ZooNotes
www.zoonotes.bio.uni-plovdiv.bg
ISSN 1313-9916

2021

ZooNotes

Supplment 10

FAUNA OF SARNENA SREDNA GORA MTS

Part 2

Университетско издателство “Паисий Хилендарски”
Plovdiv University Press “Paisii Hilendarski”

ZooNotes *Supplement 10*

Fauna of Sarnena Sredna Gora Mts

PART 2

Editors

Dilian Georgiev, Dimitar Bechev, Vesela Yancheva

Plovdiv University Press “Paisii Hilendarski”
Plovdiv, 2021

FAUNA OF SARNENA SREDNA GORA MTS, PART 2

ZOONOTES, SUPPLEMENT 10

Editors
Dilian Georgiev, Dimitar Bechev, Vesela Yancheva

ISSN: 1313-9916
www.zoonotes.bio.uni-plovdiv.bg

Photo of the cover: *Nannospalax leucodon*
Photo: Nedko Nedyalkov

Plovdiv University Press “Paisii Hilendarski”
Plovdiv, 2021

ZooNotes, *Supplement 10*, 2021

Contents by systematic groups

Contents

Georgiev, D., Bechev, D. & Yancheva, V. (Eds.)
Fauna of Sarnena Sredna Gora Mts, Part 2
ZooNotes, Supplement 10, 2021

Household and construction waste pollution of Sarnena Gora Mts, a case study

DILIAN GEORGIEV

Plovdiv University "Paisii Hilendarski", 24 Tzar Assen Str., 4000 Plovdiv, Bulgaria, diliangeorgiev@gmail.com, diliangeorgiev@uni-plovdiv.bg

Abstract. A total of 23 individual illegal dumps were located at the 5x5 km sample area around the villages of Hrishteni and Kolena. About ¼ of them were situated near the Medven Hill, bordering with some agricultural lands. Their surface area can be spotted even on satellite images. Even the studied area is small it represents the real situation not only in the region of Sarnena Gora, but in the whole country.

Key words: pollution, ecological problems, Bulgaria.

Introduction

Household hazardous waste, sometimes called retail hazardous waste or "home generated special materials', is post-consumer waste which qualifies as hazardous waste when discarded. It includes household chemicals and other substances for which the owner no longer has a use, such as consumer products sold for home care, personal care, automotive care, pest control and other purposes. These products exhibit many of the same dangerous characteristics as fully regulated hazardous waste due to their potential for reactivity, ignitability, corrosivity, toxicity, or persistence. Examples include drain cleaners, oil paint, motor oil, antifreeze, fuel, poisons, pesticides, herbicides and rodenticides, fluorescent lamps, lamp ballasts, medical waste, some types of cleaning chemicals, and consumer electronics (such as televisions, computers, and cell phones) (https://en.wikipedia.org/wiki/Household_hazardous_waste). Construction and demolition materials are created during the process of creating a new building or structure or when renovating or demolishing an existing structure. These materials are usually heavy materials used in large volumes in modern construction, such as concrete, steel, wood, asphalt and gypsum (https://en.wikipedia.org/wiki/Construction_waste).

In this case study I would like to emphasize a very pressing problem in Bulgaria - the dumping of waste in illegal landfills.

Material and Methods

A sample area of 5 square kilometers was selected in the area of the villages of Hrishteni and Kolena - the southern slope of Sarnena Gora, east of Stara Zagora city (Fig. 1). The area has been monitored on feet for a period of five years, and the location of illegal dumps has been located both using a GPS and Google Earth satellite images.

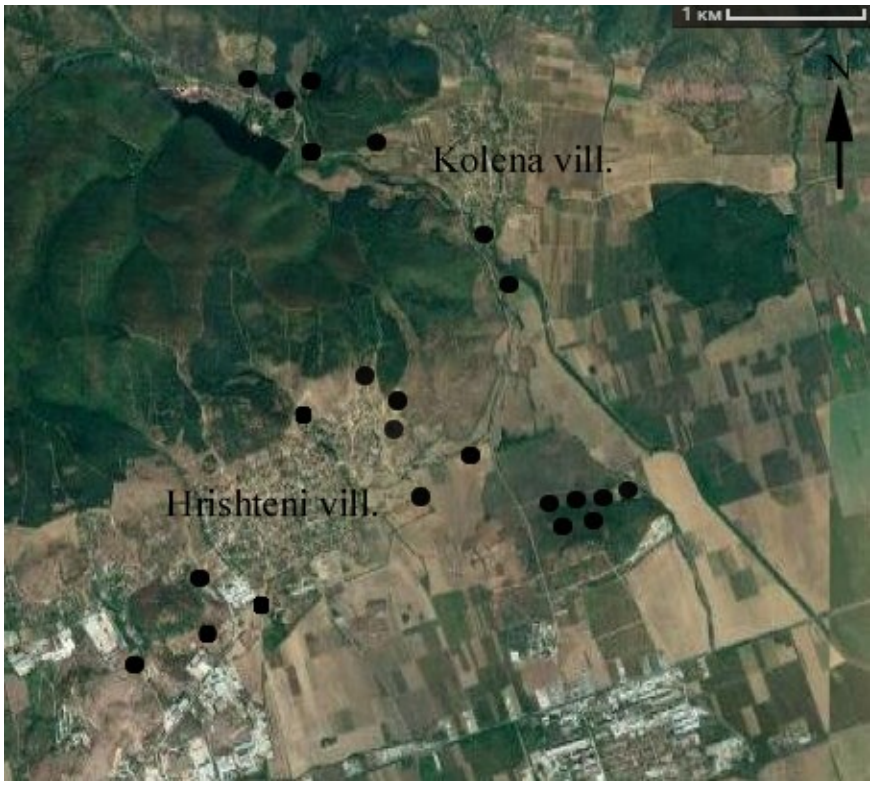

Fig. 1. Position of the illegal dumps in the study area (black dots) (modified Google Earth satellite image).

Results

A total of 23 individual illegal dumps were located at the 5x5 km sample area around the villages of Hrishteni and Kolena. About ¼ of them were situated near the Medven Hill, bordering with some agricultural lands. Their surface area can be spotted even on satellite images (Fig. 2, 3).

Fig. 2. Position of the largest illegal dump at the area, near the Medven Hill. Left - modified Google Earth satellite image, the object is pointed by an arrow, right – view from the dump site.

Landfills have also been recorded in human health important areas: on the hills of the mountains above the water supply zone of the Hrishteni village, and near agricultural lands. Such dump sites are often met and near or in the forests, streams and other natural habitats, important for the wildlife (Fig. 4).

Even the studied area is small it represents the real situation not only in the region of Sarnena Gora, but in the whole country. Many illegal dumps are now an integral part of the landscape. Even travelers on Bulgaria's main roads and highways can observe piles of dumped construction and household waste. Garbage is dumped even in city parks, canals, rivers and dams. Some of the illegal dumps are so large that they can be seen on Google satellite images.

Fig. 3. A small dump site near the largest one at the area of Medven Hill.

Fig. 4. A dump site in the forest, NE of the wall of Kilena Dam.

If extrapolated for the whole area of Stara Zagora municipality (85.11 km²), it can be speculated that the number of individual illegal dump sites is around 400 (!). Such (growing) numbers of pollution for sure is a serious threat to the nature of the area and is a big danger for the human health. In particular, combined with other important aspects, concerning the destruction of nature such as the chemical and waste water pollution, poaching and illegal logging. Much more measures are needed to prevent such illegal activities and strengthen the control of the municipality and the country as a whole.

References

Household hazardous waste. Wikipedia, The Free Encyclopedia. Available at: https://en.wikipedia.org/wiki/Household_hazardous_waste. (Accessed on 13 Januray 2021).

Construction waste. Wikipedia, The Free Encyclopedia. Available at: https://en.wikipedia.org/wiki/Construction_waste. (Accessed on 13 Januray 2021).

Georgiev, D., Bechev, D. & Yancheva, V. (Eds.)
Fauna of Sarnena Sredna Gora Mts, Part 2
ZooNotes, Supplement 10, 2021

Three gastropod species as new records to Sarnena Gora Mountains

DILIAN GEORGIEV*, TEODORA TEOFILOVA**, NIKOLAY KODZHABASHEV

**Department of Ecology and Environmental Conservation, Plovdiv University "Paisii Hilendarski", 24 Tzar Assen Str., 4000 Plovdiv, Bulgaria, diliangeorgiev@gmail.com*
***Institute of Biodiversity and Ecosystem Research (IBER), Bulgarian Academy of Sciences (BAS), 1 Tsar Osvoboditel Blvd., 1000 Sofia, Bulgaria; *e-mail: oberon_zoo@abv.bg*
****Department of Hunting and Game Management, Faculty of Forestry, University of Forestry, 10 Kliment Ohridski Blvd., 1756 Sofia, Bulgaria; e-mail: ndkodjak@abv.bg*

Abstract. The species *Lehmannia horezia* Grosu et Lupu, 1962, *Lehmannia nyctelia* (Bourguiguat, 1861) and *Oxychilus* (*Riedelius*) *depressus* (Sterki, 1880) were newly recorded to Sarnena Gora Mts. After this report the known list of molluscs of this area consists of 112 species.

Key words: terrestrial, Mollusca, slugs, snails, distribution.

Introduction

With this short note we add three more mollusk species to the known list of the mountains of 109 species (Georgiev *et al.*, 2020).

Material and Methods

Material was collected by all authors (pitfall traps: T. Teofilova, N. Kodzhabashev; by hand: D. Georgiev). Specimens were identified by D. Georgiev and deposited in his collection.

Results

Lehmannia horezia Grosu et Lupu, 1962

Material examined: 1 specimen, 22.3.-7.7.-11.11.2019, pitfall trap, *Fagus sylvatica* forest, near Svezhen Hut, N42 30 35 E25 03 51, 1100 m a.s.l., T. Teofilova, N. Kodzhabashev leg.

Lehmannia nyctelia (Bourguiguat, 1861)

Material examined: 1 specimen, 11.2019, pitfall trap, wet mesophilic *Fagus sylvatica* forest with well-developed undergrowth, at the path between Svezhen Hut and Bratan Peak, N42 30 56 E25 03 55, 975 m a. s. l., T. Teofilova, N. Kodzhabashev leg.

Oxychilus (*Riedelius*) *depressus* (Sterki, 1880)

Material examined: 1 specimen, 16.03.2018, collected by hand, yard in Hrishteni vill., in an old barn, N42 27 13.41 E25 42 19.06, 232 m a.s.l., D. Georgiev leg.

References

Georgiev, D., Dedov, I. & Schneppat, U. (2020) The malacofauna (Mollusca: Gastropoda and Bivalvia) of Sarnena Gora Mts – published data and new records. *ZooNotes*, Supplement 9: 35-40.

Georgiev, D., Bechev, D. & Yancheva, V. (Eds.)
Fauna of Sarnena Sredna Gora Mts, Part 2
ZooNotes, Supplement 10, 2021

Some new records of Diptera species from Sarnena Gora Mts

LIBOR DVOŘÁK*, ULRICH SCHNEPPAT**, DILIAN GEORGIEV***, KATEŘINA DVOŘÁKOVÁ*

**Tři Sekery 21, CZ-353 01 Mariánské Lázně; e-mails: lib.dvorak@seznam.cz, k.marsova@seznam.cz*
***Churwalden-Malix, CH-7074, Sennereiweg 8, Switzerland*
****Plovdiv University "Paisii Hilendarski", 24 Tzar Assen Str., 4000 Plovdiv, Bulgaria, diliangeorgiev@gmail.com*

Abstract. Altogether 12 species from six Diptera families are presented in this paper. The species *Lipoptena fortisetosa* Maa, 1965 and *Euthera fascipennis* (Loew, 1854) are new records to Bulgaria.

Key words: Diptera, Balkans, distribution.

Introduction

These are the results of collecting of some Diptera by D. Georgiev during the period 2016-2020, and later identified by Libor Dvořák, Kateřina Dvořáková and Ulrich Schneppat. Some species were new records to the area of Sarnena Gora Mts, and two – new to Bulgaria.

Material and Methods

The specimens were collected using entomological net, bait traps (beer) or by hand by D. Georgiev. They were stored in ethanol and send to Libor Dvořák, Kateřina Dvořáková and Ulrich Schneppat for identification, several specimens were determined by D. Georgiev. If not stated otherwise, the specimens were identified by L. Dvořák.

Results

HELEOMYZIDAE

***Suillia affinis* (Macquart, 1834)**

Sarnena Gora Mts, S of Kolena vill., Medven hill, broadleaf forest, 215 m, 42°27'23.6" N, 25°44'00.6" E, 23.-25.5.2017, DG, 3 M, 6 F, K. Dvořáková det.

Remarks: Common species known from almost the whole Europe (Woźnica 2013), the most often *Suillia* species captured by bait traps (Dvořáková 2008).

HIPPOBOSCIDAE

***Lipoptena fortisetosa* Maa, 1965**

Sarnena Gora Mts, north of Kolena village, valley of Kolenska River, mixed broad leaf forest, from the arm of the collector, 306 m, 42°29'33.83''N 25°43'6.84''E, 31.08.2016, 1 F,

very freshly hatched (exo-skeleton only pale yellowish white and still soft, both wings fully perfect), Dilian Georgiev leg., 31.08.2016, Ulrich E. Schneppat-BNM det.; *Additional record*: Stara Planina Mts, West of Gabrovo town, Uzana area, plantation of *Picea abies* and grass terrains, from the body of the collector, 1253 m, 42°45' 07.2''N 25°14'06.2'' E, 06.09.2020, many specimens, Dilian Georgiev leg, det.

Remarks: *L. fortisetosa* is considered to have been introduced into Europe with sika deer (*Cervus nippon*) from the Eastern Palaearctic and is continuously expanding its range. Little is known about the medical importance of deer keds, but they can cause hair loss in cervids and are suspected to be vectors of several diseases (Kurina *et al.* 2019).

STRATIOMYIDAE

***Beris chalybata* (Forster, 1771)**

Sarnena Gora Mts, N of Stara Zagora, along Bedechka River, flood forest, 227 m, 42°27'06.9" N, 25°37'54.8" E, 16.5.2017, DG, 1 M.

The species known from almost whole Europe, also from Bulgaria (Rozkošný 1982-1983).

***Chloromyia speciosa* (Macquart, 1834)**

Sarnena Gora Mts, Hristeni vill., yard, 42°27'12.7"N, 25°42'18.9"E, 183 m, 2.7.2017, D. Georgiev leg. 1 M.

In Europe restricted to central and southern areas, known also from Bulgaria (Rozkošný 1982-1983).

***Lasiopa villosa* (Fabricius, 1794)**

Sarnena Gora Mts, Hristeni vill., yard, 42°27'12.7"N, 25°42'18.9"E, 183 m, 2.7.2017, D. Georgiev leg. 1 F, dtto, 10.6.2018, 1 F.

Known from cental and SE parts of Europe, also from Bulgaria (Rozkošný 1982-1983).

***Microchrysa polita* (Linnaeus, 1758)**

Sarnena Gora Mts, Hristeni vill., yard, 42°27'12.7"N, 25°42'18.9"E, 183 m, 2.7.2017, D. Georgiev leg. 1 F.

Widely distributed species distributed throughout the whole Europe, known also from Bulgaria (Rozkošný 1982-1983).

TACHINIDAE

***Euthera fascipennis* (Loew, 1854)**

Sarnena Gora Mts, Hristeni vill., yard, 42°27'12.7"N, 25°42'18.9"E, 231 m, 2.7.2017, in an old barn 1 F (Fig. 1); same locality, 6.8.2017, D. Georgiev leg. 1 F, on *Prunus sativa* tree.

E. fascipennis is the only representative of the genus in Europe and is also found in North Africa and the Afrotropical and Oriental regions (Francati *et al.* 2017).

Fig. 1. *Euthera fascipennis*: 2.7.2017, Sarnena Gora, Hrishteni village, yard of a house 1 ex. in an old barn (photo: D. Georgiev).

TABANIDAE

***Chrysops flavipes* Meigen, 1804**

Sarnena Gora Mts, Kirilovo vill., near river, 30.7.2017, D. Georgiev leg. 1 F.

Mediterranean species penetrating into southern parts of central Europe, it is known from all Balcan countries (Chvála 2013). Altogether 53 species and subspecies of Tabanidae are known from the Sarnena Gora Mts. (Ganeva 2020), but *C. flavipes* is published for the first time from this region.

ULIDIIDAE

***Herina nigrina* (Meigen, 1826)**

Sarnena Gora Mts., N of Kolena vill., xeric forest (*Carpinus orientalis, Quercus spp.*), 42°29'20.5"N, 25°43'13.6", 294 m, 31.8.–5.9.2016, D. Georgiev leg. , 1 M.

Distributed in most parts of Europe except extreme north and east (Fauna Europaea). Firstly publihed from Bulgaria from locality "Kotel" by Kameneva (2007).

***Otites lamed* (Schrank, 1781)**

Sarnena Gora Mts, S of Kolena vill., Medven hill, broadleaf forest, 215 m, 42°27'23.6" N, 25°44'00.6" E, 23.-25.5.2017, DG, 1 M, 1 F; Sarnena Gora Mts, N of Stara Zagora, along Bedechka River, flood forest, 227 m, 42°27'06.9" N, 25°37'54.8" E, 16.5.2017, DG, 1 M.
Europe from France to SW Russia and from Sweden to Greece, known also from Bulgaria (Kameneva 1997, Kameneva & Greve Jensen 2013).

***Otites levigata* (Loew, 1873)**

Sarnena Gora Mts, Starozagorski bani, park forest, 383 m, 42°26'59.3" N, 25°29'39.2" E, 23.-10.5.2018, DG, 1 F.

Species of SE Europe known from Albania, Bulgaria, Croatia, Hungary, Italy, Romania, Serbia, and Slovakia ((Kameneva 1997, Kameneva & Greve Jensen 2013).

***Otites ruficeps* (Fabricius, 1805) (= *Otites formosa* (Panzer, 1798))**

Sarnena Gora Mts, S of Kolena vill., Medven hill, broadleaf forest, 215 m, 42°27'23.6" N, 25°44'00.6" E, 23.-25.5.2017, DG, 3 M, 1 F; Sarnena Gora Mts, N of Stara Zagora, along Bedechka River, flood forest, 227 m, 42°27'06.9" N, 25°37'54.8" E, 16.5.2017, D. Georgiev

leg. 1 F; Sarnena Gora Mts, Hristeni vill., yard, 42°27'12.7"N, 25°42'18.9"E, 183 m, 15.6.2017, D. Georgiev leg., 1 F; Sarnena Gora Mts, Hristeni vill., yard, 42°27'12.7"N, 25°42'18.9"E, 183 m, 5.5.2018, D. Georgiev leg. 1 F.

Europe from France and Germany to central Russia on east and Greece on southeast, known also from Bulgaria ((Kameneva 1997, Kameneva & Greve Jensen 2013).

References

Dvořáková, K. (2008) Heleomyzidae and Lauxaniidae (Diptera: Brachycera: Acalyptrata) trapped in the Czech Republic with syrup and fermented fruit. *Linzer biologische Beiträge,* 40: 507-515.

Chvála, M. (2013) Fauna Europaea: Tabanidae. *In*: Pape T. & Beuk P. (Eds): *Fauna Europaea: Diptera Brachycera. Fauna Europaea version 2017.06*. http://www.faunaeur.org/

Francati, S., Dindo, M., & Cerretti, P. (2017) A new host record for *Euthera fascipennis* (Diptera: Tachinidae), *Fragmenta entomologica*, 49 (1): 93-95.

Ganeva, D. (2020) Horse flies (Tabanidae, Diptera) of Sarnena Gora Mountains. *ZooNotes*, Supplement 9: 52-59.

Kameneva, E. P. (1997) A preliminary review of the *Otites formosa* species-group (Diptera, Ulidiidae, Otitinae). *Russian Entomological Journal*, (1996) 5 (1-4): 125-133.

Kameneva E. P. (2007) A new species of *Herina* (Diptera, Ulidiidae) from Switzerland, with a key to European species and notes on nomenclature and distribution. *Vestnik zoologii,* 41 (5): 405-421,

Kameneva, E. P. & Greve Jensen, L. (2013) Ulidiidae. *In*: Pape, T. & Beuk, P. (ed.) *Fauna Europea. Diptera: Brachycera. Fauna Europaea version 2017.06*, https://fauna-eu.org

Kurina, O., Kirik, H., Õunap, H. & Õunap, E. (2019) The northernmost record of a blood-sucking ectoparasite, Lipoptena fortisetosa Maa (Diptera: Hippoboscidae), in Estonia. *Biodiversity Data Journal*, 7: e47857.

Roháček, J. & Heřman, P. (2009) Ulidiidae. *In*: Roháček J. & Ševčík J. (Eds): *Diptera of the Poľana Protected Landscape Area – Biosphere Reserve (Central Slovakia)*. SNC SR, Administration of the PLA – BR Poľana, Zvolen, pp. 195-197.

Rozkošný, R. (1982/1983) *A biosystematic study of the European Stratiomyidae (Diptera)*. Vols 1-2. W. Junk, The Hague-Boston-London, 401 + 431 pp.

Woźnica, A. (2013) Fauna Europaea: Heleomyzidae. *In*: Pape T. & Beuk P. (Eds): *Fauna Europaea: Diptera Brachycera. Fauna Europaea version 2017.06*. http://www.faunaeur.org/

Georgiev, D., Bechev, D. & Yancheva, V. (Eds.)
Fauna of Sarnena Sredna Gora Mts, Part 2
ZooNotes, Supplement 10, 2021

Campodeinae (Campodeidae, Diplura) records from Sarnena Gora Mts, Bulgaria

ALBERTO SENDRA*, DILIAN GEORGIEV**

**Research Team on Soil Biology and Subterranean Ecosystems, Department of Life Sciences, Faculty of Biology, Chemistry and Environmental Sciences, University of Alcalá (UAH), A.P. 20, Campus Universitario, 28805 Alcalá de Henares, Madrid, Spain, alberto.sendra@uv.es*
***Plovdiv University "Paisii Hilendarski", 24 Tzar Assen Str., 4000 Plovdiv, Bulgaria, diliangeorgiev@gmail.com*

Abstract. Four species of Campodeidae have been recorded from Sarnena Gora Mts. region from which *Campodea* (*Dicampa*) *caucasica* Rusek, 1965 and *Campodea* (*Campodea*) *magna* Ionescu, 1955 are new records to the fauna of Bulgaria.

Key words: Diplura, Balkans, distribution.

Introduction

There were no records of Diplura from Sarnena Gora Mts (Bulgaria) till present study (Silvestri 1931, Bareth & Condé 2001, Sendra & Reboleira 2020). However, four soil dwelling species were already known in of Campodeinae (Campodeidae, Diplura) were known in Bulgaria: *Campodea* (*Dicampa*) *campestris* Ionescu, 1955, *Campodea* (*Dicampa*) *frenata* Silvestri, 1931, *Campodea* (*Dicampa*) *sprovieri* Silvestri, 1933 and *Campodea* (*Paurocampa*) *suensoni* Tuxen, 1930

At the present note we have studied ten specimens from Sarnena Gora Mountains.

Material and Methods

All material was collected during 2017 by using Berlese trap or by hand by the second author. The specimens were stored in 96% ethanol in small plastic vials. They were identified by the first author, and then stored in his collection.

Results and Discussion

Campodeidae

Campodea* (*Campodea*) cf. *fragilis/silvestrii: 6.6.2017, 1 juvenile, Sarnena Gora Mts, near Trakia University, N422402.4 E253359.9, 279 m, grass land in detritus, Berlese trap.

This unclear specimen belongs to *C. fragilis* or *C. silvestri* both unknown from Bulgaria but with widely distributed in Europe (Sendra & Reboleira 2020). Further research is needed to clarify which species occurs in Sarnena Gora Mts if not both.

***Campodea* (*Campodea*) *magna* Ionescu, 1955**: 16.7.2017, 1 female, 2 juveniles, Bulgaria Sarnena Gora Mts near Kolena Dam, near river, N42 296.2 E254129.2 detritus of *Alnus glutinosa*; *Campodea* (*Campodea*) *magna-taunica*: 15.6.2017, 2 juveniles, Sarnena Gora, near Kolena village, N42296.2 E254129.16, 300 m a. s. l., Bank of stream, soil and litter among roots of *Alnus glutinosa*, Berlese trap.

Known from Austria, Romania and Turkey (Sendra & Reboleira 2020). New record for Bulgaria.

***Campodea* (*Dicampa*) *caucasica* Rusek, 1965**: 15.6.2917, 1 female, Bulgaria, Sarnena Gora near Kolena village, N42296.2 E254129.16, 300 m a. s. l., Bank of stream, soil and litter among roots of *Alnus glutinosa*, Berlese trap and hand collecting.

Known from Russia (Sendra & Reboleira 2020). New record for Bulgaria.

***Campodea* (*Dicampa*) *sprovieri* Silvestri, 1933**: 13.6.2017, 5 specimens, Bulgaria, Sarnena Gora, Hrishteni village, N422712 E254218, 183 m a. s. l., yard litter of *Corylus avellana*, Berlese trap.

Known from Bulgaria, Greece, Romania and Turkey (Sendra & Reboleira 2020).

References

Bareth, C. & Condé, B. (2001) Campodéidés des grottes de Bulgarie (Insecta: Diplura). *Mémoires de Bioespéologie*, 28: 9–27.

Sendra, A. & Reboleira, A. (2020) Euro-Mediterranean fauna of Campodeinae (Campodeidae, Diplura). *European Journal of Taxonomy*, 728: 1–130.

Silvestri, F. (1931) Contributo alla conoscenza dei Campodeidae (Thysanura) della grotte della Bulgaria. *Bulletin des Institutions royales d'Histoire naturelle à Sofia*, 6: 97–107.

Georgiev, D., Bechev, D. & Yancheva, V. (Eds.)
Fauna of Sarnena Sredna Gora Mts, Part 2
ZooNotes, Supplement 10, 2021

Population dynamics trends of four Artiodactyla species in Sarnena Sredna Gora Mts (Bulgaria) based on hunting statistics

EVGENIY RAICHEV[1*], STANISLAVA PEEVA[1], KRASIMIR KIRILOV[1], DILIAN GEORGIEV[2]

[1]Department of Animal production - Non-ruminants and other animals, Faculty of Agriculture, Trakia University, 6000 Stara Zagora, Bulgaria, email: eraichev@uni-sz.bg*
[2] University of Plovdiv, Faculty of Biology, Department of Ecology and Environmental Conservation, 24 Tzar Assen Str., BG-4000 Plovdiv

Abstract. Annual harvest hunting data and counting statistics from 2009 to 2019 were used as methods for assessing changes in four Artiodactyla species population trends. The study area covers approximately 100,000 ha territory from Sredna Gora Mts. The results showed trend for a stable increase in the Red Deer population, because of provided conservation measures. The Fallow Deer could be considered an occasional species. An increase in Roe Deer number was observed, with steeper rising between 2014 and 2018, followed by a strong decline in 2019. The Wild Boar number was changing significantly over the years, reflected in peaks and falls of number shot individuals for the study period. Tracking and comparing the hunting bag statistics data for ungulates in the study area for a longer period would give a clearer picture on their population trends and would help in selecting conservation measures.

Key words: large herbivores, population, Balkans.

Introduction

Hunting bag statistics provide data from different seasons for many years ago, making them suitable and in most cases the only tracking trend in population development. It is the most reliable resource for estimating the hunting mammals abundance and for comparing it by regions in Europe (Cretois *et al.* 2020), giving information about: the species demographic attributes (Aebischer 2019, Massei *et al.* 2015) and the impact of multiple drivers of population change (Hagen *et al.* 2014, Reimoser *et al.* 2014). Despite that the hunting data available in the official statistics are often incomplete, dispersed and heterogeneous in different European countries (Consortium *et al.* 2018) they are applicable in a local scale. In Bulgaria the game counting is an obligatory hunting event under the Law for hunting and protection of the game. Until now, enough data have been accumulated for the Sredna Gora region to investigate the population dynamics of some game species. Tracking trends in their population number changes will help in creating appropriate management programs.

Material and Methods

In the present study, the Red Deer (*Cervus elaphus*) and Fallow Deer (*Cervus dama*) counting statistics, as well as the Roe Deer (*Capreolus capreolus*) and Wild Boar (*Sus scrofa*) hunting bag statistics were used. The Red Deer and Fallow Deer hunting is not intense and only 1-2 individuals yearly were shot, motivating the usage of their counting statistics. The

data were extracted from the information system of the Executive Forest Agency for the region of the Hunting Fishing Association "Stara Zagora" for eleven years period from 2009 to 2019. The area covers approximately 100,000 ha territory from Sredna Gora Mts.

Results

The results showed trend for a stable increase in the Red Deer population (Fig. 1). It is concentrated around the State Game Breeding Area "Monument", with coordinates N 42°32′08″ E 25°43′09″. At this territory comprising approximately 22,000 ha the number of Red Deer keeps high due to the efective conservation measures and timely provided hunting events such as: feeding, improving game habitats, reducing predators and etc. Moreover, the oak forests spotted with meadows, as well as cornfields for the game represent a suitable habitat for the Red Deer. Last but not least, of great importance is the calmness of the game due to the remoteness of the area from large settlements, as well as the lack of agricultural activity. The graph built on the basis of the Red Deer counting data showed a rapid and stable increase in its number with low variations, because of provided conservation measures (Vc= 15.64).

During the last decade of the 20th century, there were several groups of Fallow Deer in Sredna Gora Mts that disappeared in the early 21st century due to poaching (Raichev's personal observation). Nowadays, the Fallow Deer could be considered an occasional species, as a group of 4-5 animals in the area of village Lyaskovo from 2011 to 2016 had been observed. Their origin is unknown, assuming that they were escaped from the zoo in Stara Zagora or from private zoos close to the area. Sredna Gora Mts region is a suitable habitat for the Fallow Deer, provided that strict protection measures are applied.

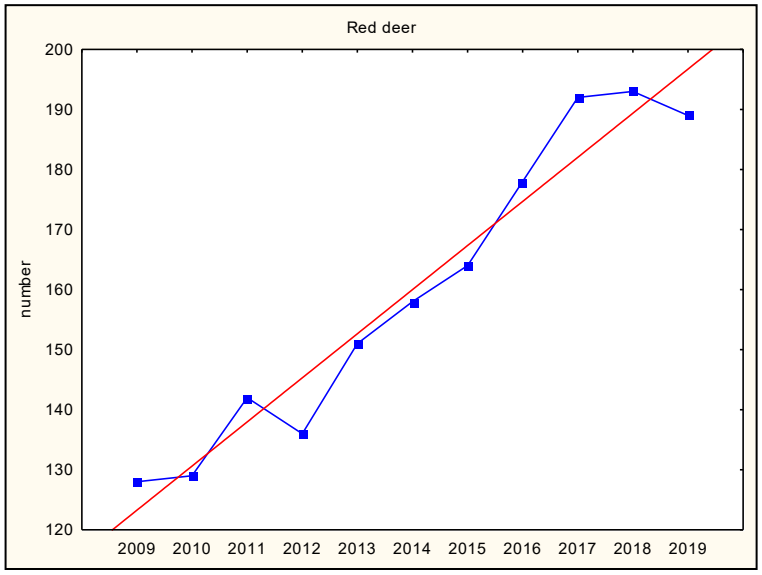

Fig. 1. Red Deer population dynamics trends in Sredna gora Mts (Bulgaria), according to annual counting statistics of the Hunting Fishing Association "Stara Zagora" for 11 years.

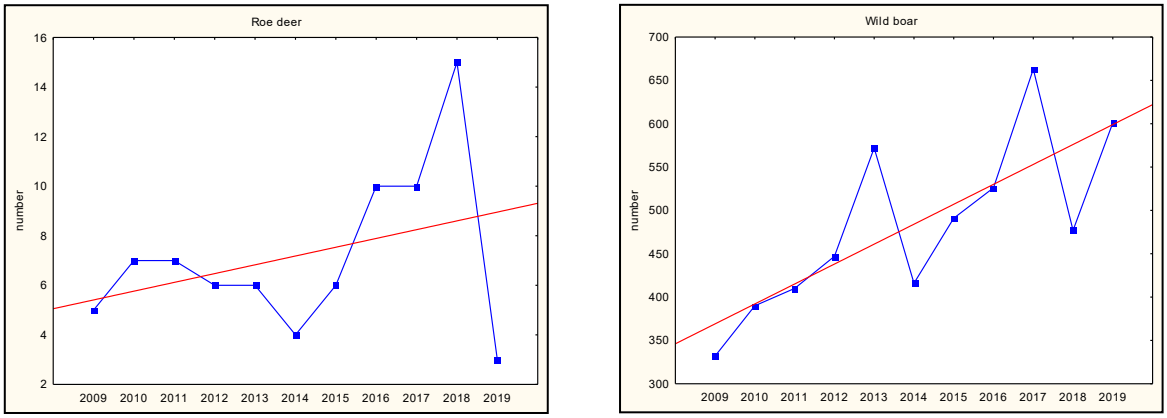

Fig. 2. Roe Deer (left) and Wild Boar (right) population dynamics trends in Sredna gora Mts (Bulgaria), according to hunting data base obtained from Hunting Fishing Association "Stara Zagora" for 11 years.

Some authors consider that the Roe Deer shooting data does not give the most accurate information for population number (Velevski *et al.* 2003). Despite this statement, an increase in its number was observed from the data provided, with steeper rising between 2014 and 2018 (Fig. 2). A strong decline of the Roe Deer number was observed in 2019. It is difficult to point out certain reasons for the changes in its number. Although the Roe Deer is one of the most common victims of poaching, the proper hunting events conducted in recent years, as well as the effective control over them by the Regional Forest Directorate Stara Zagora were a prerequisite for increasing its number. These two counteracting factors induce variations in its number during the study period (Vc = 46.94). Overall, the trend of increasing Roe Deer numbers in the region is in line with that over the last few decades across Europe (Valente *et al.* 2014).

Two significant peaks in the shot Wild Boars' number were observed - 572 in 2013 and 663 in 2017 (Fig. 2). What is noticeable is that they were followed by sharp declines - 416 in 2014 and 477 in 2018. According to these data, the Wild Boar number was changing significantly (Vc = 20.53) over the years, reflected in peaks and falls of number shot individuals for the study period. This observed trend correlates with the steady increase in Wild Boar population throughout Europe since the 1980s (Massei *et al.* 2015).

Tracking and comparing the hunting bag statistics data for ungulates in the study area for a longer period would give a clearer picture on their population trends and would help in selecting conservation measures.

References

Aebischer, N. (2019) Fifty-year trends in UK hunting bags of birds and mammals, and calibrated estimation of national bag size, using GWCT's NationalGamebag Census. *European Journal of Wildlife Research*, 65(4): 64-76.

Consortium, E., Vicente, J., Plhal, R., Blanco-Aguiar, J., Sange, M., Podgórski, T., Petrovic, K., Scandura, M., Nabeiro, A., Body, G., Keuling, O., Apollonio, M., Ferroglio, E., Zanet, S., Brivio, F., Smith, G., Croft, S., Acevedo, P., & Soriguer, R. (2018) Analysis of hunting statistics collection frameworks for wild boar across Europe and proposals for improving the harmonization of data collection. EFSA supporting publication 2018:EN-1523. 33pp. doi:10.2903/sp.efsa.2018.EN-1523.

Cretois, B., Linnell, J., Grainger, M., Nilsen, E. & Rod, J. (2020) Hunters as citizen scientists: Contributions to biodiversity monitoring in Europe. *Global Ecology and Conservation*, 23(2020)e01077.

Hagen, R., Heurich, M., Kroschel, M. & Herdtfelder, M. (2014) Synchrony in hunting bags: reaction on climatic and human induced changes? The *Science of the total environment*, 468-469: 140-146.

Massei, G., Kindberg, J., Licoppe, A., Gačić, D., Šprem, N., Kamler, J., Baubet, E., Hohmann, U., Monaco, A., Ozoliņš, J., Cellina, S., Podgórski, T., Fonseca, C., Markov, N., Pokorny, B., Rosell, C. & Náhlik, A. (2015) Wild boar populations up, numbers of hunters down? A review of trends and implications for Europe. *Pest Management Science*, 71(4): 492-500.

Reimoser, S., Smidt, S., Reimoser, F. & Wildauer, L. (2014) Changes of hunting bag and habitat in the southern Vienna-Woods since 1891. *Allgemeine Forst-Und Jagdzeitung*, 185(1/2): 16-27.

Valente, A., Fonseca, C., Marques, T., Santos, J., Rodrigues, R. & Torres, R. (2014) Living on the edge: Roe deer (*Capreolus capreolus*) density in the margins of its geographical range. *PLoS ONE* 9(2): e88459.

Velevski, M., Melovski, L., Maletik, V., Dzabirski, V. & Hristovski, S. (2003) *Report: Food Availability for Vultures (Aegypiinae) in Macedonia - Natural Sources and Livestock Breeding*. Macedonian Ecological Society, Skopje.

Berza, T., Constantinescu, E. & Vlad, S.-E. (1998) Upper Cretaceous magmatic series and associated mineralization in the Carpathian-Balkan orogen. *Resource Geology*, 48(4): 291-306.

Georgiev, D., Bechev, D. & Yancheva, V. (Eds.)
Fauna of Sarnena Sredna Gora Mts, Part 2
ZooNotes, Supplement 10, 2021

Ants (Hymenoptera, Formicidae) of Sarnena Sredna Gora Mountains (Bulgaria)

ALBENA LAPEVA-GJONOVA[1], VERA ANTONOVA[2], TOSHKO LJUBOMIROV[3]

[1]*Sofia University, Department of Zoology and Anthropology, 8 Dragan Tzankov blvd., 1164 Sofia, Bulgaria, gjonova@gmail.com*
[2]*Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 2 Gagarin Str., 1113, Sofia, Bulgaria, vera_antonova@yahoo.com*
[3]*Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 1, Tsar Osvoboditel blvd., 1000 Sofia, Bulgaria, toshkoljubomirov@gmail.com*

Abstract. A list of 61 ant species from the Sarnena Sredna Gora Mountains (Bulgaria), based on 32 studied localities is provided. Two morphospecies from each of the *Messor semirufus* group and *Tetramorium caespitum* complex were also found. There have been only two species – *Stigmatomma denticulatum* Roger, 1859 and *Formica pratensis* Retzius, 1783 reported so far from the region, the latter confirmed here. The ant species found in this survey belong to three zoogeographical classes as Euro-Caucasian and Mediterranean zoogeographical elements prevail. Despite the significant increase in the number of recorded species, we expect that their number should be higher in a long-term study.

Key words: faunistic data, new records, insect fauna, Bulgaria

Introduction

The ants (Hymenoptera, Formicidae) in Bulgaria are relatively well studied and about 180 species are known. However, a number of areas in the country remain poorly known or unexplored (Lapeva-Gjonova *et al.* 2010). So far, only two species are known from the Sarnena Sredna Gora Mountains – *Stigmatomma denticulatum* Roger, 1859 and *Formica pratensis* Retzius, 1783 (Gateva 1975; Atanassov & Dlussky 1992). The presence of a variety of natural habitats (Georgiev 2020), especially in the higher parts of the mountain, as well as semi-natural xerothermic habitats in the lower parts, suggests the existence of a rich myrmecofauna.

The aim of the present study is to summarize the results for the ant fauna from short-term ant collections in the area.

Material and Methods

The present study is based on the ant material collected in the period 10.08.-14.08.2020 and on 27.09.2020 from 18 localities in the western and central parts of the mountain. There are also additional data from 14 localities collected on 05.08.2014, 10.06.-12.06.2016, and 19.04.-30.05.2018 (Table 1). The collected material by A. Lapeva-Gjonova and I. Gjonov were identified by A. Lapeva-Gjonova and were deposited in the Sofia University collection (BFUS). Material collected by V. Antonova, T. Ljubomirov, V. Peneva and R. Bańkowska were identified by V. Antonova, unless otherwise noted, and were deposited in IBER's collection, Sofia. Specimens collected by R. Bańkowska (Museum and

Institute of Zoology, Warsaw) were included but some information for sampling from Kazanlak and Stara Zagora is not available and they are not included in Table 1. The main applied collection method was by hand, but sweeping, Tullgren funnel extraction and Moerike traps (blue, red and yellow) were also used. The following abbreviations in the results are used: for ant castes – q. - queen/s, m. - male/s, w. - worker/s; for collectors – ALG – A. Lapeva-Gjonova, IG – I. Gjonov, RB – R. Bańkowska, TL – T. Ljubomirov, VA – V. Antonova, VP – V. Peneva.

Table 1. Studied localities (in alphabetical order).

locality name	GPS coordinates	altitude	type of habitat / collecting method
Cherganovo vill.	N42.5854 E25.4652	339 m	field with essential oil crops / sweeping
Domlyan dam, near Domlyan vill. 1	N42.5408 E24.9407	369 m	xerothermophilous grassland / hand collecting
Domlyan dam, near Domlyan vill. 2	N42.5408 E24.9407	369 m	the edge of a forest of *Carpinus* / hand collecting
Hrishteni vill.	N42.4567 E25.7342	211 m	ruderal grassland with trees of *Quercus*, *Carpinus* / hand collecting, sweeping
Kalofer (S)	N42.5959 E24.9756	602 m	forest edge of *Picea abies* (L.) H.Karst. / hand collecting
Kriva krusha vill.	N42.5477 E25.8782	435 m	grassland with single trees of *Quercus*, *Carpinus* / hand collecting, sweeping
Momino vill. 1	N42.2919 E24.8805	175 m	oilseed rape (*Brassica napus* L.) field at the margin of the crop plantation / sweeping
Momino vill. 2	N42.2942 E24.8836	175 m	pasture land next to oilseed rape field / sweeping
Momino vill. 3	N42.2950 E24.8836	175 m	grassland / Tullgren funnel extraction
Mrachenik vill.	N42.5054 E24.9403	577 m	near road, grassland with single trees of *Carpinus*, *Quercus* / hand collecting, sweeping
Mrachenik vill., the grave of Hadzhi Dimitar	N42.5177 E24.9877	939 m	forest of *Quercus*, *Carpinus* / hand collecting
Novo selo vill.	N42.4867 E25.5102	481 m	xerothermophilous *Quercus* forest / hand collecting
Pryaporets vill.	N42.4508 E25.521	356 m	xerothermophilous *Quercus* forest / hand collecting, sweeping
Rozovets vill. 1	N42.4946 E25.0868	1062 m	grassland along a road / hand collecting
Rozovets vill. 2	N42.4975 E25.1105	978 m	along a road, mixed deciduous forest / hand collecting
Rozovo vill.	N42.5722 E25.4132	339 m	field with essential oil crops / sweeping
Sarnevets vill.	N42.4177 E25.3487	411 m	xerothermophilous *Quercus* forest / hand collecting, sweeping

Srednogorovo vill.	N42.5207 E25.3363	442 m	along a small river, *Ulmus* trees / hand collecting, sweeping
Svezhen hut 1	N42.5135 E25.0546	1088 m	grassland among *Fagus* forest / hand collecting
Svezhen hut 2	N42.5151 E25.0491	1054 m	forest of *Picea* and *Pinus* / hand collecting
Svezhen hut 3	N42.5074 E25.0696	1081 m	grassland / hand collecting
Svezhen vill. 1	N42.5077 E25.0003	435 m	grassland near a *Quercus* forest / hand collecting, sweeping
Svezhen vill. 2	N42.4894 E25.0407	797 m	near a marsh / hand collecting, sweeping
Turiya vill.	N42.5686 E25.1717	460 m	along a small river and *Quercus* forest / hand collecting
Zelenikovo vill. 1	N42.4168 E25.0796	339 m	field with essential oil crops / sweeping
Zelenikovo vill. 2	N42.3889 E25.0592	289 m	pasture land next to oilseed rape field / sweeping, Moerike trap
Zelenikovo vill. 3	N42.3805 E25.0786	290 m	pasture land next to oilseed rape field / Moerike trap
Zelenikovo vill. 4	N42.3867 E25.0475	281 m	oilseed rape (*Brassica napus* L.) field at the margin of the crop plantation / sweeping
Zelenikovo vill. 5	N42.3792 E25.0811	288 m	oilseed rape (*Brassica napus* L.) field at the margin of the crop plantation / sweeping
Zelenikovo vill. 6	N42.3805 E25.0786	290 m	grassland / Tullgren funnel extraction

Results

Subfamily Amblyoponinae

***Stigmatomma denticulatum* Roger, 1859**

Literature data: the slopes of Sredna Gora Mts by Stara Zagora (Atanassov & Dlussky 1992).

Subfamily Ponerinae

***Ponera coarctata* (Latreille, 1802)**

Material examined: Rozovets vill. 1, 12.08.2020, 4 w., leg. ALG; Novo selo vill., 13.08.2020, 1 w., leg. ALG; Sarnevets vill., 14.08.2020, 1 w., leg. ALG; Pryaporets vill., 14.08.2020, 2 w., leg. ALG.

***Ponera testacea* Emery, 1895**

Material examined: Rozovets vill. 1, 12.08.2020, 3 w., leg. ALG.

Subfamily Myrmicinae

***Myrmica rugulosa* Nylander, 1849**

Material examined: Srednogorovo vill., 13.08.2020, 5 w., leg. ALG; Turiya vill., 13.08.2020, 26 w., leg. ALG.

***Myrmica speciodes* Bondroit, 1918**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 6 w., leg. ALG.

***Myrmica scabrinodis* Nylander, 1846**

Material examined: Zelenikovo vill. 2, 26.04.2018, 3 w., leg. TL; Svezhen vill. 2, 11.08.2020, 2 w., leg. ALG; same locality, 11.08.2020, 1 w., leg. IG; Novo selo vill., 13.08.2020, 11 w., leg. ALG.

***Myrmica sabuleti* Meinert, 1861**

Material examined: Svezhen vill. 2, 11.08.2020, 4 w., leg. IG; Sarnevets vill., 14.08.2020, 10 w., leg. ALG.

***Myrmica lonae* Finzi, 1926**

Material examined: Domlyan dam, near Domlyan vill. 1, 11.08.2020, 3 q., 2 m., 28 w., leg. ALG.

***Myrmica curvithorax* Bondroit 1920**

Material examined: Zelenikovo vill. 2, 27-28.05.2018, 1 m., 3 w., leg. TL.

***Myrmica lobicornis* Nylander, 1846**

Material examined: Svezhen hut 1, 12.08.2020, 11 w., leg. ALG.

***Aphaenogaster subterranea* (Latreille, 1798)**

Material examined: Domlyan dam, near Domlyan vill. 2, 11.08.2020, 9 q., 50 m., 55 w., leg. ALG; Pryaporets vill., 14.08.2020, 10 q., 46 m., 47 w., leg. ALG; Hrishteni vill., 27.09.2020, 22 w., leg. ALG.

***Messor structor* (Latreille, 1798)**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 10 w.; Svezhen vill. 1, 11.08.2020, 4 w.; Novo selo vill., 13.08.2020, 11 w.; Kriva krusha vill., 27.09.2020, 6 w..

***Messor semirufus* group**

Material examined: Stara Zagora, 1959, leg. RB; Momino vill. 2, 30.05.2018, 7 w., leg. TL.

***Crematogaster schmidti* (Mayr, 1853)**

Material examined: Zelenikovo vill. 1, 11.06.2016, 1 w., leg. IG; Mrachenik vill., 11.08.2020, 3 w., leg. ALG; same locality, 11.08.2020, 3 w., leg. IG; Turiya vill., 13.08.2020, 15 w., leg. ALG; Sarnevets vill., 14.08.2020, 8 w., leg. ALG; Hrishteni vill., 27.09.2020, 3 w., leg. IG; Kriva krusha vill., 27.09.2020, 4 w., leg. ALG.

***Crematogaster sordidula* (Nylander, 1849)**

Material examined: Sarnevets vill., 14.08.2020, 3 w., leg. IG.

Pheidole* cf. *pallidula

Material examined: Kriva krusha vill., 27.09.2020, 70 w., leg. ALG.

Recenty Seifert (2016) distinguished 3 cryptic species with sympatric ranges in the Balkans and Asia Minor, namely *Ph. pallidula* (Nylander, 1849), *Ph. balcanica* Seifert, 2016 and *Ph. koshewnikovi* Ruzsky, 1905, the first two recorded for Bulgaria. The standard comparative morphology is not sufficient for their reliable distinction.

***Solenopsis fugax* (Latreille, 1798)**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 6 w., leg. ALG; Domlyan dam, near Domlyan vill. 2, 11.08.2020, 41 w., leg. ALG; Sarnevets vill., 14.08.2020, 9 w., leg. ALG; Hrishteni vill., 27.09.2020, 8 q., 3 m., 57 w., leg. ALG; Kriva krusha vill., 27.09.2020, 11 m., 26 w., leg. ALG.

***Myrmecina graminicola* (Latreille, 1802)**

Material examined: Sarnevets vill., 14.08.2020, 2 w., leg. ALG.

***Temnothorax affinis* (Mayr, 1855)**

Material examined: Pryaporets vill., 14.08.2020, 2 w., leg. ALG.

***Temnothorax interruptus* (Schenck, 1852)**

Material examined: Turiya vill., 13.08.2020, 1 w., leg. ALG.

***Temnothorax parvulus* (Schenck, 1852)**

Material examined: Mrachenik vill., 11.08.2020, 1 m., 7 w., leg. ALG; Svezhen vill. 1, 11.08.2020, 30 q., 8 m., 63 w., leg. ALG; Novo selo vill., 13.08.2020, 5 w., leg. ALG; Turiya vill., 13.08.2020, 23 q., 11 m., 16 w., leg. ALG; Sarnevets vill., 14.08.2020, 1 m., 7 w., leg. ALG.

***Temnothorax helenae* Csösz, Heinze & Mikó, 2015**

Material examined: Srednogorovo vill., 13.08.2020, 1 w., leg. ALG.

***Temnothorax lichtensteini* (Bondroit, 1918)**

Material examined: Novo selo vill., 13.08.2020, 2 w., leg. ALG.

***Temnothorax semiruber* (André, 1881)**

Material examined: Sarnevets vill., 14.08.2020, 9 w., leg. IG.

***Tetramorium caespitum* complex**

Material examined: Momino vill. 3, 21.04.2018, 1 w., leg. VP; Domlyan dam, near Domlyan vill. 1, 10.08.2020, 30 w., leg. ALG; Domlyan dam, near Domlyan vill. 2, 11.08.2020, 65 w., leg. ALG; Rozovets vill. 1, 12.08.2020, 26 w., leg. ALG; Srednogorovo vill., 13.08.2020, 2 w., leg. ALG; Turiya vill., 13.08.2020, 24 w., leg. ALG; Pryaporets vill., 14.08.2020, 13 w., leg. ALG; Sarnevets vill., 14.08.2020, 15 w., leg. ALG; Kriva krusha vill., 27.09.2020, 19 w., leg. ALG.

***Tetramorium impurum* (A. Förster, 1850)**

Material examined: Rozovets vill. 2, 12.08.2020: 1 q., 8 m., 13 w., leg. ALG.

The presence of all castes from the studied nest sample and especially morphology of the male genitalia allowed to delimit this species from the *T. caespitum* complex.

***Tetramorium moravicum* Kratochvíl, 1941**

Material examined: Svezhen vill. 2, 11.08.2020, 4 w., leg. IG; Novo selo vill., 13.08.2020, 11 w., leg. ALG; Pryaporets vill., 14.08.2020, 3 w., leg. ALG; Sarnevets vill., 14.08.2020, 14 w., leg. ALG; Hrishteni vill., 27.09.2020, 40 w., leg. ALG; Kriva krusha vill., 27.09.2020, 30 w., leg. ALG.

***Tetramorium chefketi* Forel, 1911**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 12 w., leg. ALG; Mrachenik vill., 11.08.2020, 2 w., leg. ALG; Hrishteni vill., 27.09.2020, 2 w., leg. IG.

Subfamily Dolichoderinae

***Dolichoderus quadripunctatus* (Linnaeus, 1771)**

Material examined: Mrachenik vill., 11.08.2020, 1 w., leg. IG; Mrachenik vill., the grave of Hadzhi Dimitar, 3 w., leg. ALG; Svezhen vill. 1, 11.08.2020, 2 w., leg. ALG; same locality, 11.08.2020, 3 w., leg. IG; Novo selo vill., 13.08.2020, 1 w., leg. ALG; Turiya vill., 13.08.2020, 1 q., 3 w., leg. ALG; Pryaporets vill., 14.08.2020, 17 w., leg. ALG; same locality, 14.08.2020, 2 w., leg. IG.

Tapinoma* cf. *erraticum

Material examined: Zelenikovo vill. 2, 26.04.2018, 2 w., leg. TL; same locality, 27-28.05.2018, 5 w., leg. TL; Zelenikovo vill. 3, 26-27.04.2018, 2 w., leg. TL; Momino vill. 2, 27.04.2018, 2 w., leg. TL; same locality, 30.05.2018, 1 m., 6 w., leg. TL; Svezhen vill. 1, 11.08.2020, 1 w., leg. IG; Novo selo vill., 13.08.2020, 1 w., leg. ALG; Sarnevets vill., 14.08.2020, 1 q., 17 w.; 54 w., leg. ALG.

In Wagner *et al.* (2018) is noted that a species close to *T. erraticum* (Latreille, 1798) is widespread in the southern Balkans and its description is forthcoming.

***Tapinoma subboreale* Seifert, 2011**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 24 w., leg. ALG; Svezhen vill. 1, 11.08.2020, 6 w., leg. ALG.

***Liometopum microcephalum* (Panzer, 1798)**

Material examined: Kazanlak, 1964, 5 w., leg. RB.

Subfamily Formicinae

***Plagiolepis pygmaea* (Latreille, 1798)**

Material examined: Zelenikovo vill. 2, 27-28.05.2018, 2 w., leg. TL; Zelenikovo vill. 3, 26-27.04.2018, 2 w., leg. TL; Zelenikovo vill. 5, 28.05.2018, 1 w., leg. TL; Momino vill. 2, 30.05.2018, 5 m., leg. TL; Domlyan dam, near Domlyan vill. 1, 10.08.2020, 22 w., leg. ALG; Novo selo vill., 13.08.2020, 3 w., leg. ALG; Srednogorovo vill., 1 w., leg. IG; Turiya vill., 13.08.2020, 1 w., leg. ALG; Pryaporets vill., 14.08.2020, 5 m., 12 w., leg. ALG; same locality, 14.08.2020, 1 w., leg. IG; Sarnevets vill., 14.08.2020, 16 w., leg. ALG; same locality, 14.08.2020, 2 w., leg. IG; Kriva krusha vill., 27.09.2020, 1 q., 10 w., leg. ALG.

***Prenolepis nitens* (Mayr, 1853)**

Material examined: Zelenikovo vill. 6, 11.06.2018, 2 m., leg. VP, det. T. Ljubomirov.

***Camponotus herculeanus* (Linnaeus, 1758)**

Material examined: Svezhen hut 1, 12.08.2020, 5 w., leg. ALG.

***Camponotus vagus* (Scopoli, 1763)**

Material examined: Sarnevets vill., 14.08.2020, 1 w., leg. IG.

***Camponotus lateralis* (Olivier 1792)**

Material examined: Sarnevets vill., 14.08.2020, 20 w., leg. ALG; Hrishteni vill., 27.09.2020, 9 w., leg. ALG; Kriva krusha vill., 27.09.2020, 2 q., 1 m., 16 w., leg. ALG.

***Camponotus piceus* (Leach, 1825)**

Material examined: Zelenikovo vill. 2, 27-28.05.2018, 1 w., leg. TL; Zelenikovo vill. 5, 28.05.2018, 1 w., leg. TL; Momino vill. 2, 30.05.2018, 3 w., leg. TL; Svezhen vill. 1, 11.08.2020, 1 w., leg. ALG; Novo selo vill., 13.08.2020, 5 w., leg. ALG.

***Camponotus atricolor* (Nylander, 1849)**

Material examined: Mrachenik vill., 11.08.2020, 3 w., leg. IG; Svezhen vill. 2, 11.08.2020, 1 w., leg. IG; Turiya vill., 13.08.2020, 2 w., leg. ALG; Pryaporets vill., 14.08.2020, 1 w., leg. IG; Sarnevets vill., 14.08.2020, 4 w., leg. IG.

***Camponotus aethiops* (Latreille, 1798)**

Material examined: Stara Zagora, 1959, 6 w., leg. RB; Zelenikovo vill. 2, 27-28.05.2018, 2 w., leg. TL; Zelenikovo vill. 3, 26-27.04.2018, 2 w., leg. TL; Zelenikovo vill. 5, 28.05.2018, 1 w., leg. TL; Mrachenik vill., 11.08.2020, 2 q., 2 m., 8 w., leg. ALG; Svezhen vill. 1, 11.08.2020, 2 w., leg. ALG; same locality, 11.08.2020, 1 w, leg. IG; Novo selo vill., 13.08.2020, 5 w., leg. ALG; Turiya vill., 13.08.2020, 1 w., leg. ALG; Sarnevets vill., 14.08.2020, 1 w., leg. IG; Hrishteni vill., 27.09.2020, 12 w., leg. ALG; same locality, 27.09.2020, 1 w., leg. IG.

***Camponotus samius* Forel, 1888**

Material examined: Hrishteni vill., 27.09.2020, 2 w., leg. ALG.

***Colobopsis truncata* (Spinola, 1808)**

Material examined: Zelenikovo vill. 1, 11.06.2016, 1 w., leg. IG; Mrachenik vill., 11.08.2020, 1 w., leg. IG.

***Lasius alienus* (A. Förster, 1850)**

Material examined: Momino vill. 3, 21.04.2018, 1 w., leg. VP; Momino vill. 2, 27.04.2018, 2 w., leg. TL; same locality, 30.05.2018, 7 w., leg. TL; Zelenikovo vill. 4; 27.05.2018, 3 w., leg. TL; Zelenikovo vill. 5, 28.05.2018, 3 w., leg. TL; Mrachenik vill., 11.08.2020, 15 w., leg. ALG; Svezhen hut 1, 12.08.2020, 1 q., 7 m., 12 w., leg. ALG; Rozovets vill. 1, 13.08.2020, 35 q., 24 m., 10 w., leg. ALG.

***Lasius psammophilus* Seifert, 1992**

Material examined: Svezhen vill. 1, 11.08.2020, 11 w., leg. ALG; Novo selo, 13.08.2020, 7 w., leg. ALG; Turiya vill., 13.08.2020, 7 w., leg. ALG.

***Lasius paralienus* Seifert, 1992**

Material examined: Zelenikovo vill. 4, 28.05.2018, 3 w., leg. TL; Novo selo vill., 13.08.2020, 5 w., leg. ALG; Srednogorovo vill., 1 w., leg. IG.

***Lasius bombycina* Seifert & Galkowski, 2016**

Material examined: Turiya vill., 13.08.2020, 7 w., leg. ALG; Pryaporets vill., 14.08.2020, 2 w., leg. IG; Sarnevets vill., 14.08.2020, leg. IG; Kriva krusha vill., 27.09.2020, 15 w., leg. ALG.

***Lasius niger* (Linnaeus, 1758)**

Material examined: Cherganovo vill, 10.06.2016, 1 w., leg. IG; Zelenikovo vill. 2, 26.04.2018, 12 w., leg. TL.

***Lasius platythorax* Seifert, 1991**

Material examined: Mrachenik vill., 11.08.2020, 12 m., 7 w., leg. ALG; Novo selo vill., 13.08.2020, 4 w., leg. ALG.

***Lasius emarginatus* (Olivier, 1792)**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 23 w., leg. ALG.

***Lasius brunneus* (Latreille, 1798)**

Material examined: Stara Zagora, 1959, 1 w., leg. RB; Mrachenik vill., the grave of Hadzhi Dimitar, 11.08.2020, 12 w., leg. ALG; Srednogorovo vill., 13.08.2020, 2 w., leg. ALG; Pryaporets vill., 14.08.2020, 2 w., leg. IG.

***Lasius myops* Forel, 1894**

Material examined: Mrachenik vill., 11.08.2020, 7 w., leg. ALG.

***Lasius meridionalis* (Bondroit, 1920)**

Material examined: Pryaporets vill., 14.08.2020, 20 w., leg. ALG.

***Lasius fuliginosus* (Latreille, 1798)**

Material examined: Mrachenik vill., the grave of Hadzhi Dimitar, 11.08.2020, 9 w., leg. ALG.

***Cataglyphis nodus* (Brullé, 1832)**

Material examined: Zelenikovo vill. 2, 27-28.05.2018, 1 w., leg. TL; Domlyan dam, near Domlyan vill. 1, 10.08.2020, 1 w., leg. ALG; Kriva krusha vill., 27.09.2020, 1 w., leg. ALG.

***Proformica* sp.**

Material examined: Kriva krusha vill., 27.09.2020, 1 w., leg. IG.

A single minor worker was collected by sweeping net and the lack of sufficient specimens did not allow correct species identification.

***Formica fusca* Linnaeus, 1758**

Material examined: Mrachenik vill., the grave of Hadzhi Dimitar, 11.08.2020, 10 w., leg. ALG.

***Formica gagates* Latreille, 1798**

Material examined: Hrishteni vill., 27.09.2020, 1 w., leg. ALG; same locality, 27.09.2020, 1 w., leg. IG.

***Formica cunicularia* Latreille, 1798**

Material examined: Zelenikovo vill. 2, 27-28.05.2018, 1 w., leg. TL; Momino vill. 1, 29.05.2018, 1 w., leg. TL; Domlyan dam, near Domlyan vill. 1, 10.08.2020, 6 w., leg. ALG; Svezhen vill. 1, 11.08.2020, 1 w., leg. ALG; Svezhen vill. 2, 11.08.2020, 1 w., leg. IG; Svezhen hut 1, 12.08.2020, 8 w., leg. ALG; Rozovets vill. 1, 12.08.2020, 5 w., leg. ALG; Kriva krusha vill., 27.09.2020, 4 w., leg. ALG.

***Formica rufibarbis* Fabricius, 1793**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 8 w., leg. ALG; Svezhen vill. 1, 11.08.2020, 3 w., leg. ALG; Novo selo vill., 13.08.2020, 5 w., leg. ALG; Turiya vill., 13.08.2020, 2 w., leg. ALG; Sarnevets vill., 14.08.2020, 1 w., leg. IG.

***Formica cinerea* Mayr, 1853**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 13 w., leg. ALG; Svezhen vill. 2, 11.08.2020, 3 w., leg. IG; Rozovo vill., 12.06.2016, 1 w., leg. IG; Srednogorovo vill., 13.08.2020, 4 w., leg. ALG; same locality, 13.08.2020, 3 w., leg. IG; Turiya vill., 13.08.2020, 5 w., leg. ALG.

***Formica pratensis* Retzius, 1783** (Fig. 1: 1)

Literature data: Stara Zagora (Gateva 1975)

Material examined: S from Kalofer, 05.08.2014, 10 w., leg. VA; Svezhen hut 1, 12.08.2020, 8 w., leg. ALG; Svezhen hut 3, 12.08.2020, 10 w., leg. ALG; Rozovets vill. 1, 12.08.2020, 3 w., leg. ALG.

***Formica rufa* Linnaeus, 1761** (Fig. 1: 2)

Material examined: Mrachenik vill., the grave of Hadzhi Dimitar, 11.08.2020, 15 w., leg. ALG; Svezhen hut 2, 12.08.2020, 10 w., leg. ALG.

***Polyergus rufescens* (Latreille, 1798)**

Material examined: Domlyan dam, near Domlyan vill. 1, 10.08.2020, 2 w., leg. ALG.

Fig. 1. 1: nest of *Formica pratensis* (Svezhen hut 1 locality), 2: nest of *Formica rufa* (Svezhen hut 2 locality).

Discussion

In total, 61 ant species from 32 localities were found with different sampling methods. They are about 30% of the Bulgarian myrmecofauna (Lapeva-Gjonova *et al.* 2010). We consider the number of ants should be higher in long-term studies as the geographical location, relief and climate are favourable for their high diversity. Additionally, few more species could exist in *Tetramorium caespitum* complex and *Messor semirufus* group. According to Wagner *et al.* (2017) there are 10 species in the *T. caespitum* complex in Europe, for the correct determination of some of which the study of the male genitalia is also necessary. The studied nest samples belong to at least two morphospecies, but none of them contained males to be identified. The *Messor semirufus* group from the Balkans needs thorough modern revision, given the large number of names of various rank (Bračko *et al.* 2016; Salata & Borowiec 2019).

Sarnena Sredna Gora Mts has a significant conservation value as *Formica rufa* and *F. pratensis* are considered as species of special conservation measures in Europe (IUCN 2021). They are recognized as Lower Risk /Near Threatened species and included in CORINE biotopes checklist (Annex 4). In addition, *F. rufa* is protected by the Bulgarian Biodiversity Act (2002), Annex 2 and 3.

The ant species found in this survey belong to three zoogeographical classes (according to Czechowski *et al.* 2012): Coniferous forest zone (9.8%), Mixed and deciduous forest zone (45.9%) and a zone of Semi-arid and arid areas (39.3%). The zoogeographical elements in Coniferous forest class are represented only by two: Boreo-montane (2 species) and North-Palaearctic (4 species). The rest elements are highly heterogenous and are shown on Fig. 2.

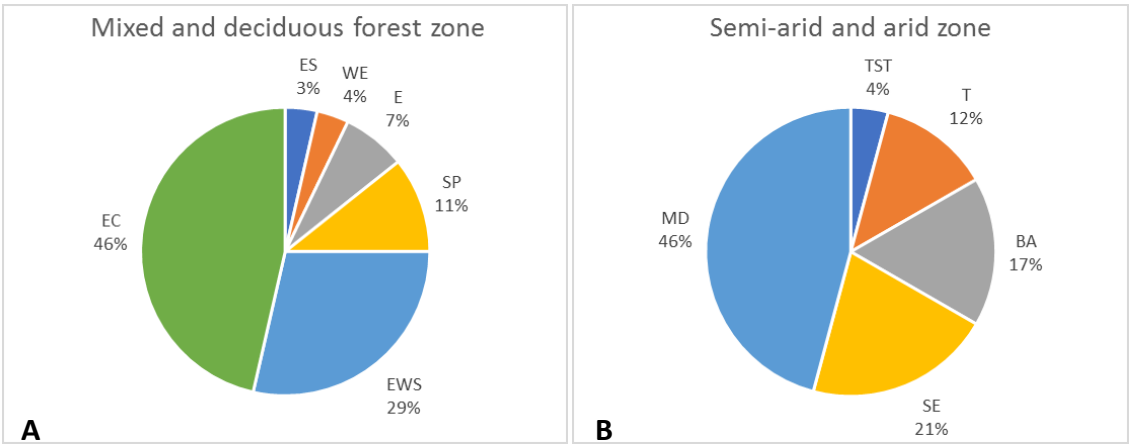

Fig. 2. Ant species by zoogeographical categories (in percentage). **A** - Mixed and deciduous forest class: EC (Euro-Caucasian), EWS (Euro-West-Siberian), SP (South-Palaearctic), E (European forests), WE (West-European) and ES (Euro-Siberian); **B** – Semi-arid and arid class: MD (Mediterranean), SE (South-European), BA (Balkan-Anatolian), T (Tethyan) and TST (Turano-Steppic).

Most of the species are Euro-Caucasian and Mediterranean. As the climate of Sarnena Sredna Gora Mts is transitional-continental, with strong submediterranean influence (Georgiev 2020), the findings of Mediterranean, South-European, South-Palaearctic and Balkan-Anatolian elements are expected. The high participation of Euro-Caucasian and Euro-West Siberian elements is related to the forests, mainly of oak and hornbeam, and in the higher parts of beech. Most likely, the mountain shares a common ant fauna with that of the neighboring Central Stara Planina Mts and Sashtinska Sredna Gora Mts.

Conclusion

The myrmecofauna of Sarnena Sredna Gora Mts is highly diverse of faunistical and zoogeographical aspect. Nevertheless, the number of ants should be higher in long-term research on larger area. The region contains two ant species with conservation significance.

Acknowledgements. We are grateful to I. Gjonov (Sofia University) for the material provided for the research. This work has been carried out in the framework of the National Science Program "Environmental Protection and Reduction of Risks of Adverse Events and Natural Disasters", approved by the Resolution of the Council of Ministers No577/17.08.2018 and supported by the Ministry of Education and Science (MES) of

Bulgaria (Agreement No Д01-363/17.12.2020) (for A. Lapeva-Gjonova) and STACCATO (BiodivERsA-FACCE2014-47 „SusTaining AgriCultural ChAnge Through ecological engineering and Optimal use of natural resources“) (for T. Ljubomirov).

References

Atanassov, N. & Dlussky, G. (1992) *Fauna Bulgarica. 22. Hymenoptera, Formicidae.* Bulgarian Academy of Sciences, Sofia, 310 pp. (in Bulgarian).

Bračko, G., Kiran, K., Karaman, C., Salata, S. & Borowiec, L. (2016) Survey of the ants (Hymenoptera: Formicidae) of the Greek Thrace. *Biodiversity Data Journal*, 4: e7945.

Bulgarian Biodiversity Act (2002) Darzhaven Vestnik 77(9): 49 (In Bulgarian).

Czechowski, W., Radchenko, A., Czechowska, W. & Vepsäläinen, K. (2012) *The ants of Poland with reference to the myrmecofauna of Europe*. Natura optima dux Foundation, Warszawa: 1-496.

Gateva, R. (1975) Morfologichna, biologichna I ekologichna harakteristika na mravkite ot rod *Formica*, sreshtasthi se v Balgaria. *Gorskostopanska Nauka*, 12 (6): 48–59. (in Bulgarian).

Georgiev, D. (2020) The habitats of Sarnena Gora Mountains: a short review. *In*: Georgiev, D., Bechev, D. & Yancheva, V. (Eds.) *Fauna of Sarnena Sredna Gora Mts, Part 1* ZooNotes, Supplement 9: pp. 28-30.

IUCN (2021) The IUCN Red List of Threatened Species. Version 2021-1. Available at: https://www.iucnredlist.org. (Accessed on 18 May 2021).

Lapeva-Gjonova, A., Antonova, V., Radchenko, A. & Atanasova, M. (2010) Catalogue of the ants (Hymenoptera: Formicidae) of Bulgaria. *ZooKeys,* 62, 1–124.

Salata, S. & Borowiec, B. (2019) Preliminary contributions toward a revision of Greek *Messor* Forel, 1890 (Hymenoptera: Formicidae). *Turkish Journal of Zoology*, 43: 52-67.

Seifert, B. (2016) Inconvenient hyperdiversity – the traditional concept of "*Pheidole pallidula*" includes four cryptic species (Hymenoptera: Formicidae). *Soil Organisms*, 88(1): 1-17.

Wagner, H.C., Arthofer, W., Seifert, B., Muster, Ch., Steiner, F.M. & Schlick-Steiner, B.C. (2017) Light at the end of the tunnel: Integrative taxonomy delimits cryptic species in the *Tetramorium caespitum* complex (Hymenoptera: Formicidae). *Myrmecological News,* 25, 95-129.

Wagner, H.C., Seifert, B., Borovsky, R. & Paill, W. (2018) First insight into the ant diversity of the Vjosa valley, Albania (Hymenoptera: Formicidae). *Acta ZooBot Austria*, 155, 315–321.

Georgiev, D., Bechev, D. & Yancheva, V. (Eds.)
Fauna of Sarnena Sredna Gora Mts, Part 2
ZooNotes, Supplement 10, 2021

Notes on jumping plant-lice (Hemiptera, Psylloidea) from the Sarnena Gora Mountains

MONIKA PRAMATAROVA*, IGOR MALENOVSKÝ**, ***, ILIA GJONOV*

**Department of Zoology and Anthropology, Faculty of Biology, Sofia University, Dragan Tzankov 8, 1164 Sofia, Bulgaria, monicapramatarova@gmail.com, gjonov@cicadina.com*
***Department of Botany and Zoology, Faculty of Science, Masaryk University, Kotlarska 2, 611 37 Brno, Czech Republic, malenovsky@sci.muni.cz*
****Department of Entomology, Moravian Museum, Zelný trh 6, 659 37 Brno, Czech Republic, imalenovsky@mzm.cz*

Abstract. Jumping plant-lice (Hemiptera, Sternorrhyncha, Psylloidea) are small phloem-feeding insects. With about 400 species distributed in Europe, the European fauna is considered well-studied. However, information on psyllids occurring in the eastern Balkan Peninsula is insufficient. So far, less than a hundred psyllid species are known for Bulgaria, most of which have been reported only from a few regions. Knowledge on the psyllid fauna of the Sarnena Sredna Gora Mountains in central Bulgaria is sparse and relatively old, with only a handful of recorded species. The aim of the present study is to summarise the information on Psylloidea from this region, including recently collected material kept in the zoological collection of Sofia University. A total of 17 species were found of which 7 species had been previously published and 10 species from 3 families are new to the region: *Aphalara freji* Burckhardt & Lauterer, 1997 (Aphalaridae), *Diaphorina lycii* Loginova, 1978, *Arytaina maculata* (Löw, 1886), *Cacopsylla bidens* (Šulc, 1907), *Cacopsylla melanoneura* (Foerster, 1848), *Cacopsylla pulchra* (Zetterstedt, 1838), *Livilla horvathi* (Scott, 1879), *Psylla foersteri* Flor, 1861 (all Psyllidae), *Bactericera modesta* (Foerster, 1848) and *Trioza rotundata* Flor, 1861 (Triozidae).

Key words: Psyllids, the Balkans, Bulgaria.

Introduction

Jumping-plant lice or psyllids are a group of phytophagous, phloem-feeding insects belonging to the suborder Sternorrhyncha (Hemiptera) with about 4000 described species worldwide (Burckhardt *et al.* 2021). They are usually highly host-specific. From Bulgaria, 99 species have been reported; however, the group is considered poorly known. Information on the psyllid fauna of the Sarnena Gora Mountains in central Bulgaria is sparse and relatively old, with only a few psyllid records. At the beginning of the last century, Joakimov (1909) published the first data on the jumping-plant lice in Bulgaria, including several species collected in the Sarnena Gora Mountains. Harizanov (1964) and Klimaszewski (1965) reported three more species. This brings the number of psyllid species published to date from Sarnena Gora to seven. The region was occasionally visited by the authors in recent years during their faunistic work on the Psylloidea of Bulgaria. The aim of the present study, which is part of a larger initiative on the faunistic survey of the Sarnena Gora Mountains (Georgiev *et al.* 2020), is to summarise the information on Psylloidea from this region, including the recently collected material.

Material and Methods

Recent material was collected using an entomological sweep net. Specimens were dry mounted and stored in the entomological collection of Sofia University. Identification was mainly based on Burckhardt (1984), Burckhardt & Hodkinson (1986), Burckhardt & Lauterer (1997a,b, 2002, 2006), Hodkinson & Hollis (1987) and Ossiannilsson (1992). The material of Psylloidea from the collection of Joakimov, kept in the National Museum of Natural History of the Bulgarian Academy of Sciences in Sofia, was reviewed, but the specimens from Sarnena Gora published by Joakimov (1909) were not found, so their original identification could not be verified. Even the specimens collected and published by Harizanov (1964), formerly at the Agricultural University in Plovdiv, have not survived to the present day (V. Harizanova, pers. comm.). The classification and nomenclature of Psylloidea follows Burckhardt *et al.* (2021) and Ouvrard (2021), the nomenclature of host plants is adopted from WFO (2021). The distribution of individual psyllid species in Bulgaria follows the morphostructural territorial classification of Hubenov (1997).

Results

Aphalaridae Löw, 1879

Aphalarinae Löw, 1879

Aphalara freji Burckhardt & Lauterer, 1997

Material examined. Domljan vill., N42°32'28.1" E24°56'28.6", 364 m a.s.l., 10.viii.2020, 3 ♀♀; Srednogorovo vill., N42°31'14.4" E25°20'10.8", 418 m a.s.l., 13.vii.2020, , 1♂, 3 ♀♀.
Known distribution in Bulgaria. Rila-Rhodopi Massif: Krupnik-Sandanski-Petrich Valley, Western Rhodopi Mts (Głowacka & Harizanov 1983; Klimaszewski 1965; both as *Aphalara polygoni*); Bulgaria, without precise locality data (Burckhardt 2004).
Comments. *Aphalara* is a difficult genus to identify because many species are similar in morphology. Many records published before Ossiannilsson (1992) and Burckhardt and Lauterer (1997b) were misidentified. Records of *Aphalara polygoni* Foerster, 1848 previously published for Bulgaria, with the host plant *Polygonum* sp. given, probably concern *A. freji* or *A. avicularis* Ossiannilsson, 1981 (cf. Burckhardt & Lauterer 1997b). *Aphalara freji* is widespread in the Palaearctic region (Burckhardt & Lauterer 1997b; Cho *et al.* 2017). First record for the region of Sarnena Gora.

Psyllidae Latreille, 1807

Diaphorininae Vondráček, 1951

Diaphorina lycii Loginova, 1978

Material examined. Kriva krusha vill., N42°32'52.0" E25°52'41.5", 438 m a.s.l., 27.ix.2020, 5 ♂♂, 5 ♀♀.
Known distribution in Bulgaria. Black Sea coast: Northern Black Sea coast, Southern Black Sea coast (Loginova 1978); Rila-Rhodopi Massif: Western Rhodopi Mts (Nakabachi *et al.* 2020).
Comments. *Diaphorina lycii* is associated with several host species of the genus *Lycium* in southern Europe, North Africa, Caucasus, Middle East, Central Asia and Mongolia (Burckhardt 1984). In Bulgaria, it occurs on *Lycium barbarum* (Loginova 1978). First record for the region of Sarnena Gora.

Psyllinae Latreille, 1807

***Arytaina maculata* (Löw, 1886)**

Material examined. Chavdar hut, N42°45'23.0" E23°56'41.2", 1145 m a.s.l., 17.viii.2020, 1 ♂, 2 ♀♀.

Known distribution in Bulgaria. Rila-Rhodopi Massif: Krupnik-Sandanski-Petrich Valley (Głowacka 1989), Mesta Valley (Klimaszewski 1970), Pirin Mt. (Głowacka 1989), Western Rhodopi Mts (Głowacka & Harizanov 1983; Klimaszewski 1965).

Comments. On *Cytisus* spp. in central and southern parts of Europe (Hodkinson & Hollis 1987; Malenovský *et al.* 2011). First record for the region of Sarnena Gora.

Fig. 1. *Diaphorina lycii* Loginova, 1978 – adult, Bjaga vill., 15.04.2017, photo I. Gjonov.

***Cacopsylla bidens* (Šulc, 1907)**

Material examined. Novo selo vill., N42°29'12.1" E25°30'34.7", 457 m a.s.l., 13.viii.2020, 1 ♀.

Known distribution in Bulgaria. Transitional region: Kraishte-Konyavo district, Sofia Basin (Etropolska *et al.* 2015); Rila-Rhodopi Massif: Krupnik-Sandanski-Petrich Valley (Głowacka 1989).

Comments. The species is widespread in southern and central Europe, North Africa, southwestern and Central Asia, India, and it was introduced to South America (Cho *et al.* 2020; Valle *et al.* 2017). It develops on *Pyrus communis*, *P. pyraster* and *P. syriaca* (Burckhardt & Hodkinson 1986). First record for the region of Sarnena.

***Cacopsylla crataegi* (Schrank, 1801)**

Published records. Straldzhansko marsh, N42°37'20.3" E26°45'54.0", viii.1905 (Joakimov 1909).
Material examined. 11.viii.2020, Svezhen vill., Hadzhi Dimitar place, N42°30'28.2" E25°0'1.4", 879 m a.s.l., 1 ♂; 17.viii.2020, Chavdar hut, N42°45'23.0" E23°56'41.2", 1145 m a.s.l., 1 ♂, 1 ♀.
Known distribution in Bulgaria. Transitional region: Podbalkan Basins (Joakimov 1909), Sofia Basin (Joakimov 1909); Rila-Rhodopi Massif: Krupnik-Sandanski-Petrich Valley (Joakimov 1909), Western Rhodopi Mts (Klimaszewski 1965).
Comments. On *Crataegus* spp., widespread in the Palearctic region (Ossiannilsson 1992).

***Cacopsylla melanoneura* (Foerster, 1848)**

Material examined. Chavdar hut, N42°45'23.0" E23°56'41.2", 1145 m a.s.l., 17.viii.2020, 1 ♂, 3 ♀♀.
Known distribution in Bulgaria. Danubian Plain: Popovo-Provadiya district (Joakimov 1909); Stara Planina Range system: Middle Predbalkan (Klimaszewski 1970); Transitional region: Kraishte-Konyavo district, Sofia Basin, Thracian Lowland (Etropolska *et al.* 2015, Joakimov 1909); Rila-Rhodopi Massif: Mesta Valley (Klimaszewski 1970), Pirin Mt. (Głowacka 1989; Klimaszewski 1970), Western Rhodopi Mts (Głowacka & Harizanov 1983; Harizanov & Lauterer 1968; Klimaszewski 1965).
Comments. The species is widespread in Europe, North Africa, Caucasus, Middle East, Russia and Mongolia (Ouvrard 2021). It has been also reported from most main regions in Bulgaria. The host plants belong to the genera *Crataegus*, *Malus*, *Mespilus* and *Pyrus* (Ossiannilsson 1992). A vector of the apple proliferation phytoplasma (Jarausch *et al.* 2019). First record for the region of Sarnena Gora.

***Cacopsylla peregrina* (Foerster, 1848)**

Published records. Straldzhansko marsh, N42°37'20.3" E26°45'54.0", viii.1905 (Joakimov 1909).
Material examined. Mrachenik vill., Hadzhi Dimitar place, N42°31'4.8" E24°59'14.3", 11.viii.2020, 940 m a.s.l., 1 ♂; Chavdar hut, N42°45'23.0" E23°56'41.2", 1145 m a.s.l., 17.viii.2020, 9 ♂♂, 3 ♀♀.
Known distribution in Bulgaria. Transitional region: Sushtinska Sredna Gora Mts (Joakimov 1909), Podbalkan Basins Sofia Basin (Nokkala *et al.* 2003); Rila-Rhodopi Massif: Krupnik-Sandanski-Petrich Valley, Western Rhodopi Mts (Głowacka & Harizanov 1983).
Comments. Common species across Europe, oligophagous on *Crataegus* spp. (Lauterer 1999).

***Cacopsylla picta* (Foerster, 1848)**

Published records. Stara Zagora, N42°25'28.8" E25°37'32.3", 1962 (Harizanov 1963).
Known distribution in Bulgaria. Black Sea coast: Northern Black Sea coast (Harizanov 1963, 1966a), Southern Black Sea coast (Harizanov 1963, 1966a); Stara Planina Range system: Middle Stara Planina Mts (Balkan) (Harizanov 1966a); Transitional region: Kraishte-Konyavo district (Etropolska *et al.* 2015, Harizanov 1966a), Sofia Basin (Etropolska *et al.* 2015), Thracian Lowland (Harizanov 1963, 1966a); Rila-Rhodopi Massif: Boboshevo-Simitli Valley (Harizanov 1966a), Western Rhodopi Mts (Głowacka & Harizanov 1983).

Comments. Widespread in Europe and Turkey, a vector of the apple proliferation phytoplasma (Drohojowska & Burckhardt 2014; Jarausch *et al.* 2019). In Bulgaria, it is considered as a pest on *Malus* spp. and it was studied by Harizanov (1966a).

Cacopsylla pulchra (Zetterstedt, 1838)

Material examined. Chavdar hut, N42°45'23.0" E23°56'41.2", 1145 m a.s.l., 17.viii.2020, 1 ♂.
Known distribution in Bulgaria. Transitional region: Kraishte-Konyavo district (Percy & Cronk 2020); Rila-Rhodopi Massif: Krupnik-Sandanski-Petrich Valley (Percy & Cronk 2020), Western Rhodopi Mts (Głowacka & Harizanov 1983).
Comments. Widespread in the Palearctic region, associated with many *Salix* spp. (Percy & Cronk 2020, Lauterer 1999). First record for the region of Sarnena Gora.

Cacopsylla pyrisuga (Foerster, 1848)

Published records. Strjama vill., N42°15'46.6" E24°52'43.7, 1961-1965 (Harizanov 1964); Borets vill., N42°20'43.1" E24°55'55.2", 1961-1965 (Harizanov 1964); Dolna Mahala vill., N42°24'59.2" E24°46'52.7", 1961-1965 (Harizanov 1964).
Known distribution in Bulgaria. Danubian Plain: Popovo-Provadiya district (Harizanov 1963); Black Sea coast: Northern Black Sea coast (Harizanov 1963), Southern Black Sea coast (Harizanov 1963); Stara Planina Range system: Eastern Stara Planina Mts (Balkan), Eastern Predbalkan (Harizanov 1963); Transitional region: Bakadzhik-Bourgas district (Harizanov 1963), Sushtinska Sredna Gora Mts (Harizanov 1966b; Joakimov 1909), Podbalkan Basins (Etropolska *et al.* 2015, Harizanov 1963), Kraishte-Konyavo district, Sofia Basin (Etropolska *et al.* 2015); Thracian Lowland (Harizanov 1966b); Sofia Basin (Joakimov 1909; Klimaszewski 1965); Rila-Rhodopi Massif: Pirin Mt. (Głowacka 1989), Rila Mt. (Joakimov 1909); Eastern Rhodopi Mts (Harizanov 1963).
Comments. Widespread in the western Palearctic region (Cho *et al.* 2020); associated with *Pyrus communis*, *P. amygdaliformis* and *P. salicifolia* (Burckhardt & Hodkinson 1986).

Livilla horvathi (Scott, 1879)

Material examined. Svezhen vill., marshy biotope, N42°30'48.5" E25°3'22.4", 1078 m a.s.l., 12.viii.2020, 2 ♀♀.
Known distribution in Bulgaria. Rila-Rhodopi Massif: Mesta Valley (Głowacka 1989), Western Rhodopi Mts (Głowacka & Harizanov 1983; Klimaszewski 1965).
Comments. Distributed in the eastern parts of Europe as well as Italy and Turkey; known host plants are *Cytisus austriacus* and *Genista tinctoria* (Hodkinson & Hollis 1987; Drohojowska & Burckhardt 2014, Seljak 2020). First record for the region of Sarnena Gora.

Fig. 2. *Livilla horvathi* (Scott, 1879) – adult, Gaberovo vill., 01.05.2019, photo I. Gjonov.

***Psylla foersteri* Flor, 1861**

Material examined. Turia vill., N42°34'7.8" E25°10'17.3", 412 m a.s.l., 13.viii.2020, 3♂♂, 1♀; Srednogorovo vill., N42°31'14.4" E25°20'10.8", 418 m a.s.l., 13.viii.2020, 6 ♂♂, 8 ♀♀.
Known distribution in Bulgaria. Transitional region (Joakimov 1909); Rila-Rhodopi Massif: Krupnik-Sandanski-Petrich Valley (Głowacka 1989; Głowacka & Harizanov 1983; Klimaszewski 1965).
Comments. Widespread in the western Palearctic region, associated with *Alnus glutinosa* and *A. incana* (Ossiannilsson 1992, Ouvrard 2021). First record for the region of Sarnena Gora.

Triozidae Löw, 1879

***Bactericera modesta* (Foerster, 1848)**

Material examined. Rozovets vill., N42°29'50.676", E25°6'38.592", 1005 a.s.l., 13.viii.2020, 1 ♀.
Known distribution in Bulgaria. Rila-Rhodopi Massif: Western Rhodopi Mts (Głowacka & Harizanov 1983); Bulgaria, without precise locality data (Burckhardt & Lauterer 1997a).
Comments. The species is widespread in the western Palearctic region and Mongolia and associated with *Sanguisorba minor* and *S. officinalis* (Burckhardt & Lauterer 1997a). First record for the region of Sarnena Gora.

***Eryngiofaga dlabolai* (Vondráček, 1957)**

Published records. Turia vill., N42°34'21.6", E25°10'55.2", ix. 1905, (Joakimov, 1909, as *Trioza mesomela* Flor, 1861).
Material examined. Domljan vill., N42°32'28.1" E24°56'28.6", 364 m a.s.l., 10.viii.2020, 1 ♀; Kriva krusha vill., N42°32'52.0" E25°52'41.5", 438 m a.s.l., 27.ix.2020, 2 ♀♀.
Known distribution in Bulgaria. Transitional region: Podbalkan Basins (Joakimov 1909).
Comments. The record of *Trioza mesomela* Flor, 1861 (now *Eryngiofaga mesomela*) published by Joakimov (1909) is attributed here to *E. dlabolai*, based on the identification of recently collected material. *Eryngiofaga dlabolai* has been reported from eastern Europe and Caucasus and is associated with *Eryngium campestre* (Loginova 1977).

Fig. 3. *Eryngiofaga dlabolai* (Vondráček, 1957) – adults and immatures, Brjagovec vill., 06.09.2016, photo I. Gjonov.

***Phylloplecta trisignata* (Löw, 1886)**

Published records. Turia vill., N42°34'21.6", E25°10'55.2", ix. 1905 (Joakimov, 1909).
Known distribution in Bulgaria. Transitional region: Podbalkan Basins (Joakimov 1909); Rila-Rhodopi Massif: Krupnik-Sandanski-Petrich Valley (Głowacka 1989).
Comments. On *Rubus* spp., widespread in southern Europe and Turkey (Conci & Tamanini 1984, Drohojowska & Burckhardt 2014).

***Trioza galii* Foerster, 1848**

Published records. Stara Zagora, N42°25'28.8" E25°37'32.3", 200 m a.s.l., 08.vi.1959, 2 ♀♀ (Klimaszewski 1965).

Known distribution in Bulgaria. Transitional region: Thracian Lowland (Klimaszewski 1965); Rila-Rhodopi Massif: Eastern Rhodopi Mts (Klimaszewski 1965).
Comments. The *Trioza galii* complex was recently revised by Burckhardt & Lauterer (2006). The material recorded from Bulgaria by Klimaszewski (1965) has to be revised as it may belong to *T. galii*, *T. velutina* or both species which are associated with Rubiaceae, mainly *Galium* and *Asperula* spp. (Burckhardt & Lauterer 2006).

***Trioza rotundata* Flor, 1861**

Material examined. Chavdar hut, N42°45'23.0" E23°56'41.2", 1145 m a.s.l., 17.viii.2020, 1 ♀.
Known distribution in Bulgaria. Rila-Rhodopi Massif: Pirin Mt. (Głowacka 1989; Głowacka & Harizanov 1983), Western Rhodopi Mts (Głowacka & Harizanov 1983; Harizanov & Lauterer 1968); Bulgaria, without precise locality data (Burckhardt & Lauterer 2002).
Comments. Host plants of *T. rotundata* are *Cardamine* species (Burckhardt & Lauterer 2002). First record for the region of Sarnena Gora.

Fig. 4. *Phylloplecta trisignata* – adult, Novi han vill., 21.08.2016, photo I. Gjonov.

Fig. 5. *Phylloplecta trisignata* – immature, Novi han vill., 21.08.2016, photo I. Gjonov.

Discussion

A total of 17 species were found in Sarnena Gora. Ten species from 3 families are new to the region. So far, four of them, viz. *Aphalara freji*, *Arytaina maculata*, *Livilla horvathi* and *Bactericera modesta*, had been known in Bulgaria only from the region of the Rila-Rhodopes Massif. Most other species currently known from Sarnena Gora are quite widespread in Europe or at least in its southern or eastern parts and they have been also reported from several other regions of Bulgaria (Etropolska *et al.* 2015, Joakimov 1909; Harizanov 1963, 1966a,b; Klimaszewski 1965, 1970; Harizanov & Lauterer 1968; Loginova 1978; Głowacka & Harizanov 1983; Głowacka 1989; Nokala *et al.* 2003; Nakabachi *et al.* 2020; Percy & Cronk 2020).

With 17 species recorded so far, the psyllid fauna of Sarnena Gora is still poorly studied. In comparison, the number of known species from the well-studied Western Rhodope subregion is 62 (Głowacka 1989). We assume that after more detailed field work many more species will be found due to the great diversity of habitats and flora in the mountains.

Acknowledgements. Igor Malenovský was supported through long-term conceptual development program for research institutions (MK000094862, to Moravian Museum, Brno) by the Ministry of Culture of the Czech Republic.

References

Burckhardt, D. (1984) The Mediterranean species of Diaphorina Loew (Homoptera, Psylloidea). *Phytophaga* 2: 1–30.

Burckhardt, D. (2004) Fauna Europaea: Psylloidea. Fauna Europaea version 1.0, http://www.faunaeur.org.

Burckhardt, D. & Hodkinson, I. (1986) A revision of the west Palearctic pear psyllids (Hemiptera: Psyllidae). *Bulletin of Entomogical Research* 76: 119–132.

Burckhardt, D. & Lauterer, P. (1997a) A taxonomic reassessment of the triozid genus Bactericera (Hemiptera: Psylloidea). *Journal of Natural History* 31: 99–153.

Burckhardt, D. & Lauterer, P. (1997b) Systematics and biology of the Aphalara exilis (Weber and Mohr) species assemblage (Hemiptera, Psyllidae). *Entomologica scandinavica* 28: 271–305.

Burckhardt, D. & Lauterer, P. (2002) Revision of the Central European Trioza rotundata (Hemiptera, Psylloidea): taxonomy and bionomy. *Bulletin de La Société Entomologique Suisse* 75: 21–34.

Burckhardt, D. & Lauterer, P. (2006) The Palaearctic triozids associated with Rubiaceae (Hemiptera, Psylloidea): A taxonomic re-evaluation of the Trioza galii Foerster complex. *Revue Suisse de Zoologie* 113: 269–286.

Burckhardt, D., Ouvrard, D. & Percy, D. (2021) An updated classification of the jumping plant-lice (Hemiptera: Psylloidea) using molecular and morphological evidence. *European Journal of Taxonomy* 736: 137–182.

Cho, G., Burckhardt, D.H. & Lee, S. (2017) On the taxonomy of Korean jumping plant-lice (Hemiptera: Psylloidea). *Zootaxa* 4238: 531–561.

Cho, G., Malenovský, I., Burckhardt, D., Inoue, H. & Lee, S. (2020) DNA barcoding of pear psyllids (Hemiptera: Psylloidea: Psyllidae), a tale of continued misidentifications. *Bulletin of Entomological Research* 110: 521–534.

Conci, C. & Tamanini, L. (1984) Phylloplecta trisignata (Low, 1886), host plant Rubus sp., of the complex Rubi Corylifolii (Homoptera: Psylloidea). *Studi Trentini di Scienze Naturali* 61: 249–261.

Drohojowska, J. & Burckhardt, D. (2014) The jumping plant-lice (Hemiptera: Psylloidea) of Turkey: A checklist and new records. *Turkish Journal of Zoology* 38: 559–568.

Etropolska, A., Jarausch, W., Jarausch, B. & Trenchev, G. (2015) Detection of European fruit tree phytoplasmas and their insect vectors in important fruit-growing regions in Bulgaria. *Bulgarian Journal of Agricultural Science* 21: 1248–1253.

Georgiev, D., Bechev, D. & Yancheva, V. (2020) Fauna of Sarnena Sredna Gora Mts, Part 1. *Zoonotes* 9: 184 pp.

Głowacka, E. (1989) Jumpin plant-lice (Homaptera: Psylloidea) of the Pirin Mountains (Bulgaria). *Acta Biologica Silesiana* 13: 14–19.

Głowacka, E. & Harizanov, A. (1983) The jumping plant lice (Homoptera, Psylloidea) from Western Rodope Mountains (Bulgaria). *Acta Biologica Katowice* 12: 62–69.

Harizanov, A. (1963) [Jumping plan-lice on fruit trees in Bulgaria]. *Priroda [Nature]* 12: 91–97.

Harizanov, A. (1964) [Jumping plan-lice on fruit trees]. *Ovoshtarstvo [Pomology]*, 30–33.

Harizanov, A. (1966a) [Biological studies on southern apple jumping plant-lice — Psylla costalis Flor.]. *Landwirtschaftlichen Hochschule „Wassil Kolarow“ Plowdiw, Bulgarien* 15: 261–270.

Harizanov, A. (1966b) [Physiological changes in pear leaves damaged by the larvae of Psylla pyri L.]. *Priroda [Nature]* 4: 52–54.

Harizanov, A. & Lauterer, P. (1968) Beitrag zur fauna der Blattflöhe (Homoptera-Psylloidea) in Bulgarien. *Landwirtschaftlichen Hochschule „Wassil Kolarow" Plowdiw, Bulgarien* 17: 139–145.

Hodkinson, I. & Hollis, D. (1987) The legume-feeding psyllids (Homoptera) of the West Palaearctic Region. *Bulletin of the British Museum (Natural History)* 56: 1–86.

Hubenov, Z. (1997) Possibilities for using of a system from the really defined natural territories for the faunistic researches in Bulgaria. *Acta Zoologica Bulgarica* 49: 5–9.

Jarausch, B., Tedeschi, R., Sauvion, N., Gross, J. & Jarausch, W. (2019) Psyllid vectors. *Pp. 53–78. In: Bertaccini, A. et al. (eds.), Phytoplasmas: Plant Pathogenic Bacteria - II: Transmission and Management of Phytoplasma - Associated Diseases*, 53–78.

Joakimov, D. (1909) [On the Fauna of Hemiptera of Bulgaria]. *[Collection of folklore, science and literature]* 25: 1–34.

Klimaszewski, S. (1965) Psyllidologische Notizen XII— XIV (Homoptera). *Annales Zoologici* 23: 195–209.

Klimaszewski, S. (1970) Psyllidologische Notizen XVIII—XX (Homoptera). *Annales Zoologici* 27: 417–428.

Lauterer, P. (1999) Results of the investigations on Hemiptera in Moravia, made by the Moravian museum (Psylloidea 2). *Acta Musei Moraviae, Scientiae Biologicae (Brno)* 84: 71–151.

Loginova, M. (1978) New species of psyllids (Homoptera, Psylloidea). *Trudy Zoologicheskogo Instituta* 61: 30–123.

Loginova, M.M. (1977) A review of the genus Eryngiofaga Klimasz. (Triozidae, Homoptera). *Zoologicheskii Zhurnal* 56: 510–521.

Malenovský, I., Baňař, P. & Kment, P. (2011) A contribution to the faunistics of the Hemiptera (Cicadomorpha, Fulgoromorpha, Heteroptera, and Psylloidea) associated with dry grassland sites in southern Moravia (Czech Republic). *Acta Musei Moraviae, Scientiae Biologicae (Brno)* 96: 41–187.

Nakabachi, A., Malenovský, I., Gjonov, I. & Hirose, Y. (2020) 16S rRNA Sequencing Detected Profftella, Liberibacter, Wolbachia, and Diplorickettsia from Relatives of the Asian Citrus Psyllid. *Microbial Ecology* 80:410-422.

Nokkala, S., Grozeva, S., Kuznetsova, V. & Maryańska-Nadachowska, A. (2003) The origin of the achiasmatic XY sex chromosome system in Cacopsylla peregrina (Frst.) (Psylloidea, Homoptera). *Genetica* 119: 327–332.

Ossiannilsson, F. (1992) The Psylloidea (Homoptera) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* 26: 347.

Ouvrard, D. (2021) Psyl'list - The World Psylloidea Database. http://www.hemiptera-databases.com/psyllist. Accessed on 6 December 2021.

Percy, D. & Cronk, Q. (2020) Salix transect of Europe: patterns in the distribution of willow-feeding psyllids (Hemiptera: Psylloidea) from Greece to Arctic Norway. *Biodiversity Data Journal* 8: 1–20.

Seljak, G. (2020) Jumping plant-lice of Slovenia (Insecta: Hemiptera: Psylloidea). *Journal of the Slovenian Museum of Natural History, Ljubljana* 98: 1–224.

Valle, D., Burckhardt, D., Mujica, V., Zappolo, R. & Morelli, E. (2017) The occurrence of the Pear Psyllid, Cacopsylla bidens (Šulc, 1907) (Insecta: Hemiptera: Psyllidae), in Uruguay. *Check list* 13: 2088.

WFO (2021) World Flora Online. Published on the Internet; http://www.worldfloraonline.org. Accessed on: 06 Dec 2021.