

RECORDS OF APHIDIINAE (HYMENOPTERA: BRACONIDAE) IN CHERNIVTSI REGION OF UKRAINE WITH NOTES ON THE FAUNA OF THE UKRAINIAN CARPATHIANS

Калюжна, М. О. Знахідки Aphidiinae (Hymenoptera: Braconidae) у Чернівецькій області України з нотатками щодо фауни Карпатського регіону. *Вісті Харківського ентомологічного товариства*. 2026. Т. XXXIV, вип. 1. С. 9–13. DOI: 10.36016/KhESG-2026-34-1-2.

На основі ревізії колекційного матеріалу, зібраного у 2008 році, для Чернівецької області наведено чотири види Aphidiinae (Hymenoptera: Braconidae). Досліджений матеріал включає знахідки як із гірських, так і з рівнинних локалітетів Буковинських Карпат та прилеглих територій. Два види, *Ephedrus niger* Gautier, Bonnamour et Gaumont, 1929 та *E. plagiator* (Nees, 1811), раніше були відомі з території Карпатського біосферного заповідника, тоді як представники родів *Trioxys* Haliday, 1833 та *Binodoxys* Mackauer, 1960 залишаються порівняно рідко задокументованими в Карпатському регіоні. Уперше для Карпатського регіону України наведено верифіковану знахідку представника роду *Trioxys* s. str. — *Trioxys pallidus* Haliday, 1833. Особливий інтерес становить також знахідка *Binodoxys centaureae* (Haliday, 1833) з високогірного локалітету на висоті 1 820 м н. р. м. У роботі коротко обговорено сучасний стан вивченості Aphidiinae Карпатського регіону України та підкреслено значення ревізії колекційних матеріалів і критичного аналізу попередньо опублікованих даних для регіональних фауністичних досліджень. 17 назв.

Ключові слова: біорізноманіття, Буковинські Карпати, фауністика, паразитоїди попелиць.

Kaliuzhna, M. O. Records of Aphidiinae (Hymenoptera: Braconidae) in Chernivtsi Region of Ukraine with notes on the fauna of the Ukrainian Carpathians. *The Kharkiv Entomological Society Gazette*. 2026. Vol. XXXIV, iss. 1. P. 9–13. DOI: 10.36016/KhESG-2026-34-1-2.

Four species of Aphidiinae (Hymenoptera: Braconidae) are recorded from Chernivtsi Region based on revised collection material collected in 2008. The examined material includes records from both mountain and lowland localities of the Bukovynian Carpathians and adjacent areas. Two species, *Ephedrus niger* Gautier, Bonnamour et Gaumont, 1929 and *E. plagiator* (Nees, 1811), were previously known from the Carpathian Biosphere Reserve, whereas representatives of the genera *Trioxys* Haliday, 1833 and *Binodoxys* Mackauer, 1960 remain comparatively poorly documented in the Ukrainian Carpathians. The present study provides the first verified record of the genus *Trioxys* s. str. for the Ukrainian Carpathians based on the record of *Trioxys pallidus* Haliday, 1833. The record of *Binodoxys centaureae* (Haliday, 1833) from a high-montane locality at 1,820 m a. s. l. is also of particular interest. The paper briefly discusses the current state of knowledge of Aphidiinae in the Ukrainian Carpathians and highlights the importance of revising collection material and critically analyzing previously published data for regional faunistic studies. 17 refs.

Keywords: biodiversity, Bukovynian Carpathians, faunistics, aphid parasitoids.

Introduction. Aphidiinae (Hymenoptera: Braconidae) are specialized endoparasitoids of aphids and play an important role in the natural regulation of aphid populations in natural and agricultural ecosystems (Kaliuzhna, 2015). Currently, Aphidiinae comprise more than 600 described species worldwide, of which over 80 species have been recorded from Ukraine (Yu, van Achterberg, Horstmann, 2016; Kaliuzhna, 2017). Despite their ecological importance, the fauna of Aphidiinae in the Ukrainian Carpathians remains insufficiently studied and is based mainly on fragmentary regional publications and collection records. The most important contribution to the study of Aphidiinae in the Ukrainian Carpathians was provided by investigations conducted in the Carpathian Biosphere Reserve (Zerova *et al.*, 1996; Zagorodniuk, Chumak, Zerova, 1997; Pokynchereda, 2003a). According to published data, 19 species belonging to seven genera were previously known from the Ukrainian Carpathians.

Aphidiinae species were also mentioned for the Carpathian Biosphere Reserve in conference abstracts (Pokynchereda, 2003b), however, these records were published without cited material and probably reflected preliminary identifications, which complicates their verification and interpretation in the context of the regional fauna. Most verified records were based on material examined in the preprint by Zerova *et al.* (1996), whereas later publications mainly summarized records by mountain massifs without detailed specimen data. In addition, some older records require taxonomic clarification because of subsequent changes in the interpretation of several Aphidiinae taxa.

The territory of Chernivtsi Region includes parts of the Bukovynian Carpathians as well as adjacent foothill and lowland territories, resulting in considerable habitat heterogeneity (Marynych, Shyshchenko, 2005; DENR ChRSA, 2024). Nevertheless, Aphidiinae of this area remain poorly documented and are represented

mainly by isolated records and unpublished collection material. Revision of museum collections and published records, therefore, remains an important source of verified faunistic information for the Ukrainian Carpathians. Findings from Chernivtsi Region were previously mentioned in regional summaries and digitized collection datasets (Kaliuzhna, 2015; Babytskiy *et al.*, 2025), but without detailed discussion in the context of the Carpathian fauna.

This study **aims** to clarify the distribution of Aphidiinae in Chernivtsi Region based on revised collection material and to discuss these records in the broader context of the Carpathian fauna. The objectives of the study were:

- (1) to provide verified records of Aphidiinae species from mountain and lowland localities of the Ukrainian Carpathians;
- (2) to compare the obtained data with previous records from the Ukrainian Carpathians;
- (3) to clarify the current interpretation of representatives of the genera *Trioxys* Haliday, 1833 and *Binodoxys* Mackauer, 1960 in the regional fauna.

Materials and methods. The study is based on the examination of Aphidiinae material collected in Chernivtsi Region in 2008 by Dr. L. Tymochko (Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine). Specimens were identified by the author using the taxonomic keys of Tobias and Kyriyak (1986) and Davidian (2007).

The studied material originates from both mountain and lowland localities of the Bukovynian Carpathians and adjacent areas, including high-montane meadow habitats near the border of coniferous forests and deciduous forest habitats. The examined specimens are deposited in the collection of the I. I. Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine (SIZK).

Nomenclature and taxonomy follow current interpretations of Aphidiinae within Braconidae. Information on distribution was compiled from available literature sources and annotated catalogues (Tobias, Kyriyak, 1986; Zerova *et al.*, 1996; Zagorodniuk, Chumak, Zerova, 1997; Pokynchereda, 2003a; Kaliuzhna, 2015; Yu, van Achterberg, Horstmann, 2016; Babytskiy *et al.*, 2025).

Results and discussion. Four species of Aphidiinae belonging to three genera were recorded from Chernivtsi Region based on revised collection material. Two species (*Ephedrus niger* Gautier, Bonnamour et Gaumont, 1929 and *Binodoxys centaureae* (Haliday, 1833)) were collected in high-montane localities of the Bukovynian Carpathians at Mt Yarovytsia (1,820 m a. s. l.), whereas two other species (*Ephedrus plagiator* (Nees, 1811) and *Trioxys pallidus* Haliday, 1833) were recorded from foothill and lowland habitats near Horoshivtsi village. Below, information on the recorded species is provided.

Family BRACONIDAE Nees, 1811

Subfamily APHIDIINAE Haliday, 1833

Genus *Ephedrus* Haliday, 1833

Ephedrus niger Gautier, Bonnamour et Gaumont, 1929

= *Ephedrus aphidivora* (Rondani, 1848), = *Ephedrus campestris* Stary, 1962

Material. Ukraine, Chernivtsi Region, Putyla District, Mt Yarovytsia, 1,820 m a. s. l., meadow vegetation near the border of coniferous forest, 6.07.2008 (L. Tymochko) — 1 ♀ (SIZK).

Trophic specialization. Broad oligophagous.

Hosts. Aphids of the genera *Macrosiphoniella* and *Uroleucon*, as well as *Acyrtosiphon*, *Aphis*, *Dysaphis*, *Hyperomyzus*, *Macrosiphum*, *Megoura*, *Metopeurum*, *Microsiphoniella*, *Titanosiphon*, and *Uromelan* (Yu, van Achterberg, Horstmann, 2016).

Geographic distribution. Europe, North Africa (Algeria), the Caucasus (Georgia, Azerbaijan), Russia, the Middle East (Israel, Iran), Central Asia (Tajikistan), China, Mongolia, the Korean Peninsula, and India (Yu, van Achterberg, Horstmann, 2016).

Distribution in Ukraine. Previously recorded from Zakarpattia (Zerova *et al.*, 1996; Zagorodniuk, Chumak, Zerova, 1997; Pokynchereda, 2003a, 2003b), Kyiv, Mykolaiv, Kharkiv, and Chernivtsi regions (Kaliuzhna, 2015; Babytskiy *et al.*, 2025).

Remarks. The present record confirms its occurrence in the Bukovynian part of the Ukrainian Carpathians, including high-montane localities.

***Ephedrus plagiator* (Nees, 1811)**

= *Ephedrus homostigma* Fahringer, 1935, = *Ephedrus japonicus* Ashmead, 1906, = *Ephedrus parvicornis* (Nees, 1834)

Material. Ukraine, Chernivtsi Region, Zastavna District, vicinity of Horoshivtsi village, beech forest, 13.07.2008 (L. Tymochko) — 2 ♀♀ (SIZK).

Trophic specialization. Polyphagous.

Hosts. Aphids of the genera *Acyrtosiphon*, *Amphicercidus*, *Anoecia*, *Anuraphis*, *Aphis*, *Aulacorthum*, *Brachycaudus*, *Brachycorynella*, *Brachysiphoniella*, *Capitophorus*, *Cavariella*, *Ceratovacuna*, *Ceruraphis*, *Corylobium*, *Cryptomyzus*, *Cryptosiphum*, *Diuraphis*, *Dysaphis*, *Elatobium*, *Eriosoma*, *Hayhurstia*, *Hyadaphis*, *Hyalopteroides*, *Hyalopterus*, *Hyperomyzus*, *Hysteroneura*, *Impatientinum*, *Liosomaphis*, *Lipaphis*, *Macromyzus*, *Macrosiphoniella*, *Macrosiphum*, *Melanaphis*, *Metopolophium*, *Myzaphis*, *Myzocallis*, *Myzus*, *Nasonovia*, *Neorhopalomyzus*, *Ovatus*, *Pachypappa*, *Parachaitophorus*, *Pemphigus*, *Phorodon*, *Pleotrichophorus*, *Prociphilus*, *Rhopalomyzus*, *Rhopalosiphoninus*, *Rhopalosiphum*, *Sappaphis*, *Schizaphis*, *Sinomegoura*, *Sipha*, *Sitobion*, *Staticobium*, *Tetraneura*, *Toxoptera*, and *Uroleucon* (Yu, van Achterberg, Horstmann, 2016).

Geographic distribution. Europe, North Africa, the Caucasus, the Middle East, Central and East Asia, India, Australia, New Zealand, North and South America (Yu, van Achterberg, Horstmann, 2016).

Distribution in Ukraine. Previously recorded from Zakarpattia (Zerova *et al.*, 1996, Zagorodniuk, Chumak, Zerova, 1997; Pokynchereda, 2003a, 2003b); Poltava (Telenga, 1950), Kyiv, Kharkiv, Kherson, Chernivtsi Regions (Kaliuzhna, 2015; Babytskiy *et al.*, 2025), AR Crimea (Akhvlediani, 1983; Starý, 1965), and steppe zone of Ukraine (Berest, 1985).

Remarks. Studied material confirms the occurrence of the species in forest habitats of Chernivtsi Region.

Genus *Trioxys* Haliday, 1833

***Trioxys pallidus* Haliday, 1833**

= *Trioxys callipteri* (Marshall, 1896), = *Trioxys pulcher* Gautier et Bonnamour, 1924, = *Trioxys resolutus* (Nees, 1834)

Material. Ukraine, Chernivtsi Region, Zastavna District, vicinity of Horoshivtsi village, near a stream, 13.07.2008 (L. Tymochko) — 1 ♀ (SIZK).

Trophic specialization. Broad oligophagous.

Hosts. Aphids of the genera *Chromaphis*, *Eucallipterus*, *Hoplocallis*, *Monellia*, *Monelliopsis*, *Myzocallis*, *Panaphis*, *Pterocallis*, *Thelaxes*, *Therioaphis*, *Tinocallis*, *Tuberculatus*, and *Tuberculoides* (Yu, van Achterberg, Horstmann, 2016).

Geographic distribution. Europe, North Africa, the Caucasus, the Middle East, Central and East Asia, and North America (Yu, van Achterberg, Horstmann, 2016).

Distribution in Ukraine. Previously recorded from Kyiv and Chernivtsi regions (Kaliuzhna, 2015; Babytskiy *et al.*, 2025).

Remarks. This record is the first verified finding of the genus *Trioxys* s. str. in the Bukovynian part of the Ukrainian Carpathians.

Genus *Binodoxys* Mackauer, 1960

***Binodoxys centaureae* (Haliday, 1833)**

= *Binodoxys orientalis* (Starý et Schlinger, 1967), = *Binodoxys uroleucon* Takada et Rishi, 1980

Material. Ukraine, Chernivtsi Region, Putyla District, Mt Yarovytsia, 1,820 m a. s. l., meadow vegetation near the border of coniferous forest, 6.07.2008 (L. Tymochko) — 1 ♀ (SIZK).

Trophic specialization. Broad oligophagous.

Hosts. Aphids of the genera *Uroleucon*, *Macrosiphoniella*, and *Aphis*, as well as *Microlophium*, *Rhopalosiphum*, and *Sitobion* (Yu, van Achterberg, Horstmann, 2016).

Geographic distribution. Europe, North Africa (Algeria), the Caucasus, Central and East Asia, India, and Russia (Yu, van Achterberg, Horstmann, 2016).

Distribution in Ukraine. Kirovohrad, Cherkasy, and Chernivtsi regions (Kaliuzhna, 2015; Babytskiy *et al.*, 2025).

Remarks. Records of the genus *Binodoxys* from the Ukrainian Carpathians remain scarce. Previous mentions of *Binodoxys* (formerly treated within *Trioxys*) were based mainly on older literature sources (Tobias, Kyriyak, 1986) or brief publications without material citation (Pokynchereda, 2003a, 2003b). The studied specimen represents a documented high-montane record of *B. centaureae* from the Bukovynian Carpathians.

Two species recorded in the current study, *E. niger* and *E. plagiator*, were previously known for the Ukrainian Carpathians from the Carpathian Biosphere Reserve (Zeroва *et al.*, 1996; Zagorodniuk, Chumak, Zeroва, 1997; Pokynchereda, 2003a, 2003b). Their occurrence in Chernivtsi Region confirms a wider distribution of these common species within different parts of the Ukrainian Carpathians. Both taxa are characterized by broad trophic associations and occur in various natural habitats (Starý, 1965; Tobias, Kyriyak, 1986; Kaliuzhna, 2015).

Particular attention should be paid to representatives of the genera *Trioxys* and *Binodoxys*. Earlier records from the Ukrainian Carpathians included *Binodoxys similis* (Mackauer, 1959), although this species was listed under *Trioxys* in Pokynchereda (2003a, 2003b) according to the taxonomic interpretation used at that time. However, this species belongs to genus *Binodoxys* (Lazarević *et al.*, 2024). Consequently, the record of *T. pallidus* presented here represents the first verified record of the genus *Trioxys* s. str. for the Ukrainian Carpathians. Representatives of the genus *Binodoxys* were previously reported from Zakarpattia Region (Tobias, Kyriyak, 1986) and the Carpathian Biosphere Reserve (Pokynchereda, 2003a, 2003b), however, the number of findings was low. This record of *B. centaureae* confirms the occurrence of this species in the Bukovynian Carpathians, including high-montane localities at 1,820 m a. s. l.

The fauna of Aphidiinae in the Ukrainian Carpathians remains insufficiently investigated. According to available published data, 19 species belonging to seven genera were previously known from the region (Zeroва *et al.*, 1996; Zagorodniuk, Chumak, Zeroва, 1997; Pokynchereda, 2003a; Tobias, Kyriyak, 1986). This study increases this number to 21 species from eight genera. At the same time, the actual diversity of Aphidiinae in the Ukrainian Carpathians is probably considerably higher. In particular, Zagorodniuk, Chumak, and Zeroва (1997) reported 176 species of aphids from the Carpathian Biosphere Reserve, whereas only a relatively small number of associated aphidiine parasitoids have so far been documented. This indicates that the Aphidiinae fauna of the Ukrainian Carpathians remains strongly underexplored and requires further targeted investigations, revision of historical material and bibliographic verification. Specimen-based records with precise locality data therefore remain especially valuable for clarifying the composition and distribution of the regional Aphidiinae fauna.

Conclusions. Four species of Aphidiinae were confirmed from Chernivtsi Region based on revised collection material from mountain and lowland localities of the Bukovynian Carpathians and adjacent territories. Two species, *E. niger* and *E. plagiator*, confirm the wider distribution of these taxa within the Ukrainian Carpathians. The record of *T. pallidus* represents the first verified occurrence of the genus *Trioxys* s. str. in the Ukrainian Carpathians, whereas the record of *B. centaureae* expands current knowledge of the distribution of this genus in the Bukovynian Carpathians, including high-montane localities. The results increase the number of verified Aphidiinae known from the Ukrainian Carpathians from 19 species in seven genera to 21 species in eight genera and clarify the current interpretation of the genera *Trioxys* and *Binodoxys* in the regional fauna.

Acknowledgments. This study was supported by the National Research Foundation of Ukraine (grant registration number 2025.07/0110). The author is sincerely grateful to Dr. L. Tymochko (Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine) for providing the material from Chernivtsi Region used in the present study.

Declaration of competing interest. The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

- Akhvlediani, M. P. 1983. On the fauna of aphid parasitoids (Hymenoptera: Aphidiidae, Aphelinidae) in the USSR [К фауне паразитов тлей (Hymenoptera: Aphidiidae, Aphelinidae) в СССР]. In: *Fauna and Ecology of Invertebrates of Georgia [Фауна и экология беспозвоночных животных Грузии]*. Metsniereba, Tbilisi, 51–76. [in Russian].
- Babytskiy, A., Kaliuzhna, M., Varga, O., Kavurka, V., Prokhorov, A., Kletionkin, V., Martynova, K., Nuzhna, A., Klymenko, S., Fursov, V., Parkhomenko, M. 2025. Biodata mobilisation of the entomological collections of the Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine. *Biodiversity Data Journal*, 13, e152004. DOI: <https://doi.org/10.3897/BDJ.13.e152004>.

- Berest, Z. L. 1985.** Parasitoids of cereal aphids in the steppe zone of the Ukrainian SSR [Паразиты листовых злаковых тлей степной зоны УССР]. *Zoological Journal [Зоологический журнал]*, **64**(5), 772–775. [in Russian].
- Davidian, E. M. 2007.** Family Aphidiidae [Сем. Aphidiidae]. In: Leley, A. S., ed. *Key to the Insects of the Russian Far East. Volume 4. Neuropteroidea, Mecoptera, Hymenoptera. Part 5 [Определитель насекомых Дальнего Востока России. Том 4. Сетчатокрылообразные, скорпионницы, перепончатокрылые. Часть 5]*. Dalnauka, Vladivostok, 192–255. URL: <https://www.zin.ru/labs/insects/hymenopt/projects/key-fe/pdf-4-5/0192-0254.pdf>. [in Russian].
- DENR ChRSA** (Department of Ecology and Natural Resources of the Chernivtsi Regional State Administration [Управління екології та природних ресурсів Чернівецької обласної державної адміністрації]). **2024.** *Ecological Passport of Chernivtsi Region 2024. [Екологічний паспорт Чернівецької області 2024 рік]*. URL: <https://ueprcv.oda.org.ua/news/1743492660>. [Accessed: May 5, 2026]. [in Ukrainian].
- Kaliuzhna, M. O. 2015.** *Aphidiid Wasps (Hymenoptera, Aphidiidae) of the Forest-Steppe Zone of Ukraine [Їдці-афідіїди (Hymenoptera, Aphidiidae) лісостепової зони України]*. The dissertation thesis for the scientific degree of the candidate of biological sciences. I. I. Schmalhausen Institute of Zoology, Kiev, 1–240. URL: <https://nrat.ukrintei.ua/searchdoc/0415U001714>. [in Ukrainian].
- Kaliuzhna, M. O. 2017.** Modern data on the species composition of aphidiines (Hymenoptera, Braconidae, Aphidiinae) of the fauna of Ukraine [Современные данные о видовом составе наездников-афидиин (Hymenoptera, Braconidae, Aphidiinae) фауны Украины]. *Results and Prospects of Entomology Development in Eastern Europe: Proceedings of the II International Scientific and Practical Conference, Minsk, 6–8 September 2017 [Итоги и перспективы развития энтомологии в Восточной Европе: сборник статей II международной научно-практической конференции, Минск, 6–8 сентября 2017 г.]*. A. N. Varaksin, Minsk, 220–232. URL: <http://entomology2017.biobel.by/files/entomology-2017.pdf>. [in Russian].
- Lazarevič, M. J., Žikič, V. A., Milenković, D. N., Tomanović, Ž. M. 2024.** Tritrophic associations and identification key for European species of the genus *Binodoxys* (Mackauer) (Hymenoptera: Braconidae: Aphidiinae). *Archives of Biological Sciences*, **76**(3), 281–301. DOI: <https://doi.org/10.2298/ABS240510020L>.
- Marynych, O. M., Shyshchenko, P. H. 2005.** *Physical Geography of Ukraine [Фізична географія України]*. Znannia, Kyiv, 1–511. ISBN: 966-346-092-X. URL: <https://irbis-nbuv.gov.ua/ulib/item/ukr0000016739>. [in Ukrainian].
- Pokynchereda, V. V. 2003a.** Aphidiid wasps (Hymenoptera, Aphidiidae) of the Carpathian Biosphere Reserve [Їдці-афідіїди (Hymenoptera, Aphidiidae) Карпатського біосферного заповідника]. *Scientific Bulletin of Uzhhorod University. Series: Biology [Наукowyi вісник Ужгородського університету. Серія: Біологія]*, **13**, 132–133. URL: <https://dspace.uzhnu.edu.ua/jspui/handle/lib/47163>. [in Ukrainian].
- Pokynchereda, V. V. 2003b.** On the species composition of aphidiid wasps (Hymenoptera, Aphidiidae) of the Carpathian Biosphere Reserve [О видовом составе наездников-афидиин (Hymenoptera, Aphidiidae) Карпатского биосферного заповедника]. *VI Congress of the Ukrainian Entomological Society, Bila Tserkva, 8–11 September 2003: abstracts [VI з'їзд Українського ентомологічного товариства, Біла Церква, 8–11 вересня 2003 р.: тези доповідей]*. Nizhyn, 89–90. [in Russian].
- Starý, P. 1965.** Aphidiid parasites of aphids in the USSR (Hymenoptera, Aphidiidae). *Acta Faunistica Entomologica Musei Nationalis Pragae*, **10**(96), 187–227. URL: https://www.aemnp.eu/data/article-117/98-10_0_187.pdf.
- Telenga, N. A. 1950.** On the use of Aphidiidae parasitoids in the control of migratory aphids [К вопросу об использовании паразитов семейства Aphidiidae в борьбе с мигрирующими тлями]. *Scientific Proceedings of the Institute of Entomology and Phytopathology of the Academy of Sciences of the Ukrainian SSR [Научные труды Института энтомологии и фитопатологии АН УССР]*, **2**, 199–209 [in Russian].
- Tobias, V. I., Kyriyak, I. G. 1986.** Family Aphidiidae [Сем. Aphidiidae]. In: Medvedev, G. S., ed. *Key to the Insects of the European Part of the USSR. Hymenoptera. Volume 3, Part 5 [Определитель насекомых европейской части СССР. Перепончатокрылые. Том 3, Часть 5]*. Nauka, Leningrad, 232–308. [in Russian].
- Yu, D. S., van Achterberg, C., Horstmann, K. 2016.** *Taxapad 2016. Ichneumonidea 2015*. Database on flash-drive. Ottawa, Ontario, Canada.
- Zagorodniuk, I. V., Chumak, V. O., Zerova, M. D. 1997.** Animal world [Тваринний світ]. In: Movchan, Ya. I. et al., eds. *Biodiversity of the Carpathian Biosphere Reserve [Біорізноманіття Карпатського біосферного заповідника]*. Interekotsentr, Kyiv, 239–335. ISBN: 9669508118. [in Ukrainian].
- Zerova, M. D., Kotenko, A. G., Radchenko, O. G., Diakonchuk, L. A., Chervonenko, O. V., Gumovsky, A. V., Senatos, G. V., Simutnik, S. A. 1996.** *Hymenopterous Entomophagous Insects of the Carpathian Biosphere Reserve [Перетинчастокрилі комахи-ентомофаги Карпатського заповідника]*. Preprint 96.2. I. I. Schmalhausen Institute of Zoology NAS of Ukraine, Kyiv, 1–38. [in Ukrainian].



This is an open access article under the terms of the **Creative Commons Attribution License 4.0**, which permits use and distribution in any medium, the use is commercial and modifications or adaptations are made, provided the original work is properly cited