

Rove beetle (Coleoptera: Staphylinidae) communities of the upper forest line of the Ukrainian Carpathians: structure and biotopic distribution (on the example of the Polonynskyi ridge)

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abstract

The results of studies of species diversity, community structure, and biotopic distribution of rove beetles (Insecta: Coleoptera: Staphylinidae) at the upper forest line on the Yavirnyk and Stinka mountain ridges (Polonynskyi massif, Ukrainian Carpathians) are presented. As a result, 91 species of Staphylinidae belonging to 53 genera and 10 subfamilies were found. In particular, 71 species were found on Yavirnyk, and 69 species on Stinka. The largest number of species was noticed on meadows of both ridges: 48 species on Yavirnyk and 51 on Stinka. The lowest number of species was recorded in ecotones: 39 species on Yavirnyk and 40 on Stinka. The rove beetle dominant complex of the Yavirnyk ridge includes four species, including two eudominants — *Eusphalerum alpinum* and *Philonthus politus*, and two dominants — *Eusphalerum anale* and *Philonthus decorus*. The dominant complex of the Stinka ridge includes six species: three eudominants — *Eusphalerum alpinum*, *Ocypus macrocephalus*, and *Staphylinus erythroptery*, and three dominants in almost equal proportions — *Anotylus mutator*, *Dinothenarus fossor*, and *Philonthus decorus*. All indices of species richness and diversity of the rove beetle communities have higher values on the Stinka ridge, and they are the highest in forest biotopes of both mountain ridges, which indicates their high ecological quality and stability. This is also confirmed by the highest rate of originality of the species composition of Staphylinidae in these areas. The most similar in species composition are the rove beetle communities of meadows. The original fauna of rove beetles of Yavirnyk is represented by 25 species, and of Stinka by 19 species. Among the species of Staphylinidae, 18 occurred in all biotopes of the upper forest line, which is 19.8% of the total number of species found here. In terms of trophic specialization, predators that live in the forest floor, among remains of organic origin and in fungi predominate in all biotopes of the upper forest line (UFL). In terms of biotopic distribution, eurytopic species predominate.

Угрупування жуків-стафілінід (Coleoptera, Staphylinidae) верхньої межі лісу Українських Карпат: структура і біотопний розподіл (на прикладі Полонинського хребта)

Неля Коваль, Сергій Глотов, Василь Чумак

Резюме. Наведено результати досліджень видового різноманіття, структури угруповань та біотопного розподілу жуків-стафілінід (Coleoptera, Staphylinidae) на верхній межі лісу гірських масивів Явірник і Стінка (Полонинський хребет, Українські Карпати). У результаті проведених досліджень тут виявлено 91 вид жуків-стафілінід, що належать до 53 родів і 10 підродин: 71 вид — на хребті Явірник, а 69 — на хребті Стінка. Найбільшу кількість видів відмічено на луках-полонинах обох хребтів: на Явірнику — 48, на Стінці — 51 вид, а найменше — на екотонних ділянках: на Явірнику — 39, а на Стінці — 40 видів. У домінантний комплекс хребта Явірник входять 4 види — 2 еудомінанти: *Eusphalerum alpinum* і *Philonthus politus* та 2 домінанти: *Eusphalerum anale* та *Philonthus decorus*, а Стінки — 6 видів: 3 еудомінанти *Eusphalerum alpinum*, *Ocypus macrocephalus*, *Staphylinus erythropterus* і у майже рівних частках 3 домінанти: *Anotylus mutator*, *Dinothenarus fossor*, *Philonthus decorus*. Всі індекси видового багатства та різноманіття угруповань стафілінід мають вищі показники на хребті Стінка, і найвищі вони у лісових біотопах обох масивів, що вказує на їх високу екологічну якість і стабільність. Це підтверджує і найвищий показник оригінальності видового складу стафілінід на цих ділянках. Найбільш подібні за видовим складом угруповання жуків-стафілінід на полонинах. Оригінальна фауна жуків-стафілінід Явірника представлена 25 видами, а хребта Стінка — 19 видами. Серед видів стафілінід, які траплялись у всіх біотопах верхньої межі лісу — 18 видів, що становить 19,8 % від загальної кількості виявлених тут видів. За трофічною спеціалізацією у всіх біотопах ВМЛ переважають хижаки, які мешкають в підстилці, рештках органічного походження та грибах. За біотопною приуроченістю переважають евритопні види.

Ключові слова: жуки-стафілініди, Staphylinidae, Карпати, верхня межа лісу, фауністичні угруповання, структура домінування, біотопний розподіл.

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Introduction

Rove beetles (Coleoptera, Staphylinidae) are one of the richest and most diverse families of beetles, which today include more than 63 000 species belonging to 3672 genera and 32 subfamilies (Klimaszewski *et al.* 2018). Representatives of the family are distributed in all natural areas of the planet, inhabit almost all terrestrial natural and anthropogenic biotopes, where they actively contribute to the functioning of biogeocoenoses. Larvae and imagoes of rove beetles inhabit the forest floor, plant and animal remains, animal excrements, fungi, and other substrates. Some specialized species live in deep caves or successfully co-exist with other animals, living in burrows of mammals, nests of birds and social insects. Most larvae and imagoes of rove beetles are non-specialized predators that feed on various invertebrates acting as natural regulators of their numbers. In addition, some members of the family are endoparasitoids of larvae and pupae of dipterous insects and sawflies (Tikhomirova 1973). The results of the study of rove beetle communities of such a special ecological system as the upper forest line are presented.

The upper forest line (UFL) was originally associated with the concept of ecotone, or the transition zone between different biotopes. Later, the concept of ecotone narrowed to the understanding of a junction zone, or a transition area between two or more different plant communities (Odum 1975). However, the UFL is an exceptionally complex ecological system that combines different types of biotopes that have been formed nearly under the same extreme conditions, as well as combines not only different physiographical and landscape systems, but also different living organisms that inhabit it (Stoyko 2004). Since Staphylinidae are one of the most numerous groups of faunal assemblages of various biotopes, and their ecology is poorly studied, in our work we tried to assess the state of such a complex natural ecosystem as the upper forest line through analysing the distribution of rove beetle communities in different types of its biotopes, as well as to show their structure through diversity

indices. Diversity indices can be used as environmental indicators or as ecosystem well-being indices (Megarran 1992). Additionally, due to the high ecological specialization, rove beetle communities can be used for bioindication assessment of the ecological state of ecosystems and of the significance of the impact of human factors on them (Bohac 1999).

Material and Methods

The research was carried out at the upper forest line of the Polonynskyi massif of the Ukrainian Carpathians that includes the Stinka and Yavirnyk mountain ridges, which are part of the Uzhanskyi National Nature Park (Uzhanskyi NNP). The Stinka ridge, with the highest peak Mount Stinska (1092 m asl), is the eastern spur of the Verkhovyna watershed ridge, located in the basin of the rivers Ulichka and Uzh, and stretches along the Ukrainian–Slovak state border. The Yavirnyk ridge, with the highest peak Mount Yavirnyk (1017 m asl), is located in the south-western part of the Uzhanskyi NNP, on the watershed of the Uzh River's basin.

The upper forest line on these ridges is formed mainly by meadows of artificial origin, which are surrounded by beech forests of different ages with a permanent admixture of *Acer pseudoplatanus* (mostly over 150 years old) and *Sorbus aucuparia*. This is a typical variant of the beech forest line formed by beech (*Fagetum*), less frequently maple–beech (*Acereto-Fagetum*) and rowan–beech (*Sorbeto-Fagetum*) phytocoenoses (Stoyko, 2008). Such phytocoenoses are formed at a height above 900 m asl, in the high-altitude sub-band of mountain beeches, where the viability of *Fagus sylvatica* is reduced, which creates favourable coenotic conditions for the participation of other species — components of beech forests such as *Acer pseudoplatanus*, *A. platanoides*, and *Ulmus scabra*. The grass cover is dominated by eutrophic and mesotrophic species. Open areas of the ridges are represented mainly by mountain meadows, with rich grass vegetation and a significant admixture of shrubs *Vaccinium myrtillus* and *V. vitis-idaea*, as well as more or less represented inclusions of shrubs and pioneer trees, especially *Salix* spp., *Sorbus aucuparia*, *Betula pendula*, *Acer platanoides*, and, occasionally, *Alnus incana* and *Abies alba*.

The flora of the mountain meadows contains many species of plants that are specific for deciduous and coniferous forests, left over from the once dominant here but consolidated beech and spruce forests and krummholz, as well as those that penetrated the mountain meadows due to human economic activities (Malynovskyi & Bilonoha 2003). Such mountain meadows are secondary coenoses formed as a result of centuries-long pasture use. In addition, such open forest-free areas were often used as hayfields during the Soviet era. In particular, it happened on Yavirnyk. However, for several decades now, all economic activities have been suspended here, and thus a secondary overgrowth of meadows with woody and shrubby vegetation takes place (spontaneous sylvatization).

The state border between Ukraine and Slovakia runs along the Stinka ridge, which significantly complicates access to this territory, and the southern slope of the ridge is a protected area of the Uzhanskyi NNP. This apparently resulted in a smaller, in comparison with Yavirnyk, anthropogenic transformation of the UFL. Due to the steep rocky slopes, this mountain ridge is characterized by a specific vegetation. It is also interesting in floristic and geobotanical terms, as it is part of the western border of distribution of many plant species of the Eastern Carpathians. In total, more than 150 species of vascular plants grow on the Ukrainian part of the Stinka ridge (Stoyko 2008). Sod grass phytocoenoses unfavourable for the natural regeneration of *Fagus sylvatica* are widespread in such meadows (Stoyko 2009). Ecotones, that is, transitional phytocoenoses between forests and forestless areas — mountain meadows, on both ridges are formed by shrubby–woody vegetation with *Sorbus aucuparia*, *Acer platanoides*, *Salix* spp., and thickets of various herbaceous plants, among which species of Umbelliferae and Poaceae, and *Carex* spp. predominate.

In order to study the biotopic and spatial distribution of Staphylinidae of the UFL of the Polonynskyi massif, one stationary sampling plot was organized on each mountain ridges — Yavirnyk and Stinka. In turn, each sampling plot included three study sites in biotopes common for the UFL: forest, mountain meadow, and ecotone (Fig. 1).

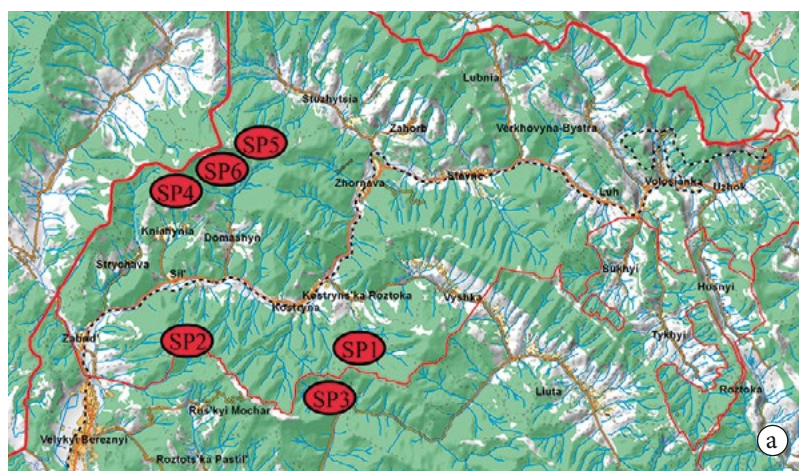


Fig. 1. Location map of the study sites at the UFL of the Yavirnyk and Stinka ridges: *a* — general map of the research area; *b* — location details of the study sites on the Yavirnyk ridge; *c* — location details of the study sites on the of Stinka ridge.

Legend: SP1 — forest (Yavirnyk ridge); SP2 — mountain meadow (Yavirnyk ridge); SP3 — ecotone (Yavirnyk ridge); SP4 — forest (Stinka ridge); SP5 — mountain meadow (Stinka ridge); SP6 — ecotone (Stinka ridge).

Рис. 1. Схема розташування дослідних ділянок на ВМЛ хребтів Явірник і Стінка: *a* — загальна схема району досліджень, *b* — деталі розташування пробних ділянок на хребті Явірник, *c* — деталі розташування пробних ділянок на хребті Стінка.

Позначення: ПП1 — ліс (хребет Явірник); ПП2 — полонина (хребет Явірник); ПП3 — еко-тон (хребет Явірник); ПП4 — ліс (хребет Стінка); ПП5 — полонина (хребет Стінка); ПП6 — еко-тон (хребет Стінка).

The material was collected with the help of soil and combined traps (Fig. 2). The soil trap was a funnel-shaped trap (similar to the Barber trap) with a diameter of 16 cm, while the combined trap was a combination of a funnel-shaped and a window trap consisting of a yellow plastic funnel with a diameter of 60 cm, to which two transparent organic glass plates are fixed perpendicularly.

The funnel was fixed to two vertical supports at a height of 1 m above the ground and filled with 5% formaldehyde solution. Both types of traps were located three by three in random order, at a distance of about 10 metres from each other, in each section of the respective biotope. In total, 36 traps



Fig. 2. Combined trap (a combination of yellow funnel-shaped and window traps) and soil funnel-shaped trap (analogue of the Barber trap) installed in the ecotone of the Yavirnyk ridge.

Рис. 2. Комбінована (комбінація жовтої лійковидної та віконної пасток) та ґрунтова лійковидна (аналог пастки Барбера) пастки, встановлені в екотоні хребта Явірник.

were installed (18 on each ridge). Removal of the material was carried out every 10–14 days. The traps were exposed from 15 April to 30 October in 2018–2019. The collected material was preserved in 70% ethanol solution.

The analysis of the taxonomic composition and structure of rove beetle communities of the UFL of the Polonynskyi massif is based on the study of 5839 specimens of Staphylinidae.

To analyse the dominance structure of communities, O. Renkonen's scheme with changes was adopted (Rizun 2003), according to which eudominants of the communities include species whose part exceeds 10% of the total number of individuals, dominants — 6–10%, subdominants — 2–5%, recedents — 1–2%, and sub-recedents — less than 1%.

Several indices were used to assess the main aspects of diversity of rove beetle communities, namely the Margalef index and the Menchinique index to assess species richness, and the dominance indices — the Simpson index and the alternative Berger–Parker index — to assess the complexity of the communities. Additionally, the Shannon index and its alternative — the Brillouin index — were used as a generalized measure of diversity that takes into account both the number of species and the equality between them by their numbers.

Statistical data processing was performed using the program Past 4.03. To compare the communities, the Chekanovsky–Sørensen similarity index was used (Pesenko 1982).

To study the biotopic distribution of rove beetles of the Polonynskyi massif, one stationary sampling plot was installed on each the Yavirnyk and Stinka ridges, which included three study sites in biotopes common for the UFL: forest, mountain meadow, and ecotone (Fig. 3).

Below is given a brief description of the six sampling plots, where SP1, SP2, and SP3 are study sites of the sampling plot on Yavirnyk, and SP4, SP5, and SP6 are study sites within the sampling plot on Stinka.

SP1 (48.902609° N, 22.556894° E; 997 m asl) (Fig. 3a) — a section of maple–beech forest on the north-eastern slope of the Yavirnyk ridge with a steepness of 20–35°. Formation: beech forests (*Fagetea sylvaticae*), subformation: maple–beech forests (*Acereto pseudoplatanae-Fageta*), association: *Acereto (pseudoplatani)–Fagetum (sylvaticae) dentariosum (bulbiferae)*. This phytocoenosis is formed on brown earth, rocky soils, with a forest stand density of 0.6–0.7, bonitet II. Natural regeneration is dominated by *Fagus sylvatica* and *Acer pseudoplatanus*; *Sorbus aucuparia* and *Acer platanoides* occur



Fig. 3. Typical biotopes of the UFL studied by the authors: *a*—Yavirnyk ridge, beech-maple forest (SP1), *b* — Yavirnyk ridge, mountain meadow (SP2), *c* — Yavirnyk ridge, section of ecotone (SP3), *d* — Stinka ridge, beech forest with *Aceretum lunariosum* (SP4), *e* — Stinka ridge, section of mountain meadow (SP5), *f* — Stinka ridge, section of ecotone (SP6).

Рис. 3. Типові біотопи ВМЛ, досліджені авторами: *a* — хребет Явірник, буково-яворовий ліс (ПП1), *b* — хребет Явірник, ділянка полонина (ПП2), *c* — хребет Явірник, ділянка екотону (ПП3), *d* — хребет Стінка, букова яворина лунарієва (ПП4), *e* — хребет Стінка, ділянка полонина (ПП5), *f* — хребет Стінка, ділянка екотону (ПП6).

(Stoyko 2008). Due to the lack of anthropogenic impact (protected zone of the Uzhanskyi NNP), the natural state of the forest is well preserved. A significant amount of dead wood and broken branches and trees with tinder fungus has been noted. The following nemoral species are specific for the grass cover: *Dentaria bulbifera*, *Galium odoratum*, *Athyrium filix-femina*, *Circea alpina*, *Carex* sp., and others.

SP2 (48.904999° N, 22.554423° E; 1012 m asl) (Fig. 3b) — a mountain meadow on the Yavirnyk ridge formed by characteristic plant associations: *Nardetum campanulosum abietinae* and *Poetum Chaixii scorzonerosum* (Stoyko 2008), which alternate with thickets of *Vaccinium myrtillus* and, in a smaller admixture, with *V. vitis-idaea*. The mountain meadow is noticeably overgrown with shrubs of *Salix silesiaca* and *Sorbus aucuparia*.

SP3 (48.902447° N, 22.536894° E; 1010 m asl) (Fig. 3c) — an ecotone area on the Yavirnyk ridge formed on the border of the forest by shrubs of *Salix* and *Sorbus aucuparia* and undergrowth of *Acer platanoides*, which gradually turns into thickets of herbaceous plants, among which various *Apiaceae* and *Poaceae* predominate.

SP4 (49.003737° N, 22.536894° E; 957 m asl) (Fig. 3d) — a section of forest on the south-western steep rocky slope of the Stinka ridge. Formation: beech forests (*Fagetea sylvaticae*), subformation: maple-beech forests (*Acereto pseudoplatanae-Fageta*), association: *Acereto (pseudoplatani)-Fagetum (sylvaticae) lunariosum (redivivae)*. This area is characterized by a significant number of fallen rotten trees with tinder fungus, cluttered with broken branches, hollow and dead standing trees. There is an outcrop of rocks, in some places very massive.

SP5 (49.004997° N, 22.541035° E; 961 m asl) (Fig. 3e) — a mountain meadow on the Stinka ridge; the herbaceous phytocoenoses here are represented by the association *Achylleo strictae-Calamagrostietum arundinaceae* and monodominant thickets of *Vaccinium myrtillus* and *Vaccinium vitis-idaea*. There is a number of rare and Carpathian endemic plants: *Carlina acaulis*, *Centaurea nigriceps*, *Senecio carpathicus*, *Silene nutans*, *Gladiolus imbricatus*, and *Gentiana asclepiadea* (Stoyko 2008). The mountain meadow here is intensively overgrown with various pioneer trees: *Sorbus aucuparia*, *Salix*, *Acer pseudoplatanus*, *Betula pendula*, and in some places *Abies alba*.

SP6 (49.004919° N, 22.540863° E; 949 m asl) (Fig. 3f) — an ecotone area on the Stinka ridge. Similarly to Yavirnyk, the forest border turns into a strip of shrubs of *Acer platanoides*, *Sorbus aucuparia*, and *Salix aurita*, and solitary trees of *Betula pendula* and *Abies alba*. On the ground are many broken branches and rotten trees.

The systematic and taxonomic structure, as well as the names of the Staphylinidae taxa are conventional and are given according to the 'Catalogue of Palaearctic Beetles' (Schülke & Smetana 2015). The names of plants and phytocoenoses are given according to S. M. Stoyko and colleagues (Stoyko et al. 2008).

Results and Discussion

As a result of the conducted research, a total of 5836 individuals of 91 species, belonging to 53 genera and 10 subfamilies of the Staphylinidae family, were collected on the UFL of the Polonynskyi massif. Among them are 34 species of the Staphylininae subfamily, 24 of Aleocharinae, 14 of Tachyporinae, 6 of Omaliinae, 4 of Oxytelinae, 3 of Paederinae, and 2 species of Scaphidiinae, and 2 species of Proteininae.

Almost the same number of species has been noted on both mountain ridges: 71 on Yavirnyk, and 69 on Stinka. However, on the Yavirnyk ridge, there were almost three times as many individuals collected — 4126 against 1710 on the Stinka ridge.

Based on the detailed analysis of the obtained data, an attempt was made to study the dominance structure of the rove beetle communities of the meadow, ecotone, and forest biotopes of the UFL of the Yavirnyk and Stinka ridges.

Staphylinidae communities of the Yavirnyk ridge

On the Yavirnyk ridge, 4126 specimens of rove beetles belonging to 71 species and 45 genera were collected and identified (Table 1).

The dominant Staphylinidae complex of the UFL of Yavirnyk is formed by three species: the eudominant *Eusphalerum alpinum* (61.29%) and the dominants *Eusphalerum anale* (7.80%) and *Philonthus politus* (5.89%). Most specimens of these species were collected in summer with yellow combined traps installed on the mountain meadow. The high share of the antophagous species *Eusphalerum alpinum* in the collection can be apparently explained by their high number in meadow biotopes during the mass flowering of herbaceous plants, pollen and parts of flowers of which they feed on, as well as by the significant attractiveness of the yellow combined traps and their active migratory ability while flying between flowers. The subdominant group included *Philonthus decorus* (4.60%), *Ocypus macrocephalus* (3.34%) and *Philonthus punctus* (2.81%). Recedents here were *Drusilla canaliculata* (1.91%), *Ocypus tenebricosus* (1.58%), *Anotylus mutator* (1.51%), *Eusphalerum atrum* (1.38%) and *Aleochara brevipennis* (1.07%). Sixty species are sub-recedents, which is 7.66% of the total number of the Staphylinidae specimens collected in this area. Among them, 13 species, which are known from isolated finds, were found only on Yavirnyk: *Aloconota sulcifrons*, *Amischa analis*, *Dacrila fallax*, *Homalota plana*, *Mycetoporus mulsanti*, *Phloeocharis subtilissima*, *Scaphisoma agaricinum*, *Tachinus sibiricus*, *Tachyporus hypnorum*, *T. abdominalis*, *Tasgius pedator*, *Velleius dilatatus*, and *Xantholinus elegans*. Among the identified species, *Velleius dilatatus* is rare and is listed in the Red Book of the Ukrainian Carpathians as ‘vulnerable’ (VU). *Xantholinus azuganus* is a Carpathian endemic, and *Plataraea elegans* is listed for the first time for the fauna of Ukraine.

Table 1. Species composition and dominance structure of rove beetle communities (Coleoptera, Staphylinidae) in the study sites of the Polonynskiy massif

Таблиця 1. Видовий склад і структура домінування угруповань стафілінід (Coleoptera, Staphylinidae) на дослідних ділянках ВМЛ Полонинського хребта

Species	Yavirnyk								Stinka							
	forest		meadow		ecotone		Total		forest		meadow		ecotone		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<i>Abemus chloropterus</i>	–	–	1	0.07	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Acrotona troglodytes</i>	–	–	–	–	2	0.13	2	0.05	–	–	–	–	–	–	–	–
<i>Aleochara brevipennis</i>	25	2.01	3	0.22	16	1.05	44	1.07	5	1.17	5	0.63	1	0.2	11	0.64
<i>Aloconota sulcifrons</i>	1	0.08	–	–	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Amischa analis</i>	1	0.08	–	–	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Anotylus insectatus</i>	–	–	–	–	3	0.2	3	0.07	–	–	–	–	–	–	–	–
<i>Anotylus mutator</i>	11	0.88	6	0.44	4	0.26	21	1.51	33	7.75	39	4.93	40	8.11	112	6.55
<i>Anotylus tetracaratus</i>	2	0.16	–	–	3	0.2	5	0.12	–	–	–	–	1	0.2	1	0.06
<i>Atheta crassicornis</i>	–	–	9	0.66	2	0.13	11	0.27	2	0.47	–	–	10	–	12	0.12
<i>Atheta occulta</i>	–	–	6	0.44	3	0.2	9	0.22	1	0.47	2	0.25	4	0.81	7	0.47
<i>Atheta vaga</i>	2	0.16	1	0.07	–	–	3	0.07	–	–	1	0.13	–	–	1	0.06
<i>Athrobium atrocephalum</i>	2	0.16	11	0.81	–	–	13	0.29	–	–	18	2.28	–	–	18	1.05
<i>Bisnius fimetarius</i>	–	–	3	0.22	–	–	3	0.07	1	0.23	–	–	–	–	1	0.06
<i>Dacrila fallax</i>	1	0.08	–	–	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Dinothenarus fossor</i>	1	0.08	28	2.06	5	0.33	34	0.82	7	1.64	64	8.09	48	9.74	119	6.96
<i>Drusilla canaliculata</i>	1	0.08	69	5.08	9	0.59	79	1.91	–	–	–	–	–	–	–	–
<i>Eusphalerum alpinum*</i>	677	54.47	976	71.87	876	57.44	2529	61.29	28	6.57	236	29.84	36	7.3	300	17.54
<i>Eusphalerum anale</i>	65	5.23	17	1.25	240	15.74	322	7.8	1	0.23	4	0.51	–	–	5	0.29
<i>Eusphalerum atrum</i>	47	3.78	–	–	10	0.66	57	1.38	5	1.17	13	1.64	4	0.81	22	1.29
<i>Heterothops dissimilis</i>	–	–	–	–	–	–	–	–	1	0.23	–	–	–	–	1	0.06
<i>Ilyobates mech</i>	–	–	–	–	–	–	–	–	–	–	1	0.13	–	–	1	0.06
<i>Homalota plana</i>	1	0.08	–	–	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Ilyobates merkli</i>	–	–	11	0.81	6	0.39	17	0.41	5	1.17	6	0.76	–	–	11	0.64
<i>Ilyobates nidricollis</i>	1	0.08	10	0.74	2	0.13	13	0.32	1	0.23	2	0.25	1	0.2	4	0.23
<i>Ischnosoma longicorne</i>	–	–	–	–	–	–	–	–	–	–	1	0.13	–	–	1	0.06
<i>Lathrobium geminum</i>	2	0.16	–	–	–	–	2	0.05	–	–	3	0.38	2	0.41	5	0.29
<i>Leptacinus sulcifrons</i>	–	–	1	0.07	–	–	1	0.02	–	–	1	0.13	1	0.2	2	0.12
<i>Liogluta longiuscula</i>	–	–	–	–	–	–	–	–	1	0.23	–	–	–	–	1	0.06
<i>Liogluta pagana</i>	–	–	–	–	–	–	–	–	1	0.23	–	–	–	–	1	0.06

Species	Yavirnyk								Stinka							
	forest		meadow		ecotone		Total		forest		meadow		ecotone		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<i>Liogluta microptera</i>	17	1.37	9	0.66	4	0.26	30	0.73	–	–	–	–	–	–	–	–
<i>Liogluta nitidula</i>	5	0.4	1	0.07	2	0.13	8	0.19	–	–	–	–	–	–	–	–
<i>Lordithon lunulatus</i>	–	–	3	0.22	3	0.2	6	0.15	–	–	1	0.13	8	1.62	9	0.53
<i>Metopsia similis</i>	–	–	–	–	–	–	–	–	–	–	4	0.51	–	–	4	0.23
<i>Mycetoporus baudueri</i>	1	0.08	1	0.07	2	0.13	4	0.1	2	0.47	2	0.25	1	0.2	5	0.29
<i>Mycetoporus longulus</i>	–	–	1	0.07	4	0.26	5	0.12	–	–	1	0.13	–	–	1	0.06
<i>Mycetoporus mulsanti</i>	–	–	–	–	1	0.07	1	0.02	–	–	–	–	–	–	–	–
<i>Mycetoporus splendens</i>	–	–	3	0.22	1	0.07	4	0.1	3	0.7	–	–	–	–	3	0.18
<i>Mocyta fungi</i>	2	0.16	–	–	–	–	2	0.05	–	–	–	–	2	0.41	2	0.12
<i>Ocypus fulvipennis</i>	–	–	–	–	–	–	–	–	–	–	1	0.13	1	0.2	2	0.12
<i>Ocypus fuscatus</i>	29	2.33	18	1.33	91	5.97	138	3.34	108	25.35	27	3.41	147	29.82	282	16.49
<i>Ocypus macrocephalus</i>	29	2.33	18	1.33	91	5.97	138	3.34	108	25.35	27	3.41	147	29.82	282	16.49
<i>Ocypus nitens*</i>	1	0.08	7	0.52	20	1.31	28	0.68	–	–	6	0.76	3	0.61	9	0.53
<i>Ocypus ophthalmicus*</i>	–	–	–	–	–	–	–	–	–	–	–	–	1	0.2	1	0.06
<i>Ocypus picipenis*</i>	–	–	1	0.07	1	0.07	2	0.05	–	–	2	0.25	1	0.2	3	0.18
<i>Ocypus tenebricosus</i>	14	1.13	34	2.5	17	1.11	65	1.58	18	4.23	26	3.29	11	2.23	55	3.22
<i>Olophrum assimile</i>	1	0.08	4	0.29	2	0.13	7	0.17	–	–	1	0.13	1	0.2	2	0.12
<i>Omalium rivulare</i>	1	0.08	–	–	–	–	1	0.02	1	0.23	–	–	–	–	1	0.06
<i>Ontholestes murinus</i>	1	0.08	1	0.07	–	–	2	0.05	–	–	1	0.13	–	–	1	0.06
<i>Othius punctulatus</i>	5	0.4	2	0.15	2	0.13	9	0.22	6	1.41	4	0.51	1	0.2	11	0.64
<i>Oxypoda vittata</i>	–	–	–	–	2	0.13	2	0.05	1	0.23	–	–	7	1.42	8	0.47
<i>Oxyporus maxillosus</i>	–	–	–	–	–	–	–	–	10	2.35	–	–	–	–	10	0.58
<i>Oxytelus sculptus</i>	–	–	–	–	–	–	–	–	1	0.23	2	0.25	–	–	3	0.18
<i>Paederus schoenherri</i>	–	–	9	0.66	–	–	9	0.22	2	0.47	18	2.28	4	0.81	24	1.4
<i>Parabolitobius formosus</i>	–	–	–	–	–	–	–	–	3	0.7	–	–	–	–	3	0.18
<i>Pella limbata</i>	–	–	–	–	–	–	–	–	8	1.88	2	0.25	–	–	10	0.58
<i>Pella lugens</i>	4	0.32	–	–	–	–	4	0.1	–	–	–	–	–	–	–	–
<i>Philonthus decorus</i>	69	5.55	3	0.22	118	7.74	190	4.6	6	1.41	59	7.46	25	5.07	90	5.26
<i>Philonthus politus</i>	212	17.06	6	0.44	25	1.64	243	5.89	25	5.87	32	4.05	7	1.42	64	3.74
<i>Philonthus punctus*</i>	13	1.05	2	0.15	25	1.64	40	2.81	4	0.94	5	0.63	10	2.03	19	1.11
<i>Philonthus tenuicornis</i>	–	–	3	0.22	–	–	3	0.07	–	–	–	–	–	–	–	–
<i>Phloeocharis subtilissima</i>	1	0.08	–	–	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Plataraea brunnea</i>	3	0.24	2	0.15	–	–	5	0.12	–	–	1	0.13	1	0.2	2	0.12
<i>Plataraea elegans</i>	–	–	4	0.29	–	–	4	0.1	2	0.47	1	0.13	5	1.01	8	0.47
<i>Platydracus fulvipes</i>	1	0.08	38	2.8	2	0.13	41	0.99	6	1.41	8	1.01	–	–	14	0.82
<i>Platydracus stercorarius*</i>	–	–	–	–	–	–	–	–	–	–	5	0.63	–	–	5	0.29
<i>Proteinus brachypterus</i>	1	0.08	2	0.15	–	–	3	0.07	–	–	–	–	–	–	–	–
<i>Quedius boops*</i>	1	0.08	–	–	–	–	1	0.02	10	2.35	–	–	1	0.2	11	0.64
<i>Quedius fuliginosus</i>	4	0.32	1	0.07	1	0.07	6	0.15	12	2.82	12	1.52	7	1.42	31	1.81
<i>Quedius maurus</i>	–	–	–	–	–	–	–	–	1	0.23	1	0.13	–	–	2	0.12
<i>Quedius mesomelius*</i>	4	0.32	2	0.15	1	0.07	7	0.17	27	6.34	5	0.63	10	2.03	42	2.46
<i>Quedius paradisiensis</i>	4	0.32	21	1.55	10	0.66	35	0.85	17	3.99	16	2.02	18	3.65	51	2.98
<i>Rugilus rufipes</i>	–	–	–	–	–	–	–	–	4	0.94	1	0.13	–	–	5	0.29
<i>Scaphidium quadrimaculatum</i>	1	0.08	–	–	–	–	1	0.02	1	0.23	–	–	–	–	1	0.06
<i>Scaphisoma agaricinum</i>	–	–	1	0.07	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Schistoglossa drusilloides</i>	–	–	–	–	–	–	–	–	–	–	–	–	1	0.2	1	0.06
<i>Sepedophilus immaculatus</i>	–	–	–	–	–	–	–	–	–	–	1	0.13	–	–	1	0.06
<i>Sepedophilus marshami</i>	2	0.16	–	–	–	–	2	0.05	–	–	–	–	–	–	–	–
<i>Staphylinus caesareus*</i>	1	–	16	1.18	1	0.07	18	0.44	12	2.82	34	4.3	15	3.04	61	3.57
<i>Staphylinus erythropterus*</i>	1	0.08	2	0.15	7	0.46	10	0.24	43	10.09	94	11.88	46	9.33	183	10.7
<i>Tachinus elongatus</i>	1	0.08	–	–	–	–	1	0.02	–	–	–	–	4	0.81	4	0.23
<i>Tachinus humeralis*</i>	–	–	–	–	–	–	–	–	1	0.23	–	–	1	0.2	2	0.12
<i>Tachyporus hypnorum</i>	–	–	1	0.07	–	–	1	0.02	–	–	1	0.13	–	–	1	0.06
<i>Tasgius pedator*</i>	–	–	1	0.07	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Tachinus sibiricus</i>	1	0.08	–	–	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Tachyporus abdominalis</i>	–	–	1	0.07	–	–	1	0.02	–	–	–	–	–	–	–	–
<i>Tasgius melanarius*</i>	–	–	4	0.29	–	–	4	0.1	–	–	2	0.25	5	1.01	7	0.41
<i>Velleius dilatatus</i>	–	–	–	–	1	0.07	1	0.02	–	–	–	–	–	–	–	–
<i>Xantholinus azuganus*</i>	2	0.16	–	–	–	–	2	0.05	–	–	1	0.13	–	–	1	0.06
<i>Xantholinus elegans</i>	–	–	–	–	1	0.07	1	0.02	–	–	–	–	–	–	–	–
<i>Xantholinus longiventris</i>	–	–	–	–	–	–	–	–	–	–	2	0.25	–	–	2	0.12
<i>Xantholinus tricolor</i>	–	–	2	0.15	–	–	2	0.05	–	–	11	1.39	–	–	11	0.64
Total	1243	100	1358	100	1525	100	4126	100	426	100	791	100	493	100	1710	100

* Species represented by nominative subspecies.

In the forest biotope of the Yavirnyk ridge (SP1), 1243 specimens of Staphylinidae belonging to 46 species and 32 genera were collected. Eurytopic species dominate in forest biotopes. Among them are two eudominants — *Eusphalerum alpinum* (54.47%) and *Philonthus politus* (17.06%), and two dominants — *Eusphalerum anale* (5.23%) and *Philonthus decorus* (5.55%). Among the subdominants, a significant share has the species *Eusphalerum atrum* (3.78%). In addition, *Ocypus macrocephalus* (2.33%) and *Aleochara brevipennis* (2.01%) are subdominants here. Recedents are *Liogluta microp-tera* (1.37%), *Ocypus tenebricosus* (1.13%) and *Philonthus punctus* (1.05%). The remaining 35 species (6.03%) are sub-recedents. *Aloconota sulcifrons*, *Amischa analis*, *Dacrila fallax*, *Homalota plana*, *Pella lugens*, *Phloeocharis subtilissima*, *Sepedophilus marshami*, and *Tachinus sibiricus* occurred only in the forest of Yavirnyk.

In the meadow biotope of the Yavirnyk ridge (SP2), 1358 specimens of 48 species and 30 genera of Staphylinidae were collected. The dominance structure of the meadow rove beetle communities is as follows: one eudominant — *Eusphalerum alpinum* (71.87%); one dominant — *Drusilla canalicu-lata* (5.08%); three subdominants — *Platydracus fulvipes* (2.80%), *Ocypus tenebricosus* (2.50%), and *Dinothenarus fossor* (2.06%); four recedents — *Quedius paradisianus* (1.55%), *Ocypus macrocephalus* (1.33%), *Eusphalerum anale* (1.25%) and *Staphylinus caesareus* (1.18 %). The sub-recedents include 39 species (9.57%). Among the identified species, *Abemus chloropterus*, *Philonthus tenuicornis*, *Sca-phisoma agaricinum*, *Tachyporus abdominalis*, and *Tasgius pedator* occurred only in the meadow of Yavirnyk.

In the ecotone biotope of the Yavirnyk ridge (SP3), 1525 specimens were collected belonging to 39 species of 20 genera. The dominant group here was formed by two eudominants — *Eusphalerum alpinum* (54.44%) and *Eusphalerum anale* (15.74%), and one dominant — *Philonthus decorus* (7.74%). There are no subdominants, and five species belong to the recedents: *Philonthus punctus* and *P. politus* (1.64% each), *Ocypus nitens* (1.31%), *O. tenebricosus* (1.11%), and *Aleochara brevipennis* (1.05%). The other 30 species were sub-recedents in the ecotones of Yavirnyk, which together make up 6.36% of the total number of Staphylinidae specimens collected here. *Acrotona troglodytes*, *Anotylus insecatus*, *Mycetoporus mulsanti*, *Velleius dilatatus*, and *Xantholinus elegans* were found only in the ecotone bio-tope of Yavirnyk.

Staphylinidae communities of the Stinka ridge

On the Stinka ridge, 1710 specimens of Staphylinidae belonging to 69 species and 51 genera were collected and identified (Table 1).

The dominant rove beetle complex of the Stinka ridge is formed by six species, including three eu-dominants — *Eusphalerum alpinum* (17.54%), *Ocypus macrocephalus* (16.49%), and *Staphylinus eryth-ropterus* (10.70%); three dominants — *Dinothenarus fossor* (6.96%), *Anotylus mutator* (6.55%), and *Philonthus decorus* (5.26%); five subdominants — *Philonthus politus* (3.74%), *Staphylinus caesareus* (3.57%), *Ocypus tenebricosus* (3.22%), *Quedius paradisianus* (2.98%), and *Q. mesomelius* (2.46%); five recedents — *Quedius fuliginosus* (1.81%), *Paederus schoenherri* (1.40%), *Eusphalerum atrum* (1.29%), *Philonthus punctus* (1.11%) and *Athrobium atrocephalum* (1.05%); and 52 sub-recedents that make up 8.89% of the total number of Staphylinidae specimens collected on Stinka. Among them are eight spe-cies that were found only on Stinka where they occurred in single specimens: *Heterothops dissimilis*, *Ilyobates mech*, *Ischnosoma longicorne*, *Liogluta longiuscula*, *Liogluta pagana*, *Ocypus ophthalmicus*, *Schistoglossa drusilloides*, and *Sepedophilus immacula*.

In the forest biotope of the Stinka ridge (SP4), 426 specimens of rove beetles belonging to 40 spe-cies and 26 genera were collected. The dominant component here is formed by two eudominants — *Ocypus macrocephalus* (25.35%) and *Staphylinus erythropterus* (10.09%); four dominants — *Anotylus mutator* (7.75%), *Eusphalerum alpinum* (6.57%), *Quedius mesomelius* (6.34%), and *Philonthus politus* (5.87%); six subdominants: *Philonthus politus* (5.87%), *Ocypus tenebricosus* (4.23%), *Quedius rar-adisianus* (3.99%), *Staphylinus caesareus* (2.82%), *Quedius boops*, and *Oxyporus maxillosus* (2.35%

each); seven recedents — *Pella limbata* (1.88%), *Dinothenarus fossor* (1.64%), *Philonthus decorus*, *Othius punctulatus* and *Platydracus fulvipes* (1.41% each), *Aleochara brevipennis* and *Eusphalerum atrium* (1.17% each); and 21 sub-recedents that make up 8.22% of the total number of the Staphylinidae specimens collected in the forest biotope of Stinka. *Heterothops dissimilis*, *Liogluta longiuscula*, *Liogluta pagana*, *Metopsia similis*, *Oxyporus maxillosus*, *Oxytelus sculptus*, and *Parabolitobius formosus* were found only in the forest of Stinka.

In the meadow biotope of the Stinka ridge (SP5), 791 specimens of 51 species belonging to 30 genera were collected, which is the highest among all study sites. The dominant group consists of four species, including two eudominants — *Eusphalerum alpinum* (29.84%) and *Staphylinus erythropterus* (11.88%), and two dominants — *Dinothenarus fossor* (8.09%) and *Philonthus decorus* (7.46%). Subdominants include eight species: *Anotylus mutator* (4.93%), *Staphylinus caesareus* (4.30%), *Philonthus politus* (4.05%), *Ocypus macrocephalus* (3.41%), *O. tenebricosus* (3.29%), *Athrobium atrocephalum* and *Paederus schoenherri* (2.28% each), and *Quedius paradisianus* (2.02%). Recedents are three species: *Eusphalerum atrum* (1.64%), *Quedius fuliginosus* (1.52%), *Xantholinus tricolor* (1.39%), and *Platydracus fulvipes* (1.01%). There are 35 species of sub-recedents in the meadows of Stinka, which together make up 9.10% of the total number of specimens collected. The original component of the rove beetle fauna of the meadow of Stinka includes five species: *Ilyobates mech*, *Ischnosoma longicorne*, *Platydracus stercorarius*, *Sepedophilus immaculatus*, and *Xantholinus longiventris*.

In the ecotone biotope of the Stinka ridge (SP6), 493 specimens of Staphylinidae belonging to 40 species of 22 families were collected. The dominant component is formed here by one eudominant species — *Ocypus macrocephalus*, which makes up almost a third (29.82%) of all rove beetles collected here. There are also five dominants: *Dinothenarus fossor* (9.74%), *Staphylinus erythropterus* (9.33%), *Anotylus mutator* (8.11%), *Eusphalerum alpinum* (7.30%) and *Philonthus decorus* (5.07%). Subdominants include five species: *Quedius paradisianus* (3.65%), *Staphylinus caesareus* (3.04%), *Ocypus tenebricosus* (2.23%), *Quedius mesomelius* and *Philonthus punctus* (2.03% each). Recedents in the ecotones of Stinka are six species: *Lordithon lunulatus* (1.62%), *Oxypoda vittata*, *Quedius fuliginosus* and *Philonthus politus* (1.42% each), *Plataraea elegans* and *Tasgius melanarius* (1.01% each). The sub-recedents include 22 species that make up 5.68% of the total number of the Staphylinidae specimens collected in the ecotones of Stinka. Two species of rove beetles occurred only in the ecotone of Stinka: *Ocypus ophthalmicus* and *Schistoglossa drusilloides*.

As a result of comparing species richness and diversity indices of the rove beetle communities of the Yavirnyk and Stinka ridges (Table 2) it was found that their values are higher in the Stinka ridge. However, the Simpson index is much higher for Yavirnyk, which is related to the significant degree of dominance of three species: *Philonthus politus*, *Eusphalerum alpinum*, and *E. anale*. The high value of the Berger-Parker index for Yavirnyk is also associated with the significant degree of dominance of the most widespread species here — *Eusphalerum alpinum*. Analysis of the biotopic distribution of rove beetles of each ridge has shown that the highest values of species richness (Menchinique index) and species diversity (Shannon index) are inherent in the forest biotopes of both ridges (SP1 and SP4). In turn, the lowest index of species richness has been found for ecotone areas of these ridges (SP3 and SP6), and the lowest species diversity was found for the mountain meadow (SP2) on Yavirnyk and for the ecotone (SP6) on Stinka. An important parameter of the community structure is evenness, which is much higher for the communities of the Stinka ridge (0.28) indicating a more even distribution of species by number on this ridge. For Yavirnyk, this index has a very low value (0.09), which indicates that the number of species here is distributed very unevenly. At the same time, the highest value of the evenness index was found for the forest of Stinka (SP4), and the lowest for the mountain meadow of Yavirnyk (SP2).

Table 2. Parameters of rove beetle communities (Coleoptera, Staphylinidae) of the upper forest line of the Polonynskyi massif

Таблиця 2. Параметри угруповань стафілінід (Coleoptera, Staphylinidae) верхньої межі лісу Полонинського хребта

Community parameters	Study sites							
	ridges		various types of biotopes*					
	Yavirnyk	Stinka	SP1	SP2	SP3	SP4	SP5	SP6
Number of species	71	69	46	48	39	41	51	40
Number of individuals	4126	1710	1243	1358	1525	426	791	493
Menchinique index	1.11	1.67	1.31	1.30	1.00	1.99	1.81	1.80
Margalef Index	8.41	9.14	6.31	6.52	5.18	6.61	7.49	6.29
Simpson index	0.39	0.09	0.33	0.52	0.37	0.10	0.13	0.13
Berger-Parker index	0.61	0.18	0.54	0.72	0.57	0.25	0.30	0.30
Shannon index	1.80	2.97	1.76	1.47	1.64	2.86	2.73	2.67
Brillouin index	1.77	2.9	1.71	1.42	1.60	2.71	2.63	2.54
Evenness index	0.09	0.28	0.67	0.48	0.63	0.90	0.87	0.87

* Study sites in different types of biotopes: SP1 — Yavirnyk, forest; SP2 — Yavirnyk, meadow; SP3 — Yavirnyk, ecotone; SP4 — Stinka, forest; SP5 — Stinka, meadow; SP6 — Stinka, ecotone.

The lower values of the studied species richness and diversity indices of rove beetle communities indicate some disturbance of the ecosystem of the upper forest line on Yavirnyk. More so than on Stinka, the anthropogenic impact negatively affects the distribution of species in the Staphylinidae communities, as indicated by the high value of the Simpson index. It is known that in disturbed ecosystems that are under stress, there is a deviation from the normal distribution of species abundance towards increasing in the dominance of several species (Megarran 1992). This confirms our assumption that the upper forest line on the Stinka ridge is more natural and environmentally less modified. And this contributes to a more even distribution of species in communities. The highest values of species richness, species diversity and evenness for forest biotopes on both ridges indicate that among all types of biotopes of the UFL forests have the highest ecological quality and stability.

As a result of comparing the rove beetle communities of all analogous pairs of study sites of both ridges (Table 3) it was specified that the most similar in species composition (Chekanovsky–Sørensen coefficient is 0.75; 37 common species) are the rove beetle communities of such biotopes as mountain meadows (SP2 and SP5), as well as the communities of mountain meadows and ecotones (SP2 and SP3; SP5 and SP6). At the same time, on Yavirnyk, the index is 0.69, and there are 30 common species, and in the areas of Stinka the index is slightly lower — 0.64, and there are 27 common species. The least similar in species composition (Chekanovsky–Sørensen coefficient is 0.57; only 25 common species), were the rove beetle communities of the forest of Yavirnyk and mountain meadows of Stinka (SP1 and SP5), and the ecotone of Stinka and the forest of Yavirnyk (SP1 and SP6) (see Table 1).

Table 3. Combined matrix of intersection-similarity of the rove beetle communities in biotopes of the UFL of the Polonynskyi massif

Таблиця 3. Комбінована матриця перетинання-подібності угруповань стафілінід у біотопах ВМЛ Полонинського хребта

Study sites	Study sites	SP1	SP2	SP3	SP4	SP5	SP6
	Number of species	46	48	39	41	51	40
SP1	46	–	28	25	25	28	25
SP2	48	0.60	–	30	26	37	25
SP3	39	0.59	0.69	–	24	26	24
SP4	41	0.57	0.58	0.60	–	27	24
SP5	51	0.60	0.75	0.58	0.59	–	29
SP6	40	0.58	0.57	0.61	0.59	0.64	–

Note: SP1 — Yavirnyk, forest; SP2 — Yavirnyk, meadow; SP3 — Yavirnyk, ecotone; SP4 — Stinka, forest; SP5 — Stinka, meadow; SP6 — Stinka, ecotone. The number common species for all pairs of study sites is given in the upper triangle, whereas values of the Chekanovsky–Sørensen are presented in the lower triangle.

There is an assumption that for different groups of fauna, species richness is higher for communities that consist of species of different ecological specialization (Zagorodniuk 2003). Therefore, the high level of species diversity in meadow biotopes is associated with the fact that the complex of species here consists of both species specific for areas with grassy vegetation and species specific for forest areas. The distribution of species in meadow and forest biotopes mainly depends on microclimatic conditions of the soil and humidity level. The high level of numbers of representatives of the genus *Eusphalerum* (*E. alpinum* and *E. anale*) in the meadows is due to the type of trophic specialization of these species; their number increases significantly during the mass flowering of herbaceous plants, pollen and parts of flowers of which they feed on; migrating in search of flowers they actively fall into the combined trap.

The shrubby ecotone areas on both ridges have the poorest soil cover, which obviously affects the number of invertebrates (soil-dwelling insect species, insect larvae, millipedes, springtail, etc.) that inhabit it and is the main food source for most rove beetles — the competition becomes stronger, and this reduces the species diversity of faunal complexes (Begon 1989).

The high number of species of *Dinothenarus fossor*, *Philonthus decorus*, *P. politus*, *Staphylinus erythropterus*, *Ocypus macrocephalus*, and *Anotylus mutator* is probably related to the wide trophic specialization of these species: acting as predators, they actively hunt and feed on larvae and eggs of various insects and mites, actively moving within the biotope while hunting.

The original part of the rove beetle fauna of Yavirnyk includes 25 species: *Abemus chloropterus*, *Acrotona troglodytes*, *Aloconota sulcifrons*, *Amischa analis*, *Anotylus insecatus*, *Dacrila fallax*, *Drusilla canaliculata*, *Homalota plana*, *Mycetoporus mulsanti*, *Mocytta fungi*, *Liogluta microptera*, *L. nitidula*, *Ocypus nitens*, *Pella lugens*, *Philonthus tenuicornis*, *Phloeocharis subtilissima*, *Proteinus brachypterus*, *Scaphisoma agaricinum*, *Sepedophilus marshami*, *Tachinus elongatus*, *T. sibiricus*, *Tasgius pedator*, *Tachyporus abdominalis*, *Velleius dilatatus*, and *Xantholinus elegans*. This is more than a third part (35.2%) of all species found on Yavirnyk and almost a third part (27.5%) of the total number of Staphylinidae species found on both ridges. The original component of the rove beetle fauna of Stinka includes 19 species: *Heterothops dissimilis*, *Ilyobates mech*, *Ischnosoma longicorne*, *Liogluta longiuscula*, *L. pagana*, *Metopsia similis*, *Ocypus fulvipennis*, *O. ophthalmicus*, *Oxyporus maxillosus*, *Oxytelus sculptus*, *Parabolitobius formosus*, *Pella limbata*, *Platydracus stercorarius*, *Quedius maurus*, *Rugilus rufipes*, *Schistoglossa drusilloides*, *Sepedophilus immaculatus*, *Tachinus humeralis*, and *Xantholinus longiventris*. This is about a third part of all Staphylinidae species found on this ridge (27.5%) and almost a fifth part (20.9%) of the total species composition. Among the rove beetles that occurred in all biotopes of the upper forest line, there are 18 species, which is 19.8% of the total number of species found here, including: *Aleochara brevipennis*, *Anotylus mutator*, *Dinothenarus fossor*, *Eusphalerum alpinum*, *Ilyobates nidricollis*, *Mycetoporus baudueri*, *Ocypus fuscatus*, *O. macrocephalus*, *O. tenebricosus*, *Othius punctulatus*, *Philonthus decorus*, *P. politus*, *P. punctus*, *Quedius fuliginosus*, *Q. mesomelius*, *Q. paradisianus*, *Staphylinus caesareus*, and *S. erythropterus*. Of them, seven species (*Eusphalerum alpinum*, *Ocypus macrocephalus*, *Dinothenarus fossor*, *Philonthus decorus*, *P. politus*, *Staphylinus erythropterus*, and *Anotylus mutator*) belong to the dominant complex on both ridges.

Conclusions

As a result of the research, it was revealed that the fauna of Staphylinidae of the UFL of the Polonynskyi massif includes 91 species belonging to 53 genera and 10 subfamilies. Almost the same number of species has been noted on both ridges: 71 on Yavirnyk and 69 on Stinka. Among the biotopes, the largest number of species was noted on meadows of both ridges: 39 on Yavirnyk and 40 on Stinka.

It was found that the values of indices of species richness and diversity of rove beetle communities are higher in biotopes of the UFL of the Stinka ridge. This indicates that the upper forest line on the Stinka ridge is more natural and less altered under the influence of anthropogenic factors. Among the

biotopes of the both ridges, the highest indicators of species richness, species diversity and evenness were revealed for the forest biotopes, which indicates their high ecological quality and stability. This is confirmed by the highest indicator of the originality of the species composition of Staphylinidae in these areas.

The research has shown that the species composition of rove beetles in different biotopes of the UFL is varied. The most similar in species composition are the Staphylinidae communities in the meadows, as well as in the meadow and ecotone areas of each of the ridges.

It has been established that for the rove beetle communities of each of the studied biotopes of the UFL there are some complexes of dominant species which are specific only for them, and they include three species on Yavirnyk (*Eusphalerum alpinum*, *Eu. anale*, and *Philonthus politus*), and six species on Stinka (*Eusphalerum alpinum*, *Ocypus macrocephalus*, *Staphylinus erythropterus*, *Dinothenarus fossor*, *Anotylus mutator*, and *Philonthus decorus*). In terms of trophic specialization, predators predominate in all biotopes of the UFL, and most of them occur in rotten organic remains, wood, and fungi. In terms of biotopic distribution, eurytopic species predominate.

The rich species composition and diversity of rove beetles in the studied area indicates a satisfactory state of the upper forest line of the north-western part of the Polonynskiy massif in terms of biodiversity conservation.

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