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RARE SPECIES OF FIRE FLIES (LEPIDOPTERA, PYRALOIDEA) OF THE HETMANSKYI NATIONAL NATURE PARK

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Hetmanskyi National Nature Park is one of two national parks created in Sumy region. The Park, located in Okhtyrka district of the south-eastern part of Sumy region, reaches a total area of 23 360,1 ha, including 11 673,2 ha of land provided for permanent use. The article presents the results of research on the species composition of fire flies in the Hetmanskyi National Nature Park, conducted from 2016 to 2023. As a result, 120 species of fire flies from 10 subfamilies were identified, making this area one of the most studied in the north-east of Ukraine. Most of these species are widespread in the region. Among them, 13 species had not been recorded in Sumy region before this study: Synaphe punctalis (Fabricius, 1775), Elegia fallax (Staudinger, 1881), Pempelia palumbella (Denis & Schiffermüller, 1775), Acrobasis glaucella Staudinger, 1859, Phycitodes saxicola Vaughan, 1870, Elegia similella Zincken, 1818, Homoeosoma inustella Ragonot, 1884, Cadra furcatella (Herrich-Schäffer, 1849), Chrysocrambus craterella (Scopoli, 1763), Catoptria mytilella (Hubner, 1805), Atralata albofascialis (Treitschke, 1829), Pyrausta rectefascialis Toll, 1936, Pyrausta aerealis (Hübner, 1793). The article provides information on these species, including their distribution in Europe and Ukraine (representation in the GBIF and UkrBIN global biodiversity databases) and our findings in the Park, as well as some biological and ecological features.

The article notes that insect species from the steppe zone and the Black Sea region are increasingly being registered in Sumy region. Species from more southern regions of Ukraine may be expanding their range due to climate change and vegetation succession in the Park, in particular due to the invasion of alien plants. In general, the species composition of fire flies on the territory of the Park has been studied unevenly so these results do not reflect the full picture of fire flies fauna of the Park and require further research.

Key words: *Ukraine, Sumy region, protected areas, biodiversity, fire flies, species composition, Pyraloidea.*

Говорун Олександр, Фірман Леся, Литвиненко Юлія, Орлова-Гудім Катерина. Рідкісні види вогнівок (Lepidoptera, Pyraloidea) Гетьманського національного природного парку

Національний природний парк «Гетьманський» – один із двох національних парків, створених на території Сумської області. Парк, розташований в Охтирському районі південно-східної частини Сумської області, загальною площею 23 360,1 га, зокрема й 11 673,2 га земель, що надаються в постійне користування. У статті представлено результати досліджень видового складу вогнівок на території національного природного парку «Гетьманський», проведеного із 2016 по 2023 рік. У результаті вияв-

лено 120 видів вогнівок із 10 підродин, що робить цю територію однією з найбільш досліджених на північному сході України. Переважно це поширені в цьому регіоні види. Серед них 13 видів не були зареєстровані на Сумщині до початку досліджень: Synaphe punctalis (Fabricius, 1775 рік), Elegia fallax (Staudinger, 1881 рік), Pempelia palumbella (Denis & Schiffermüller, 1775 рік), Acrobasis glaucella Staudinger (1859 рік), Phycitodes saxicola Vaughan (1870 рік), Elegia similella Zincken (1818 рік), Homoeosoma inustella Ragonot (1884 рік), Cadra furcatella (Herrich-Schäffer, 1849 рік), Chrysocrambus craterella (Scopoli, 1763 рік), Catoptria mytilella (Hubner, 1805 рік), Atralata albofascialis (Treitschke, 1829 рік), Pyrausta rectefascialis Toll (1936 рік), Pyrausta aerealis (Hübner, 1793 рік). У статті наведено інформацію про ці види, зокрема про їх поширення на території Європи й України (представлену у глобальних базах біорізноманіття GBIF та UkrBIN), а також дані про наші знахідки на території парку, деякі біологічні й екологічні особливості видів.

У статті зазначається, що на Сумщині все частіше реєструються види комах із зони Степів та Причорномор'я. Вихідці з більш південних регіонів України, можливо, розширюють свій ареал через кліматичні зміни та сукцесії рослинного покриву національного парку, зокрема через інвазію чужорідних рослин. Загалом видовий склад вогнівок на території Національного природного парку «Гетьманський» досліджений ще вкрай нерівномірно, отже, ці результати не відображають повної картини фауни цих метеликів парку та зумовлюють проведення подальших досліджень.

Ключові слова: *Україна, Сумська область, заповідні території, біорізноманітність, вогнівки, видовий склад, Pyraloidea.*

Introduction. Hetmanskyi National Nature Park (here and hereafter HNNP) was established in 2009 to monitor the unique natural complexes of the Left Bank Forest-Steppe, in particular the floodplain of Vorskla river, their changes in terms of recreational use, and to develop scientific recommendations on environmental protection and efficient use of natural resources [1].

The Park located in Okhtyrka district (the south-eastern part of Sumy region) covers a total area of 23 360,1 hectares, including 11 673,2 hectares of land provided for permanent use. The length of the Park is 122 km, which corresponds to the length of Vorskla river within its boundaries. Over 50% of the Park's area is covered by forest vegetation, over 20% by meadows, 22% by marshes, and less than 5% by water bodies. The climate of the region is temperate continental.

Despite the high degree of anthropogenic impact the river basin has preserved a variety of landscapes of the left-bank forest-steppe – from lowland floodplains and sphagnum bogs to relict indigenous forests characterised by rich resource potential, gene pool of flora and fauna, historical and cultural monuments that require urgent protection and environmentally sound sustainable use.

The study of regional faunas and ecological features of individual species is one of the priority areas of zoological research, which fully applies to Lepidoptera of the north-east of Ukraine. Despite fairly complete studies of butterflies, compared to other insects groups, the species composition of the lepidopteran fauna of certain Ukrainian regions remains rather fragmentary. This also applies to the territory of HNNP where the species composition of insects has been studied unevenly, and some groups have not been studied at all.

One of the lepidoptera groups that has been well studied in the Park over the past eight years is the moths of the superfamily Pyraloidea. These moths are distributed almost everywhere [2–7]. According to some estimates, the total number of species and subspecies of the world fauna reaches more than 16,000, the vast majority of which are distributed in the tropics. In general, about 850 species from 13 subfamilies are listed for Europe, including more than 400 species for its middle part. The superfamily unites small and medium-sized butterflies with a wingspan of 7 to 50 mm, usually with bright and variegated colour and a silky shine. At rest, the wings are folded like a flat triangle or wrapped around the body in a tube form. Caterpillars of most species feed on the tissues of various living plants; saprophagy is also quite common. Caterpillars and moths are an essential part of the diet of many invertebrate and vertebrate species. About 25% of moth species are known to be pests of cultivated plants, food supplies and beekeeping. Pests of practical importance are primarily pests of food stocks (flour, cereals, dried fruit, etc.), seed and fodder grains, forest plantations and weed phytophages.

The study of nocturnal butterflies species composition, including fire flies, on the territory of HNNP began in 2012 [8–10]. Until that time, the fauna of the Park's lepidoptera remained unexplored.

Material and methods. The material was collected in 2016–2023, mainly in 6 locations of the Park (figs. 1–4).

The material was collected at night by light (fig. 5). At dusk (19,30–21,30) a Philips ML 250W E27 arc mercury lamp was switched on. The lamp was placed at a height of 2–2,5 m from the soil surface against a white screen. A petrol generator was used to power the lamp.

The captured butterflies were immediately placed in ethyl acetate stains. After midnight (1,00–3,00 am) the light was switched off. The captured insects were mounted on entomological needles or placed in mattresses for further identification (figs. 6, 7).

Butterflies were collected by hand in places of their daytime residence (vegetation, trunks and stumps, fences, walls of buildings, storage facilities, etc.). This method

Fig. 1. The floodplain of Vorskla river near Podil village (50.374430805309736, 34.90817124003085)

Fig. 2. Meadows in the floodplain of Vorskla river on the border of "Lytovskyi Bir" tract near Lytovka village (50.39252240082388, 34.94176932814512)

Fig. 3. Meadows, floodplain forest near Zhuravne village (50.25708417526543, 34.77851935902161)

allowed us to find some species that did not come to the light and also allowed us to collect material in places where it was impossible to use lamps.

Species identification was based on preparations of their genitalia, wing patterns and external morphological features [11–16].

Disscussion. By 2000, 177 fireflies species were found in the Polissya and Forest-Steppe zones of the Left Bank of Ukraine. Later, this list was supplemented by 19 more species, including those found in the Park's territory.

The Park's Chronicles of Nature currently contain an information about 120 species of fireflies on its territory. Among them, 13 are species that we have not recorded in Sumy region before research of the Park's territory. Below is the information on these species, including their distribution in the world and our findings in the Park, as well as some biological and ecological features.

Synaphe punctalis (Fabricius, 1775)

This butterfly is widespread in Europe except for Ireland and Iceland [17–19]. The UkrBIN database contains

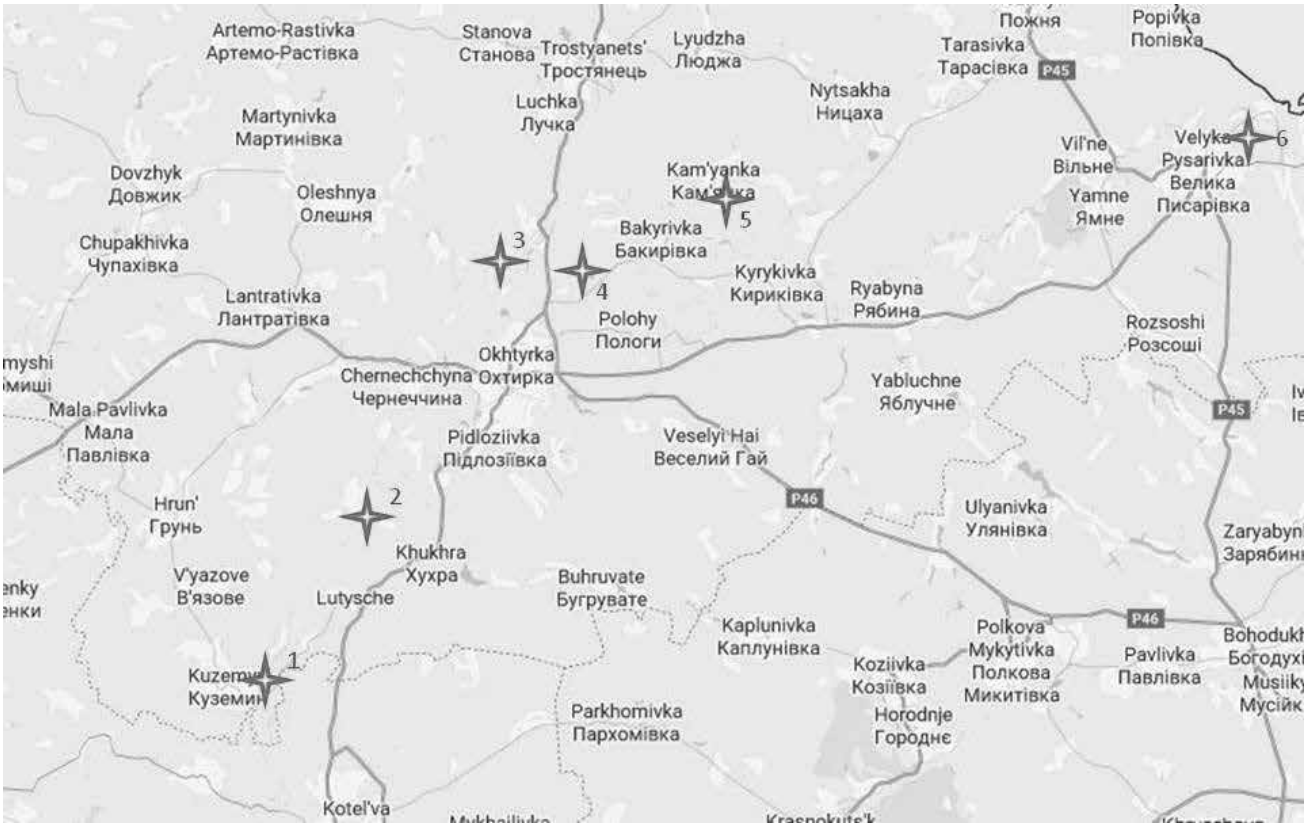

Fig. 4. Material collection points on the territory of Hetmanskyi National Nature Park**: 1 – Kuzemyn village; 2 – Zhuravne village; 3 – Podil village; 4 – "Lytovskyi Bir" tract, 5 – Kamianka village; 6 – Velyka Pysarivka and Oleksandrivka villages**

Fig. 5. Collection of fire flies in the floodplain of Vorskla river near Podil village on 20 June 2020 (50.374430805309736, 34.90817124003085)

information on its registration on the left bank of Ukraine (fig. 6).

One specimen was recorded in a floodplain aspen forest near Zhuravne village on 11 August 2022 (50.25708417526543, 34.77851935902161).

Wingspan is 22–27 mm.

The forewings of *S. punctalis* have an ochre-brown background colour with darker markings. Towards the body, in the postdorsal area, which crosses the entire wing, there is a light wavy line bordered by darker background shades. From this line to the outer edge the colour of the wing can gradually darken approaching the edge even in shades of brown. This feature is not present in all specimens. Females are usually darker than males.

The hindwing is grey and may have an intense dark patina more intense towards the edge which has a fringe.

It has long tentacles the colour of which is similar to that of the forewings as well as the head and breast while the abdomen is usually slightly darker.

It flies in one generation from June to August. Males sometimes fly both during the day and at night. Hibernates in the larval stage. The larva lives in a light web hidden in a moss discharging its excrement on the surface. The larva is dark grey or deep black with a dark brown head, pronotum and anal plates.

It turns into a pupa in a silken cocoon among moss. The pupa is ocher-brown in colour.

Elegia fallax (Staudinger, 1881)

The species is known from Spain, Portugal, France, Italy, Croatia, Czech Republic, Slovenia, Hungary, Romania, Bulgaria, North Macedonia and Greece [17–19]. It was also recorded in the Channel Islands in 2005. This species is registered in the Dnipro region of Ukraine on the UkrBIN website (fig. 7).

We recorded this species twice in the floodplain of Vorskla River on the border of the "Lytovskyi Bir" tract (50.39252240082388, 34.94176932814512) in 2020 and 2021.

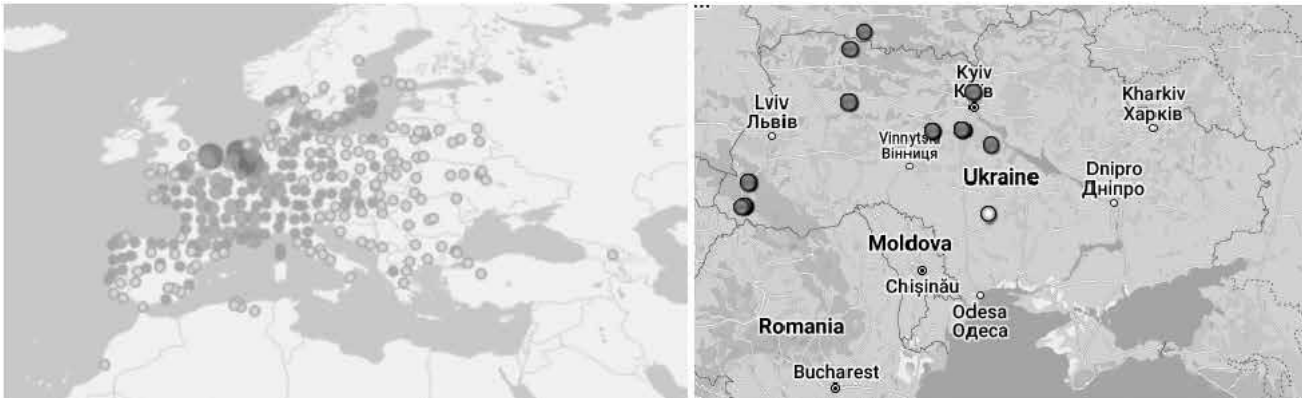

Fig. 6. *S. punctalis* registration on GBIF and UkrBIN maps

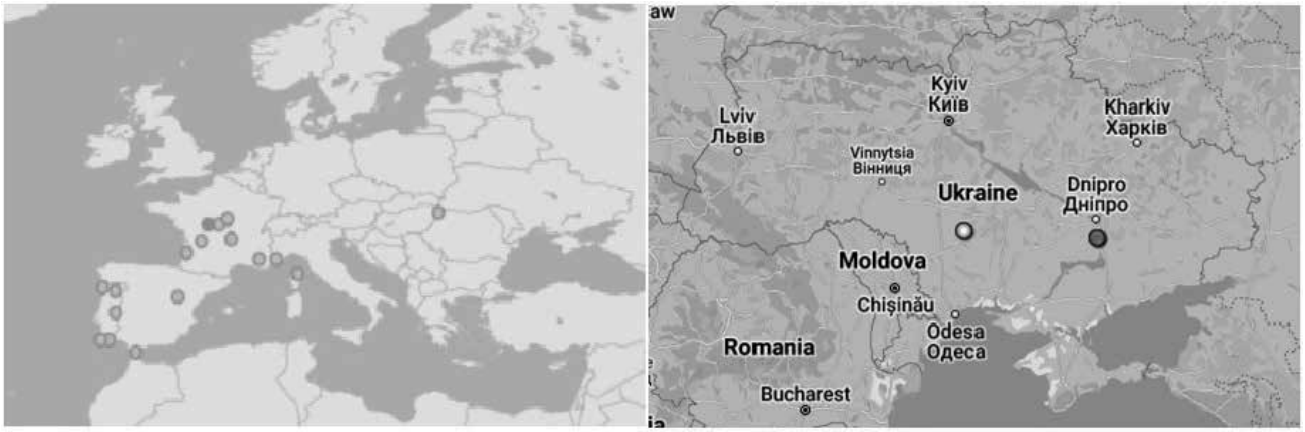

Fig. 7. *E. fallax* registration on GBIF and UkrBIN maps

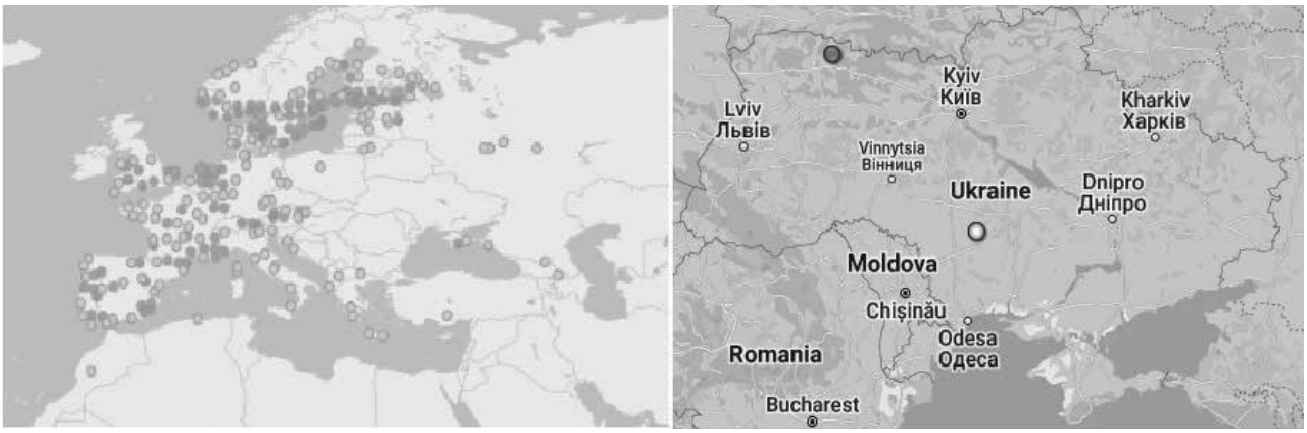

Fig. 8. *P. palumbella* **registration on GBIF and UkrBIN maps**

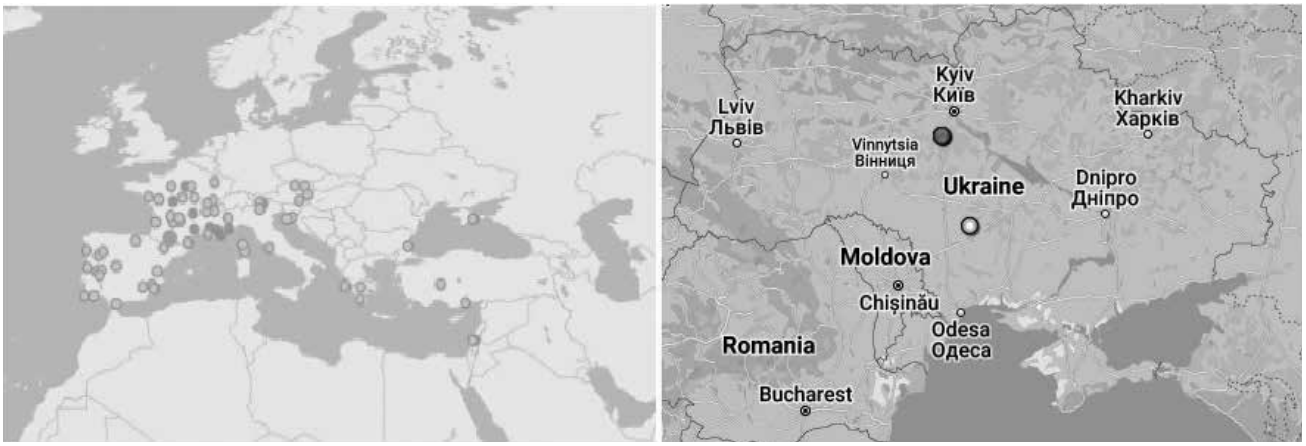

Fig. 9. ***Acrobasis glaucella*** **registration on GBIF and UkrBIN maps**

Wingspan is 17–19 mm. Larvae feed on oaks.

Pempelia palumbella (Denis & Schiffermüller, 1775)

This species is widespread in Europe. It is also recorded in Polissya according to UkrBIN website [17–19] (fig. 8).

We recorded one specimen on 11 August 2022 in a floodplain aspen forest near Zhuravne village (50.25708417526543, 34.77851935902161).

Wingspan is 21–27 mm. Flies in one generation from May to September. The caterpillar feeds on *Calluna* Salisb., *Thymus* L., and Polygalaceae species.

Acrobasis glaucella Staudinger, 1859

It is found in most of Europe [18–20] (fig. 9).

One specimen of this species was recorded in the floodplain of Vorskla river on the border of the "Lytovskyi Bir" tract (50.39252240082388, 34.94176932814512) in 2020.

The wingspan is 19–23 mm. Adults fly away from June to August. The larvae feed on various oak species.

Phycitodes saxicola Vaughan, 1870

It is found in most of Europe (except Poland and the western part of the Balkan Peninsula), as well as in Iran, Morocco and the Canary Islands. The species is not registered on the UkrBIN website [17–19] (fig. 10).

Four specimens were caught on 28.07.2007 in a meadow area near Kuzemyn village (50.14225477094884, 34.68502975482776) [1].

Wingspan is 12–19 mm. Adults fly from June to August in one generation per year. Larvae feed on flower heads of Asteraceae species.

Elegia similella Zincken, 1818

E. similella is known in most of Europe including Ukraine [17–19] (fig. 11).

We recorded four specimens near Podil village in 2019 (50.374430805309736, 34.90817124003085), and 6 more specimens near the "Lytovskyi Bir" tract in 2021 (50.39252240082388, 34.94176932814512).

The butterflies are mostly found in old, mature forests and parks.

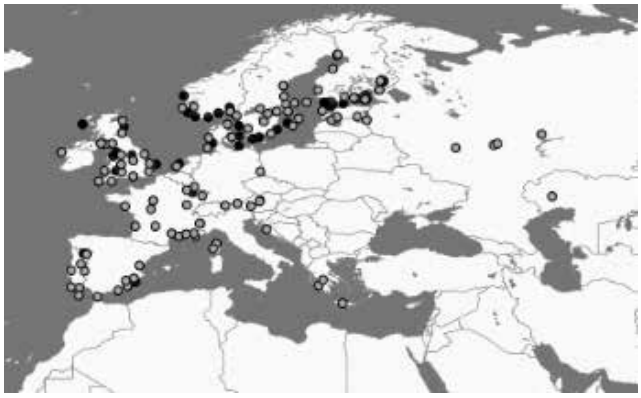

Fig. 10. ***Ph. saxicola*** **registration on GBIF maps**

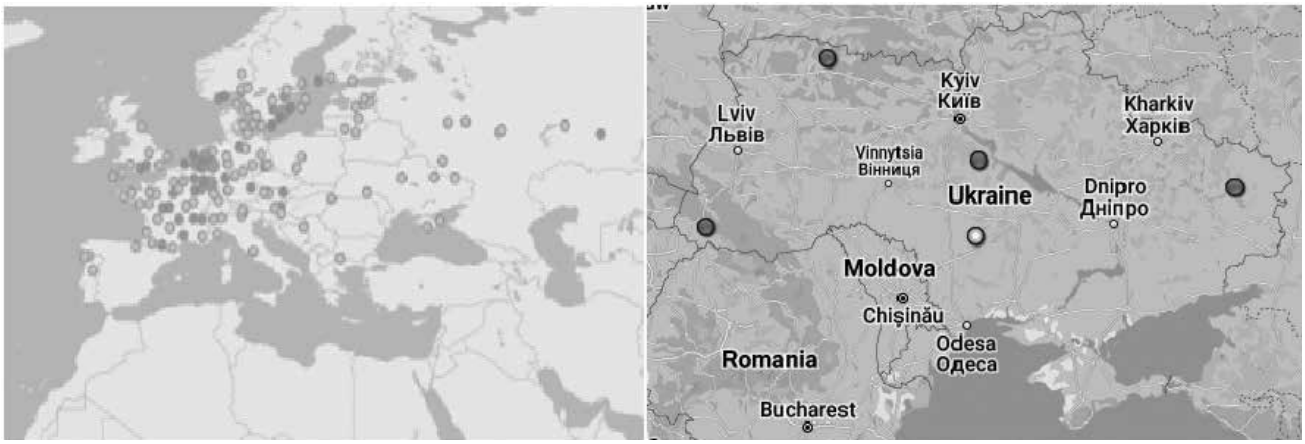

Fig. 11. *E. similella* registration on GBIF and UkrBIN maps

Wingspan is 19–22 mm. They fly from June to July and usually high in trees. Larvae feed on oaks.

Homoeosoma inustella Ragonot, 1884

The species occurs in Spain, France, Italy, Switzerland, Austria, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, North Macedonia, Ukraine, Belarus and Russia, although it is poorly represented on GBIF maps [17–19] (fig. 12).

We recorded 3 specimens in the area of Oleksandrivka village in 2015 (50.44836874433891, 35.500055973861954), and another specimen was recorded near Zhuravne village in 2022 (50.25708417526543, 34.77851935902161). Wingspan is about 20 mm.

Cadra furcatella (Herrich-Schäffer, 1849)

The species is found in Southern Europe, Southern Russia, Turkey, Morocco, Libya, Iran, Afghanistan, Uzbekistan, Turkmenistan, Azerbaijan and Georgia (fig. 13).

We recorded one specimen near Kuzemyn village (50.14225477094884, 34.68502975482776) in 2016.

Chrysocrambus craterella (Scopoli, 1763)

It occurs in southern Europe and the Middle East [17–19] (fig. 14). Two specimens were recorded near

Fig. 12. *H. inustella* registration on GBIF and UkrBIN maps

Fig. 13. *C. furcatella* registration on GBIF and UkrBIN maps

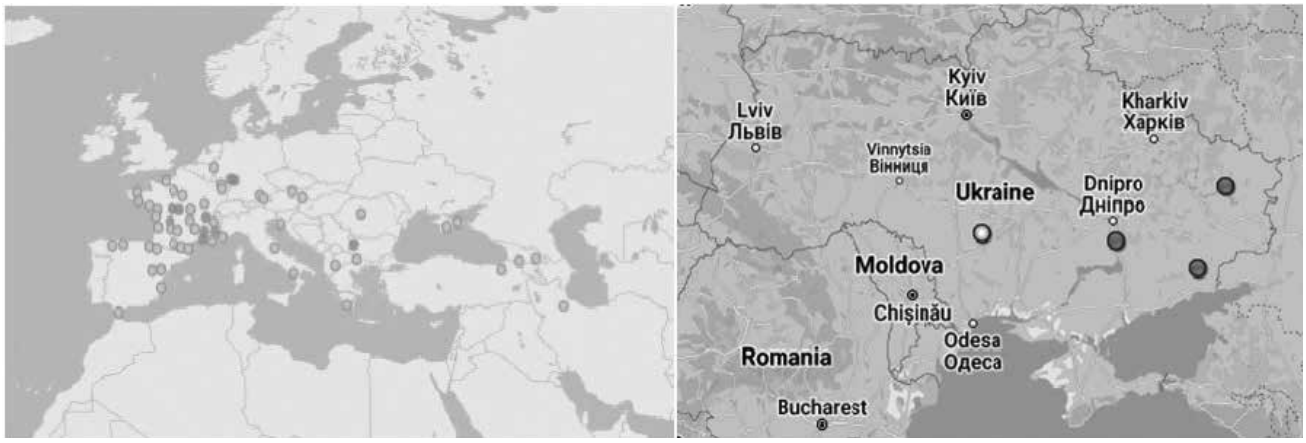

Fig. 14. *Ch. craterellus* registration on GBIF and UkrBIN maps

Podil village (50.14225477094884, 34.68502975482776) in 2019.

Ch. craterellus has a wingspan of about 20 mm. The butterfly flies from June to July. The larvae feed on *Festuca* L. and other cereal species.

It prefers meadows and pastures.

Catoptria mytilella (Hubner, 1805)

The species is found in large parts of Europe (except Ireland, Great Britain, the Netherlands, Denmark, the Baltic region, Portugal), Asia Minor and the North Caucasus. The species is not registered on the UkrBIN website [17–19] (fig. 15).

One specimen was recorded on 19.06.2009 in alder on the edge of a pine forest in Kuzemyn village (50.14225477094884, 34.68502975482776) [8].

Fig. 15. *C. mytilella* registration on GBIF maps

Wingspan is 17–25 mm. Adults fly from mid-June to late July in one generation per year. Larvae probably feed on mosses.

Atralata albofascialis (Treitschke, 1829)

It is found in most of Europe, except Ireland, Great Britain, Norway, Finland, Lithuania and Greece [17–19] (fig. 16).

We recorded one specimen in a meadow area near Velyka Pysarivka (50.426900193375026, 35.422485049718496) on 24.06.2012 [9; 10].

Wingspan is 10–14 mm. Can produce two generations per year.

Larvae feed on Asteraceae plants, in particular *Inula conyza* (Griess.) DC. The caterpillar mines the leaves of the host plant. The mine looks like a large brown spot on the leaf. One mine contains several larvae.

***Pyrausta rectefascialis* Toll, 1936**

The species occurs in central and eastern Europe, it was also recorded in the steppe zone of Ukraine.

Two specimens were recorded in Zhuravne village (50.24134289807154, 34.76729463476857) in 2013.

Pyrausta aerealis (Hübner, 1793)

The species is found in most of Europe (except Portugal, Ireland, Great Britain, Benelux, Norway, Czech Republic, Croatia and Hungary). It has also been recorded in Kyrgyzstan, Kazakhstan, Afghanistan, China, and Algeria [17–19] (fig. 18).

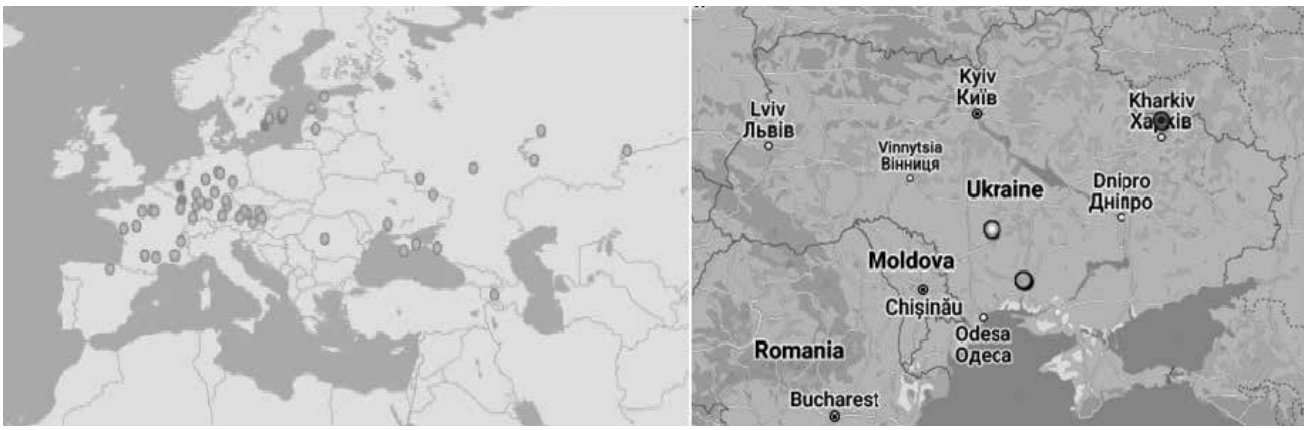

Fig. 16. *A. albofascialis* registration on GBIF and UkrBIN maps

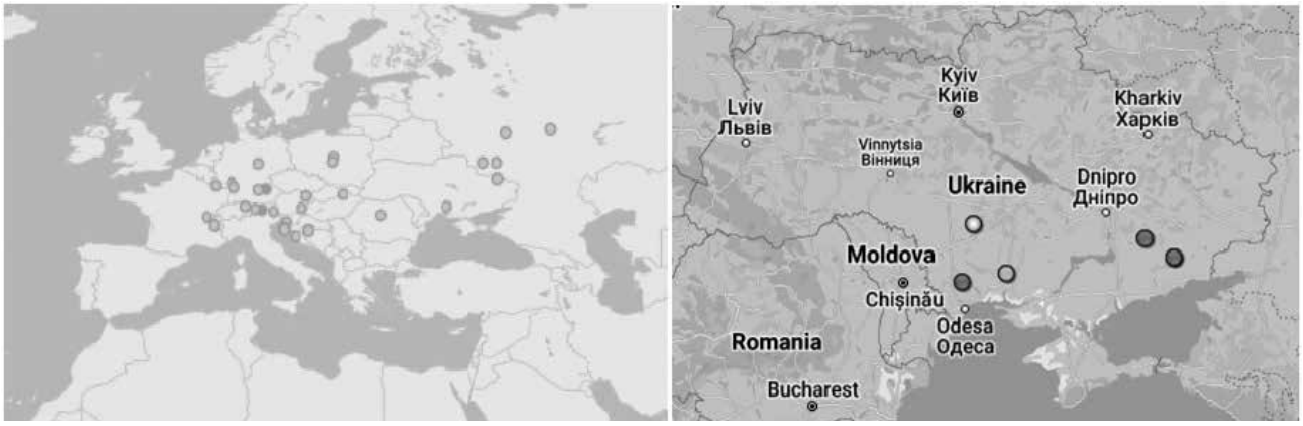

Fig. 17. *P. rectefascialis* registration on GBIF and UkrBIN maps

Fig. 18. *P. aerealis* registration on GBIF and UkrBIN maps

We recorded one specimen in Zhuravne village (50.24134289807154, 34.76729463476857) in 2013.

Wingspan is 18–26 mm. It is known that *P. aerealis* larvae feed on plants such as *Artemisia vulgaris*, *Thymus serpyllum*, *Scrophularia*, *Gnaphalium*, *Helichrysum* and *Thalictrum*.

Results. In total, 120 species of fireflies from 10 subfamilies were found in the Hetmanskyi National Nature Park during the entire period of research. It makes this area one of the most studied in the north-east of Ukraine. Most of these species are widespread in the northeastern forest-steppe of Ukraine.

It should be noted that species from the steppe and Black Sea regions are being recorded increasingly in Sumy region. Species native to more southern regions of Ukraine may be expanding their range due to climate change.

In general, the species composition of fire flies on the territory of the Park has been studied unevenly so these results do not reflect the full picture of fire flies fauna of the Park and require further research.

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