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The current state of species diversity of insect geobionts in disturbed biotopes of Kyiv Polissya

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Abstract. Soil insects (geobionts), which live in the soil and subsoil permanently or for a certain period of their life cycle are central in the biodiversity of entomofauna. Preservation and rational use of natural biodiversity are becoming one of the priority tasks for biologists, ecologists, and entomologists. The study aimed to conduct faunal analysis of the entomological biodiversity of geobionts in the disturbed biotopes of Kyiv Polissya due to anthropogenic activity. The study determined the current state of the entomological biodiversity of geobionts in the disturbed biotopes of Kyiv Polissya, in particular within the settlements of Lyutizh, Demydiv, Kozarovychi, Huta Mezhyhirska and Gostomel, located in the floodplain of the Irpin River (Vyshhorod district, Kyiv region, Ukraine). The dynamics of the number of species in the period 2022-2024 was analysed, their systematic affiliation was established, and the impact of anthropogenic factors on the composition of the entomofauna of the studied territories was assessed. In the context of reduced biodiversity levels biocenoses, it is relevant to conduct research on the real state and distribution of species, as well as create a list of existing entomological biodiversity. For research on entomological diversity, traditional methods of accounting for entomofauna were used. As a result of the research and analysis of the current state and the compilation of a list of entomological biodiversity of geobionts in biotopes disturbed as a result of anthropogenic activity, 56 species of geobiont insects from 11 families of 4 orders were identified. The dominant order in terms of families and species was the Coleoptera order, which included 53 species from 8 families, which accounted for 94.6% of the total amount of studied entomological biodiversity. The conducted studies of the records of the entomological biodiversity of geobionts will contribute to the preservation and restoration of natural biodiversity in Kyiv Polissya Ukraine

Keywords: analytical studies; faunal studies; structure of entomofauna; order; family; monitoring

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INTRODUCTION

Analysis of the current state of species diversity of insect-geobionts in damaged biotopes of Kyiv Polissya is relevant for determination of the ecological processes occurring in these regions in the context of changes caused by anthropogenic impact, climate change and degradation of natural environments. Disturbed biotopes, such as deforestation, agricultural land and other anthropogenic changes, can significantly affect the structure of biocoenoses, including the number and composition of insect species, which are several components of these ecosystems. Other aspects, such as mechanisms of adaptation and migration of insects, and their role in the restoration of damaged biotopes, are also noteworthy. Analysis of these processes can be used to assess the impact of human activity on biodiversity and develop measures to preserve natural environments. Research into the species diversity of geobiont insects can not only determine the state of the ecosystem but also develop strategies for restoring biodiversity in the face of changes occurring in the ecosystems of Kyiv Polissya.

Insects account for more than half of the planet's biodiversity. According to R. McLellan *et al.* (2020), the presence of entomological biodiversity in an optimal amount in a biogeocenosis ensures ecological stability. Among the entire biodiversity of entomofauna, soil insects (geobionts), which live in the ground, soil and subsoil permanently or for a certain period of their life cycle are central (Pivtoraiko *et al.,* 2022; Vagaliuk *et al.*, 2024). As noted by C.A. Hallmann *et al.* (2021), and F. Bocchi *et al.* (2022), some insect species spend their entire life cycle in the soil, and some only during certain periods of ontogenesis or at certain intervals. A.Y. Kawahara *et al.* (2021), and O.L. Klyachenko *et al.* (2022) have studied that many species of geobiont insects spend their larval and some pupal periods in the soil. Among insects with incomplete transformation, *Gryllotalpa gryllotalpa* (Linnaeus, 1758) was noted. Among insects with complete metamorphosis are many species of the families Carabidae, Staphylinidae, Elateridae, Tenebrionidae, Scarabaeidae, Crysomelidae (species of the genus *Sagrinae*), some species of the families Cerambycidae, Curculionidae, Myrmeleonidae, Bibionidae, Tipulidae, Stratiomyidae, Tabanidae, Asilidae, Therevidae, as well as species from the genera *Apodea*, *Sphecodea*, etc.

According to a study by T.A. Hallman & W.D. Robinson (2020), conducted in the soil environment, the number of entomofauna geobionts on average in 1 m^2 of soil contains from several tens to several hundred. According to C. Lopez-Vaamonde *et al.* (2021), the impact of insects on the soil is substantial. It is determined by their nutrition and burrowing ability. By moving in the soil, insects affect its aeration, structure, etc. Insects can mix the soil, carry its particles from deeper layers to the upper horizons, and vice versa, bring them deeper. S. Seibold *et al.* (2019) noted that many soil insects are exclusively saprophages or caprophages, most others also partially feed on organic residues. This helps accelerate the destruction of organic residues and has a positive effect on soil humification processes. A study by A.D. Barnosky *et al.* (2012), as well as special laboratory studies, confirmed that in the absence of soil invertebrates, the accumulation of humic substances occurs very slowly or stops altogether.

The aforementioned indicates that insect geobionts are substantial in the biological cycle of organic matter movement in nature under normal conditions of existence for insects. To determine the significance and impact of the entomological biodiversity of geobionts on the soil environment, studies were conducted in various biotopes: natural and disturbed by human activity. Review of the sources on the selected topic determined that the current state of the entomological biodiversity of the entomofauna of geobionts in the biotopes of Kyiv Polissya that were affected by human activity were not studied sufficiently. The study aimed to conduct faunal studies of the entomological biodiversity of geobionts in the biotopes of Kyiv Polissya that have been disturbed as a result of anthropogenic activity.

MATERIALS AND METHODS

The study was conducted in two stages. The first stage included an analysis of literature sources (Didukh, 2017; Kuzemko *et al.,* 2018; Minyailo *et al.*, 2020), which established the composition of the entomofauna of geobionts of the Kyiv Polissya biotopes in the 20th century. The second stage was faunal collections conducted from 2022 to

June 2024, which determined the species diversity of the entomocomplex of geobionts of the disturbed biotopes of Kyiv Polissya.

The studied biotopes of Kyiv Polissya, affected by anthropogenic activity, were located in the Vyshgorod district of Kyiv region. These areas included flooded and waterlogged ones near the settlements of Lyutizh, Demydiv, Kazarovychi, Huta Mezhyhirska, and Hostomel, within the floodplain of the Irpin River. The research was conducted from 2022 to June 2024. The following soil types occurred in the research area: gray podzolised chornozem, and typical weakly humus-rich light loams (Lisovoy *et al.*, 1999; Sozinov, 2005). The vegetation cover of the studied biotopes was represented mainly by wild vegetation. The terrain was slightly undulating.

Regarding the study of entomofauna in areas negatively affected by anthropogenic activity: following the Russian invasion of the Kyiv region, the water pumping station from the Irpin River to the Dnieper River in the village of Kazarovichi lost power and thus stopped. As a result, the channel and floodplain of the Irpin River were flooded to a depth of more than 2 meters. These changes created difficult conditions for free movement in the area and for conducting entomological biodiversity surveys. The flooding caused significant damage to the natural environment and biodiversity: trees, shrubs, and grassy vegetation were soaked; adults, larvae, pupae, and eggs of soil insects perished; and many small, mouse-like rodents also died.

The identification and determination of the systematic affiliation of the entomological biodiversity of geobionts was conducted at the National University of Life and Environmental Sciences of Ukraine, the Department of Ecobiotechnology and Biodiversity (chamber studies). During the research, analytical, statistical and experimental methods were used, approved and recommended for field, forest and laboratory research in entomology, ecology and plant protection (Sozinov, 2005; Minyailo *et al.*, 2020; Klyachenko *et al.*, 2022).

The collection and registration of the entomological biodiversity of geobionts were conducted using generally accepted methods (Hallman & Robinson, 2020; Vagaliuk *et al.*, 2024) once every 7-10 days at stationary sites. The taxonomic affiliation of biological collections was determined using an entomological identifier (Lisovoy *et al.*, 1999). The research was conducted following ethical standards and compliance with relevant requirements and standards, in particular, complying with the requirements of the Convention on Biological Diversity (1992).

RESULTS AND DISCUSSION

Based on the results of analytical and faunal studies, a list of the biodiversity of insect geobionts was compiled (Table 1).

Table 1. List of known and existing biodiversity of geobiont insects in the biotopes of Kyiv Polissya (presence (+) or absence (–) of the species during faunal studies

Order, family, insect species	Presence+/absence– of species
Orthoptera; Gryllotalpidae	
1. *Gryllotalpa gryllotalpa* (Linnaeus, 1758)	+
Dermatoptera; Forficulidae	
2. *Forficula auricularia* (Linnaeus, 1758)	+
3. *Forficula tomis* (Kolenati, 1846)	–
Homoptera; Cixiidae	
4. *Pentastiridius leporinus* (Linnaeus, 1761)	–
Diptera; Tipulidae	
5. *Tipula paludosa* (Meigen, 1830)	+
Coleoptera; Silphidae	
6. *Silpha obscura* (Linnaeus 1758)	+
Carabidae	
7. *Pterostichus vernalis* (Panzer, 1795)	+
8. *Harpalus distinguendus* (Duftschmid, 1812)	+
9. *Harpalus luteicornis* (Duftschmid, 1812)	+
10. *Broscus cephalotes* (Linnaeus, 1758)	+
11. *Calathus erratus* (Sahlberg, 1827)	+

Table 1. Continued

Order, family, insect species	Presence+/absence– of species
12. *Bembidion properans* (Stephens, 1828)	+
13. *Amara aenea* (De Geer, 1774)	+
14. *Amara familiaris* (Duftschmid, 1812)	+
15. *Pterostichus cupreus* (Linnaeus, 1758)	+
16. *Pterostichus melanarius* (Illiger, 1798)	+
17. *Amara plebeja* (Gyllenhal, 1810)	+
18. *Amara similata* (Gyllenhal, 1810)	+
19. *Amara spreta* (Dejean, 1831)	+
20. *Amara bifrons* (Gyllenhal, 1810)	+
21. *Amara convexiuscula* (Marsham, 1802)	–
22. *Amara consularis* (Duftschmid, 1812)	+
23. *Amara ingenua* (Duftschmid, 1812)	+
24. *Zabrus tenebrioides* (Goeze, 1777)	+
Scarabaeidae	
25. *Pentodon idiota* (Herbst, 1789)	+
26. *Anomala dubia* (Scopoli, 1763)	–
27. *Anomala errans* (Fabricius, 1775)	–
28. *Phyllopertha horticola* (Linnaeus, 1758)	–
29. *Anisoplia segetum* (Herbst, 1783)	+
30. *Anisoplia austriaca* (Herbst, 1783)	+
31. *Anisoplia deserticola* (Fischer von Waldheim, 1824)	–
32. *Melolontha melolontha* (Linnaeus, 1758)	
33. *Melolontha hippocastani* (Fabricius, 1801)	–
34. *Polyphylla fullo* (Linnaeus, 1758)	–
35. *Anoxia pilosa* (Fabricius, 1792)	+
36. *Rhizotrogus aestivus* (Olivier, 1789)	+
37. *Miltotrogus vernus* (Germar, 1823)	+
38. *Miltotrogus aeguinoctialis* (Herbst, 1790)	–
39. *Amphimallon solstitialis* (Linnaeus, 1758)	–
40. *Serica brunnea* (Linnaeus, 1758)	–
41. *Maladera holosericea* (Scopoli, 1772)	–
42. *Hoplia parvula* (Krynicki, 1832)	+
Elateridae	
43. *Selatosomus latus* (Fabricius, 1801)	+
44. *Selatosomus aeneus* (Linnaeus, 1758)	+
45. *Cidnopus aeruginosus* (Olivier, 1790)	–
46. *Athous jejunus* (Kiesenwetter, 1858)	+
47. *Melaotus brunnipes* (Germar, 1824)	–
48. *Agriotes lineatus* (Linnaeus, 1767)	+
49. *Agriotes obscurus* (Linnaeus, 1758)	+
50. *Agriotes sputator* (Linnaeus, 1758)	+
Alleculidae	
51. *Podonta daghestanica* (Reitter, 1885)	+
Tenebrionidae	
52. *Opatrum sabulosum* (Linnaeus, 1761)	+
53. *Opatrum riparium* (Gerhardt, 1896)	+
54. *Crypticus quisquilius* (Linnaeus, 1761)	+
55. *Oodescelis polita* (Sturm, 1807)	+
56. *Pedinus femoralis* (Linnaeus, 1767)	+
Chrysomelidae	
57. *Leptinotarsa decemlineata* (Say, 1824)	–
58. *Phyllotreta vittula* (Redtenbacher 1849)	+

Table 1. Continued

Order, family, insect species	Presence+/absence– of species
Curculionidae	
59. *Otiorrhynchus fullo* (Schrank, 1781)	–
60. *Otiorrhynchus ligustici* (Linnaeus, 1758)	+
61. *Otiorrhynchus raucus* (Fabricius, 1776)	–
62. *Otiorrhynchus singularis* (Linnaeus, 1767)	–
63. *Phyllobius maculicornis* (Germar, 1824)	–
64. *Phyllobius viridicollis* (Fabricius, 1792)	–
65. *Phyllobius urticae* (De Geer, 1775)	–
66. *Sciaphobus squalidus* (Gyllenhal, 1834)	–
67. *Brachysomus echinatus* (Bonsdorff, 1785)	–
68. *Cneorrhinus albinus* (Boheman, 1833)	–
69. *Sitona crinitus* (Herbst, 1795)	+
70. *Sitona cylindricollis* (Fahraeus, 1840)	+
71. *Sitona flavescens* (Marsham, 1802)	+
72. *Sitona griseus* (Fabricius, 1775)	+
73. *Sitona hispidulus* (Fabricius, 1776)	+
74. *Sitona humeralis* (Stephens, 1829)	+
75. *Sitona inops* (Gyllenhal, 1834)	+
76. *Sitona lineatus* (Linnaeus 1758)	+
77. *Sitona longulus* (Gyllenhal, 1834)	+
78. *Sitona puncticollis* (Stephens, 1831)	+
79. *Sitona sulcifrons* (Thunberg, 1798)	+
80. *Sitona tibialis* (Herbst, 1795)	–
81. *Tanymecus palliatus* (Fabricius, 1787)	+
82. *Chlorophanus viridis* (Linnaeus, 1758)	–
83. *Bothynoderes punctiventris* (Germar, 1794)	+
84. *Chromoderus fasciatus* (Müller, 1776)	–
85. *Cyphocleonus tigrinus* (Panzer, 1789)	–

Source: compiled by the authors based on Ya.P. Didukh (2017), A.A. Kuzemko *et al*. (2018), A.A. Minyailo *et al*. (2020)

The analysis determined that the biodiversity of geobiont insects in the biotopes of Kyiv Polissya amounted to 85 species and consisted of 5 orders, which included 12 families (Table 2). Ecological analysis of the entomofauna showed that the Coleoptera order had the largest number of families (8), which was 94.08% of the total. The orders Orthoptera, Homoptera, Dermatoptera and Diptera – 1 family each, which was 4.68%. The most numerous in terms of species were the Curculionidae, Carabidae and Scarabaeidae families: 27, 18, and 18 species, respectively. This is attributable to the fact that the larvae of these species have a habitat in the soil, where they spend a fairly significant period of their life cycle – from 1 to 4.5 years, until the emergence of the adult. The families Gryllotalpidae, Cixiidae, Alleculidae, Silphidae and Tipulidae each had 1 species. As a result of faunal studies conducted in biotopes disturbed by anthropogenic activity, 56 species of geobiont insects belonging to 11 families from 4 orders were collected, identified and systematised (Table 3).

Table 2. Taxonomic structure of biodiversity of insects-geobionts of biotopes of Kyiv Polissya according to analytical studies

No.	Order	Family	Species	
			quantity	(%)
1	Orthoptera	Gryllotalpidae	1	1.17
2	Dermatoptera	Forficulidae	2	2.35
3	Homoptera	Cixiidae	1	1.17

Table 2. Continued

No.	Order	Family	Species	
			quantity	(%)
4	Coleoptera	Carabidae	18	21.17
		Scarabaeidae	18	21.17
		Elateridae	8	9.41
		Alleculidae	1	1.17
		Tenebrionidae	5	5.88
		Chrysomelidae	2	2.35
		Curculionidae	27	31.76
		Silphidae	1	1.17
5	Diptera	Tipulidae	1	1.17
Total	5	12	85	100

Source: developed by the authors based on Ya.P. Didukh (2017), A.A. Kuzemko *et al*. (2018), A.A. Minyailo *et al*. (2020)

Table 3. Taxonomic structure of biodiversity of geobiont insects of disturbed biotopes of Kyiv Polissya during faunal studies, 2022-2024

No.	Order	Family	Species	
			quantity	(%)
1	Coleoptera	Carabidae	17	30.35
		Scarabaeidae	8	14.28
		Elateridae	6	10.71
		Tenebrionidae	5	8.92
		Curculionidae	14	25.0
		Chrysomelidae	1	1.78
		Silphidae	1	1.78
		Alleculidae	1	1.78
2	Orthoptera	Gryllotalpidae	1	1,78
3	Dermatoptera	Forficulidae	1	1.78
4	Diptera	Tipulidae	1	1.78
Total	4	11	56	100

Source: compiled by the authors

The largest number of species (17) belongs to the family Carabidae, the family Curculionidae – 14 species, Scarabaeidae – 8, Elateridae – 6, Tenebrionidae – 5 species, and Silphidae, Alleculidae, Gryllotalpidae, Forficulidae, Tipulidae – had 1 species each. Thus, the soil entomofauna in 2022-2024 was represented mainly by the order Coleoptera (82.26%), in which the dominant species were the Carabidae family: *Pterostichus vernalis* (Panzer, 1795), *Harpalus distinguendus* (Duftschmid, 1812), *Broscus cephalotes* (Linnaeus, 1758), *Amara similata* (Gyllenhal, 1810), *Amara aenea* (DeGeer, 1774), *Amara familiaris* (Duftschmid, 1812), *Calathus erratus* (Sahlberg, 1827), *Bembidion properans* (Stephens, 1828), *Harpalus luteicornis* (Duftschmid, 1812), which is 30.0% of the total, and Curculionidae: *Otiorrhynchus ligustici* (Linnaeus, 1758), *Sitona crinitus* (Herbst, 1795), *Sitona humeralis* (Stephens, 1829), *Sitona lineatus* (Linnaeus 1758), *Sitona longulus* (Gyllenhal, 1834), *Sitona puncticollis* (Stephens, 1831), which was 25.0%.

The most numerous families (Carabidae, Curculionidae, Scarabaeidae) of the Coleoptera order occupied 69.63% of the total in terms of species. A comparison of the taxonomic structure of the existing entomofauna of geobionts with the known science indicated a significant decrease in species biodiversity (Fig. 1).

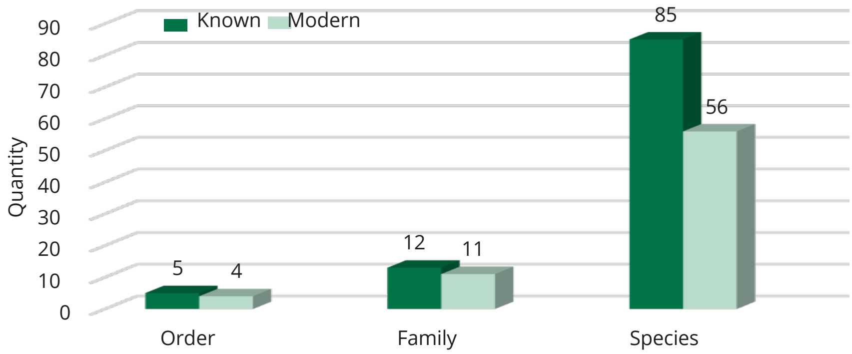

Figure 1. Comparative analysis of the results of the study of the known and current state of biodiversity of insect geobionts of biotopes of Kyiv Polissya by orders, families, and species
Source: compiled by the authors

Thus, the family Carabidae was represented by 17 compared to the known 18 species (a decrease of 1.05 times); Curculionidae – 14 against 27 (1.92 times); Scarabaeidae, respectively, – 8 against 18 (2.25 times); Elateridae – 6 against 8 (1.33 times); Tenebrionidae – 5 against 5; families Chrysomelidae and Forficulidae – 1 against 2 (2 times). Following the above analysis, the families Gryllotalpidae, Alleculidae, Tipulidae and Silphidae remained unchanged in species composition and were represented by one species per family.

Significant changes occurred in the taxonomic structure of the geobiont entomological complex. Thus, the number of orders decreased from 5 to 4, families from 12 to 11, and species from 85 to 56. The authors did not identify a significant part of the species (29), which will be the subject of further research and analysis. Analysis of the dynamics of the number of species of the entomological biodiversity of geobionts in biotopes disturbed by anthropogenic activity showed the following (Fig. 2).

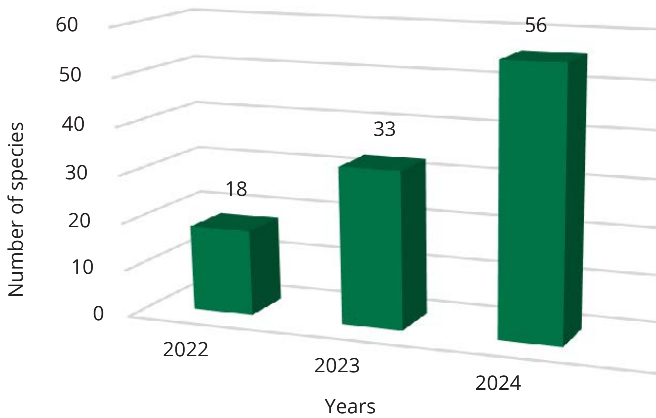

Figure 2. Dynamics of the number of geobiont insect species by year (biotopes of Kyiv Polissya disturbed due to anthropogenic activities)
Source: compiled by the authors

In 2022, the number of species was critically low – 18. It was caused by various reasons: stress and death of insects (adults, larvae, pupae, eggs) caused by flooding of biotopes with water, inaccessible places for surveys, etc. Studies in 2023 and 2024 showed an increase in the number of insect geobiont species at the level of 33-56, the result of which was the restoration of natural potential (migration to soil islands and settlement of flooded coastal areas) (see Fig. 2). In the spring and summer, migratory activity and colonisation of disturbed biotopes by entomological biodiversity of the soil environment will increase.

Research on the ecological state of river basins according to O.O. Sydorenko (2011) ensured conservation and conservation of nature. At the same time, the ecosystem approach was based on ecological aspects and research methodology, which is is primarily used to identify key factors that affect the life of the river basin and interact with the surrounding environment. I. Zagorodniuk *et al.* (2023) noted that the study of diversity focused on the expressions: "rarity", "threatened" and "extinction", which in practice was manifested in the preservation of rare and endangered genetic, taxonomic and ecological units, while the greater part of living beings remained beyond the focus of the researcher.

S.R. Loarie *et al.* (2009) stated that populations of species were responding to global climate change by shifting their geographical ranges to regions with suitable climatic conditions or by remaining in their current locations and adapting phenotypically or genetically. Insects are responding to recent climate change in a variety of ways, including shifting their geographic ranges to cooler climates. The ability of a species to change its geographic range depended on its ability to disperse, and on physiological and behavioural adaptations that were able to keep pace with the rate of climate change. The survival of species may depend not only on their ability to adapt to changing climates but also on the extent to which the climate is stable. I. Zagorodniuk (2012) noted that the extinction of species was an evolutionary process, which was an objective fact, as was their appearance. Extinction liberated a biological niche for new species. However, in every biotope, some species became extinct due to changes in the habitat and the activity of new species, including invasive ones.

A.A. Protasov (2002) concluded that due tostructural and functional complexity, an ecosystem can hardly be fully assessed by only one criterion, which was biodiversity, or rather structural aspects. If biodiversity is in large quantities and abundance, which contributes to sustainable development, then the question of what should be the conditions for obtaining numerical biodiversity is relevant. The author further noted that a model of changes in groups according to ecological indicators was proposed: a wide range of bioresources and their stability. Still, changes in biodiversity indicators were a reaction not only to environmental conditions. When biodiversity is at a minimum under stressful conditions, it is necessary to positively change these conditions (reduce anthropogenic pressure, reduce pollution, feed and water, etc.) and the biota will begin to increase. However, diversity did not grow monotonically, but, having reached a certain maximum, decreased, even under favourable conditions. Biodiversity was assessed not only by the environment that humans can influence (for example, by creating protected areas) but also by biotic interactions, which weredifficult to influence.

In an analysis of biodiversity in a particular area of land or water, E. Morris *et al.* (2014) concluded that it all started with an assessment of species. Firstly, species present in a given area were identified with subsequent compilation of an annotated list. This was the simplest assessment of species diversity. The numerical indicator was "species richness", the number of species. That indicator, although beneficial, was not very informative for characterising ecological groups, since it did not address the level of representation of each species.

E.M. Dillon *et al.* (2022) noted that the newest direction of biodiversity research was conservation paleobiology, which was currently being formed as a separate interdisciplinary branch of science. The need for such a direction was determined by modern (in the non-ontological sense) conservation biology studies and monitors biodiversity, which was under constant human pressure. Since the temperature state of the environment has changed over geological eras, the combination of the results of palaeontology, archaeology and conservation biology allowed authors to study the impact of stress factors on antiquity and choose promising new approaches to the preservation and restoration of biodiversity.

During the research of the current state of species diversity of geobiont insects in the biotopes of Kyiv Polissya, which were disturbed as a result of military actions, many questions regarding the future state and restoration of the natural floodplain of the Irpin River, as well as the restoration of the natural abundance of entomological biodiversity and, in particular, the community of geobiont insects that were stressed, became relevant. Measures are needed to restore biodiversity and determine the possible timeframe for this process.

CONCLUSIONS

The analysis of literary sources established that the biodiversity of insect geobionts in the biotopes of Kyiv Polissya amounted to 85 species and consisted of 5 orders, which included 12 families. The ecological analysis of the entomofauna demonstrated that the order Coleoptera had the largest number of families (8), which was 94.08% of the total. The orders Orthoptera, Homoptera, Dermatoptera and Diptera – 1 family each, which was 4.68%. The most numerous in terms of species were the families Curculionidae, Carabidae and Scarabaeidae: 27, 18, and 18 species, respectively. Faunistic studies (2022-2024) of the entomological biodiversity of geobionts of Kyiv Polissya in biotopes disturbed by anthropogenic activity identified 56 species that systematically belong to 11 families from 4 orders. The study determined that the soil entomofauna is represented mainly by the order of Coleoptera (82.26%), in which the dominant species are *Pterostichus vernalis* (Panzer, 1795), *Harpalus distinguendus* (Duftschmid, 1812), *Broscus cephalotes* (Linnaeus, 1758), *Amara similata* (Gyllenhal, 1810), *Amara aenea* (De Geer, 1774), *Amara familiaris* (Duftschmid, 1812), *Calathus erratus* (Sahlberg, 1827), *Bembidion properans* (Stephens, 1828), *Harpalus luteicornis* (Duftschmid, 1812), family Carabidae which is 30.0% of the total, and *Otiorrhynchus ligustici* (Linnaeus, 1758), *Sitona crinitus* (Herbst, 1795), *Sitona humeralis* (Stephens, 1829), *Sitona lineatus* (Linnaeus 1758), *Sitona longulus* (Gyllenhal, 1834), *Sitona puncticollis* (Stephens, 1831) of the family Curculionidae, which is 25.0%.

The state of the known and modern entomofauna of geobionts was compared and, determining that significant changes have occurred in the taxonomic structure of the entomocomplex of geobionts: the number of orders decreased from 5 to 4, families from 12 to 11, species from 85 to 56. A significant part of the species (29) was not found. The current dynamics of the entomological biodiversity of geobionts of Kyiv Polissya were studied and analysed, which was positively reflected by the years: 2022 – 18 species, 2023 – 33 species, 2024 – 56 species.

The study determined the real state of the existing entomological biodiversity of geobionts in the biotopes of Kyiv Polissya was disturbed as a result of anthropogenic activity. Further research will be should be conducted as the studied biotopes that were subjected to negative human influence did not return to their previous state (until 2022). Furthermore, 4 years is a rather short period for the natural reproduction of biodiversity. Future research will address long-term monitoring of population dynamics, assessing trends in species adaptation to environmental changes, and developing conservation strategies for biodiversity preservation in affected biotopes.

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CONFLICT OF INTEREST

None.

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Сучасний стан видового різноманіття комах-геобіонтів порушених біотопів Київського Полісся

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Анотація. Серед біорізноманіття ентомофауни значну роль відіграють ґрунтові комахи (геобіонти), які мешкають в ґрунті та підґрунті постійно або певний проміжок життєвого циклу. Збереження і раціональне використання природного біорізноманіття стає однією з пріоритетних задач для біологів, екологів, ентомологів. Метою дослідження було провести фауністичні дослідження ентомологічного біорізноманіття геобіонтів в порушених, внаслідок антропогенної діяльності, біотопах Київського Полісся. У результаті дослідження визначено сучасний стан ентомологічного біорізноманіття геобіонтів у порушених біотопах Київського Полісся, зокрема в межах населених пунктів Лютіж, Демидів, Козаровичі, Гута Межигірська та Гостомель, розташованих у заплаві річки Ірпінь (Вишгородський район, Київська область, Україна). Проаналізовано динаміку чисельності видів у період 2022-2024 років, встановлено їх систематичну приналежність та оцінено вплив антропогенних факторів на склад ентомофауни досліджуваних територій. З урахуванням проблеми зниження рівня чисельності біорізноманіття в біоценозах актуальним і дієвим є проведення досліджень щодо реального стану та розповсюдження видів, а також створення списку наявного ентомологічного біорізноманіття. Для досліджень ентомологічного різноманіття використовували загальновідомі методи обліку ентомофауни. В результаті проведених досліджень і аналізу поточного стану складено список ентомологічного біорізноманіття геобіонтів в порушених, внаслідок антропогенної діяльності, біотопах та виявлено 56 видів комах-геобіонтів із 11 родин 4 рядів. Домінуючим за родинами і видами є ряд Coleoptera, до якого входять 53 види з 8 родин, що становить 94,6 % від загальної кількості дослідженого ентомологічного біорізноманіття. Проведені дослідження обліків ентомологічного біорізноманіття геобіонтів сприятимуть збереженню та відновленню природного біорізноманіття Київського Полісся України

Ключові слова: аналітичні дослідження; фауністичні дослідження; структура ентомофауни; ряд; родина; моніторинг