

Spittlebugs (Hemiptera: Cercopoidea) of Sarnena Sredna Gora (Bulgaria)

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Abstract. The superfamily Cercopoidea (spittlebugs), an insect group in the suborder Auchenorrhyncha (Hemiptera), is represented in Europe by two families – Cercopidae and Aphrophoridae. Currently there are 18 species – 5 of cercopids and 13 of aphrophorids, known in Bulgaria. Two of them – *Haematoloma dorsata* (Ahrens, 1812) and *Aphrophora costalis* (Matsumura, 1903) are recorded in the country without any location data and their presence needs to be confirmed.

The spittlebugs of Sarnena Sredna Gora mountain are very poorly examined. The present study is based on material, collected between 2016 and 2020. As a result, 7 species were recorded - *Cercopis intermedia* Kirschbaum, 1868 (Cercopidae), *Aphrophora alni* (Fallén, 1805), *A. salicina* (Goeze, 1778), *A. pectoralis* (Matsumura, 1903), *Lepyronia coleoptrata* (Linnaeus, 1758), *Neophilaenus campestris* (Fallén, 1805) and *Philaenus spumarius* (Linnaeus, 1758) (Aphrophoridae). The Euro-Siberian species associated with willows (*Salix* spp.), *Aphrophora pectoralis*, was recorded for the first time with locality data in Bulgaria.

Key words: Cicadomorpha, spittlebugs, Cercopoidea, Bulgaria, Sarnena Sredna Gora.

Introduction

The superfamily Cercopoidea (spittlebugs) are a group of xylem-feeding insect in the suborder Auchenorrhyncha, with approximately 3000 species worldwide. The nymphs undergo metamorphosis in a foam, which is made from fluid voided from the anal tube and from a mucilaginous substance secreted by the glands on the seventh and eighth abdominal segments. Then the nymph introduces air bubbles into the fluid by means of the caudal appendages in order to make foam (Triplehorn & Jhonson 2005). In Europe they are represented by two families – Cercopidae and Aphrophoridae. Currently there are 18 species – 5 of cercopids and 13 of aphrophorids, known in Bulgaria. Two of them – *Haematoloma dorsata* (Ahrens, 1812) and *Aphrophora costalis* (Matsumura, 1903) are recorded in Bulgaria without any location data or preserved specimens and their presence in the country needs to be confirmed. The record of *A. costalis* probably concerns *A. pectoralis*.

Sarnena Sredna Gora is part from the eastern Sredna Gora Mts, situated on the territory of four districts – Plovdiv, Stara Zagora, Sliven and Yambol. The only spittlebug recorded from the area before is *Aphrophora salicina* (Goeze, 1778) from Gergevec vill. (Joakimov 1909).

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Material and Methods

The insects were collected between 2016 and 2021 using an entomological sweep net. The specimens were dry stored in Sofia University's Zoological Collection (BFUS). All of the information about the specimens is included in the collection database. Identification was made using (Biedermann & Niedringhaus 2009).

Results

Aphrophoridae Amyot & Serville, 1843

***Aphrophora* Germar, 1821**

***Aphrophora alni* (Fallén, 1805) (Fig. 1)**

Material examined. Mrachenik vill., 42.50549°N, 24.94018°E, 610 a.s.l., 11.08.2020, 1♀ (BFUS-I-IG004080) 1♂ (BFUS-I-IG004081); Svezhen hut, 42.5135°N, 25.05625°E, 1078 a.s.l., 11.08.2020, 1♀ (BFUS-I-IG004076); Svezhen vill., marsh, 42.49037°N, 25.03965°E, 835 a.s.l., 11.08.2020, 1♀ (BFUS-I-IG004077) 2♂ (BFUS-I-IG004078, BFUS-I-IG004079); Novo selo vill., 42.48672°N, 25.50964°E, 457 a.s.l., 13.08.2020, 1♀ (BFUS-I-IG004069) 1♂ (BFUS-I-IG004070); Rozovets vill., 42.49741°N, 25.11072°E, 1005 a.s.l., 13.08.2020, 3♀ (BFUS-I-IG004071, BFUS-I-IG004072, BFUS-I-IG004073); Svezhen 2, 42.49438°N, 25.08309°E, 1091 a.s.l., 12.08.2020, 1♀ (BFUS-I-IG004074) 1♂ (BFUS-I-IG004075); Brezovo vill., on *Rosa damascaena* (Mill., 1768), 42.3742°N, 25.0866°E, 296 a.s.l., 11.06.2016, 1♀ (BFUS-I-IG003916); Sarnevets vill., Bratja Daskalovi, 42.41742°N, 25.34908°E, 439 a.s.l., 14.08.2020, 3♀ (BFUS-I-IG004062, BFUS-I-IG004064, BFUS-I-IG004065) 2♂ (BFUS-I-IG004063, BFUS-I-IG004066); Prjaporets vill., 42.45087°N, 25.52211°E, 307 a.s.l., 14.08.2020, 1♀ (BFUS-I-IG004067); Srednogorovo vill., 42.52068°N, 25.33636°E, 418 a.s.l., 13.08.2020, 1♂ (BFUS-I-IG004068); Starozagorski bani, 42.265813°N, 25.293919°E, 379 a.s.l., 11.09.2016, 1♀ (BFUS-I-IG004232); Turia vill., 42.56884°N, 25.17149°E, 412 a.s.l., 13.08.2020, 2♀ (BFUS-I-IG004675, BFUS-I-IG004676), 2♂ (BFUS-I-IG004674, BFUS-I-IG004677).

Known distribution in Bulgaria. Eastern and Northern Bulgaria without any information on localities (Nedjalkov 1908); Vitosha Mt. Sofia, (Gruev & Cantoreanu 1967; Joakimov 1909); Lyulin Mt.: Knyazhevo (Joakimov 1909), Western Predbalkan: Vratsa, around Belogradchik, above Vratsa and Troyan, Glava Panega (Bairamova 1978; Joakimov 1909; Lindberg 1949); Rila Mt. (Lindberg 1949); Thracian Lowland: In the park "Lauta" near Plovdiv; in the UOS of VSI "V. Kolarov" (Dirimanov & Harizanov 1964); Middle Stara Planina Mts. Shipka peak, Western Rodopi Mts.: Zdravetz hut, (Gruev & Cantoreanu 1967); Sofia basin: Kostinbrod, Lesnovo vill., Doganovo vill., Podgumer (Bairamova 1978; Bajrjamova 1970); Southern Black Sea Coast: Arkutino, camping "Perla", Sozopol, Ahtopol vill, Sinemorets vill. and Rezovo vill. (Bairamova 1978; Bayryamova 1976b) Western Stara Planina:, Buchin Prohod, Belidie Han (Bairamova 1978); Strandzha mt. without any exact localities (Bairamova 1978).

Comments.: Polyphagous and eurytopic. Occurs VI-X (Nickel 2006). Widespread and common. First record for Sarnena Sredna Gora.

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Fig. 1. *Aphrophora alni* (Fallén, 1805) – adult, Dunavci vill., 01.09.2012, photo I. Gjonov.

***Aphrophora pectoralis* (Matsumura, 1903) (Fig. 2)**

Material examined. Srednogorovo vill., 42.52068°N, 25.33636°E, 418 a.s.l., 13.08.2020, 1♀ (BFUS-I-IG004061).

Known distribution in Bulgaria. Krupnik-Sandanski-Petrich Valley: Melnik (Sander 1985) (mentioned as *Aphrophora costalis*).

Comments. “*Aphrophora salicis forneri* Haupt, 1919; *Aphrophora costalis* Matsumura, 1903 sec. Komatsu (1997b) Recently some material of the extensive Matsumura collection was revised by Komatsu (1997a, 1997b, 1997c). *A. costalis* Mats., which has been used in European literature since Vilbaste (1968b), was declared a junior synonym of *A. pectoralis* Mats.” Adults and nymphs live on various species of willows (*Salix*). Occurs VII-IX (Nickel 2006). First record for Sarnena Sredna Gora.



Fig. 2. *Aphrophora pectoralis* (Matsumura, 1903) – adult, Sliven, 30.08.2012, photo I. Gjonov.

***Aphrophora salicina* (Goeze, 1778) (Fig. 3)**

Material examined. Brezovo vill., *Rosa damascaeana* 42.3742°N, 25.0866°E, 296 a.s.l., 11.06.2016, 1♂ (BFUS-I-IG003915).

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Known distribution in Bulgaria. Eastern and Northern Bulgaria without any information on localities (Nedjalkov 1908); Sofia basin: Sofia, Vrazhdebna village, Kostinbrod, Suhodol (Joakimov 1909; Pelov 1968; Sander 1985); Western Rodopi Mt.: Narechenski bani (Joakimov 1909); Eastern Rodopi Mt. Haskovo (Joakimov 1909); Sarnena Sredna Gora: Gergevec vill (Joakimov 1909); Sakar-Toundzha district: Svilengrad (Dlabola 1957); Ludogorie-Dobruzha district: Srebarna vill.; (Pelov 1968); Krupnik-Sndanski-Petrich Valley: Melnik (Sander 1985); Eastern Rodopi Mts.: Stremtsi vill. (Kardzhali) 430m (Gjonov 2004).

Comments. Adults and nymphs are associated with willows (*Salix*). Occurs VI-X (Nickel 2006).



Fig. 3. *Aphrophora salicina* (Goeze, 1778) – adult, Sliven, 30.08.2012, photo I. Gjonov.

***Lepyronia* Amyot & Serville, 1843**

***Lepyronia coleoptrata* (Linnaeus, 1758)** (Fig. 4)

Material examined. Svezhen vill., marsh, 42.49037°N, 25.03965°E, 835 a.s.l., 11.08.2020, 1♀ (BFUS-I-IG004059); Rozovets vill., 42.49741°N, 25.11072°E, 1005 a.s.l., 13.08.2020, 1♀ (BFUS-I-IG004058); Sarnevetts vill., Bratja Daskalovi, 42.41742°N, 25.34908°E, 439 a.s.l., 14.08.2020, 1♀ (BFUS-I-IG004056) 1♂ (BFUS-I-IG004057); Svezhen vill., Hadzhi Dimitar place, 42.50784°N, 25.0004°E, 879 a.s.l., 11.08.2020, 1♀ (BFUS-I-IG004060); Hrishteni vill., 42.45695°N, 25.73418°E, 204 a.s.l., 27.09.2020, 5♀ (BFUS-I-IG004553, BFUS-I-IG004554, BFUS-I-IG004555, BFUS-I-IG004557, BFUS-I-IG004558) 2♂ (BFUS-I-IG004552, BFUS-I-IG004556); Turia vill., 42.56884°N, 25.17149°E, 412 a.s.l., 13.08.2020, 2♀ (BFUS-I-IG004672, BFUS-I-IG004671), 1♂ (BFUS-I-IG004673).

Known distribution in Bulgaria. Eastern and Northern Bulgaria without any information on localities (Nedjalkov 1908); Sofia basin: Sofia, Lesново vill., Elin Pelin, Stolnik vill., Doganovo vill., Petkovo vill., Elin Pelin, Kazichene vill., Vrana Park Museum, Gorublyane vill. Kostinbrod, Chelophehene vill., Gorna Malina vill. (Bajrjamova 1970; Bayryamova 1976a; Joakimov 1909; Lindberg 1949); Western Predbalkan: Vratsa, Glava Panega (Joakimov 1909; Lindberg 1949); Vitosha mt. without exact localities (Lindberg 1949); Sakar-Toundzha district: Svilengrad, Konyuvets, (Dlabola 1957; Joakimov 1909); Podbalkan basin: Straldzhansko Lake (Joakimov 1909); Thracian Lowland: In the park "Lauta" near Plovdiv (Dirimanov & Harizanov 1964; Gruev & Cantoreanu 1967); Lozenska Planina: Gorni Lozen vill., Dolni Lozen vill., (Bayryamova 1976a); Krupnik-Sandanski-

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Petrich Valley: Melnik, (Sander 1985); Western Rodopi Mts.: Bachkovo, Dospat (Sander 1985); Belasitsa mt. Without any exact localities (Bajrjamova 1988); Eastern Rodopi Mts. Svetulka vill. (Ardino) 561m, Stremtsi vill. (Kardzhali) 430m, Belopoltsi vill. (Kardzhali), Kamilski dol (Ivaylovgrad) 477m, Lubimec, Marica river, Pastrook vill. (Ivaylovgrad), Drabishna vill. (Ivaylovgrad) 404m (Gjonov 2004); Western Danubian Plane: In the experimental field of KOS Lom (Tsolova, Angelova 2008).

Comments. Polyphagous, widespread, occurs V-X (Nickel 2006). First record for Sarnena Sredna Gora.



Fig. 4. *Lepyronia coleoptrata* (Linnaeus, 1758) – adult, Boboshevo, 24.06.2010, photo I. Gjonov.

Neophilaenus Haupt, 1935

Neophilaenus campestris (Fallén, 1805) (Fig. 5)

Material examined. Svezhen vill., Hadzhi Dimitar place, 42.50784°N, 25.0004°E, 879 a.s.l., 11.08.2020, 3♀ (BFUS-I-IG004122, BFUS-I-IG004124, BFUS-I-IG004126) 4♂ (BFUS-I-IG004120, BFUS-I-IG004121, BFUS-I-IG004123, BFUS-I-IG004125); Rozovo vill., *Mentha* sp., 42.57223°N, 25.41318°E, 340 a.s.l., 12.06.2016, 1♂ (BFUS-I-IG003925).

Known distribution in Bulgaria. Sofia basin: (Joakimov 1909), Lyulin mt.: Knyazhevo (Joakimov 1909), Vitosha mt.: near Popova Skala and Boyana waterfall, above hut Kumata, under Cherni Vrah peak (Bayryamova 1984; Joakimov 1909), Western Predbalkan: Mezdra (Joakimov 1909); Krupnik-Sandanski-Petrich Valley: Melnik, Sandanski (Sander 1985); Southern Black Sea Coast: Sozopol (Sander 1985).

Comments. Mainly on grassy ruderal sites, widespread on lowlands, occurs V-X (Nickel 2006). First record for Sarnena Sredna Gora.

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Fig. 5. *Neophilaenus campestris* (Fallén, 1805) – adult, Ajtos, 05.06.2020, photo I. Gjonov.

***Philaenus* Stål, 1864**

***Philaenus spumarius* (Linnaeus, 1758) (Fig. 6)**

Material examined. Mrachenik vill. 42.50549°N, 24.94018°E, 610 a.s.l., 11.08.2020 1♀ (BFUS-I-IG004117); Svezhen hut, 42.5135°N, 25.05625°E, 1078 a.s.l. 11.08.2020, 2♀ (BFUS-I-IG004097, BFUS-I-IG004100) 3♂ (BFUS-I-IG004098, BFUS-I-IG004099, BFUS-I-IG004101); Svezhen vill., marsh, 42.49037°N, 25.03965°E, 835 a.s.l., 11.08.2020, 2♀ (BFUS-I-IG004102, BFUS-I-IG004103); Novo selo vill., 42.48672°N, 25.50964°E, 457 a.s.l., 13.08.2020, 2♀ (BFUS-I-IG004086, BFUS-I-IG004087) 2♂ (BFUS-I-IG004084, BFUS-I-IG004085); Rozovets vill., 42.49741°N, 25.11072°E, 1005 a.s.l., 13.08.2020, 4♀ (BFUS-I-IG004088, BFUS-I-IG004089, BFUS-I-IG004094, BFUS-I-IG004095), 4♂ (BFUS-I-IG004090, BFUS-I-IG004091, BFUS-I-IG004092, BFUS-I-IG004093); Svezhen 2, 42.49438°N, 25.08309°E, 1091 a.s.l., 12.08.2020, 1♂ (BFUS-I-IG004096); Brezovo vill., *Rosa damascaena* 42.3742°N, 25.0866°E, 296 a.s.l., 11.06.2016, 1♀ (BFUS-I-IG003917); Sarnevets vill., Bratja Daskalovi, 42.41742°N, 25.34908°E, 439 a.s.l., 14.08.2020, 1♂ (BFUS-I-IG004082); Prjaporets vill., 42.45087°N, 25.52211°E, 307 a.s.l., 14.08.2020, 1♂ (BFUS-I-IG004083); Svezhen vill., Hadzhi Dimitar place, 42.50784°N, 25.0004°E, 879 a.s.l., 11.08.2020, 5♀ (BFUS-I-IG004105, BFUS-I-IG004106, BFUS-I-IG004107, BFUS-I-IG004109, BFUS-I-IG004110) 2♂ (BFUS-I-IG004104, BFUS-I-IG004108); Hrishteni vill., 42.45695°N, 25.73418°E, 204 a.s.l., 27.09.2020, 6♀ (BFUS-I-IG006544, BFUS-I-IG006545, BFUS-I-IG006547, BFUS-I-IG006549, BFUS-I-IG006550, BFUS-I-IG006551) 4♂ (BFUS-I-IG006546, BFUS-I-IG006548, BFUS-I-IG006552, BFUS-I-IG006553); Rozovo vill., *Mentha* sp., 42.57223°N, 25.41318°E, 340 a.s.l., 12.06.2016, 2♀ (BFUS-I-IG003919, BFUS-I-IG003922), 3♂ (BFUS-I-IG003920, BFUS-I-IG003921, BFUS-I-IG003923); Mrachenik vill., Hadzhi Dimitar place, 42.51803°N, 24.98733°E, 940 a.s.l., 11.08.2020, 2♀ (BFUS-I-IG004111, BFUS-I-IG004112) 4♂ (BFUS-I-IG004113, BFUS-I-IG004114, BFUS-I-IG004115, BFUS-I-IG004116); Domljan vill., 42.54115°N, 24.94129°E, 364 a.s.l., 10.08.2020, 1♀ (BFUS-I-IG004118) 1♂ (BFUS-I-IG004119); Srednogorovo vill. *Matricaria* sp., *Rubus* sp. 42.55039°N, 25.34353°E, 421 a.s.l., 12.06.2016, 1♂ (BFUS-I-IG003918).

Known distribution in Bulgaria. Western Predbalkan: Vratsa, around Belogradchik, above Vratsa and Troyan, Zli dol (Bairamova 1978; Nedjalkov 1908); Sofia basin: Vrazhdebna, Pavlovo, Stolnik vill., Musachevo vill., Elin Pelin, Bogrov vill., Petkovo vill., Lesnovo vill., Novi han vill., Grigorevo vill., Doganovo vill. Kazichene vill., Vrana Park

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Museum, Gorublyane vill., Kostinbrod, Chelophehene vill., Gorna Malina vill, Podgumer. (Bairamova 1978; Bajrjamova 1970; Bayryamova 1976a; Joakimov 1909; Lindberg 1949; Nedjalkov 1908); Northern Black Sea Coast: Varna (Nedjalkov 1908); Vitosha mt.: (Bairamova 1978; Gruev & Cantoreanu 1967; Joakimov 1909; Lindberg 1949); Rila Mt.: Urdina river, Raduil, (Joakimov 1909; Lindberg 1949), Sushtinska Sredna gora mt.: (Joakimov 1909); Sakar-Toundzha district: Konjovec (Joakimov 1909); Lyulin Mt.: Knyazhevo (Bairamova 1978; Joakimov 1909); Podbalkan basin: Kurtovo Konare vill. Voynagovo vill., Stoletovo vill, the Sliven Balkans - Karandila)(Bairamova 1978; Dirimanov & Harizanov 1964; Gruev & Cantoreanu 1967) Western Rodopi Mts.: Gorni Voden vill., Dospat, (Dirimanov & Harizanov 1964; Sander 1985); Middle Danubian Plane: ,Svishtov (Dirimanov & Harizanov 1964); Middle Stara Planina Mts.: Balkanski Rozi hut, Shipka peak (Gruev & Cantoreanu 1967; Pelov 1968); Middle Predbalkan: Groznitsa vill., (Pelov 1968); Lozenska Planina: Gorni Lozen vill., Dolni Lozen vill.,(Bairamova 1978; Bayryamova 1976a); Southern Black Sea Coast: camping “Perla”, Sozopol, camping “Perla”, Arkutino, Ahtopol vill, Sinemorets vill. and Rezovo vill (Bairamova 1978; Bayryamova 1976b; Sander 1985), Strandzha mt.: Gramatikovo vill., Kachul, Vizitsa vill. and in the area of Zvezdets vill. (Bairamova 1978; Bayryamova 1976b) Stara Planina Western Stara Planina Mts.: Buchin Prohod, Belidie Khan (Bairamova 1978); Plana mt: (Bairamova 1978); Ludogorie-Dobruza district: Seslav (Bairamova 1978); Krupnik-Sandanski-Petrich Valley: Melnik, (Sander 1985); Belasitsa mt.(Bajrjamova 1988); Eastern Rodopi Mts.: Stremtsi vill.(Kardzhai) 430m, Beli plast vill. (Kardzhali) 514m, Vransko vill. (Krumovgrad) 358m, Kamilski dol (Ivaylovgrad) 477m, Lubimec, Marica river, Drabishna vill. (Ivaylovgrad) 404m, Dolno Lukovo vill. (Ivaylovgrad) 143m (Gjonov 2004); Western Danubian Plane: In the experimental field of KOS Lom (Tsolova, Angelova 2008).

Comments. Extremely polyphagous and eurytopic. Adults and spittle masses with nymphs as a general rule are on dicotyledonous herbs (but also on grasses, ferns, horsetails, dwarf shrubs, and even adventitious shoots of shrubs and trees). Occurs from May to November (Nickel 2006). First record for Sarnena Sredna Gora.



Fig. 6. *Philaenus spumarius* (Linnaeus, 1758) – adult.

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Cercopidae Leach, 1815

Cercopis Fabricius, 1775

***Cercopis intermedia* Kirschbaum, 1868** (Fig. 7)

Material examined. Hrishteni vill., near agricultural buildings, 42.451056°N, 25.702556°E, 227 a.s.l., 29.04.2019, 1♀ (BFUS-I-IG004236).

Known distribution in Bulgaria. Sashtinska Sredna Gora Mts.: (Dirimanov & Harizanov 1964); Thracian Lowland: on mint and herbaceous plants in the UOS of VSI "V. Kolarov" - Plovdiv (Dirimanov & Harizanov 1964); Podbalkan basin: Voinyagovo vill, Plovdiv region (Dirimanov & Harizanov 1964); Popovo-Provadia district: Sindel vill. (Gruev & Cantoreanu 1967); Southern Black Sea Coast: Sozopol (Sander 1985); Eastern Rhodopi Mts, Drabishna vill; Iskra vill, Mechka river (Gjonov 2004).

Comments. Occurs IV-VI. (Della Giustina 1983). Mostly on karst terrains. Polyphagous. First record for Sarnena Sredna Gora.



Fig. 7. *Cercopis intermedia* Kirschbaum, 1868 – adult.

Conclusion

As a result, we have documented 6 new species in the region (Sarnena Sredna Gora mountain) – *Cercopis intermedia*, *Aphrophora alni*, *Aphrophora pectoralis*, *Lepyronia coleoptrata*, *Neophilaenus campestris*, *Philaenus spumarius* and we can confirm the presence of *Aphrophora salicina* in Sarnena Sredna Gora with our second record.

The Euro-Siberian species associated with willows (*Salix* spp.) *Aphrophora pectoralis* is recorded for the second time with locality data in Bulgaria.

Further research is needed, because we assume that other new species will be discovered in the future.

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