

## Beetle communities (Insecta: Coleoptera) of Beech Forests at the Foothills of the Volcanic Carpathians, Ukraine

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Diedus V., Chumak V., Hleb R., Glotov S., Khrapov D., Chumak M., Motruk Y. 2022. Beetle communities (Insecta: Coleoptera) of Beech Forests at the Foothills of the Volcanic Carpathians, Ukraine. *Baltic J. Coleopterol.*, 22(2): 443–471.

The paper focuses on the results of the study of beetle communities (Insecta: Coleoptera) in beech forests at the foothills of the Volcanic Carpathians. 4438 specimens of beetles, belonging to 346 species of 58 families have been collected using interception traps (polytraps). The theoretically calculated number of expected species (Chao estimation) is 474. The families of rove beetles (Staphylinidae) – 56 species (16.2%), weevils (Curculionidae) – 31 species (9%) and minute tree-fungus beetles (Ciidae) – 22 species (6.4%) predominate in terms of species richness. Among rove beetles in terms of quantity *Mycetoporus longulus* (38.7%), *Lordithon exoletus* (9.5%), *Platarea brunea* (7.5%), *Lordithon lunulatus* (5.2%) are eudominants. Among the representatives of the weevil guild *Anisandrus dispar* (41.9%), *Xyleborinus saxesenii* (22.5%) and *Taphrorychus bicolor* (15.2%) are eudominants. Dominants are presented by one species – *Ernoporicus fagi* (9.2%). *Cis fagi* (13.4%), *C. festivus* (10.8%) are eudominants among minute tree-fungus beetles. *C. micans* and *Sulcacis nitidus* (9.3% each), *Ennearthron cornutum* (8.1%) and *Orthocis alni* (7%) represent a group of dominants.

The ecological characteristics of the beetle fauna have been in the focus of the author's attention: 6 trophic groups were identified according to the peculiarities of trophic. Saprophages predominate on the larval stage – 129 species and on the imago stage with the total number of 103 species. Since the feeding of larvae and imago varies, the ratios of trophic groups for larvae and imago is different. However, both stages of development are characterized by the predominance of saprophagous and mycetophagous beetles. 26 categories were identified according to the types of microhabitats. Xylodetricolous, fungicolous, phytodetricolous and arboricolous constitute the group of predominant categories on the larval stage. Xylodetricolous, fungicolous and phytodetricolous are predominants on the imago stage. 2 groups have been identified according to ecological valence. 3 groups each have been singled out according to landscape preferences and to the humidity criterion.

Key words: coleoptera, saproxylic beetles, microhabitat, ecological characteristics, the Volcanic Carpathians.

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## INTRODUCTION

The intensive rate of biodiversity loss in Europe's terrestrial ecosystems is becoming increasingly apparent. Studies conducted in protected areas have shown that the biomass of flying insects has decreased by more than 75% over the past 27 years (Hallmann et al. 2017). Therefore, the results of research on insect groups, their species and taxonomic composition, structure, species preferences, etc. are becoming more and more important.

The fauna of the Coleoptera of the Ukrainian Carpathians foothills has been constantly the object of scientific research. The list of works starts with the researchers dating back to the beginning of the previous century (Roubal 1930, 1936, 1941) and ends with the current species lists (Mirutenko 2010; Koval et al. 2018). However, the number of the works we have been aware of touches upon the problems of fauna. Only epigeobiont guilds of beetles of other mountain massifs have been studied systematically at the community level (Rizun & Chumak 2003; Chumak et al. 2005).

Several authoritative sources describe fauna and beetle community in the area under study. O. Mateleshko describes in his "Coleoptera Ecological Group of Tepla Yama Natural Reserve" paper (Mateleshko 2002) the species composition of the beetles group of an oak-beech forest, enumerating 171 species from 39 families. Various methods of collecting material have been used by the author who described the composition

of various ecological groups of beetles. Other publications directly related to the study area are the result of beetle fauna studying using only Barber soil traps. The paper by K. Ocheretna (Ocheretna 2013) describes the ecogroup of terrestrial mesofauna, which includes 91 species from 16 families, O. Mateleshko and S. Farinets (Mateleshko & Farinets 2008) enumerate 54 species from 8 families in their study.

The paper aims at describing the communities of flying species of beetles in beech forests of the Volcanic Carpathians foothills (Ukraine).

## MATERIAL AND METHODS

The studies of beetle communities were carried out on the territory of Kamianytsia forestry (Uzhhorod forestry, Kamianytsia suburbs, Uzhhorod district, Transcarpathia, Ukraine) on the territory of a 60–80-year-old deciduous forest with beech predominance, in which selective coupe is carried out (Fig. 1).

The material collection was carried out within the period from May till September, 2020, at two experimental sites. Each experimental sites (ES) consisted of four research plots (RP). One combined window trap (polytrap) was installed on each of the research plots (Nageleisen & Buget 2009); the total number of traps is equivalent to 8. The radius of the trap is 45 cm, the height of the plates is 70 cm (Fig. 2). The material collection has been carried out twice a month. 4% formalin solution served as a fixing substance.

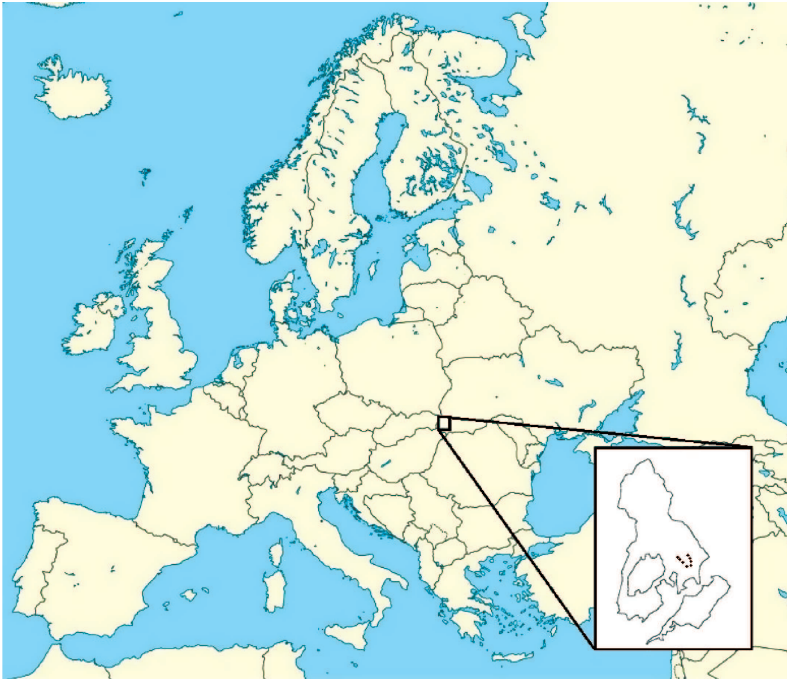


Fig. 1. Map showing the locations of the traps in the Kamianytisia forestry, Ukraine.



Fig. 2. Scheme and general view of the window combined trap (polytrap).

A research plot was a circle with an area of 500 m<sup>2</sup> (horizontal radius is equivalent to 12.62 m). On the slopes, the length of the radius of the research plot was adapted according to the angle of exposure (Commarmot et al. 2013). Tree heights were measured using a “Vertex IV” altimeter.

The volume of dead wood and the stages of decomposition of dead wood were recorded according to Raphaela Tinner’s method (Commarmot et al. 2010).

To determine the basal area, we took the measurements of the diameters of standing tree trunks at 1.37 m height (DBH).

To assess the diversity of ecological niches on trees, we counted the number of microhabitats on all the trees of the trial area. Tree microhabitats are various dead parts of a tree, abnormal growths of a living part of a tree, fruiting bodies of saproxylic fungi, etc. Tree microhabitats of saproxylobiont insect species were counted and evaluated according to the L. Larrieu’s classification (Larrieu et al. 2018). In total, they are represented by 7 types:

1. Cavities – the holes in the tree, which can be formed by: a) cavity builders (e.g. woodpeckers, saproxylic insects); b) decay processes (rot hole); c) morphological particularities on the trunk or collar (e.g. dendrotelms in forks or buttres-root concavity);
2. Injuries – mechanical damage to the bark of the tree, which opens access to the sapwood. It can be the result of wind, snow, frost influence. Bare wood and injuries can turn to rot in the course of time if the wound does not heal over time;
3. Crown deadwood – dead parts of branches in the crown, which remain after the fall of the main part of the branch, or dead dry branches in the crown;
4. Excrescences caused by reactive growth to an increase in light availability or to a parasitic or microbial intrusion where the tree creates specific structures to isolate the pathogen (e.g. canker, burr);

5. Fungal fruiting bodies and slime moulds;
6. Epiphytic and epixylic structures being represented by various structures, using a tree trunk as a mechanical support. These include liana-like plants, mosses, nests of vertebrates and invertebrates, microsoils in the fork of trees and more;
7. Fresh exudates, fresh sap runs or resinosis.

The results of microhabitats surveys on the research plots are shown in table 1.

Classes of animal dominance were determined by the Renkonen system with some changes. The eudominants of the group include species whose percentage of the total number of collected individuals exceeded 10%, dominants – 5–10%, subdominants – 1–5%, recedents – 0.5–1%, sub-recedents – 0–0.5% (Renkonen 1938).

Research plot № 1 (Fig. 3.1). Coordinates 48.7194547 22.4207926. Basal area 1.14 m<sup>2</sup> (*Fagus sylvatica* L. – 0.96 m<sup>2</sup>, *Ulmus glabra* Huds. – 0.07 m<sup>2</sup>, *Fraxinus excelsior* L. – 0.09 m<sup>2</sup>, *Carpinus betulus* L. – 0.02 m<sup>2</sup>). The tallest tree of the first tier *Fagus sylvatica* – 40 m.

Research plot № 2 (Fig. 3.2). Coordinates 48.7200978 22.4211365. Basal area 1.12 m<sup>2</sup> (*Fagus sylvatica* – 0.96 m<sup>2</sup>, *Carpinus betulus* – 0.04 m<sup>2</sup>, *Larix sibirica* Ledeb. – 0.12 m<sup>2</sup>). I tier *Fagus sylvatica* – 42 m.

Research plot № 3 (Fig. 3.3). Coordinates: 48.7204820 22.4206145. Basal area 1.29 m<sup>2</sup> (*Fagus sylvatica* – 0.87 m<sup>2</sup>, *Carpinus betulus* – 0.23 m<sup>2</sup>, *Ulmus glabra* – 0.01 m<sup>2</sup>, *Fraxinus excelsior* – 0.09 m<sup>2</sup>, *Acer platanoides* L. – 0.10 m<sup>2</sup>). I tier *Fagus sylvatica* – 46 m.

Research plot № 4 (Fig. 3.4). Coordinates: 48.720896 22.420683. Basal area 0.98 m<sup>2</sup> (*Fagus sylvatica* – 0.357 m<sup>2</sup>, *Carpinus betulus* – 0.26 m<sup>2</sup>, *Acer platanoides* – 0.186 m<sup>2</sup>, *Acer pseudoplatanus* L. – 0.177 m<sup>2</sup>). I tier *Fagus sylvatica* – 37 m.

Research plot № 5 (Fig. 3.5). Coordinates: 48.7184088 22.4224442. Basal area 1.53 m<sup>2</sup> (*Fagus sylvatica* – 0.729 m<sup>2</sup>, *Carpinus betulus* – 0.257 m<sup>2</sup>, *Tilia cordata* Mill. – 0.278 m<sup>2</sup>, *Robinia pseudoacacia* L. – 0.107 m<sup>2</sup>, *Prunus avium* L. – 0.159 m<sup>2</sup>). I tier *Fagus sylvatica* – 30 m.

Research plot № 6 (Fig. 3.6). Coordinates: 48.7186139 22.4224317. Basal area – 1.54 m<sup>2</sup> (*Fagus sylvatica* – 1.226 m<sup>2</sup>, *Carpinus betulus* – 0.165 m<sup>2</sup>, *Prunus avium* – 0.113 m<sup>2</sup>, *Acer platanoides* – 0.036 m<sup>2</sup>). I tier *Fagus sylvatica* – 40 m.

Research plot № 7 (Fig. 3.7). Coordinates: 48.7191710 22.4227980. Basal area 1.51 m<sup>2</sup> (*Fagus sylvatica* – 1.29 m<sup>2</sup>, *Acer platanoides* – 0.065 m<sup>2</sup>, *Fraxinus excelsior* – 0.152 m<sup>2</sup>). I tier *Fagus sylvatica* – 35 m.

Research plot № 8 (Fig. 3.8). Coordinates: 48.7194765 22.4228645. Basal area 1.57 m<sup>2</sup> (*Fagus sylvatica* – 0.694 m<sup>2</sup>, *Carpinus betulus* – 0.202 m<sup>2</sup>, *Acer platanoides* – 0.388 m<sup>2</sup>, *Fraxinus excelsior* – 0.159 m<sup>2</sup>, *Prunus avium* – 0.084 m<sup>2</sup>, *Ulmus glabra* – 0.026 m<sup>2</sup>, *Quercus petraea* (Matt.) Liebl. – 0.025 m<sup>2</sup>). I tier *Fagus sylvatica* – 38 m.

Table 1. Results of microhabitats' count, volumes of dead wood and basal area on research plots

RP	N	Microhabitats								M	Vm	BA
		Total	C	I	DC	G	F	EEC	E			
1	21	30	2	8	13	0	1	4	0	18	1.3	1.1
2	21	44	3	17	9	0	5	9	0	20	1.3	1.1
3	23	39	5	11	12	0	5	4	0	19	9.0	1.3
4	14	24	6	5	1	0	0	12	0	12	4.2	1
5	39	46	9	21	7	0	5	2	0	26	6	1.5
6	40	41	11	22	3	0	3	1	0	26	8	1.5
7	45	33	7	17	4	0	4	1	0	24	4.4	1.5
8	45	36	3	20	7	0	3	2	0	29	4.7	1.6

Symbols: N – number of trees; M – the number of trees with microhabitat; Vm – Volume of dead wood (m<sup>3</sup> per trial area); BA – basal area (m<sup>2</sup>); Microhabitats: C – cavities, I – injuries, DC – dead crown, G – growths, F – fruiting bodies of fungi, EES – epiphytic and epixile structures, E – exudates.

## RESULTS

### Fauna structure

We have registered 4438 beetles belonging to 346 species from 58 families (Table 2<sup>1</sup>). The projected number of expected species (Chao estimation) is 474 (Fig. 4). According to this indicator, we collected 73% of the theoretically calculated species.

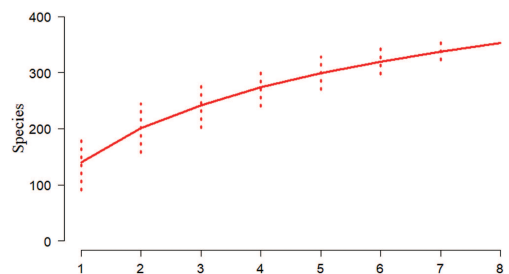


Fig. 4. Species accumulation curve.

<sup>1</sup> Species are listed in alphabetical order. Species names according to the catalogues (Lóbl & Smetana 2007, 2010; Robertson *et al.* 2015; Lóbl & Lóbl 2015, 2016, 2017; Alonso-Zarazaga *et al.* 2017; Gimmel *et al.* 2019; Iwan & Lóbl 2020; Danilevsky 2020; Cai *et al.* 2022)



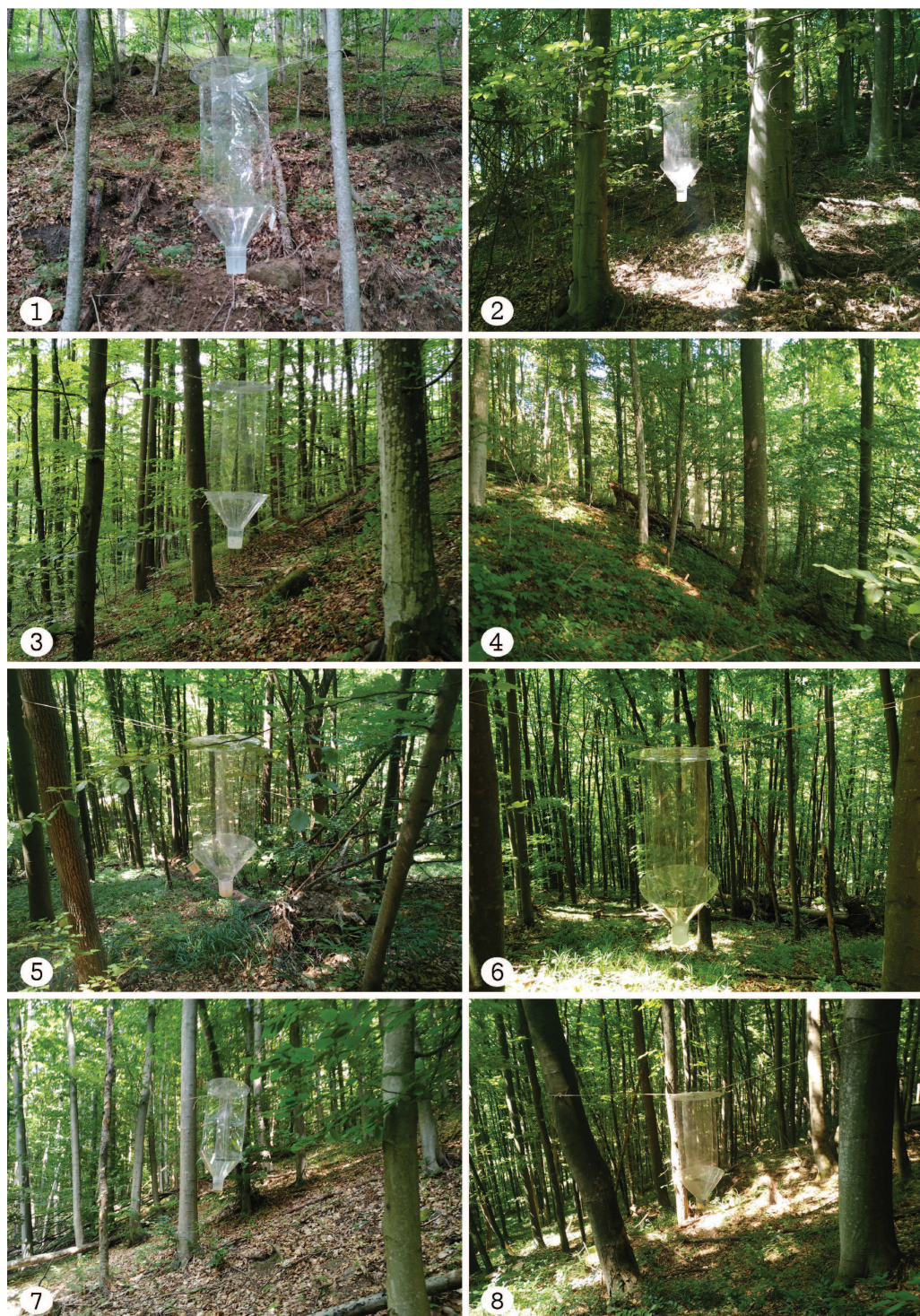


Fig. 3. General view of research plots.

Table 2. Species composition of the community and its ecological characteristics (N – number of individuals, SI – sylvicolous, SN – synanthropes, PR – praticolous, EU – eurytopes, ST – stenotopes, ME – mesophiles, KS – xerophiles, HH – hygrophiles)

Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotope	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<b>Aderidae</b>	<b>1</b>							
<i>Phytobaenus amabilis</i> R.F. Sahlberg, 1834	1	saproxylophagous	saproxylophagous	ST	SI	ME	arboricolous	arboricolous
<b>Anamorhidae</b>	<b>7</b>							
<i>Symbiotes gibberosus</i> (Lucas, 1846)	5	mycetophagous	mycetophagous	ST	SN	ME	fungicolous	fungicolous
<i>S. latus</i> Redtenbacher, 1849	2	mycetophagous	mycetophagous	EU	SN	ME	corticolous	fungicolous
<b>Anthribidae</b>	<b>5</b>							
<i>Dissoleucas niveostris</i> (Fabricius, 1798)	2	saproxylomycetophagous	saproxylomycetophagous	ST	SI	KS	xylo-detriticolous	xylo-detriticolous
<i>Platyrhinus resinus</i> (Scopoli, 1763)	1	saproxylomycetophagous	saproxylomycetophagous	ST	SI	ME	xylo-detriticolous	xylo-detriticolous
<i>Platystomos albinus</i> (Linnaeus, 1758)	2	saproxylophagous	saproxylophagous	ST	SI	ME	xylo-detriticolous	xylo-detriticolous
<b>Attelabidae</b>	<b>1</b>							
<i>Lasiorhynchites cavifrons</i> (Gyllenhal, 1833)	1	saproxylophagous	saproxylophagous	ST	SI	ME	arboricolous	herbicolous
<b>Biphylidae</b>	<b>13</b>							
<i>Diplocoelus fagi</i> (Guérin-Méneville, 1838)	13	saproxylomycetophagous	saproxylomycetophagous	ST	SI	ME	corticolous	xylo-detriticolous
<b>Brentidae</b>	<b>5</b>							
<i>Trichopteration holosericeum</i> (Gyllenhal, 1833)	5	carpophagous	carpophagous	ST	SI	KS	arboricolous	arboricolous
<b>Cantharidae</b>	<b>28</b>							
<i>Malthinus balteatus</i> Suffrian, 1851	11	predator and facultative necrophagous	entomophagous	ST	SI	KS	arboricolous	herbicolous
<i>M. biguttatus</i> (Linnaeus, 1758)	11	predator and facultative necrophagous	entomophagous	EU	SI	ME	arboricolous	herbicolous
<i>Malthodes spathifer</i> Kiesenwetter, 1852	5	predator and facultative necrophagous	entomophagous	EU	SI	ME	arboricolous	herbicolous
<i>Rhagonycha lignosa</i> (O.F. Müller, 17644)	1	predator and facultative necrophagous	entomophagous	EU	PR	ME	arboricolous	herbicolous
<b>Carabidae</b>	<b>10</b>							
<i>Acupalpus meridianus</i> (Linnaeus, 1760)	1	predator and facultative necrophagous	entomophagous	EU	SI	HH	phyto-detriticolous	ripicolous
<i>Amara apricaria</i> (Paykull, 1790)	1	predator	polinophagous	EU	PR	KS	herbicolous	herbicolous
<i>Bembidion octomaculatum</i> (Goeze, 1777)	1	predator and facultative necrophagous	entomophagous	EU	SI	HH	phyto-detriticolous	ripicolous
<i>Omoglymmius germari</i> (Ganglbauer, 1891)	3	saproxylophagous	saproxylophagous	ST	SI	ME	corticolous	corticolous
<i>Philorhizus sigma</i> (P. Rossi, 1790)	1	predator and facultative necrophagous	saproxylophagous	EU	SI	HH	phyto-detriticolous	phyto-detriticolous
<i>Rhysodes sulcatus</i> (Fabricius, 1787)	3	saproxylophagous	saproxylophagous	ST	SI	ME	corticolous	corticolous
<b>Cerambycidae</b>	<b>10</b>							
<i>Alosterna tabacicolor</i> (De Geer, 1775)	1	saproxylophagous	polinophagous	EU	SI	ME	xylo-detriticolous	floricolous
<i>Anoplodera sexguttata</i> (Fabricius, 1775)	2	saproxylomycetophagous	polinophagous	ST	SI	KS	xylo-detriticolous	floricolous
<i>Leiopus linnei</i> Wallin, Nylander & Kvamme, 2009	1	saproxylophagous	phylophagous	ST	SI	ME	xylo-detriticolous	herbicolous
<i>Pogonocherus hispidus</i> (Linnaeus, 1758)	2	saproxylophagous	phylophagous	EU	SI	ME	xylo-detriticolous	arboricolous-herbicolous



Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotope	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<i>Prionus coriarius</i> (Linnaeus, 1758)	2	saproxylous	phyllous	ST	SI	ME	xylo-	arboricol-herbicolous
<i>Stenurella melanura</i> (Linnaeus, 1758)	2	saproxylous	polinous	EU	SI	ME	xylo-	floricolous
<b>Cerylonidae</b>	<b>40</b>							
<i>Cerylon fagi</i> Brisout de Barneville, 1867	15	myxomycetous	myxomycetous	ST	SI	ME	xylo-	xylo-
<i>C. ferrugineum</i> Stephens, 1830	4	myxomycetous	myxomycetous	EU	SI	ME	xylo-	xylo-
<i>C. histeroideus</i> (Fabricius, 1792)	21	myxomycetous	myxomycetous	EU	SI	ME	xylo-	xylo-
<b>Chrysomelidae</b>	<b>3</b>							
<i>Cryptocephalus pusillus</i> Fabricius, 1777	3	phyllous	phyllous	EU	SI	HH	arboricolous	herbicolous
<b>Ciidae</b>	<b>172</b>							
<i>Cis boleti</i> (Scopoli, 1763)	12	mycetous	mycetous	EU	SI	ME	fungicolous	fungicolous
<i>C. castaneus</i> (Herbst, 1793)	8	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. dentatus</i> Mellié, 1849	1	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. fagi</i> Waltl, 1839	23	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. festivus</i> (Panzer, 1793)	18	mycetous	mycetous	EU	SI	ME	fungicolous	fungicolous
<i>C. fissicollis</i> Mellié, 1849	6	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. fissicornis</i> Mellié, 1849	1	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. glabratus</i> Mellié, 1849	4	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. micans</i> (Fabricius, 1792)	16	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. jacquemartii</i> Mellié, 1849	5	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. lineatocribratus</i> Mellié, 1849	10	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. punctulatus</i> Gyllenhal, 1827	1	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>C. rugulosus</i> Mellié, 1849	4	mycetous	mycetous	EU	SI	ME	fungicolous	fungicolous
<i>C. submicans</i> Abeille de Perrin, 1874	3	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>Ennearthron cornutum</i> (Gyllenhal, 1827)	14	mycetous	mycetous	EU	SI	ME	fungicolous	fungicolous
<i>Octotemnus glabriculus</i> (Gyllenhal, 1827)	3	mycetous	mycetous	EU	SI	ME	fungicolous	fungicolous
<i>Orthocis alni</i> (Gyllenhal, 1813)	12	mycetous	mycetous	EU	SI	ME	fungicolous	fungicolous
<i>O. pseudolinearis</i> (Lohse, 1965)	2	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>Rhopalodontus perforatus</i> (Gyllenhal, 1813)	8	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>Sirigocis bicornis</i> (Mellié, 1849)	4	mycetous	mycetous	ST	SI	ME	fungicolous	fungicolous
<i>Sulcacis fronticornis</i> (Panzer, 1805)	1	mycetous	mycetous	EU	SI	ME	fungicolous	fungicolous
<i>S. nitidus</i> (Fabricius, 1792)	16	mycetous	mycetous	EU	SI	ME	fungicolous	fungicolous
<b>Clambidae</b>	<b>24</b>							
<i>Clambus gibbulus</i> (LeConte, 1850)	12	mycetous	mycetous	EU	SI	ME	phyto-	phyto-
<i>C. pubescens</i> Redtenbacher, 1849	1	mycetous	mycetous	EU	SN	ME	phyto-	phyto-
<i>C. punctulum</i> (Beck, 1817)	11	mycetous	mycetous	EU	SI	HH	phyto-	phyto-
<b>Cleridae</b>	<b>9</b>							
<i>Opilo mollis</i> (Linnaeus, 1758)	1	predator and facultative necrophagous	entomophagous	EU	SI	ME	corticolous	xylo-
<i>Thanasimus formicarius</i> (Linnaeus, 1758)	1	predator and facultative necrophagous	entomophagous	EU	SI	ME	corticolous	xylo-



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Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotop	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<i>Tillus elongatus</i> (Linnaeus, 1758)	7	predator and facultative necrophagous	entomophagous	EU	SI	ME	xylodetrificialous	xylodetrificialous
<b>Coccinellidae</b>	<b>3</b>							
<i>Chilocorus renipustulatus</i> (L.G. Scriba, 1791)	1	coccidophagous	coccidophagous	EU	PR	HH	arboricolous	herbiculous
<i>Vibidia duodecimguttata</i> (Poda von Neuhaus, 1761)	2	mycetophagous	mycetophagous	ST	SI	KS	xylodetrificialous	fungiculous
<b>Corylophidae</b>	<b>49</b>							
<i>Arihrolips obscura</i> (C.R. Sahlberg, 1833)	44	mycetophagous	mycetophagous	ST	SI	ME	phytodetrificialous	phytodetrificialous
<i>Orthoperus brunripes</i> (Gyllenhal, 1808)	5	mycetophagous	mycetophagous	ST	SI	ME	phytodetrificialous	phytodetrificialous
<b>Cryptophagidae</b>	<b>26</b>							
<i>Antherophagus pallens</i> (Linnaeus, 1758)	1	necrophagous	polinophagous	EU	PR	KS	bombiculous	floriculous
<i>Atomaria fimetarius</i> (Fabricius, 1792)	2	saprophytophagous	saprophytophagous	ST	SI	KS	phytodetrificialous	phytodetrificialous
<i>A. munda</i> Erichson, 1846	2	saprophytophagous	saproxylo-mycetophagous	EU	SN	ME	phytodetrificialous	phytodetrificialous
<i>A. ornata</i> Heer, 1841	1	saprophytophagous	saprophytophagous	ST	SI	ME	xylophytodetrificialous	phytodetrificialous
<i>A. pusilla</i> (Paykull, 1798)	3	saprophytophagous	saprophytophagous	EU	SI	ME	humiculous	phytodetrificialous
<i>A. umbrina</i> (Gyllenhal, 1827)	1	mycetophagous	mycetophagous	ST	SI	ME	agariculous	phytodetrificialous
<i>Cryptophagus dentatus</i> (Herbst, 1793)	1	saproxylophagous	saproxylo-mycetophagous	EU	SN	ME	xylodetrificialous	corticulous
<i>C. pallidus</i> Sturm, 1845	1	saproxylo-mycetophagous	saproxylo-mycetophagous	EU	SI	ME	xylophytodetrificialous	phytodetrificialous
<i>C. pubescens</i> Sturm, 1845	1	necrophagous	saprophytophagous	EU	SI	ME	bombiculous	humiculous
<i>C. punctipennis</i> C.N.F. Brisout de Barneville, 1863	2	saproxylophagous	saprophytophagous	ST	SN	ME	xylodetrificialous	phytodetrificialous
<i>C. scanicus</i> (Linnaeus, 1758)	10	saprophytophagous	saprophytophagous	EU	SN	ME	phytodetrificialous	phytodetrificialous
<i>Micrambe bimaculata</i> (Panzer, 1798)	1	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	xylodetrificialous	phytodetrificialous
<b>Cucujidae</b>	<b>20</b>							
<i>Pediacus dermestoides</i> (Fabricius, 1792)	20	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	corticulous	corticulous
<b>Curculionidae</b>	<b>1443</b>							
<i>Acalles echinatus</i> (Germar, 1823)	1	saproxylophagous	saproxylophagous	ST	SI	KS	xylodetrificialous	phytodetrificialous
<i>Anisandrus dispar</i> (Fabricius, 1792)	604	ambrosia beetles	saproxylo-mycetophagous	EU	SI	ME	arboricolous	arboricolous
<i>Brachysomus dispar</i> Penecke, 1910	2	rhizophagous	phyllophagous-carpophagous	ST	SI	ME	rhiziculous	herbiculous
<i>B. echinatus</i> (Bonsdorff, 1785)	1	rhizophagous	phyllophagous-carpophagous	ST	SI	ME	rhiziculous	herbiculous
<i>Dryocoetes autographus</i> (Ratzeburg, 1837)	10	saproxylophagous	xylophagous	EU	SI	ME	arboricolous	corticulous
<i>D. villosus</i> (Fabricius, 1792)	1	saproxylophagous	xylophagous	ST	SI	ME	arboricolous	corticulous
<i>Dryophthorus corticalis</i> (Paykull, 1792)	1	saproxylophagous	saproxylophagous	EU	SI	ME	xylodetrificialous	xylodetrificialous
<i>Ermoporicus fagi</i> (Fabricius, 1798)	133	saproxylophagous	xylophagous	ST	SI	ME	arboricolous	corticulous
<i>Hylastes ater</i> (Paykull, 1800)	3	saproxylophagous	xylophagous	ST	SI	ME	rhiziculous	corticulous
<i>H. brunneus</i> (Erichson, 1836)	1	saproxylophagous	xylophagous	ST	SI	ME	rhiziculous	corticulous
<i>H. opacus</i> Erichson, 1836	3	saproxylophagous	xylophagous	ST	SI	ME	rhiziculous	corticulous
<i>Hylesinus crenatus</i> (Fabricius, 1787)	9	saproxylophagous	xylophagous	ST	SI	ME	arboricolous	corticulous

Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotope	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<i>H. taranio</i> (Danthoine, 1788)	31	saproxylophagous	xylophagous	ST	SI	ME	arboricolous	corticolous
<i>Magdalis armigera</i> (Geoffroy, 1785)	2	saproxylophagous	saproxylophagous	ST	SI	ME	arboricolous	herbicolous
<i>Mecinus pascuorum</i> (Gyllenhal, 1813)	1	phylophagous	phylophagous	ST	PR	ME	floricolous	herbicolous
<i>Orchestes fagi</i> (Linnaeus, 1758)	1	phylophagous	phylophagous	ST	SI	ME	floricolous	herbicolous
<i>Otiorhynchus multipunctatus</i> (Fabricius, 1792)	2	rhizophagous	phylophagous	EU	SI	ME	arboricolous	herbicolous
<i>Phyllobius pilicornis</i> Desbrochers des Loges, 1872	3	rhizophagous	phylophagous	ST	SI	ME	rhizicolous	herbicolous
<i>Platypus cylindrus</i> (Fabricius, 1792)	4	ambrosia beetles	saproxylo-mycetophagous	ST	SI	ME	arboricolous	lignicolous
<i>Polydrusus pterygomalis</i> Boheman, 1840	1	rhizophagous	phylophagous	EU	SI	ME	rhizicolous	arboricolous
<i>P. viridicinctus</i> Gyllenhal, 1834	4	rhizophagous	phylophagous	ST	SI	KS	rhizicolous	arboricolous
<i>Scolytus carpini</i> (Ratzeburg, 1837)	2	saproxylophagous	xylophagous	ST	SI	ME	arboricolous	corticolous
<i>S. mali</i> (Bechstein, 1805)	6	saproxylophagous	xylophagous	ST	SN	ME	corticolous	arboricolous
<i>S. rugulosus</i> (P.W.J. Müller, 1818)	3	saproxylophagous	xylophagous	ST	SN	ME	corticolous	arboricolous
<i>Taphrorychus bicolor</i> (Herbst, 1793)	219	saproxylophagous	xylophagous	ST	SI	ME	arboricolous	corticolous
<i>Trypodendron domesticum</i> (Linnaeus, 1758)	5	ambrosia beetles	saproxylo-mycetophagous	ST	SI	ME	arboricolous	arboricolous
<i>T. lineatum</i> (Olivier, 1800)	2	ambrosia beetles	saproxylo-mycetophagous	ST	SI	ME	arboricolous	arboricolous
<i>T. signatum</i> (Fabricius, 1792)	1	ambrosia beetles	saproxylo-mycetophagous	ST	SI	ME	arboricolous	arboricolous
<i>Xyleborinus saxesenii</i> (Ratzeburg, 1837)	324	ambrosia beetles	saproxylo-mycetophagous	EU	SI	ME	arboricolous	arboricolous
<i>Xyleborus dryographus</i> (Ratzeburg, 1837)	62	saproxylophagous	xylophagous	ST	SI	ME	arboricolous	arboricolous
<i>X. monographus</i> (Fabricius, 1792)	1	saproxylophagous	xylophagous	ST	SI	ME	arboricolous	arboricolous
<b>Elateridae</b>	<b>70</b>							
<i>Agriotes pilosellus</i> (Schönherr, 1817)	10	rhizophagous	polinophagous	EU	SI	ME	humicolous	floricolous
<i>Ampedus nigrinus</i> (Herbst, 1784)	1	saproxylophagous	polinophagous	ST	SI	HH	xylo-detriticolous	floricolous
<i>A. pomonae</i> (Stephens, 1830)	4	predator and facultative necrophagous	polinophagous	ST	SI	ME	xylo-detriticolous	floricolous
<i>A. pomorum</i> (Herbst, 1784)	2	saproxylophagous	polinophagous	EU	SI	ME	xylo-detriticolous	floricolous
<i>A. praeustus</i> (Fabricius, 1792)	1	predator and facultative necrophagous	predator and facultative necrophagous	ST	SI	ME	xylo-detriticolous	arboricolous
<i>A. rufipennis</i> (Stephens, 1830)	3	predator and facultative necrophagous	polinophagous	EU	SI	ME	xylo-detriticolous	cavernicolous
<i>Athous subfuscus</i> (O.F. Müller, 1764)	7	predator and facultative necrophagous	polinophagous	EU	SI	ME	humicolous	floricolous
<i>Denticollis linearis</i> (Linnaeus, 1758)	13	predator and facultative necrophagous	polinophagous	EU	SI	ME	xylo-detriticolous	floricolous
<i>Drasterius bimaculatus</i> (Rossi, 1790)	1	predator and facultative necrophagous	polinophagous	ST	PR	KS	humicolous	floricolous
<i>Hypoganus inunctus</i> (Lacordaire, 1835)	2	predator and facultative necrophagous	polinophagous	ST	SI	ME	xylo-detriticolous	arboricolous
<i>Melanotus villosus</i> (Geoffroy, 1785)	12	predator and facultative necrophagous	polinophagous	EU	SI	ME	xylo-detriticolous	floricolous

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Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotop	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<i>Omalisus fontisbellaquaei</i> Geoffroy, 1785	5	predator and facultative necrophagous	polinophagous	EU	SI	ME	herbicolous	floricol-herbicolous
<i>Pheletes quercus</i> (Olivier, 1790)	5	rhizophagous	polinophagous	ST	PR	KS	herbicolous	floricolous
<i>Stenagostus rhombeus</i> (Olivier, 1790)	4	predator and facultative necrophagous	polinophagous	EU	SI	ME	xylodetriticolous	arboricolous
<b>Endomychidae</b>	<b>15</b>							
<i>Endomychus coccineus</i> (Linnaeus, 1758)	5	mycetophagous	mycetophagous	EU	SI	ME	polyporicolous	fungicolous
<i>Leistes seminiger</i> (Gyllenhal, 1808)	3	mycetophagous	mycetophagous	ST	SI	ME	polyporicolous	fungicolous
<i>Mycetina cruciata</i> (Schaller, 1783)	7	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<b>Eroylidae</b>	<b>216</b>							
<i>Dacne bipustulata</i> (Thunberg, 1781)	47	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	fungicolous
<i>D. rufifrons</i> (Fabricius, 1775)	22	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>Triplax aenea</i> (Schaller, 1783)	43	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>T. carpathica</i> Reitter, 1890	2	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>T. collaris</i> (Schaller, 1783)	59	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>T. elongata</i> Lacordaire, 1842	17	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>T. lepida</i> (Faldermann, 1837)	3	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>T. rufipes</i> (Fabricius, 1787)	12	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>T. russica</i> (Linnaeus, 1758)	1	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	fungicolous
<i>Tritoma bipustulata</i> Fabricius, 1775	10	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	fungicolous
<b>Eucinetidae</b>	<b>5</b>							
<i>Nycteus hopffgarteni</i> (Reitter, 1885)	5	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	KS	xylodetriticolous	phytodetriticolous
<b>Eucnemidae</b>	<b>60</b>							
<i>Hylis olexai</i> (Palm, 1955)	3	saproxylophagous	aphagous	ST	SI	ME	arboricolous	xylodetriticolous
<i>Isoriphis marmottani</i> (Bonvouloir, 1871)	2	saproxylophagous	aphagous	ST	SI	ME	lignicolous	xylodetriticolous
<i>I. melasoides</i> Laporte, 1835	1	saproxylophagous	aphagous	ST	SI	ME	lignicolous	xylodetriticolous
<i>I. nigriceps</i> (Mannerheim, 1823)	17	saproxylophagous	aphagous	ST	SI	ME	arboricolous	xylodetriticolous
<i>Melasis buprestoides</i> (Linnaeus, 1761)	27	saproxylophagous	aphagous	EU	SI	ME	lignicolous	xylodetriticolous
<i>Microrhagus lepidus</i> (Rosenhauer, 1847)	8	saproxylophagous	aphagous	ST	SI	ME	arboricolous	xylodetriticolous
<i>Nematodes filum</i> (Fabricius, 1801)	2	saproxylophagous	aphagous	ST	SI	ME	lignicolous	xylodetriticolous
<b>Helophoridae</b>	<b>1</b>							
<i>Helophorus granularis</i> (Linnaeus, 1760)	1	predator	saprophytophagous	ST	SI	HH	ripicolous	ripicolous
<b>Histeridae</b>	<b>141</b>							
<i>Abraeus granulum</i> Erichson, 1839	51	saproxylophagous	saproxylophagous	EU	SI	ME	xylodetriticolous	xylodetriticolous
<i>A. perpusillus</i> (Marsham, 1802)	8	saproxylophagous	saproxylophagous	EU	SI	ME	xylodetriticolous	xylodetriticolous
<i>Acritus nigricornis</i> (Hoffmann, 1803)	1	coprophagous	saprophytophagous	EU	SI	ME	stercoricolous	phytodetriticolous
<i>Aeletes atomarius</i> (Aubé, 1842)	1	saproxylophagous	saproxylophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>Gnathoncus buyssoni</i> Auzat, 1917	1	predator and facultative necrophagous	necrophagous	EU	SI	ME	nidicolous	nidicolous
<i>G. rotundatus</i> (Kugelann, 1792)	1	predator and facultative necrophagous	necrophagous	EU	SN	ME	nidicolous	nidicolous

Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotope	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<i>Margarinotus marginatus</i> (Erichson, 1834)	1	saprophytophagous	necrophagous	EU	SI	ME	phytodetriticolous	micro-cavernicolous
<i>Paromalus flavicornis</i> (Herbst, 1791)	22	predator	predator	EU	SI	ME	xylodetriticolous	xylodetriticolous
<i>P. parallelepipedus</i> (Herbst, 1791)	3	predator	predator	EU	SI	ME	xylodetriticolous	xylodetriticolous
<i>Plegaderus dissectus</i> Erichson, 1839	52	predator	saproxyliphagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<b>Hydrophilidae</b>	<b>1</b>							
<i>Cercyon analis</i> (Paykull, 1798)	1	saprophytophagous	saprophytophagous	EU	SI	HH	phytodetriticolous	phytodetriticolous
<b>Laemophiloidae</b>	<b>19</b>							
<i>Laemophloeus monilis</i> (Fabricius, 1787)	14	saproxylomycetophagous	saproxylomycetophagous	ST	SI	ME	corticulous	corticulous
<i>Placonotus testaceus</i> (Fabricius, 1787)	5	saproxylomycetophagous	saproxylomycetophagous	ST	SI	ME	corticulous	corticulous
<b>Lampyridae</b>	<b>42</b>							
<i>Lampyris noctiluca</i> (Linnaeus, 1767)	40	predator	aphagous	EU	SI	ME	phytodetriticolous	herbiculous
<i>Lamprohiza splendidula</i> (Linnaeus, 1767)	2	predator	aphagous	EU	PR	ME	phytodetriticolous	herbiculous
<b>Latridiidae</b>	<b>284</b>							
<i>Cartodere nodifer</i> (Westwood, 1839)	4	mycetophagous	mycetophagous	EU	SN	ME	phytodetriticolous	phytodetriticolous
<i>Corticaria elongata</i> (Gyllenhal, 1827)	5	mycetophagous	mycetophagous	EU	SI	KS	phytodetriticolous	humicolous
<i>C. impressa</i> (Olivier, 1790)	4	mycetophagous	mycetophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>C. longicollis</i> (Zetterstedt, 1838)	1	mycetophagous	mycetophagous	ST	SI	ME	xylodetriticolous	phytodetriticolous
<i>C. longicornis</i> (Herbst, 1783)	2	mycetophagous	mycetophagous	ST	SI	ME	xylodetriticolous	phytodetriticolous
<i>C. obscura</i> Brisout, 1863	6	myxomycetophagous	myxomycetophagous	EU	SI	KS	herbiculous	phytodetriticolous
<i>Enicmus fungicola</i> Thomson, 1868	3	mycetophagous	mycetophagous	EU	SI	ME	myxomyceticulous	phytodetriticolous
<i>E. rugosus</i> (Herbst, 1793)	3	myxomycetophagous	myxomycetophagous	ST	SI	ME	myxomyceticulous	phytodetriticolous
<i>E. testaceus</i> (Stephens, 1830)	16	mycetophagous	mycetophagous	ST	SI	ME	myxomyceticulous	phytodetriticolous
<i>Latridius consimilis</i> (Mannerheim, 1844)	187	mycetophagous	mycetophagous	ST	SN	ME	corticulous	polyporicolous
<i>L. hirtus</i> Gyllenhal, 1827	5	mycetophagous	mycetophagous	ST	SI	ME	corticulous	xylodetriticolous
<i>Strophostethus alternans</i> (Mannerheim, 1844)	44	mycetophagous	mycetophagous	ST	SN	ME	xylodetriticolous	phytodetriticolous
<i>S. angusticollis</i> (Gyllenhal, 1827)	4	mycetophagous	mycetophagous	ST	SI	ME	xylodetriticolous	phytodetriticolous
<b>Leiodidae</b>	<b>151</b>							
<i>Agathidium badium</i> Erichson, 1845	6	myxomycetophagous	myxomycetophagous	EU	SI	ME	fungicolous	xylodetriticolous
<i>A. confusum</i> Brisout de Barneville, 1863	3	myxomycetophagous	myxomycetophagous	EU	SI	ME	fungicolous	xylodetriticolous
<i>A. marginatum</i> Sturm, 1807	1	myxomycetophagous	myxomycetophagous	EU	SN	ME	fungicolous	xylodetriticolous
<i>A. nigripenne</i> (Fabricius, 1792)	11	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	corticulous
<i>A. seminulum</i> (Linnaeus, 1758)	7	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	xylodetriticolous
<i>Amphicyllis globus</i> (Fabricius, 1792)	64	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	phytodetriticolous
<i>Anisotoma castanea</i> (Herbst, 1791)	6	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	xylodetriticolous



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<i>A. glabra</i> (Fabricius, 1787)	1	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	phytodetriticolous
<i>A. humeralis</i> (Herbst, 1791)	2	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	phytodetriticolous
<i>Catops chrysomeloides</i> (Panzer, 1798)	1	necrophagous	necrophagous	EU	SI	KS	cadavernicolous	phytodetriticolous
<i>C. subfuscus</i> Kellner, 1846	3	necrophagous	necrophagous	ST	SI	ME	cadavernicolous	cadavernicolous
<i>Choleva agilis</i> (Illiger, 1798)	2	necrophagous	necrophagous	EU	SI	ME	microcavernicolous	microcavernicolous
<i>C. elongata</i> (Paykull, 1798)	1	necrophagous	necrophagous	EU	SI	HH	microcavernicolous	microcavernicolous
<i>Leiodes oblonga</i> (Erichson, 1845)	4	mycetophagous	mycetophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>L. calcarata</i> (Erichson, 1845)	34	mycetophagous	mycetophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>Liodopria serricornis</i> (Gyllenhal, 1813)	1	mycetophagous	mycetophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>Nemadus colonoides</i> (Kraatz, 1851)	3	necrophagous	necrophagous	EU	SI	ME	nidicolous	phytodetriticolous
<i>Ptomaphagus varicornis</i> (Rosenhauer, 1847)	1	necrophagous	necrophagous	EU	SI	HH	microcavernicolous	microcavernicolous
<b>Lophocateridae</b>	<b>1</b>							
<i>Grynocharis oblonga</i> (Linnaeus, 1758)	1	predator and facultative mycetophagous	entomophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<b>Lucanidae</b>	<b>9</b>							
<i>Aesalus scarabaeoides</i> (Panzer, 1793)	5	saproxylophagous	saproxylophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>Sinodendron cylindricum</i> (Linnaeus, 1758)	4	saproxylophagous	saproxylophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<b>Melandryidae</b>	<b>6</b>							
<i>Melandrya barbata</i> (Fabricius, 1787)	1	saproxylophagous	saproxylophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>Orchesia undulata</i> Kraatz, 1853	4	mycetophagous	mycetophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>Serropalpus barbatus</i> (Schaller, 1783)	1	saproxylophagous	saproxylophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<b>Melyridae</b>	<b>4</b>							
<i>Dasyles plumbeus</i> (Müller, 1776)	4	predator and facultative necrophagous	polinophagous	ST	SI	ME	xylodetriticolous	floricolous
<b>Monotomidae</b>	<b>59</b>							
<i>Rhizophagus bipustulatus</i> (Fabricius, 1792)	40	predator and facultative mycetophagous	scolytidophagous	EU	SI	ME	corticulous	xylodetriticolous
<i>R. fenestralis</i> (Linnaeus, 1758)	2	predator and facultative mycetophagous	scolytidophagous	ST	SI	ME	corticulous	xylodetriticolous
<i>R. ferrugineus</i> (Paykull, 1800)	1	predator and facultative mycetophagous	scolytidophagous	EU	SI	ME	corticulous	xylodetriticolous
<i>R. nitidulus</i> (Fabricius, 1798)	1	predator and facultative mycetophagous	entomophagous	ST	SI	ME	corticulous	xylodetriticolous
<i>R. perforatus</i> Erichson, 1845	15	predator and facultative mycetophagous	entomophagous	EU	SI	ME	corticulous	xylodetriticolous
<b>Mordellidae</b>	<b>35</b>							
<i>Mordellochroa abdominalis</i> (Fabricius, 1775)	2	saproxylo-mycetophagous	polinophagous	ST	SI	KS	xylodetriticolous	floricolous
<i>Tomoxia bucephala</i> Costa, 1854	33	saproxylo-mycetophagous	polinophagous	ST	SI	ME	xylodetriticolous	floricolous
<b>Mycetaeidae</b>	<b>1</b>							
<i>Mycetaea subterranea</i> (Fabricius, 1801)	1	mycetophagous	mycetophagous	EU	SN	ME	phytodetriticolous	fungicolous
<b>Mycetophagidae</b>	<b>103</b>							
<i>Litargus connexus</i> (Geoffroy, 1785)	36	mycetophagous	mycetophagous	EU	SI	ME	corticulous	fungicolous

Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotope	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<i>Mycetophagus ater</i> (Reitter, 1879)	10	mycetophagous	mycetophagous	ST	SI	ME	polyporicolous	fungicolous
<i>M. atomarius</i> (Fabricius, 1787)	8	mycetophagous	mycetophagous	EU	SI	ME	polyporicolous	fungicolous
<i>M. decempunctatus</i> Fabricius, 1801	1	mycetophagous	mycetophagous	ST	SI	ME	polyporicolous	fungicolous
<i>M. multipunctatus</i> Fabricius, 1792	2	mycetophagous	mycetophagous	ST	SI	ME	polyporicolous	fungicolous
<i>M. piceus</i> (Fabricius, 1777)	2	mycetophagous	mycetophagous	ST	SI	ME	polyporicolous	fungicolous
<i>M. populi</i> (Fabricius, 1798)	1	mycetophagous	mycetophagous	ST	SI	ME	xylodetriticolous	fungicolous
<i>M. quadriguttatus</i> P.W.J. Müller, 1821	3	mycetophagous	mycetophagous	EU	SN	ME	xylodetriticolous	fungicolous
<i>M. quadripustulatus</i> (Linnaeus, 1760)	40	mycetophagous	mycetophagous	ST	SI	ME	polyporicolous	fungicolous
<b>Nitidulidae</b>	<b>158</b>							
<i>Amphotis marginata</i> (Fabricius, 1781)	5	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>Carpophilus sexpustulatus</i> (Fabricius, 1792)	1	predator and facultative necrophagous	saprophytophagous	EU	SI	ME	corticolous	phytodetriticolous
<i>Cychramus luteus</i> (Fabricius, 1787)	12	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	fungicolous
<i>Cylloides ater</i> (Herbst, 1792)	17	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	polyporicolous
<i>Epuraea aestiva</i> (Linnaeus, 1758)	1	necrophagous	saprophytophagous	EU	SI	ME	bombicolous	succicolnidi-colous
<i>E. biguttata</i> (Thunberg, 1784)	2	saproxylophagous	saprophytophagous	EU	SI	ME	xylodetriticolous	succicolous
<i>E. distincta</i> (Grimmer, 1841)	5	mycetophagous	saprophytophagous	ST	SI	ME	fungicolous	succicolous
<i>E. limbata</i> (Fabricius, 1787)	3	mycetophagous	saprophytophagous	EU	SI	ME	fungicolous	succicolous
<i>E. longula</i> Erichson, 1845	16	saprophytophagous	phylophagous	ST	SI	ME	phytodetriticolous	floricolherbicolous
<i>E. melanocephala</i> (Marsham, 1802)	16	saproxylo-mycetophagous	phylophagous	EU	SI	ME	arboricolous	floricolous
<i>E. variegata</i> (Herbst, 1793)	48	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	polyporicolous
<i>Glischrochilus hortensis</i> (Geoffroy, 1785)	1	saprophytophagous	saprophytophagous	EU	SI	ME	phytodetriticolous	succicolous
<i>Ipidia binotata</i> Reitter, 1875	3	predator	polinophagous	ST	SI	ME	corticolous	floricolous
<i>Physoronia wajdelota</i> (Wankowicz, 1869)	1	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>Stelidota geminata</i> (Say, 1825)	20	saprophytophagous	saprophytophagous	EU	SI	ME	phytodetriticolous	succicolous
<i>Thalycra fervida</i> (Olivier, 1790)	7	mycetophagous	polinophagous	ST	SI	ME	fungicolous	floricolous
<b>Prostomidae</b>	<b>3</b>							
<i>Prostomis mandibularis</i> (Fabricius, 1801)	3	predator	entomophagous	ST	SI	ME	corticolous	corticolous
<b>Ptiliidae</b>	<b>10</b>							
<i>Nossidium pilosellum</i> (Marsham, 1802)	1	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	HH	xylodetriticolous	xylodetriticolous
<i>Ptenidium laevigatum</i> Erichson, 1845	1	mycetophagous	saprophytophagous	ST	SI	HH	phytodetriticolous	phytodetriticolous
<i>P. punctatum</i> (Gyllenhal, 1827)	5	mycetophagous	saprophytophagous	ST	SI	ME	phytodetriticolous	phytodetriticolous
<i>P. pusillum</i> (Gyllenhal, 1808)	3	mycetophagous	saprophytophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<b>Ptinidae</b>	<b>142</b>							
<i>Anobium punctatum</i> (De Geer, 1774)	61	saproxylophagous	saproxylophagous	EU	SN	ME	lignicolous	lignicolous
<i>Dorcatoma dresdensis</i> Herbst, 1792	9	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous

*Beetle communities (Insecta: Coleoptera) of Beech Forests at the Foothills of the Volcanic Carpathians, Ukraine*

Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotop	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<i>Dryophilus pusillus</i> (Gyllenhal, 1808)	2	saproxylophagous	saproxylophagous	EU	SI	ME	xylo-detriticolous	xylo-detriticolous
<i>Hadrobregmus pertinax</i> (Linnaeus, 1758)	2	saproxylophagous	saproxylophagous	EU	SN	ME	lignicolous	lignicolous
<i>Ptinomorphus imperialis</i> (Linnaeus, 1767)	1	saproxylophagous	saproxylophagous	EU	SI	ME	arboricolous	arboricolous
<i>Hemicoelus fulvicornis</i> (Sturm, 1837)	3	saproxylophagous	saproxylophagous	ST	SI	ME	arboricolous	arboricolous
<i>H. rufipennis</i> (Duftschmid, 1825)	1	saproxylophagous	saproxylophagous	ST	SI	ME	arboricolous	arboricolous
<i>Ptilinus pectinicornis</i> (Linnaeus, 1758)	60	saproxylophagous	saproxylophagous	EU	SI	ME	arboricolous	arboricolous
<i>Hyperisus plumbeum</i> (Illiger, 1801)	3	saproxylophagous	saproxylophagous	ST	SI	ME	lignicolous	lignicolous
<b>Pyrochroidae</b>	<b>2</b>							
<i>Pyrochroa coccinea</i> (Linnaeus, 1760)	1	predator and facultative mycetophagous	polinophagous	EU	SI	ME	corticolous	floricolous
<i>Schizotus pectinicornis</i> (Linnaeus, 1758)	1	predator and facultative mycetophagous	polinophagous	ST	SI	ME	corticolous	floricolous
<b>Salpingidae</b>	<b>202</b>							
<i>Rabocerus gabrieli</i> (Gerhardt, 1901)	1	predator	scolytidophagous	ST	SI	ME	xylo-detriticolous	xylo-detriticolous
<i>Salpingus planirostris</i> (Fabricius, 1787)	165	predator	scolytidophagous	EU	SI	ME	xylo-detriticolous	xylo-detriticolous
<i>Salpingus ruficollis</i> (Linnaeus, 1760)	22	predator	scolytidophagous	ST	SI	ME	xylo-detriticolous	xylo-detriticolous
<i>Sphaeristes reyi</i> (Abeille de Perrin, 1874)	2	predator	coleopterophagous	EU	SI	ME	xylo-detriticolous	xylo-detriticolous
<i>Vincenzellus ruficollis</i> (Panzer, 1794)	12	predator	scolytidophagous	ST	SI	ME	xylo-detriticolous	xylo-detriticolous
<b>Scarabaeidae</b>	<b>42</b>							
<i>Agrilinus ater</i> (De Geer, 1774)	16	coprophagous	coprophagous	EU	SN	KS	humicolous	stercoricolous
<i>Limarus zenkeri</i> (Germar, 1813)	8	coprophagous	coprophagous	ST	SI	ME	humicolous	stercoricolous
<i>Onthophagus fracticornis</i> (Preyßler, 1790)	1	coprophagous	coprophagous	EU	SI	KS	humicolous	stercoricolous
<i>O. vacca</i> (Linnaeus, 1767)	1	coprophagous	coprophagous	ST	PR	KS	humicolous	stercoricolous
<i>Plagiogonus arenarius</i> (Olivier, 1789)	2	coprophagous	coprophagous	ST	SN	KS	humicolous	stercoricolous
<i>Pleurophorus caesus</i> (Panzer, 1796)	1	coprophagous	coprophagous	ST	SI	KS	humicolous	stercoricolous
<i>Serica brunnea</i> (Linnaeus, 1758)	9	rhizophagous	phylophagous	ST	PR	KS	arboricolous	herbiculous
<i>Valgus hemipterus</i> (Linnaeus, 1758)	3	saproxylophagous	polinophagous	EU	SI	KS	xylo-detriticolous	floricolous
<i>Volinus sticticus</i> (Panzer, 1798)	1	coprophagous	coprophagous	EU	SN	KS	humicolous	stercoricolous
<b>Scirtidae</b>	<b>1</b>							
<i>Sacodes flavicollis</i> (Kiesenwetter, 1859)	1	saprophytophagous	saprophytophagous	ST	SI	HH	phyto-detriticolous	ripicolous
<b>Scraptiidae</b>	<b>17</b>							
<i>Anaspis flava</i> (Linnaeus, 1758)	4	saproxylo-mycetophagous	polinophagous	ST	SI	ME	xylo-detriticolous	floricolous
<i>A. frontalis</i> (Linnaeus, 1758)	5	saproxylo-mycetophagous	polinophagous	ST	SI	ME	xylo-detriticolous	floricolous
<i>Anaspis thoracica</i> (Linnaeus, 1758)	8	saproxylo-mycetophagous	polinophagous	ST	SI	ME	xylo-detriticolous	floricolous

Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotope	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<b>Silvanidae</b>	<b>8</b>							
<i>Silvanoprus fagi</i> (Guérin-Méneville, 1844)	4	mycetophagous	mycetophagous	EU	SI	ME	corticulous	corticulous
<i>Uleiota planatus</i> (Linnaeus, 1761)	4	mycetophagous	mycetophagous	EU	SI	ME	corticulous	corticulous
<b>Sphindidae</b>	<b>20</b>							
<i>Aspidiphorus orbiculatus</i> (Gyllenhal, 1808)	14	myxomycetophagous	myxomycetophagous	EU	SI	ME	myxomyceticulous	myxomyceticulous
<i>Odontosphindus grandis</i> (Hampe, 1861)	2	myxomycetophagous	myxomycetophagous	ST	SI	ME	myxomyceticulous	myxomyceticulous
<i>Sphindus dubius</i> (Gyllenhal, 1808)	4	myxomycetophagous	myxomycetophagous	EU	SI	ME	myxomyceticulous	myxomyceticulous
<b>Staphylinidae</b>	<b>612</b>							
<i>Abemus chloropterus</i> (Panzer, 1796)	13	predator	predator	EU	SI	ME	phytodetriticulous	phytodetriticulous
<i>Agaricochara latissima</i> (Stephens, 1832)	5	mycetophagous	mycetophagous	EU	SI	ME	fungiculous	fungiculous
<i>Aleochara brevipennis</i> Gravenhorst, 1806	9	predator	predator	ST	SI	HH	phytodetriticulous	phytodetriticulous
<i>Anaulacaspis nigra</i> (Gravenhorst, 1802)	23	predator	predator and facultative necrophagous	EU	SI	KS	phytodetriticulous	phytodetriticulous
<i>Atheta castanoptera</i> (Mannerheim, 1830)	1	predator	predator and facultative necrophagous	EU	SI	ME	phytodetriticulous	phytodetriticulous
<i>A. crassicornis</i> (Fabricius, 1792)	5	predator	predator and facultative necrophagous	EU	SI	ME	phytodetriticulous	succiculous
<i>Atrecus affinis</i> (Paykull, 1789)	2	predator and facultative necrophagous	predator and facultative necrophagous	ST	SI	HH	xylodetriticulous	xylodetriticulous
<i>Bibloporus bicolor</i> (Denny, 1825)	2	predator and facultative necrophagous	predator and facultative necrophagous	EU	SI	ME	xylodetriticulous	xylodetriticulous
<i>Bolitochara pulchra</i> (Gravenhorst, 1806)	4	predator	mycetophagous	EU	SI	ME	xylodetriticulous	fungiculous
<i>Bryaxis nigripennis</i> (Aubé, 1844)	2	saprophytophagous	saprophytophagous	EU	SI	ME	phytodetriticulous	phytodetriticulous
<i>B. nodicornis</i> (Aubé, 1833)	6	saprophytophagous	saprophytophagous	EU	PR	HH	ripiculous	ripiculous
<i>Bythinus burrellii</i> Denny, 1825	2	saprophytophagous	saprophytophagous	EU	SI	ME	humiculous	phytodetriticulous
<i>Coprophilus striatulus</i> (Fabricius, 1792)	3	saprophytophagous	saprophytophagous	EU	SI	ME	phytodetriticulous	phytodetriticulous
<i>Dendroxena quadrimaculata</i> (Scopoli, 1771)	1	predator	entomophagous	EU	SI	ME	phytodetriticulous	arboriculous
<i>Euconnus fimetarius</i> (Chaudoir, 1845)	1	saprophytophagous	saprophytophagous	EU	SN	ME	phytodetriticulous	phytodetriticulous
<i>Euplectus brunneus</i> (Grimmer, 1841)	3	saprophytophagous	saprophytophagous	EU	SI	ME	xylodetriticulous	xylodetriticulous
<i>Eusphalerum macropterum</i> (Kraatz, 1857)	5	predator and facultative necrophagous	predator and facultative necrophagous	ST	SI	HH	phytodetriticulous	floriculous
<i>Gyrophana boleti</i> (Linnaeus, 1758)	5	mycetophagous	mycetophagous	EU	SI	ME	fungiculous	fungiculous
<i>G. poweri</i> Crotch, 1867	4	mycetophagous	mycetophagous	EU	SI	ME	fungiculous	fungiculous
<i>Holobus flavicornis</i> (Lacordaire, 1835)	4	predator	predator and facultative necrophagous	ST	SI	ME	phytodetriticulous	phytodetriticulous
<i>Liogluta microptera</i> Thomson, 1867	8	predator	predator and facultative necrophagous	EU	SI	HH	humiculous	phytodetriticulous
<i>Lordithon exoletus</i> (Erichson, 1839)	58	predator	predator and facultative necrophagous	ST	SI	ME	fungiculous	fungiculous
<i>L. lumulatus</i> (Linnaeus, 1760)	32	predator	predator and facultative necrophagous	ST	SI	ME	fungiculous	fungiculous
<i>L. speciosus</i> (Erichson, 1839)	1	predator	predator and facultative necrophagous	ST	SI	ME	fungiculous	fungiculous



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Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotop	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<i>Medon brunneus</i> (Erichson, 1839)	2	predator	predator and facultative necrophagous	EU	SI	ME	phytodetriticolous	nidicol-phytodetriticolous
<i>Megarthritis hemipterus</i> (Illiger, 1794)	2	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	fungicolous
<i>Mycetoporus longulus</i> Mannerheim, 1830	237	predator	predator	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>Neuraphes angulatus</i> (P.W.J. Müller & Kunze, 1822)	2	saprophytophagous	saprophytophagous	EU	SI	HH	phytodetriticolous	phytodetriticolous
<i>Nicrophorus humator</i> (Gleditsch, 1767)	3	necrophagous	necrophagous	EU	SI	ME	cadavernicolous	cadavernicolous
<i>N. vespillo</i> (Linnaeus, 1758)	1	necrophagous	necrophagous	EU	SI	ME	cadavernicolous	cadavernicolous
<i>N. vespilloides</i> Herbst, 1783	3	necrophagous	necrophagous	EU	SI	ME	cadavernicolous	cadavernicolous
<i>Olophrum assimile</i> (Paykull, 1800)	1	predator	predator	EU	SI	HH	phytodetriticolous	phytodetriticolous
<i>Omalium rivulare</i> (Paykull, 1789)	4	predator	predator	EU	SI	ME	phytodetriticolous	succicolous
<i>Oxyporus rufus</i> (Linnaeus, 1758)	1	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	agaricolous
<i>Parabolitobius formosus</i> (Gravenhorst, 1806)	3	predator	predator and facultative necrophagous	EU	SI	HH	phytodetriticolous	humicolous
<i>Pella limbata</i> (Paykull, 1789)	25	predator	predator and facultative necrophagous	ST	SI	HH	phytodetriticolous	phytodetriticolous
<i>Philonthus atratus</i> (Gravenhorst, 1802)	2	predator	predator and facultative necrophagous	ST	SI	HH	ripicolous	phytodetriticolous
<i>P. decorus</i> (Gravenhorst, 1802)	3	predator	predator and facultative necrophagous	EU	SI	HH	humicolous	phytodetriticolous
<i>Plataraea brunnea</i> (Fabricius, 1798)	45	predator	predator and facultative necrophagous	EU	PR	ME	phytodetriticolous	phytodetriticolous
<i>Rugilus rufipes</i> Germar, 1836	1	predator	predator and facultative necrophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>Rybaxis longicornis</i> (Leach, 1817)	10	predator	predator and facultative necrophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>Scaphidium quadrimaculatum</i> Olivier, 1790	7	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	fungicolous
<i>Scaphisoma agaricinum</i> (Linnaeus, 1758)	1	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	fungicolous
<i>S. assimile</i> Erichson, 1845	23	mycetophagous	mycetophagous	ST	SI	HH	fungicolous	fungicolous
<i>S. balcanicum</i> Tamanini, 1954	2	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>S. boleti</i> (Panzer, 1793)	2	mycetophagous	mycetophagous	ST	SI	HH	fungicolous	fungicolous
<i>S. inopinatum</i> Löbl, 1967	4	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>Schistoglossa curtispennis</i> (Sharp, 1869)	1	predator and facultative necrophagous	predator and facultative necrophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>Scydmaenus perrisi</i> (Reitter, 1879)	1	saprophytophagous	saprophytophagous	ST	SI	ME	phytodetriticolous	phytodetriticolous
<i>Sepedophilus littoreus</i> (Linnaeus, 1758)	2	mycetophagous	mycetophagous	EU	SI	ME	fungicolous	phytodetriticolous
<i>Stenichnus bicolor</i> (Denny, 1825)	3	saprophytophagous	saprophytophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>S. collaris</i> (Müller & Kunze, 1822)	3	saprophytophagous	saprophytophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>Tachyporus hypnorum</i> (Fabricius, 1775)	1	predator	predator and facultative necrophagous	EU	SI	ME	phytodetriticolous	phytodetriticolous
<i>Thamiaraea hospita</i> (Märkel, 1844)	16	predator	predator	ST	SI	ME	phytodetriticolous	succicolous
<i>Trimium carpathicum</i> Saulcy, 1875	1	predator	predator and facultative necrophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>Tychus niger</i> (Paykull, 1800)	1	predator	predator	ST	PR	ME	phytodetriticolous	phytodetriticolous

Taxon	N	Trophic (Larvae)	Trophic (Imago)	Ecol. Val.	Biotope	Humidity	Microhabitat (Larvae)	Microhabitat (Imago)
<b>Tenebrionidae</b>	<b>74</b>							
<i>Bolitophagus reticulatus</i> (Linnaeus, 1767)	2	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<i>Corticus unicolor</i> Piller & Mitterpacher, 1783	22	predator and facultative mycetophagous	scolytidophagous	ST	SI	KS	corticolous	corticolous
<i>Gonodera luperus</i> (Herbst, 1783)	20	saproxylophagous	polinophagous	ST	SI	ME	xylodetriticolous	floricolous
<i>Lagria atripes</i> Mulsant & Guillebeau, 1855	1	saprophytophagous	polinophagous	ST	SI	KS	phytodetriticolous	floricolous
<i>L. hirta</i> (Linnaeus, 1758)	1	saprophytophagous	polinophagous	EU	SI	KS	phytodetriticolous	floricolous
<i>Mycetochara axillaris</i> (Paykull, 1799)	12	saproxylo-mycetophagous	saproxylo-mycetophagous	EU	SI	ME	xylodetriticolous	cavernicolous
<i>Palorus depressus</i> (Fabricius, 1790)	2	saproxylophagous	saproxylophagous	EU	SN	ME	xylodetriticolous	xylodetriticolous
<i>Pentaphyllus testaceus</i> (Hellwig, 1792)	1	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	xylodetriticolous	cavernicolous
<i>Platydema dejeani</i> Laporte de Castelnaud & Brullé, 1831	8	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	polyporicolous
<i>Prionychus ater</i> (Fabricius, 1775)	3	saproxylo-mycetophagous	saproxylo-mycetophagous	EU	SI	ME	xylodetriticolous	cavernicolous
<i>Pseudocstela ceramboides</i> (Linnaeus, 1758)	1	saproxylophagous	saproxylophagous	EU	SI	ME	xylodetriticolous	herbicolous
<i>Stenomax aeneus</i> (Scopoli, 1763)	1	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	xylodetriticolous	cavernicolous
<b>Teredidae</b>	<b>3</b>							
<i>Oxylaemus cylindricus</i> (Creutzer, 1796)	3	predator and facultative necrophagous	entomophagous	ST	SI	ME	corticolous	corticolous
<b>Tetratomidae</b>	<b>1</b>							
<i>Tetratoma ancora</i> Fabricius, 1790	1	mycetophagous	mycetophagous	ST	SI	ME	fungicolous	fungicolous
<b>Throscidae</b>	<b>7</b>							
<i>Aulonothroscus brevicollis</i> (Bonvouloir, 1859)	7	saproxylophagous	polinophagous	ST	SI	ME	xylodetriticolous	herbicolous
<b>Thymalidae</b>	<b>2</b>							
<i>Thymalus limbatus</i> (Fabricius, 1787)	2	mycetophagous	entomophagous	EU	SI	ME	fungicolous	xylodetriticolous
<b>Trogositidae</b>	<b>24</b>							
<i>Nemozoma caucasicum</i> Ménériés, 1832	1	predator and facultative necrophagous	entomophagous	EU	SI	ME	corticolous	corticolous
<i>N. elongatum</i> (Linnaeus, 1761)	23	predator and facultative necrophagous	entomophagous	EU	SI	ME	corticolous	corticolous
<b>Zopheridae</b>	<b>18</b>							
<i>Colydium elongatum</i> (Fabricius, 1787)	3	predator and facultative necrophagous	entomophagous	EU	SI	ME	corticolous	xylodetriticolous
<i>Endophloeus marcovichianus</i> (Piller & Mitterpacher, 1783)	1	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>Pycnomerus terebrans</i> (Olivier, 1790)	3	saproxylo-mycetophagous	entomophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>Synchita humeralis</i> (Fabricius, 1792)	3	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>S. undata</i> Guérin-Ménéville, 1844	3	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous
<i>S. variegata</i> Hellwig, 1792	5	saproxylo-mycetophagous	saproxylo-mycetophagous	ST	SI	ME	xylodetriticolous	xylodetriticolous

Families representation is given in Table 3. By the number of species eudominants are representatives of the family of rove beetles (56 species – 16.2%), the group of dominants is represented by weevils (31 species – 9%) and minute tree-fungus beetle (22 species – 6.4%). By the number of individuals – weevils (Curculionidae) – 1443 individuals (32.5%) and rove beetles (Staphylinidae) – 612 individuals (13.8%).

Table 3. Representativeness of beetle families in beech forest (Kamianytsia forestry)

Families	Species	%	Individuals	%
Aderidae	1	0.3	1	0.02
Anamorphidae	2	0.6	7	0.2
Anthribidae	3	0.9	5	0.1
Attelabidae	1	0.3	1	0.02
Biphyllidae	1	0.3	13	0.3
Brentidae	1	0.3	5	0.1
Cantharidae	4	1.2	28	0.6
Carabidae	6	1.7	10	0.2
Cerambycidae	6	1.7	10	0.2
Cerylonidae	3	0.9	40	0.9
Chrysomelidae	1	0.3	3	0.07
Ciidae	22	6.4	172	3.9
Clambidae	3	0.9	24	0.5
Cleridae	3	0.9	9	0.2
Coccinellidae	2	0.6	3	0.1
Corylophidae	2	0.6	49	1.1
Cryptophagidae	12	3.5	26	0.6
Cucujidae	1	0.3	20	0.5
Curculionidae	31	9	1443	32.5
Elateridae	14	4.18	70	1.8
Endomychidae	3	0.9	15	0.3
Erotylidae	10	2.9	216	4.9
Eucinetidae	1	0.3	5	0.1
Eucnemidae	7	2	60	1.4
Helophoridae	1	0.3	1	0.02
Histeridae	10	2.9	141	3.2
Hydrophilidae	1	0.3	1	0.02
Laemophloidae	2	0.6	19	0.4
Lampyridae	2	0.6	42	1
Latridiidae	13	3.8	284	6.4
Leiodidae	18	5.2	151	3.4
Lophocateridae	1	0.3	1	0.02
Lucanidae	2	0.6	9	0.2

Melandryidae	3	0.9	6	0.1
Melyridae	1	0.3	4	0.1
Monotomidae	5	1.5	59	1.3
Mordellidae	2	0.6	35	0.8
Mycetaeidae	1	0.3	1	0.02
Mycetophagidae	9	2.6	103	2.3
Nitidulidae	16	4.6	158	3.6
Prostomidae	1	0.3	3	0.1
Ptiliidae	4	1.2	10	0.2
Ptinidae	9	2.6	142	3.2
Pyrochroidae	2	0.6	2	0.1
Salpingidae	5	1.5	202	4.6
Scarabaeidae	9	2.6	42	1
Scirtidae	1	0.3	1	0.02
Scraptiidae	3	0.9	17	0.4
Silvanidae	2	0.6	8	0.2
Sphindidae	3	0.9	20	0.5
Staphylinidae	56	16.2	612	13.8
Tenebrionidae	12	3.5	74	1.7
Teredidae	1	0.3	3	0.1
Tetatomidae	1	0.3	1	0.02
Throscidae	1	0.3	7	0.7
Thymalidae	1	0.3	2	0.1
Trogositidae	2	0.6	24	0.5
Zopheridae	6	1.7	18	0.4
Total:	346	100.00	4438	100.00

## COMMUNITY STRUCTURE

### Dominant structure of the community

Table 2 demonstrates the share of each species in the community, which allows us to assess the abundance of species in terms of both taxonomic and environmental guilds. In terms of the quantity the most represented are the families of rove beetles (Staphylinidae) (56 species), weevils (Curculionidae) – 31 species and minute tree-fungus beetles (Ciidae) (22 species).

Among rove beetles, eudominants are represented by one species only – *Mycetoporus longulus* (38.7%). Dominants are represented by *Lordithon exoletus* (9.5%), *Platarea brunea* (7%) and *Lordithon lunulatus* (5.2%). Eudominants of the weevils guild are the following: *Anisandrus dispar* (41.9%), *Xyleborinus saxesenii* (22.5%)

and *Taphrorychus bicolor* (15.2%). Dominants are represented by one species as well – *Ernoporicus fagi* (9.2%). Among minute tree-fungus beetles eudominantes are: *Cis fagi* (13.4%), *C. festivus* (10.5%) and the group of dominants is made up by *C. micans* and *Sulcacis nitidus* (9.3% each), *Ennearthron cornutum* (8.1%) and *Orthocis alni* (7%).

**Trophic structure of the community**

Tables 4 shows the quantitative distribution of species and individuals by types of trophic, Figures 5 and 6 demonstrate the species distribution to trophic communities. The results of the analysis are presented separately for larvae and imago.

Table 4. Trophic communities and types

Trophic group	Trophic type	Larva		Imago	
		Species	Individuals	Species	Individuals
Mycetophagous	Mycetophagous	104	1189	98	1167
Mycetophagous	Ambrosia beetles	6	940	0	0
Myxomycetophagous	Myxomycetophagous	11	79	11	79
Phytophagous	Rhizophagous	9	37	0	0
Phytophagous	Xylophagous	0	0	14	484
Phytophagous	Phyllophagous	3	5	13	61
Phytophagous	Phylophagous-carpophagous	0	0	2	3
Phytophagous	Carpophagous	1	5	1	5
Phytophagous	Polinophagous	0	0	33	176
Saproxylophagous	Saproxylophagous	59	811	27	274
Saproxylophagous	Saproxylomycetophagous	27	170	27	1040
Saproxylophagous	Coprophagous	8	31	7	30
Saproxylophagous	Saprophytophagous	23	86	30	91
Saproxylophagous	Necrophagous	12	21	12	21
Zoophagous	Scolytidophagous	0	0	8	265
Zoophagous	Predator (sensu lato)	41	840	9	306
Zoophagous	Coccidophagous	1	1	1	1
Zoophagous	Coleopterophagous	0	0	1	2
Zoophagous	Entomophagous (sensu lato)	0	0	20	95
Zoophagous	Predator and facultative necrophagous	32	139	23	236
Zoophagous	Predator and facultative mycetophagous	9	84	0	0
Aphagous	Aphagous	0	0	9	102
Total:		346	4438	346	4438

According to the peculiarities of trophic, we have identified 6 trophic groups of Coleoptera, namely: phytophagous, zoophagous, mycetophagous, myxomycetophagous, saprophagous and aphagous.

**1. Phytophagous.** The trophic group of phytophagous is represented by species that feed on living plants or their parts. It includes smaller

categories, xylophagous (species that feed on wood); carpophagous (species that feed on plant fruits); rhizophagous (species that feed on tree roots); polinophagous (species that feed on pollen); phyllophagous (feed on green parts of tree leaves); phyllophagous-carpophagous (feed on the green parts of tree leaves or their fruits).



At the larval stage, phytophagous are representatives the families of Chrysomelidae, Curculionidae, Brentidae, Elateridae and Scarabaeidae – 13 species in total. At the imago stage, phytophagous include 63 species of beetles, the largest share of which is polinophagous (33 species).

**2. Zoophagous.** Species that feed on small animals or their parts. They include predators (s.l.) (species that prey on a variety of small arthropods); predators and facultative mycetophagous (species that feed on a variety of small organisms or hyphae of fungi); predators and facultative necrophagous (species that feed on various small organisms or their parts); entomophagous (s.l.) (feed on a variety of small insects); coccidophagous (species that feed on members of the family Coccidae); coleopterophagous (species that feed on larvae or imago beetles); scolytidophagous (species that feed on beetles, representatives the subfamily Scolytinae).

Zoophagy is characteristic of 83 species at the larval stage, and of 62 species at the imago stage. Most of them are predators in broad sense (41 species).

**3. Mycetophagous** – combines species being dominated by fungi in feeding. This trophic community includes obligate mycetophagous (species that feed on mycelium or fruiting bodies of fungi) and ambrosia beetles (species that feed on ambrosia fungi cultivated in the tunnels in wood or under bark).

Mycetophagy is a type of feeding that is inherent of almost a third of the species: 110 for larvae and 98 for imago.

**4. Myxomycetophagous** are species that feed on the plasmodium of myxomycetes. The material is represented by eleven species.

**5. Saprophagous** are species that are feeding on decomposing organic matter of plant or animal origin. These include saprophytophagous (feed on dead plant remains); saproxylrophagous (feed on dead wood in the relatively early stages of decomposition of wood or bark (sometimes for species that develop mainly in the bark use the term fleophagous)); saproxylomycetophagous (or destructive mycetophagous – species that feed on dead wood containing mycelium of saproxyllic fungi); coprophagous (feeding on vertebrate excrement) and necrophagous (feeding on the carcasses of other animals).

Saprophagy is characteristic of the majority of species: 129 species for larvae, and 103 species for imago.

**6. Aphagous** – species that do not feed in imago stage (9 species).

Since the diet of larvae and adults varies, the ratio of trophic groups for larvae and imago differs (Figs 5, 6), although both stages of life are characterized by a predominance of saprophagous and mycetophagous.

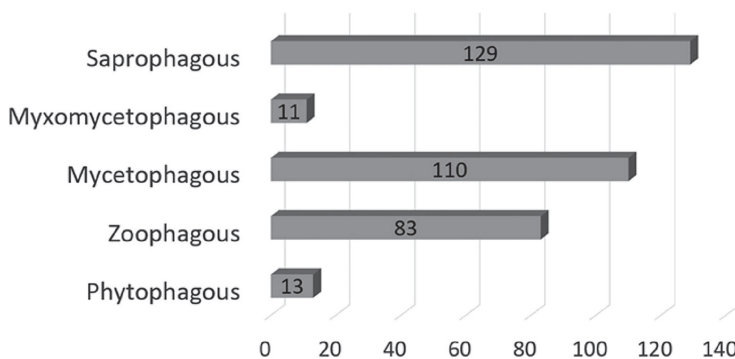


Fig. 5. Trophic groups (larvae).

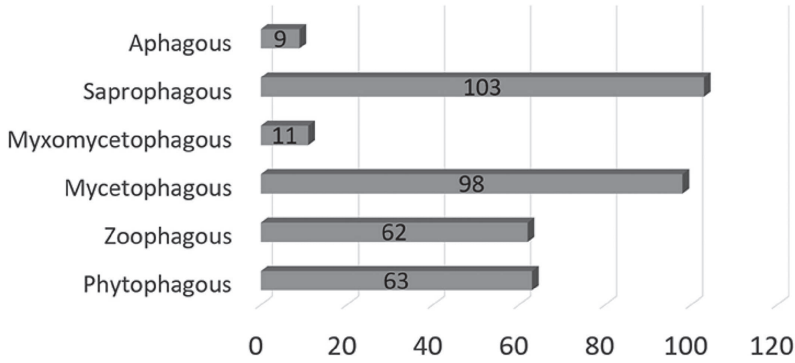


Fig. 6. Trophic groups (imago).

**Community structure by the types of microhabitats**

According to Resolution № 6 of the Berne Convention, Annex II of the Habitats Directive (Directive of 21.05.1992, № 92/43 / EEC. “Directive on the Protection of Natural Habitats and Wild Fauna and Flora”) – natural habitats means terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural, where the species exists at any stage of its life cycle. Microhabitat is a narrower concept and provides very specific conditions depending on its characteristics: size, shape, location, the stage of wood decomposi-

tion, the state of the host plant (living or dead), etc. (Larrieu et al. 2018). Thus, there can be several microhabitats within the living space of a tree: bark, roots, dead xylem, crown, etc. To determine the categories of insects by the types of microhabitats they live in at certain stages of their development, we have used the “Die Käfer Mitteleuropas. Ökologie” as algorithms (Koch 1989a, b, 1992).

Table 2 demonstrates the characteristics of species of the community depending on the types of habitat they inhabit. Table 5 analyzes the representation of habitat types in the community at the larval and imago stages.

Table 5. Species categories according to habitat

Substrate where a habitat is formed	Species category by a habitat	Larva		Imago	
		Number of species	%	Number of species	%
Wood	Xylodetriticolous	81	23.4	61	17.6
Wood	Lignicolous	7	2.0	4	1.2
Wood	Xylo-Phytodetriticolous	2	0.6	0	0
Wood	Succicolous	0	0	8	2.3
Wood	Arboricolous	35	10.1	21	6.1
Wood	Corticolous	31	9	24	6.9
Wood	Succicol-Nidicolous	0	0	1	0.3
Wood	Arboricol-Herbicolous	0	0	2	0.6
Fungy or myxomycetes	Fungicolous	70	20.2	67	19.4
Fungy or myxomycetes	Polyporicolous	8	2.3	4	1.2
Fungy or myxomycetes	Myxomyceticolous	6	1.7	3	0.9
Fungy or myxomycetes	Agaricolous	1	0.3	1	0.3

Substrate where a habitat is formed	Species category by a habitat	Larva		Imago	
		Number of species	%	Number of species	%
Grasses	Phytodetrificial	59	17.1	67	19.4
Grasses	Herbicolous	4	1.2	21	6.1
Grasses	Rhizicolous	8	2.3	0	0
Grasses	Floricolous	2	0.6	29	8.4
Grasses	Floricol-Herbicolous	0	0	2	0.6
Soil	Humicolous	14	4.1	3	0.9
Soil	Ripicolous	3	0.9	5	1.5
Animals	Cadavernicolous	5	1.5	4	1.2
Animals	Stercoricolous	1	0.3	7	2.02
Nests or holes	Bombicolous	3	0.9	0	0
Nests or holes	Microcavernicolous	3	0.9	4	1.2
Nests or holes	Cavernicolous	0	0	5	1.5
Nests or holes	Nidicolous	3	0.9	2	0.6
Nests or holes	Nidicol-Phytodetrificial	0	0	1	0.3
Total:		346	100	346	100

We have identified 25 categories of species, which can be grouped into 6 groups (depending on the substrate where the habitat is formed and its quality or condition).

### 1. Microhabitats in fungi or myxomycetes

- agaricolous – species that use fungi of Agaricomycetes class as habitats;
- myxomyceticolous – species that use the fruiting bodies of myxomycetes as habitats;
- polyporicholous – species of insects that use the fruiting bodies of xylophilic fungi of the Polyporaceae family as habitats;
- fungicolous – species of insects that are adapted to life and development in the fruiting bodies of fungi.

### 2. Microhabitats in live trees or dead wood

- arboricolous – species adapted to life on trees;
- arboricol-herbicolous – species adapted to life and development on trees and in the grass cover;
- corticolous – species that are adapted to life and development under the bark of trees;

- xylo-detrificial – species that are adapted to life and development in dead wood at different stages of decomposition;
- lignicolous – species adapted to life and development in wood including wood products;
- succicolous – species that use sap, flowing from the trees as a habitat;
- xylo-phytodetrificial – species that are adapted to life and development in dead plant remains and in wood in particular;
- succicol-nidicolous – species that use tree sap as a habitat or can live and develop in bird nests.

### 3. Microhabitats in grassy vegetation

- herbicolous – species that are adapted to life and development in the grass cover;
- rhizicolous – species whose larval development occurs in the roots of plants;
- floricolous – species that are adapted to life on flowers;
- floricol-herbicolous – species that are adapted to life and development in the grass cover and flowers;
- phytodetrificial – species that are adapted to life and reproduction in rotting plant remains (shoots, litter...).

#### 4. Microhabitats in nests or holes

- cavernicolous – species that are adapted to develop in tree hollows;
- microcavernicolous – species that are adapted to life in the nests and burrows of mammals;
- nidicolous – species that live and develop in bird nests;
- nidicol-phytodetriticolous – species that live and develop in bird nests or plant remains;
- bombicolous – species that are adapted to existing in bumblebee nests.

#### 5. Microhabitats in organic remains of animal origin

- cadavernikolous – species that develop in animal carcasses;
- stercolicolous – species that are adapted to life and development in mammalian feces.

#### 6. Microhabitats in the soil environment

- humicolous – species that use the top organic layer of soil as a habitat;
- ripicolous – species that use the shore of reservoirs as a habitat;

The predominant types of categories at larval stage are xylo-detriticolous, fungicolous, phytodetriticolous and arboricolous. Imago stage is represented by xylo-detriticolous, fungicolous and phytodetriticolous.

#### *Community structure by the ecological valence of species*

According to the ability of species to exist at different climate values or habitat quality the following categories of species are singled out:

- eurytopic – able to exist in different ecological conditions of the environment – 167 species;
- stenotopic – able to exist only under specific ecological conditions of the environment – 179 species.

#### *Community structure by landscape preferences*

In assessing this structure, we approached from the point of view of the type of landscape.

- silvicolous – adapted to live in forests – 310 species;
- praticolous – inhabitants of meadow cenoses – 13 species;
- synanthropes – adapted to life near human settlements – 23 species. Most of them are optional synanthropes.

#### *The community structure by the humidity*

3 types of communities have been singled out according to the criteria of habitat humidity [Musiienko et al. 2004].

- mesophiles – species adapted to existence at moderate humidity – 290 species;
- xerophiles – organisms living in the conditions of extremely low humidity, and not tolerating high humidity – 29 species;
- hygrophiles – organisms living in the conditions of high humidity – 27 species.

The predominant types of categories for larvae are xylo-detriticolous, fungicolous, phytodetriticolous and arboricolous. The group of imago is represented by xylo-detriticolous, fungicolous and phytodetriticolous.

#### DISCUSSION

Clear-cutting, which was used in Ukraine before, led to the formation of even-aged stands. In fact, the territory we studied is a beech forest 80+ years old and is a forest ecosystem formed at the site after clear-cutting. Importantly, such forests were “uninteresting” to researchers, so any publications on communities or guild analysis are not existing (except for ground beetles guilds of epigeobiont fauna). At the same time, of course, the own fauna of different systematic groups was studied in different types of forests.

For comparison, we can use the data obtained as a result of long-term research conducted in the beech forests of the Uholksky massif of the Carpathian Biosphere Reserve. The age of the trees of the first story of such forests ranges from 200 to 350 years. These forests have a complex vertical and horizontal structure. As a result, when old trees fall and sometimes due to wind-fall, “windows” of different sizes are formed in the tent. This increases the faunal diversity in the massifs, because along with the high level of microhabitats, additional ecological niches for beetles are created. This massif can be a model of a “hot spots” for beetle biodiversity.

For convenience, we will designate these communities as “Uholka” and “Kamianytsia” (Table 6).

Table 6. Comparison of beetles communities of even-aged and uneven-aged forests

Indicator	Kamianytsia (Even-aged stands)	Uholka (Uneven-aged stands)
All species	346	478
Saproxylic species	215	335
Red list species	0	10
Saproxylic relict primeval species	11	17

An important component of the fauna of forest communities is the saproxylic component of the fauna. The analysis showed that at the present time the number of saproxylic species of the Coleoptera of the “Uholka” group is 335 species, which means 70% of all species registered here (Chumak et al. 2018).

Our result showed that in the community of “Kamianytsia” 215 species were registered (62% of all species collected there). That is to say, the percentage share of saproxylic species of Kamianytsia community is lower, obviously, due to the lower number of microhabitats.

A comparison of rare species with official status in Ukraine (Red Data Book of Ukraine 2009;

Red Data Book of the Ukrainian Carpathians 2011) showed that there are 10 of them in the “Uholka” group: *Rhysodes sulcatus*, *Quedius dilatatus* Fabricius, 1787, *Lucanus cervus* Linnaeus, 1758, *Ceruchus chrysomelinus* Hochenwarth, 1785, *Triplax carpathica*, *Cucujus cinnaberinus* Scopoli, 1763, *Dicerca berolinensis* Herbst, 1779, *Limonicus violaceus* P.W.J. Müller, 1821, *Osmoderma barnabita* Motschulsky, 1845, *Rosalia alpina* Linnaeus, 1758 (Chumak et al. 2022).

At the same time, such species were absent in the “Kamianytsia” community. So old-growth forests are important because they ensure the existence of stable populations of endangered species.

Another important indicator, in our opinion, is the number of “saproxylic relict primeval forest species” (Müller, 2005). The comparison of the saproxylic primeval relict species composition showed: community of “Uholka” consist of 17 species: *Rhysodes sulcatus*, *Abraeus parvulus* Aubé, 1842, *Ampedus elegantulus* Schönherr, 1817, *Ischnodes sanguinicollis* Panzer, 1793, *Crepidophorus mutilatus* Rosenhauer, 1847, *Nematodes filum*, *Ipidia binotata*, *Pediacus dermestoides*, *Triplax elongata*, *Cryptophagus confusus* Bruce, 1934, *Mycetophagus ater*, *M. decempunctatus*, *Leiestes seminiger*, *Phytobaenus amabilis*, *Mycetochara flavipes* Fabricius, 1792, *Platydemia dejeani*, *Rosalia alpina* (Chumak 2013).

At the same time, community of “Kamianytsia” consist of 11 species: *Phytobaenus amabilis*, *Omoglymmius germari*, *Rhysodes sulcatus*, *Pediacus dermestoides*, *Leiestes seminiger*, *Triplax collaris*, *T. elongata*, *Nematodes filum*, *Ipidia binotata*, *Platydemia dejeani*.

It is obvious that in terms of the number of species, primeval forest communities prevail, but the even-age forest massifs also provide the existence of populations of such species. The territory we are studying is affected by a spatially distant, less disturbed massif by the imago of beetles, which constantly inhabits adjacent territories.



As a result, the conditions for the existence of stable populations of species that will form full-fledged communities or guilds in the later stages of forest succession are gradually formed in the even-age forests.

In conclusion, forests consisting of individual trees with a large number of microhabitats are “hot spots” for maintaining faunal diversity. Among the communities, a certain share of species will be both rare species with official statuses and primeval forest saproxylic relict indicator species.

Similar studies conducted to compare indicators of faunal diversity of communities of primeval forests and transformed forests in Ukraine showed that the authors of the studies did not find a direct correlation. In particular, the average number of species per plot was not higher in primeval forests than in managed forests. Although some diversity indices showed higher values for natural forests (Chumak et al. 2005, 2016).

## CONCLUSIONS

The community of Coleoptera species collected in the beech forest of the Volcanic Carpathians foothills is characterized by a high level of faunal diversity. The fauna of flying species of beetles (collected with window combined traps), accounts for 346 species, representing 58 families. The Chao estimation is 474 species. Such diversity indicators are determined by the species composition of forest, undergrowth, shrub and grass cover. A considerable proportion of ancient trees, dead wood at different stages of decomposition provides the presence of ecological niches due to the diversity of microhabitats for saproxylic beetles.

The dominance of representatives of minute tree-fungus beetles (Ciidae – 6.4% of species) and weevils (Curculionidae – 9% of species) is determined by the diversity of habitats, and the predominance in groups of rove beetles (Staphylinidae – 16.2%), which are a predator, indicates a high variety of small arthropods, which are their food base.

According to a number of indicators, these communities approach those of natural forests (and namely, the beech primeval forests of the Uholsky Massif of the Carpathian Biosphere Reserve). The trophic structure of the community is complicated – the species are classified into 6 trophic groups: phytophagous, zoophagous, mycetophagous, myxomycetophagous, saprophagous and aphagous, representing 22 types of trophic; while 15 types are characteristic of larvae, and 19 – of imago. Most species are stenotopes, silvicols and mesophiles.

The community structure by the ecological niches and the types of microhabitat is represented by 25 categories. The predominant types of habitat categories for larvae are xylo-detriticolous, fungicolous, phytodetriticolous and arboricols and for imago stage are xylo-detriticolous, fungicolous and phytodetriticolous.

The result of our research is a section of the composition of the beetle community at a certain stage of forest succession (and beetle communities). 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) permanent forest use, which Ukrainian forestry is gradually moving towards.

## ACKNOWLEDGEMENTS

The authors are grateful to Mariia Varyvoda and Maksym Kozhemiakin for their help in collecting the material and describing the research plots.

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*Received: 08.10.2022.*

*Accepted: 20.12.2022.*