0.72	7.25	14.49	0.72	-	-	-	-	-	-	-	-	-
40	***Cicadula frontalis***	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
41	***Cicadula persimilis***	-	2.76	-	-	-	-	14.29	0.92	-	-	-	81.57	-	-	-	-	-	0.46	-	-

	Species	E-M	U-Ap	S-Gf	Pa	Sv-C	D-Ae	L-Pa	V-F	Cr	Ss	Ap	Arr	A-T	Dg	Fp	S-P	A-Bp	A-U	Tc-C	Q-P
42	***Cicadula quadrinotata***	0.49	0.28	2.86	4.98	0.18	0.14	0.88	9.07	14.05	55.21	7.52	2.15	0.64	-	0.21	0.25	-	0.99	-	0.11
43	***Cicadula saturata***	6.25	-	-	-	-	-	-	12.50	25.00	56.25	-	-	-	-	-	-	-	-	-	-
44	***Cixius nervosus***	-	-	16.66	-	-	-	-	-	-	16.66	-	-	-	-	-	-	-	16.66	50.02	-
45	***Cixius simplex***	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-
46	***Conomelus anceps***	1.85	0.93	2.78	-	-	-	6.48	12.96	2.78	18.52	24.07	1.85	-	-	0.93	-	-	21.30	-	5.56
47	***Conosanus obsoletus***	-	-	-	-	-	-	-	20.41	21.43	45.92	11.22	1.02	-	-	-	-	-	-	-	-
48	***Cosmotettix caudatus***	-	-	-	-	-	-	-	25.00	-	50.00	25.00	-	-	-	-	-	-	-	-	-
49	***Cosmotettix costalis***	-	-	-	25.00	-	-	-	25.00	50.00	-	-	-	-	-	-	-	-	-	-	-
50	***Criomorphus albomarginatus***	-	7.69	-	-	-	-	7.69	-	-	-	11.54	3.85	-	-	-	15.38	7.69	7.69	-	38.46
51	***Delphacodes venosus***	-	-	-	-	-	-	42.31	19.23	-	19.23	11.54	3.85	-	-	-	-	-	-	-	3.85
52	***Delphax pulchellus***	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-
53	***Deltocephalus pulicaris***	0.10	-	0.36	-	-	-	77.74	-	-	-	18.99	0.47	2.02	0.10	-	-	-	0.05	0.05	0.10
54	***Dicranotropis hamata***	-	7.79	2.27	0.65	-	1.62	21.10	1.30	3.90	-	1.95	44.48	-	4.22	1.62	0.32	-	4.87	2.92	0.97
55	***Dikraneura variata***	-	-	3.70	3.70	7.41	-	-	-	-	-	-	3.70	-	-	-	-	-	22.22	-	59.26
56	***Doliotettix lunulatus***	-	-	-	2.86	-	-	-	42.86	-	40.00	11.43	-	-	-	-	-	-	2.86	-	-
57	***Doratura exilis***	-	-	-	-	87.50	-	-	-	-	-	-	-	12.50	-	-	-	-	-	-	-
58	***Doratura homophyla***	-	-	-	-	0.52	-	17.62	-	-	-	-	1.04	80.83	-	-	-	-	-	-	-
59	***Doratura impudica***	-	-	-	-	83.33	-	-	-	-	-	-	-	-	-	16.67	-	-	-	-	-
60	***Doratura stylata***	-	0.14	-	-	3.62	8.10	18.67	-	2.60	-	2.60	46.02	4.78	2.46	2.89	6.95	-	-	-	1.16
61	***Edwardsiana ampliata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
62	***Edwardsiana rosae***	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	***Edwardsiana soror***	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	***Elymana kozhevnikovi***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100
65	***Elymana sulphurella***	6.19	0.66	1.11	-	2.43	1.11	13.94	13.27	4.42	0.44	20.58	12.17	-	2.88	1.33	0.66	2.21	12.39	2.21	1.99
66	***Emelianoviana mollicula***	-	-	-	-	4.65	-	1.74	-	-	-	-	5.81	-	16.28	59.30	2.33	9.30	-	-	0.58

	Species	E-M	U-Ap	S-Gf	Pa	Sv-C	D-Ae	L-Pa	V-F	Cr	Ss	Ap	Arr	A-T	Dg	Fp	S-P	A-Bp	A-U	Tc-C	Q-P
67	***Empoasca affinis***	28.57	-	-	-	-	14.29	-	14.29	-	14.29	-	-	-	-	-	-	-	-	14.29	14.29
68	***Empoasca decipiens***	-	-	3.45	-	-	-	6.90	-	-	-	3.45	3.45	-	-	-	-	-	-	82.76	-
69	***Empoasca pteridis***	5.20	6.17	1.93	1.16	-	2.50	6.36	7.32	1.73	3.85	7.71	7.13	0.77	7.71	6.74	3.47	1.16	6.17	19.85	3.08
70	***Empoasca vitis***	1.00	1.00	-	-	-	-	1.00	-	3.00	1.00	1.00	-	-	-	-	-	1.00	10.00	20.00	61.00
71	***Endria nebulosa***	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-
72	***Errastunus ocellaris***	6.55	2.30	0.12	3.89	0.53	4.78	11.68	3.07	1.77	-	10.32	30.68	1.89	4.84	0.06	16.81	-	0.24	0.24	0.24
73	***Erythria aureola***	-	-	-	-	3.64	-	-	-	-	-	-	-	-	-	94.55	1.82	-	-	-	-
74	***Erzaleus metrius***	-	1.33	-	92.67	-	-	0.67	-	-	-	2.00	-	-	-	-	-	-	1.33	2.00	-
75	***Euconomelus lepidus***	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-
76	***Eupelix cuspidata***	-	-	-	-	3.33	18.33	3.33	-	3.33	-	-	38.33	-	-	13.33	8.33	5.00	-	-	6.67
77	***Eupteryx adspersa***	72.73	9.09	-	-	-	-	-	-	-	-	-	9.09	-	-	-	-	-	-	9.09	-
78	***Eupteryx atropunctata***	2.59	89.41	0.24	0.24	-	-	-	1.18	0.24	0.24	0.94	2.12	0.24	1.41	-	0.24	0.24	0.24	0.47	-
79	***Eupteryx aurata***	-	61.54	2.56	-	-	2.56	2.56	-	-	2.56	2.56	-	-	-	-	-	-	2.56	23.08	-
80	***Eupteryx calcarata***	-	83.27	1.45	-	-	-	2.18	-	-	1.09	0.73	0.36	-	-	0.73	-	-	-	8.36	1.82
81	***Eupteryx cyclops***	-	94.85	1.87	0.31	-	0.16	-	0.31	0.47	1.40	-	0.16	-	-	-	-	-	-	0.16	0.31
82	***Eupteryx florida***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96.15	3.85
83	***Eupteryx lelievrei***	-	-	-	-	-	-	-	75.00	-	-	25.00	-	-	-	-	-	-	-	-	-
84	***Eupteryx notata***	-	-	4.65	2.33	18.60	16.28	23.26	-	-	-	-	13.95	-	6.98	9.30	-	-	-	4.65	-
85	***Eupteryx tenella***	-	-	-	-	-	-	-	-	-	-	50.00	-	-	-	-	-	-	-	-	50.00
86	***Eupteryx thoulessi***	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-
87	***Eupteryx urticae***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
88	***Eupteryx vittata***	-	-	4.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.64	31.82
89	***Eurhadina concinna***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
90	***Eurhadina pulchella***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50.00	50.00
91	***Eurybregma nigrolineata***	-	-	-	-	-	13.79	-	-	1.48	-	1.48	7.39	-	2.46	-	73.40	-	-	-	-

	Species	E-M	U-Ap	S-Gf	Pa	Sv-C	D-Ae	L-Pa	V-F	Cr	Ss	Ap	Arr	A-T	Dg	Fp	S-P	A-Bp	A-U	Tc-C	Q-P
92	***Eurysula lurida***	11.76	5.88	17.65	-	-	5.88	41.18	-	-	-	11.76	5.88	-	-	-	-	-	-	-	-
93	***Euscelidius schenckii***	50.00	-	-	-	-	-	50.00	-	-	-	-	-	-	-	-	-	-	-	-	-
94	***Euscelis distinguendus***	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	***Euscelis incisus***	0.46	1.83	0.69	0.23	1.15	4.24	42.09	-	1.03	-	7.11	26.95	2.75	9.40	1.49	0.34	-	-	0.23	-
96	***Evacanthus interruptus***	-	50.00	-	-	-	-	-	50.00	-	-	-	-	-	-	-	-	-	-	-	-
97	***Fagocyba cruenta***	25.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.25	-	12.50	56.25	-
98	***Fieberiella septentrionalis***	-	-	-	-	-	-	-	5.88	-	2.94	-	-	-	-	55.88	11.76	5.88	-	17.65	-
99	***Florodelphax leptosoma***	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	***Forcipata citrinella***	-	0.50	1.49	-	0.50	0.50	5.45	46.04	16.34	7.92	17.82	0.50	-	-	-	-	-	2.97	-	-
101	***Forcipata forcipata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36.14	19.88	43.98
102	***Gargara genistae***	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	***Graphocraerus ventralis***	1.02	-	-	0.34	1.02	2.37	1.02	-	3.05	-	0.34	56.27	1.36	7.80	-	25.08	-	-	-	0.34
104	***Grypotes puncticollis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100
105	***Hardya tenuis***	-	-	-	-	41.18	-	5.88	-	-	-	-	-	-	-	11.76	-	23.53	-	-	17.65
106	***Hephathus nanus***	-	-	-	-	22.22	55.56	-	-	-	-	-	11.11	11.11	-	-	-	-	-	-	-
107	***Hyledelphax elegantulus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.14	10.71	82.14
108	***Iassus lanio***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
109	***Idiocerus stigmaticalis***	-	33.33	-	-	-	-	16.67	-	-	-	-	-	-	16.67	-	-	-	33.33	-	-
110	***Jassargus flori***	-	-	-	-	11.11	-	-	-	5.56	-	-	-	-	-	11.11	-	-	-	11.11	61.11
111	***Jassargus pseudocellaris***	-	-	-	-	1.05	28.06	5.27	-	-	-	2.11	61.60	0.84	0.42	-	0.21	0.21	0.21	-	-
112	***Jassidaeus lugubris***	-	-	-	-	27.27	9.09	27.27	-	-	-	-	36.36	-	-	-	-	-	-	-	-
113	***Javesella dubia***	-	-	-	-	-	-	15.38	-	-	-	7.69	-	-	-	-	-	-	-	76.92	-
114	***Javesella obscurella***	-	7.69	30.77	-	-	-	-	-	-	-	61.54	-	-	-	-	-	-	-	-	-
115	***Javesella pellucida***	0.79	1.19	4.37	1.06	0.07	2.58	30.84	1.19	6.49	3.04	24.29	12.38	0.07	6.09	0.20	0.46	0.26	0.66	1.72	2.25
116	***Kelisia confusa***	-	-	-	-	-	-	-	33.33	33.33	-	33.33	-	-	-	-	-	-	-	-	-

	Species	E-M	U-Ap	S-Gf	Pa	Sv-C	D-Ae	L-Pa	V-F	Cr	Ss	Ap	Arr	A-T	Dg	Fp	S-P	A-Bp	A-U	Tc-C	Q-P
117	***Kelisia monoceros***	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
118	***Kelisia praecox***	-	-	-	-	-	-	-	5.43	2.17	92.39	-	-	-	-	-	-	-	-	-	-
119	***Kelisia punctulum***	-	-	-	-	-	-	-	-	29.41	58.82	-	-	-	-	-	-	-	11.76	-	-
120	***Kosswigianella exigua***	-	-	-	-	50.36	47.45	0.73	-	-	-	-	-	-	-	-	1.46	-	-	-	-
121	***Kybos calyculus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
122	***Kybos populi***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
123	***Kybos smaragdulus***	-	-	11.11	-	-	-	33.33	-	11.11	-	-	22.22	-	-	-	-	-	11.11	11.11	-
124	***Laburrus impictifrons***	-	-	-	-	98.46	-	-	-	-	-	-	1.54	-	-	-	-	-	-	-	-
125	***Laodelphax striatellus***	1.54	1.82	0.56	0.42	0.98	1.40	49.09	-	0.84	0.42	14.03	20.34	2.38	1.40	1.96	0.28	-	1.26	1.12	0.14
126	***Ledra aurita***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
127	***Limotettix striola***	-	33.33	-	-	-	-	-	-	-	-	66.67	-	-	-	-	-	-	-	-	-
128	***Linnavuoriana sexmaculata***	-	-	-	-	-	-	-	33.33	-	-	33.33	-	-	-	-	-	-	33.33	-	-
129	***Macropsis fuscula***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100
130	***Macrosteles cristatus***	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
131	***Macrosteles frontalis***	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
132	***Macrosteles laevis***	0.21	3.80	0.47	0.44	0.62	0.60	42.76	0.16	0.54	0.40	20.09	19.13	9.17	1.24	0.18	0.03	-	0.06	0.08	0.01
133	***Macrosteles ossiannilssoni***	-	-	18.99	-	-	-	-	-	-	-	79.75	-	-	-	-	-	-	1.27	-	-
134	***Macrosteles sardus***	-	-	-	-	-	-	-	-	75.00	25.00	-	-	-	-	-	-	-	-	-	-
135	***Macrosteles septemnotatus***	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-
136	***Macrosteles sexnotatus***	-	1.52	53.54	-	-	-	-	-	-	-	44.95	-	-	-	-	-	-	-	-	-
137	***Macrosteles variatus***	-	96.79	-	-	-	-	-	-	-	1.28	-	0.64	-	-	-	-	-	-	1.28	-
138	***Macrosteles viridigriseus***	-	-	10.53	-	-	-	-	-	5.26	-	84.21	-	-	-	-	-	-	-	-	-
139	***Macustus grisescens***	8.33	8.33	-	-	-	-	-	16.67	16.67	41.67	8.33	-	-	-	-	-	-	-	-	-
140	***Megadelphax sordidulus***	3.43	-	-	0.86	0.43	0.86	1.72	-	-	-	0.86	91.42	-	0.43	-	-	-	-	-	-
141	***Megamelus notula***	-	-	8.33	8.33	-	-	8.33	-	16.67	16.67	33.33	-	-	-	-	-	-	-	8.33	-

	Species	E-M	U-Ap	S-Gf	Pa	Sv-C	D-Ae	L-Pa	V-F	Cr	Ss	Ap	Arr	A-T	Dg	Fp	S-P	A-Bp	A-U	Tc-C	Q-P
142	***Megophthalmus scanicus***	-	35.29	-	9.80	1.96	-	5.88	1.96	-	1.96	3.92	7.84	1.96	27.45	-	1.96	-	-	-	-
143	***Metalimnus formosus***	-	7.69	-	76.92	-	-	-	-	7.69	-	-	7.69	-	-	-	-	-	-	-	-
144	***Metalimnus steini***	42.86	-	-	-	-	-	14.29	-	-	-	-	-	-	-	-	42.86	-	-	-	-
145	***Micantulina stigmatipennis***	8.33	-	-	-	16.67	-	-	-	-	-	-	16.67	-	16.67	41.67	-	-	-	-	-
146	***Mirabella albifrons***	68.75	-	-	-	-	-	6.25	4.17	6.25	4.17	6.25	2.08	-	-	-	-	-	2.08	-	-
147	***Mocuellus collinus***	-	-	-	-	-	0.33	6.34	-	-	-	-	17.40	19.67	4.07	0.16	35.61	16.42	-	-	-
148	***Mocydiopsis attenuata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-
149	***Mocydiopsis parvicauda***	50.00	50.00	-	-	3.33	56.67	16.67	-	-	-	-	20.00	-	-	3.33	-	-	-	-	-
150	***Muellerianella brevipennis***	-	-	6.14	-	0.44	-	5.26	1.75	4.39	0.88	20.18	0.88	0.44	-	-	-	-	37.28	20.61	1.75
151	***Muellerianella fairmairei***	-	-	9.84	-	-	-	14.75	8.20	3.28	2.46	51.64	-	-	0.82	-	-	-	1.64	6.56	0.82
152	***Muirodelphax aubei***	-	-	-	-	51.22	12.20	2.44	-	-	-	-	19.51	-	2.44	12.20	-	-	-	-	-
153	***Neoaliturus fenestratus***	-	-	-	-	92.59	-	-	-	-	-	-	-	-	-	7.41	-	-	-	-	-
154	***Neoaliturus guttulatus***	-	-	-	-	85.71	-	-	-	-	-	-	-	-	-	14.29	-	-	-	-	-
155	***Neophilaenus campestris***	-	-	-	-	25.00	-	-	-	-	-	-	-	-	-	-	25.00	-	-	-	50.00
156	***Neophilaenus exclamationis***	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
157	***Neophilaenus lineatus***	24.07	-	-	-	33.33	-	-	14.81	12.96	3.70	7.41	-	-	-	-	1.85	-	1.85	-	-
158	***Neophilaenus minor***	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
159	***Notus flavipennis***	-	-	2.54	22.79	-	-	0.06	1.97	17.76	50.09	4.68	0.06	-	-	-	-	-	-	-	0.06
160	***Oncopsis alni***	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
161	***Oncopsis flavicollis***	-	-	-	9.52	-	-	4.76	-	4.76	-	9.52	-	-	-	-	4.76	-	-	66.67	-
162	***Ophiola decumana***	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
163	***Paluda flaveola***	-	-	-	-	-	-	-	61.11	-	2.78	33.33	2.78	-	-	-	-	-	-	-	-
164	***Paraliburnia adela***	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-
165	***Philaenus spumarius***	5.04	5.57	20.42	0.53	2.92	2.65	4.24	13.00	14.59	3.45	14.59	5.04	0.53	1.06	0.27	0.27	-	3.71	0.80	1.33
166	***Planaphrodes trifasciata***	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Species	E-M	U-Ap	S-Gf	Pa	Sv-C	D-Ae	L-Pa	V-F	Cr	Ss	Ap	Arr	A-T	Dg	Fp	S-P	A-Bp	A-U	Tc-C	Q-P
167	***Populicerus confusus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
168	***Populicerus populi***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
169	***Psammotettix alienus***	3.56	1.88	0.42	4.60	11.09	5.86	16.95	2.51	4.81	2.51	10.67	16.95	13.18	1.46	0.63	0.63	-	-	1.88	0.42
170	***Psammotettix cephalotes***	-	-	-	-	0.67	-	0.13	-	98.66	-	-	-	-	-	-	0.54	-	-	-	-
171	***Psammotettix confinis***	0.07	-	-	0.07	14.53	6.45	39.19	0.07	0.50	-	1.84	7.80	24.17	2.91	2.20	0.14	-	0.07	-	-
172	***Psammotettix excisus***	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
173	***Psammotettix nodosus***	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
174	***Recilia coronifera***	-	-	-	-	-	-	-	-	-	-	6.25	-	-	-	-	-	-	56.25	12.50	25.00
175	***Rhopalopyx adumbrata***	-	-	-	-	-	59.09	-	4.55	-	-	-	36.36	-	-	-	-	-	-	-	-
176	***Rhopalopyx preyssleri***	-	-	5.00	-	-	-	30.00	-	-	-	5.00	15.00	-	-	-	30.00	15.00	-	-	-
177	***Rhopalopyx vitripennis***	-	-	-	-	55.56	19.61	1.31	-	-	-	-	15.03	1.31	-	7.19	-	-	-	-	-
178	***Rhytistylus proceps***	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
179	***Ribautiana tenerrima***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.11	88.89
180	***Ribautodelphax albostriatus***	2.29	1.15	0.38	-	-	11.45	18.70	0.38	0.38	-	1.15	51.53	4.20	5.73	-	1.91	-	-	0.76	-
181	***Ribautodelphax angulosus***	-	-	-	-	25.00	-	-	-	-	-	6.25	68.75	-	-	-	-	-	-	-	-
182	***Ribautodelphax collinus***	-	-	-	-	3.63	51.97	9.85	-	1.24	-	-	25.73	-	1.45	1.45	-	3.84	-	0.83	-
183	***Sorhoanus assimilis***	-	0.65	0.65	-	-	0.65	-	37.00	50.01	5.84	5.19	-	-	-	-	-	-	-	-	-
184	***Speudotettix subfusculus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.00	32.00	40.00
185	***Stenocranus fuscovittatus***	-	-	-	-	-	-	-	14.36	2.93	81.12	1.60	-	-	-	-	-	-	-	-	-
186	***Stenocranus major***	2.43	5.31	7.67	47.22	1.37	0.49	0.70	0.39	0.81	0.04	4.08	18.44	0.04	10.27	0.04	0.07	-	0.07	0.35	0.21
187	***Stenocranus minutus***	4.81	0.96	-	-	-	3.85	10.58	11.54	8.65	0.96	0.96	16.35	3.85	-	7.69	-	12.50	13.46	1.92	1.92
188	***Stiroma affinis***	-	-	-	-	-	-	-	-	-	-	5.56	-	-	-	-	-	-	33.33	-	61.11
189	***Stiroma bicarinata***	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	***Streptanus aemulans***	-	-	-	-	-	-	42.86	-	-	-	14.29	42.86	-	-	-	-	-	-	-	-
191	***Streptanus confinis***	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-

	Species	E-M	U-Ap	S-Gf	Pa	Sv-C	D-Ae	L-Pa	V-F	Cr	Ss	Ap	Arr	A-T	Dg	Fp	S-P	A-Bp	A-U	Tc-C	Q-P
192	***Streptanus sordidus***	-	-	17.39	4.35	-	-	8.70	-	-	-	56.52	-	-	-	-	-	-	-	13.04	-
193	***Stroggylocephalus agrestis***	-	-	25.00	-	-	-	-	-	-	50.00	25.00	-	-	-	-	-	-	-	-	-
194	***Struebingianella lugubrina***	-	1.23	92.02	-	-	-	-	-	0.61	0.61	4.91	0.61	-	-	-	-	-	-	-	-
195	***Tachycixius pilosus***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-
196	***Tettigometra impressopunctata***	-	-	-	-	-	50.00	-	-	-	-	-	-	-	-	50.00	-	-	-	-	-
197	***Thamnotettix confinis***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.29	42.86	42.86
198	***Turrutus socialis***	-	-	-	-	10.52	13.18	1.37	-	-	-	-	24.06	17.51	1.95	18.59	9.15	3.60	-	0.07	-
199	***Utecha lugens***	-	-	-	-	-	54.55	27.27	-	-	-	-	-	-	-	18.18	-	-	-	-	-
200	***Utecha trivia***	-	-	-	-	-	2.18	92.37	-	-	-	-	1.31	3.70	-	-	-	-	-	0.44	-
201	***Verdanus abdominalis***	-	-	-	-	0.89	-	-	14.29	7.14	-	13.84	0.45	-	-	2.23	48.21	12.95	-	-	-
202	***Wagneripteryx germari***	-	-	-	-	-	-	20.00	-	-	-	-	-	-	-	-	-	-	-	-	80.00
203	***Xanthodelphax flaveolus***	-	-	-	-	-	28.57	38.10	-	-	-	-	4.76	-	-	-	-	-	28.57	-	-
204	***Xanthodelphax stramineus***	6.06	-	-	-	-	-	48.48	-	-	-	-	42.42	-	3.03	-	-	-	-	-	-
205	***Zonocyba bifasciata***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
206	***Zygina angusta***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.33	-	16.67	75.00
207	***Zygina flammigera***	-	-	-	-	-	-	4.55	-	-	-	-	-	-	-	-	-	-	13.64	36.36	45.45
208	***Zygina hyperici***	4.00	-	-	-	16.00	8.00	-	-	-	-	-	4.00	-	28.00	20.00	8.00	-	-	8.00	4.00
209	***Zygina suavis***	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	***Zyginidia pullula***	-	2.50	-	-	5.00	2.50	13.75	2.50	2.50	-	5.00	60.00	6.25	-	-	-	-	-	-	-

Table 38. Values of species diversity indices with standard deviation *sd (Ĥ)*, *sd (H')* i *sd (I')* for the Fulgoromorpha nad Cicadomorpha collected by sweep netting method in particular researh plots. The lowest value marked light grey, the highest value marked dark grey.

Plot	The number of species	Brillouin's index		Shannon-Weaver's coefficient			Pielou's evenness coefficient	Simpson's index			
		Ĥ	sd (Ĥ)	H'	sd (H')	H_{max}	J'	I'	sd (I')	Ip	dI
1	17	0.880	0.287	0.929	0.354	4.087	22.73%	0.347	0.155	0.941	36.87%
2	44	2.415	0.163	2.515	0.165	5.459	46.07%	0.820	0.015	0.977	83.91%
3	36	1.673	0.306	1.719	0.357	5.170	33.25%	0.680	0.120	0.972	69.94%
4	39	2.015	0.102	2.064	0.119	5.285	39.05%	0.771	0.039	0.974	79.13%
5	55	2.439	0.047	2.498	0.060	5.781	43.21%	0.850	0.043	0.982	86.57%
6	36	1.596	0.428	1.621	0.464	5.170	31.35%	0.650	0.158	0.972	66.86%
7	52	2.361	0.318	2.441	0.331	5.700	42.82%	0.797	0.062	0.981	81.26%
8	39	2.684	0.131	2.753	0.151	5.285	52.09%	0.909	0.009	0.974	93.29%
9	54	2.743	0.331	2.802	0.351	5.755	48.69%	0.884	0.115	0.981	90.07%
10	56	1.773	0.389	1.797	0.409	5.807	30.94%	0.704	0.094	0.982	71.68%
11	49	1.979	0.697	2.038	0.761	5.615	36.30%	0.697	0.199	0.980	71.15%
12	51	1.826	0.415	1.859	0.437	5.672	32.77%	0.664	0.139	0.980	67.73%
13	52	1.087	0.631	1.103	0.647	5.700	19.35%	0.396	0.261	0.981	40.38%
14	61	2.839	0.133	2.903	0.198	5.931	48.95%	0.902	0.029	0.984	91.70%
15	47	2.276	0.145	2.339	0.156	5.555	42.11%	0.831	0.048	0.979	84.91%
16	36	1.699	0.300	1.760	0.310	5.170	34.04%	0.564	0.118	0.972	58.01%
17	40	1.677	0.147	1.733	0.184	5.322	32.56%	0.710	0.038	0.975	72.82%
18	38	1.705	0.095	1.734	0.110	5.248	33.04%	0.696	0.045	0.974	71.48%
19	67	2.413	0.421	2.469	0.426	6.066	40.70%	0.810	0.124	0.985	82.23%
20	54	1.773	0.566	1.791	0.582	5.755	31.12%	0.667	0.170	0.981	67.96%
21	44	1.729	0.928	1.761	0.965	5.459	32.26%	0.622	0.314	0.977	63.65%
22	56	2.372	0.166	2.419	0.168	5.807	41.65%	0.843	0.049	0.982	85.83%
23	36	1.997	0.105	2.032	0.099	5.170	39.30%	0.752	0.040	0.972	77.35%
24	53	2.352	0.299	2.395	0.303	5.728	41.81%	0.818	0.072	0.981	83.37%
25	35	1.720	0.346	1.737	0.354	5.129	33.86%	0.716	0.149	0.971	73.71%
26	38	2.562	0.309	2.618	0.274	5.248	49.89%	0.884	0.043	0.974	90.79%
27	44	2.611	0.044	2.704	0.059	5.459	49.53%	0.869	0.014	0.977	88.92%
28	45	2.362	0.135	2.424	0.106	5.492	44.14%	0.869	0.027	0.978	88.88%
29	26	1.959	0.138	2.032	0.147	4.700	43.23%	0.771	0.036	0.962	80.18%
30	58	3.029	0.172	3.175	0.164	5.858	54.20%	0.933	0.013	0.983	94.94%
31	45	3.138	0.177	3.334	0.175	5.492	60.71%	0.953	0.011	0.978	97.47%
32	36	2.560	0.150	2.789	0.202	5.129	54.37%	0.895	0.025	0.971	92.13%
33	41	2.622	0.043	2.940	0.044	5.358	54.88%	0.900	0.008	0.976	92.25%
34	47	2.902	0.559	3.097	0.564	5.555	55.76%	0.922	0.064	0.979	94.20%
35	38	2.339	0.439	2.459	0.479	5.248	46.86%	0.836	0.118	0.974	85.86%

Table 39. A brief description of the planthoppers and leafhoppers communities with list of the characteristic and differential species.

Lp	Communities of planthoppers and leafhoppers			
1	**Communities connected with the plant association *Echio-Melilotetum***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Arthaldeus arenarius		+	
	Balclutha calamagrostis		+	
	Mirabella albifrons		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Balclutha calamagrostis	57.64%		66.59%
	Errastunus ocellaris	8.95%		
2	**Communities connected with the plant association *Urtico-Aegopodietum podagrariae***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Balclutha rhenana	+		
	Eupteryx atropunctata			+
	Eupteryx aurata			+
	Eupteryx calcarata		+	
	Eupteryx cyclops		+	
	Macrosteles variatus	+		
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Macrosteles laevis	22.95%		**65.85%**
	Eupteryx cyclops	22.91%		
	Eupteryx atropunctata	20.00%		
3	**Communities connected with the plant association *Sparganio-Glycerietum fluitantis***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Macrosteles sexnotatus			+
	Struebingianella lugubrina		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Arthaldeus pascuellus	27.85%		40.45%
	Stenocranus major	12.60%		
4	**Communities connected with the plant association *Phalaridetum arundinaceae***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Cicadula flori		+	
	Erzaleus metrius		+	
	Metalimnus formosus		+	

4	**The most numerous planthoppers and leafhoppers species in the plant association**	**Share from all three seasons**		**The most numerous species together**
	Stenocranus major	52.30%		66.00%
	Notus flavipennis	13.70%		
5	**Communities connected with the plant association *Spergulo vernalis-Corynephoretum***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Doratura exilis		+	
	Kosswigianella exigua		+	
	Laburrus impictifrons	+		
	Muirodelphax aubei		+	
	Neoaliturus fenestratus		+	
	Neoaliturus guttulatus		+	
	Neophilaenus minor	+		
	Psammotettix excisus	+		
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Psammotettix excisus	21,56%		44,79%
	Neophilaenus minor	13.54%		
	Psammotettix confinis	9.69%		
6	**Communities connected with the plant association *Diantho-Armerietum elongatae***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Mocydiopsis parvicauda			+
	Rhopalopyx adumbrata			+
	Ribautodelphax collinus		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Ribautodelphax collinus	22.42%		34.35%
	Turrutus socialis	11.93%		
7	**Communities connected with the plant association *Lolio-Polygonetum arenastri***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Deltocephalus pulicaris		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Macrosteles laevis	56.15%		65.14%
	Deltocephalus pulicaris	8.99%		
8	**Communities connected with the plant association *Valeriano-Filipenduletum***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Cercopis vulnerata			+
	Cicadella viridis			+
	Eupteryx lelievrei		+	

8	**The most numerous planthoppers and leafhoppers species in the plant association**	**Share from all three seasons**		**The most numerous species together**
	Cicadella viridis	18.45%		33.12%
	Cicadula quadrinotata	14.67%		
9	**Communities connected with the plant association *Cirsietum rivularis***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Psammotettix cephalotes	+		
	Sorhoanus assimilis			+
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Psammotettix cephalotes	32.37%		59.30%
	Cicadula quadrinotata	15.19%		
	Notus flavipennis	11.74%		
10	**Communities connected with the plant association *Scirpetum silvatici***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Cicadula frontalis	+		
	Cicadula quadrinotata		+	
	Kelisia praecox		+	
	Notus flavipennis		+	
	Stenocranus fuscovittatus		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Cicadula quadrinotata	43.12%		71.38%
	Notus flavipennis	28.26%		
11	**Communities connected with the plant association *Alopecuretum pratensis***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Arthaldeus pascuellus			+
	Muellerianella fairmairei		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Macrosteles laevis	44.59%		60.01%
	Arthaldeus pascuellus	15.42%		
12	**Communities connected with the plant association *Arrhenatheretum elatioris****			
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Macrosteles laevis	43.02%		49.07%
	Errastunus ocellaris	6.05%		
13	**Communities connected with the plant association *Achillea millefolium-Taraxacum officinale***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Chlorita paolii		+	
	Doratura homophyla			+

13	**The most numerous planthoppers and leafhoppers species in the plant association**	**Share from all three seasons**		**The most numerous species together**
	Macrosteles laevis	46.11%		70.32%
	Chlorita paolii	24.21%		
14	**Communities connected with the plant association *Dactylis glomerata****			
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Macrosteles laevis	25.07%		40.05%
	Chlorita paolii	14.98%		
15	**Communities connected with the plant association *Festucetum pallentis***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Emelianoviana mollicula		+	
	Erythria aureola		+	
	Fieberiella septentrionalis			+
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Turrutus socialis	30.69%		42.95%
	Emelianoviana mollicula	12.26%		
16	**Communities connected with the plant association *Sileno-Phleetum***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Eurybregma nigrolineata			+
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Errastunus ocellaris	25.60%		41.19%
	Mocuellus collinus	15.59%		
17	**Communities connected with the plant association *Adonido-Brachypodietum pinnati***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Adarrus multinotatus		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Adarrus multinotatus	42.97%		59.22%
	Mocuellus collinus	16.25%		
18	**Communities connected with the plant association *Alno-Ulmion***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Recilia coronifera			+
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Balclutha punctata	15.20%		28.83%
	Muellerianella brevipennis	13.63%		

19	**Communities connected with the plant association *Tilio cordatae-Carpinetum betuli***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Eupteryx florida	+		
	Oncopsis flavicollis		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Empoasca pteridis	15.19%		25,09%
	Balclutha punctata	9.90%		
20	**Communities connected with the plant association *Quercus robur-Pinus sylvestris***			
	Species	**differential species**	**characteristic species**	**probably characteristic species**
	Balclutha punctata		+	
	Empoasca vitis		+	
	The most numerous planthoppers and leafhoppers species in the plant association	**Share from all three seasons**		**The most numerous species together**
	Balclutha punctata	30.6%		40.26%
	Empoasca vitis	9.66%		

* - Distinguishing the characteristic and differential species for this community could not be done

Table 40. The share of particular chorological elements in the total amount of material collected in the area of the Częstochowa city (N – sum of the element)

Chorological analysis	N	%
Cosmopolitic	1	0.38
Holarctic	10	3.76
Transpalaearctic	30	11.28
Western Palaearctic	32	12.03
Siberian	25	9.40
Euro-Siberian	63	23.68
European	74	27.82
West European	3	1.13
North European	3	1.13
South European	7	2.63
Mediterranean	7	2.63
Exclusively Mediterranean	4	1.50
Kazakh	7	2.63

Table 41a. Percentage share of chorological elements in particular research plots 1-10 in the area of the Częstochowa city (N – sum of the element).

Chorological analysis	Plots																			
	1		2		3		4		5		6		7		8		9		10	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Cosmopolitic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.79
Holarctic	1	5.88	6	13.64	3	8.33	3	7.69	5	9.09	5	13.89	5	9.62	3	7.69	4	7.41	4	7.14
Transpalaearctic	7	41.18	8	18.18	12	33.33	10	25.64	11	20.0	7	19.44	11	21.15	11	28.21	12	22.22	13	23.21
Western Palaearctic	2	11.76	6	13.64	5	13.89	6	15.38	8	14.55	3	8.33	8	15.38	4	10.26	8	14.81	7	12.50
Siberian	1	5.88	5	11.36	2	5.56	4	10.26	4	7.27	4	11.11	1	1.92	-	-	5	9.26	5	8.93
Euro-Siberian	4	23.53	8	18.18	7	19.44	6	15.38	13	23.64	9	25.00	5	9.62	7	17.95	10	18.52	13	23.21
European	-	-	6	13.64	3	8.33	7	17.95	10	18.18	4	11.11	11	21.15	4	10.26	5	9.26	5	8.93
West European	1	5.88	1	2.27	1	2.78	-	-	1	1.82	-	-	1	1.92	2	5.13	-	-	1	1.79
North European	1	5.88	1	2.27	1	2.78	-	-	2	3.64	1	2.78	2	3.85	2	5.13	2	3.70	2	3.57
South European	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2.56	1	1.85	1	1.79
Mediterranean	-	-	1	2.27	2	5.56	2	5.13	-	-	2	5.56	1	1.92	1	2.56	3	5.56	1	1.79
Exclusively Mediterranean	-	-	-	-	-	-	-	-	-	-	-	-	1	1.92	-	-	2	3.70	-	-
Kazakh	-	-	2	4.55	-	-	1	2.56	1	1.82	1	2.78	6	11.54	4	10.26	2	3.70	3	5.36

Table 41b. Percentage share of chorological elements in particular research plots 11-20 in the area of the Częstochowa city (N – sum of the element).

Chorological analysis	Plots																			
	11		12		13		14		15		16		17		18		19		20	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Cosmopolitic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.49	-	-
Holarctic	5	10.20	5	9.80	5	9.62	4	6.56	2	4.26	3	8.33	3	7.50	2	5.26	5	7.46	4	7.41
Transpalaearctic	12	24.49	11	21.57	10	19.23	9	14.75	11	23.40	12	33.33	6	15.00	6	15.79	14	20.90	13	24.07
Western Palaearctic	8	16.33	8	15.69	10	19.23	10	16.39	6	12.77	4	11.11	7	17.50	4	10.53	7	10.45	7	12.96
Siberian	1	2.04	2	3.92	3	5.77	8	13.11	5	10.64	2	5.56	6	15.00	6	15.79	6	8.96	3	5.56
Euro-Siberian	10	20.41	9	17.65	10	19.23	17	27.87	12	25.53	8	22.22	10	25.00	13	34.21	16	23.88	11	20.37
European	6	12.24	7	13.73	8	15.38	7	11.48	7	14.89	2	5.56	6	15.00	3	7.89	11	16.42	10	18.52
West European	-	-	-	-	-	-	1	1.64	1	2.13	-	-	-	-	1	2.63	1	1.49	1	1.85
North European	2	4.08	1	1.96	2	3.85	1	1.64	1	2.13	1	2.78	1	2.50	1	2.63	1	1.49	3	5.56
South European	1	2.04	1	1.96	-	-	2	3.28	-	-	1	2.78	-	-	-	-	1	1.49	1	1.85
Mediterranean	1	2.04	4	7.84	2	3.85	1	1.64	1	2.13	1	2.78	-	-	1	2.63	2	2.99	-	-
Exclusively Mediterranean	-	-	-	-	-	-	1	1.64	1	2.13	1	2.78	1	2.50	1	2.63	1	1.49	1	1.85
Kazakh	3	6.12	3	5.88	2	3.85	-	-	-	-	1	2.78	-	-	-	-	1	1.49	-	-

Table 41c. Percentage share of chorological elements in particular research plots 21-30 in the area of the Częstochowa city (N – sum of the element).

Chorological analysis	Plots																			
	21		22		23		24		25		26		27		28		29		30	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Cosmopolitic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Holarctic	6	13.64	3	5.36	4	11.11	5	9.43	4	11.43	4	10.53	3	6.82	3	6.67	-	-	6	10.34
Transpalaearctic	9	20.45	12	21.43	8	22.22	10	18.87	8	22.86	9	23.68	12	27.27	11	24.44	5	19.23	12	20.69
Western Palaearctic	9	20.45	10	17.86	6	16.67	7	13.21	6	17.14	9	23.68	11	25.0	8	17.78	6	23.08	6	10.34
Siberian	1	2.27	1	1.79	1	2.78	5	9.43	-	-	1	2.63	-	-	-	-	-	-	5	8.62
Euro-Siberian	8	18.18	13	23.21	7	19.44	11	20.75	7	20.00	7	18.42	4	9.09	8	17.78	6	23.08	14	24.14
European	4	9.09	8	14.29	1	2.78	6	11.32	1	2.86	3	7.89	6	13.64	8	17.78	5	19.23	9	15.52
West European	-	-	-	-	-	-	1	1.89	-	-	-	-	1	2.27	-	-	-	-	1	1.72
North European	2	4.54	2	3.57	2	5.56	2	3.77	2	5.71	2	5.26	1	2.27	2	4.44	2	7.69	3	5.17
South European	1	2.27	1	1.79	1	2.78	-	-	-	-	-	-	-	-	-	-	-	-	1	1.72
Mediterranean	-	-	2	3.57	2	5.56	2	3.77	3	8.57	1	2.63	1	2.27	3	6.67	1	3.85	1	1.72
Exclusively Mediterranean	1	2.27	1	1.79	-	-	1	1.89	1	2.86	-	-	1	2.27	-	-	-	-	-	-
Kazakh	3	6.82	3	5.36	4	11.11	3	5.66	3	8.57	2	5.26	4	9.09	2	4.44	1	3.85	-	-

Table 41d. Percentage share of chorological elements in particular research plots 31-35 in the area of the Częstochowa city and other zone, such as: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU) (N – sum of the element).

Chorological analysis	Plots and Regions																			
	31		32		33		34		35		M		O		UWR		WCz		WU	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Cosmopolitic	-	-	-	-	-	-	-	-	-	-	1	0.41	1	0.68	1	0.53	-	-	-	-
Holarctic	5	11.11	2	5.56	3	7.32	5	10.64	4	10.53	9	3.72	9	6.08	10	5.26	7	4.76	7	4.19
Transpalaearctic	11	24.44	8	22.22	10	24.39	12	25.53	8	21.05	30	12.40	22	14.86	24	12.63	23	15.65	22	13.17
Western Palaearctic	7	15.56	4	11.12	5	12.20	5	10.64	5	13.16	27	11.16	20	13.51	27	14.21	19	12.93	18	10.78
Siberian	2	4.44	1	2.78	3	7.32	2	4.26	2	5.26	23	9.50	12	8.11	22	11.58	6	4.08	17	10.18
Euro-Siberian	9	20.00	7	19.44	8	19.51	10	21.28	12	31.58	59	24.38	32	21.62	49	25.79	29	19.73	41	24.55
European	9	20.00	9	25.00	8	19.51	9	19.15	4	10.53	63	26.03	33	22.30	37	19.47	39	26.53	41	24.55
West European	-	-	-	-	-	-	-	-	1	2.63	3	1.24	1	0.68	1	0.53	2	1.36	1	0.60
North European	-	-	1	2.78	1	2.44	1	2.13	1	2.63	3	1.24	2	1.35	3	1.58	2	1.36	5	2.99
South European	-	-	1	2.78	-	-	1	2.13	1	2.63	7	2.89	2	1.35	4	2.11	4	2.72	2	1.20
Mediterranean	2	4.44	2	5.56	2	4.88	2	4.26	-	-	7	2.89	5	3.38	5	2.63	7	4.76	5	2.99
Exclusively Mediterranean	-	-	-	-	-	-	-	-	-	-	3	1.24	4	2.70	2	1.05	2	1.36	4	2.40
Kazakh	-	-	1	2.78	1	2.44	-	-	-	-	7	2.89	5	3.38	5	2.63	7	4.76	4	2.40

Table 42. The share of particular ecological elements in the total amount of material collected in the area of the Częstochowa city, (N – sum of the element).

Ecological analysis		**N**	**%**
Humidity of the environment	hygrophilous	66	24.81
	mesohygrophilous	151	56. 77
	xerophilous	49	18.42
Insolation of the environment	helophilous	80	30.07
	mesoheliophilous	180	67.67
	skiophilous	6	2.26
Trophic relationships	monophagous - m1	77	28.95
	monophagous - m2	67	25.19
	oligophagous - o1	56	21.05
	oligophagous - o2	24	9.02
	polyphagous	41	15.41
	unknown	1	0.38
The strength of relationship of a species with its habitat	eurytopic species	58	21.80
	oligotopic species	133	50.00
	stenotopic species	75	28.20
Overwintering stage	imago	36	13.53
	overwintering in nymphal stage	42	15.79
	overwintering in egg stage	188	70.68
Number of generations	species with one generation	147	55.26
	species with two generation	119	44.74

Table 43a. Percentage share of ecological elements in particular research plots 1-10 in the area of the Częstochowa city (N – sum of the element).

Chorological analysis	Plots																			
	1		2		3		4		5		6		7		8		9		10	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Humidity of the environment																				
hygrophilous	2	11.76	2	4.55	7	19.44	10	25.64	16	29.1	11	30.56	1	1.92	1	2.56	3	5.56	7	12.50
mesohygrophilous	14	82.35	35	79.55	28	77.78	26	66.67	36	65.45	22	61.11	25	48.08	17	43.59	34	62.96	37	66.07
xerophilous	1	5.88	7	15.9	1	2.78	3	7.69	3	5.45	3	8.33	26	50.0	21	53.85	17	31.48	12	21.43
Insolation of the environment																				
helophilous	4	23.53	16	36.36	7	19.44	11	28.21	11	20.0	10	27.78	31	59.62	26	66.67	27	50.0	22	39.29
mesoheliophilous	13	76.47	28	63.64	26	72.22	26	66.67	42	76.36	26	72.22	21	40.38	13	33.33	26	48.15	34	60.71
skiophilous	-	-	-	-	3	8.33	2	5.13	2	3.64	-	-	-	-	-	-	1	1.85	-	-
Trophic relationships																				
monophagous - m1	1	5.88	8	18.18	7	19.44	10	25.64	7	12.73	6	16.67	15	28.85	11	28.21	14	25.93	9	16.07
monophagous - m2	5	29.41	9	20.45	5	13.89	6	15.38	15	27.27	8	22.22	6	11.54	7	17.95	11	20.37	14	25.0
oligophagous - o1	5	29.41	13	29.54	9	25.00	10	25.64	14	25.45	12	33.33	21	40.38	13	33.33	15	27.78	21	37.50
oligophagous - o2	1	5.88	2	4.55	2	5.56	3	7.69	6	10.91	2	5.56	4	7.69	4	10.26	3	5.56	3	5.36
polyphagous	5	29.41	12	27.27	13	36.11	10	25.64	13	23.64	8	22.22	6	11.54	4	10.26	11	20.37	9	16.07
unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
The strength of relationship of a species with its habitat																				
eurytopic species	11	64.71	24	54.54	18	50.00	16	41.03	18	32.72	13	36.11	16	30.77	13	33.33	24	44.44	26	46.43
oligotopic species	3	17.65	15	34.09	14	38.89	17	43.59	23	41.82	16	44.44	18	34.62	13	33.33	23	42.59	21	37.50
stenotopic species	3	17.65	5	11.36	4	11.11	6	15.38	14	25.45	7	19.44	18	34.62	13	33.33	7	12.96	9	16.07
Overwintering stage																				
overwintering in adult stage	3	17.65	6	13.64	7	19.44	5	12.82	6	10.91	3	8.33	9	17.31	7	17.95	13	24.07	11	19.64
overwintering in nymphal stage	4	23.53	10	22.73	6	16.67	9	23.08	11	20.0	10	27.78	6	11.54	8	20.51	14	25.93	10	17.86
overwintering in egg stage	10	58.82	28	63.64	23	63.89	25	64.1	38	69.09	23	63.89	37	71.15	24	61.54	27	50.0	35	62.5
Number of generations during the year																				
species with one generation	12	70.59	19	43.18	16	44.44	15	38.46	21	38.18	13	36.11	22	42.31	18	46.15	26	48.15	24	42.86
species with two generation	5	29.41	25	56.82	20	55.56	24	61.54	34	61.82	23	63.89	30	57.69	21	53.85	28	51.85	32	57.14

Table 43b. Percentage share of ecological elements in particular research plots 11-20 in the area of the Częstochowa city (N – sum of the element).

Chorological analysis	Plots																			
	11		12		13		14		15		16		17		18		19		20	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Humidity of the environment																				
hygrophilous	2	4.08	4	7.84	7	13.46	22	36.06	18	38.3	5	13.89	17	42.50	18	47.37	17	25.37	22	40.74
mesohygrophilous	30	61.22	32	62.75	37	71.15	38	62.3	28	59.57	25	69.44	22	55.00	20	52.63	44	65.67	31	57.41
xerophilous	17	34.69	15	29.41	8	15.38	1	1.64	1	2.13	6	16.67	1	2.50	-	-	6	8.96	1	1.86
Insolation of the environment																				
helophilous	27	55.1	26	50.98	16	30.77	11	18.03	10	21.28	12	33.33	6	15.00	6	15.79	18	26.87	12	22.22
mesoheliophilous	22	44.9	24	47.06	34	65.38	49	80.33	36	76.6	24	66.66	32	80.00	32	84.21	49	73.13	41	75.93
skiophilous	-	-	1	1.96	2	3.85	1	1.64	1	2.13	-	-	2	5.00	-	-	-	-	1	1.86
Trophic relationships																				
monophagous - m1	11	22.45	8	15.69	11	21.15	11	18.03	5	10.64	4	11.11	7	17.50	7	18.42	7	10.45	8	14.81
monophagous - m2	10	20.41	10	19.61	11	21.15	18	29.51	16	34.04	9	25.00	13	32.50	13	34.21	17	25.37	12	22.22
oligophagous - o1	17	34.69	21	41.18	17	32.69	15	24.59	9	19.15	14	38.89	6	15.00	7	18.42	23	34.33	18	33.33
oligophagous - o2	3	6.12	3	5.88	4	7.69	3	4.92	6	12.77	2	5.56	1	2.50	2	5.26	5	7.46	6	11.11
polyphagous	8	16.32	9	17.65	9	17.31	14	22.95	10	21.28	7	19.44	12	30.00	9	23.68	15	22.39	10	18.52
unknown	-	-	-	-	-	-	-	-	1	2.13	-	-	1	2.50	-	-	-	-	-	-
The strength of relationship of a species with its habitat																				
eurytopic species	23	46.94	19	37.25	25	48.08	24	39.34	17	36.17	16	44.44	13	32.50	13	34.21	22	32.84	19	35.19
oligotopic species	20	40.82	26	50.98	20	38.46	21	34.43	15	31.91	15	41.67	14	35.00	12	31.58	32	47.76	20	37.04
stenotopic species	6	12.24	6	11.76	7	13.46	16	26.23	15	31.91	5	13.89	13	32.50	13	34.21	13	19.40	15	27.78
Overwintering stage																				
overwintering in adult stage	7	14.29	9	17.65	11	21.15	9	14.75	6	12.77	5	13.89	5	12.50	6	15.79	9	13.43	4	7.41
overwintering in nymphal stage	13	26.53	9	17.65	14	26.92	10	16.39	9	19.15	8	22.22	6	15.00	8	21.05	16	23.88	14	25.93
overwintering in egg stage	29	59.18	33	64.71	27	51.92	42	68.85	32	68.09	23	63.89	29	72.50	24	63.16	42	62.69	36	66.66
Number of generations during the year																				
species with one generation	14	28.57	24	47.06	23	44.23	40	65.57	21	44.68	20	55.56	21	52.50	25	65.79	40	59.70	22	40.74
species with two generation	35	71.43	27	52.94	29	55.77	21	34.43	26	55.32	16	44.44	19	47.50	13	34.21	27	40.30	32	59.26

Table 43c. Percentage share of ecological elements in particular research plots 21-30 in the area of the Częstochowa city (N – sum of the element).

Chorological analysis	Plots																			
	21		22		23		24		25		26		27		28		29		30	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Humidity of the environment																				
hygrophilous	3	6.82	5	8.93	-	-	1	1.89	1	2.86	2	5.26	1	2.27	1	2.22	1	3.85	12	20.69
mesohygrophilous	34	77.27	35	62.5	24	66.67	38	71.70	24	68.57	26	68.42	21	47.73	28	62.22	14	53.85	46	79.31
xerophilous	7	15.91	16	28.57	12	33.33	14	26.42	10	28.57	10	26.32	22	50.0	16	35.56	11	42.31	-	-
Insolation of the environment																				
helophilous	17	38.64	30	53.57	19	52.78	24	45.28	19	54.29	20	52.63	26	59.09	24	53.33	11	42.31	7	12.07
mesoheliophilous	26	59.09	26	46.43	17	47.22	29	54.72	15	42.86	18	47.37	18	40.91	21	46.67	15	57.69	49	84.48
skiophilous	1	2.27	-	-	-	-	-	-	1	2.86	-	-	-	-	-	-	-	-	2	3.45
Trophic relationships																				
monophagous - m1	7	15.91	13	23.21	6	16.67	12	22.64	6	17.14	7	18.42	10	22.73	7	15.55	3	11.54	7	12.07
monophagous - m2	7	15.91	10	17.86	5	13.89	10	18.87	4	11.43	4	10.53	10	22.73	6	13.33	4	15.38	13	22.41
oligophagous - o1	15	34.09	19	33.93	15	41.67	21	39.62	17	48.57	16	42.11	12	27.27	18	40.0	9	34.62	15	25.86
oligophagous - o2	5	11.36	4	7.14	3	8.33	4	7.55	2	5.71	3	7.89	4	9.09	3	6.67	2	7.69	3	5.17
polyphagous	10	22.73	10	17.86	7	19.44	6	11.32	6	17.14	8	21.05	8	18.18	11	24.44	8	30.77	20	34.48
unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
The strength of relationship of a species with its habitat																				
eurytopic species	21	47.73	23	41.07	18	50.00	25	47.17	16	45.71	19	50.00	16	36.36	21	46.67	10	38.46	29	50.00
oligotopic species	21	47.73	25	44.64	16	44.44	22	41.51	16	45.71	15	39.47	15	34.09	19	42.22	13	50.00	20	34.48
stenotopic species	2	4.54	8	14.29	2	5.56	6	11.32	3	8.57	4	10.53	13	29.54	5	11.11	3	11.54	9	15.52
Overwintering stage																				
overwintering in adult stage	7	15.91	7	12.5	5	13.89	10	18.87	7	20.0	3	7.89	10	22.73	2	4.44	5	19.23	10	17.24
overwintering in nymphal stage	8	18.18	16	28.57	8	22.22	14	26.42	4	11.43	10	26.32	8	18.18	11	24.44	5	19.23	14	24.14
overwintering in egg stage	29	65.91	33	58.93	23	63.89	29	54.72	24	68.57	25	65.79	26	59.09	32	71.11	16	61.54	34	58.62
Number of generations during the year																				
species with one generation	17	38.64	21	37.5	12	33.33	25	47.17	15	42.86	13	34.21	17	38.64	20	44.44	15	57.69	32	55.17
species with two generation	27	61.36	35	62.5	24	66.67	28	52.83	20	57.14	25	65.79	27	61.36	25	55.56	11	42.31	26	44.83

Table 43d. Percentage share of ecological elements in particular research plots 31-35 in the area of the Częstochowa city and other zone, such as: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU) (N – sum of the element).

Chorological analysis	Plots and Regions																			
	31		32		33		34		35		M		O		UWR		WCz		WU	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Humidity of the environment																				
hygrophilous	10	22.22	2	5.56	5	12.2	6	12.77	6	15.79	24	16.22	64	26.45	52	27.37	13	8.84	45	26.95
mesohygrophilous	32	71.11	32	88.88	31	75.61	35	74.47	31	81.58	93	62.84	131	54.13	106	55.79	88	59.86	98	58.68
xerophilous	3	6.67	2	5.56	5	12.2	6	12.77	1	2.63	31	20.95	47	19.42	32	16.84	46	31.29	24	14.37
Insolation of the environment																				
helophilous	10	22.22	5	13.88	7	17.07	13	27.66	7	18.42	50	33.78	75	30.99	60	31.58	63	42.85	45	26.95
mesoheliophilous	31	68.89	30	83.33	33	80.49	33	70.21	31	81.58	94	63.51	161	66.53	126	66.32	81	55.10	117	70.06
skiophilous	4	8.89	1	2.78	1	2.44	1	2.13	0	0.00	4	2.70	6	2.48	4	2.11	3	2.04	5	2.99
Trophic relationships																				
monophagous - m1	8	17.78	6	16.66	9	21.95	7	14.89	4	10.53	37	25.00	69	28.51	53	27.89	37	25.17	41	24.55
monophagous - m2	8	17.78	5	13.88	6	14.63	6	12.77	9	23.68	31	20.94	62	25.62	49	25.79	23	15.65	42	25.15
oligophagous - o1	14	31.11	8	22.22	7	17.07	16	34.04	11	28.95	41	27.70	52	21.49	45	23.68	39	26.53	38	22.75
oligophagous - o2	2	4.44	4	11.12	4	9.76	5	10.64	2	5.26	14	9.46	19	7.85	9	4.74	17	11.56	16	9.58
polyphagous	13	28.89	13	36.11	15	36.59	13	27.66	12	31.58	25	16.89	39	16.12	34	17.89	31	21.09	29	17.37
unknown	-	-	-	-	-	-	-	-	-	-	-	-	1	0.41	-	-	-	-	1	0.60
The strength of relationship of a species with its habitat																				
eurytopic species	22	48.89	14	38.88	16	39.02	21	44.68	19	50.00	44	29.73	54	22.31	49	25.79	41	27.89	45	26.95
oligotopic species	18	40.00	18	50.00	22	53.66	20	42.55	12	31.58	76	51.35	115	47.52	87	45.79	73	49.66	82	49.10
stenotopic species	5	11.11	4	11.12	3	7.32	6	12.77	7	18.42	28	18.91	73	30.17	54	28.42	33	22.45	40	23.95

Chorological analysis	Plots and Regions																			
	31		32		33		34		35		M		O		UWR		WCz		WU	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Overwintering stage																				
overwintering in adult stage	6	13.33	8	22.22	6	14.63	9	19.15	8	21.05	25	16.89	34	14.05	29	15.26	24	16.33	23	13.77
overwintering in nymphal stage	11	24.44	5	13.88	5	12.2	8	17.02	7	18.42	23	15.54	42	17.36	39	20.53	21	14.29	30	17.96
overwintering in egg stage	28	62.22	23	63.89	30	73.17	30	63.83	23	60.53	100	67.57	166	68.60	122	64.21	102	69.39	114	68.26
Number of generations during the year																				
species with one generation	16	35.56	24	66.66	22	53.66	22	46.81	27	71.05	79	53.38	142	58.68	113	59.47	78	53.06	84	50.30
species with two generation	29	64.44	12	33.33	19	46.34	25	53.19	11	28.95	69	46.62	100	41.32	77	40.53	69	46.94	83	49.70

Table 44. Characteristics of the Fulgoromorpha and Cicadomorpha species collected in the Częstochowa city: * species new for Poland , ** species new for the Krakowsko-Wieluńska Upland; 1-degree monophagous – (abbreviated m1); 2-degree monophagous - (m2); 1-degree oligophagous - (o1); 2-degree oligophagous – (o2); polyphagous – (po); unknown – (un); overwintering in egg stage (Egg); overwintering in nymphal stage (Nym); overwintering in adult stage (Ad).

N	Species	Chorological elements	ECOLOGICAL ANALYSIS					
			Habitat humidity	Insolation	Trophic relationships; overwintering stage	Food plant	Number of generation per year	Strength of relationship
	1	2	3	4	5	6	7	8
1	***Cixius nervosus*** **(Linnaeus, 1758)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	po? Nym	Deciduous woody plants	1	eurytopic
2	***Cixius simplex*** **(Herrich-Schaffer, 1835)****	European?	mesohygrophilous	mesoheliophilous	po? Nym	Deciduous woody plants	1	eurytopic
3	***Tachycixius pilosus*** **(Olivier, 1791)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po? Nym	Deciduous woody plants	1	oligotopic
4	***Kelisia confusa*** **Linnavuori, 1957**	Southern European	higrophilous	mesoheliophilous	m2 Egg	*Carex* spp.	1	stenotopic
5	***Kelisia monoceros*** **Ribaut, 1934**	European	xerophilous	heliophilous	m2 Egg	*Carex otrubae*, *C. sempervirens*?	1	stenotopic
6	***Kelisia praecox*** **Haupt H., 1935**	Euro-Siberian	higrophilous	mesoheliophilous	m2 Ad	*Carex brizoides*	1	stenotopic
7	***Kelisia punctulum*** **(Kirschbaum, 1868)**	European	higrophilous	mesoheliophilous	m1? Egg	*Carex acutiformis*	1	stenotopic
8	***Kelisia vittipennis*** **(J. Sahlberg, 1868)**	Euro-Siberian	higrophilous	mesoheliophilous	m2 Egg	*Eriophorum*, *Carex* ?	1	stenotopic
9	***Anakelisia perspicillata*** **(Boheman, 1845)**	Euro-Siberian	xerophilous	heliophilous	m2 Egg	*Carex flacca*, *C. pilulifera*	1	stenotopic
10	***Stenocranus fuscovittatus*** **(Stål, 1858)****	Euro-Siberian	higrophilous	heliophilous	m2 Ad	*Carex* spp.	1	stenotopic
11	***Stenocranus major*** **(Kirschbaum, 1868)**	Western Palearctic?	mesohygrophilous	mesoheliophilous	m1? Ad	*Phalaris arundinacea*	1	eurytopic
12	***Stenocranus minutus*** **(Fabricius, 1787)**	Western Palearctic	mesohygrophilous	mesoheliophilous	m2? Ad	*Dactylis glomerata*, *D. polygama*?	1	eurytopic
13	***Jassidaeus lugubris*** **(Signoret, 1865)**	South European	xerophilous	heliophilous	m2 Ad	*Festuca ovina*, *Stipa capillata*?	1	oligotopic
14	***Megamelus notula*** **(Germar, 1830)**	Euro-Siberian?	higrophilous	mesoheliophilous	m2 Egg?	*Carex* spp.	1	stenotopic
15	***Conomelus anceps*** **(Germar, 1821)**	zachodnioEuropean	higrophilous	mesoheliophilous	m2 Egg	*Juncus* spp.	1	stenotopic
16	***Eurysula lurida*** **(Fieber, 1866)**	Siberian	mesohygrophilous	mesoheliophilous	m2 Nym	*Calamagrostis epigejos*, *C. canescens*	1	oligotopic
17	***Eurybregma nigrolineata*** **Scott, 1875**	Euro-Siberian?	mesohygrophilous	heliophilous	o1 Nym	*Elymus repens*, *Holcus lanatus*	1	oligotopic
18	***Stiroma affinis*** **Fieber, 1866**	Euro-Siberian	mesohygrophilous	mesoheliophilous	o1 Nym	Poaceae	1	oligotopic
19	***Stiroma bicarinata*** **(Herrich-Schäffer, 1835)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	o1 Nym	Poaceae	1	eurytopic
20	***Euconomelus lepidus*** **(Boheman, 1847)**	Euro-Siberian	higrophilous	mesoheliophilous	m2? Egg	*Eleocharis palustris*, *E.uniglumis*?	1	stenotopic
21	***Delphax pulchellus*** **(Curtis, 1833)**	European	higrophilous	sciophilous	m1 Egg	*Phragmites australis*	1	stenotopic

N	1	2	3	4	5	6	7	8
22	***Chloriona glaucescens* Fieber, 1866**	Western Palearctic	higrophilous	mesoheliophilous	m1 Nym	*Phragmites australis*	2	stenotopic
23	***Chloriona smaragdula* (Stål, 1853)**	Western Palearctic	higrophilous	mesoheliophilous	m1 Nym	*Phragmites australis*	2	oligotopic
24	***Megadelphax sordidulus* (Stål, 1853)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m1 Nym	*Arrhenatherum elatius*	2	eurytopic
25	***Laodelphax striatellus* (Fallén, 1826)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po? Nym	Poaceae	2	eurytopic
26	***Paraliburnia adela* (Flor, 1861)**	Euro-Siberian?	higrophilous	mesoheliophilous	m1 Nym	*Phalaris arundinacea*	2	stenotopic
27	***Hyledelphax elegantulus* (Boheman, 1847)**	Euro-Siberian	mesohygrophilous	heliophilous	o1 Nym	Poaceae, *Festuca spp.*	2	stenotopic
28	***Mirabella albifrons* (Fieber, 1879)**	Euro-Siberian?	mesohygrophilous	mesoheliophilous	m2 Nym	*Calamagrostis epigejos, C. canescens*	2	eurytopic
29	***Delphacodes venosus* (Germar, 1830)**	European?	mesohygrophilous	mesoheliophilous	o1? Ad	Poaceae, *Carex* spp.?	1	oligotopic
30	***Muellerianella brevipennis* (Boheman, 1847)**	Euro-Siberian?	higrophilous	mesoheliophilous	m1 Egg	*Deschampsia cespitosa*	1	stenotopic
31	***Muellerianella fairmairei* (Perris, 1857)**	Western Palearctic	higrophilous	mesoheliophilous	m2 Egg	*Holcus lanatus, H. mollis*	1	stenotopic
32	***Muirodelphax aubei* (Perris, 1857)**	Western Palearctic	xerophilous	heliophilous	m1? Nym	*Poa pratensis*?	2	stenotopic
33	***Acanthodelphax denticauda* (Boheman, 1847)**	European	higrophilous	heliophilous	m1 Nym	*Deschampsia cespitosa*	2	oligotopic
34	***Acanthodelphax spinosus* (Fieber, 1866)**	European	mesohygrophilous	heliophilous	m2 Nym	*Festuca rubra, F. ovina*	2	eurytopic
35	***Dicranotropis hamata* (Boheman, 1847)**	Transpalearctic?	mesohygrophilous	mesoheliophilous	o1 Nym	Poaceae	2	eurytopic
36	***Florodelphax leptosoma* (Flor, 1861)**	European?	higrophilous	mesoheliophilous	m2 Nym	*Juncus articulatus*	2	stenotopic
37	***Kosswigianella exigua* (Boheman, 1847)**	European	xerophilous	heliophilous	m1 Nym	*Festuca ovina*	2	stenotopic
38	***Struebingianella lugubrina* (Boheman, 1847)**	European	higrophilous	mesoheliophilous	m2 Nym	*Glyceria maxima, G. fluitans*	2	stenotopic
39	***Xanthodelphax flaveolus* (Flor, 1861)**	Siberian?	mesohygrophilous	mesoheliophilous	m1? Nym	*Poa pratensis*	1?	eurytopic
40	***Xanthodelphax stramineus* (Stål, 1858)**	Siberian?	mesohygrophilous	mesoheliophilous	m2 Nym	*Agrostis canina, A. capillaris*	2	eurytopic
41	***Criomorphus albomarginatus* Curtis, 1833**	European	higrophilous	mesoheliophilous	o2? Nym	Poaceae	1	eurytopic
42	***Javesella dubia* (Kirschbaum, 1868)**	Transpalearctic	higrophilous	mesoheliophilous	o1? Nym	*Agrostis capillaris, A. stolonifera*	2	stenotopic
43	***Javesella obscurella* (Boheman, 1847)**	Transpalearctic	mesohygrophilous	mesoheliophilous	o1? Nym	*Alopecurus,* Cyperaceae?	2	oligotopic
44	***Javesella pellucida* (Fabricius, 1794)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po? Nym	Poaceae, Cyperaceae?	2	eurytopic
45	***Ribautodelphax albostriatus* (Fieber, 1866)**	Western Palearctic	mesohygrophilous	heliophilous	m1 Nym	*Poa pratensis*	2	eurytopic
46	***Ribautodelphax angulosus* (Ribaut, 1953)**	European	xerophilous	heliophilous	m1 Nym	*Anthoxanthum odoratum*	2	stenotopic
47	***Ribautodelphax collinus* (Boheman, 1847)**	European?	xerophilous	heliophilous	m1 Nym	*Agrostis capillaris*	2	oligotopic
48	***Tettigometra impressopunctata* Dufour, 1846**	Exclusively Mediterranean	xerophilous	heliophilous	po? Ad	?	1	stenotopic

N	1	2	3	4	5	6	7	8
49	***Cercopis sanguinolenta* (Scopoli, 1763)**	Mediterranean	xerophilous	heliophilous	po Nym	Mainly dicotyledonous herbs	1	oligotopic
50	***Cercopis vulnerata* Rossi, 1807**	European	mesohygrophilous	mesoheliophilous	po Nym	Mainly dicotyledonous herbs	1	oligotopic
51	***Neophilaenus campestris* (Fallén, 1805)**	Mediterranean?	xerophilous	heliophilous	o1 Egg	Poaceae	1	oligotopic
52	***Neophilaenus exclamationis* (Thunberg, 1784)**	European	mesohygrophilous	mesoheliophilous	o1? Egg	*Festuca ovina, Deschampsia flexuosa*?	1	eurytopic
53	***Neophilaenus lineatus* (Linnaeus, 1758)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po Egg	Poaceae, Cyperaceae, Juncaceae	1	eurytopic
54	***Neophilaenus minor* (Kirschbaum, 1868)**	Western Palearctic	xerophilous	heliophilous	o1 Egg	*Festuca ovina, Corynephorus canescens*	1	stenotopic
55	***Aphrophora alni* (Fallén, 1805)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po Egg	Ad: Deciduous woody plants, Nym.: mainly dicotyledonous herbs	1	eurytopic
56	***Aphrophora pectoralis* Matsumura 1903**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2 Egg	*Salix caprea, S. purpurea*	1	stenotopic
57	***Aphrophora salicina* (Goeze, 1778)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2 Egg	*Salix alba, S. purpurea*	1	oligotopic
58	***Philaenus spumarius* (Linnaeus, 1758)**	Transpalearctic	mesohygrophilous	mesoheliophilous	Po Egg	Mainly dicotyledonous herbs	1	eurytopic
59	***Gargara genistae* (Fabricius, 1775)**	Transpalearctic	mesohygrophilous	heliophilous	o1 Egg	*Cytisus scoparius, Ononis*	1	stenotopic
60	***Centrotus cornutus* (Linnaeus, 1758)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	Po Nym	Herbs, shrubs	1	eurytopic
61	***Ulopa reticulata* (Fabricius, 1775)**	European	mesohygrophilous	mesoheliophilous	m1 Nym	*Calluna vulgaris*	2	oligotopic
62	***Utecha lugens* (Germar, 1821)**	Mediterranean	xerophilous	heliophilous	m1? Ad	*Hippocrepis*?, *Plantago*?, *Echium*?	1	oligotopic
63	***Utecha trivia* (Germar, 1821)**	Mediterranean	xerophilous	heliophilous	m1? Ad	*Hippocrepis*?, *Plantago*?, *Echium*?	1	oligotopic
64	***Megophthalmus scanicus* (Fallén, 1806)**	Mediterranean	mesohygrophilous	heliophilous	o1 Egg	Fabaceae	1	oligotopic
65	***Ledra aurita* (Linnaeus, 1758)**	European	mesohygrophilous	mesoheliophilous	po Nym	*Quercus, Betula*	1	stenotopic
66	***Oncopsis alni* (Schrank, 1801)**	European	mesohygrophilous	mesoheliophilous	m2 Egg	*Alnus glutinosa, A. incana*	1	oligotopic
67	***Oncopsis appendiculata* Wagner, 1944**	European	mesohygrophilous	heliophilous	m1? Egg	*Betula pendula*	1	oligotopic
68	***Oncopsis carpini* (J. Sahlberg, 1871)**	European	mesohygrophilous	mesoheliophilous	m1 Egg	*Carpinus betulus*	1	oligotopic
69	***Oncopsis flavicollis (Linnaeus, 1761)***	Transpalearctic	mesohygrophilous	mesoheliophilous	m2 Egg	*Betula pendula, B. pubescens*	1	oligotopic
70	***Oncopsis tristis* (Zetterstedt, 1840)**	Euro-Siberian	mesohygrophilous	heliophilous	m2 Egg	*Betula pendula, B. pubescens*	1	oligotopic
71	***Pediopsis tiliae* (Germar, 1831)**	European	mesohygrophilous	mesoheliophilous	m2 Egg	*Tilia cordata, T. platyphyllos*	1	oligotopic
72	***Macropsis fuscula* (Zetterstedt, 1828)**	Western Palearctic	mesohygrophilous	mesoheliophilous	m2 Egg	*Rubus idaeus, R. caesius, R. fruticosus*	1	stenotopic
73	***Macropsis infuscata* (Sahlberg, 1871)**	Western Palearctic	mesohygrophilous	heliophilous	m1 Nym	*Poa pratensis*	2	eurytopic
74	***Macropsis vicina* (Horváth, 1897)**	Western Palearctic	mesohygrophilous	heliophilous	m1 Egg	*Populus alba*	1	oligotopic
75	***Hephathus nanus* (Herrich-Schäffer, 1835)**	Exclusively Mediterranean	xerophilous	heliophilous	m1? Egg	*Carlina acaule*?	1	oligotopic

N	1	2	3	4	5	6	7	8
76	***Agallia brachyptera* (Boheman, 1847)**	Western Palearctic	higrophilous	mesoheliophilous	o2 Egg	Asteraceae, Fabaceae?	1	oligotopic
77	***Agallia consobrina* Curtis, 1833**	Mediterranean	mesohygrophilous	sciophilous	o1 Ad	Lamiaceae	1	oligotopic
78	***Anaceratagallia ribauti* (Ossiannilsson, 1938)**	Western Palearctic	mesohygrophilous	heliophilous	o2 Ad	*Plantago, Trifolium, Medicago*	1	oligotopic
79	***Anaceratagallia venosa* (Fourcroy, 1785)**	Euro-Siberian	xerophilous	heliophilous	o2? Egg	*Hippocrepis comosa, Lotus corniculatus*	1	oligotopic
80	***Rhytidodus decimusquartus* (Schrank, 1776)**	Western Palearctic	mesohygrophilous	mesoheliophilous	m1? Egg?	*Populus nigra*	1?	oligotopic
81	***Idiocerus stigmaticalis* Lewis, 1834**	European	higrophilous	mesoheliophilous	m2 Egg	*Salix* spp.	1	oligotopic
82	***Idiocerus lituratus* (Fallén, 1806)**	Western Palearctic	higrophilous	mesoheliophilous	m2 Egg	*Salix cinerea, S. aurita, S. caprea, S. repens*	1	stenotopic
83	***Idiocerus herrichi* Kirschbaum, 1868**	Western Palearctic	higrophilous	mesoheliophilous	m2 Ad	*Salix alba , S. fragilis*	1	stenotopic
84	***Idiocerus vicinus* Melichar, 1898***	European	higrophilous	mesoheliophilous	m1 Ad	*Salix purpurea*	1	stenotopic
85	***Viridicerus ustulatus* (Mulsant &Rey, 1855)**	Western Palearctic	higrophilous	mesoheliophilous	m1 Ad	*Populus alba*	1	oligotopic
86	***Tremulicerus distinguendus* (Kirschbaum, 1868)**	European	mesohygrophilous	mesoheliophilous	m1 Egg	*Populus alba*	1	eurytopic
87	***Tremulicerus tremulae* (Estlund, 1796)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m1 Egg	*Populus tremula*	1	eurytopic
88	***Populicerus albicans* (Kirschbaum, 1868)**	Western Palearctic	mesohygrophilous	heliophilous	m1 Egg	*Populus alba*	1	oligotopic
89	***Populicerus confusus* (Flor, 1861)**	Transpalearctic	higrophilous	mesoheliophilous	m2 Egg	*Salix* spp.	1	oligotopic
90	***Populicerus populi* (Linnaeus, 1761)**	Transpalearctic	mesohygrophilous	mesoheliophilous	m1 Egg	*Populus tremula*	1	eurytopic
91	***Acericerus ribauti* Nickel & Remane 2002**	European	mesohygrophilous	heliophilous	m2 Ad	*Acer* spp.	1	oligotopic
92	***Balcanocerus larvatus* (Herrich-Schäffer,1835)****	South European	xerophilous	heliophilous	m1 Egg	*Prunus spinosa*	1	stenotopic
93	***Iassus lanio* (Linnaeus, 1761)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2 Egg	*Quercus robur, Q. petraea*	1	oligotopic
94	***Eupelix cuspidata* (Fabricius, 1775)**	Transpalearctic	xerophilous	heliophilous	m2 Nym	*Festuca rubra, Festuca ovina*	1	eurytopic
95	***Aphrodes bicinctus* (Schrank, 1776)**	Euro-Siberian	mesohygrophilous	heliophilous	o1? Egg	Fabaceae	1	eurytopic
96	***Aphrodes makarovi* Zachvatkin, 1948**	European?	mesohygrophilous	mesoheliophilous	po Egg	*Urtica dioica, Taraxacum*	1	oligotopic
97	***Planaphrodes trifasciata* Geoffr. 1875**	Euro-Siberian	mesohygrophilous	heliophilous	o2? Egg	*Calluna vulgaris*?, *Thymus*?	1	oligotopic
98	***Anoscopus albifrons* (Linnaeus, 1758)**	European	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	1	eurytopic
99	***Anoscopus flavostriatus* (Donovan, 1799)**	Euro-Siberian	higrophilous	mesoheliophilous	o1 Egg	Poaceae	1	eurytopic
100	***Anoscopus serratulae* (Fabricius, 1775)**	European	mesohygrophilous	heliophilous	o1 Egg	Poaceae	1	oligotopic
101	***Stroggylocephalus agrestis* (Fallén, 1806)**	Euro-Siberian	higrophilous	heliophilous	m2 Egg	*Carex* spp.	1	oligotopic
102	***Evacanthus interruptus* (Linnaeus, 1758)**	Transpalearctic	higrophilous	mesoheliophilous	po Egg	Asteraceae, *Urtica, Epilobium*	1	eurytopic

N	1	2	3	4	5	6	7	8
103	***Cicadella lasiocarpae* Ossiannilsson, 1981**	Siberian	higrophilous	mesoheliophilous	m2? Egg	*Carex nigra*	1	stenotopic
104	***Cicadella viridis* (Linnaeus, 1758)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po Egg	*Juncus, Carex*	1	oligotopic
105	***Alebra albostriella* (Fallén, 1826)**	European	mesohygrophilous	mesoheliophilous	m1 Egg	*Quercus robur, Alnus glutinosa*?	1	oligotopic
106	***Alebra neglecta* Wagner, 1940**	Euro-Siberian?	mesohygrophilous	mesoheliophilous	o2 Egg	*Carpinus, Prunus padus, Crataegus*	1	oligotopic
107	***Alebra wahlbergi* (Boheman, 1845)**	European	mesohygrophilous	mesoheliophilous	po Egg	Deciduous woody plants	1	oligotopic
108	***Erythria aureola* (Fallén, 1806)**	European	xerophilous	heliophilous	o2 Egg	*Thymus, Calluna*	2	stenotopic
109	***Emelianoviana mollicula* (Boheman, 1845)**	Western Palearctic	xerophilous	heliophilous	po Egg	Lamiaceae, *Verbascum*	2	oligotopic
110	***Dikraneura variata* Hardy, 1850**	Holarctic?	mesohygrophilous	mesoheliophilous	o1 Egg?	*Deschampsia flexuosa*	2	oligotopic
111	***Micantulina stigmatipennis* (Mulsant et Rey,1855)**	Western Palearctic	xerophilous	heliophilous	m1? Egg	*Verbascum lychnitis*	2	stenotopic
112	***Forcipata citrinella* (Zetterstedt, 1828)**	Siberian?	higrophilous	mesoheliophilous	m2? Egg	*Carex* spp.	2	stenotopic
113	***Forcipata forcipata* (Flor, 1861)**	Siberian?	mesohygrophilous	mesoheliophilous	po? Egg	*Carex, Luzula,* Poaceae?	2	oligotopic
114	***Notus flavipennis* (Zetterstedt, 1828)**	Euro-Siberian	higrophilous	mesoheliophilous	o1? Egg	*Carex* spp., *Bolboschoenus*?	2	stenotopic
115	***Kybos abstrusus* (Linnavuori, 1949)**	Transpalearctic	mesohygrophilous	mesoheliophilous	m1 Egg	*Populus tremula*	1	eurytopic
116	***Kybos butleri* (Edwards, 1908)**	Euro-Siberian	higrophilous	mesoheliophilous	m2 Egg	*Salix triandra, S. repens, S. cinerea, S. aurita*	2	stenotopic
117	***Kybos calyculus* (Cerutti, 1939)****	European?	higrophilous?	mesoheliophilous?	m1? Egg	*Betula pubescens*?	2	oligotopic
118	***Kybos lindbergi* (Linnavuori, 1951)**	Siberian?	mesohygrophilous	mesoheliophilous	m2 Egg	*Betula pendula, B. pubescens*	2	oligotopic
119	***Kybos populi* (Edwards, 1908)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2 Egg	*Populus tremula, P. alba, P. nigra*	2	eurytopic
120	***Kybos smaragdulus* (Fallén, 1806)**	Euro-Siberian	mesohygrophilous	heliophilous	m2 Egg	*Alnus glutinosa, A. incana*	2	oligotopic
121	***Kybos virgator* (Ribaut, 1933)**	Euro-Siberian?	higrophilous	mesoheliophilous	m2 Egg	*Salix alba, S. fragilis*	2	oligotopic
122	***Empoasca affinis* Nast, 1937**	Siberian	mesohygrophilous	mesoheliophilous	po Ad?	Dicotyledonous herbs, woody plants	1	eurytopic
123	***Empoasca decipiens* Paoli, 1930**	Western Palearctic	mesohygrophilous	mesoheliophilous	po Ad	Dicotyledonous herbs, woody plants	2	oligotopic
124	***Empoasca pteridis* Dahlbom, 1850**	Western Palearctic	mesohygrophilous	mesoheliophilous	po Egg?	Dicotyledonous herbs	2	eurytopic
125	***Empoasca vitis* (Göthe, 1875)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po Ad	Deciduous woody plants	1	eurytopic
126	***Chlorita paolii* (Ossiannilsson, 1939)**	Kazakh	xerophilous	heliophilous	o1 Egg	*Achillea millefolium, Artemisia campestris*	2	oligotopic
127	***Fagocyba carri* (Edwards, 1914)**	European	mesohygrophilous	mesoheliophilous	m2 Egg	*Quercus robur, Q. petraea*	2	oligotopic
128	***Fagocyba cruenta* (Herrich-Schäffer, 1838)**	European	mesohygrophilous	mesoheliophilous	po Egg	Deciduous woody plants	2	eurytopic

N	1	2	3	4	5	6	7	8
129	***Ossiannilssonola callosa*** **(Then, 1886)**	European	mesohygrophilous	mesoheliophilous	m1 Egg	*Acer pseudoplatanus*	1	oligotopic
130	***Edwardsiana ampliata*** **(Wagner, 1947)**	European	mesohygrophilous	mesoheliophilous	o2? Egg	*Acer, Corylus, Quercus robur*	2	oligotopic
131	***Edwardsiana crataegi*** **(Douglas, 1876)**	Euro-Siberian?	mesohygrophilous	mesoheliophilous	o1 Egg	Rosaceae	2	oligotopic
132	***Edwardsiana flavescens*** **(Fabricius, 1794)**	European	mesohygrophilous	mesoheliophilous	o2 Egg	*Carpinus betulus, Fagus sylvatica*	2	oligotopic
133	***Edwardsiana geometrica*** **(Schrank 1801)**	European	mesohygrophilous	mesoheliophilous	m2 Egg	*Alnus glutinosa, A. incana*	2	oligotopic
134	***Edwardsiana gratiosa*** **(Boheman, 1852)**	European	higrophilous	mesoheliophilous	m1 Egg	*Alnus glutinosa*	2	oligotopic
135	***Edwardsiana plebeja*** **(Edwards, 1914)**	Western Palearctic	mesohygrophilous	mesoheliophilous	m2 Egg	*Ulmus* spp.	2	oligotopic
136	***Edwardsiana prunicola*** **(Edwards, 1914)**	European	mesohygrophilous	mesoheliophilous	o2 Egg	*Prunus spinosa, P. domestica, Salix cinerea, S. aurita, S. viminalis*	2	oligotopic
137	***Edwardsiana rosae*** **(Linnaeus, 1758)**	Transpalearctic	mesohygrophilous	mesoheliophilous	o1 Egg	*Rosa, Prunus spinosa*	2	eurytopic
138	***Edwardsiana salicicola*** **(Edwards, 1885)**	Siberian	higrophilous	mesoheliophilous	m2 Egg	*Salix cinerea, S. aurita, S. caprea*	2	oligotopic
139	***Edwardsiana soror*** **(Linnavuori, 1950)**	Siberian	mesohygrophilous	mesoheliophilous	m1? Egg	*Alnus incana*	2	stenotopic
140	***Edwardsiana spinigera*** **(Edwards, 1924)**	European	mesohygrophilous	mesoheliophilous	m1 Egg	*Corylus avellana*	2	stenotopic
141	***Edwardsiana stehliki*** **Lauterer, 1958**	European	mesohygrophilous	mesoheliophilous	m1 Egg	*Corylus avellana*	2	oligotopic
142	***Edwardsiana ulmiphagus*** **(Wls. et Cla., 1999)**	European	mesohygrophilous	mesoheliophilous	m2 Egg	*Ulmus* spp.	2	oligotopic
143	***Eupterycyba jucunda*** **(Herrich-Schäffer, 1837)**	European	higrophilous	mesoheliophilous	m1 Egg	*Alnus glutinosa*	1	oligotopic
144	***Linnavuoriana sexmaculata*** **(Hardy, 1850)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2 Egg?	*Salix cinerea, S. aurita, S. caprea, S. viminalis*	1	oligotopic
145	***Ribautiana ognevi*** **(Zachvatkin, 1948)**	South European	higrophilous	mesoheliophilous	m1 Egg	*Ulmus laevis*	2	oligotopic
146	***Ribautiana tenerrima*** **(Herrich-Schäffer, 1834)**	European	mesohygrophilous	mesoheliophilous	o2? Egg	*Rubus*	2	oligotopic
147	***Typhlocyba quercus*** **(Fabricius, 1777)**	Western Palearctic	mesohygrophilous	mesoheliophilous	o2? Egg	*Prunus, Quercus*	1?	oligotopic
148	***Zonocyba bifasciata*** **Boheman, 1851**	European	mesohygrophilous	mesoheliophilous	o2 Egg	*Carpinus, Ulmus minor, U. glabra*	1?	oligotopic
149	***Eurhadina concinna*** **(Germar, 1831)**	European	mesohygrophilous	mesoheliophilous	o2? Egg	*Quercus, Fagus*?, *Betula*?, *Alnus*?	1	oligotopic
150	***Eurhadina pulchella*** **(Fallén, 1806)**	Transpalearctic?	mesohygrophilous	mesoheliophilous	m2 Egg	*Quercus robur, Q. petraea*	1	oligotopic
151	***Eupteryx adspersa*** **(Herrich-Schäffer, 1838)****	Kazakh	xerophilous	heliophilous	m1? Egg	*Artemisia absinthium, A. pontica*?	2	oligotopic
152	***Eupteryx atropunctata*** **(Goeze, 1778)**	European	mesohygrophilous	mesoheliophilous	po Egg	Lamiaceae and other dicotyledonous herbs	2	oligotopic
153	***Eupteryx aurata*** **(Linnaeus, 1758)**	European	higrophilous	sciophilous	po Egg	Lamiaceae, Asteraceae, Apiaceae, Malvaceae	2	oligotopic

N	1	2	3	4	5	6	7	8
154	***Eupteryx calcarata* Ossiannilsson, 1939**	Western Palearctic	mesohygrophilous	heliophilous	m1 Egg	*Urtica dioica*	2	oligotopic
155	***Eupteryx curtisii* (Flor, 1861)**	European	mesohygrophilous	mesoheliophilous	o1 Egg	*Teucrium scorodonia*	2	oligotopic
156	***Eupteryx cyclops* Matsumura, 1906**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m1 Egg	*Urtica dioica*	2	oligotopic
157	***Eupteryx florida* Ribaut, 1936**	Mediterranean?	mesohygrophilous	mesoheliophilous	o1 Egg	Lamiaceae	2	oligotopic
158	***Eupteryx lelievrei* (Lethierry, 1874)**	European	mesohygrophilous	mesoheliophilous	m1 Egg	*Betonica officinalis*	2	oligotopic
159	***Eupteryx thoulessi* Edwards, 1926****	Exclusively Mediterranean	mesohygrophilous	mesoheliophilous	o2 Egg	*Nepeta cataria, Salvia officinalis, Mentha* spp.	2	oligotopic
160	***Eupteryx notata* Curtis, 1837**	Kazakh	xerophilous	heliophilous	o2 Egg	*Hieracium pilosella, Leontodon, Prunella*	2	oligotopic
161	***Eupteryx tenella* (Fallén, 1806)**	European	mesohygrophilous	heliophilous	m1 Egg	*Achillea millefolium*	2	stenotopic
162	***Eupteryx urticae* (Fabricius, 1803)**	European	higrophilous	sciophilous	m1? Egg	*Urtica dioica*	2	eurytopic
163	***Eupteryx vittata* (Linnaeus, 1758)**	European	higrophilous	mesoheliophilous	o2 Egg	*Ranunculus repens, Glechoma hederacea*	2	oligotopic
164	***Wagneripteryx germari* (Zetterstedt, 1840)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2 Egg	*Pinus sylvestris, P. mugo*	1	stenotopic
165	***Aguriahana stellulata* (Burmeister, 1841)**	Euro-Siberian?	mesohygrophilous	mesoheliophilous	po ? Egg	*Tilia, Prunus, Populus, Betula, Acer*	1?	eurytopic
166	***Alnetoidia alneti* (Dahlbom, 1850)**	Euro-Siberian	higrophilous	mesoheliophilous	po Egg	Deciduous woody plants	2	eurytopic
167	***Zyginidia pullula* (Boheman, 1845)**	Western Palearctic	mesohygrophilous	heliophilous?	o1 Ad	Poaceae	2?	eurytopic
168	***Zygina angusta* Lethierry, 1874**	Euro-Siberian?	mesohygrophilous	mesoheliophilous	o2 Ad	*Crataegus, Rosa, Prunus, Quercus, Fagus*	1	oligotopic
169	***Zygina flammigera* (Geoffroy, 1785)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	o1? Ad	*Prunus*	1	eurytopic
170	***Zygina griseombra* Remane, 1994***	European?	mesohygrophilous	mesoheliophilous	(m1) Ad	*Carpinus betulus*	1	oligotopic
171	***Zygina hyperici* (Herrich-Schäffer, 1836)**	Western Palearctic	xerophilous	heliophilous	m1 Egg	*Hypericum perforatum*	2	stenotopic
172	***Zygina ordinaria* (Ribaut, 1936)**	Euro-Siberian?	mesohygrophilous	mesoheliophilous	m2 Ad	*Salix alba, S. triandra, S. repens, S. fragilis*	1	oligotopic
173	***Zygina schneideri* (Günthart, 1974)**	European?	xerophilous	heliophilous	o1 Ad	*Prunus spinosa, Rosa*	1?	oligotopic
174	***Zygina suavis* Rey, 1891****	Euro-Siberian?	mesohygrophilous	sciophilous	o1 Ad	*Rhamnus, Frangula*	1?	stenotopic
175	***Zygina tiliae* (Fallén, 1806)**	European	mesohygrophilous	mesoheliophilous	o2 Ad	*Alnus glutinosa, A. incana, Tilia*?	1?	oligotopic
176	***Arboridia velata* (Ribaut, 1952)**	South European	mesohygrophilous	heliophilous	m2? Ad	*Quercus* spp.	1	oligotopic
177	***Fieberiella septentrionalis* Wagner, 1963**	Western Palearctic	xerophilous	heliophilous	po Egg	*Prunus spinosa, Rosa, Vincetoxicum hirudinaria*	1	oligotopic

N	1	2	3	4	5	6	7	8
178	***Grypotes puncticollis*** **(Herrich-Schäffer, 1834)**	European	xerophilous	heliophilous	m1 Egg	*Pinus sylvestris*	1	oligotopic
179	***Japananus hyalinus*** **(Osborn, 1900)****	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2 Egg	*Acer campesrte*	1	eurytopic
180	***Neoaliturus fenestratus*** **(Herrich-Schäffer, 1834)**	Transpalearctic	xerophilous	heliophilous	m2? Ad	*Leontodon* spp., *Hieracium pilossella*	2	stenotopic
181	***Neoaliturus guttulatus*** **(Kirschbaum, 1868)**	Transpalearctic	xerophilous	heliophilous	m2? Ad	*Leontodon* spp., *Hieracium pilossella*	2	stenotopic
182	***Balclutha calamagrostis*** **Ossiannilsson, 1961**	północnoEuropean	mesohygrophilous	mesoheliophilous	m2 Ad	*Calamagrostis epigejos, C. pseudophragmites*	1	eurytopic
183	***Balclutha punctata*** **(Fabricius, 1803)**	Holarctic	mesohygrophilous	mesoheliophilous	(o1) Ad	Poaceae	1	eurytopic
184	***Balclutha rhenana*** **Wagner, 1939**	Euro-Siberian	higrophilous	mesoheliophilous	m1 Ad	*Phalaris arundinacea*	1	stenotopic
185	***Balclutha saltuella*** **(Kirschbaum, 1868)**	Cosmopolitic	xerophilous	heliophilous	o1? Ad?	Poaceae?	1?	oligotopic
186	***Macrosteles cristatus*** **(Ribaut, 1927)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	po? Egg	Poaceae	2	eurytopic
187	***Macrosteles frontalis*** **(Scott, 1875)**	Holarctic	mesohygrophilous	mesoheliophilous	m2 Egg	*Equisetum arvense, E. palustre, E. sylvaticum*	2	stenotopic
188	***Macrosteles laevis*** **(Ribaut, 1927)**	Holarctic	mesohygrophilous	heliophilous	po Egg	Poaceae	2	eurytopic
189	***Macrosteles maculosus*** **(Then, 1897)**	South European	xerophilous	heliophilous	m1 Egg	*Polygonum aviculare*	2	oligotopic
190	***Macrosteles ossiannilssoni*** **Lindberg, 1954**	Northern European	mesohygrophilous	mesoheliophilous	po? Egg	*Carex*?, *Juncus*?, *Rhynchospora*?	2	stenotopic
191	***Macrosteles sardus*** **Ribaut, 1948**	Western Palearctic	higrophilous	mesoheliophilous	un Egg	?	2	stenotopic
192	***Macrosteles septemnotatus*** **(Fallén, 1806)**	Euro-Siberian	higrophilous	heliophilous	m1 Egg	*Filipendula ulmaria*	2	stenotopic
193	***Macrosteles sexnotatus*** **(Fallén, 1806)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po Egg	Poaceae, Cyperaceae, Juncaceae	2	eurytopic
194	***Macrosteles variatus*** **(Fallén, 1806)**	Holarctic	mesohygrophilous	sciophilous	m1? Egg	*Urtica dioica*	2	eurytopic
195	***Macrosteles viridigriseus*** **(Edwards, 1922)**	European	higrophilous	mesoheliophilous	o2? Egg	Poaceae, Cyperaceae?	2	stenotopic
196	***Deltocephalus pulicaris*** **(Fallén, 1806)**	Holarctic	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	2	eurytopic
197	***Recilia coronifera*** **(Marshall, 1866)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	o1 Egg	*Holcus mollis, Molinia caerulea*	1	oligotopic
198	***Endria nebulosa*** **(Ball, 1900)**	Siberian	mesohygrophilous	mesoheliophilous	m1? Egg	*Calamagrostis epigejos, C. canescens*?	1	oligotopic
199	***Doratura exilis*** **Horváth, 1903**	Kazakh	xerophilous	heliophilous	m1 Egg	*Festuca ovina*	1	stenotopic
200	***Doratura homophyla*** **(Flor, 1861)**	Transpalearctic	xerophilous	heliophilous	o1 Egg	Poaceae	2	oligotopic
201	***Doratura impudica*** **Horváth, 1897**	Kazakh	xerophilous	heliophilous	m1? Egg	*Calamagrostis epigejos, Elymus* spec.?	1	stenotopic
202	***Doratura stylata*** **(Boheman, 1847)**	Transpalearctic	mesohygrophilous	heliophilous	o1 Egg	*Festuca rubra, Agrostis capillaris*	1	oligotopic
203	***Platymetopius major*** **Kirschbaum, 1868****	European	mesohygrophilous	heliophilous	po Egg	Ad.: *Betula, Quercus;* Nym.: rośliny zielne	1	oligotopic

N	1	2	3	4	5	6	7	8
204	***Allygus communis*** **(Ferrari, 1882)**	European	mesohygrophilous	mesoheliophilous	po? Egg	Ad.: *Quercus, Betula; Nym.: Poaceae*	1	oligotopic
205	***Allygus modestus*** **Scott, 1876****	European	mesohygrophilous	mesoheliophilous	po? Egg	Nym.: Poaceae, Ad.: deciduous trees	1	oligotopic
206	***Allygus mixtus*** **(Fabricius, 1794)**	European	mesohygrophilous	mesoheliophilous	po? Egg	Nym.: Poaceae, Ad.: deciduous trees	1	oligotopic
207	***Allygidius commutatus*** **(Fieber, 1872)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	po? Egg	Nym.: Poaceae, Ad.: deciduous trees	1	oligotopic
208	***Graphocraerus ventralis*** **(Fallén, 1806)**	Euro-Siberian	mesohygrophilous	heliophilous	o1 Egg	Poaceae	1	oligotopic
209	***Rhytistylus proceps*** **(Kirschbaum, 1868)**	zachodnioEuropean	xerophilous	heliophilous	m1? Egg	*Festuca ovina*	1	stenotopic
210	***Hardya tenuis*** **(Germar, 1821)**	European	xerophilous	mesoheliophilous	o1? Ad?	*Festuca ovina, Poa*?, *Agrostis*?	1	stenotopic
211	***Paluda flaveola*** **(Boheman, 1845)**	Siberian	mesohygrophilous	mesoheliophilous	o1? Egg	*Calamagrostis* spp., *Molinia*?,*Phalaris*?	1	oligotopic
212	***Rhopalopyx adumbrata*** **(C. Sahlberg, 1842)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2 Egg	*Festuca rubra, F. ovina*	1	oligotopic
213	***Rhopalopyx preyssleri*** **(Herrich-Schäffer, 1838)**	Euro-Siberian	xerophilous	heliophilous	m1 Egg	*Poa pratensis*	1	stenotopic
214	***Rhopalopyx vitripennis*** **(Flor, 1861)**	Transpalearctic	xerophilous	heliophilous	m2? Egg	*Festuca ovina, F. rubra*?	2	stenotopic
215	***Elymana kozhevnikovi*** **(Zachvatkin, 1938)**	Siberian	higrophilous	mesoheliophilous	m2 Egg	*Calamagrostis arundinacea, C. canescens*	1	stenotopic
216	***Elymana sulphurella*** **(Zetterstedt, 1828)**	Transpalearctic	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	1	eurytopic
217	***Cicadula flori*** **(J. Sahlberg, 1871)**	Euro-Siberian	higrophilous	mesoheliophilous	m2? Egg	*Carex acuta, C. acutiformis*?	2	stenotopic
218	***Cicadula frontalis*** **(Herrich-Schäffer, 1835)****	Siberian?	higrophilous	mesoheliophilous	m2 Egg	*Carex acutiformis, C. riparia*	1	stenotopic
219	***Cicadula persimilis*** **(Edwards, 1920)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m1 Egg	*Dactylis glomerata*	2	eurytopic
220	***Cicadula quadrinotata*** **(Fabricius, 1794)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m2? Egg	*Carex* spp.	2	oligotopic
221	***Cicadula saturata*** **(Edwards, 1915)**	Siberian	higrophilous	mesoheliophilous	m2? Egg	*Carex nigra, C. rostata*?	1	stenotopic
222	***Mocydiopsis attenuata*** **(Germar, 1821)**	European	mesohygrophilous	mesoheliophilous	m2 Ad	*Festuca ovina, F. rubra, F. heterophylla*	1	oligotopic
223	***Mocydiopsis parvicauda*** **Ribaut, 1939**	European	mesohygrophilous	mesoheliophilous	m1 Ad	*Agrostis capillaris*	1	stenotopic
224	***Speudotettix subfusculus*** **(Fallén, 1806)**	Transpalearctic	mesohygrophilous	mesoheliophilous	po Nym	Nym.: *Carex,* Poaceae? Ad.: deciduous woody plants	1	eurytopic
225	***Hesium domino*** **(Reuter, 1880)**	European	xerophilous	mesoheliophilous	o2? Egg	Ad.: *Betula;* Nym.: Poaceae?	1	oligotopic
226	***Thamnotettix confinis*** **Zetterstedt, 1828**	Holarctic	higrophilous	mesoheliophilous	po Nym	Ad.: Deciduous woody plants; Nym.: rośliny zielne	1	eurytopic
227	***Pithyotettix abietinus*** **(Fallén, 1806)**	Euro-Siberian	mesohygrophilous	mesoheliophilous	m1 Nym	*Picea excelsa*	1	oligotopic
228	***Macustus grisescens*** **(Zetterstedt, 1828)**	Euro-Siberian	higrophilous	mesoheliophilous	o2 Nym	*Carex,* Poaceae	1	oligotopic

N	1	2	3	4	5	6	7	8
229	***Doliotettix lunulatus*** **(Zetterstedt, 1840)**	Siberian, nearktyczny	higrophilous	mesoheliophilous	m1? Nym	*Agrostis stolonifera*?	1	stenotopic
230	***Athysanus argentarius*** **Metcalf, 1955**	Euro-Siberian	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	1	oligotopic
231	***Athysanus quadrum*** **Boheman, 1845**	Siberian	higrophilous	mesoheliophilous	m1 Egg	*Lathyrus, Inula, Filipendula*	1	stenotopic
232	***Ophiola decumana*** **(Kontkanen, 1949)**	Euro-Siberian	xerophilous	heliophilous	o1? Egg	*Polygonum aviculare, Rumex acetosella*	2	eurytopic
233	***Limotettix striola*** **(Fallén, 1806)**	Transpalearctic	higrophilous	mesoheliophilous	o1 Egg	*Eleocharis, Trichophorum*?, *Schoenoplectus*?	2	oligotopic
234	***Laburrus impictifrons*** **(Boheman, 1852)**	Kazakh	xerophilous	heliophilous	m1 Egg	*Artemisia campestris*	1	stenotopic
235	***Euscelidius schenckii*** **(Kirschbaum, 1868)**	Western Palearctic	mesohygrophilous	heliophilous	po? Egg	*Urtica dioica*?	1	oligotopic
236	***Conosanus obsoletus*** **(Kirschbaum, 1858)**	Exclusively Mediterranean	higrophilous	mesoheliophilous	o2 Egg	*Juncus*, Poaceae	1	oligotopic
237	***Euscelis distinguendus*** **(Kirschbaum, 1858)**	Euro-Siberian	mesohygrophilous	heliophilous	o1? Egg	*Taraxacum*?, *Picris*?	1	oligotopic
238	***Euscelis incisus*** **(Kirschbaum, 1858)**	Transpalearctic	xerophilous	heliophilous	o2 Nym	*Fabaceae,* Poaceae	2	oligotopic
239	***Streptanus aemulans*** **(Kirschbaum, 1868)**	Holarctic	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	2?	oligotopic
240	***Streptanus confinis*** **(Reuter, 1880)**	Siberian	mesohygrophilous	mesoheliophilous	m1 Egg	*Deschampsia cespitosa*	1	oligotopic
241	***Streptanus sordidus*** **(Zetterstedt, 1828)**	European	higrophilous	mesoheliophilous	o1? Egg	*Agrostis stolonifera, A.capillaris*	2?	oligotopic
242	***Paralimnus phragmitis*** **(Boheman, 1847)****	Western Palearctic?	higrophilous	mesoheliophilous	m1 Egg	*Phragmites australis*	1	stenotopic
243	***Metalimnus formosus*** **(Boheman, 1845)**	Siberian	higrophilous	heliophilous	m2 Egg	*Carex acuta, C.elata*	1	stenotopic
244	***Metalimnus marmoratus*** **(Flor, 1861)****	Siberian	higrophilous	mesoheliophilous	m1 Egg	*Carex limosa*	1	stenotopic
245	***Metalimnus steini*** **(Fieber, 1869)**	European?	xerophilous	heliophilous	m1? Egg	*Carex hirta*	2?	oligotopic
246	***Arocephalus languidus*** **(Flor, 1861)**	Kazakh	xerophilous	heliophilous	o1 Egg	*Sesleria, Stipa, Koeleria*?	1	eurytopic
247	***Arocephalus longiceps*** **(Kirschbaum, 1868)**	European	mesohygrophilous	heliophilous	o1 Egg	*Holcus mollis, Bromus erectus*	2	oligotopic
248	***Psammotettix alienus*** **(Dahlbom, 1850)**	Holarctic	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	2	eurytopic
249	***Psammotettix cephalotes*** **(Herrich-Schäffer, 1834)**	European	xerophilous	heliophilous	m1 Egg	*Briza media*	2	stenotopic
250	***Psammotettix confinis*** **(Dahlbom, 1850)**	holarktyczny	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	2	eurytopic
251	***Psammotettix excisus*** **Matsumura, 1906**	zachodnioEuropean	xerophilous	heliophilous	m1? Egg	*Corynephorus canescens*	2	stenotopic
252	***Psammotettix nodosus*** **(Ribaut, 1925)**	European	xerophilous	mesoheliophilous	o1 Egg	Poaceae	2	oligotopic
253	***Adarrus multinotatus*** **(Boheman, 1847)**	Western Palearctic	mesohygrophilous	mesoheliophilous	m1 Egg	*Brachypodium pinnatum*	2	oligotopic

N	1	2	3	4	5	6	7	8
254	***Errastunus ocellaris*** **(Fallén, 1806)**	Transpalearctic	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	2	eurytopic
255	***Turrutus socialis*** **(Flor, 1861)**	Euro-Siberian	xerophilous	heliophilous	o1 Egg	Poaceae	2	oligotopic
256	***Jassargus pseudocellaris*** **(Flor, 1861)**	Northern European	mesohygrophilous	mesoheliophilous	o1 Egg	*Festuca rubra, Agrostis capillaris*	2	eurytopic
257	***Jassargus flori*** **(Fieber, 1869)**	European?	mesohygrophilous	mesoheliophilous	m1? Egg	*Poa pratensis*?	2	oligotopic
258	***Verdanus abdominalis*** **(Fabricius, 1803)**	Western Palearctic	mesohygrophilous	mesoheliophilous	o1 Egg	Poaceae	1	oligotopic
259	***Arthaldeus arenarius*** **Remane, 1960**	Siberian?	mesohygrophilous	mesoheliophilous	m1 Egg	*Calamagrostis epigejos*	1	oligotopic
260	***Arthaldeus pascuellus*** **(Fallén, 1826)**	Euro-Siberian	mesohygrophilous	heliophilous	o1 Egg	Poaceae	2	oligotopic
261	***Sorhoanus assimilis*** **(Fallén, 1806)**	Siberian?	higrophilous	mesoheliophilous	m2? Egg	*Carex rostata*?, *C. panicea*?, *C. nigra*?	1	oligotopic
262	***Cosmotettix caudatus*** **(Flor, 1861)**	Siberian	higrophilous	mesoheliophilous	m1 Egg	*Carex hirta*	1	stenotopic
263	***Cosmotettix costalis*** **(Fallén, 1826)****	Siberian	higrophilous	heliophilous	m2? Egg	*Carex acuta, C.nigra*?	1	stenotopic
264	***Calamotettix taeniatus*** **(Horváth, 1911)**	South European	higrophilous	mesoheliophilous	m1 Egg	*Phragmites australis*	1	stenotopic
265	***Mocuellus collinus*** **(Boheman, 1850)**	Euro-Siberian	xerophilous	heliophilous	o1 Egg	Poaceae	2	oligotopic
266	***Erzaleus metrius*** **(Flor, 1861)**	Siberian	higrophilous	mesoheliophilous	m1 Egg	*Phalaris arundinacea*	2	stenotopic

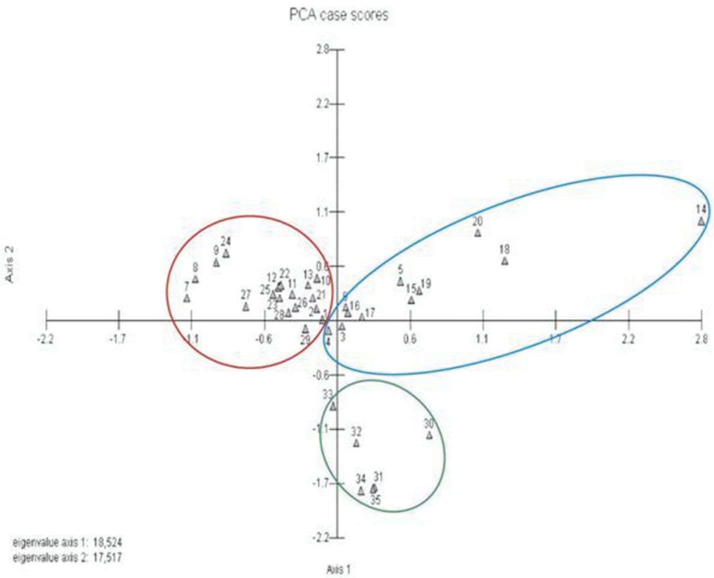

Fig. 37. Principal Components Analysis (PCA) based on the calculation of the number of individuals of all species.

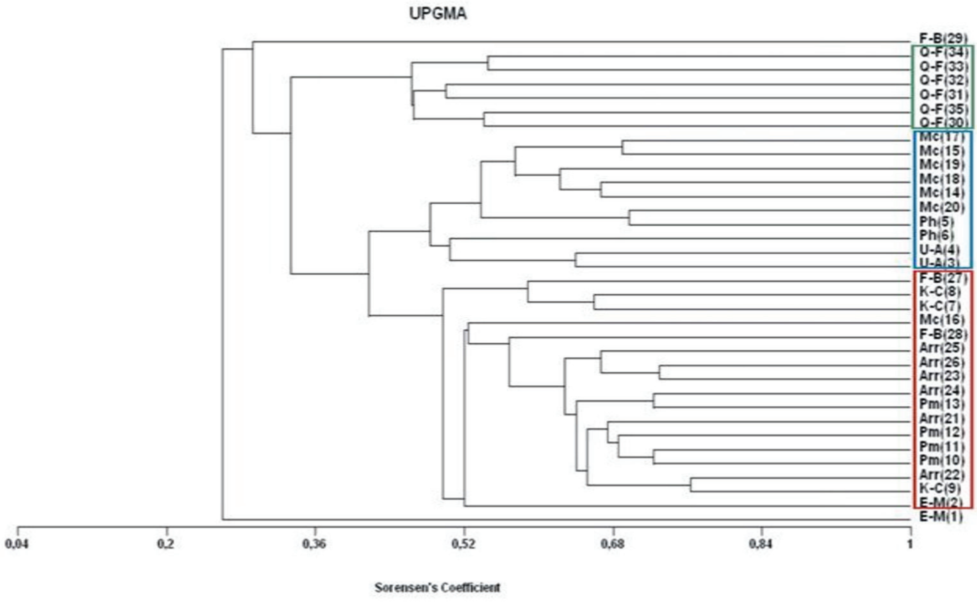

Fig. 38. Dendrogram of Euclidean distances of community similarities based on the calculation of the number of individuals of all species; Ward's method. A plant associations in descriptions referred to the following abbreviations: *Echio-Melilotetum* (E-M), *Urtico-Aegopodietum podagrariae* (U-A), *Phragmitetea* (Ph), *Koelerio glaucae-Corynephoretea canescentis* (K-C), *Plantaginetalia majoris* (Pm), *Molinietalia caerulae* (Mc), *Arrhenatheretalia* (Arr), *Festuco-Brometea* (F-B), *Querco-Fagetea* (Q-F).

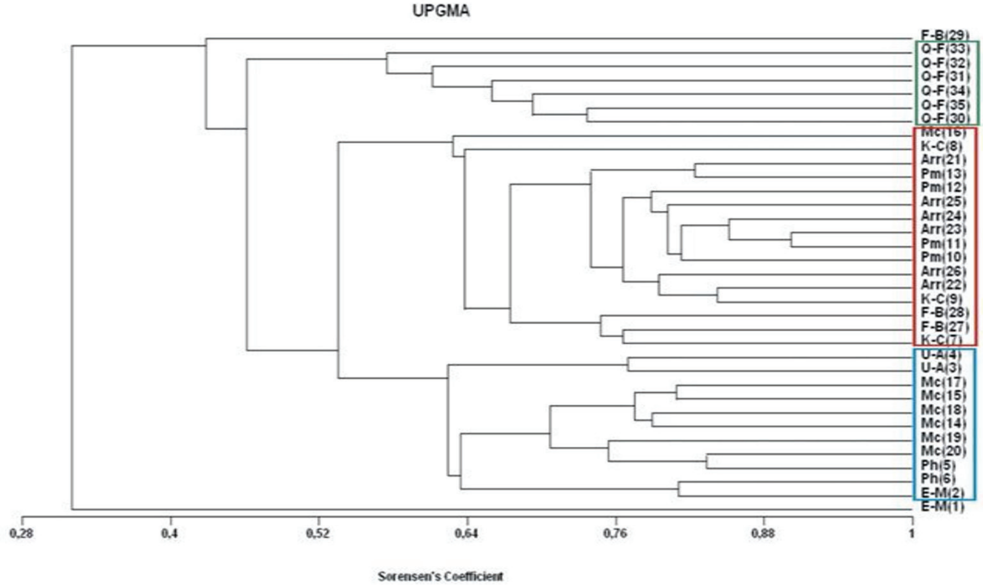

Fig. 39. Dendrogram of Euclidean distances of community similarities based on the calculation of the number of individuals of dominating species; Ward's method. A plant associations in descriptions referred to the following abbreviations: *Echio-Melilotetum* (E-M), *Urtico-Aegopodietum podagrariae* (U-A), *Phragmitetea* (Ph), *Koelerio glaucae-Corynephoretea canescentis* (K-C), *Plantaginetalia majoris* (Pm), *Molinietalia caerulae* (Mc), *Arrhenatheretalia* (Arr), *Festuco-Brometea* (F-B), *Querco-Fagetea* (Q-F).

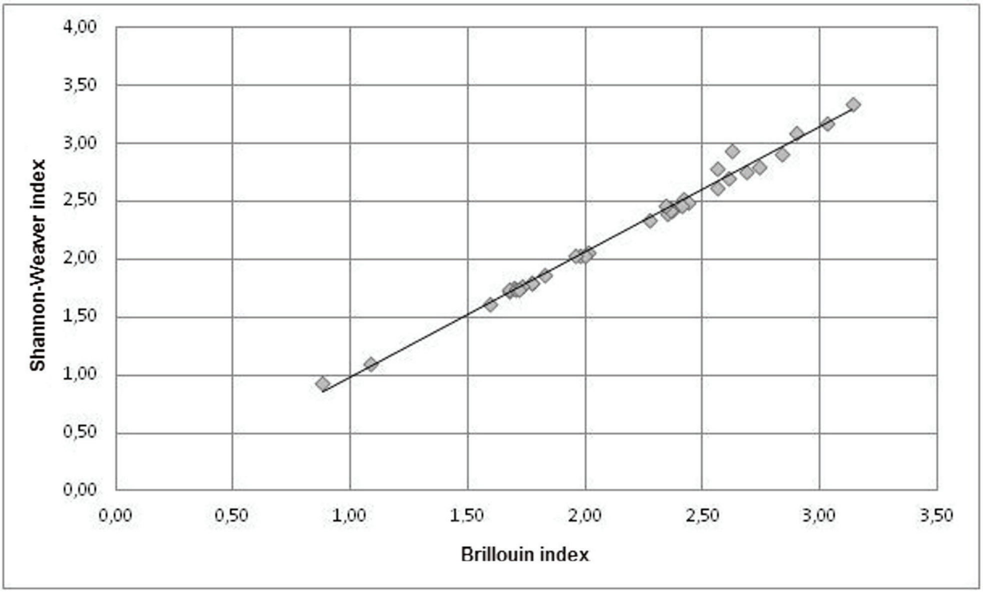

Fig. 40. Values of Brillouin's index and Shannon-Weaver's coefficient correlated with each other significantly in all studied plots.

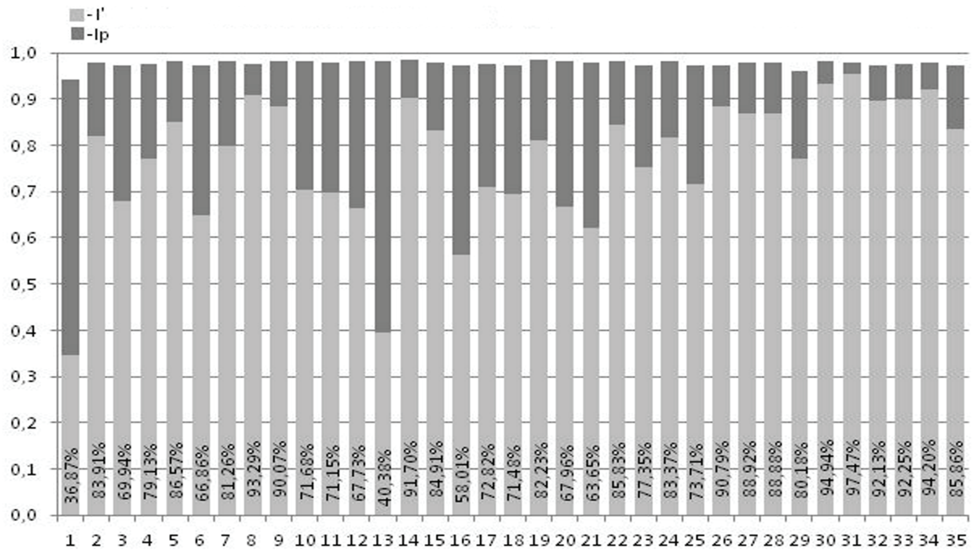

Fig. 41. The observed diversity index (*I'*) and the degree of disparity between its potential (*Ip*) and observed values.

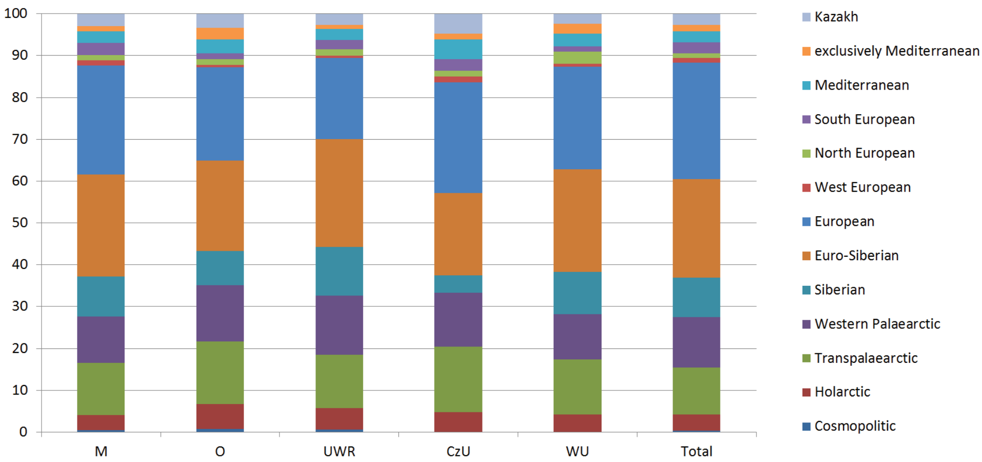

Fig. 42. The share of particular chorological elements in the total amount of material collected in the area of the Częstochowa: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU).

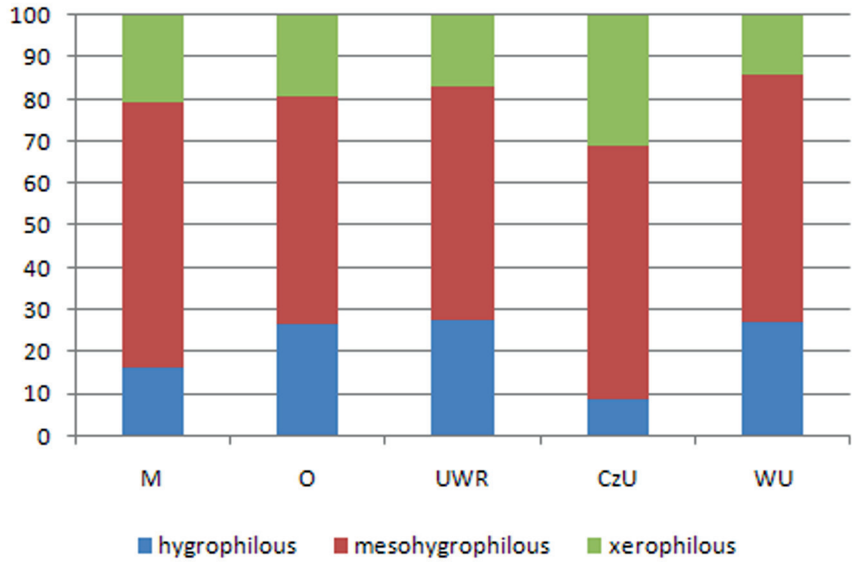

Fig. 43. Percentage share of ecological elements in the area of the Częstochowa: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU) – Humidity of the environment.

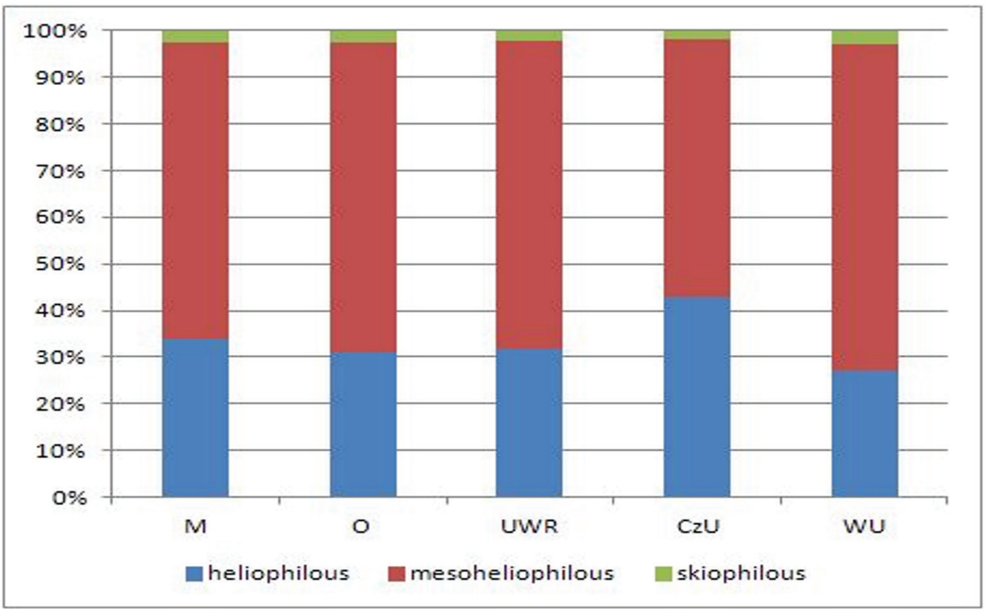

Fig. 44. Percentage share of ecological elements in the area of the Częstochowa: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU) – Insolation of the environment.

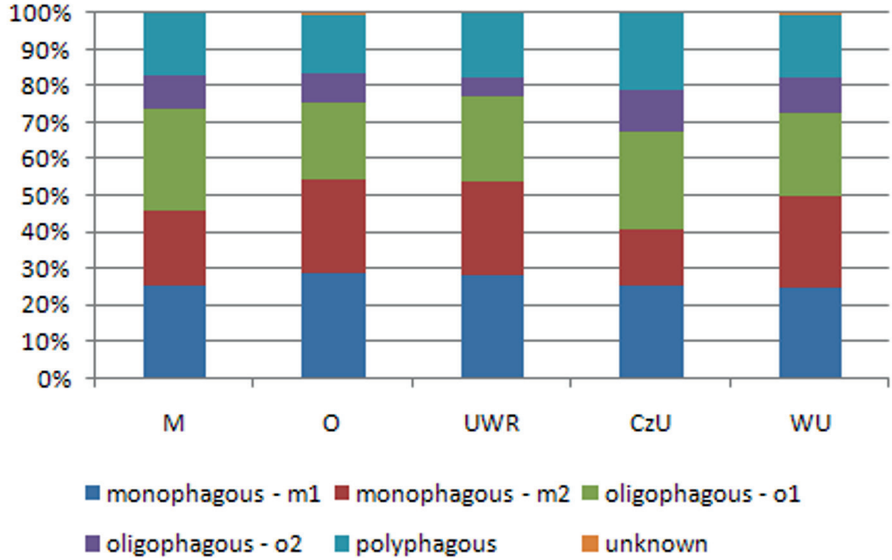

Fig. 45. Percentage share of ecological elements in the area of the Częstochowa: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU) – Trophic relationships.

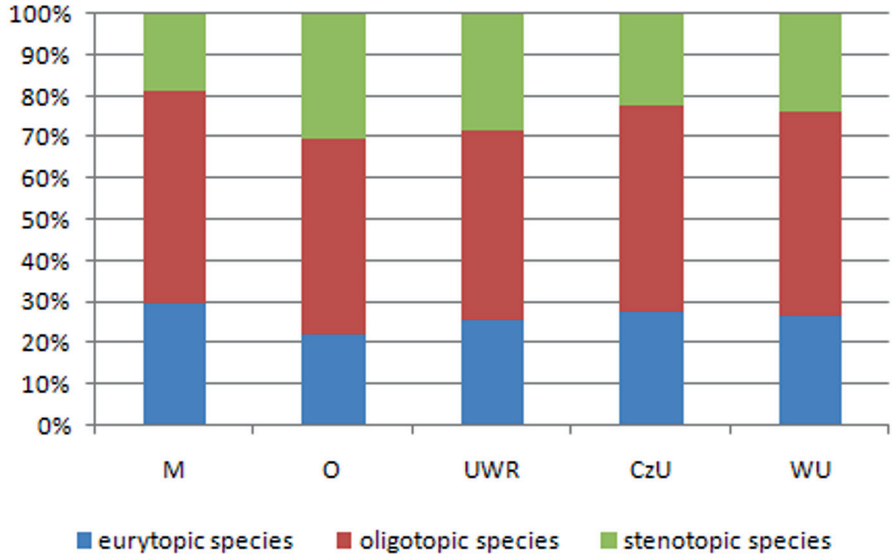

Fig. 46. Percentage share of ecological elements in the area of the Częstochowa: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU) – The strength of relationship of a species with its habitat.

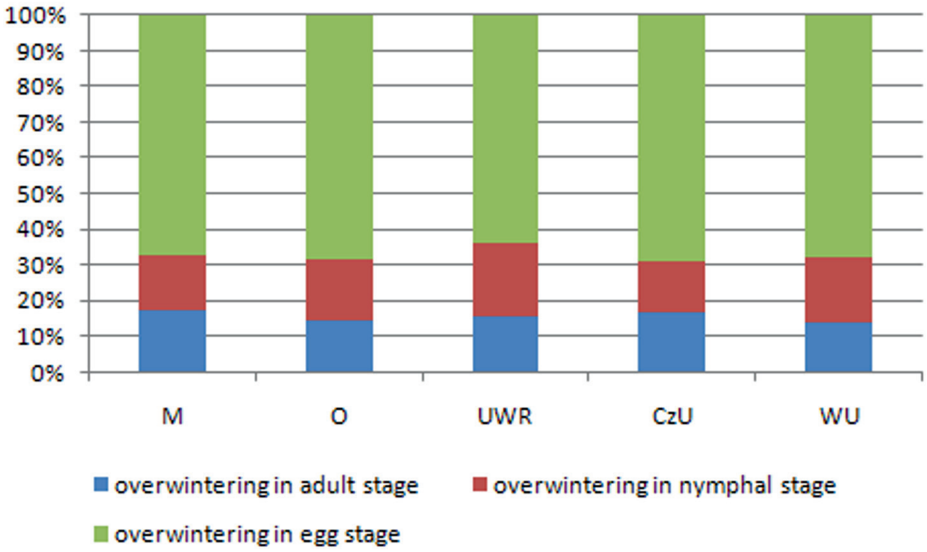

Fig. 47. Percentage share of ecological elements in the area of the Częstochowa: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU) – Overwintering stage.

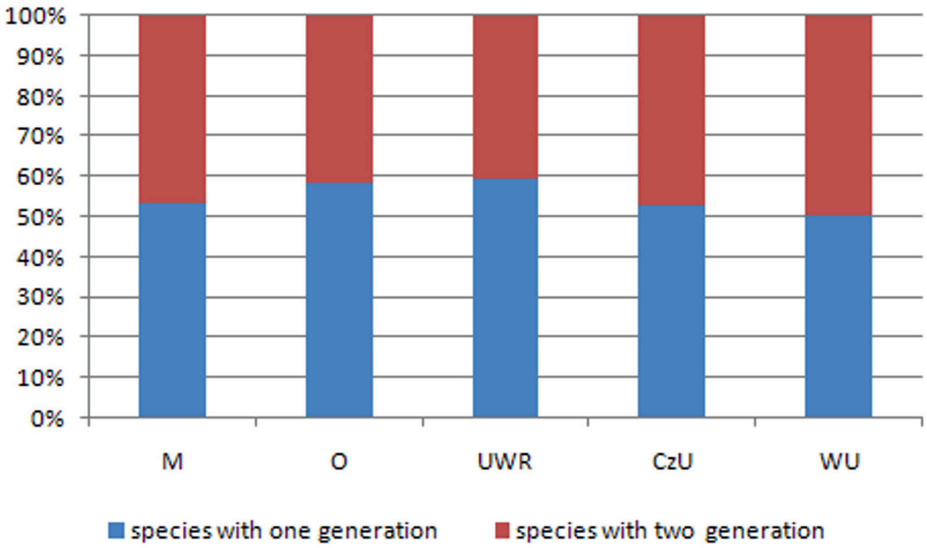

Fig. 48. Percentage share of ecological elements in the area of the Częstochowa: city centre (M), buffer zone (O), lowland of Upper Warta River mesoregion (UWR), Częstochowska Upland mesoregion (CzU), Wieluńska Upland mesoregion (WU) – Number of generation per year.

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References should be listed alphabetically with book and journal titles given in full. Use small letters a ... z to indicate references published by the same author(s) within one year. For papers published using an alphabet other than Latin but having a summary, title, or abstract in Latin alphabet, cite this "original" translation. If there is no such translation, use an English translation in brackets [ ] with an indication of the original language.

Examples: Mazur S. 1984. A world catalogue of Histeridae. Polskie Pismo Entomologiczne, 54: 1–379.

Mulsant E., Rey A. 1844a. Histoire Naturelle des Coléopteres de France. Maison, Paris: vii + 1–196, pl. 1.

Lawrance J.F. 1982. Coleoptera. [in:] Parker S.P. (ed.). Synopsis and Classification of Living Organisms. Vol. 2, McGraw-Hill, New York: 482–553.

Ponomarenko A.G. 1985. [Beetles from the Jurassic of Siberia and western Mongolia]. Trudy Paleontologicheskogo Instituta, 211: 47–87. [In Russian].

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