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CONTRIBUTION TO FAUNA OF SAPROXYLIC ROVE BEETLES (COLEOPTERA: STAPHYLINIDAE) IN CONIFEROUS FORESTS OF THE CARPATHIAN NATIONAL NATURE PARK

Saproxylic beetles are insects that depend on dead and decaying wood for at least part of their lifecycle and play an important ecological roles in European ecosystems. Together with fungi, they contribute to the destruction of deadwood as well as are involved in decomposition processes and the recycling of nutrients in natural ecosystems. The family rove beetles Staphylinidae is one of the largest families of beetles. Many species of the family Staphylinidae are characterized by high abundance, a clear allocation to certain

natural habitats, and the ability to respond sensitively to changes in the environment, which allows them to be used as objects for bioindication of environmental pollution processes and monitoring of ecosystems. The aim of the study is to investigate the diversity of saproxylic beetles (Coleoptera, Staphylinidae) in primeval fir forest of the Carpathian National Nature Park. The report is based on the results of observations and collections which were conducted in coniferous forests of the Carpathian National Nature Park in 2023–2024. All traps were set up and operated yearly during the vegetation season from early April to late September. The community of saproxylic rove beetles collected in coniferous forests of the Carpathian National Nature Park is characterized by a high level of faunal diversity. The fauna of saproxylic rove beetles accounts for 217 species, of which 127 species are obligate or facultative saproxylic. The community of rove beetles collected in coniferous forests of the Carpathian National Nature Park is characterized by a high level of faunal diversity. The result of our research is a section of the composition of the beetle community at a certain stage of forest succession. In the future, these data can be used by researchers to assess other territories, in particular with the aim of forming proposals for rational sustainable forest use, which Ukrainian forestry is gradually moving towards. The presented taxonomic list does not claim to be comprehensive, but it serves as a basis for further inventorying and monitoring the diversity of saproxylic beetles, as well as maintaining a cadastre of natural complexes in the Carpathian National Nature Park
Key words: Coleoptera, Staphylinidae, saproxylic species, coniferous forests, fauna.

Introduction. Rove beetes (Coleoptera: Staphylinidae) is one of the largest families of beetles; to date, the world fauna comprises more than 66,928 species belonging to 35 subfamilies and 4038 genera [10]. More than 1,300 species are known in the fauna of Ukraine [12].

A number of progressive adaptive features has led to the emergence of specialized forms that successfully coexist with other animals, living in caves, burrows of mammals, nests of birds and social insects. Most larvae and adults of rove beetles are non-specialized predators that feed on a variety of invertebrates, acting as their natural regulators [13]. There are significantly fewer mycophages and saprophages among them; the first feed on the parts of fruit body and fungal spores [2, 5], while the second ones – on plant and animal remnants taking an active part in soil formation processes and in a natural cycle of matter [13]. Many rove beetles are characterized by high abundance, clear habitat allocation and the ability to respond sensitively to environmental changes. These features allow them to be used as indicators of environmental pollution and for ecosystem monitoring as well [3].

Saproxylic beetles are insects that depend on dead and decaying wood for at least part of their lifecycle and play an important ecological roles in European biocenozis [1]. Together with fungi, they contribute to the destruction of deadwood and are involved in decomposition processes and the recycling of nutrients in natural ecosystems. They interact with other organisms such as mites, nematodes, bacteria, and fungi, assisting in their dispersal across the landscape. They also provide an important food source for birds and mammals. The conservation of beetles that depend on dying or dead wood, has received a great deal of attention in many parts of the world in recent years. Human activities such as urbanization and logging, and their results, e.g. global warming, destroy natural ecosystems and threaten rare species [1].

The precise number of saproxylic beetle species is not known, but in Europe without doubt there are several thousands of saproxylic species [8, 9]. Beetle species inhabiting decaying wood are dependent on specific tree species, light and moisture regimes, wood decay stage, microorganisms, and other factors [1]. Saproxylic beetles have important interactions with other organisms which are significant for ecosystem and economy [8].

Materials and methods. The report is based on the results of observations and collections of Yu.B. Motruk, V.I. Diedus, and M.V. Chumak which were conducted in the

coniferous forests of the Carpathian National Nature Park in 2023–2024. All traps were set up and operated yearly during the vegetation season from early April to late September [4]. The current taxonomic status, nomenclature, and general distribution of the species follow A. Newton [10]. The geographical coordinates of localities and places of collecting are given according to www.google.com/maps/. Identification to species was carried out using a binocular magnifier MBS-10. If necessary, the mandibles, genitalia, and other parts of the beetles' bodies were dissected and fixed using thin dissecting needles. Sometimes the material was clarified by boiling or holding in a 10% NaOH solution. After that, the organs were placed in a fixing solution for long-term storage. Canadian balsam or Euparal was used as a fixative.

Study area. The Carpathian National Nature Park (hereinafter referred to as the Carpathian NNP) is the first and one of the largest national nature parks in Ukraine. Its territory stretches 55 km from north to south and 20 km from west to east. The majority of the park's territory is located within the absolute altitudes of 500 to 2000 m above sea level. The highest point of Ukraine, the top of Mount Hoverla (2061 m above sea level) is located within the Park. The park is located in the highest and most interesting sector of the Gorgany massif in terms of geography. The main part of its territory covers the upper reaches of the Prut River and its tributaries, as well as the Chornyi Cheremosh River basin. The most important objects of the park's protection are natural forest, subalpine and alpine biogeocenoses of Chornohora, relict *Pinus cembra* stands preserved on the rocky placers of the Chornohora and Gorgany massifs, alpine landscapes with glacial holes, ramparts and lakes of glacial origin, valuable botanical, geological, and morphological monuments. The most valuable areas of the park were protected even before it was declared the National Nature Park. However, various forms of anthropogenic impact have taken place over a large area, resulting in significant transformations in the natural structure of the vegetation cover [6].

Fig. 1. ***General view of research plots and general view of the combined window traps.***

Section of an old-aged spruce forest (Fig. 2.1). It is located on a south-eastern slope, at an altitude of 975 m above sea level, in the unit 10, quarter 22 of the Pidlisnivskyi Nature Research Department, Carpathian National Nature Park, near the village of Mykulychyn. Coordinates of the section: 48.357647 N, 24.634125 E. The section is located on well-drained, medium- and high-humus mountain-forest brown soils with a high organic content. The age of the plantations is approximately 110 years. The tree stand is characterized by horizontal crown closure and consists of 100% *Picea abies*, with some *Abies alba, Fagus sylvatica*, and *Betula pendula*. The undergrowth is well developed and consists of *Abies alba* (60%) and *Picea abies* (40%), which is due to the higher shade tolerance of *Abies alba*, allowing it to successfully regenerate under the forest canopy. The undergrowth is about 30 years old, up to 3 m high, with a total density of about 1000 trees/ha. The understory consists of *Rubus* sp., *Rhamnus cathartica*, and young *Picea abies*. The herbaceous cover includes *Dryopteris filix-mas*, *Oxalis acetosella*, and mosses of the genera *Pleurozium* and *Hylocomium*. This composition is characteristic of the moist and undisturbed spruce forests of the Ukrainian Carpathians, which contributes to the formation of a unique microclimate and a large number of microhabitats.

Section of a middle-aged spruce forest (Fig. 2.2). It is located on a southwestern slope at an altitude of 820 m above sea level, in the unit 5, quarter 11 of the Pidlisnivskyi Nature Research Department, Carpathian National Nature Park, near the village of Mykulychyn. Coordinates of the section: 48.378711 N, 24.601081 E. The section is located on acidic brown soils, with significant development of larch-spruce type litter. The age of the plantations is about 60 years. The plantations are represented by a pure stand of *Picea abies* (100%), without accompanying species. The undergrowth is fragmented, mainly consisting of young *Picea abies*. The understory includes *Rubus idaeus*, *Rubus fruticosus*, *Juniperus communis* as well as typical shade-loving species, including *Oxalis acetosella* and *Dryopteris austriaca*. The dense canopy closure, limited access to sunlight, and large amount of dead wood, represented mainly by branches and scattered fallen tree trunks, create conditions for the development of many species of saproxylic insects that colonize dead wood at various stages of its decomposition.

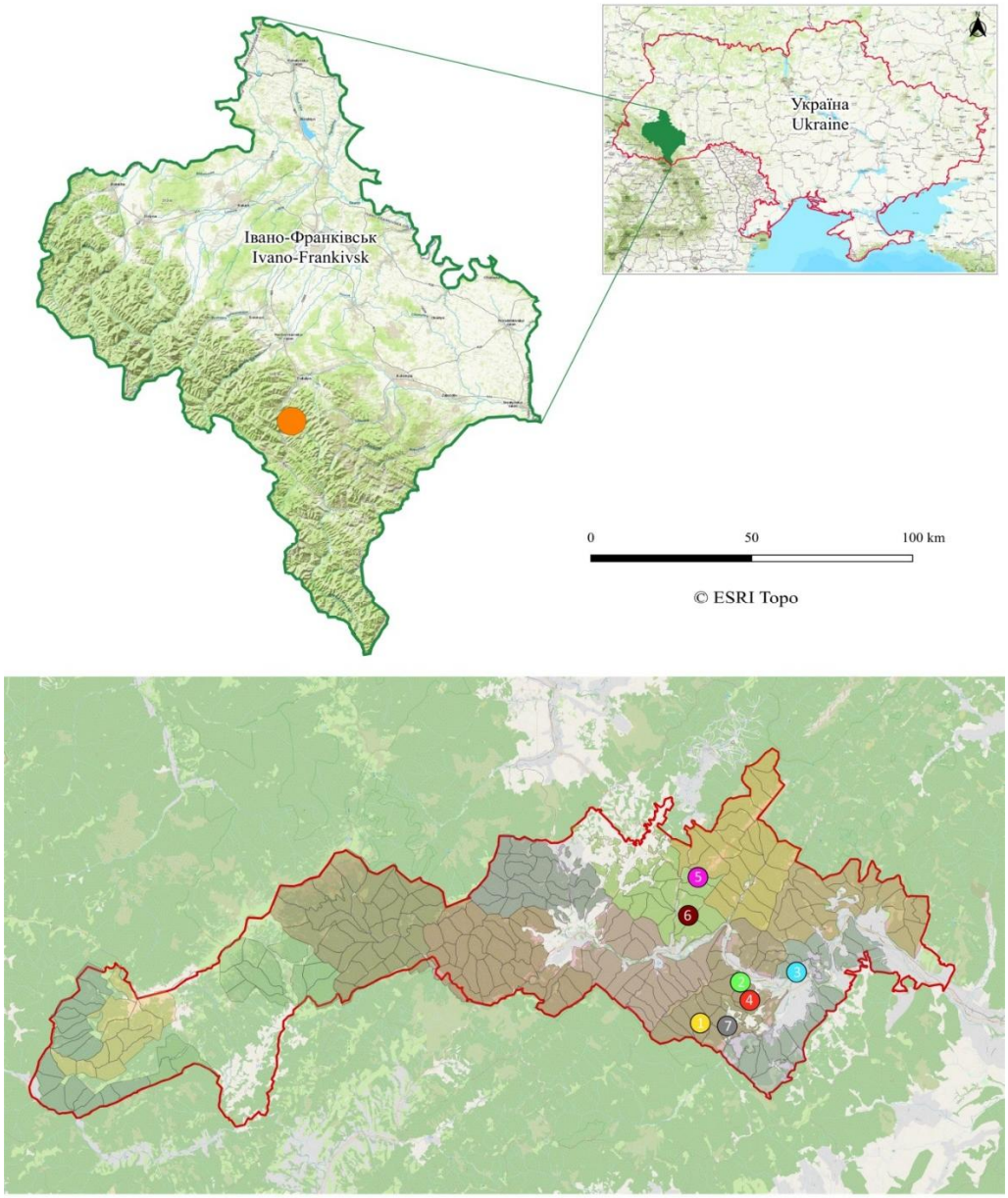

Fig. 2. ***Location of the study area in fir forest of the Carpathian NNP: 1 – section of an old-growth spruce forest; 2 – section of a middle-aged spruce forest; 3 – section of a middle-aged spruce forest; 4 – section of an old-aged fir forest; 5 – section of a middle-aged managed fir forest; 6 – section of an old-aged non-managed fir primeval forest or forest; 7 – section of a middle-aged managed spruce forest.***

Section with a drying old-aged spruce forest (Fig. 2.3). It is located on a south-eastern slope, at an altitude of 715 m above sea level, in the unit 5, quarter 11 of the Yamnianskyi Nature Research Department, Carpathian National Nature Park, near the village of Mykulychyn. Coordinates of the section: 48.412419 E, 24.589156 E. The section is located on predominantly humus-brown soils with reduced acidity. The age of the plantings is about 100 years. The tree stand is represented by *Picea abies* (90%) and *Abies alba* (10%), with a small admixture of *Fagus sylvatica*. The undergrowth consists of *Calamagrostis arundinacea*, *Calluna vulgaris*, and young tree seedlings. Increased light under the forest canopy actively promotes the renewal of *Abies alba* and *Fagus sylvatica*. Within the site, the forest is severely damaged by *Ips typographus*, which has led to the death of a significant number of trees, resulting in the accumulation of large amounts of dead wood, dry wood, brushwood, and fallen trees. In some microareas with a higher

degree of degradation, the undergrowth is dominated by grassy patches, including *Rumex acetosa* and *Galium mollugo*. The section is of great importance as a habitat for saproxylic insects that colonize dead wood in the middle and late stages of decomposition.

Section of an old-aged fir forest (Fig. 2.4) is located on a western slope at an altitude of 760 m above sea level, in units 30 and 31, quarter 13 of the Pidlisnivskyi Nature Research Department, Carpathian National Nature Park, near the village of Mykulychyn. Coordinates of the section: 48.384000 N, 24.613367 E. The section is located on slightly acidic and deep brown soils with a well-formed humus horizon. The section is represented by reference old-growth fir forests, almost 190 years old. The forest stand consists almost exclusively of *Abies alba* (100%), with occasional *Picea abies* and *Fagus sylvatica*. The pure fir composition is exceptional for the region and indicates the high natural value of the site. The undergrowth is well developed, consisting mainly of young trees around 30 years old, with a ratio of *Abies alba* (80%) to *Picea abies* and *Fagus sylvatica* (20%). The average height of the undergrowth is around 4 meters, and its density is high. The understory is represented by phytocenoses typical of fir forests, including *Corylus avellana*, *Juniperus communis*, and *Sambucus nigra*. The total undergrowth density is approximately 0.1. The grass cover within the site is rich and consists of shade-loving plant species, including *Brachythecium* ssp., *Plagiomnium* ssp., *Asarum europaeum*, and *Symphytum officinale*. The site is rich in standing and fallen dead wood at various stages of decomposition, providing favorable conditions for the development of a wide range of saproxylic insects. The biotope is unique in terms of its naturalness and is an important reference model for research on old-aged forests in the Ukrainian Carpathians.

Section of a middle-aged managed fir forest (Fig. 2.5). It is located on a slope of medium steepness, north-western exposure, at an altitude of 835 m above sea level, in the unit 19, quarter 20 of the Pidlisnivskyi Nature Research Department, Carpathian National Nature Park, near the village of Mykulychyn. Coordinates of the section: 48.372464 N, 24.636042 E. The section is located on mountain-forest brown soils with a well-drained, slightly acidic soil profile. The age of the plantations is about 100 years. The tree stand is characterized by horizontal closure with uneven density, creating a mosaic structure of the vertical profile, and is represented by mixed coniferous and broad-leaved species, with a predominance of *Abies alba* (90%), with an admixture of *Picea abies* (10%) and a few *Fagus sylvatica*. In some parts of the section, there is a decrease in closure, which promotes light penetration into the lower tiers and stimulates the formation of undergrowth. The undergrowth is represented by a well-developed generation of young trees, formed mainly by *Abies alba* (60%), *Picea abies* (20%), and *Fagus sylvatica* (20%). The age of the undergrowth is about 25 years, the average height is 3 m, and the density is approximately 2,000 trees/ha, which indicates that the forest is actively regenerating. In areas with low canopy cover, the undergrowth forms local clumps among the herbaceous vegetation. The understory consists of *Rubus* sp., *Rhamnus cathartica*, and young *Picea abies*. Its closure is about 0.1, which indicates weak development of the understory in conditions of dense light deficiency. The herbaceous cover is represented by *Oxalis acetosella*, *Dryopteris filix-mas*, and mosses of the genera *Pleurozium* and *Hylocomium*.

Section of old-aged non-managed fir primeval forest or forest (Fig. 2.6). It is located on a south-facing slope at an altitude of 975 m above sea level, in the unit 2, quarter 6 of the Yablunytskyi Nature Research Department, Carpathian National Nature Park, near the village of Tatariv. Coordinates of the section: 48.349783 N, 24.544597 E. The section is located on soils typical for the southern slopes in the upper mountain belt of the Eastern Carpathians and is represented by mountain-forest slightly acidic brown soils with a well-drained profile, high humus content, and medium stoniness. The basis of the spruce primeval forest, which is about 170 years old, is *Abies alba* (100%) with a small admixture of *Betula pendula*, in the form of single trees or lighting groups, mainly on the periphery of the forest. The density of the plantation is uneven, which determines the mosaic structure of the canopy and variable lighting conditions in the ground layer. The undergrowth,

approximately 40 years old, is quite dense and well developed, consisting mainly of *Picea abies* (70%) and *Abies alba* (30%), with an average height of up to 8 meters and a density of approximately 1,500 trees/ha. This structure indicates active natural regeneration under conditions of gradual thinning of the main tree layer. The undergrowth is poorly developed but has an important structural component in the form of berry bushes. Clumps of *Vaccinium myrtillus* bushes grow sporadically across the section, covering approximately 20% of the area. *Oxalis acetosella* is found in the shaded parts of the section as well as *Pleurozium schreberi* and *Hylocomium splendens* mosses, the presence of which indicates stable humid conditions in the environment.

Section of a middle-aged managed spruce forest (Fig. 2.7). It is located on a southwestern slope at an altitude of 1,000 meters above sea level, in the unit 20, quarter 3 of the Yablunytskyi Nature Research Department, Carpathian National Nature Park, near the village of Yablunytsia. Coordinates of the section: 48.353317 N, 24.513503 E. The section is located on slightly acidic brown soils of the mountain-forest type, well-drained soils with a high content of organic matter, where characteristic flora of shade-loving and mesophytic species as well as a stable microclimate usually form. The age of the plantations is about 80 years. The forest stand is characterized by horizontal canopy closure and uneven density, with *Picea abies* (100%) predominating and constituting the bulk of the forest stand, with a small admixture of *Betula pendula*, which grows mainly in glades or in lighted areas. The undergrowth is fragmented, consisting mainly of young *Picea abies* individuals, which occur singly or in small clusters. *Abies alba* is found in shaded areas, indicating the natural dynamics of forest regeneration and a potential change in the dominant species in the future. The understory is not particularly diverse, but there are characteristic representatives of mesophytic and shade-loving flora, including *Rubus idaeus*, *Rubus fruticosus*, *Oxalis acetosella*, *Asarum europaeum* as well as isolated *Dryopteris* and *Hylocomium splendens*, *Pleurozium schreberi*, which form a continuous cover in the lower tier.

Results and discussion. As a result of research and analysis of the collected material, it was found that the family of staphylinid beetles in the coniferous forests of the Carpathian National Nature Park is represented by 217 species [7], of which 102 species (Table 1) are obligate saproxylic organisms [10]. The vast majority of saproxylic rove beetles do not feed directly on dead wood but they use dead wood at various stages of decomposition as wintering sites or places where beetles pupate and then emerge as adults. In most cases, these are representatives of the genera *Lordithon*, *Olisthaerus*, *Phloeocharis*, *Scaphidium*, *Scaphisoma*, and *Syntomium*. The complex of cortical species are unspecialized predators that hunt insect larvae and other invertebrates that live under the bark of trees. These are representatives of the genera *Cyphea, Dadobia, Dinaraea, Euryusa, Phloeopora, Silusa, Leptusa, Oligota, Anomognathus, Ischnoglossa, Haploglossa, Placusa, Phloeonomus, Phloeostiba*, and *Atrecus*. The entire complex of mycetobiont species is associated with various xylotrophic fungi, such as representatives of the genera *Agaricochara* and *Gyrophaena*, whose larvae and adults feed on fungal spores while remaining constantly on the surface of the fruiting body. There are also species of the genera *Megarthrus Oxyporus*, *Proteinus*, *Scaphidium*, *Scaphisoma*, and *Sepedophilus*, whose larvae and adults feed on basidiom particles, sometimes gnawing passages in them. The group of mycetobionts also includes species in which one of the stages of ontogenesis is associated with fungi, or which are found in fungi, acting as predators (genera *Bolitochara* and *Lordithon*). In addition, 25 species identified are facultative saproxylic (Table 1), which use dead wood as shelter or a place where they hunt for insect larvae and other invertebrates that develop in dead wood or xylotrophic fungi.

Table 1

Species composition of saproxylic rove beetles in coniferous forests of the Carpathian National Nature Park

Species	Preferences for microhabitats	Saproxylic	I	II	III	IV	V	VI	VII	To-tal
1	2	3	4	5	6	7	8	9	10	11
Aleochara curtula (Goeze, 1777)	Ed/Sx	fc	–	–	1	–	–	1	–	2
Aleochara cuniculorum Kraatz, 1858	Ed/Sx	fc	1	–	3	2	4	7	7	24
Aleochara fumata Gravenhorst, 1802	Ed/Sx	fc	–	–	–	1	–	1	–	2
Aleochara lanuginosa Gravenhorst, 1802	Ed/Sx	fc	–	–	1	–	–	1	–	2
Aleochara sparsa Heer, 1839	Ed/Sx	fc	6	–	–	–	–	–	–	6
Atheta crassicornis (Fabricius, 1792)	Sx	ob	1	–	1	–	1	1	–	4
Cyphea curtula (Erichson, 1837)	Sx	ob	–	–	–	1	–	2	1	4
Dadobia immersa (Erichson, 1837)	Sx	ob	–	–	–	–	–	1	–	1
Dinaraea linearis (Gravenhorst, 1802)	Sx	ob	–	–	–	–	–	2	–	2
Euryusa castanoptera Kraatz, 1856	Sx	ob	–	–	–	–	–	–	1	1
Liogluta microptera C.G.Thomson, 1867	Ed/Sx	fc	8	3	–	7	30	30	1	79
Mocyta fungi (Gravenhorst, 1806)	Ed/Sx	fc	8	–	2	17	1	44	16	88
Phloeopora testacea (Mannerheim, 1830)	Sx	ob	–	–	–	–	–	–	1	1
Silusa rubiginosa Erichson, 1837	Sx	ob	–	–	–	–	–	2	–	2
Bolitochara obliqua Erichson, 1837	Sx	ob	–	1	–	3	–	–	1	5
Bolitochara pulchra (Gravenhorst, 1806)	Sx	ob	–	–	–	2	–	–	–	2
Gyrophaena affinis Mannerheim, 1830	Sx	ob	2	–	2	6	3	–	6	19
Gyrophaena boleti (Linnaeus, 1758)	Sx	ob	–	–	–	22	14	25	16	77
Gyrophaena gentilis Erichson, 1839	Sx	ob	1	–	–	10	3	2	3	19
Gyrophaena joyi Wendeler, 1924	Sx	ob	–	–	–	1	–	–	–	1
Gyrophaena joyioides Wüsthoff, 1937	Sx	ob	–	–	–	3	14	–	–	17
Gyrophaena minima Erichson, 1837	Sx	ob	–	–	–	–	2	–	–	2

Species	Preferences for microhabitats	Saproxylic	I	II	III	IV	V	VI	VII	To-tal
Gyrophaena munsteri A.Strand, 1935	Sx	ob	–	–	–	–	–	–	1	1
Gyrophaena nana (Paykull, 1800)	Sx	ob	–	–	–	1	–	–	–	1
Gyrophaena pulchella Heer, 1839	Sx	ob	–	–	–	–	1	–	–	1
Gyrophaena strictula Erichson, 1839	Sx	ob	–	–	–	4	–	–	–	4
Leptusa fumida (Erichson, 1839)	Sx	ob	5	1	–	16	4	14	35	75
Leptusa pulchella (Mannerheim, 1830)	Sx	ob	3	10	26	81	30	68	93	311
Leptusa ruficollis (Erichson, 1839)	Sx	ob	–	–	–	7	9	1	2	19
Oligota pumilio Kiesenwetter, 1858	Sx	ob	2	–	–	–	1	11	5	19
Oligota pusillima (Gravenhorst, 1806)	Sx	ob	–	–	–	1	–	1		2
Anomognathus cuspidatus (Erichson, 1839)	Sx	ob	–	–	1	17	1	8	13	40
Pella limbata (Paykull, 1789)	Ed/Sx	fc	–	10	159	5	5	–	–	179
Ischnoglossa prolixa (Gravenhorst, 1802)	Sx	ob	3	1		4		7	3	18
Haploglossa villosula (Stephens, 1832)	Sx	ob	4	–	2	17	6	44	23	96
Oxypoda alternans (Gravenhorst, 1802)	Sx	ob	1	–	–	12	14	14	16	57
Placusa atrata (Mannerheim, 1830)	Sx	ob	–	–	–	–	1	–	–	1
Placusa complanata Erichson, 1839	Sx	ob	–	–	–	–	–	10		10
Placusa incompleta Sjöberg, 1934	Sx	ob	–	–	–	–	3	1		4
Placusa tachyporoides (Waltl, 1838)	Sx	ob	–	–	–	21	–	–	–	21
Bobitobus lunulatus (Linnaeus, 1767)	Sx	ob	2	4	–	12	3	2	12	35
Bolitobius castaneus (Stephens, 1832)	Sx	ob	–	–	–	1	–	23	1	25
Lordithon exoletus (Erichson, 1839)	Sx	ob	–	–	–	2	–	–	–	2
Lordithon speciosus (Erichson, 1839)	Sx	ob	1	–	1	2	1	–	–	5
Lordithon thoracicus (Fabricius, 1777)	Sx	ob	–	–	–	–	1	–	3	4
Lordithon trimaculatus (Fabricius, 1792)	Sx	ob	–	–	–	–	1	–	–	1
Lordithon trinotatus (Erichson, 1839)	Sx	ob	2	1	2	7	1	1	–	14

Species	Preferences for microhabitats	Saproxylic	I	II	III	IV	V	VI	VII	To-tal
Parabolitobius formosus (Gravenhorst, 1806)	Sx	ob	–	–	–	–	–	13	4	17
Parabolitobius inclinans (Gravenhorst, 1806)	Sx	ob	–	–	–	–	–	1	–	1
Olisthaerus substriatus (Paykull, 1790)	Sx	ob	1	–		–	–	–	–	1
Anthobium atrocephalum (Gyllenhal, 1827)	Ed/Sx	fc	–	–	–	11	–	–	12	23
Dropephylla ioptera (Stephens, 1834)	Sx	ob	–	–	–	3	–	–	2	5
Acrulia inflata (Gyllenhal, 1813)	Sx	ob	2	–	1	5	–	4	1	13
Hapalaraea pygmaea (Paykull, 1800)	Sx	ob	–	–	1	–	–	–	–	1
Omalium rivulare (Paykull, 1789)	Sx	ob	–	–	1	9	1	–	4	15
Phloeonomus punctipennis C.G.Thomson, 1867	Sx	ob	3	–	2	6	2	3	5	21
Phloeonomus pusillus (Gravenhorst, 1806)	Sx	ob	7	2	–	25		–	–	34
Phloeostiba plana (Paykull, 1792)	Sx	ob	1	5	5	3	1	–	–	15
Oxyporus maxillosus Fabricius, 1792	Sx	ob	–	–	1	–	1	–	–	2
Syntomium aeneum (P.W.J.Müller, 1821)	Sx	ob	21	3	34	19	5	15	1	98
Phloeocharis subtilissima Mannerheim, 1830	Sx	ob	–	2	–	1	–	–	–	3
Megarthrus depressus (Paykull, 1789)	Sx	ob	1	–	–	5	3	–	1	10
Megarthrus hemipterus (Illiger, 1794)	Sx	ob	1	–	–	–	1	–	–	2
Proteinus brachypterus (Fabricius, 1792)	Sx	ob	2	–	1	4	1	1	8	17
Batrisodes venustus (Reichenbach, 1816)	Sx	ob	–	–	1	2	–	–	–	3
Euplectus bonvouloiri narentinus Reitter, 1882	Sx	ob	–	–	–	1	–	–	–	1
Euplectus brunneus (Grimmer, 1841)	Sx	ob	1	–	–	3	–	–	–	4
Euplectus duponti Aubé, 1833	Sx	ob	–	1	–	4	–	–	–	5
Euplectus infirmus Raffray, 1910	Sx	ob	1	–	1	4	5	1	–	12
Euplectus karstenii (Reichenbach, 1816)	Sx	ob	–	–	–	1	–	–	–	1
Euplectus mutator Fauvel, 1895	Sx	ob	–	–	1	2	–	–	–	3
Euplectus piceus Motschulsky, 1835	Sx	ob	2	1	–	23	17	58	7	108

Species	Preferences for microhabitats	Saproxylic	I	II	III	IV	V	VI	VII	To-tal
Euplectus signatus (Reichenbach, 1816)	Sx	ob	8	–	1	11	8	20	1	49
Bibloporus bicolor (Denny, 1825)	Sx	ob	1	2	–	–	–	–	–	3
Bibloporus mayeti Guillebeau, 1888	Sx	ob	1	–	–	–	–	–	–	1
Bibloporus minutus Raffray, 1915	Sx	ob	73	–	11	189	92	337	210	912
Bibloplectus tenebrosus (Reitter, 1881)	Sx	ob	–	–	–	17		–	–	17
Trimium carpathicum Saulcy, 1875	Sx	ob	–	–	–	208	38	6	–	252
Trimium minimum Dodero, 1900	Sx	ob	1	–	–	–	–	–	–	1
Plectophloeus fischeri (Aubé, 1833)	Sx	ob	–	–	–	2	–	–	–	2
Plectophloeus nitidus (Fairmaire, 1858)	Sx	ob	–	–	–	8	1	–	–	9
Plectophloeus nubigena (Reitter, 1877)	Sx	ob	–	–	–	3	–	–	–	3
Brachygluta trigonoprocta (Ganglbauer, 1895)	Sx	ob	–	–	1	–	–	–	–	1
Bryaxis frivaldszkyi (Reitter, 1887)	Sx	ob	3	1	2	15	6	8	1	36
Bryaxis nigripennis (Aubé, 1844)	Sx	ob	1	–	–	10	1	–	–	12
Bryaxis viertli (Reitter, 1882)	Sx	ob	–	–	–	1	–	–	–	1
Scaphidium quadrimaculatum A.G.Olivier, 1790	Sx		1	1	6	2	6	2	–	18
Scaphisoma agaricinum (Linnaeus, 1758)	Sx	ob	–	–	–	–	–	4	4	8
Scaphisoma assimile Erichson, 1845	Sx	ob	–	–	–	2	–	1	1	4
Scaphisoma boleti (Panzer, 1793)	Sx	ob	1	–	–	1	–	–	–	2
Scaphisoma boreale (Lundblad, 1952)	Sx	ob	–	1	5	2	–	–	–	8
Scaphisoma inopinatum (Löbl, 1967)	Sx	ob	2	–	–	1	1	1	–	5
Scaphisoma limbatum Erichson, 1845	Sx	ob	–	1	–	–	–	–	–	1
Scaphisoma subalpinum Reitter, 1881	Sx	ob	2	1	2	4	–	–	–	9
Cephennium carpathicum Saulcy, 1878	Sx	ob	–	–	–	–	1	–	–	1
Euconnus denticornis (P.W.J.Müller & Kunze, 1822)	Sx	ob	–	–	–	–	–	1	–	1

Species	Preferences for microhabitats	Saproxylic	I	II	III	IV	V	VI	VII	To-tal
Eutheia linearis Mulsant & Rey, 1861	Sx	ob	–	–	–	2	–	–	–	2
Neuraphes elongatulus (P.W.J.Müller & Kunze, 1822)	Sx	ob	–	–	–	–	2	3	1	6
Scydmoraphes minutus (Chaudoir, 1845)	Sx	ob	–	–	–	1	–			1
Stenichnus bicolor (Denny, 1825)	Sx	ob	–	–	–	–	–	4		4
Stenichnus carpathicus Lokay, 1921	Sx	ob	–	–	–	–	–	6	2	8
Stenichnus godarti (Latreille, 1806)	Sx	ob	–	–	–	2	1	–	–	3
Bisnius fimetarius (Gravenhorst, 1802)	Ed/Sx	fc	2	–	3	10	13	7	7	42
Gabrius exspectatus Smetana, 1952	Sx	ob	–	1	3	–	–	–	–	4
Quedius cinctus (Paykull, 1790)	Sx	ob	–	–	3	–	1	–	4	8
Quedius fumatus (Stephens, 1833)	Ed/Sx	fc	–	1	–	4	2	–	–	7
Quedius humeralis Stephens, 1832	Ed/Sx	fc	–	–	1	–	–	–	–	1
Quedius lateralis (Gravenhorst, 1802)	Ed/Sx	fc	–	–	–	–	–	–	1	1
Quedius lucidulus Erichson, 1839	Ed/Sx	fc	2	3	11	26	10	31	33	116
Quedius mesomelinus (Marsham, 1802)	Ed/Sx	fc	1	–	–	–	3	6	2	12
Quedius paradisianus (Heer, 1839)	Ed/Sx	fc	2	1	4	15	8	2	14	46
Quedius truncicola Fairmaire & Laboulbène, 1856	Sx	ob	–	–	–	–	–	1	–	1
Quedionuchus plagiatus (Mannerheim, 1843)	Sx	ob	–	–	–	1	–	–	–	1
Sepedophilus immaculatus (Stephens, 1832)	Sx	ob	1	–	–	–	–	–	–	1
Sepedophilus littoreus (Linnaeus, 1758)	Sx	ob	–	–	1	3	–	–	–	4
Sepedophilus testaceus (Fabricius, 1792)	Sx	ob	1	–	–	–	–	–	–	1
Tachinus corticinus Gravenhorst, 1802	Ed/Sx	fc		3	–	–	–	–	–	3
Tachinus humeralis Gravenhorst, 1802	Ed/Sx	fc	1	2	4	1	–	1	–	9
Tachinus laticollis Gravenhorst, 1802	Ed/Sx	fc	–	–	–	–	–	1	–	1
Tachinus lignorum (Linnaeus, 1758)	Ed/Sx	fc	1	–	–	–	–	–	–	1

Species	Preferences for microhabitats	Saproxylic	I	II	III	IV	V	VI	VII	To-tal
Tachinus pallipes (Gravenhorst, 1806)	Ed/Sx	fc	4	2	–	13	13	3	13	48
Tachinus proximus Kraatz, 1855	Ed/Sx	fc	–	–	–	–	4	–	–	4
Tachinus rufipennis Gyllenhal, 1810	Ed/Sx	fc	–	–	–	2	–	–	–	2
Tachinus subterraneus (Linnaeus, 1758)	Ed/Sx	fc	–	1	–	–	–	–	–	1
Atrecus affinis (Paykull, 1789)	Sx	ob	–	–	–	–	–	–	2	2
Atrecus pilicornis (Paykull, 1790)	Sx	ob	4	–	–	5	3	8	9	29
Othius crassus Motschulsky, 1858	Ed/Sx	fc	–	2	–	–	–	–	–	2
Othius subuliformis Stephens, 1833	Ed/Sx	fc	–	5	2	–	–	–	–	7
Total (species*/specimens):			50/206	50/73	37/308	71/957	54/385	55/861	47/599	128/3089

Note: Ed – edaphic or edaphicolous species; Sx – saproxylic species; fc – facultative saproxylic species; ob – obligate saproxylic species; I – section of an old-growth spruce forest; II – section of a middle-aged spruce forest; III – section of a middle-aged spruce forest; IV – section of an old-aged fir forest; V – section of a middle-aged managed fir forest; VI – section of an old-aged non-managed fir primeval forest or forest; VII – section of a middle-aged managed spruce forest.

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ДО ФАУНИ САПРОКСИЛОБІОНТНИХ ЖУКІВ-СТАФІЛІНІД (COLEOPTERA: STAPHYLINIDAE) ХВОЙНИХ ЛІСІВ КАРПАТСЬКОГО НАЦІОНАЛЬНОГО ПРИРОДНОГО ПАРКУ

Сапроксилобіонтні жуки – це комахи, які на різних стадіях життєвого циклу залежать від мертвої та гниючої деревини та відіграють важливу екологічну роль у біоценозах Європи. Разом із грибами вони виступають в ролі деструкторів мертвої деревини, а також беруть участь у процесах ґрунтоутворення та кругообігу речовин в природі. Родина жуків-стафілінід є однією з найбільших родин жуків. Багато видів родини Staphylinidae характеризуються високою чисельністю, чітким розподілом на певні природні середовища існування та здатністю чутливо реагувати на зміни в навколишньому середовищі, що дозволяє використовувати їх як об'єкти для біоіндикації процесів забруднення навколишнього середовища та моніторингу екосистем. Метою дослідження є вивчення різноманіття сапроксилобіонтних жуків-стафілінід хвойних лісів Карпатського національного природного парку. Рукопис базується на результатах наукових спостережень та зборів, проведених у хвойних лісах Карпатського національного природного парку у 2023–2024 роках. Усі бар'єрні пастки або політрапи встановлювалися та працювали два роки поспіль, протягом вегетаційного сезону з початку квітня до кінця вересня. Угруповання сапроксилобіонтних жуків-стафілінід, зібраних у хвойних лісах Карпатського національного природного парку, характеризується високим рівнем видового різноманіття. Фауна сапроксильних жуків-стафілінід налічує 217 видів, з яких 127 є облігатними або факультативними сапроксильними видами. Результатом нашого дослідження є зріз різноманніття угрупованнь представників родини на певних етапах лісової сукцесії. У майбутньому ці дані можуть бути використані дослідниками для оцінки рівня збереженості інших територій, зокрема з метою формування пропозицій щодо

раціонального сталого лісокористування, до чого поступово рухається українське лісове господарство. Представлений таксономічний список не претендує на повноту, але є основою для подальшої інвентаризації та моніторингу різноманіття сапроксилобіонтних твердокрилих, а також ведення кадастру природних комплексів НПП «Карпатский».
Ключові слова: Жуки-стафіліниди, сапроксилобіонтнтні види, хвойні ліси, фауна.

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