

## **Auchenorrhynchous bugs (Hemiptera: Fulgoromorpha et Cicadomorpha) in the collection of the royal cartographer Karol de Perthées (1739–1815) and its importance for the knowledge of the fauna of Poland**

CEZARY GĘBICKI<sup>1</sup>, DARIUSZ ŚWIERCZEWSKI<sup>1</sup>, ADAM STROIŃSKI<sup>2</sup>, JACEK SZWEDO<sup>3</sup>

<sup>1</sup>Department of Zoology and Animal Ecology, Jan Długosz University, 13/15, Al. Armii Krajowej, PL42-201 Częstochowa, Poland, e-mail: cgeb@ajd.czyst.pl, dswier@ajd.czyst.pl

<sup>2</sup>Museum and Institute of Zoology, Polish Academy of Sciences, 64, Wilcza St., PL00-679 Warszawa, Poland, e-mail: adam@miiz.waw.pl

<sup>3</sup>Department of Invertebrate Zoology and Parasitology, Faculty of Biology, University of Gdańsk, 59, Wita Stwosza St., PL80-308 Gdańsk, Poland, e-mail: jacek.szwedo@biol.ug.edu.pl

**ABSTRACT. Auchenorrhynchous bugs (Hemiptera: Fulgoromorpha et Cicadomorpha) in the collection of the royal cartographer Karol de Perthées (1739–1815) and its importance for the knowledge of the fauna of Poland.**

The paper presents the results of the authors' inventory of planthopper and leafhopper (former Auchenorrhyncha) species collected in the vicinity of Warsaw by the royal cartographer Karol de Perthées and described during his stay in Vilnius at the turn of 1802, on the basis of the drawings and descriptions included in his unpublished manuscript, entitled Volume I. In total, 38 species and 9 colour forms were identified, of which 23 can be regarded as correctly named by Perthées. Most of the species represent suborder Cicadomorpha (33), and only 5 belong to suborder Fulgoromorpha. This is the first documented historical information on the planthopper and leafhopper fauna of Poland.

**KEY WORDS:** Fulgoromorpha, Cicadomorpha, Poland, historical records.

### INTRODUCTION

Karol de Perthées was born in Dresden, in December 1739, into a family of French Huguenots, who had settled in Germany (BUCZEK 2003). At the age of 15 he was sent to a military academy in Berlin, and afterwards, in October 1763, having been recommended to Stanislaus August Poniatowski. Perthées started to work for the future king as a cartographer. After his coronation, King Stanislaus August appointed Karol Perthées as a royal cartographer and offered him a tied dwelling in Warsaw castle. Perthées' main cartographic works were a map of the Kingdom of Poland and the Grand Duchy of Lithuania entitled *Polonia secundum legitimas proiectionis stereographicae regulas* (1770) and an Atlas of Poland (started in 1781) comprising maps presenting particular provinces. After the abdication and death of the King, Perthées moved with his family to Vilnius, where he undertook work for the Russian army as the Emperor's geographer. Perthées passed on December 2, 1815 and was buried in the Calvinist cemetery in Vilnius (BUCZEK 2003, PAWŁOWSKI 2003a).

Perthées was also an amateur entomologist who provided the earliest known data on the entomofauna of Poland. He surveyed mainly Warsaw and its vicinity within a radius of 20-30 km. Other material collected in the surroundings of Cracow and from many other distant villages (Rawa, Kielce, Puławy, Siemiatycze, Rzeszów, Sambor, Lwów) was obtained by exchange with local entomologists or was provided by the cartographer's friends.

The main techniques for collecting insects employed by Perthées were catching them with an entomological net and shaking down or direct collection from plants. He must also have possessed an appropriate set of preparation instruments, probably similar to those described in a manual by SCHÄFFER (1766).

Perthées' entomological collection comprised more than 2600 species from 18 present insect orders. Of this number more than two thousand were identified by the cartographer himself, and the rest by Stanisław Batys Gorski (1802-1864), who after Perthées' death had a possibility of revising the collection (PAWŁOWSKI 1998, 2003b). Perthées was, first of all, an expert on butterflies (Lepidoptera). This part of his collection, comprising more than 600 species, was kept in a large cabinet ('grande armoire') and was the best documented. The second largest collection made by Perthées (in terms of the number of species) is that dedicated to beetles (Coleoptera), supplemented by a large number of field observations and drawings. The majority of pinned specimens were affixed with labels with a different letter, numeral and/or drawn symbol, referring to the species identification or determined specimens.

After the cartographer's death, his entomological collection was purchased by Vilnius University for its Natural History Division in 1823. After the closure of the University, the collection was moved to the Medical and Surgical Academy in Vilnius, and when that closed down (1841), the collection was transferred to the Medical Department of St. Vladimir University in Kiev. There it stayed for one hundred years till World War II, when the collection was destroyed by fire during a battle to take over the city in 1943 (PAWŁOWSKI 2003b).

As the Perthées collection was completely destroyed, his entomological legacy can only be known from the preserved manuscripts. After Perthées death, these were purchased by S. B. Gorski who, between 1832–1836, provided the volumes with covers and entitled them as "*Insecta Polonica et Lithuanica*". The next owner was a Polish zoologist, Professor Antoni Waga, whose library was purchased by the Physiographic Commission Museum in Cracow. Today, Perthées' manuscripts are housed in the Institute of the Systematics and Evolution of Animals of the Polish Academy of Sciences in Cracow (PAWŁOWSKI 1998, 2003b).

These documents can be divided into three groups: working notes, quotes from literature and so called 'final studies'. The first two groups provide us with knowledge on Perthées' entomological expertise: ways of collecting the material, rearing and preserving the prepared specimens and documenting the collection (manuscripts assigned as III, IV/1-2 V/1-2, VI/1ab-2-3. The 'final studies' were dedicated mainly to butterflies (VII, VIII, IX), and far less so to other groups of insects (I, II/3).

## MATERIAL AND METHODS

The basis of the presented taxonomical diagnostics and systematic analyses of Auchenorrhyncha were the drawings made by Karol de Perthées, supplemented by his descriptions in French from his manuscript entitled Volume I (pages 149-158 and 181, dimensions: 83×210 mm; Fig. 1). The drawings prepared in ink, with the same quill pen as for the manuscript, are characterised by plenty of detail, important for the identification of the species. In addition to the general body shape and proportions, they show the colour pattern of the head, pronotum and fore wings, and sometimes the characteristic shape of the frons. Parts of the body important for identification, such as the fore wings and hind legs, are often depicted in separate drawings. In some cases, the drawings include a scale bar, which enabled the authors to identify the species properly. Particular drawings or groups of drawings are supplemented with numbers or letters (in frames), which referred to particular specimens in the collection.

The auchenorrhynchans in the collection were classified by Perthées to genera *Fulgora*, *Cicada* and *Cercopis*. Only a few specimens were identified at the species level and in some cases the names and descriptions are not provided with the drawings. This particularly relates to large, easily identified species such as *Ledra aurita* or *Dictyophara europea*. During the identification, Perthées used the sources available at that time, mainly that of DE GEER (1774), GEOFFROY (1762), SCHÄFFER (1764a-b, 1766, 1779), SCOPOLI (1763), and followed the binominal system established by LINNAEUS (1758). In his manuscript, in part devoted to hemipterans, Perthées tried to combine and reconcile the early system of LINNAEUS (1758), with the one proposed by FABRICIUS (1794), but with some inconsistencies (PAWLOWSKI 2003c).

Below, a critical overview of the species of Fulgoromorpha and Cicadomorpha identified by Perthées is presented. The species are listed systematically, with the numbers in bold in square brackets referring to the arrangement in Perthées' manuscript. For each species the following information is provided:

original name/number of drawings/collection register/manuscript page

In some cases the original names are supplemented with additional comments/names made probably by Antoni Waga, who was a subsequent owner of the collection and the manuscripts.

Finally, scans of pages from Perthées manuscript referring to auchenorrhynchous insects as well as photos of the habitus of several species depicted by Perthées, are also provided. It should be noted that the colour forms of *Philaenus spumarius* LINNAEUS, 1758 were recognized as a distinct species in Perthées' time; according to Article 45.6.4. of the Code of Zoological Nomenclature (ICZN 1999), the names of colour forms should be treated as subspecific.

It must be emphasized that varietal names of *Philaenus spumarius* should be considered as infrasubspecific names which may cause confusion with subspecific names, and their use should be avoided (HAMILTON 1979). The classification within the genus *Philaenus* is now the subject of morphological and molecular research (MARYAŃSKA-NADACHOWSKA *et al.* 2012) and many subspecies are now regarded as valid species. Here, just for clarity, we use the notion of 'forma' with the scientific name.

FULGOROMORPHA EVANS, 1946

Cixiidae SPINOLA, 1839

*Cixius nervosus* (LINNAEUS, 1758)

[12] – *Cicada nervosa*/2 drawings/1009/150 (Fig. 2).

Identified as *Cicada nervosa* LINNAEUS, 1758 (now in the genus *Cixius* LATREILLE, 1804). It shows typical for the species colour pattern of the fore wings with darker basal part, pterostigma and transverse band, which distinguish this species from similar ones, such as *Cixius simplex* HERRICH-SCHÄFFER, 1835, *Cixius distinguendus* KIRSCHBAUM, 1868, *Cixius beieri* WAGNER, 1939, *Cixius heydenii* KIRSCHBAUM, 1868 and *Cixius cambricus* CHINA, 1935. One of the most common and widespread representatives of the family Cixiidae.

Delphacidae LEACH, 1815

*Asiraca clavicornis* (FABRICIUS, 1794)

[52] – *Cicada* (*Asiraca clavicornis*)/7 drawings, scale bar/without collection registers/181 (Fig. 7).

Detailed drawings clearly indicate that depicted planthopper represents *Asiraca clavicornis* FABRICIUS, 1794. This species is rather local in Poland, associated with xerothermic and dry ruderal habitats.

Dictyopharidae SPINOLA, 1839

*Dictyophara europaea* (LINNAEUS, 1767)

[1] – *Fulgora Europaea*/without drawing and scale bar/without collection registers/149 (Fig. 2).

Although without drawing, undoubtedly, it was correctly identified as *Fulgora europaea* LINNAEUS, 1767 (now in the genus *Dictyophara* GERMAR, 1833). It is difficult to misidentify this species with other representatives of Polish planthoppers, being also only species of Dictyopharidae known from Poland. The species is rarely recorded in Poland, although locally quite abundant, associated with xerothermic habitats, mainly dry grasslands and ruderal sites.

Issidae SPINOLA, 1839

*Issus coleoptratus* (FABRICIUS, 1781)

[5] – *Cicada coleoptrata* (*Cercopis*)/1 drawing, without scale bar/1015/149 (Fig. 2).



Correctly identified as *Cercopis coleoprata* FABRICIUS, 1781 (now in the genus *Issus* FABRICIUS, 1803). General body shape (in dorsal view) and fore wings coloration in the drawing are typical for two Central European representatives of the genus *Issus* FABR. It is easily distinguished from closely related *Issus muscaeformis* SCHRANK, 1781 by the colour pattern of frons which should have been noticed by Perthées but not depicted. This planthopper is rare in Poland now and probably endangered.

#### Tettigometridae GERMAR, 1821

##### *Tettigometra leucophaea* (PREYSSLER, 1792)

[39] – Cicada/2 drawings, scale bar/H/155 (Fig. 5).

Characteristic colour pattern of the fore wings does not clearly correspond with those of *Tettigometra leucophaea* PREYSSLER, 1792 and *Tettigometra virescens* PANZER, 1799, two representatives of Tettigometridae known at the beginning of 19<sup>th</sup> century. On the other hand, white dots in the basal part of the wings may suggest southern European *Tettigometra griseola* FIEBER, 1865. However, taking into account the variability of colour pattern, it can be assumed that the drawings probably show the first species. The species is characteristic for xerothermic habitats, facing an extremely high risk of extinction.

#### CICADOMORPHA EVANS, 1946

##### Cercopidae LEACH, 1815

##### *Cercopis sanguinolenta* (SCOPOLI, 1763)

[4] – Cicada sanguinolenta (Cercopis)/without drawings and scale bar/1011/149 (Fig. 2).

Identified as *Cicada sanguinolenta* SCOPOLI, 1763 (now in the genus *Cercopis* FABRICIUS, 1775). One of the most easily distinguishable leafhoppers, with black background and bloody red dots, being also the most common representative of Cercopidae.

#### Aphrophoridae AMYOT et AUDINET-SERVILLE, 1843

##### *Aphrophora corticea* GERMAR, 1821

[32] – Cicada/4 drawings, scale bar/without collection register/153 (Fig. 4, Fig. 8a).

Perthées depicted insect, which was named 20 years later by German entomologist Wilhelm Germar, thus having difficulties with the proper identification. The only known representatives of the genus *Aphrophora* GERMAR, 1821 that time were *Aphrophora alni* (FALLÉN, 1805) (= *Cicada cincta* THUNBERG, 1784: *nomen oblitum*) and *Aphrophora salicina* GOEZE, 1778. Diagnostic characters are body length (almost 12 mm in the drawing) and contrasting colouration of head, pronotum and scutum.

This cercopid, associated with pine forests, with *Pinus silvestris* as host plant, is rather local in Poland.

***Philaenus spumarius* (LINNAEUS, 1758) forma *typica***

[8] – *Cicada spumaria*/1 drawing/1012/149 (Fig. 2).

Correctly identified as *Cicada spumaria* LINNAEUS, 1758 of that time. Coloration of dorsum typical for this colour morph.

***Philaenus spumarius* (SCHRANK, 1776) forma *albomaculata***

[7] – *Cicada biguttata* (*Cercopis*)/1 drawing, scale bar/1016/149 (Fig. 2).

Incorrectly identified as *Cercopis biguttata* FABRICIUS, 1781 = *Cercopis gibba* FABRICIUS, 1775 of that time. The colour pattern of dorsum (dark head and pronotum) typical for *Philaenus spumarius* (SCHRANK, 1776) forma *albomaculata*.

***Philaenus spumarius* (FABRICIUS, 1787) forma *fasciata***

[33] – *Cicada fasciata* (*Cercopis*)/5 drawings, scale bar/1020/153-154 (Fig. 4).

Correctly identified as *Cercopis fasciata* FABRICIUS, 1787 of that time. The colour pattern of dorsum typical for this colour form.

Drawing marked as (a) shows the fore wing of the rare hybrid form *Philaenus spumarius* forma *fasciata* × *Philaenus spumarius* forma *populella*.

***Philaenus spumarius* (LINNAEUS, 1758) forma *lateralis***

[15] – *Cicada lateralis*/1 drawing, scale bar/997/151 (Fig. 3).

Correctly identified as *Cicada lateralis* LINNAEUS, 1758 of that time. The coloration of dorsum typical for this colour morph.

***Philaenus spumarius* (LINNAEUS, 1758) forma *leucocephala***

[16] – *Cicada flavicollis*/2 drawings, without scale bar/1000/151 (Fig. 3).

Erroneously identified as *Cicada flavicollis* LINNAEUS, 1761. The colour patter of dorsum is typical for *Cicada leucocephala* LINNAEUS, 1758 of that time.

***Philaenus spumarius* (LINNAEUS, 1758) forma *leucophthalma***

[13] – *Cicada leucophthalma*/2 drawings, without scale bar/1013/150 (Fig. 2).

Correctly identified as *Cicada leucophthalma* LINNAEUS, 1758 of that time. Coloration of dorsum typical for the colour morph.

***Philaenus spumarius* (FABRICIUS, 1794) forma *marginella***

[14] – *Cicada leucocephala*/2 drawings, without scale bar/1014/150 (Fig. 2).

Erroneously identified as *Cicada leucocephala* LINNAEUS, 1758. Colour pattern of dorsum is typical for *Cercopis marginella* FABRICIUS, 1794 of that time.

***Philaenus spumarius* (SCHRANK, 1776) forma *quadrinaculata***

[34] – *Cicada angulata*?/4 drawings, scale bar/1029/154 (Fig. 4).

Erroneously identified as *Cicada angulata* FABRICIUS, 1794. Colour pattern of dorsum is typical for *Cicada quadrinaculata* SCHRANK, 1776 of that time.

***Philaenus spumarius* (SCHRANK, 1776) forma *trilineata***

[29] – *Cicada lineata* (Cercopis) /2 drawings, scale bar/999/153 (Fig. 4).

Correctly identified as *Cercopis lineata* FABRICIUS, 1781 (= *Cicada trilineata* SCHRANK, 1776) of that time. Coloration of dorsum typical for this colour morph.

### Membracidae RAFINESQUE, 1815

***Centrotus cornutus* (LINNAEUS, 1758)**

[2] – *Cicada cornuta*/without drawings and scale bar/without collection register/149 (Fig. 2).

Correctly identified as *Cicada cornuta* LINNAEUS, 1758 (now in the genus *Centrotus* FABRICIUS, 1803). This is one of the three representatives of Membracidae in Central Europe, with characteristic 2 pronotal horn-like appendages.

The species is widely distributed in Poland and quite frequently recorded.

### Cicadellidae LATREILLE, 1825

***Ledra aurita* (LINNAEUS, 1758)**

[3] – *Cicada aurita*/without drawings and scale bar/without collection register/149 (Fig. 2, Fig. 8b).

Correctly identified as *Cicada aurita* LINNAEUS, 1758 (presently in the genus *Ledra* FABRICIUS, 1803). This is quite large species with characteristic body shape (large pronotal ear-like appendages), which easily enables the proper identification.

The species is local in Poland, found mainly in deciduous forests.

***Oncopsis alni* (SCHRANK, 1801)**

[20] – *Cicada Schrankii*/3 drawings, scale bar/1020/151 (Fig. 3, Fig. 8d).

The species was known as *Cicada schrankii* GMELIN, 1790 at the end of 18<sup>th</sup> century (*nomen oblitum*). The drawing showing shape and location of the frontal markings seems to confirm proper identification. Other species from this genus possess markings with lower tendency of fusing.

The species is often recorded in alluvial forests, with the domination of *Alnus glutinosa* as a host plant.

***Oncopsis flavicollis*** (LINNAEUS, 1761)

[24] – *Cicada flava*/2 drawings, scale bar/1010/152 (Fig. 3, Fig. 8e).

[43] – *Cicada* (*triangularis*)/2 drawings, scale bar/1006, M/156 (Fig. 5, Fig. 8e).

[44] – *Cicada*/3 drawings, scale bar/N/156 (Fig. 5, Fig. 8e).

[24] – Identified as *Cicada flava* LINNAEUS, 1758 (*nomen nudum*). Taking into account general body shape, width of the head and colouration, the specimen resembles *Coryphaeus gyllenhalii* (FALLÉN, 1826), the species being quite rare in Europe (NAST 1987). On the other hand, proportions of the frons (depicted in the second drawing) and its characteristic markings undoubtedly indicate the representative of the genus *Oncopsis* BURMEISTER, 1838.

[43], [44] – Identified as *Cicada triangularis* FABRICIUS, 1794 = *Cicada flavicollis* LINNAEUS, 1761 (presently in the genus *Oncopsis* BURMEISTER, 1838). The drawings showing frons, pronotum and fore wing venation seem confirm proper identification, however the second drawing of frons with reduced markings may indicate any of the species from the genus *Oncopsis* BURM.

The most common representative of Macropsinae subfamily in Poland, associated with *Betula* spp.

***Macropsis fuscinervis*** (BOHEMAN, 1845)

[47] – *Cicada*/4 drawings, scale bar/1016/157 (Fig. 6, Fig. 8c).

The species unknown to science at that time, as only *Macropsis graminea* FABRICIUS, 1798 and *Macropsis prasina* BOHEMAN, 1852 (= *Cicada virescens* GMELIN, 1790: *nomen oblitum*) represented the genus *Macropsis* LEWIS, 1834 were known at the end of 18<sup>th</sup> century. Colouration of the fore wings and frons is typical for this species.

This is quite common species in Poland, tropically associated with *Populus tremula*.

***Anaceratagallia venosa*** (GEOFFROY, 1785)

[46] – *Cicada*/4 drawings, scale bar/1014, O/157 (Fig. 6, Fig. 9a).

It was the only European species known as *Cicada venosa* GEOFFROY, 1785 belonging to Agallinae subfamily that time. There is another similar species described much later *Anaceratagallia ribauti* OSSIANNILSSON, 1938, however, both species are undistinguishable using external morphological characters.

One of the most common representatives of Megophthalminae subfamily in Poland, associated with meadows with high abundance of *Lotus corniculatus*.

***Populicerus populi*** (LINNAEUS, 1761)

[11] – *Cicada populi*/1 drawing without scale bar/without collection register, Gofr?/150 (Fig. 2).

[28] – *Cicada coryli*/2 drawings, scale bar/1010/152 (Fig. 3).

[11] – Correctly identified as *Cicada populi* LINNAEUS, 1761 (now in the genus *Populicerus* DLABOLA, 1974); the drawing shows typical form of the species;

[28] – Identified as *Cicada coryli* LINNAEUS, 1761 (= *Cicada populi* LINNAEUS, 1761); the depicted specimen is very dark, with lighter head and two round vertex dots. This colour pattern may respond to one of the several dark colour forms of the species.

One of the most common representatives of Idiocerinae subfamily in Poland, associated with woodland margins dominated by *Populus tremula* as a host plant.

***Rhytidodus decimusquartus* (SCHRANK, 1776)**

[49] – Cicada/1 drawing with scale bar/1013, R/157 (Fig. 6).

The length of described specimen is about 10 mm, with head wider than pronotum and uniformly dark coloration. These characters suggest *Rhytidodus decimusquartus* (SCHRANK, 1776) – the largest representative of European Idiocerinae BAKER, 1915.

Presently, the species is rarely recorded in Poland, trophically associated with *Populus nigra*, especially in urban habitats, overwintering often in human settlements.

***Stenidiocerus poecilus* (HERRICH-SCHÄFFER, 1835)**

[45] – Cicada/2 drawings without scale bar/without collection register/156 (Fig. 5).

The drawings of two tegmina represent *Stenidiocerus poecilus* HERRICH-SCHÄFFER, 1835, the species unknown to science that time.

The species is rarely recorded in Poland, especially in woodlands, more common in anthropogenic habitats.

***Idiocerus* (s. lat.) sp.**

[50] – Cicada/4 drawings without scale bar/1014, B/158 (Fig. 6).

The identification to species level is impossible on the basis of the drawings.

***Iassus lanio* (LINNAEUS, 1761)**

[18] – Cicada lanio/2 drawings with scale bar/1020/151 (Fig. 3).

Correctly identified as *Cicada lanio* LINNAEUS, 1761 (now in the genus *Iassus* FABRICIUS, 1803).

In the time of Perthées, this species comprised also described a bit later *Iassus scutellaris* (FIEBER, 1868). Both species differ by the length of vertex measured at midline. The specimen probably represents the colour form *Iassus lanio* var. *brunnea* (FABRICIUS, 1794).

The species is rarely recorded in Poland, associated with woodlands with domination of *Quercus* spp. as host plants.

***Penthimia nigra* (GOEZE, 1778)**

[21] – Cicada haemorhoea Schr./2 drawings with scale bar/1037/151 (Fig. 3).

Identified as *Cicada haemorhoea* [sic!: *haemorrhoea*] SCHRANK, 1781 = *Cicada nigra* GOEZE, 1778 (now in the genus *Penthimia* GERMAR, 1821). The drawing shows specimen with distinct and characteristic round spots (red) on lateral parts of pronotum.

This xerothermophilous species is rarely recorded in Poland, being associated with woodlands and scrublands.

***Aphrodes makarovi*** ZACHVATKIN, 1948

[6] – *Cicada rustica* (Cercopis) /1 drawing with scale bar/1017, Deger/149 (Fig. 2).

Identified as *Cercopis rustica* FABRICIUS, 1775 = Primary homonym of *Aphrodes bicincta* (SCHRANK, 1776). It was the only representative of the genus *Aphrodes* CURTIS, 1833 at that time. However, uniformly dark coloration and body length suggest that the specimen belongs to much later described *Aphrodes makarovi*.

Very common in moist habitats, trophically associated with *Taraxacum* spp. and *Urtica* spp.

***Anoscopus albifrons*** (LINNAEUS, 1758)

[9] – *Cicada albifrons*/1 drawing without scale bar/without collection register/150 (Fig. 2, Fig. 9e).

Correctly identified as *Cicada albifrons* LINNAEUS, 1758 (now in the genus *Anoscopus* KIRSCHBAUM, 1858). Coloration of females is variable, from uniformly stramineous to blackish brown.

Quite common species in Poland, recorded both in woodlands and grasslands.

***Anoscopus histrionicus*** (FABRICIUS, 1794)

[36] – *Cicada* (*Cercopis transversalis*)/4 drawings with scale bar/1018, E/154 (Fig. 4).

Erroneously identified as *Cercopis transversalis*, which probably refers to *Cicada transversalis* FOURCROY, 1785, being a synonym of *Anoscopus serratulae* FABRICIUS, 1775. The drawings show males with typical coloration for *Anoscopus histrionicus* (FABRICIUS, 1794).

Presently, the species is rarely recorded in Poland and probably endangered.

***Anoscopus serratulae*** (FABRICIUS, 1775)

[35] – *Cicada*/1 drawing without scale bar/D/154 (Fig. 4, Fig. 9f).

[37] – *Cicada*/3 drawings without scale bar/r/154 (Fig. 4, Fig. 9f).

The depicted specimens is characterised by a simple colour pattern – typical for males of *Anoscopus serratulae* (FABRICIUS, 1775).

The species is rarely recorded in Poland, associated with grasslands.

***Stroggylocephalus agrestis*** (FALLÉN, 1806)

[40] – *Cicada*/2 drawings with scale bar/without collection register/155 (Fig. 5).

Unnamed specimen with coloration and body shape similar to *Stroggylocephalus* (*Cicada*) *agrestis* FALLÉN, 1806, described three years later, when Perthées had finished his work with the collection.

Local species, inhabiting moist meadows and peat-bogs, trophically associated with *Carex* spp.

***Evacanthus acuminatus*** (FABRICIUS, 1794)

[42] – Cicada/3 drawings with scale bar/L./156 (Fig. 5, Fig. 8g).

Brachypterous tegmina and their coloration as well as a colour pattern of pronotum and hind tibiae chaetotaxy clearly indicate this species.

Very common leafhopper species in Poland, recorded in woodlands as well as in grasslands.

***Evacanthus interruptus*** (LINNAEUS, 1758)

[17] – Cicada interupta/2 drawings with scale bar/998/151 (Fig. 3, Fig. 8f).

Correctly identified as *Cicada interupta* [sic!: *interrupta*] LINNAEUS, 1758 (now in the genus *Evacanthus* LE PELETIER et SERVILLE, 1825). The depicted specimen has the coloration typical for the species.

Very common leafhopper species in Poland, associated with moist woodlands and grasslands.

***Cicadella viridis*** (LINNAEUS, 1758)

[23] – Cicada viridis/2 drawings with scale bar/1001/152 (Fig. 3).

Correctly identified as *Cicada viridis* LINNAEUS, 1758 (now in the genus *Cicadella* LATREILLE, 1817). One of the most common leafhoppers species, however, there is another similar species described much later *Cicadella lasiocarpae* OSSIANNILSSON, 1981, much rarer and probably present in Poland only locally.

***Edwardsiana rosae*** (LINNAEUS, 1758)

[27] – Cicada rosae/without drawings and scale bar/1004/152 (Fig. 3).

Identified as *Cicada rosae* LINNAEUS, 1758 (now in the genus *Edwardsiana* ZACHVATKIN, 1929).

Identification of the representatives of Typhlocybae subfamily requires the knowledge of male genital structures. General body shape and coloration play only complementary role. Thus, verification of species names given by Perthées for Typhlocybae and Deltocephalinae leafhoppers based on the external characters and coloration must be treated very carefully.

Quite common and abundant representative of Typhlocybae subfamily, trophically associated with Rosaceae.

***Edwardsiana* sp.**

[51] – Cicada flavescens/without drawings and scale bar/1008/158 (Fig. 6).

Identified as *Cicada flavescens* FABRICIUS, 1794, however, it can represent any of the following three species: *Edwardsiana flavescens* FABRICIUS, 1794, *Edwardsiana lethierryi* EDWARDS, 1881 or *Edwardsiana avellanae* EDWARDS, 1888. All mentioned above species have intensively yellow fore wings, except for their apical part, thus this character suggested by Perthées cannot be used for the proper identification. Moreover, other similarly coloured genera like *Fagocyba* DLABOLA, 1958 and the representatives of other typhlocybinae tribes like Emposcini DISTANT, 1908 and Erythroneurini YOUNG, 1952 should also be taken into account.



*Aguriahana pictilis* (STÅL, 1853)

[48] – Cicada (*Typhlocyba stellulata* Burm!)/1 drawing with scale bar/1018, a/157 (Fig. 6, Fig. 9c).

Perthées depicted and described (but without giving a scientific name and establishing the types) species of *Typhlocyba* subfamily unknown to science at his time, described much later as *Typhlocyba pictilis* STÅL, 1853 (now in the genus *Aguriahana* DISTANT, 1918). The separate drawing of the fore wing shows colour pattern typical for the species.

This is a North Euro-Siberian species, presently very rare in Poland.

*Eupteryx aurata* (LINNAEUS, 1758)

[19] – Cicada *festiva*/without drawings and scale bar/1003/151 (Fig. 3, Fig. 9b).

Identified as *Cicada festiva* FABRICIUS, 1794 = *Cicada aurata* LINNAEUS, 1758 (now in the genus *Eupteryx* CURTIS, 1833). Taking into account the characteristic coloration of the representatives of the ‘aurata group’, it can be assumed that the specimen was identified correctly.

One of the most common leafhopper species, recorded in moist habitats.

*Platymetopius* sp.

[25] – Cicada *aurata*/2 drawings without scale bar/1006/152 (Fig. 3, Fig. 9d).

Incorrectly identified as *Cicada aurata* LINNAEUS, 1758 (see previous species). General body shape as well as the colour pattern of dorsum clearly indicate one of the species belonging to genus *Platymetopius* BURMEISTER, 1838 – *Platymetopius major* KIRSCHBAUM, 1868 or *Platymetopius undatus* DE GEER, 1773.

*Psammotettix* sp., *Lamprotettix nitidulus* (FABRICIUS, 1787) or *Thamnotettix dilutior* (KIRSCHBAUM, 1868)

[10] – Cicada *striata*/5 drawings without scale bar/without collection register/150 (Fig. 2).

Identified as *Cicada striata* LINNAEUS, 1758. Longitudinal pronotal bands and scattered spots on fore wings are characteristic for *Psammotettix poecilus* (FLOR, 1861) or darker forms of *Psammotettix sabulicola* (CURTIS, 1837). On the other hand, length about 6 mm may suggest *Lamprotettix nitidulus* (FABRICIUS, 1787) or *Thamnotettix dilutior* (KIRSCHBAUM, 1868). Both mentioned species present similar body coloration. It is difficult to say what the systematic position of specimen described as *Cicada striata* LINNAEUS, 1758 is, as the type specimen probably was lost. According to some authors, it can be known from Palaearctic and Poland *Psammotettix striatus* (LINNAEUS, 1758) (OMAN *et al.* 1990, KNIGHT 2010).

*Allygus maculatus* RIBAUT, 1952

[30] – Cicada *geographica*/2 drawings with scale bar/without collection register/153 (Fig. 4).

Identified as *Cicada geographica* [sic!: *geografica*] GOEZE, 1778, however, the systematic position of this species is unclear (NAST 1972). Body length and coloration, notably that of frons, make the specimen attributable to the representatives of *Allygus* FIEBER, 1875, especially *Allygus maculatus* RIBAUT, 1952.

The species is presently rarely recorded in Poland, found mainly in different types of woodlands.

### ***Cicadula quadrinotata* (FABRICIUS, 1794)**

[26] – *Cicada ulmi*/3 drawings with scale bar/1007/152 (Fig. 3).

Identified incorrectly as *Cicada ulmi* LINNAEUS, 1758 (now in the genus *Ribautiana* ZACHVATKIN, 1947). The specimen can be identified as *Cicadula quadrinotata* FABRICIUS, 1794 as recognized at times of Perthées, on the basis of two pairs of dots located on vertex (showed on the separate drawing) and dark lateral margins of frontoclypeus.

One of the most common leafhopper species in Poland.

### ***Euscelis* sp. or *Euscelidius* sp.**

[31] – *Cicada squalida*/3 drawings with scale bar/without collection register/153 (Fig. 4).

Identified as *Cicada squalida* O.F. MÜLLER, 1776, however, the systematic position of this taxon is unclear (NAST 1972). Taking into account head coloration, the depicted specimen resembles some species belonging to Athysanini VAN DUZEE, 1892, such as those from genera *Euscelis* BRULLÉ, 1832 or *Euscelidius* RIBAUT, 1942.

### ***Euscelis venosus* (KIRSCHBAUM, 1868)**

[41] – *Cicada aptera*/1 drawing without scale bar/1012/155 (Fig. 5, Fig. 9g).

Identified as *Cicada aptera* LINNAEUS, 1758, however, the systematic position of this taxon is unclear (NAST 1972). General coloration and shortened wings suggest the male of *Euscelis venosus* (KIRSCHBAUM, 1868) – species unknown to science at times of Perthées work.

This is quite rarely recorded leafhopper species in Poland, with preference toward xerothermic ecosystems.

### ***Verdanus abdominalis* (FABRICIUS, 1803)**

[38] – *Cicada*/4 drawings with scale bar/1015/155 (Fig. 5).

General body shape and length as well as the uniform coloration with darker apical parts of the fore wings resemble *Verdanus abdominalis* (FABRICIUS, 1803).

The most common species of the genus *Verdanus* OMAN, 1949 in Europe, recorded in different types of meadows.

### ***Cicadellidae incertae sedis***

[22] – *Cicada leporina*/3 drawings, scale bar/1026/151 (Fig. 3).

Incorrectly identified as *Cicada leporina* LINNAEUS, 1761 (now in the genus *Pentastiridius* KIRSCHBAUM, 1868 of the planthopper family Cixiidae) as the depicted specimen belongs to subfamily Deltocephalinae FIEBER, 1866.

## DISCUSSION AND CONCLUSIONS

Until the year 1801, about 140 European species of planthoppers and leafhoppers (collectively known as ‘Auchenorrhyncha’ – paraphyletic assemblage) had been described (NAST 1972), belonging to currently recognized superfamilies Fulgoroidea, Cicadoidea, Cercopoidea and Membracoidea, which comprise about 8% of the recent European fauna. Of that number, 79 species have a stable taxonomic position, while the taxonomic status of the other 61 species is unclear. Fulgoromorpha was represented by 17 species, with 6 belonging to Cixiidae. Cicadomorpha comprised mainly the representatives of Cicadidae (13 species), Aphrophoridae (6) and Cicadellidae (43). The unavailability of a stereoscopic microscope meant the studies focused mainly on the larger specimens, excluding minute representatives of Delphacidae (with several exceptions), Typhlocybinae (9 species known to science at that time) and Deltocephalinae (8 species). Between the years 1802-1806, mainly thanks to FALLÉN (1806), a further 30 species of auchenorrhynchans were described, including 9 species of Typhlocybinae and 11 species of Deltocephalinae.

The bibliography dedicated to auchenorrhynchous bugs was quite rich at the end of 18th century covering works by the following authors: C. de GEER (born 1720 - passed 1778), E. DONOVAN (1768-1837), J. CH. FABRICIUS (1745-1808), A. F. FOURCROY (1755-1809), GMELIN (1748-1804), J. A. E. GOEZE (1731-1793), C. LINNAEUS (1707-1778), O.F. MÜLLER (1730-1784), A. G. OLIVIER (1756-1814), P. S. PALLAS (1741-1811), G. W. F. PANZER (1755-1829), N. PODA VON NEUHAUS (1723-1798), E. PONTOPPIDAN (1698-1764), J. D. E. PREYSLER (1768-1839), P. ROSSI (1738-1804), F. P. SCHRANK (1747-1835), J. A. SCOPOLI (1723-1788), J. H. SULZER (1735-1813), C. P. THUNBERG (1743-1828) and F. WEBER (1781-1823). The Perthées’ work originally included descriptions and drawings of 51 planthopper and leafhopper species, with 37 taxa identified to species level. The analysis of the drawings and descriptions conducted by the authors revealed 38 species (with 9 colour forms), of which 23 can be identified with certainty, and these records constitute the first information on the auchenorrhynchan fauna of Poland (referring mainly to Mazowiecka Lowland). The number of species known from Poland at the end of 18<sup>th</sup> century constituted up to 27% of European species known at those times. Compared to this, the current number of 542 species makes up just over 30% (GĘBICKI *et al.* 2013).

Most of the identified species are either of average size (at least 5 mm) or quite large. Numerous dendrophilous species (16) of Macropsinae, Idiocerinae and Typhlocybinae subfamilies suggest collection from *Salix*, *Populus*, *Alnus*, *Betula*, *Fagus*, *Pinus*, *Quercus*, *Rosa* and *Rubus* – shrubs and trees typical for deciduous and coniferous forests. Another group is formed by species typical for meadows (including those species associated with *Juncus* and *Carex*) as well as those associated with antropogenic habitats (living on *Urtica* and *Taraxacum*).

It is worth mentioning a group of 8 species which were unknown to science in Perthées’ time, with *Aguriahana pictilis*, for which a detailed description and fore wing drawing were provided. Unfortunately, he did not give the scientific name and, according to the International Code of Zoological Nomenclature (ICZN 1999), this description cannot be treated as a nomenclatural act.

Several species, which appear in the manuscript, presently have an uncertain systematic position or are treated as dubious and cannot be verified because the type material was lost (NAST 1972).

The work by Karol de Perthées, although not published, contains the first faunistic information on Fulgoromorpha and Cicadomorpha occurring in Poland, based on field investigations. Beside the historical issue of the paper, the manuscript provides historical data on the presence of these taxa in the beginning of the 19<sup>th</sup> century. Such data could be much useful in documenting Polish fauna evolution, for instance in the frame of the global warming by attesting the presence of these particular planthoppers and leafhoppers at this time and this area.

## REFERENCES

- BUCZEK K. 2003. Kartograf króla Stanisława Augusta. Życie i dzieła, In: PAWŁOWSKI J. (Ed.) Karol Perthées (1739-1815). Kartograf Pierwszej Rzeczypospolitej i entomolog. Komitet Historii Nauki i Techniki Polskiej Akademii Nauk. *Rozprawy z Dziejów Nauki i Techniki* 14: 21–134.
- DE GEER CH. 1774. Mémoires pour servir à l'histoire des Insects, 4. P. Hesselberg, Stockholm: xii + 456 pp., 419 pls.
- FABRICIUS J.Ch. 1794. Entomologia systematica emendata et aucta: secundum classes, ordines, genera, species, adjectis synonymis, locis, observationibus, descriptionibus, 4. Impensis Christ. Gottl. Proft., Hafniae: 472 pp.
- FALLEN C.F. 1806. Forsök till Svenska Cicad-Arternas uppställning och beskrifning (continued). *Nya Handlingar Kongliga Svenska Vetenskaps-Akademiens* 27: 6–43.
- GEOFFROY É.L. 1762. Histoire abrégée des Insectes qui se trouvent aux environs de Paris, dans laquelle ces animaux sont rangés suivant un ordre méthodique. Durand, Paris. 1: 614 pp., 2: 760 pp.
- GĘBICKI C., ŚWIERCZEWSKI D., SZWEDO J. 2013. Planthoppers and Leafhoppers of Poland (Hemiptera: Fulgoromorpha et Cicadomorpha). Systematics, Check-list, Bionomy. The Monograph. *Annals of the Upper Silesian Museum, Entomology* 21-22: 1–245.
- HAMILTON K.G.A. 1979. Synopsis of the North American Philaenini (Rhynchota: Homoptera: Cercopidae) with a new genus and four new species. *The Canadian Entomologist* 111(2): 127–141. doi:10.4039/Ent111127-2
- ICZN [International Commission on Zoological Nomenclature] 1999. International code of zoological nomenclature. Fourth Edition. International Trust for Zoological Nomenclature, London: 335 pp.
- KNIGHT W.J. 2010. Leafhoppers (Cicadellidae) of the Pacific. An annotated systematic checklist of the leafhoppers recorded in the Pacific region during the period 1758 – 2000. <http://www.tymbal.org/publicat/KnightCatalogue.pdf>
- LINNAEUS C. 1758. Systema naturae: per regna tria naturae, secundum classes, ordines, genera, species cum characteribus, differentiis, synonymis, locis. Editio decima, reformata. L. Salvii, Holmiae: 824 pp.
- MARYAŃSKA-NADACHOWSKA A., KAJTOCH Ł. & LACHOWSKA D. 2012. Genetic diversity of *Philaenus spumarius* and *P. tessellatus* (Hemiptera, Aphrophoridae): implications for evolution and taxonomy. *Systematic Entomology* 37(1): 55–64. doi:10.1111/j.1365-3113.2011.00592.x
- NAST J. 1972. Palaearctic Auchenorrhyncha (Homoptera). An annotated checklist. Polish Academy of Sciences Institute of Zoology, Warszawa: 550 pp.
- OMAN P.W., KNIGHT W.J. & NIELSON M.W. 1990. Leafhoppers (Cicadellidae): A Bibliography, Generic Check-list and Index to the World Literature 1956-1985. CAB International, Wallingford, Oxon, UK: 368 pp.
- PAWŁOWSKI J. 1998. Szkic dziejów muzealnictwa przyrodniczego w Polsce. Polska Fundacja Ochrony Przyrody „Pro Natura”, Kraków: 91 pp.
- PAWŁOWSKI J. 2003a. Wprowadzenie, In: PAWŁOWSKI J. (Ed.) Karol Perthées (1739-1815). Kartograf Pierwszej Rzeczypospolitej i entomolog. Komitet Historii Nauki i Techniki Polskiej Akademii Nauk. *Rozprawy z Dziejów Nauki i Techniki* 14: 11–20.

- PAWŁOWSKI J. 2003b. Suplement do biografii Karola Perthéesa, In: PAWŁOWSKI J. (Ed.) Karol Perthées (1739-1815). Kartograf Pierwszej Rzeczypospolitej i entomolog. Komitet Historii Nauki i Techniki Polskiej Akademii Nauk. *Rozprawy z Dziejów Nauki i Techniki* 14: 135–163.
- PAWŁOWSKI J. 2003c. Wstępna ocena działalności entomologicznej Karola Perthéesa, In: PAWŁOWSKI J. (Ed.) Karol Perthées (1739-1815). Kartograf Pierwszej Rzeczypospolitej i entomolog. Komitet Historii Nauki i Techniki Polskiej Akademii Nauk. *Rozprawy z Dziejów Nauki i Techniki* 14: 193–260.
- SCHÄFFER J.C. 1764a. Abhandlungen von Insecten. Zweyter Band. Nebst XVIII. Kupfertafeln mit ausgemahlten Abbildungen. Montag, Regensburg: 460 pp., 18 pls.
- SCHÄFFER J.C. 1764b. Abhandlungen von Insecten. Erster Band. Nebst XVI. Kupfertafeln mit ausgemahlten Abbildungen. Montag, Regensburg: [1-2], I-XL, 402 pp, 16 pls.
- SCHÄFFER J.C. 1766. Elementa entomologica. CXXXV. Tabulae aere excusae floridisque coloribus distinctae. Einleitung in die Insectenkenntnis. CXXXV. Ausgemahlte Kupfertafeln. Regensburg, Gedruckt mit Weissischen Schriften: 160 pp.
- SCHÄFFER J.C. 1779. Abhandlungen von Insecten. Dritter und letzter Band. Nebst XIV. Kupfertafeln mit ausgemahlten Abbildungen. Montag, Regensburg: [1-6], 158 pp., 14 pls.
- SCOPOLI G.A. 1763. Entomologia Carniolica exhibens insecta Carnioliae indigena et distributa in ordines, genera, species, varietates. Johann Thomas von Trattner, Vienna: i-xxx, 421 pp.

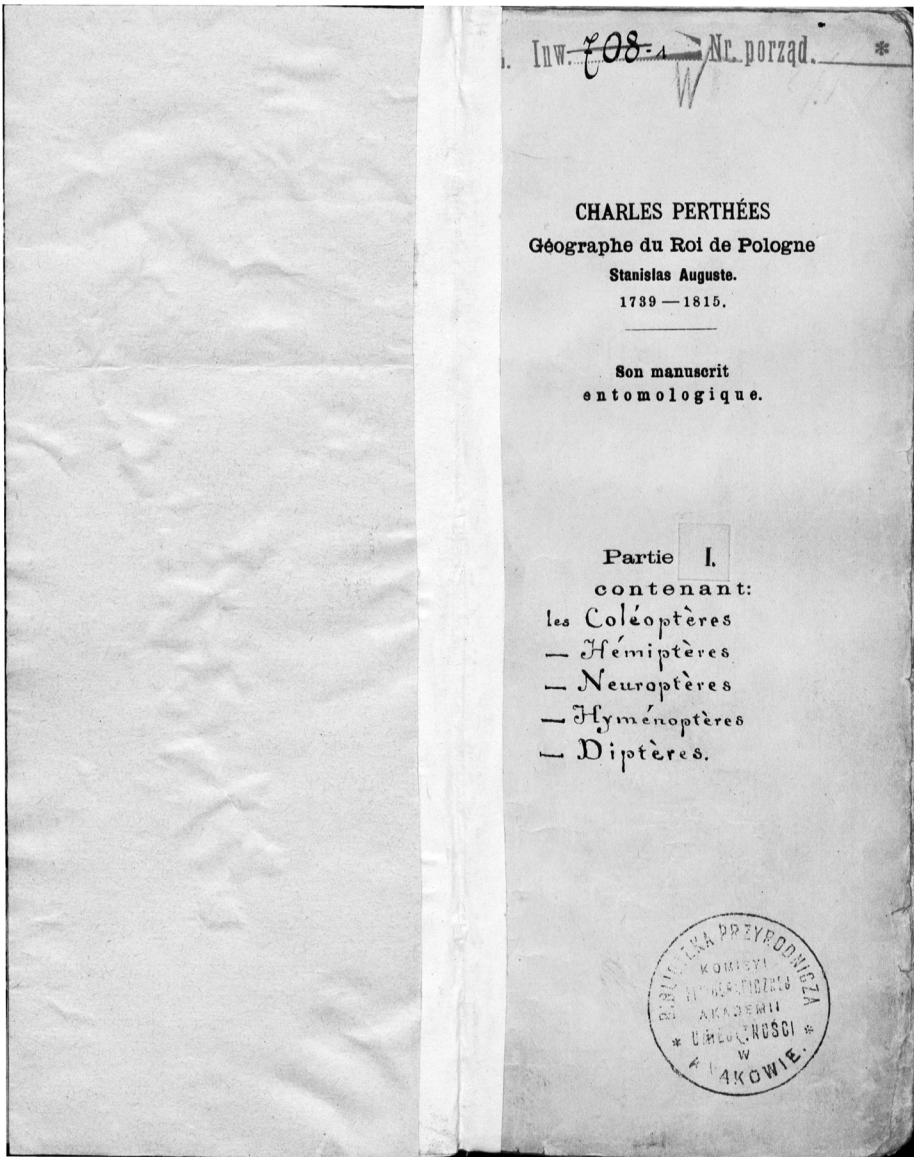


Fig. 1. Title page of the Volume I by Perthées containing part dedicated to Auchenorrhyncha–Hemiptera (Hémiptères).

Ryc. 1. Strona tytułowa pierwszego tomu manuskryptu Perthées zawierająca część dotyczącą piewików (Hemiptera).



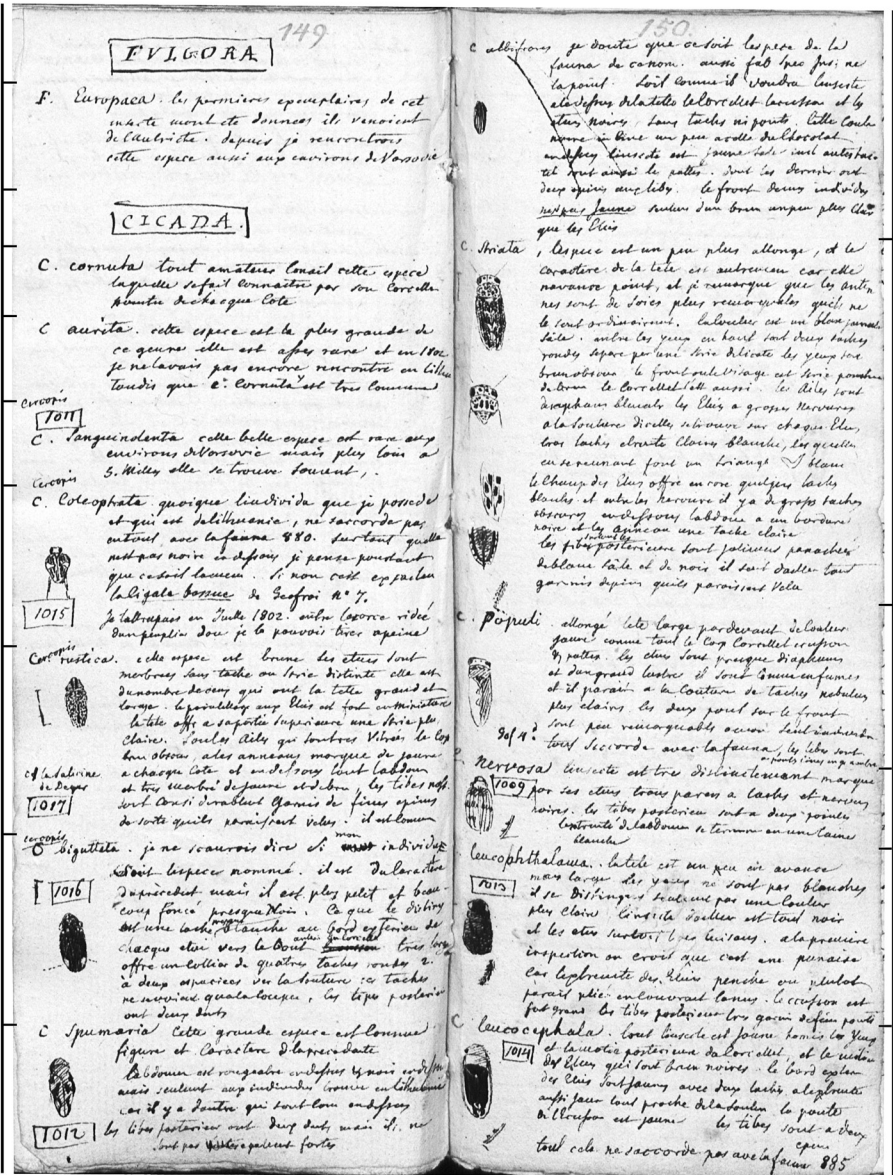


Fig. 2. Pages 149–150 of the Volume I referring to Auchenorrhyncha–Hemiptera. For the explanation of numbers 1–14 see the “Material and methods” section.

Ryc. 2. Strony 149–150 tomu pierwszego dotyczące piewików. Wyjaśnienia numeracji 1–14 w części „Material i metody”.





Fig. 3. Pages 151–152 of the Volume I referring to Auchenorrhyncha–Hemiptera. For the explanation of numbers 15–28 see the “Material and methods” section.

Ryc. 3. Strony 151–152 tomu pierwszego dotyczące piewików. Wyjaśnienia numeracji 15–28 w części „Material i metody”.



Fig. 4. Pages 153–154 of the Volume I referring to Auchenorrhyncha–Hemiptera. For the explanation of numbers 29–37 see the “Material and methods” section.

Ryc. 4. Strony 153–154 tomu pierwszego dotyczące piewików. Wyjaśnienia numeracji 29–37 w części „Materiał i metody”.



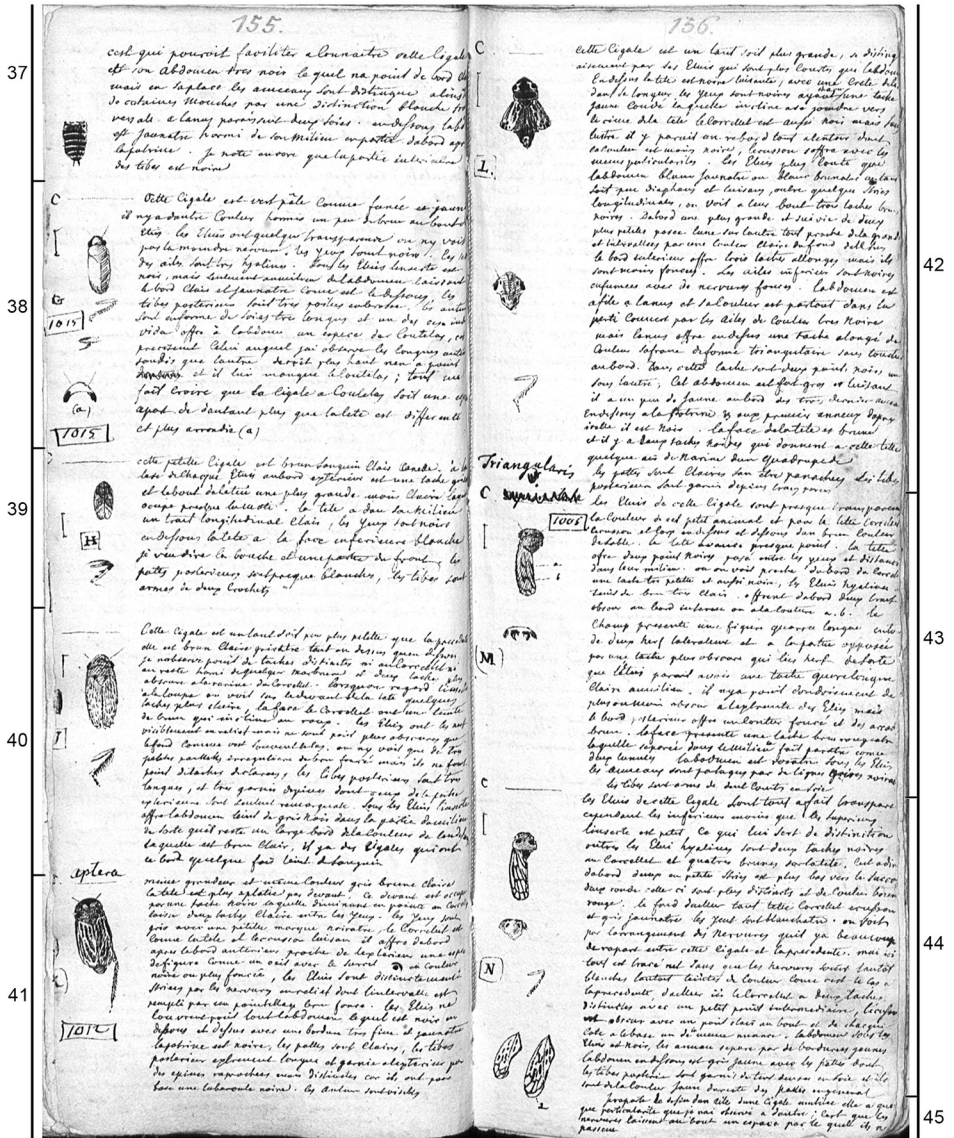


Fig. 5. Pages 155–156 of the Volume I referring to Auchenorrhyncha–Hemiptera. For the explanation of numbers 37–45 see the “Material and methods” section.

Ryc. 5. Strony 155–156 tomu pierwszego dotyczące piewików. Wyjaśnienia numeracji 37–45 w części „Materiał i metody”.





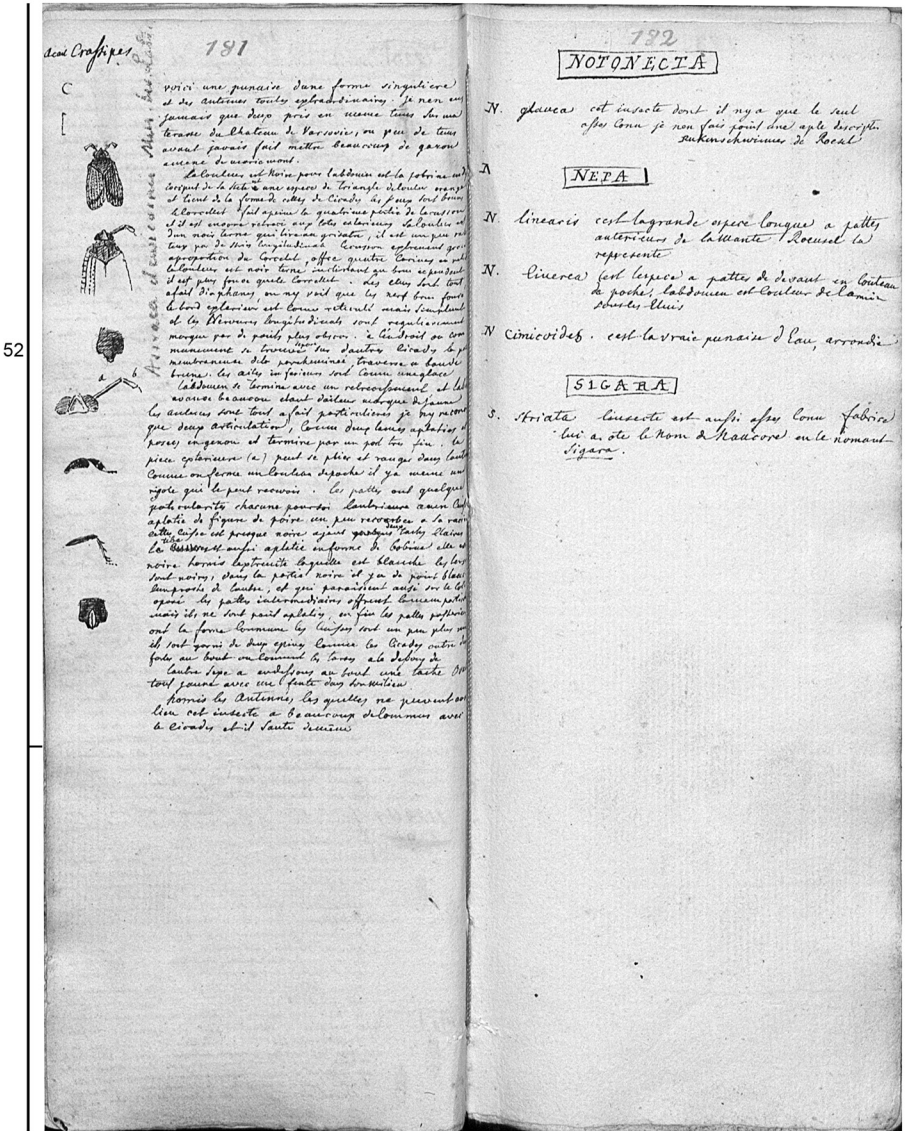


Fig. 7. Page 181 of the Volume I referring to Auchenorrhyncha–Hemiptera. For the explanation of the number 52 see the “Material and methods” section.

Ryc. 7. Strona 181 tomu pierwszego dotyczące powikłków. Wyjaśnienie numeru 52 w części „Materiał i metody”.

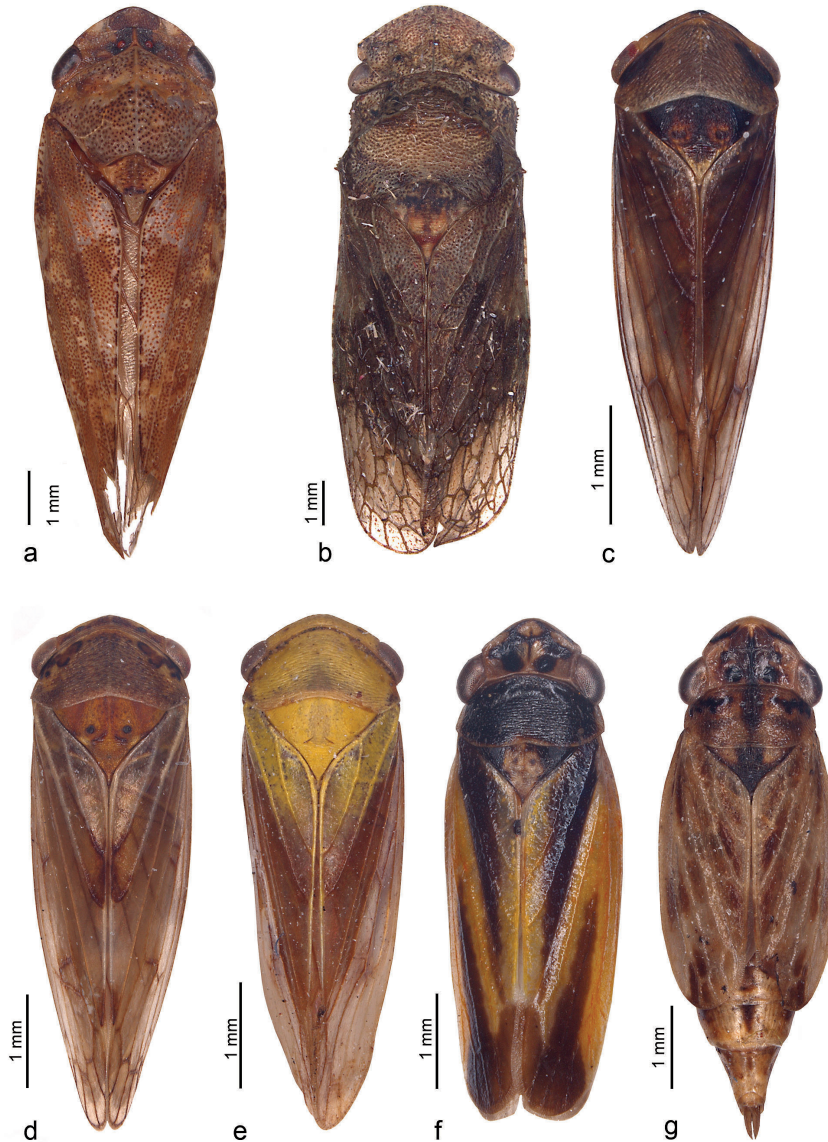


Fig. 8. Photos of habitus (dorsal view) of the following auchenorrhynchan species depicted in the Perthées manuscript: a – *Aphrophora corticea*, b – *Ledra aurita*, c – *Macropsis fuscinervis*, d – *Oncopsis alni*, e – *Oncopsis flavicollis*, f – *Evacanthus interruptus*, g – *Evacanthus acuminatus* (photos A. Stroiński).

Ryc. 8. Fotografie habitusów (widok od góry) następujących gatunków piewików zilustrowanych w manuskrypcie Perthéesa: a – *Aphrophora corticea*, b – *Ledra aurita*, c – *Macropsis fuscinervis*, d – *Oncopsis alni*, e – *Oncopsis flavicollis*, f – *Evacanthus interruptus*, g – *Evacanthus acuminatus* (fot. A. Stroiński).

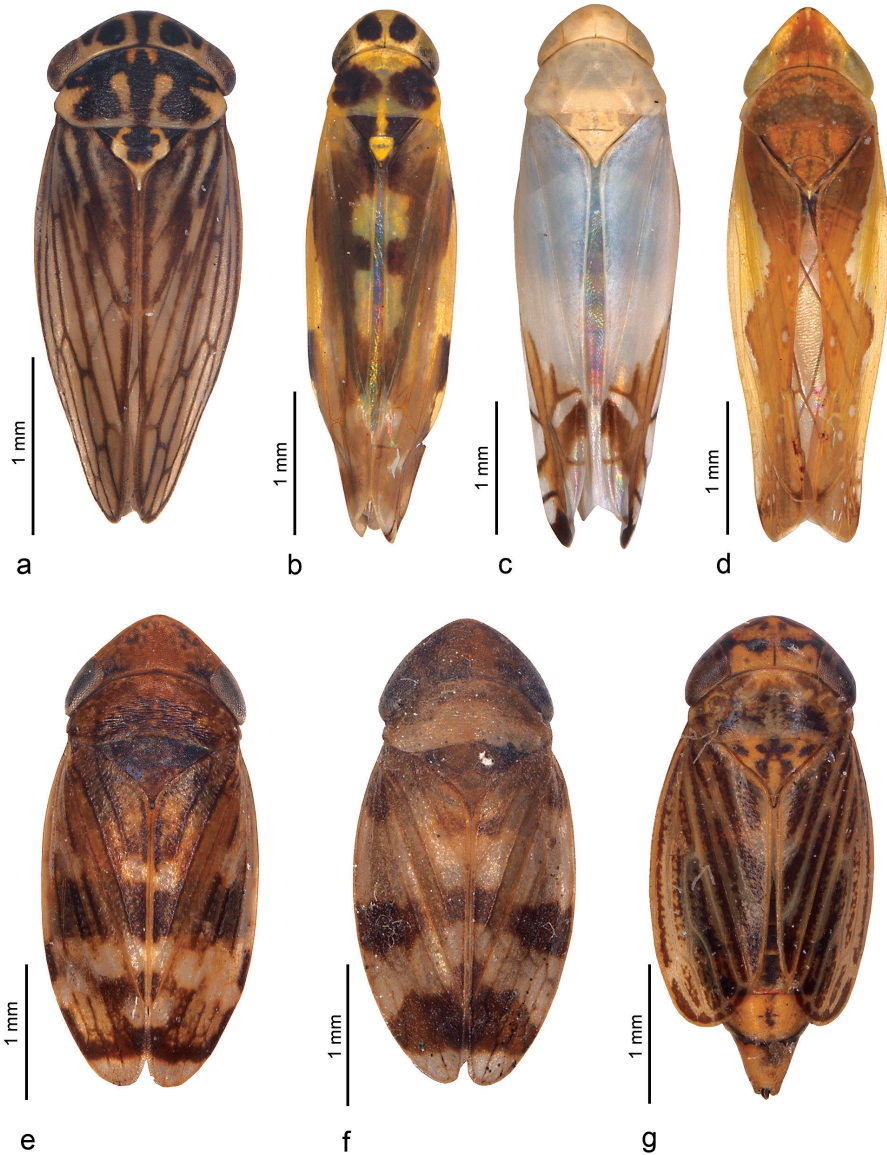


Fig. 9. Photos of habitus (dorsal view) of the following auchenorrhynchan species depicted in the Perthées manuscript: a – *Anaceratagallia venosa*, b – *Eupteryx aurata*, c – *Aguriahana pictilis*, d – *Platymetopius* sp., e – *Anoscopus albifrons*, f – *Anoscopus serratulae*, g – *Euscelis venosus* (photos A. Stroński).

Ryc. 9. Fotografie habitusów (widok od góry) następujących gatunków piewików zilustrowanych w manuskrypcie Perthées. a – *Anaceratagallia venosa*, b – *Eupteryx aurata*, c – *Aguriahana pictilis*, d – *Platymetopius* sp., e – *Anoscopus albifrons*, f – *Anoscopus serratulae*, g – *Euscelis venosus* (fot. A. Stroński).



## STRESZCZENIE

### **Piewiki (Hemiptera: Fulgoromorpha et Cicadomorpha) w kolekcji kartografa królewskiego Karola de Perthéesa (1739–1815) i jej znaczenie dla poznania fauny Polski**

Publikacja prezentuje najstarsze dane na temat piewików Polski (Fulgoromorpha et Cicadomorpha, dawniej „Auchenorrhyncha”) zawarte w manuskrypcie kartografa króla Stanisława Augusta Poniatowskiego, Karola de Perthéesa. Prezentowany materiał zbierany był przez Perthéesa zebranych w okolicach Warszawy i opracowany przez niego w trakcie pobytu w Wilnie w roku 1802. Manuskrypt zawiera nazwy, opisy i rysunki piewików obecnie zaliczanych do podrzędów Cicadomorpha oraz Fulgoromorpha. W rezultacie badań nad nieopublikowanym manuskrypcem (jego pierwszym tomem), zidentyfikowano 38 gatunków i 9 form barwnych tych owadów. Większość form przedstawionych i opisanych przez Perthéesa przyporządkowano do gatunków zaliczanych do Cicadomorpha (33), zaledwie 5 do podrzędu Fulgoromorpha. Manuskrypt Karola de Perthéesa to pierwszy dokument zawierający informacje na temat piewików Polski.

*Accepted: 9 February 2017; published: 3 March 2017*

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