








Psyllids (Hemiptera: Psylloidea) in the entomological collection of the National Museum of Natural History, Bulgarian Academy of Sciences

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Abstract: The entomological collection of the National Museum of Natural History at the Bulgarian Academy of Sciences in Sofia (NMNHS) preserves a total of 89 specimens representing 25 species of jumping plant lice (Hemiptera: Psylloidea). These were recorded and digitised in the Specify platform as part of the Distributed System of Scientific Collections project (DissCo-BG). This paper summarises all available data on these specimens. Twenty-four species were collected in Bulgaria, one species in Greece. Voucher specimens for Psylloidea published in a historical treatise on the Bulgarian fauna of Hemiptera by Dimitar Joakimov were not found in the NMNHS and are most likely lost. However, Joakimov's collection, later acquired and supplemented by the museum, contains unpublished material, including three species reported here for the first time from Bulgaria: *Aphalara maculipennis* Löw, 1886, *Cacopsylla ulmi* (Foerster, 1848) and *Dyspersa abdominalis* (Flor, 1861).

Keywords: Balkan Peninsula, Bulgaria, DissCo-BG, faunistics, jumping plant lice, NMNHS

Introduction

Jumping plant lice or psyllids (Hemiptera: Psylloidea) are small phytophagous insects that feed on the phloem of mainly dicotyledonous plants. There are over 4000 described species of psyllids worldwide, with the greatest diversity found in the tropics (Burckhardt et al., 2021). The Palaearctic psyllid fauna is considered well studied, with about 400 known species in Europe (Burckhardt, 2013; Serbina et al., 2015), of which less than a hundred have been reported from Bulgaria so far (Pramatarova et al., 2021).

The entomological collection of the National Museum of Natural History of the Bulgarian Academy of Sciences in Sofia (NMNHS) is one of

the richest in the Balkan Peninsula (Popov, 1991) and includes about 20000 Hemiptera specimens (N. Simov, pers. comm.). The core of the historical Hemiptera collection was formed by material collected by Dimitar Joakimov (1864–1952), Nikola Nedjalkov (1852–1919) and Pencho Drenski (1886–1963) (Popov, 1999). Joakimov (1909) was also the first to publish faunistic data on psyllids from Bulgaria; he listed 17 species of Psylloidea from the country. However, due to numerous later changes in psyllid taxonomy, some of the species listed by Joakimov (1909) are doubtful and require a revision.

The aim of this paper is to identify the Psylloidea material available in the NMNHS and to summarise all relevant data.



Fig. 1. *Aphalara maculipennis* Löw, 1886, female.

Material and methods

All the material studied is in the entomological collection of the National Museum of Natural History, Bulgarian Academy of Sciences, Sofia (NMNHS). Several specimens were originally mounted on cardboard plates, while most of the others were pinned on entomological pins or minutiae on pieces of elderberry (*Sambucus* sp.) pith. The minutiae were often badly corroded and brittle. Therefore, as part of this study, some specimens of the psyllids were remounted and glued on cardboard plates. Some series of specimens were originally mounted on a single piece of elderberry pith and bore a handwritten label or just a number (cited by us in square brackets in the list of material below), probably corresponding to Joakimov's field notes, which are now no longer available. These specimens have been separated for identification and digitisation on a piece of white polyethylene foam, with new labels referring to the original. All specimens were digitised on a Specify collection management platform (<https://www.specifysoftware.org/>) as part of the Distributed System of Scientific Collections project (DissCo-BG). Each specimen was labelled with software-generated labels containing toponyms and collectors in Cyrillic script transliterated according to NMNHS collection rules. Separate labels were provided with

human and machine readable, newly generated individual identification numbers according to NMNHS collection rules (e.g. BG-NMNHS-ENT-0000000001377 and QR code with the same content). In addition, a third label was applied with the current taxonomic identification of the specimen. All original labels of the specimens were kept on the pins. The transliterated locality and collector data of the specimens are used in the Results section.

The monographs by Ossiannilsson (1992) and Vondráček (1957) were mainly used for the identification of psyllids. Burckhardt et al. (2021), Cho et al. (2022) and Ouvrard (2023) were used for the classification and nomenclature of the psyllids.

Results

Aphalaridae Löw, 1879

Aphalarinae Löw, 1879

Aphalara maculipennis Löw, 1886 (Fig. 1)

Material examined: 1 ♀, no locality data, 18.08.1902, (BG-NMNHS-ENT-000000001378), [originally identified as *Aphalara* sp., No. 46, 30].



Fig. 2. *Aphalara* cf. *polygona* Foerster, 1848, female.

Comments: *Aphalara maculipennis* is widespread in the Palearctic region, including most of Europe, and is associated with *Persicaria* and *Polygonum* spp. (Polygonaceae) (Burckhardt & Lauterer, 1997; Ouvrard, 2023). Although the examined specimen from NMNHS bears no locality information, it is likely that it was collected in Bulgaria. In this case, this would be the first record of *A. maculipennis* from Bulgaria. The occurrence of *A. maculipennis* in Bulgaria has also been confirmed by recently collected material (Pramatarova et al., unpubl.).

Aphalara nigrimaculosa Gegechkori, 1981

Material examined: 1 ♀, no locality data, 28.07.1902, (BG-NMNHS-ENT-000000001377), [originally identified as *Psylla* sp., No. 15, 31].

Comments: Joakimov (1909) reported *Aphalara exilis* (Weber & Mohr, 1804) from Bulgaria (Sofia). However, his record might actually refer to *A. nigrimaculosa*, as both species are very similar, and the report was published before the taxonomic revision of the group by Burckhardt & Lauterer (1997). The latter authors also reported *A. nigrimaculosa*, but not *A. exilis* from Bulgaria. Apart from Bulgaria, *A. nigrimaculosa* is known from the Caucasus and Greece (Burckhardt & Lauterer, 1997).

Aphalara cf. *polygona* Foerster, 1848 (Fig. 2)

Material examined: 1 ♀, locality data illegible, 27.09.1902, (BG-NMNHS-ENT-000000001379).

Comments: *Aphalara* Foerster is considered a taxonomically difficult genus due to the minor morphological differences between species (Ossiannilsson, 1992; Burckhardt & Lauterer, 1997). Without additional male specimens or data on the host plant, the present material cannot be reliably identified.

Carsidaridae Crawford, 1911

Homotominae Heslop-Harrison, 1958

Homotoma ficus (Linnaeus, 1758)

Material examined: 5 ♂♂, 6 ♀♀, Greece, Thasos, 25.04.1943, P. Drenski leg., (BG-NMNHS-ENT-000000001428 – BG-NMNHS-ENT-000000001436, BG-NMNHS-ENT-000000001438 – BG-NMNHS-ENT-000000001440).

Comments: Probably native to western Asia, introduced with its host plant, *Ficus carica* into many countries of the Mediterranean (including also Greece), western, central and southeastern Europe,

Middle East, Caucasus, Transcaucasia, and USA (Soors et al., 2020; Ouvrard, 2023).

Liviidae Löw, 1879

Euphyllurinae Crawford, 1914

Psyllopsis fraxinicola (Foerster, 1848)

Material examined: 2 ♂♂, 8 ♀♀, Sofia, 08.07.1926, (BG-NMNHS-ENT-000000001400 – BG-NMNHS-ENT-000000001401 – BG-NMNHS-ENT-000000001409), [No. 38].

Comments: Widespread in Europe, Caucasus, Middle East and North Africa, introduced into North and South America, Australia and New Zealand (Ouvrard, 2023). From Bulgaria, published by Głowacka & Harizanov (1983).

Liviinae Löw, 1879

Livia junci (Schrank, 1789)

Material examined: 2 ♂♂, 5 ♀♀, Vitosha Mt, upper valley of the Dragalevska river, 07.1905, (BG-NMNHS-ENT-000000004349 – BG-NMNHS-ENT-000000004354), [originally identified as *Livia juncorum*].

Comments: Widespread in the Palaearctic region (Ouvrard, 2023). From Bulgaria, reported by Joakimov (1909), Klimaszewski (1965), Vondráček (1953), Głowacka (1989) and Głowacka & Harizanov (1983).

Psyllidae Latreille, 1807

Psyllinae Latreille, 1807

Arytaina maculata (Löw, 1886)

Material examined: 1 ♀ (without head), Bansko, Banderitsa river, 11.08.1923, (BG-NMNHS-ENT-000000001381) [identified as *Psylla* sp.].

Comments: *Arytaina maculata* is widespread in southeastern Europe (Malenovský et al., 2011),

including Bulgaria (Klimaszewski, 1965, 1970; Głowacka, 1989; Pramatarova et al., 2021).

Cacopsylla breviantennata (Flor, 1861)

Material examined: 1 ♂, no locality and date, (BG-NMNHS-ENT-000000001426) [identified as *Aphalara calthae* var. *maculipennis*]; 1 ♀, (BG-NMNHS-ENT-000000001427) [No. 41]; 1 ♀, Boyanski waterfall, 27.09.1909, (BG-NMNHS-ENT-000000004357), [originally identified as *Psylla breviantennata*, No. 17].

Comments: Distributed in central and southern Europe, Turkey and Caucasus (Ouvrard, 2023). Recorded from Bulgaria by Klimaszewski (1970).

Cacopsylla crataegi (Schrank, 1801)

Material examined: 1 ♂, no locality data, 18.08.1902, (BG-NMNHS-ENT-000000001380); 1 specimen (without head and terminalia), Straldzhalsko lake, 30.05.1907, (BG-NMNHS-ENT-000000004355) [originally identified as *Psylla crataegi*]; 1 ♂, Pancharevo, 14.05.1908, (BG-NMNHS-ENT-000000004356), [originally identified as *Psylla crataegi*].

Comments: Widespread in the Palaearctic region (Ouvrard, 2023). Reported from Bulgaria by Joakimov (1909), Klimaszewski (1965) and Pramatarova et al. (2021).

Cacopsylla melanoneura (Foerster, 1848)

Material examined: 3 ♂♂, 2 ♀♀, 1 specimen without abdomen, Vitosha Mt, 01.11.1923, (BG-NMNHS-ENT-000000001382 – BG-NMNHS-ENT-000000001387), [identified as *Psylla melanoneura*, field No 42]; 1 ♀, Sofia, 06.04.1909, Velikdenov leg., (BG-NMNHS-ENT-000000001388); 1 ♀ (without head), Boyanski waterfall, 27.09.1909, (BG-NMNHS-ENT-000000004360); 1 ♀, Kamen del, 23.10.1905, (BG-NMNHS-ENT-000000004359), [originally identified as *Psylla pyrisuga*].

Comments: Widespread in the Palaearctic region (Ouvrard, 2023). Reported from Bulgaria by Joakimov (1909) and several other authors (see Pramatarova et al., 2021). The specimen from



Fig. 3. *Cacopsylla ulmi* (Foerster, 1848), female.

“Kamen del” location may correspond to the record of ‘*Psylla melanoneura*’ in Joakimov (1909).

Cacopsylla pruni (Scopoli, 1763)

Material examined: 1 ♀, Turiya, 19.09.1922, (BG-NMNHS-ENT-000000001389).

Comments: Widespread in Europe, Caucasus, Transcaucasia and Middle East (Ouvrard, 2023). From Bulgaria, recorded by Klimaszewski (1965), Harisanow (1966), Głowacka & Harizanov (1983) and Głowacka (1989).

Cacopsylla pulchra (Zetterstedt, 1838)

Material examined: 1 ♂, Sofiisko opitno pole, 30.04.1921, (BG-NMNHS-ENT-000000001390), [No. 42].

Comments: Widespread in the Palaearctic region, including Bulgaria (Głowacka & Harizanov, 1983; Percy & Cronk, 2020; Pramatarova et al., 2021).

Cacopsylla pyri (Zetterstedt, 1838)

Material examined: 1 ♂, 1 specimen without abdomen, Aleko hut, 08.10.1920, (BG-NMNHS-ENT-000000001391, BG-NMNHS-ENT-000000001393), [No. 38].

Comments: Widespread in Europe and western Asia (Cho et al., 2017). From Bulgaria, reported by Klimaszewski (1965), Harizanov (1966) and Głowacka & Harizanov (1983).

Cacopsylla pyrisuga (Foerster, 1848)

Material examined: 1 ♀, Sofia, 01.03.1903, (BG-NMNHS-ENT-000000001394); 1 ♂, Sofia, 15.04.1900, (BG-NMNHS-ENT-000000004358); 1 ♂, 1 ♀, 1 nymph, Stara Zagora, on pear, 26.05.1936, (BG-NMNHS-ENT-000000002582 – BG-NMNHS-ENT-000000002584).

Comments: Widespread in Europe and western Asia (Cho et al., 2017). From Bulgaria, reported by Joakimov (1909) and several other authors (see Pramatarova et al., 2021).

Cacopsylla ulmi (Foerster, 1848)

(Fig. 3)

Material examined: 1 ♂, 2 ♀♀, Lyulin Mt, 24.06.1924, (BG-NMNHS-ENT-000000001395, BG-NMNHS-ENT-000000001396, BG-NMNHS-ENT-000000001397); 1 ♂ (without head), Turiya, 21.08.1909, (BG-NMNHS-ENT-000000004362), [originally identified as *Psylla ambigua*].

Comments: Widespread in the Palaearctic region, associated with *Ulmus* spp. (Gegechkori & Loginova, 1990; Ouvrard, 2023). New record for Bulgaria.



Fig. 4. *Dyspersa abdominalis* (Flor, 1861), female.

Cacopsylla sp.

Material examined: 1 ♀, Lyulin Mt, 24.06.1924, (BG-NMNHS-ENT-000000001392).

Comments: Due to its poor condition, the specimen cannot be identified.

Psylla alni (Linnaeus, 1758)

Material examined: 1 ♂, 3 ♀♀, Predel, 02.08.1921, (BG-NMNHS-ENT-000000002528 – BG-NMNHS-ENT-000000002531).

Comments: Widespread in the Holarctic realm (Ouvrard, 2023), as well as in Bulgaria (Klimaszewski, 1965, Głowacka & Harizanov, 1983, Głowacka, 1989).

Psylla foersteri Flor, 1861

Material examined: 1 ♂, 1 ♀, Pancharevo, VIII, N. Nedyalkov leg. (BG-NMNHS-ENT-000000001398, BG-NMNHS-ENT-000000001399); 1 ♂, Knyazhevo (BG-NMNHS-ENT-000000004348) [originally identified as *Psylla foersteri*].

Comments: Widespread in the Palaeartic region (Gegechkori & Loginova, 1990; Ouvrard, 2023), as well as in Bulgaria (Joakimov, 1909; Klimaszewski, 1965; Głowacka & Harizanov, 1983; Głowacka, 1989; Pramatarova et al., 2021).

Triozidae Löw, 1879

Bactericera albiventris (Foerster, 1848)

Material examined: 3 ♂♂, 2 ♀♀, Vitosha Mt, 01.11.1923, (BG-NMNHS-ENT-000000001410 – BG-NMNHS-ENT-000000001414), [identified as *Triozia albiventris*, No. 40].

Comments: Widespread in the Palaeartic region (Ouvrard, 2023), as well as in Bulgaria (Joakimov, 1909; Głowacka & Harizanov, 1983; Głowacka, 1989).

Dyspersa abdominalis (Flor, 1861) (Fig. 4)

Material examined: 1 ♂, 4 ♀♀, Vitosha Mt, 01.11.1923, (BG-NMNHS-ENT-000000001417 – BG-NMNHS-ENT-000000001420, BG-NMNHS-ENT-000000001437), [No. 39].

Comments: Widespread in the Palaeartic region, associated with *Achillea millefolium* and perhaps also some other Asteraceae (Ossiannilsson, 1992; Cho et al., 2022; Ouvrard, 2023). New record for Bulgaria.

Dyspersa sp.

Material examined: Sofia, 24.10.1923, 1 specimen without abdomen (BG-NMNHS-ENT-000000001425), [identified as *Triozia chrysanthemi* Löw, 1878].

Comments: Reliable identification was not possible due to the poor condition of the specimen, which is missing its abdomen.

Eryngiofaga dlabolai (Vondráček, 1957)

Material examined: 1 ♀, Sofiisko opitno pole, 20.04.1921, (BG-NMNHS-ENT-000000001415), [identified as *Trioza biforcipata* Šulc [sic], No. 44].

Comments: Known from Eastern Europe and the Caucasus (Loginova, 1977). Joakimov (1909) reported “*Trioza mesotela* Flor” [misspelled, currently valid as *Eryngiofaga mesomela* (Flor, 1861)] from Turiya in Bulgaria. Based on additional material recently collected in Bulgaria, Joakimov’s (1909) record probably refers to *E. dlabolai* (Pramatarova et al., 2021).

Heterotrioza chenopodii (Reuter, 1876)

Material examined: 1 ♀, Varna, 14.11.1961, N. Karnojizjy leg., (BG-NMNHS-ENT-000000002642).

Comments: Widespread in the Palaearctic region (Ouvrard, 2023), introduced to North America (Horton et al., 2018). Reported from several localities across Bulgaria (Głowacka & Harizanov, 1983, Głowacka, 1989, Harizanov & Lauterer, 1968, Klimaszewski, 1965).

Phyllopecta trisignata (Löw, 1886)

Material examined: 1 ♀, locality data illegible, 08.09.1927, (BG-NMNHS-ENT-000000001416); 2 ♂♂, Turiya, 02.09.1903, (BG-NMNHS-ENT-000000004362 – BG-NMNHS-ENT-000000004362), [originally identified as *Trioza trisignata*].

Comments: Widespread in southern Europe and Turkey (Ouvrard, 2023). From Bulgaria, reported by Joakimov (1909) and Głowacka (1989).

Trioza urticae (Linnaeus, 1758)

Material examined: 3 ♂♂, 1 ♀, Vitosha Mt 01.11.1923, (BG-NMNHS-ENT-000000001421 – BG-NMNHS-ENT-000000001424).

Comments: Widespread in the Palaearctic region

(Ouvrard, 2023), as well as in Bulgaria (Klimaszewski, 1965; Głowacka & Harizanov, 1983; Głowacka, 1989).

Conclusion

A total of 89 specimens of 25 species of Psylloidea deposited in the NMNHS entomological collection are catalogued for the first time. Although some specimens were not labelled with precise locality information, based on knowledge of the origin of the collection (Popov, 1991, 1999), it is likely that the material of 24 species originated from Bulgaria and one – *Homotoma ficus* (Linnaeus, 1758) – from Greece. Unfortunately, voucher specimens for the historical records of the Psylloidea published by Joakimov (1909) could not be found in the NMNHS. Joakimov’s collection, acquired by NMNHS in 1922 (Popov, 1991) and apparently supplemented since then, contains only previously unpublished specimens. Some of these specimens belong to the same species published by Joakimov (1909) and confirm his records (*Livia junci*, *Cacopsylla crataegi*, *C. melanoneura*, *C. pyrisuga*, *Psylla foersteri*, *Bactericera albiventris*, and *Phyllopecta trisignata*), while some other specimens were originally misidentified (*Cacopsylla breviantennata*, *Eryngiofaga dlabolai*). Three of the species preserved in the NMNHS are reported here for the first time from Bulgaria: *Aphalara maculipennis*, *Cacopsylla ulmi* and *Dyspersa abdominalis*. All three species are widely distributed in the Palaearctic region (Ouvrard, 2023) and two of them (*A. maculipennis* and *C. ulmi*) are already known from neighbouring countries of Bulgaria (Dobreanu & Manolache, 1962; Jerinić-Prodanović, 2010; Drohojowska & Burckhardt, 2014), so their occurrence in Bulgaria was expected. Recent intensive fieldwork by the authors, as well as the examination of numerous material of Psylloidea in the collections of other institutions, have yielded much additional data on the psyllid fauna of Bulgaria, which will be discussed in detail in another paper.

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