

Research article

New tree hosts of xylophagous beetles (Insecta: Coleoptera) in Bulgaria

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Abstract: During 2024–2025, xylophagous beetles were studied in the field-protected forest belts of South Dobrudzha in Northeastern Bulgaria and in solitary trees in Borisova Gradina Park, Sofia. Parts of stems and branches infected by these beetles were collected and transported to the Forest Research Institute in Sofia and the State Forest Enterprise General Toshevo. In laboratory conditions, the cuttings were placed in plastic boxes and photoelectors and reared at room temperatures (18–22°C). As a result, 12 taxa from 4 beetle families were identified: *Chrysobothris* (*Chrysobothris*) *affinis affinis*, *Agrilus* (*Quercuagrilus*) *graminis graminis*, *A. (Q.) hastulifer*, *A. (Q.) laticornis*, *A. (Q.) litura* (Coleoptera: Buprestidae), *Melasis buprestoides* (Coleoptera: Eucnemidae), *Lichenophanes varius* (Coleoptera: Bostrichidae), *Plagionotus detritus detritus*, *Xylotrechus* (*Xylotrechus*) *antilope antilope*, *Exocentrus adpersus*, *E. lusitanus*, and *Mesosa* (*Aplocnemia*) *nebulosa nebulosa* (Coleoptera: Cerambycidae). In this study, 3 new insect-host associations were established: *Agrilus (Q.) graminis graminis* was reared for the first time from *Juglans regia*, *Agrilus (Q.) hastulifer* from *Quercus rubra*, and *Agrilus (Q.) litura* from *Quercus cerris*. Additionally, 15 insect-host associations were newly recorded for Bulgaria. The majority of the xylophages (103 out of 158 specimens reared, 65.2%) belong to the genus *Agrilus*. Within this group, *A. (Q.) hastulifer* and *A. (Q.) graminis graminis* were the most abundant, accounting for 56.3% and 39.8%, respectively. These species have the most significant impact on oak mortality in the field-protective forest belts of Northeastern Bulgaria.

Keywords: *Agrilus*, Bostrichidae, Buprestidae, Cerambycidae insect-host associations, Coleoptera, Eucnemidae, field-protective forest belts, *Quercus*, South Dobrudzha

Introduction

In Bulgaria, the host plants of xylophagous beetles have not been well studied. Data on the rearing of xylophages from food plants are available in numerous literary entomological sources, but summarised information is available only for two taxonomic groups – Scolytinae (Doychev, 2014) and Cerambycidae (Doychev et al., 2017, 2018).

Recently, intensive tree-drying processes have been observed in field-protected forest belts in Southern Dobrudzha, Northeastern Bulgaria (Georgieva et al., 2024). The presence of many weakened and dried trees in these forest belts provides a good opportunity for studying the xylophagous entomofauna.

The present study reports new associations between xylophagous beetles and tree hosts in Bulgaria.

Table 1. Main characteristics of the studied areas.

N	Locality	Geographical coordinates	Altitude, m a.s.l.	Stand type	Tree species	Studied parts	Age, years
1	Rakovski Vill. 1	43.46639°N, 28.42128°E	110	forest belt	<i>Quercus rubra</i>	stems	39
2	Rakovski Vill. 2	43.47702°N, 28.37608°E	110	forest belt	<i>Quercus rubra</i>	stems	39
3	Rakovski Vill. 3	43.50666°N, 28.43588°E	95	forest belt	<i>Quercus rubra</i>	stems	39
4	Rakovski Vill. 4	43.46639°N, 28.42128°E	130	forest belt	<i>Quercus cerris</i>	stems	23
5	Sokolovo Vill. 1	43.50361°N, 28.15350°E	210	forest belt	<i>Tilia platyphyllos</i>	stems	35
6	Sokolovo Vill. 2	43.50362°N, 28.15350°E	210	forest belt	<i>Tilia platyphyllos</i>	stems	35
7	Kozloduytsi Vill. 1	43.65369°N, 27.73091°E	250	forest belt	<i>Tilia platyphyllos</i>	stems	40
8	Kozloduytsi Vill. 2	43.67103°N, 27.73091°E	250	forest belt	<i>Quercus rubra</i>	stems	40
9	Trigortsi Vill.	43.50353°N, 28.15319°E	230	forest belt	<i>Tilia platyphyllos</i>	stems	34
10	Pobeda Vill.	43.60779°N, 27.93344°E	245	forest belt	<i>Quercus cerris</i>	stems	71
11	Dropla Vill.	43.58668°N, 28.10663°E	250	forest belt	<i>Quercus petraea</i>	stems	69
12	Prisad Vill.	43.66302°N, 28.02672°E	200	forest belt	<i>Quercus robur</i>	branches	70
13	Metodievo Vill. 1	43.67103°N, 27.95226°E	200	forest belt	<i>Quercus cerris</i>	stems	70
14	Metodievo Vill. 2	43.60583°N, 28.01094°E	250	forest belt	<i>Quercus cerris</i>	branches	70
15	Lomnitsa Vill.	43.66691°N, 27.88000°E	240	forest belt	<i>Quercus cerris</i>	stems, branches	23
16	Dobrich	43.56705°N, 27.77007°E	260	forest belt	<i>Quercus rubra</i>	stems	35
17	General Toshevo	43.70185°N, 28.09749°E	200	forest belt	<i>Juglans regia</i>	stems	70
18	Sofia City	42.68778°N, 23.33806°E	553	solitary tree	<i>Quercus cerris</i>	branches	20

Material and methods

The studies were conducted in 2024 and 2025 in the field-protective forest belts in South Dobrudzha, Northeastern Bulgaria, and on ornamental trees in Borisova Gradina Park, Sofia City (Table 1). A total of six tree species were examined: *Quercus cerris* L., *Q.*

petraea Liebl., *Q. robur* L., *Q. rubra* L., *Juglans regia* L., and *Tilia platyphyllos* Scop.

Cuttings of stems and branches approximately 25–30 cm long were collected from drying trees. The samples were transported to the Forest Research Institute in Sofia and the State Forest Enterprise General Toshevo. In laboratory conditions, the

cuttings were placed in photoelectors and plastic boxes, and kept at room temperature (18–22°C). They were observed weekly for the appearance of insects.

The emerged beetles were stored in ethanol. The biological material was deposited in the entomological collections of the Forest Research Institute and in the collection of Vladimir Sakalian at the Institute of Biodiversity and Ecosystem Research of the Bulgarian Academy of Sciences.

Results

A total of 12 taxa of 4 coleopteran families were established, as follows: Buprestidae – 5 species and subspecies; Cerambycidae – 5 species and subspecies; Eucnemidae – 1 species; Bostrichidae – 1 species.

Buprestidae

Chrysobothris (*Chrysobothris*) *affinis affinis*
(Fabricius, 1794)

Material examined: 1 ex., Rakovski Vill. 1 (Loc. N 1), reared from stem cuttings of *Quercus rubra*, sample collection 05.06.2024, adult emergence 15.06.2024; 1 ex., Pobeda Vill. (Loc. N 10), reared from stem cuttings of *Quercus cerris*, sample collection 13.03.2025, adult emergence 04.07.2025 [all records V. Ivanov]. Note: *Quercus cerris* and *Q. rubra* are new hosts of *C. (C.) affinis affinis* in Bulgaria.

Agrilus (*Quercuagrilus*) *graminis graminis*
Kiesenwetter, 1857

Material examined: 7 ex., Rakovski Vill. 2 (Loc. N 2), reared from stem cuttings of *Quercus rubra*, sample collection 05.06.2024, adult emergence 15–17.06.2024; 3 ex., Kozloduytsi Vill. 2 (Loc. N 8), reared from stem cuttings of *Q. rubra*, sample collection 15.03.2025, adult emergence 04–15.07.2025; 16 ex., Dobrich (Loc. N 16), reared from stem cuttings of *Q. rubra*, sample collection 15.03.2025, adult emergence 04–16.07.2025; 5 ex., Rakovski Vill. 4 (Loc. N 4), reared from stem cuttings of *Quercus cerris*, sample collection 05.06.2024, adult emergence 17.06.2024; 4 ex., Pobeda Vill. (Loc. N 10), reared from stem cuttings of *Q. cerris*, sample collection 13.03.2025, adult emergence 04.07.2025; 2 ex., Metodievo Vill. 2 (Loc. N 14), reared from stem

cuttings of *Q. cerris*, sample collection 24.03.2025, adult emergence 04.07.2025; 3 ex., Lomnitsa Vill. (Loc. N 15), reared from stem cuttings of *Q. cerris*, sample collection 14.03.2025, adult emergence 04.07.2025; 1 ex., General Toshevo (Loc. N 17), reared from stem cuttings of *Juglans regia*, sample collection 24.03.2025, adult emergence 04.07.2025 [all records V. Ivanov]. Note: *Juglans regia* is a new host of *A. (Q.) graminis graminis*, and *Quercus cerris* and *Q. rubra* – new hosts of the species in Bulgaria.

Agrilus (*Quercuagrilus*) *hastulifer* (Ratzeburg, 1837)

Material examined: 11 ex., Dobrich (Loc. N 16), reared from stem cuttings of *Quercus rubra*, sample collection 15.03.2025, adult emergence 04–15.07.2025; 10 ex., Metodievo Vill. 1 (Loc. N 13), reared from stem cuttings of *Quercus cerris*, sample collection 13.03.2025, adult emergence 04–15.07.2025; 37 ex., Pobeda Vill. (Loc. N 10), reared from stem cuttings of *Q. cerris*, sample collection 13.03.2025, adult emergence 15.07.2025 [all records V. Ivanov]. Note: According to Jendek, Poláková (2014) and Gutowski et al. (2020), *Quercus rubra* was not mentioned as a host of *A. (Q.) hastulifer*. *Quercus cerris* is a new host of the species in Bulgaria.

Agrilus (*Quercuagrilus*) *laticornis* (Illiger, 1803)

Material examined: 3 ex., Pobeda Vill. (Loc. N 10), reared from stem cuttings of *Quercus cerris*, sample collection 13.03.2025, adult emergence 04.07.2025 [Leg. V. Ivanov]. Note: *Quercus cerris* is a new host of *A. (Q.) laticornis* in Bulgaria.

Agrilus (*Quercuagrilus*) *litura* Kiesenwetter, 1857

Material examined: 1 ex., Borisova Gradina Park in Sofia (Loc. N 18), reared from branch cuttings of *Quercus cerris*, sample collection 16.06.2025, adult emergence 17.07.2025 [Leg. M. Georgieva]. Note: According to Jendek, Poláková (2014), *Quercus cerris* was not mentioned as a host of *A. (Q.) litura*.

Eucnemidae

Melasis buprestoides (Linnaeus, 1760)

Material examined: 2 ex., Sokolovo Vill. 1 (Loc. N 5), reared from stem cuttings of *Tilia platyphyllos*,

sample collection 10.03.2024, adult emergence 09–13.05.2025; 9 ex., Kozloduytsi Vill. 1 (Loc. N 7), reared from stem cuttings of *T. platyphyllos*, sample collection 15.12.2024, adult emergence 07.04.–09.05.2025 [all records V. Ivanov]. Note: *Tilia platyphyllos* is a new host of *M. buprestoides* in Bulgaria.

Bostrichidae

Lichenophanes varius (Illiger, 1801)

Material examined: 3 ex., Trigortsi Vill. (Loc. N 9), reared from stem cuttings of *Tilia platyphyllos*, sample collection 27.11.2024, adult emergence 19.03.2025; 8 ex., Sokolovo Vill. 2 (Loc. N 6), reared from stem cuttings of *T. platyphyllos*, sample collection 29.11.2024, adult emergence 19.03.–03.04.2025 [all records V. Ivanov]. Note: *Tilia platyphyllos* is a new host of *L. varius* in Bulgaria.

Cerambycidae

Plagionotus detritus detritus (Linnaeus, 1758)

Material examined: 1 ex., Pobeda Vill. (Loc. N 10), reared from stem cuttings of *Quercus cerris*, sample collection 13.03.2025, adult emergence 09.06.07.2025 [Leg. V. Ivanov]. Note: *Quercus cerris* is a new host of *P. detritus detritus* in Bulgaria.

Xylotrechus (Xylotrechus) antilope antilope (Schoenherr, 1817)

Material examined: 10 ex., Pobeda Vill. (Loc. N 10), reared from stem cuttings of *Quercus cerris*, sample collection 13.03.2025, adult emergence 24.06.–04.07.2025 [Leg. V. Ivanov]. Note: *Quercus cerris* is a new host of *X. (X.) antilope antilope* in Bulgaria.

Exocentrus adpersus Mulsant, 1846

Material examined: 1 ex., Rakovski Vill. 1 (Loc. N 1), reared from stem cuttings of *Quercus rubra*, sample collection 05.06.2024, adult emergence 15.06.2024; 2 ex., Rakovski Vill. 4 (Loc. N 4), reared from stem cuttings of *Quercus cerris*, sample collection 05.06.2024, adult emergence 15.06.2024; 2 ex., Dropla Vill. (Loc. N 11), reared from stem cuttings of *Quercus petraea*, sample collection 04.02.2025, adult

emergence 17.04.2025; 2 ex., Prasad Vill. (Loc. N 12), reared from branch cuttings of *Quercus robur*, sample collection 04.02.2025, adult emergence 17.04.2025 [all records V. Ivanov]. Note: *Quercus cerris*, *Q. petraea*, *Q. robur* and *Q. rubra* are new hosts of *E. adpersus* in Bulgaria.

Exocentrus lusitanus (Linnaeus, 1767)

Material examined: 4 ex., Trigortsi Vill. (Loc. N 9), reared from stem cuttings of *Tilia platyphyllos*, sample collection 27.11.2024, adult emergence 19.03.2025; 8 ex., Sokolovo Vill. 2 (Loc. N 6), reared from stem cuttings of *T. platyphyllos*, sample collection 29.11.2024, adult emergence 19–21.03.2025 [all records V. Ivanov].

Mesosa (Aplocnemina) nebulosa nebulosa (Fabricius, 1781)

Material examined: 1 ex., Rakovski Vill. 3 (Loc. N 3), reared from stem cuttings of *Quercus rubra*, sample collection 26.11.2024, adult emergence 20.02.2025 [Leg. V. Ivanov]. Note: *Quercus rubra* is a new host of *M. (A.) nebulosa nebulosa* in Bulgaria.

A total of 158 specimens of xylophagous beetles were reared – 133 specimens from different oak species (*Quercus* spp.) (84.2%), 24 specimens from *Tilia platyphyllos* (15.2%), and 1 specimen from *Juglans regia* (0.6%). The predominate part (103 specimens) belong to *Agrilus* genus. Among them, *Agrilus (Q.) hastulifer* was the most abundant (56.3%), followed by *A. (Q.) graminis graminis* (39.8%), *A. (Q.) laticornis* (2.9%), and *A. (Q.) litura* (1.0%).

Three insect-host associations were identified as new in this study: *Agrilus (Q.) graminis graminis* was reared for the first time from *Juglans regia*, *Agrilus (Q.) hastulifer* – from *Quercus rubra*, and *Agrilus (Q.) litura* – from *Quercus cerris*. Additionally, 15 insect-host associations were found as new for Bulgaria: *Chrysobothris (C.) affinis affinis* – *Quercus cerris* and *Q. rubra*; *Agrilus (Q.) graminis graminis* – *Quercus cerris* and *Q. rubra*; *Agrilus (Q.) hastulifer* – *Quercus cerris*; *Agrilus (Q.) laticornis* – *Quercus cerris*; *Melasis buprestoides* – *Tilia platyphyllos*; *Lichenophanes varius* – *Tilia platyphyllos*; *Plagionotus detritus detritus* – *Quercus cerris*; *Xylotrechus (X.) antilope antilope* – *Quercus cerris*; *Exocentrus adpersus* – *Quercus cerris*, *Q. petraea*,

Q. robur and *Q. rubra*; *Mesosa* (A.) *nebulosa nebulosa* – *Quercus rubra*.

Discussion

Chrysobothris (C.) *affinis affinis* is widely distributed in Bulgaria (Sakalian, 2003). According to the author, it is extremely polyphagous with wide range of hosts among 37 tree and shrub genera, including *Quercus*. In Bulgaria, the species was previously reported in trophic association with *Castanea sativa* Mill. (Sakalian, 1993; Sakalian et al., 2021), *Populus alba* L., *Quercus pubescens* Willd. (Sakalian, 1993) and *Fagus sylvatica* L. (Dimitrova et al., 2025).

Agrilus (Q.) *graminis graminis* develops on *Quercus castaneifolia* C. A. Mey., *Q. cerris* L., *Q. dalechampii* Ten., *Q. faginea* Lam., *Q. ilex* L., *Q. petraea* (Matt.) Liebl., *Q. pubescens* Willd., *Q. pyrenaica* Willd., *Q. robur* L., *Q. rubra* L., *Q. suber* L., and representatives of other genera (*Acer*, *Alnus*, *Castanea*, *Corylus*, *Euonymus*, *Fagus*, *Fraxinus*, *Juglans*, *Ostrya*, *Viburnum*) (Jendek, Poláková, 2014). The genus *Juglans* was included in the list of hosts of *A. (Q.) graminis graminis* on the basis of information from Weidlich (1989) about the finding of adults on walnut leaves in southwestern Bulgaria. Thus, *A. (Q.) graminis graminis* was reared for the first time from *Juglans regia* in this study. In Bulgaria, the buprestid was previously reared from *Castanea sativa* as well (Sakalian et al., 2022).

Agrilus (Q.) *hastulifer* is connected with *Quercus canariensis* Willd., *Q. castaneifolia*, *Q. cerris*, *Q. coccifera* L., *Q. dalechampii* Ten., *Q. frainetto* Ten., *Q. ilex*, *Q. ithaburensis* ssp. *macrolepis* (Kotschy) Hedge & Y., *Q. pubescens*, *Q. pyrenaica*, *Q. robur*, *Q. suber*, and hosts of other genera (*Alnus*, *Carpinus*, *Castanea*, *Rosa*) (Jendek, Poláková, 2014; Gutowski et al., 2020). Therefore, the found in this study *Quercus rubra* is a new host plant of *A. (Q.) hastulifer*.

Agrilus (Q.) *laticornis* is associated with *Quercus cerris*, *Q. ilex*, *Q. petraea*, *Q. pubescens*, *Q. robur*, *Q. suber* and representatives of other genera (*Alnus*, *Betula*, *Carpinus*, *Corylus*, *Castanea*, *Fagus*, *Ligustrum*, *Pyrus*, *Rosa*, *Rubus*, *Salix*, *Tilia*) (Jendek, Poláková, 2014).

Agrilus (Q.) *litura* is oligophage on oak species (*Quercus dalechampii*, *Q. frainetto*, *Q. pubescens* and *Q. robur*) (Jendek, Poláková, 2014). Therefore, the *Q.*

cerris found in this study is a new host of the buprestid.

In Bulgaria, the eucnemid *M. buprestoides* was previously found in the wood of *Corylus avellana* L. (Georgiev, 2008) and *F. sylvatica* (Dimitrova et al., 2025), and the bostrichid *L. varius* – in the wood of dead standing stems of *Quercus suber* L. (Bencheva, Doychev, 2022).

Until the present study, no host plants of the cerambycids *Plagionotus detritus detritus* and *Xylotrechus* (X.) *antilope antilope* were known in Bulgaria. The remaining longhorn beetles have been previously found in trophic association with the same or other tree species in the country: *Exocentrus adspersus* was reared from *Betula pendula* Roth, *Corylus avellana* and *Castanea sativa* (Doychev et al., 2017), *Exocentrus lusitanus* – from *Tilia platyphyllos* and *T. tomentosa* Moench (Doychev et al., 2017), and *Mesosa* (A.) *nebulosa nebulosa* – from *Betula pendula* (Doychev et al., 2017) and *Quercus cerris* (Doychev et al., 2018).

In the present study, the xylophagous beetles were almost entirely reared from dying trees of various oak species (*Quercus* spp.). It is well known that in Europe, the main factors for acute oak decline are the buprestids of the genus *Agrilus*, and especially *Agrilus* (*Anambus*) *biguttatus* (Fabricius, 1776) (Moraal, Hilszczanski, 2000; Brown et al., 2015, 2017; Reed et al., 2018). In this study, *A. (A.) biguttatus* was not found, unlike other species of the genus, dominated by *A. (Q.) hastulifer* and *A. (Q.) graminis graminis*, which have the most significant impact on oak drying. In Northeastern Bulgaria, the representatives of *Quercus* genus occupy a dominant position in the field protective forest belts with 34.7% (Dodev et al., 2023), but their health is severely deteriorated, with the relative share of dead trees in *Quercus rubra* (43.8%), *Q. robur* (19.4%), *Q. frainetto* Ten. (17.5%) and *Q. cerris* (8.9%) (Georgiev et al., 2025).

In conclusion, the present study expands knowledge of the food plants of xylophagous beetles in Bulgaria.

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Conflicts of interest

No potential conflict of interest has been reported by the author, reviewers, or subject editor.

Author' contributions

(using [CrediT](#) )

Georgi Georgiev: investigation, methodology, project administration, writing—original draft; Vladimir Sakalian: methodology, writing—original draft; Margarita Georgieva: investigation, methodology, writing—original draft; Veselin Ivanov: investigation, resources; Denitsa Petrova: resources.

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