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MONITORING OF DIVERSITY OF SAPROXYLIC COLEOPTERA IN CONIFEROUS FORESTS OF THE CARPATHIAN NATIONAL NATURE PARK IN 2023

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MONITORING OF DIVERSITY OF SAPROXYLIC COLEOPTERA IN CONIFEROUS FORESTS OF THE CARPATHIAN NATIONAL NATURE PARK IN 2023. Yurii B. Motruk

– Coleoptera is one of the largest groups not only among insects, but also among animals in general. Today, the world fauna of beetles includes about 300,000 species. At least 5,000 species of the order live in the Ukrainian Carpathians. Many of them are known only from a few historical records. Coleoptera are widespread in all natural zones of the planet, inhabit virtually all terrestrial natural and anthropogenic habitat types, and actively participate in the activities of natural and artificial ecosystems. Larvae and adults actively inhabit litter, plant and animal remnants, excrements, fungal fruit bodies. The history of studying Coleoptera in the Ukrainian Carpathians goes back for almost 200 years. Comprehensive and stationary ecological and faunistic studies of Coleoptera in the coniferous forests of the Carpathian National Nature Park had not been conducted at all before the start of our research, and the study of the coleopterofauna in this region was mostly sporadic and fragmentary. We began comprehensive studies of the coleopterofauna of the coniferous forests of the Carpathian in 2023. The highest species diversity of Coleoptera during the study period was found in the area of old-growth spruce forest (202 species). Significantly fewer species were found in old-growth fir forest (193 species) as well as in the dieback old-growth spruce forest, where 185 species were recorded. The lowest richness, 141 species, was recorded in the middle-aged spruce forest. As a result of the research, an attempt was made for the first time to inventory the taxonomic composition of beetles in the coniferous forests of the Carpathian National Nature Park. Obtained results can be used in compiling a cadastre of the animal world of Ukraine, for analyzing species distribution, in biogeographical modeling, ecological monitoring, and predicting the impact of anthropogenic factors on natural ecosystems.

МОНІТОРИНГ РІЗНОМАНІТТЯ ТВЕРДОКРИЛИХ (COLEOPTERA) В ХВОЙНИХ ЛІСАХ КАРПАТСЬКОГО НАЦІОНАЛЬНОГО ПРИРОДНОГО ПАРКУ В 2023 РОЦІ.

Юрій Б. Мотрук – Твердокрили (Coleoptera) є однією з найбільших груп не лише серед комах, але і серед тварин загалом. На сьогодні світова фауна жуків нараховує близько 300000 видів. На території Українських Карпат живе щонайменше 5000 видів ряду. Багато із них відомі лише за поодинокими давніми знахідками. Твердокрили повсюдні в усіх природних зонах планети, населяють практично всі наземні природні та антропогенні біотопи, беруть активну участь у діяльності природних та штучних біогеоценозів. Личинки та імаго активно заселяють підстилку, рослинні та тваринні рештки, екскременти тварин, гриби тощо. Історія вивчення твердокрилих Українських Карпат триває вже майже 200 років. Незважаючи на тривале та досить інтенсивне вивчення комах в Українських Карпатах, колеоптерофауна хвойних лісів Українських Карпат донедавна залишалася майже недослідженою. Комплексних і стаціонарних еколо-

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го-фауністичних досліджень твердокрилих хвойних лісів Карпатського НПП до початку наших досліджень взагалі не проводили, а вивчення колеоптерофауни на цій території мало здебільшого спорадичний і фрагментарний характер. Комплексні дослідження колеоптерофауни хвойних лісів Карпатського НПП було розпочато нами лише у 2023 р. Найбільшим видовим різноманіттям твердокрилих за період дослідження виявлено на ділянці старовікового ялинового лісу (202 видів), значно менше видів виявлено на ділянці старовікового ялицевого пралісу – 193 видів, та на ділянці з всихаючим старовіковим ялиновим лісом, де зафіксовано 185 видів. Найменша кількість, 141 вид зареєстровано на ділянці середньовікового ялинового лісу. В результаті проведених досліджень вперше здійснено спробу інвентаризації таксономічного складу жуків хвойних лісів Карпатського НПП. Отримані результати можуть бути використані при складанні кадастру тваринного світу України, для аналізу поширення видів, а також у біогеографічному моделюванні, для проведення екологічного моніторингу та прогнозування впливу антропогенних факторів на природні екосистеми.

Coleoptera is one of the largest groups not only among insects, but also among animals in general. To date, the world fauna of beetles numbers about 300,000 species. At least 5,000 species of the order live in the Ukrainian Carpathians. Many of them are known only from sporadic historical records (Mateleshko, 2005). At the same time, both the fauna and the ecological characteristics of many families of beetles in the region remain insufficiently studied. Coleoptera are widespread in all natural zones of the planet, inhabit virtually all terrestrial natural and anthropogenic habitat types, and actively participate in ecosystem functioning. Larvae and adults actively inhabit different kinds of substrates, including litter, plant and animal remnants, excrements, and fungal fruit bodies, etc. The probability of discovering new and poorly-known species in the Ukrainian Carpathians remains quite high. At the same time, the low level of study of most insect families in the fauna of the region and Ukraine as a whole determined the choice of the topic of research.

The history of studying Coleoptera in the Ukrainian Carpathians goes back almost 200 years. In general, three separate historical stages of studying the coleopterofauna can be distinguished: pre-war (before WW2), post-war (Soviet) and modern stages, which are described in detail in the works of our colleagues (Diedus et al., 2022; Droghvalenko et al., 2025; Glotov, 2012, 2021a,b, 2022, 2023a,b; Glotov et al., 2023, 2024, 2025; Glotov, Hushtan, 2020; Koval et al., Mateleshko, 2005, Mateleshko, Potish, 2011; Motruk et al., 2025).

At the present stage, the study of Coleoptera in the Ukrainian Carpathians, including those inhabiting old-growth forests and primeval beech forests, was actively conducted until recently by the late V.O. Chumak. M.V. Chumak worked with him on this topic and continues this research today. Thanks to their efforts, a significant contribution has been made to the study of Coleoptera in beech forests and ecotones of Transcarpathia, especially saproxylobiont species associated with primeval forest ecosystems. M.Ya. Skrypnyk, M.V. Varyvoda, V.I. Diedus, and others are also involved in the study of saproxylobiont Coleoptera in the region. In particular, representatives of the Staphylinidae family are studied by S.V. Glotov and A.V. Gontarenko; the study of Cerambycidae of the Carpathian region of Ukraine is carried out by A.M. Zamoroka; the study of Buprestidae in the region is carried out by T.P. Yanytskyi; and Curculionoidea are studied by D.S. Khrapov and N.N. Yunakov. Zoological studies of Coleoptera in the Ukrainian Carpathians are covered in the works of Yu.V. Kanarskyi, O.Yu. Mateleshko, N.P. Koval, and V.B. Rizun. Detailed information on the works of the above-mentioned colleagues is provided in the works of our colleagues (Kyselyuk et al., 2009). A list of regionally rare species of Coleoptera is provided in the Red Book of the Ukrainian Carpathians (Mateleshko, Potish, 2011; Glotov et al., 2024).

Despite long-term and fairly intensive study of insects in the Ukrainian Carpathians, the coleopterofauna of the coniferous forests of the Carpathian National Nature Park remained understudied until 2023, when we began our study.

The aim of our study was to provide a comprehensive description of the Coleoptera diversity of the coniferous forests of the Carpathian National Nature Park.

Materials and methods

The report is based on own observations and collections which were conducted in the coniferous forests of the Carpathian National Nature Park (Fig. 1) in 2023 on the following sections: section of old-aged spruce forest, section of middle-aged spruce forest, section with drying old-aged spruce forest, section of old-aged fir forest. Detailed occurrence data are available through

GBIF (Motruk et al., 2025; Drogvalenko et al., 2025). A combined hanging trap (Polytrap) was installed in each of the plots (Fig. 2). The radius of the trap was 45 cm, and the height of the plates was 70 cm (Duelli et al., 1999). A 4% formalin solution was used as the fixative for the traps. The material from the traps was removed monthly and transferred to 150 ml plastic jars with 70% ethanol. All traps were set up and operated yearly during the vegetation season from early April to late September. The current taxonomic status, nomenclature, and general distribution of the species follow GBIF Backbone taxonomy (GBIF Secretariat, 2023). The geographical coordinates of localities and places of collecting are given according to Google Maps (www.google.com/maps). Species identification was carried out using MBS-10 stereomicroscope. If necessary, the mandibles, genitalia, and other parts of the beetles' bodies were dissected and fixed using thin dissecting needles. The material was clarified, if necessary, 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 (Motruk, Glotov, 2025).

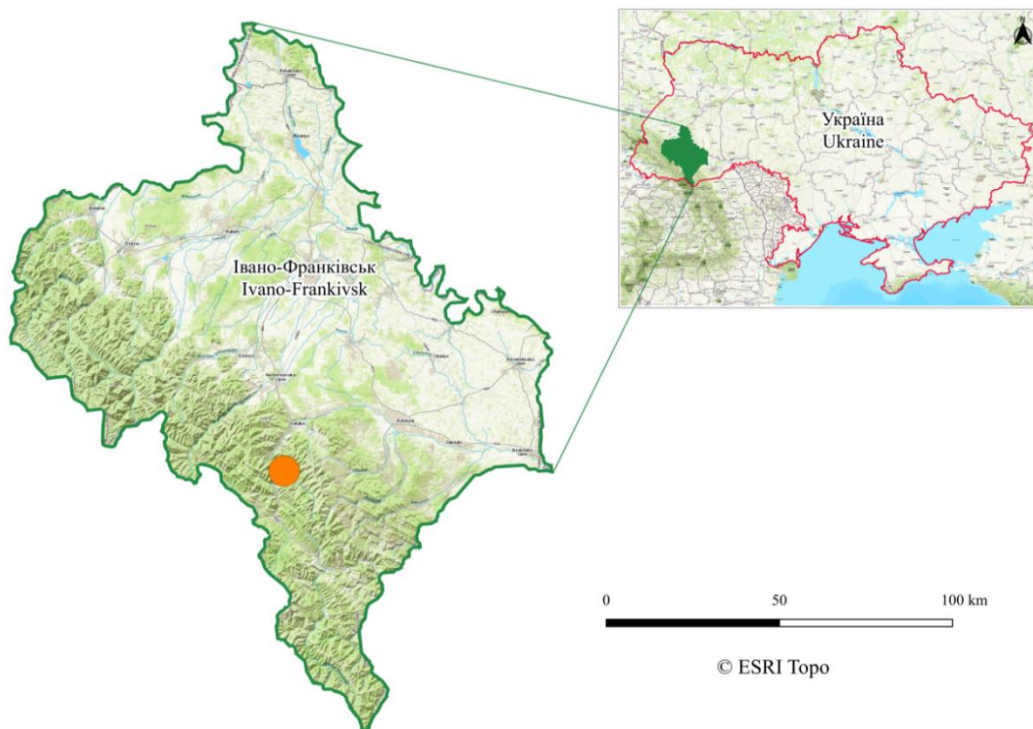


Figure 1. Location of the study area in coniferous forests of the Carpathian National Nature Park.

Рисунок 1. Місцезорозташування досліджуваних ділянок у хвойних лісах Карпатського національного природного парку.

Study area. The Carpathian National Nature Park (hereinafter referred to as the Carpathian NNP) is the oldest 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 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 situated in the highest and most interesting sector of the Gorgany massif from a geographical perspective. 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 ecosystems of Chornohora, relict *Pinus cembra* stands preserved on the rocky plateaus 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 designated as a 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 (Kyselyuk et al., 2009).



Figure 2. General view of the window combined trap (polytrap).

Рисунок 2. Загальний вигляд віконної комбінованої пастки (політрапа).

Section of an old-growth spruce forest (Fig. 3: a). It is located on a south-eastern slope, at an altitude of 975 m a. s. l., in the parcel 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., 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 diverse large number of microhabitats.

Section of a middle-aged spruce forest (Fig. 3: b). It is located on a southwestern slope at an altitude of 820 m a. s. l., in the parcel 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.

Section with a drying old-growth spruce forest (Fig. 3: c). It is located on a south-eastern slope, at an altitude of 715 m a. s. l., in the parcel 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 composed of *Picea abies* (90%) and *Abies alba* (10%), with a minor admixture of *Fagus sylvatica*.

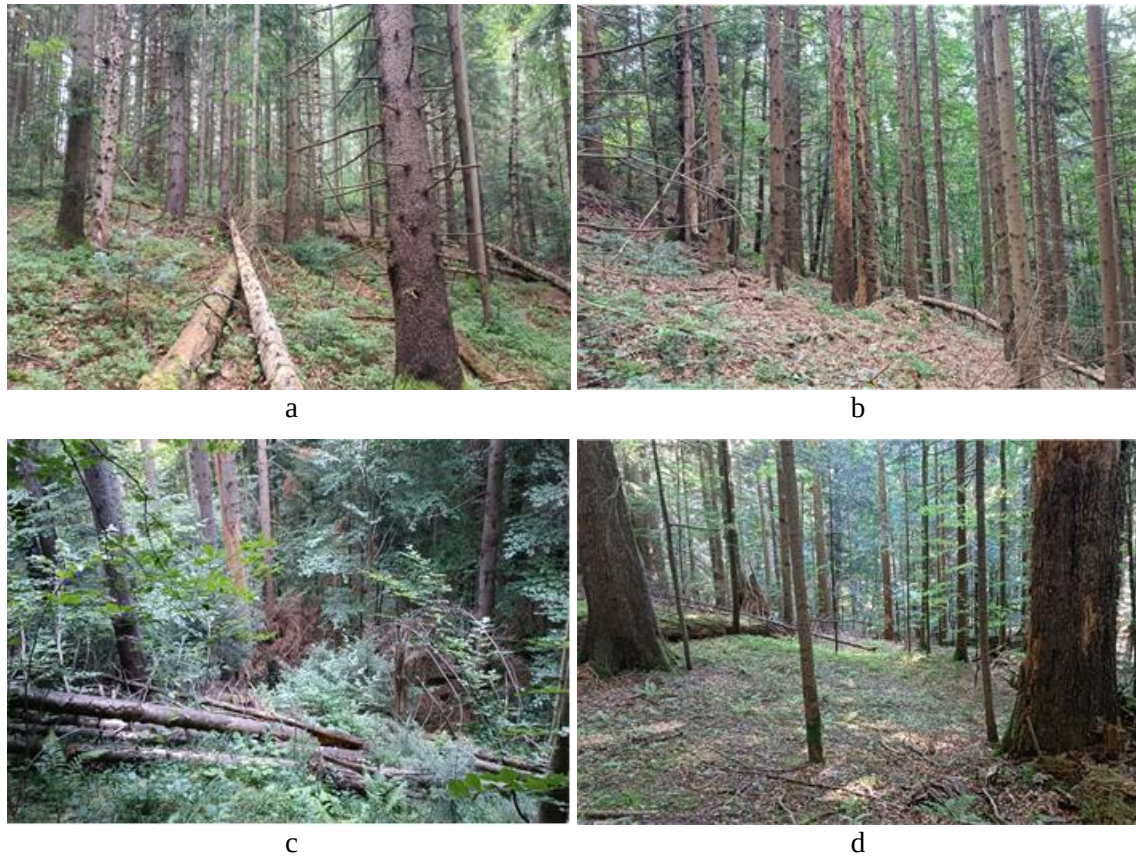


Figure 3. General view of research plots:

a – section of an old-growth spruce forest; *b* – section of a middle-aged spruce forest; *c* – section of a middle-aged spruce forest; *d* – section of an old-growth fir forest.

Рисунок 3. Загальний вигляд дослідних ділянок:

a – ділянка старовікового ялинового лісу; *b* – середньовікового ялинового лісу; *c* – з висихаючим старовіковим ялиновим лісом; *d* – старовікового ялицевого лісу.

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-growth fir forest (Fig. 3: d) is located on a western slope at an altitude of 760 m a. s. l., in parcels 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 situated on slightly acidic, and deep brown soils with a well-developed humus horizon. The section is represented by exemplary old-growth fir forests, which are 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 cordatum*. 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-growth forests in the Ukrainian Carpathians.

Results

Section of an old-growth spruce forest. As a result of identifying 1,703 specimens of beetles in the area of old-growth spruce forest, 247 species were found, including: *Laricobius erichsonii* Rosenhauer, 1846, *Calyptomerus alpestris* Redtenbacher, 1847, *Aulonothroscus brevicollis* (Bonvouloir, 1859), *Trixagus carinifrons* (Bonvouloir, 1859), *T. dermestoides* (Linnaeus, 1767), *T. meybohmi* Leseigneur, 2005, *Hylis foveicollis* (Thomson, 1874), *Ampedus erythrogonus* (P.W.J. Müller, 1821), *A. nigrinus* (Herbst, 1784), *A. pomonae* (Stephens, 1830), *A. aethiops* (Lacordaire, 1835), *Athous mollis* Reitter, 1889, *A. subfuscus* (O.F. Müller, 1767), *Dalopius marginatus* (Linnaeus, 1758), *Denticollis interpositus* Roubal, 1941, *Diacanthous undulatus* (De Geer, 1774), *Melanotus castanipes* (Paykull, 1800), *Metanomus infuscatus* (Eschscholtz, 1829), *Omalisus fontisbellaquaei* Geoffroy, 1785, *Benibotarus taygetanus* (Pic, 1905), *Dictyoptera aurora* (Herbst, 1784), *Pyropterus nigroruber* (De Geer, 1774), *Lampyris noctiluca* (Linnaeus, 1758), *Ancistronycha tigurina* Dietrich, 1857, *Malthinus biguttatus* (Linnaeus, 1758), *Malthodes* sp., *Metacantharis discoidea* (Ahrens, 1812), *Podabrus alpinus* (Paykull, 1798), *Podistra rufotestacea* (Letzner, 1845), *P. schoenherri* (Dejean, 1837), *Rhagonycha lignosa* (Müller, 1764), *Plegaderus vulneratus* (Panzer, 1797), *Ceruchus chrysomelinus* (Hochenwarth, 1785), *Sinodendron cylindricum* (Linnaeus, 1758), *Anoplotrupes stercorosus* (Scriba, 1791), *Acrotrichis intermedia* (Gillmeister, 1845), *A. rosskotheni* Sundt, 1971, *Pteryx suturalis* (Heer, 1841), *Agathidium badium* Erichson, 1845, *A. confusum* Brisout de Barneville, 1863, *A. nigripenne* (Fabricius, 1792), *A. seminum* (Linnaeus, 1758), *A. varians* Beck, 1817, *Anisotoma castanea* (Herbst, 1791), *A. humeralis* (Fabricius, 1792), *A. orbicularis* (Herbst, 1791), *Catops picipes* (Fabricius, 1787), *Colenis immunda* (Sturm, 1807), *Hydnobius multistriatus* Gyllenhal, 1813, *Leiodes oblonga* (Erichson, 1845), *Liodopria serricornis* (Gyllenhal, 1813), *Aleochara cuniculorum* Kraatz, 1858, *A. inconspicua* Aubé, 1850, *A. sparsa* Heer, 1839, *Amischa analis* (Gravenhorst, 1802), *Atheta crassicornis* (Fabricius, 1792), *A. hybrida* (Sharp, 1869), *Liogluta granigera* (Kiesenwetter, 1850), *L. microptera* C.G.Thomson, 1867, *Mocyta fungi* (Gravenhorst, 1806), *Plataraea brunnea* (Fabricius, 1798), *Gyrophæna affinis* Mannerheim, 1830, *G. gentilis* Erichson, 1839, *Leptusa fumida* (Erichson, 1839), *L. pulchella* (Mannerheim, 1830), *Oligota pumilio* Kiesenwetter, 1858, *Alevonota hepatica* (Erichson, 1839), *A. rufotestacea* Kraatz, 1856, *Geostiba circellaris* (Gravenhorst, 1806), *Ischnoglossa prolixa* (Gravenhorst, 1802), *Haploglossa villosula* (Stephens, 1832), *Oxypoda alternans* (Gravenhorst, 1802), *Bobitobus lunulatus* (Linnaeus, 1767), *Lordithon speciosus* (Erichson, 1839), *L. trinotatus* (Erichson, 1839), *Mycetoporus longulus* Mannerheim, 1830, *M. niger* Fairmaire & Laboulbène, 1856, *M. rufescens* (Stephens, 1832), *Olisthaerus substriatus* (Paykull, 1790), *Lesteva longoelytrata* Goeze, 1777, *Eusphalerum sorbi* (Gyllenhal, 1810), *Acrulia inflata* (Gyllenhal, 1813), *Phloeonomus punctipennis* C.G.Thomson, 1867, *P. pusillus* (Gravenhorst, 1806), *Phloeostiba plana* (Paykull, 1792), *Anotylus mutator* (Lohse, 1963), *Syntomium aeneum* (P.W.J.Müller, 1821), *Megarthus depressus* (Paykull, 1789), *M. hemipterus* (Illiger, 1794), *Proteinus brachypterus* (Fabricius, 1792), *Euplectus brunneus* (Grimmer, 1841), *E. infirmus* Raffray, 1910, *E. piceus* Motschulsky, 1835, *E. signatus* (Reichenbach, 1816), *Bibloporus bicolor* (Denny, 1825), *B. mayeti* Guillebeau, 1888, *B. minutus* Raffray, 1915, *Trimium minimum* Doderö, 1900, *Bryaxis frivaldszkyi* (Reitter, 1887), *B. nigripennis* (Aubé, 1844), *Scaphidium quadrimaculatum* A.G.Olivier, 1790, *Scaphisoma boleti* (Panzer, 1793), *S. inopinatum* (Löbl, 1967), *S. subalpinum* Reitter, 1881, *Bisnius fimetarius* (Gravenhorst, 1802), *Philonthus addendus* Sharp, 1867, *P. decorus* (Gravenhorst, 1802), *Quedius fuliginosus* (Gravenhorst, 1802), *Q. lucidulus* Erichson, 1839, *Q. meridiocarpaticus* Smetana, 1958, *Q. mesomelinus* (Marsham, 1802), *Q. paradisiensis* (Heer, 1839), *Sepedophilus immaculatus* (Stephens, 1832), *S. testaceus* (Fabricius, 1792), *Tachinus humeralis* Gravenhorst, 1802, *T. lignorum* (Linnaeus, 1758), *T. pallipes* (Gravenhorst, 1806), *Tachyporus chrysomelinus* (Linnaeus, 1758), *T. dispar* (Paykull, 1789), *Atrecus pilicornis* (Paykull, 1790), *Dorcatoma dresdensis* Herbst, 1792, *D. robusta* Strand, 1938, *Ernobius abietinus* (Gyllenhal, 1808), *E. angusticollis* (Ratzeburg, 1847), *Priobium carpini* (Herbst, 1793), *Ptino-*

morphus imperialis (Linnaeus, 1767), *Ptinus villiger* (Reitter, 1884), *Xestobium austriacum* Reitter, 1890, *Peltis ferruginea* (Linnaeus, 1758), *Nemozoma elongatum* (Linnaeus, 1760), *Thymalus limbatus* (Fabricius, 1787), *Charopus flavipes* (Paykull, 1798), *Dasytes caeruleus* (De Geer, 1774), *Hylecoetus dermestoides* (Linnaeus, 1761), *Anaspis rufilabris* (Gyllenhal, 1827), *Calopus serraticornis* (Linnaeus, 1758), *Salpingus ruficollis* (Linnaeus, 1761), *Hallomenus axillaris* (Illiger, 1807), *H. binotatus* (Quensel, 1790), *Tetratoma ancora* Fabricius, 1790, *Dolotarsus lividus* (C.R.Sahlberg, 1833), *Orchesia undulata* Kraatz, 1853, *Phloiotrya rufipes* (Gyllenhal, 1810), *Serropalpus barbatus* (Schaller, 1783), *Cis boleti* (Scopoli, 1763), *C. festivus* (Panzer, 1793), *Octotemnus glabriculus* (Gyllenhal, 1827), *Orthocis alni* (Gyllenhal, 1813), *Mycetophagus fulvicollis* Fabricius, 1792, *Cerylon fagi* Brisout de Barneville, 1867, *C. ferrugineum* Stephens, 1830, *C. histeroides* (Fabricius, 1792), *Cartodere nodifer* (Westwood, 1839), *Corticaria longicornis* (Herbst, 1793), *Corticarina lambiana* (Sharp, 1910), *Corticicara gibbosa* (Herbst, 1793), *Enicmus atriceps* Hansen, 1962, *E. fungicola* Thomson, 1868, *E. rugosus* (Herbst, 1793), *E. testaceus* (Stephens, 1830), *Latridius hirtus* Gyllenhal, 1827, *L. minutus* (Linnaeus, 1767), *Stephostethus alternans* (Mannerheim, 1844), *S. rugicollis* (Olivier, 1790), *Mycetina cruciata* (Schaller, 1783), *Anatis ocellata* (Linnaeus, 1758), *Scymnus abietis* (Paykull, 1798), *Triplax aenea* (Schaller, 1783), *Aspidiphorus orbiculatus* (Gyllenhal, 1808), *Rhizophagus bipustulatus* (Fabricius, 1792), *R. brancsiki* Reitter, 1905, *R. cribratus* Gyllenhal, 1827, *R. dispar* (Paykull, 1800), *R. fenestralis* (Linnaeus, 1758), *R. nitidulus* (Fabricius, 1798), *R. perforatus* Erichson, 1845, *Brassicogethes aeneus* (Fabricius, 1775), *Epuraea aestiva* (Linnaeus, 1758), *E. angustula* Sturm, 1844, *E. biguttata* (Thunberg, 1784), *E. deubeli* Reitter, 1898, *E. longula* Erichson, 1845, *E. marseuli* Reitter, 1873, *E. muehli* Reitter, 1908, *E. pallescens* (Stephens, 1835), *E. pygmaea* (Gyllenhal, 1808), *E. terminalis* (Mannerheim, 1843), *E. variegata* (Herbst, 1793), *Ipidia binotata* Reitter, 1875, *Pityophagus ferrugineus* (Linnaeus, 1758), *Pocadius ferrugineus* (Fabricius, 1775), *Stelidota geminata* (Say, 1825), *Thalycra fervida* (Olivier, 1790), *Antherophagus pallens* (Linnaeus, 1758), *Atomaria alpina* Heer, 1841, *A. bella* Reitter, 1875, *A. elongatula* Erichson, 1846, *A. longicornis* Thomson, 1863, *A. turgida* Erichson, 1846, *Cryptophagus cylindrellus* Johnson, 2007, *C. dentatus* (Herbst, 1793), *Micrambe abietis* (Paykull, 1798), *M. longitarsis* (J.Sahlberg, 1900), *Pteryngium crenulatum* (Erichson, 1846), *Dendrophagus crenatus* (Paykull, 1799), *Silvanoprus fagi* (Guérin-Ménéville, 1844), *Pediacus depressus* (Herbst, 1797), *Cryphalus asperatus* (L.Gyllenhal, 1813), *C. piceae* Wood & Bright, 1992, *C. saltuarius* Weise, 1891, *Crypturgus cinereus* (J.F.W.Herbst, 1793), *C. hispidulus* C.G.Thomson, 1870, *Dryocoetes autographus* Eichhoff, 1864, *D. hectographus* Reitter, 1913, *Ernoporicus caucasicus* (Lindemann, 1876), *E. fagi* Wood & Bright, 1992, *Hylastes cunicularius* Erichson, 1836, *Hylurgops palliatus* Wood & Bright, 1992, *Ips duplicatus* (Sahlberg, 1836), *I. typographus* (Linnaeus, 1758), *Pityogenes chalcographus* (Linnaeus, 1760), *Pityophthorus exsculptus* Eichhoff, 1864, *Pityophthorus pityographus* (Ratzeburg, 1837), *Polygraphus poligraphus* (Linnaeus, 1758), *P. punctifrons* C.G.Thomson, 1886, *Taphrorychus bicolor* (J.F.W.Herbst, 1793), *Trypodendron domesticum* (Linnaeus, 1758), *T. lineatum* (A.G.Olivier, 1800), *Xyleborus dispar* Wood & Bright, 1992, *Xylechinus pilosus* Chapuis, 1869, *Alosterna tabacicolor* (Degeer, 1775), *Anastrangalia dubia* (Scopoli, 1763), *Clytus lama* Mulsant, 1850, *Evodinus clathratus* (Fabricius, 1793), *Grammoptera ruficornis* (Fabricius, 1781), *Monochamus sartor* (Fabricius, 1787), *Oxymirus cursor* (Linnaeus, 1758), *Pachytodes cerambyciformis* (Schränk, 1781), *Pidonia lurida* (Fabricius, 1793), *Prionus coriarius* (Linnaeus, 1758), *Rhagium inquisitor* (Linnaeus, 1758), *Stenurella melanura* (Linnaeus, 1758), *Stictoleptura rubra* (Linnaeus, 1758), *Tetropium castaneum* (Linnaeus, 1758), *T. fuscum* (Fabricius, 1787), *Cryptocephalus* sp., *Leptinotarsa decemlineata* (Say, 1824).

During the study period, 1,378 specimens of saproxylic Coleoptera belonging to 202 species from 37 families were collected in the area of old-growth spruce forest, including: Derodontidae – 1 species, Clambidae – 1 species, Throscidae – 4 species, Eucnemidae – 1 species, Elateridae – 7 species, Lycidae – 3 species, Cantharidae – 2 species, Histeridae – 1 species, Lucanidae – 2 species, Ptiliidae – 2 species, Leiodidae – 9 species, Staphylinidae – 49 species, Ptinidae – 8 species, Peltidae – 1 species, Trogossitidae – 1 species, Thymalidae – 1 species, Melyridae – 1 species, Hylecoetidae – 1 species, Scaptiidae – 1 species, Oedemeridae – 1 species, Salpingidae – 1 species, Tetratomidae – 3 species, Melandryidae – 4 species, Ciidae – 4 species, Mycetophagidae – 1 species, Cerylonidae – 3 species, Latridiidae – 12 species, Endomychidae – 1 species,

Erotylidae – 1 species, Sphindidae – 1 species, Monotomidae – 7 species, Nitidulidae – 16 species, Cryptophagidae – 10 species, Silvanidae – 2 species, Cucujidae – 1 species, Curculionidae – 23 species, and Cerambycidae – 15 species.

The greatest species diversity in the area of the old-growth spruce forest is represented by the families Staphylinidae (49 species), Curculionidae (23 species), Nitidulidae (16 species), Cerambycidae (15 species), and Latridiidae (12 species). The rest of the families are represented by a fewer number of species (from 1 to 10 species).

Section of a middle-aged spruce forest. During the study period, 1,076 specimens of 170 species were found in the area of middle-aged spruce forest: *Aulonothroscus brevicollis* (Bonvouloir, 1859), *Trixagus dermestoides* (Linnaeus, 1767), *T. meybohmi* Leseigneur, 2005, *Hylis foveicollis* (Thomson, 1874), *Ampedus erythrogonus* (P.W.J. Müller, 1821), *A. nigrinus* (Herbst, 1784), *Athous mollis* Reitter, 1889, *A. subfuscus* (O.F. Müller, 1767), *Denticollis interpositus* Roubal, 1941, *D. rubens* Piller & Mitterpacher, 1783, *Melanotus castanipes* (Paykull, 1800), *Dictyoptera aurora* (Herbst, 1784), *Erotides cosnardi* (Chevrolat, 1829), *Pyropterus nigroruber* (De Geer, 1774), *Cantharis livida* Linnaeus, 1758, *C. pellucida* Fabricius, 1792, *Malthinus biguttatus* (Linnaeus, 1758), *M. fasciatus* (Olivier, 1790), *Malthodes* sp., *Metacantharis discoidea* (Ahrens, 1812), *Podabrus alpinus* (Paykull, 1798), *Podistra rufotestacea* (Letzner, 1845), *P. schoenherri* (Dejean, 1837), *Rhagonycha lignosa* (Müller, 1764), *Margarinotus striola* (C.R.Sahlberg, 1819), *Platysoma lineare* Erichson, 1834, *Sinodendron cylindricum* (Linnaeus, 1758), *Anoplotrupes stercorosus* (Scriba, 1791), *Acrotrichis intermedia* (Gillmeister, 1845), *Agathidium confusum* Brisout de Barneville, 1863, *A. nigripennis* (Fabricius, 1792), *A. seminulum* (Linnaeus, 1758), *Colenis immunda* (Sturm, 1807), *Sciodrepoides watsoni* (Spence, 1813), *Brundinia meridionalis* (Mulsant & Rey, 1853), *Liogluta alpestris* (Heer, 1839), *L. microptera* C.G.Thomson, 1867, *Plataraea brunnea* (Fabricius, 1798), *Bolitochara obliqua* Erichson, 1837, *Leptusa fumida* (Erichson, 1839), *L. pulchella* (Mannerheim, 1830), *Alevonota hepatica* (Erichson, 1839), *Pella limbata* (Paykull, 1789), *Ischnoglossa prolixa* (Gravenhorst, 1802), *Bobitobus lunulatus* (Linnaeus, 1767), *Lordithon trinitatus* (Erichson, 1839), *Mycetoporus longulus* Mannerheim, 1830, *M. niger* Fairmaire & Laboulbène, 1856, *M. rufescens* (Stephens, 1832), *Eusphalerum sorbi* (Gyllenhal, 1810), *Phloeonomus pusillus* (Gravenhorst, 1806), *Phloeostiba plana* (Paykull, 1792), *Syntomium aeneum* (P.W.J.Müller, 1821), *Lathrobium* sp., *Phloeocharis subtilissima* Mannerheim, 1830, *Euplectus duponti* Aubé, 1833, *E. piceus* Motschulsky, 1835, *Bibloporus bicolor* (Denny, 1825), *Bryaxis frivaldszkyi* (Reitter, 1887), *Scaphidium quadrimaculatum* A.G.Olivier, 1790, *Scaphisoma boreale* (Lundblad, 1952), *S. limbatum* Erichson, 1845, *Scaphisoma subalpinum* Reitter, 1881, *Oiceoptoma thoracicum* (Linnaeus, 1758), *Philonthus decorus* (Gravenhorst, 1802), *P. politus* (Linnaeus, 1758), *Gabrius exspectatus* Smetana, 1952, *Quedius fumatus* (Stephens, 1833), *Q. lucidulus* Erichson, 1839, *Q. paradisianus* (Heer, 1839), *Q. scintillans* (Gravenhorst, 1806), *Tachinus corticinus* Gravenhorst, 1802, *T. humeralis* Gravenhorst, 1802, *T. pallipes* (Gravenhorst, 1806), *T. subterraneus* (Linnaeus, 1758), *Othius crassus* Motschulsky, 1858, *O. subuliformis* Stephens, 1833, *Cacotemnus rufipes* (Fabricius, 1792), *Hemicoelus rufipennis* (Duftschmid, 1825), *Ptilinus pectinicornis* (Linnaeus, 1758), *Ptinomorphus imperialis* (Linnaeus, 1767), *Peltis ferruginea* (Linnaeus, 1758), *Nemozoma elongatum* (Linnaeus, 1760), *Dasytes caeruleus* (De Geer, 1774), *D. plumbeus* (Müller, 1776), *Hylecoetus dermestoides* (Linnaeus, 1761), *Tomoxia bucephala* Costa, 1854, *Anaspis rufilabris* (Gyllenhal, 1827), *A. thoracica* (Linnaeus, 1758), *Calopus serraticornis* (Linnaeus, 1758), *Salpingus planirostris* (Fabricius, 1787), *S. ruficollis* (Linnaeus, 1761), *Sphaeriestes stockmanni* (Biström, 1977), *Schizotus pectinicornis* (Linnaeus, 1758), *Tetratoma ancora* Fabricius, 1790, *Dolotarsus lividus* (C.R.Sahlberg, 1833), *Orchesia undulata* Kraatz, 1853, *Serropalpus barbatus* (Schaller, 1783), *Cis dentatus* Mellié, 1848, *Mycetophagus populi* Fabricius, 1798, *M. quadripustulatus* (Linnaeus, 1761), *Lagria atripes* Mulsant & Guillebeau, 1855, *Cerylon fagi* Brisout de Barneville, 1867, *C. ferrugineum* Stephens, 1830, *C. histeroides* (Fabricius, 1792), *Cartodere nodifer* (Westwood, 1839), *Corticarina lambiana* (Sharp, 1910), *Enicmus atriceps* Hansen, 1962, *E. fungicola* Thomson, 1868, *E. rugosus* (Herbst, 1793), *E. testaceus* (Stephens, 1830), *Latridius consimilis* Mannerheim, 1844, *L. hirtus* Gyllenhal, 1827, *Stephostethus alternans* (Mannerheim, 1844), *S. angusticollis* (Gyllenhal, 1827), *S. rugicollis* (Olivier, 1790), *Orthoperus punctatus* Wankowicz, 1865, *Aspidiphorus orbiculatus* (Gyllenhal, 1808), *Rhizophagus bipustulatus* (Fabricius, 1792), *R. brancsiki* Reitter, 1905, *R. dispar* (Paykull,

1800), *R. fenestralis* (Linnaeus, 1758), *R. nitidulus* (Fabricius, 1798), *R. perforatus* Erichson, 1845, *Cychramus luteus* (Fabricius, 1787), *C. variegatus* (Herbst, 1792), *Cyllodes ater* (Herbst, 1792), *Epuraea biguttata* (Thunberg, 1784), *E. longula* Erichson, 1845, *E. marseuli* Reitter, 1873, *E. melanocephala* (Marsham, 1802), *E. pygmaea* (Gyllenhal, 1808), *E. terminalis* (Mannerheim, 1843), *Glischrochilus quadriguttatus* (Fabricius, 1777), *G. quadripunctatus* (Linnaeus, 1758), *Lamiogethes ochropus* (Sturm, 1845), *Antherophagus pallens* (Linnaeus, 1758), *Atomaria alpina* Heer, 1841, *A. diluta* Erichson, 1846, *A. elongatula* Erichson, 1846, *A. turgida* Erichson, 1846, *Cryptophagus cylindrellus* Johnson, 2007, *C. dentatus* (Herbst, 1793), *Pteryngium crenulatum* (Erichson, 1846), *Dendrophagus crenatus* (Paykull, 1799), *Silvanoprus fagi* (Guérin-Ménéville, 1844), *Pediacus depressus* (Herbst, 1797), *Cryphalus piceae* Wood & Bright, 1992, *C. saltuarius* Weise, 1891, *Crypturgus cinereus* (J.F.W. Herbst, 1793), *C. hispidulus* C.G. Thomson, 1870, *C. pusillus* (L. Gyllenhal, 1813), *Dryocoetes autographus* Eichhoff, 1864, *D. hectographus* Reitter, 1913, *Hylastes cunicularius* Erichson, 1836, *Ips duplicatus* (Sahlberg, 1836), *I. typographus* (Linnaeus, 1758), *Pityogenes chalcographus* (Linnaeus, 1760), *Pityophthorus pityographus* (Ratzeburg, 1837), *Polygraphus poligraphus* (Linnaeus, 1758), *P. punctifrons* C.G. Thomson, 1886, *Taphrorychus bicolor* (J.F.W. Herbst, 1793), *Trypodendron domesticum* (Linnaeus, 1758), *T. lineatum* (A.G. Olivier, 1800), *Xylechinus pilosus* Chapuis, 1869, *Alosterna tabacicolor* (Degeer, 1775), *Evodinus clathratus* (Fabricius, 1793), *Grammoptera ruficornis* (Fabricius, 1781), *Oxymirus cursor* (Linnaeus, 1758), *Pidonia lurida* (Fabricius, 1793).

During the study period, 923 specimens of saproxylic Coleoptera belonging to 141 species from 34 families were collected in the area of middle-aged spruce forest: Throscidae – 3 species, Eucnemidae – 1 species, Elateridae – 5 species, Lycidae – 3 species, Cantharidae – 3 species, Histeridae – 2 species, Lucanidae – 1 species, Leiodidae – 3 species, Staphylinidae – 30 species, Ptinidae – 4 species, Peltidae – 1 species, Trogossitidae – 1 species, Melyridae – 2 species, Hylecoetidae – 1 species, Mordellidae – 1 species, Scaptiidae – 2 species, Oedemeridae – 1 species, Salpingidae – 3 species, Pyrochroidae – 1 species, Tetratomidae – 1 species, Melandryidae – 3 species, Ciidae – 1 species, Mycetophagidae – 2 species, Cerylonidae – 3 species, Latridiidae – 11 species, Corylophidae – 1 species, Sphindidae – 1 species, Monotomidae – 6 species, Nitidulidae – 11 species, Cryptophagidae – 7 species, Silvanidae – 2 species, Cucujidae – 1 species, Curculionidae – 18 species, and Cerambycidae – 5 species.

The greatest species diversity in the area is represented by the families Staphylinidae (30 species), Curculionidae (18 species), Nitidulidae and Latridiidae (11 species each). The remaining families are represented by a small number of species (from 1 to 7 species).

Section with a drying old-growth spruce forest. In the area with drying old-growth spruce forest, 233 species were found among the 1,822 specimens processed: *Aulonothroscus brevicollis* (Bonvouloir, 1859), *Trixagus leseigneuri* Muona, 2002, *T. meyhohmi* Leseigneur, 2005, *Hylis foveicollis* (Thomson, 1874), *Ampedus erythrogonus* (P.W.J. Müller, 1821), *A. pomonae* (Stephens, 1830), *A. sanguineus* (Linnaeus, 1758), *Athous mollis* Reitter, 1889, *A. subfuscus* (O.F. Müller, 1767), *Denticollis interpositus* Roubal, 1941, *D. linearis* (Linnaeus, 1758), *Diacanthous undulatus* (De Geer, 1774), *Liotrichus affinis* (Paykull, 1800), *Melanotus castanipes* (Paykull, 1800), *Omalisus fontisbellaquaei* Geoffroy, 1785, *Benibotarus taygetanus* (Pic, 1905), *Erotides cosnardi* (Chevrolat, 1829), *Pyropterus nigroruber* (De Geer, 1774), *Lampyrus noctiluca* (Linnaeus, 1758), *Cantharis livida* Linnaeus, 1758, *C. pellucida* Fabricius, 1792, *Macrocerus nigrinus* (Shaufuss, 1866), *Malthinus biguttatus* (Linnaeus, 1758), *M. fasciatus* (Olivier, 1790), *M. flaveolus* (Herbst, 1786), *Malthodes* sp., *Metacantharis discoidea* (Ahrens, 1812), *Podistra rufotestacea* (Letzner, 1845), *P. schoenherri* (Dejean, 1837), *Rhagonycha lignosa* (Müller, 1764), *Paromalus parallelepipedus* (Herbst, 1791), *Plegaderus caesus* (Herbst, 1791), *Ceruchus chrysomelinus* (Hochenwarth, 1785), *Acrotrichis intermedia* (Gillmeister, 1845), *A. rosskotheni* Sundt, 1971, *Colon latum* Kraatz, 1850, *C. sp.*, *Agathidium badium* Erichson, 1845, *A. confusum* Brisout de Barneville, 1863, *A. nigripennis* (Fabricius, 1792), *A. seminulum* (Linnaeus, 1758), *A. varians* Beck, 1817, *Amphicyllis globus* (Fabricius, 1792), *Anisotoma humeralis* (Fabricius, 1792), *Apocatops nigrita* (Erichson, 1837), *Catops picipes* (Fabricius, 1787), *Choleva cisteloides* (Frölich, 1799), *C. reitteri* Petri, 1915, *Colenis immunda* (Sturm, 1807), *Hydnobius multistriatus* Gyllenhal, 1813, *Leiodes fracta* (Seidlitz, 1874), *L. oblonga* (Erichson, 1845), *Liodopria serricornis* (Gyllenhal, 1813), *Ptomaphagus sericatus* (Chaudoir, 1845), *Sciodrepoides watsoni* (Spence,

1813), *Aleochara curtula* (Goeze, 1777), *A. cuniculorum* Kraatz, 1858, *A. lanuginosa* Gravenhorst, 1802, *A. peeziiana* Lohse, 1961, *Atheta crassicornis* (Fabricius, 1792), *A. sodalis* (Erichson, 1837), *Mocyta fungi* (Gravenhorst, 1806), *Plataraea brunnea* (Fabricius, 1798), *Gyrophæna affinis* Mannerheim, 1830, *Leptusa pulchella* (Mannerheim, 1830), *Alevonota hepatica* (Erichson, 1839), *Anomognathus cuspidatus* (Erichson, 1839), *Pella limbata* (Paykull, 1789), *Haploglossa villosula* (Stephens, 1832), *Ocalea concolor* Kiesenwetter, 1847, *Lordithon speciosus* (Erichson, 1839), *L. trinotatus* (Erichson, 1839), *Mycetoporus longulus* Mannerheim, 1830, *M. niger* Fairmaire & Laboulbène, 1856, *M. rufescens* (Stephens, 1832), *Lesteva longoelytrata* Goeze, 1777, *L. monticola* Kiesenwetter, 1847, *Eusphalerum sorbi* (Gyllenhal, 1810), *Acrulia inflata* (Gyllenhal, 1813), *Hapalaraea pygmaea* (Paykull, 1800), *Omalium rivulare* (Paykull, 1789), *Phloeonomus punctipennis* C.G.Thomson, 1867, *Phloeostiba plana* (Paykull, 1792), *Oxyporus maxillosus* Fabricius, 1792, *Anotylus mutator* (Lohse, 1963), *Syntomium aeneum* (P.W.J.Müller, 1821), *Proteinus brachypterus* (Fabricius, 1792), *Batrissodes venustus* (Reichenbach, 1816), *Euplectus infirmus* Raffray, 1910, *E. mutator* Fauvel, 1895, *E. signatus* (Reichenbach, 1816), *Bibloporus minutus* Raffray, 1915, *Brachygluta trigonoprocta* (Ganglbauer, 1895), *Bryaxis frivaldszkyi* (Reitter, 1887), *Scaphidium quadrimaculatum* A.G.Olivier, 1790, *Scaphisoma boreale* (Lundblad, 1952), *S. subalpinum* Reitter, 1881, *Oiceoptoma thoracicum* (Linnaeus, 1758), *Bisnius fimetarius* (Gravenhorst, 1802), *Gabrius exspectatus* Smetana, 1952, *Quedius cinctus* (Paykull, 1790), *Q. humeralis* Stephens, 1832, *Q. levicollis* (Brullé, 1832), *Q. lucidulus* Erichson, 1839, *Q. meridiocarpaticus* Smetana, 1958, *Q. paradisianus* (Heer, 1839), *Sepedophilus littoreus* (Linnaeus, 1758), *Tachinus humeralis* Gravenhorst, 1802, *Othius subuliformis* Stephens, 1833, *Cacotemnus rufipes* (Fabricius, 1792), *Dorcatoma robusta* Strand, 1938, *Ptilinus pectinicornis* (Linnaeus, 1758), *Peltis ferruginea* (Linnaeus, 1758), *Nemozoma elongatum* (Linnaeus, 1760), *Dasytes plumbeus* (Müller, 1776), *Thanasimus formicarius* (Linnaeus, 1758), *Tillus elongatus* (Linnaeus, 1758), *Hylecoetus dermestoides* (Linnaeus, 1761), *Elateroides flabellicornis* (Schneider, 1791), *Tomoxia bucephala* Costa, 1854, *Anaspis rufilabris* (Gyllenhal, 1827), *A. thoracica* (Linnaeus, 1758), *Cyrtanaspis phalerata* (Germar, 1847), *Salpingus planirostris* (Fabricius, 1787), *S. ruficollis* (Linnaeus, 1761), *Schizotus pectinicornis* (Linnaeus, 1758), *Hallomenus axillaris* (Illiger, 1807), *H. binotatus* (Quensel, 1790), *Mycetoma suturale* (Panzer, 1797), *Tetratoma ancora* Fabricius, 1790, *Orchesia minor* Walker, 1837, *O. undulata* Kraatz, 1853, *Serropalpus barbatus* (Schaller, 1783), *Cis bidentatus* (Olivier, 1790), *C. boleti* (Scopoli, 1763), *C. dentatus* Mellié, 1848, *C. fagi* Walth, 1839, *C. glabratus* Mellié, 1848, *C. punctulatus* Gyllenhal, 1827, *C. rugulosus* Mellié, 1848, *Orthocis alni* (Gyllenhal, 1813), *Mycetophagus atomarius* (Fabricius, 1787), *M. quadripustulatus* (Linnaeus, 1761), *Corticeus linearis* (Fabricius, 1790), *Pseudocistela ceramboides* (Linnaeus, 1758), *Uloma rufa* (Piller & Mitterpacher, 1783), *Cerylon fagi* Brisout de Barneville, 1867, *C. ferrugineum* Stephens, 1830, *C. histeroides* (Fabricius, 1792), *Cartodere nodifer* (Westwood, 1839), *Corticarina lambiana* (Sharp, 1910), *Corticinara gibbosa* (Herbst, 1793), *Enicmus atriceps* Hansen, 1962, *E. fungicola* Thomson, 1868, *E. rugosus* (Herbst, 1793), *E. testaceus* (Stephens, 1830), *Latridius hirtus* Gyllenhal, 1827, *Stephostethus alternans* (Mannerheim, 1844), *S. angusticollis* (Gyllenhal, 1827), *S. rugicollis* (Olivier, 1790), *Orthoperus punctatus* Wankowicz, 1865, *Mycetina cruciata* (Schaller, 1783), *Calvia decemguttata* (Linnaeus, 1767), *Chilocorus renipustulatus* (Scriba, 1791), *Scymnus abietis* (Paykull, 1798), *Tritoma bipustulata* Fabricius, 1775, *Aspidiphorus orbiculatus* (Gyllenhal, 1808), *Rhizophagus bipustulatus* (Fabricius, 1792), *R. brancsiki* Reitter, 1905, *R. dispar* (Paykull, 1800), *R. ferrugineus* (Paykull, 1800), *R. nitidulus* (Fabricius, 1798), *R. perforatus* Erichson, 1845, *Cychramus luteus* (Fabricius, 1787), *Cyllodes ater* (Herbst, 1792), *Epuraea angustula* Sturm, 1844, *E. biguttata* (Thunberg, 1784), *E. laeviuscula* (Gyllenhal, 1827), *E. longula* Erichson, 1845, *E. marseuli* Reitter, 1873, *E. melanocephala* (Marsham, 1802), *E. neglecta* (Heer, 1841), *E. pygmaea* (Gyllenhal, 1808), *E. terminalis* (Mannerheim, 1843), *E. variegata* (Herbst, 1793), *Ipidia binotata* Reitter, 1875, *Lamiogethes ochropus* (Sturm, 1845), *L. pedicularius* (Gyllenhal, 1808), *Pityophagus ferrugineus* (Linnaeus, 1758), *Sagittogethes distinctus* (Sturm, 1845), *Antherophagus pallens* (Linnaeus, 1758), *Atomaria alpina* Heer, 1841, *A. diluta* Erichson, 1846, *A. turgida* Erichson, 1846, *Cryptophagus cylindrellus* Johnson, 2007, *C. dentatus* (Herbst, 1793), *Micrambe abietis* (Paykull, 1798), *Pteryngium crenulatum* (Erichson, 1846), *Dendrophagus crenatus* (Paykull, 1799), *Silvanoprus fagi* (Guérin-Ménéville, 1844), *Pediacus depressus* (Herbst, 1797), *Cryphalus piceae* Wood & Bright, 1992, *Crypturgus cinereus* (J.F.W.Herbst,

1793), *C. hispidulus* C.G.Thomson, 1870, *C. pusillus* (L.Gyllenhal, 1813), *Dryocoetes autographus* Eichhoff, 1864, *D. hectographus* Reitter, 1913, *Ernoporicus fagi* Wood & Bright, 1992, *Hylastes cunicularius* Erichson, 1836, *H. opacus* Erichson, 1836, *Hylurgops palliatus* Wood & Bright, 1992, *Ips duplicatus* (Sahlberg, 1836), *I. typographus* (Linnaeus, 1758), *Pityogenes chalcographus* (Linnaeus, 1760), *Pityophthorus pityographus* (Ratzeburg, 1837), *Polygraphus poligraphus* (Linnaeus, 1758), *P. punctifrons* C.G.Thomson, 1886, *Rhyncolus elongatus* (Gyllenhal, 1827), *R. sculpturatus* Walth, 1839, *Scolytus laevis* Chapuis, 1869, *Trypodendron domesticum* (Linnaeus, 1758), *T. lineatum* (A.G.Olivier, 1800), *Xyleborus dispar* Wood & Bright, 1992, *Xylechinus pilosus* Chapuis, 1869, *Evodinus clathratus* (Fabricius, 1793), *Oxymirus cursor* (Linnaeus, 1758), *Pidonia lurida* (Fabricius, 1793), *Rhagium inquisitor* (Linnaeus, 1758), *R. mordax* (Degeer, 1775), *Stenurella melanura* (Linnaeus, 1758), *Tetropium castaneum* (Linnaeus, 1758), *T. fuscum* (Fabricius, 1787), *Cryptocephalus* sp.

During the study period, 1,682 specimens of saproxylic Coleoptera belonging to 185 species from 38 families were collected in the area of drying old-growth spruce forest, including: Throscidae – 3 species, Eucnemidae – 1 species, Elateridae – 7 species, Lycidae – 3 species, Cantharidae – 4 species, Histeridae – 2 species, Lucanidae – 1 species, Ptiliidae – 1 species, Leiodidae – 8 species, Staphylinidae – 39 species, Ptinidae – 3 species, Peltidae – 1 species, Trogositidae – 1 species, Melyridae – 1 species, Cleridae – 2 species, Hylecoetidae – 2 species, Mordellidae – 1 species, Scaptiidae – 3 species, Salpingidae – 2 species, Pyrochroidae – 1 species, Tetratomidae – 4 species, Melandryidae – 3 species, Ciidae – 8 species, Mycetophagidae – 2 species, Tenebrionidae – 3 species, Cerylonidae – 3 species, Latridiidae – 11 species, Corylophidae – 1 species, Endomychidae – 1 species, Erotylidae – 1 species, Sphindidae – 1 species, Monotomidae – 6 species, Nitidulidae – 14 species, Cryptophagidae – 7 species, Silvanidae – 2 species, Cucujidae – 1 species, Curculionidae – 23 species, and Cerambycidae – 8 species.

The greatest species diversity in the area of the drying old-growth spruce forest is represented by the families Staphylinidae (39 species), Curculionidae (23 species), Nitidulidae (14 species), and Latridiidae (11 species), while the remaining families are represented by a small number of species (from 1 to 8 species).

Section of an old-growth fir forest. In the area of old-growth fir forest, 433 species were found among the 4,906 specimens processed: *Amara aenea* (DeGeer, 1774), *Badister* sp., *Bembidion* sp., *Contacyphon ruficeps* (Tournier, 1868), *Laricobius erichsonii* Rosenhauer, 1846, *Calyptomerus alpestris* Redtenbacher, 1847, *Clambus punctulum* (Beck, 1817), *Curimus erichsoni* Reitter, 1881, *Aulonothroscus brevicollis* (Bonvouloir, 1859), *Trixagus carinifrons* (Bonvouloir, 1859), *T. dermestoides* (Linnaeus, 1767), *T. meyböhmi* Leseigneur, 2005, *T.* sp., *Eucnemis capucina* Ahrens, 1812, *Hylis cariniceps* (Reitter, 1902), *H. foveicollis* (Thomson, 1874), *Microrhagus lepidus* Rosenhauer, 1847, *Ampedus erythrogonus* (P.W.J. Müller, 1821), *A. nigrinus* (Herbst, 1784), *A. pomonae* (Stephens, 1830), *A. sanguineus* (Linnaeus, 1758), *Athous mollis* Reitter, 1889, *At. subfuscus* (O.F. Müller, 1767), *Cidnopus pilosus* (Leske, 1785), *Dalopius marginatus* (Linnaeus, 1758), *Denticollis interpositus* Roubal, 1941, *D. linearis* (Linnaeus, 1758), *D. rubens* Piller & Mitterpacher, 1783, *Diacanthous undulatus* (De Geer, 1774), *Melanotus castanipes* (Paykull, 1800), *Benibotarus taygetanus* (Pic, 1905), *Dictyoptera aurora* (Herbst, 1784), *Pyropterus nigroruber* (De Geer, 1774), *Lampyrus noctiluca* (Linnaeus, 1758), *Cantharis pellucida* Fabricius, 1792, *Macrocerus nigrinus* (Shaufuss, 1866), *Malthinus biguttatus* (Linnaeus, 1758), *M. fasciatus* (Olivier, 1790), *Malthodes* sp., *Metacantharis discoidea* (Ahrens, 1812), *Podistra rufotestacea* (Letzner, 1845), *P. schoenherri* (Dejean, 1837), *Rhagonycha lignosa* (Müller, 1764), *R. translucida* (Krynicky, 1832), *Abraeus granulum* Erichson, 1839, *Margarinotus brunneus* (Fabricius, 1775), *M. striola* (C.R.Sahlberg, 1819), *Paromalus parallelepipedus* (Herbst, 1791), *Platylomalus complanatus* (Panzer, 1797), *Plegaderus caesus* (Herbst, 1791), *P. vulneratus* (Panzer, 1797), *Cercyon lateralis* (Marsham, 1802), *C. pygmaeus* (Illiger, 1801), *Megasternum concinnum* (Marsham, 1802), *Ceruchus chrysomelinus* (Hochenwarth, 1785), *Sinodendron cylindricum* (Linnaeus, 1758), *Anoplotrupes stercorosus* (Scriba, 1791), *Acrossus depressus* (Kugelann, 1792), *A. rufipes* (Linnaeus, 1758), *Aphodius fimetarius* (Linnaeus, 1758), *A.* (s.l.) sp., *Bodilopsis rufus* (Moll, 1782), *Serica brunnea* (Linnaeus, 1758), *Acrotrichis dispar* (A.Matthews, 1864), *A. intermedia* (Gillmeister, 1845), *A.* sp., *Actidium coarctatum* (Haliday, 1855), *Baeocrara variolosa* (Mulsant & Rey, 1861), *Ptenidium gressneri* Erichson, 1845, *P. formicetorum* Kraatz, 1851,

P. intermedium Wankowicz, 1869, *P. pusillum* (Gyllenhal, 1808), *Hydraena* sp., *Agaricophagus cephalotes* W.L.E.Schmidt, 1841, *Agathidium atrum* (Paykull, 1798), *A. badium* Erichson, 1845, *A. confusum* Brisout de Barneville, 1863, *A. laevigatum* Erichson, 1845, *A. nigripenne* (Fabricius, 1792), *A. pisanum* Brisout de Barneville, 1872, *A. plagiatum* (Gyllenhal, 1810), *A. seminulum* (Linnaeus, 1758), *A. varians* Beck, 1817, *Anisotoma axillaris* Gyllenhal, 1810, *A. castanea* (Herbst, 1791), *A. humeralis* (Fabricius, 1792), *A. orbicularis* (Herbst, 1791), *Apocatops nigrita* (Erichson, 1837), *Catops fuliginosus* Erichson, 1837, *C. nigricans* (Spence, 1813), *C. picipes* (Fabricius, 1787), *Choleva* sp., *Colenis immunda* (Sturm, 1807), *Hydnobius multistriatus* Gyllenhal, 1813, *Leiodes oblonga* (Erichson, 1845), *Liodopria serricornis* (Gyllenhal, 1813), *Sciodrepoides fumatus* (Spence, 1813), *S. watsoni* (Spence, 1813), *Aleochara bipustulata* (Linnaeus, 1760), *A. brevipennis* Gravenhorst, 1806, *A. cuniculorum* Kraatz, 1858, *A. fumata* Gravenhorst, 1802, *Amischa analis* (Gravenhorst, 1802), *Atheta castanoptera* (Mannerheim, 1830), *A. dadopora* C.G.Thomson, 1867, *A. fungicola* (C.G.Thomson, 1852), *A. hybrida* (Sharp, 1869), *A. picipes* (C.G.Thomson, 1856), *A. vaga* (Heer, 1839), *Cyphea curtula* (Erichson, 1837), *Liogluta microptera* C.G.Thomson, 1867, *Meotica exilis* (Gravenhorst, 1806), *Mocyta fungi* (Gravenhorst, 1806), *Plataraea brunnea* (Fabricius, 1798), *Pycnota paradoxa* (Mulsant & Rey, 1861), *Bolitochara obliqua* Erichson, 1837, *B. pulchra* (Gravenhorst, 1806), *Brachida exigua* (Heer, 1839), *Gyrophæna affinis* Mannerheim, 1830, *G. boleti* (Linnaeus, 1758), *G. gentilis* Erichson, 1839, *G. joyi* Wendeler, 1924, *G. joyioides* Wüsthoff, 1937, *G. nana* (Paykull, 1800), *G. strictula* Erichson, 1839, *Encephalus complicans* Stephens, 1832, *Leptusa fumida* (Erichson, 1839), *L. pulchella* (Mannerheim, 1830), *L. ruficollis* (Erichson, 1839), *Oligota pusillima* (Gravenhorst, 1806), *Alevonota hepatica* (Erichson, 1839), *A. rufotestacea* Kraatz, 1856, *Anomognathus cuspidatus* (Erichson, 1839), *Pella limbata* (Paykull, 1789), *Myllaena intermedia* Erichson, 1837, *Ischnoglossa prolixa* (Gravenhorst, 1802), *Haploglossa villosula* (Stephens, 1832), *Ilyobates nigricollis* (Paykull, 1800), *Ocalea concolor* Kiesenwetter, 1847, *Oxypoda alternans* (Gravenhorst, 1802), *O. togata* Erichson, 1837, *Placusa tachyporoides* (Waltl, 1838), *Bobitobus lunulatus* (Linnaeus, 1767), *Bolitobius castaneus* (Stephens, 1832), *Lordithon exoletus* (Erichson, 1839), *L. speciosus* (Erichson, 1839), *L. trinotatus* (Erichson, 1839), *Mycetoporus longulus* Mannerheim, 1830, *M. niger* Fairmaire & Laboulbène, 1856, *M. punctus* (Gravenhorst, 1806), *Amphichroum canaliculatum* (Erichson, 1840), *Anthobium atrocephalum* (Gyllenhal, 1827), *Arpedium quadrum* (Gravenhorst, 1806), *Dropephylla ioptera* (Stephens, 1834), *Lesteva longoelytrata* Goeze, 1777, *Eusphalerum sorbi* (Gyllenhal, 1810), *Acrulia inflata* (Gyllenhal, 1813), *Omalium rivulare* (Paykull, 1789), *Paraphloeostiba gayndahensis* (W.J.MacLeay, 1871), *Phloeonomus punctipennis* C.G.Thomson, 1867, *P. pusillus* (Gravenhorst, 1806), *Phloeostiba plana* (Paykull, 1792), *Anotylus mutator* (Lohse, 1963), *A. tetracaratus* (Block, 1799), *Syntomium aeneum* (P.W.J.Müller, 1821), *Rugilus rufipes* Germar, 1836, *Phloeocharis subtilissima* Mannerheim, 1830, *Megarthus depressus* (Paykull, 1789), *Proteinus brachypterus* (Fabricius, 1792), *Batrisodes venustus* (Reichenbach, 1816), *Euplectus bonvouloiri narentinus* Reitter, 1882, *E. brunneus* (Grimmer, 1841), *E. duponti* Aubé, 1833, *E. infirmus* Raffray, 1910, *E. karstenii* (Reichenbach, 1816), *E. mutator* Fauvel, 1895, *E. piceus* Motschulsky, 1835, *E. signatus* (Reichenbach, 1816), *Bibloporus minutus* Raffray, 1915, *Biblopectus tenebrosus* (Reitter, 1881), *Trimium carpathicum* Saulcy, 1875, *Plectophloeus fischeri* (Aubé, 1833), *P. nitidus* (Fairmaire, 1858), *P. nubigena* (Reitter, 1877), *Bryaxis frivaldszkyi* (Reitter, 1887), *B. nigripennis* (Aubé, 1844), *B. viertli* (Reitter, 1882), *Scaphidium quadrimaculatum* A.G.Olivier, 1790, *Scaphisoma assimile* Erichson, 1845, *S. boleti* (Panzer, 1793), *S. boreale* (Lundblad, 1952), *S. inopinatum* (Löbl, 1967), *S. subalpinum* Reitter, 1881, *Eutheia linearis* Mulsant & Rey, 1861, *Scydmorephes minutus* (Chaudoir, 1845), *Stenichnus godarti* (Latreille, 1806), *Nicrophorus humator* (Gleditsch, 1767), *N. vespilloides* Herbst, 1783, *Bisnius fimetarius* (Gravenhorst, 1802), *B. pseudoparcus* (Brunne, 1976), *Ontholestes murinus* (Linnaeus, 1758), *O. tessellatus* (Geoffroy, 1785), *Philonthus addendus* Sharp, 1867, *P. politus* (Linnaeus, 1758), *P. succicola* C.G.Thomson, 1860, *Gabrius breviventer* (Sperk, 1835), *Quedius boops* (Gravenhorst, 1802), *Q. fumatus* (Stephens, 1833), *Q. limbatus* (Heer, 1839), *Q. longicornis* Kraatz, 1857, *Q. lucidulus* Erichson, 1839, *Q. meridiocarpaticus* Smetana, 1958, *Q. paradisiensis* (Heer, 1839), *Q. umbrius* Erichson, 1839, *Quedionuchus plagiatum* (Mannerheim, 1843), *Sepedophilus littoreus* (Linnaeus, 1758), *Tachinus humeralis* Gravenhorst, 1802, *T. pallipes* (Gravenhorst, 1806), *T. rufipennis* Gyllenhal, 1810, *Tachyporus dispar* (Paykull, 1789), *T. hypnorum* (Fabricius, 1775), *Atrecus*

pilicornis (Paykull, 1790), *Xantholinus longiventris* Heer, 1839, *X. tricolor* (Fabricius, 1787), *Cacotemnus rufipes* (Fabricius, 1792), *Dorcatoma dresdensis* Herbst, 1792, *D. minor* Zahradnik, 1993, *D. punctulata* Mulsant & Rey, 1864, *D. robusta* Strand, 1938, *Episernus striatellus* (Brisout de Barneville, 1863), *Ernobius abietis* (Fabricius, 1792), *E. angusticollis* (Ratzeburg, 1847), *Hadrobregmus pertinax* (Linnaeus, 1758), *Hemicoelus fulvicornis* (Sturm, 1837), *Microbregma emarginatum* (Duftschmid, 1825), *Priobium carpini* (Herbst, 1793), *Ptilinus pectinicornis* (Linnaeus, 1758), *Ptinomorphus imperialis* (Linnaeus, 1767), *Ptinus subpillosus* Sturm, 1837, *P. viliger* (Reitter, 1884), *Xestobium austriacum* Reitter, 1890, *Peltis ferruginea* (Linnaeus, 1758), *Nemozoma elongatum* (Linnaeus, 1760), *Thymalus limbatus* (Fabricius, 1787), *Dasytes aeratus* Stephens, 1830, *D. caeruleus* (De Geer, 1774), *Hypebaeus flavipes* (Fabricius, 1797), *Thanasimus formicarius* (Linnaeus, 1758), *Hylecoetus dermestoides* (Linnaeus, 1761), *Mordellistena humeralis* (Linnaeus, 1758), *Tomoxia bucephala* Costa, 1854, *Anaspis frontalis* (Linnaeus, 1758), *A. rufilabris* (Gyllenhal, 1827), *A. thoracica* (Linnaeus, 1758), *Cyrtanaspis phalerata* (Germar, 1847), *Calopus serraticornis* (Linnaeus, 1758), *Rabocerus foveolatus* (Ljungh, 1823), *Salpingus planirostris* (Fabricius, 1787), *S. ruficollis* (Linnaeus, 1761), *Vincenzellus ruficollis* (Panzer, 1794), *Hallomenus axillaris* (Illiger, 1807), *H. binotatus* (Quensel, 1790), *Tetratoma ancora* Fabricius, 1790, *Conopalpus testaceus* (Olivier, 1790), *Dolotarsus lividus* (C.R.Sahlberg, 1833), *Orchesia undulata* Kraatz, 1853, *Phloiotrya rufipes* (Gyllenhal, 1810), *Serropalpus barbatus* (Schaller, 1783), *Zilora obscura* (Fabricius, 1807), *Prostomis mandibularis* (Fabricius, 1801), *Cis boleti* (Scopoli, 1763), *C. castaneus* (Herbst, 1793), *C. dentatus* Mellié, 1848, *C. fagi* Waltl, 1839, *C. festivus* (Panzer, 1793), *C. fusciclavus* Nyholm, 1954, *C. punctulatus* Gyllenhal, 1827, *Ennearthron cornutum* (Gyllenhal, 1827), *Octotemnus glabriculus* (Gyllenhal, 1827), *Orthocis alni* (Gyllenhal, 1813), *Wagaicis wagaie* (Wankowicz, 1869), *Mycetophagus atomarius* (Fabricius, 1787), *M. populi* Fabricius, 1798, *Triphyllus bicolor* (Fabricius, 1777), *Bolitophagus reticulatus* (Linnaeus, 1767), *Corticeus unicolor* Piller & Mitterpacher, 1783, *Lagria hirta* (Linnaeus, 1758), *Pseudocistela ceramoides* (Linnaeus, 1758), *Synchita humeralis* (Fabricius, 1792), *Cerylon fagi* Brisout de Barneville, 1867, *C. ferrugineum* Stephens, 1830, *C. histeroides* (Fabricius, 1792), *Cartodere nodifer* (Westwood, 1839), *Corticaria bella* Redtenbacher, 1847, *C. lateritia* Mannerheim, 1844, *C. longicornis* (Herbst, 1793), *C. rubripes* Mannerheim, 1844, *Corticarina lambiana* (Sharp, 1910), *C. similata* (Gyllenhal, 1827), *Corticaria gibbosa* (Herbst, 1793), *Enicmus atriceps* Hansen, 1962, *E. 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nitidulus* (Fabricius, 1798), *R. parallelocolis* Gyllenhal, 1827, *R. perforatus* Erichson, 1845, *Cychramus luteus* (Fabricius, 1787), *C. variegatus* (Herbst, 1792), *Cyllodes ater* (Herbst, 1792), *Epuraea aestiva* (Linnaeus, 1758), *E. angustula* Sturm, 1844, *E. biguttata* (Thunberg, 1784), *E. laeviuscula* (Gyllenhal, 1827), *E. longula* Erichson, 1845, *E. marseuli* Reitter, 1873, *E. oblonga* (Herbst, 1793), *E. pygmaea* (Gyllenhal, 1808), *E. rufomarginata* (Stephens, 1830), *E. terminalis* (Mannerheim, 1843), *E. variegata* (Herbst, 1793), *Glischrochilus quadriguttatus* (Fabricius, 1777), *G. quadripunctatus* (Linnaeus, 1758), *Ipidia binotata* Reitter, 1875, *Meligethes denticulatus* (Heer, 1841), *M. sp.*, *Omosita depressa* (Linnaeus, 1758), *Pityophagus ferrugineus* (Linnaeus, 1758), *Pocadius ferrugineus* (Fabricius, 1775), *Stelidota geminata* (Say, 1825), *Antherophagus pallens* (Linnaeus, 1758), *Atomaria affinis* (F.Sahlberg, 1834), *A. alpina* Heer, 1841, *A. bella* Reitter, 1875, *A. diluta* Erichson, 1846, *A. elongatula* Erichson, 1846, *A. nigrirostris* Stephens, 1830, *A. ornata* Heer, 1841, *A. pulchra* Erichson, 1846, *A. sp.*, *A. turgida* Erichson, 1846, *Cryptophagus cylindrellus* Johnson, 2007, *C. dentatus* (Herbst, 1793), *C. micaceus* Rey, 1889, *C. pubescens* Sturm, 1845, *C. punctipennis* Brisout de Barneville, 1863, *C. saginatus* Sturm, 1845, *C. scanicus* (Linnaeus, 1758), *C. sp.*, *Henoticus serratus* (Gyllenhal, 1808), *Micrambe abietis*

(Paykull, 1798), *Pteryngium crenulatum* (Erichson, 1846), *Dendrophagus crenatus* (Paykull, 1799), *Silvanoprus fagi* (Guérin-Ménéville, 1844), *Pediacus depressus* (Herbst, 1797), *Phloeostichus denticollis* Redtenbacher, 1842, *Leptophloeus alternans* (Erichson, 1846), *Platystomos albinus* (Linnaeus, 1758), *Protapion fulvipes* (Geoffroy, 1785), *Cossonus parallelepipedus* (J.F.W.Herbst, 1795), *Cryphalus asperatus* (L.Gyllenhal, 1813), *C. piceae* Wood & Bright, 1992, *C. saltuarius* Weise, 1891, *Crypturgus cinereus* (J.F.W.Herbst, 1793), *C. hispidulus* C.G.Thomson, 1870, *C. pusillus* (L.Gyllenhal, 1813), *C. subcristosus* Eggers, 1933, *Dryocoetes autographus* Eichhoff, 1864, *D. hectographus* Reitter, 1913, *Ernoporicus fagi* Wood & Bright, 1992, *Hylastes cunicularius* Erichson, 1836, *Hylurgops palliatus* Wood & Bright, 1992, *Ips typographus* (Linnaeus, 1758), *Orchestes fagi* (Linnaeus, 1758), *Phloeophagus turbatus* Schönherr, 1845, *Pissodes piceae* (J.C.W.Illiger, 1808), *Pityogenes bidentatus* (J.F.W.Herbst, 1783), *P. chalcographus* (Linnaeus, 1760), *Pityokteines curvidens* (E.F.Germar, 1823), *Pityophthorus lichtensteini* Eichhoff, 1864, *P. micrographus* (Linnaeus, 1758), *P. pityographus* (Ratzeburg, 1837), *Polydrusus viridinitens* (Gravenhorst, 1807), *P. tereticollis* (DeGeer, 1775), *Polygraphus poligraphus* (Linnaeus, 1758), *P. punctifrons* C.G.Thomson, 1886, *Rhyncolus sculpturatus* Walzl, 1839, *Taphrorychus bicolor* (J.F.W.Herbst, 1793), *Trypodendron domesticum* (Linnaeus, 1758), *T. lineatum* (A.G.Olivier, 1800), *T. signatum* (J.C.Fabricius, 1792), *Tychius picirostris* (J.C.Fabricius, 1787), *Xylechinus pilosus* Chapuis, 1869, *Clytus lama* Mulsant, 1850, *Evodinus clathratus* (Fabricius, 1793), *Leptura quadrifasciata* Linnaeus, 1758, *Molorchus minor* (Linnaeus, 1758), *Obrium brunneum* (Fabricius, 1793), *Oxymirus cursor* (Linnaeus, 1758), *Pidonia lurida* (Fabricius, 1793), *Pogonocherus hispidulus* (Piller & Mitterpacher, 1783), *Prionus coriarius* (Linnaeus, 1758), *Rhagium inquisitor* (Linnaeus, 1758), *R. mordax* (Degeer, 1775), *Stictoleptura rubra* (Linnaeus, 1758), *Tetropium castaneum* (Linnaeus, 1758), *T. fuscum* (Fabricius, 1787).

In 2023, 1,709 specimens of saproxylic Coleoptera belonging to 193 species from 37 families were collected in the area of fir primeval forest, including: Throscidae – 4 species, Eucnemidae – 1 species, Elateridae – 6 species, Lycidae – 3 species, Cantharidae – 3 species, Lucanidae – 2 species, Ptiliidae – 3 species, Leiodidae – 9 species, Staphylinidae – 49 species, Ptinidae – 8 species, Peltidae – 1 species, Trogossitidae – 1 species, Thymalidae – 1 species, Melyridae – 3 species, Hylecoetidae – 1 species, Mordellidae – 1 species, Scaptitidae – 2 species, Oedemeridae – 1 species, Salpingidae – 3 species, Tetratomidae – 2 species, Melandryidae – 4 species, Ciidae – 2 species, Mycetophagidae – 2 species, Tenebrionidae – 2 species, Cerylonidae – 3 species, Latridiidae – 11 species, Corylophidae – 1 species, Endomychidae – 2 species, Erotylidae – 1 species, Sphindidae – 1 species, Monotomidae – 6 species, Nitidulidae – 16 species, Cryptophagidae – 10 species, Silvanidae – 1 species, Cucujidae – 1 species, Curculionidae – 21 species, and Cerambycidae – 5 species.

The greatest species diversity in the area is represented by the families Staphylinidae (49 species), Curculionidae (21 species), Nitidulidae (16 species), Latridiidae (11 species), and Cryptophagidae (10 species), with the remaining families represented by a small number of species (from 1 to 8 species).

Discussion

The taxonomic list of identified species does not claim to be ultimate. It may be significantly supplemented in the future, but it allows for an overall assessment of the level of diversity of Coleoptera in the coniferous forests of the Carpathian National Nature Park. It may subsequently serve as a baseline for inventory and monitoring studies in the natural ecosystems of the Carpathian National Nature Park.

The significant abundance of saproxylic Coleoptera in old-growth coniferous forests is determined primarily by the diversity of microhabitats in undisturbed forests with large amounts of dead wood, as well as a wide range of trophic specialization among representatives of the families Staphylinidae, Curculionidae, Nitidulidae, Latridiidae, and Cryptophagidae, mainly phytophages and xylophages, necrophages, saprophages, and mycetophages, which act as higher-order consumers, often occupy small spatial niches, and are very local.

Since the number of species in old-growth forests is higher than in young forests, this is probably due to the higher percentage of dead wood in various stages of decomposition, which may increase competitive opportunities for saproxylic Coleoptera. The high level observed in

areas of old-growth spruce forest and primeval fir forest indicates that, over time and with the increasing age of the tree stands, forest ecosystems can reach more stable stages of development, where biodiversity reflects a stable number of species with high abundance.

The large amount of dead wood at various stages of decomposition and the diversity of wood-related microhabitats, which are key factors for the life and development of this group of insects, makes those ecosystems especially valuable for the conservation and spread of rare beetle species to adjacent, more human-transformed areas.

Conclusions

The greatest species diversity of Coleoptera during the study period was found in the area in the area of old-growth spruce forest (202 species). Fewer species were found in the area of old-growth fir forest (193 species) as well as in the area of drying old-growth spruce forest, where 185 species were recorded, and the lowest diversity – 141 species – was recorded in the middle-aged spruce forest.

Inventory of the taxonomic composition of beetles in coniferous forests of the Carpathian National Nature Park has been carried out for the first time. The results of the study of species diversity of the Carpathian National Nature Park and its surroundings are preliminary and can be significantly extended in the future by conducting special research on the territory. Nevertheless, it showcases the diversity of the beetles in this area. The obtained results can be used in compiling the fauna cadastre of Ukraine, for comparative faunal studies, analyzing species distribution, biogeographical modeling, ecological monitoring and forecasting the effects of anthropogenic factors on natural ecosystems.

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