Acta entomologica serbica, 2020, 25(1): 55-65

UDC: 630*453:582.637.1(497.11)
DOI: 10.5281/zenodo.3765876

NEW DATA ON THE DISTRIBUTION OF PHLOEMO-XYLOPHAGOUS INSECTS OF SMOOTH-LEAVED ELM (*ULMUS MINOR* MILL.) AND THEIR PARASITOIDS AND PREDATORS IN SERBIA

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Abstract

In a study of the fauna of phloemo-xylophagous insects on *Ulmus minor* and their parasitoids and predators in Serbia, new data were obtained on the distribution of the recorded species. Some of these data have been published, but many have not. These unpublished data are presented in this paper, which contains a list of 45 species from two orders, 13 families and 41 genera (16 phloemo-xylophagous species, 24 species of parasitoids and five species of predators). For each of them, data are presented regarding the place and time of their finding.

KEY WORDS: fauna, bark borer, wood borer, collection

Introduction

Smooth-leaved elm was once a frequently encountered tree species in Serbia. However, due to the appearance of Dutch elm disease, it started to die out rapidly (Maksimović, 1986; Manojlović *et al.,* 2001). For this reason, old trees with a large stem diameter (40-50 cm) are virtually non-existent in our forests and young trees die out on a massive scale (Marković & Stojanović, 2012). These dry, dead trees are very soon inhabited by phloemo-xylophagous insects and their parasitoids and predators. About 20 years ago, they were intensively investigated in Serbia (Stojanović & Marković, 2007; Marković & Stojanović, 2012). One of the goals of those studies was to compile a list of phloemo-xylophagous species on *Ulmus minor* Mill. and their parasitoids and predators in Serbia. In the course of these studies, many new data were obtained on the distribution of the recorded species. Some of the data have been published (Marković *et al.,* 1997; Marković

& Stojanović, 1997, 2000a, 2000b, 2015); however, many have not. These unpublished data are presented in this paper.

Materials and method

Adults of the species mentioned in this paper were obtained from material collected during the period from 1993 to 2003 at 12 localities in Serbia (Table I). *Ulmus minor* trees inhabited by the larvae and pupae of phloemo-xylophagous insects were found at each of the given localities. Pieces 30-40 cm long and 3-15 cm in diameter were cut from the trees. In the laboratory, the pieces were placed in emergence boxes, which were kept in an insectarium under field conditions. During the flight of adult insects, the emergence boxes were examined daily. The emerged insects were collected, killed by ether, prepared, identified and deposited in the insect collection of the Department of Forest Protection of Belgrade University´s Faculty of Forestry. Insect species were identified by Č. Marković and A. Stojanović (Coleoptera); and by A. Stojanović and M. Brajković (Hymenoptera).

Samples of the wood from which adults of the listed species were obtained were collected by Č. Marković and A. Stojanović.

Table I. Localities on which the research was conducted.

No.	Locality	GPS coordinates
1	Aleksinac, Donji Adrovac	43°30' N, 21°39' E
2	Aleksinac, Vakup	43°33' N, 21°42' E
3	Belgrade, Ada Ciganlija	44°47' N, 20°22' E
4	Belgrade, Arboretum of the Faculty of Forestry	44°46' N, 20°25' E
5	Belgrade, Košutnjak	44°46' N, 20°25' E
6	Belgrade, Senjak	44°47' N, 20°25' E
7	Belgrade, Stepin Gaj	44°44' N, 20°32' E
8	Goč	43◦33' N, 20◦53' E
9	Kosmaj	44◦27' N, 20◦33' E
10	Obrenovac, Mala Moštanica	44°39' N, 20°17' E
11	Obrenovac, Zabran	44◦39' N, 20◦13' E
12	Progar, Bojčinska forest	44◦43' N, 20◦09' E

Results and Discussion

A total of 60 species of insects (22 phloemo-xylophagous species, 33 parasitoid species and 5 predatory species) were obtained by rearing in an insectarium. All of them are mentioned in the paper of Marković & Stojanović (2012). For 45 species from two orders, 13 families and 41 genera (16 phloemo-xylophagous species, 24 species of parasitoids and 5 species of predators), some or all of the obtained data on distribution had not been published. These unpublished data are presented in this paper. Some of them refer to species that are widely distributed in Serbia [*Clytus arietis* (Linnaeus, 1758), *Glaphyra umbellatarum* (Schreber, 1759), *Leiopus nebulosus* (Linnaeus, 1758) and *Ropalopus macropus* (Germar, 1824) (Coleoptera, Cerambycidae); *Scolytus multistriatus* (Marsham, 1802) (Coleoptera, Curculionidae); *Dendrosoter protuberans* (Nees, 1834) and *Ecphylus silesiacus* (Ratzeburg, 1848) (Hymenoptera:

Braconidae); *Entedon ergias* Walker, 1839 (Hymenoptera: Eulophidae); *Eurytoma morio* Boheman, 1836 (Hymenoptera: Eurytomidae); and *Cheiropachus quadrum* (Fabricius, 1787) (Hymenoptera: Pteromalidae) (Maksimović, 1986; Manojlovic *et al.,* 2000, 2001, 2003, Marković, 2005, 2013; Plećaš & Pavićević, 2007; Gnjatović & Žikić, 2010; Ilić *et al.,* 2013; Ilić & Ćurčić, 2013; Dobrosavljević & Mihajlović, 2014; Vukajlović & Živanović, 2014, 2015; Marković & Stojanović, 2015, 2019). However, most of the data in question refers to species still insufficiently faunistically investigated in Serbia.

The following species were recorded for the first time for the fauna of Serbia in the course of these investigations: *Doryctes striatellus* (Nees, 1834), *Eubazus augustinus* (Ruthe, 1867) and *Spathius phymatodis* Fischer, 1966 (Hymenoptera: Braconidae); *Parablastothrix plugarui* Trjapitzin, 1971 (Hymenoptera: Encyrtidae); *Entedon armigerae* Graham, 1971 and *Euderus agrili* Bouček, 1963 (Hymenoptera: Eupholidae); *Aximopsis nodularis* (Boheman, 1836) (Hymenoptera: Eurytomidae); *Cerocephala eccoptogastri* Masi, 1921 and *Heydenia pretiosa* Förster, 1856 (Hymenoptera: Pteromalidae); and *Cryptolestes ferrugineus* (Stephens, 1831) (Coleoptera: Laemophloeidae) (Maksimović, 1986; Manojlović *et al.,* 2000, 2001, 2003; Marković & Stojanović, 2001, 2003, 2019; Noyes, 2003; Ilić, 2005; Marković, 2005, 2013, 2015; Belokobylskij & Žikić, 2009; Žikić *et al.,* 2010; de Jong *et al.,* 2014). It is important to state that there exist collections in Serbia about which all data have not yet been published (the collections of Belgrade University's Faculty of Forestry, the Natural History Museum in Belgrade, Dr. Ljubodrag Mihajlović and that of Dr. Vladimir Žikić). It is therefore possible that they contain findings of the listed species that are older than those published in the present paper.

According to Marković & Stojanović (2012), among the obtained phloemo-xylophagous insects, the most frequently encountered and abundant species were *Exocentrus punctipennis* Mulsant & Guillebeau, 1856 (Coleoptera: Cerambycidae); and *Magdalis armigera* (Geoffroy, 1785), *Scolytus ensifer* Eichhoff, 1881, *S. kirschii* Skalitzky, 1876, *S. multistriatus* (Marsham, 1802) and *S. pygmaeus* (Fabricius, 1787) (Coleoptera: Curculionidae). The most frequently encountered parasitoids were the species *D. protuberans* (Nees, 1834), *E. silesiacus* (Ratzeburg, 1848), *E. augustinus* (Ruthe, 1867) and *S. rubidus* (Rossi, 1794) (Hymenoptera, Braconidae); *E. ergias* Walker, 1839) (Hymenoptera: Eulophidae); *E. morio* Boheman, 1836 (Hymenoptera: Eurytomidae); and *Acrocormus semifasciatus* Thomson, 1878, *C. quadrum* (Fabricius, 1787) and *Raphitelus maculatus* Walker, 1834 (Hymenoptera: Pteromalidae). It was impossible to ascertain the frequency and abundance of predators because many of them escaped during sample collection and transport to the laboratory, so that the method employed to calculate abundance and frequency could not be used on them.
Apart from *U. minor*, phloemo-xylophagous insects and their parasitoids and predators in Serbia have also been studied in detail on *Quercus cerris* L, *Q. frainetto* Tenore, *Q. petraea* (Mattuschka) Lieblein and *Q. robur* L. (Marković & Stojanović, 2011, 2019). Because the studies were carried out on stems with a similar diameter (1-15 cm), the number of species recorded on the indicated tree species can be compared. In doing this, it is easy to conclude that the greatest number of phloem-xylophagous insects (21) was recorded on *U. minor* (*Q. petraea* 21, *Q. robur* 16, *Q. cerris* 14, *Q. frainetto* 14), the greatest number of their parasitoids (33) was also recorded on it (*Q. cerris* 26, *Q. petraea* 26, *Q. frainetto* 21, *Q. robur* 19), while the greatest number of predators (8) was recorded on *Q. frainetto* (*Q. cerris* 6, *Q. petraea* 6, *Q. robur* 5, *U. minor* 5).

Previously unpublished data on the distribution of the obtained species are presented in the list that follows. In it, all members of the group to which they belong (phloem-xylophagous insects, parasitoids, and predators) are listed in alphabetical order. Names are taken from the databases of Noyes (2003) and de Jong (2014). The locality where they were found, the date of finding and the host on which they were found are given for each species.

Because imagoes of all insect species were obtained by rearing in an insectarium, it is important to state that the dates given in the list do not refer to the time when they flew out in the insectarium, but rather to the time when the plant material from which they were obtained was collected in the field.

List of identified insect species

Phloemo-xylophagous insects

Order Coleoptera

Family Anobiidae

Gastrallus laevigatus (Olivier, 1790)

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*.

Ptinomorphus regalis (Duftschmid, 1825)

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*.

Family Bostrichidae

Xylopertha retusa (Olivier, 1790)

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*; Kosmaj, 30.11.1994, *U. minor*.

Family Buprestidae

Anthaxia deaurata (Gmelin, 1790)

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*.

A. manca (Linnaeus, 1767)

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*; Belgrade, Košutnjak, 03.02.1996, *U. minor*; Goč, 13.05.1996, *U. minor*; Kosmaj, 30.11.1994, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Progar, Bojčinska forest, 10.04.1994, *U. minor*.

Ovalisia mirifica (Mulsant, 1855)

Goč, 13.05.1996, *U. minor*; Kosmaj, 16.01.1996, *U. minor*.

Family Cerambycidae

Clytus arietis (Linnaeus, 1758)

Progar, Bojčinska forest, 10.04.1994, *U. minor*.

Exocentrus punctipennis Mulsant & Guillebeau, 1856

Aleksinac, Donji Adrovac, 13.08.1996, *U. minor*; Aleksinac, Vakup, 18.08.1994, *U. minor*; Belgrade, Ada Ciganlija, 13.07.1995, 03.02.1996, *U. minor*; Belgrade, Košutnjak, 03.02.1996, 10.03.1997, *U. minor*; Belgrade, Senjak, 18.03.1996, *U. minor*; Goč, 13.05.1996, *U. minor*; Kosmaj, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Progar, Bojčinska forest, 10.04.1994, 17.04.1994, *U. minor.*

Glaphyra umbellatarum (Schreber, 1759)

Progar, Bojčinska forest, 17.04.1994, *U. minor*.

Leiopus nebulosus (Linnaeus, 1758)

Belgrade, Košutnjak, 03.02.1996, *U. minor*.

Neoclytus acuminatus (Fabricius, 1775)

Belgrade, Ada Ciganlija, 13.07.1995, *U. minor*; Belgrade, Košutnjak, 03.02.1996, 10.03.1997, *U. minor*.

Pogonocherus fasciculatus (De Geer, 1775)

Belgrade, Košutnjak, 10.03.1997, *U. minor*.

Ropalopus macropus (Germar, 1824)

Belgrade, Stepin Gaj, 04.07.1997, *U. minor*; Progar, Bojčinska forest, 17.04.1994, *U. minor*.

Xylotrechus arvicola (Olivier, 1795)

Progar, Bojčinska forest, 17.04.1994, *U. minor*.

Family Curculionidae

Magdalis armigera (Geoffroy, 1785)

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*; Belgrade, Arboretum of the Faculty of Forestry, 24.03.2003, *U. minor*; Belgrade, Košutnjak, 03.02.1996, 10.03.1997, *U. minor*; Belgrade, Stepin Gaj, 04.07.1997, *U. minor*; Goč, 13.05.1996, *U. minor*; Kosmaj, 30.11.1994, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Obrenovac, Zabran, 07.03.1998, *U. minor*; Progar, Bojčinska forest, 10.04.1994, *U. minor*.

Pteleobius vittatus (Fabricius, 1787)

Belgrade, Arboretum of the Faculty of Forestry, 24.03.2003, *U. minor*.

Parasitoids

Order Hymenoptera

Family Braconidae

Dendrosoter protuberans (Nees, 1834)

Belgrade, Ada Ciganlija, 18.02.2001, *U. minor*; Belgrade, Arboretum of the Faculty of Forestry, 24.03.2003, *U. minor*; Goč, 13.05.1996, *U. minor*; Kosmaj, 15.03.1995, 16.01.1996, 03.02.1996, 10.03.1997, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Obrenovac, Zabran, 07.03.1998, *U. minor*; Progar, Bojčinska forest, 10.04.1994, 17.04.1994, *U. minor*.

Doryctes leucogaster (Nees, 1834)

Kosmaj, 16.01.1996, *U. minor*

D. pomarius Reinhard, 1865

Kosmaj, 16.01.1996, *U. minor*; Goč, 13.05.1996, *U. minor*

D. striatellus (Nees, 1834)

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*; Belgrade, Košutnjak, 03.02.1996, *U. minor*; Kosmaj, 16.01.1996, *U. minor.*

Ecphylus silesiacus (Ratzeburg, 1848)

Aleksinac, Donji Adrovac, 13.08.1996, *U. minor*; Aleksinac, Vakup, 18.08.1994, 14.08.1997, *U. minor*; Belgrade, Ada Ciganlija, 13.07.1995, 03.02.1996, *U. minor*; Belgrade, Arboretum of the Faculty of Forestry, 24.03.2003, *U. minor*; Belgrade, Košutnjak, 03.02.1996, 10.03.1997, *U. minor*; Belgrade, Senjak, 18.03.1996, *U. minor*; Belgrade, Stepin Gaj, 04.07.1997, *U. minor*; Goč, 13.05.1996, *U. minor*; Kosmaj, 30.11.1994, 15.03.1995, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Obrenovac, Zabran, 07.03.1998, *U. minor*, Progar, Bojčinska forest, 10.04.1994, 17.04.1994, *U. minor*.

Eubazus augustinus (Ruthe, 1867)

Aleksinac, Donji Adrovac, 13.08.1996, *U. minor*; Aleksinac, Vakup, 18.08.1994, *U. minor*; Belgrade, Ada Ciganlija, 13.07.1995, 03.02.1996, *U. minor*; Belgrade, Košutnjak, 03.02.1996, 10.03.1997, *U. minor*; Belgrade, Senjak, 18.03.1996, *U. minor*; Goč, 13.05.1996, *U. minor*; Kosmaj, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Progar, Bojčinska forest, 10.04.1994, 17.04.1994, *U. minor*.

Leluthia paradoxa (Picard, 1938)

Goč, 13.05.1996, *U. minor*; Kosmaj, 16.01.1996, *U. minor.*

Spathius phymatodis Fischer, 1966

Goč, 13.05.1996, *U. minor*.

S. rubidus (Rossi, 1794)

Belgrade, Ada Ciganlija, 20.03.2003, *U. minor*; Belgrade, Košutnjak, 03.02.1996, 10.03.1997, *U. minor*; Kosmaj, 30.11.1994, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Obrenovac, Zabran, 07.03.1998, *U. minor*; Progar, Bojčinska forest, 10.04.1994, *U. minor*.

Family Encyrtidae

Parablastothrix plugarui Trjapitzin, 1971

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*.

Family Eulophidae

Entedon armigerae Graham, 1971

Goč, 13.05.1996, *U. minor.*

E. ergias Walker, 1839

Belgrade, Ada Ciganlija, 13.07.1995, 18.02.2001, *U. minor*; Goč, 13.05.1996, *U. minor*; Kosmaj, 15.03.1995, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Progar, Bojčinska forest, 17.04.1994, *U. minor*.

Euderus agrili Bouček, 1963

Aleksinac, Vakup, 14.08.1997, *U. minor.*

Tetrastichus ulmi Erdos, 1954

Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Progar, Bojčinska forest, 10.04.1994, 17.04.1994, *U. minor.*

Family Eurytomidae

Aximopsis nodularis (Boheman, 1836)

Belgrade, Košutnjak, 03.02.1996, *U. minor*; Progar, Bojčinska forest, 17.04.1994, *U. minor.*

Eurytoma morio Boheman, 1836

Belgrade, Ada Ciganlija, 13.07.1995, 03.02.1996, *U. minor*; Belgrade, Košutnjak, 03.02.1996, *U. minor*; Belgrade, Stepin Gaj, 04.07.1997, *U. minor*; Kosmaj, 16.01.1996, 30.11.1994, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor.*

Family Pteromalidae

Acrocormus semifasciatus Thomson, 1878

Belgrade, Ada Ciganlija, 13.07.1995, 03.02.1996, *U. minor*; Belgrade, Košutnjak, 03.02.1996, *U. minor*; Belgrade, Stepin Gaj, 04.07.1997, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Obrenovac, Zabran, 07.03.1998, *U. minor*.

Cerocephala eccoptogastri Masi, 1921

Belgrade, Ada Ciganlija, 13.07.1995, *U. minor*; Kosmaj, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor.*

Cheiropachus quadrum (Fabricius, 1787)

Aleksinac, Vakup, 18.08.1994, *U. minor*; Belgrade, Ada Ciganlija, 13.07.1995, 18.02.2001, 20.03.2003, *U. minor*; Belgrade, Arboretum of the Faculty of Forestry, 24.03.2003, *U. minor*; Belgrade, Košutnjak, 10.03.1997, *U. minor*; Belgrade, Senjak, 18.03.1996, *U. minor*; Goč, 13.05.1996, *U. minor*; Kosmaj, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Obrenovac, Zabran, 07.03.1998, *U. minor*; Progar, Bojčinska forest, 10.04.1994, 17.04.1994, *U. minor*.

Cleonymus brevis Bouček, 1972

Belgrade, Ada Ciganlija, 13.07.1995, 03.02.1996, 18.02.2001, 20.03.2003, *U. minor*; Belgrade, Arboretum of the Faculty of Forestry, 24.03.2003, *U. minor*; Belgrade, Košutnjak, 03.02.1996, 10.03.1997, *U. minor*; Belgrade, Stepin Gaj, 04.07.1997, *U. minor*; Progar, Bojčinska forest, 10.04.1994, 17.04.1994, *U. minor.*

Heydenia pretiosa Forster, 1856

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*.

Macromesus amphiretus Walker, 1848

Belgrade, Ada Ciganlija, 03.02.1996, *U. minor*; Progar, Bojčinska forest, 10.04.1994, *U. minor.*

Mesopolobus typographi (Ruschka, 1924)

Goč, 13.05.1996, *U. minor.*

Rhaphitelus maculatus Walker, 1834

Belgrade, Ada Ciganlija, 13.07.1995, 03.02.1996, 20.03.2003, *U. minor*; Belgrade, Stepin gaj, 04.07.1997, *U. minor*; Kosmaj, 15.03.1995, 16.01.1996, *U. minor*; Obrenovac, Mala Moštanica, 21.07.1995, *U. minor*; Progar, Bojčinska forest, 10.04.1994, 17.04.1994, *U. minor*.

Predators

Order Coleoptera

Family Cleridae

Opilo pallidus (Olivier, 1795)

Progar, Bojčinska forest, 10.04.1994, *U. minor.*

Thanasimus formicarius (Linnaeus, 1758)

Kosmaj, 16.01.1996, *U. minor*.

Tilloidea unifasciata (Fabricius, 1787)

Goč, 13.05.1996, *U. minor.*

Family Laemophloeidae

Cryptolestes ferrugineus (Stephens, 1831)

Belgrade, Ada Ciganlija, 13.07.1995, 03.02.1996, *U. minor*.

Family Malachiidae

Malachius bipustulatus (Linnaeus, 1758)

Progar, Bojčinska forest, 10.04.1994, *U. minor*.

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НОВИ ПОДАЦИ О РАСПРОСТРАЊЕЊУ ФЛОЕМО-КСИЛОФАГНИХ ИНСЕКАТА ПОЉСКОГ БРЕСТА (*ULMUS MINOR* MILL.), ЊИХОВИХ ПАРАЗТОИДА И ПРЕДАТОРА У СРБИЈИ

ЧЕДОМИР МАРКОВИЋ и АЛЕКСАНДАР СТОЈАНОВИЋ

Извод

Проучавањем фауне флоемо-ксилофагних инсеката, њихових паразтоида и предатора на пољском бресту у Србији добијени су нови подаци о распрострањењу констатованих врста. Неки од њих су публиковани. У овом раду су наведени непубликовани подаци. У њему се налази списак од 45 врста из 2 реда, 13 фамилија и 41 рода (16 флоемо-ксилофагне врсте, 24 врсте паразитоида, 5 врста предатора). За сваку од њих наведени су подаци о месту и времену налажења.

Received: January 31st, 2020
Accepted: April 14th, 2020