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RESULTS OF FIREFLY MOTHS FAUNA (LEPIDOPTERA, PYRALOIDEA) RESEARCH IN THE NATURAL RESERVE «MYKHAILIVSKA TSILYNA» IN 2022

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Until 2002, studies of the nocturnal Lepidoptera fauna in the Nature Reserve «Mykhailivska Tsilyna» were fragmentary and the species composition of certain butterflies groups has not yet been studied. In addition to the bombicoid complex butterflies only the fauna of Pyraloidea superfamily has been studied in detail in the territory of the Reserve. So far, various publications contain information about 112 species of this superfamily butterflies from the territory of the Reserve.

In total, 55 species of firefly moths from 2 families and 8 subfamilies were identified in the Reserve territory in 2022. For the first time for Sumy region, 2 species of firefly moths were registered (Clasperopsis fumella (Eversmann, 1844) and Acrobasis sodalella Zeller, 1848) which were previously registered only in the south of Ukraine.

The fauna of firefly moths in the territory of the Reserve has been studied quite completely. For now it is one of the most complete lists in the northeastern Ukraine.

In order to analyze the influence of the types of plant communities on the fauna, the lists of firewood species found in the territory of the reserve were compared with those in other well-studied areas of the Sumy region. The data obtained indicate a small share of steppe component in the fauna of the firefly moths of the «Mykhailivska Tsilyna» Reserve. Despite the obvious «forest» features of the firefly moths fauna, the Reserve remains a place where their diversity is observed.

The work planned in the Reserve's territory management project to reduce tree growth is likely to reduce biodiversity in this area. At the same time, further overgrowth of the steppe will reduce the number of butterfly species whose development is associated with steppe vegetation.

In our opinion, it is necessary to prevent and/or stop further afforestation of the protected area. It is also possible to contribute to the preservation of diversity, for example, by periodically mowing the steppe areas that are still preserved; moderating livestock grazing; reintroducing to the territory of the wild population of large ungulates with the creation of conditions for their living, etc.

***Key words**: fauna, Lepidoptera, firefly moths, Nature Reserve «Mykhailivska Tsilyna».*

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РЕЗУЛЬТАТИ ДОСЛІДЖЕНЬ ФАУНИ ВОГНІВОК (LEPIDOPTERA, PYRALOIDEA) У ПРИРОДНОМУ ЗАПОВІДНИКУ «МИХАЙЛІВСЬКА ЦИНА» У 2022 РОЦІ

Дослідження фауни нічних лускокрилих природного заповідника «Михайлівська цілина» до 2002 р. носили фрагментарний характер, при чому видовий склад окремих груп метеликів ще й досі залишається недослідженим. Крім метеликів бомбікоїдного комплексу, на території заповідника детально досліджено фауну лише представників

надродини Вогнівки. Натепер в різних публікаціях є відомості про 112 видів метеликів цієї надродини на території заповідника.

В ході польових досліджень 2022 року зареєстровано 55 видів вогнівок з двох родин. У статті представлений їх список. Вперше для Сумської області зареєстровано 2 види вогнівок: Clasperopsis fumella (Eversmann, 1844) та Acrobasis sodalella Zeller, 1848, які раніше реєстрували лише на півдні України. На сьогодні даний список є одним із найповніших на північному сході України.

Для аналізу впливу типів рослинних угрупувань на фауну порівнювали списки видів вогнівок, знайдених на території заповідника з такими на інших добре вивчених територіях Сумської області. Отримані дані свідчать про невелику частку степового компоненту в фауні вогнівок заповідника «Михайлівська цілина». Не зважаючи на явні «лісові» риси фауни вогнівок заповідник залишається місцем, де спостерігається їх високе розмаїття.

Заплановані в проекті організації території заповідника роботи по зменшенню порості дерев вірогідно призведе до зменшення біорізноманіття на цій території. В той же час подальше заростання степу знизить чисельність видів метеликів, розвиток яких пов'язаний зі степовою рослинністю.

На нашу думку, необхідно запобігти та/або припинити подальше заліснення заповідної території. Збереженню різноманіття також можливо сприяти наприклад, шляхом періодичного скошування степових ділянок, які ще збереглися; помірний випас худоби; реінтродукція на територію дикої популяції великих копитних тварин із створенням умов для їх проживання тощо.

Ключові слова: *фауна, лускокрилі, вогнівки, природний заповідник «Михайлівська цілина».*

Pyraloidea superfamily unites small and medium-sized butterflies with a wingspan of 7 to 50 mm. Most species caterpillar feed on the tissues of various living plants; saprophagia is also quite common. Caterpillar and butterflies are an essential part of the diet of many invertebrates and vertebrates species. It is known that about 25% of these lepidopteran species are pests of cultivated plants, food supplies (flour, cereals, dried fruits, etc.), seed and fodder grains, forest plantations, beekeeping products, etc. At the same time, thanks to its diversity and wide distribution, firefly moths are an integral and important component of biocenoses.

In total, about 850 species of firefly moths from 13 subfamilies are listed for Europe, and for its middle part – more than 400 species [5-8].

Cataloging of the firefly moths fauna in Ukraine continues, certain changes are observed, which are probably related to climatic changes [1, 9-11].

Until 2002, studies of the nocturnal Lepidoptera fauna of the Nature Reserve «Mikhailivska Tsilina» (hereinafter referred to as the Reserve) were fragmentary. Thus some butterflies species composition still remains unstudied. In addition to the butterflies of the bombicoid complex, only the fauna of firefly moths superfamily has been studied in detail in the Reserve. These studies of firefly moths species composition began in 2002 and continues until now [4]. The paper presents a general list of registered species and the results of firefly moths study in 2022.

The aim of the work according to the programme of the research laboratory «Animal and Plant Populations Monitoring in Sumy Region» is to continue the Lepidopteran fauna study on the nature reserve territory.

MATERIALS AND METHODS

Firefly moths was collected during three expedition trips: 13-15 of July, 2022 in Velyki Luky village on the steppe area near the reserve field office (50°44′44″ N, 34°9′48″ E), 29-31 of July and 27-28 of August, 2022, on another part of virgin steppe (50°44'53.7"N, 34°10'55.7"E). A standard method of catching insects by light was used: with the onset of dusk, 1-2 arc-mercury lamps of 250 W were turned on, fixed at a height of 2-2.5 m from the soil surface against the background of white screens. Caught butterflies were immediately placed in stains filled with ethyl acetate. At night before dawn, the lights were turned off. Insects were mounted on entomological needles or placed in mattresses for further identification.

Butterflies were also collected by hand in places where adults spend the day. This method found some species that did not fly to the light.

Identification of species was carried out by external morphological features, in particular the wing pattern, as well as preparations of the genital apparatus.

The list of firefly moths is arranged according to the accepted family system with some changes [3].

RESULTS AND DISCUSSION

In total, in 2022, 367 firefly moths were registered on the Reserve territory.

In total, 55 species of firefly moths from 2 families and 8 subfamilies were identified. A generalized list of firefly moths registered on the Reserve territory in 2022 is below. The number of caught individuals is indicated in in parentheses.

Superfamily Pyraloidea

Family Pyralidae

Subfamily Galleriinae

1. *Aphomia zelleri* (Joannis, 1932) – 13-15.VII.2022 (5);
2. *Lamoria anella* (Denis & Schiffermüller, 1775) – 13-15.VII.2022 (1); 29-31.VII.2022 (7);

Subfamily Pyralinae

3. *Pyralis farinalis* (Linnaeus, 1758) – 29-31.VII.2022 (1);
4. *Hypsopygia costalis* (Fabricius, 1775) – 13-15.VII.2022 (23);
5. *Hypsopygia glaucinalis* (Linnaeus, 1758) – 13-15.VII.2022 (1);
6. *Endotricha flammealis* (Denis & Schiffermüller, 1775) – 13-15.VII.2022 (3);

Subfamily Phycitinae

7. *Clasperopsis fumella* (Eversmann, 1844) – 13-15.VII.2022 (1);
8. *Sciota rhenella* (Zincken, 1818) – 13-15.VII.2022 (1); 29-31.VII.2022 (7);
9. *Sciota hostilis* (Stephens, 1834) – 13-15.VII.2022 (1);
10. *Sciota adelphella* (Fischer v. Roslerstamm, 1836) – 13-15.VII.2022 (4); 27.VIII.2022 (2);
11. *Etiella zinckenella* (Treitschke, 1832) – 27.VIII.2022 (5);
12. *Laodamia faecella* (Zeller, 1839) – 13-15.VII.2022 (3); 29-31.VII.2022 (1);

13. *Nephopterix angustella* (Hübner, 1796) – 29-31.VII.2022 (2);
14. *Acrobasis sodalella* Zeller, 1848 – 29-31.VII.2022 (2);
15. *Acrobasis obtusella* (Hübner, 1796) – 29-31.VII.2022 (7);
16. *Glyptoteles leucacrinella* Zeller, 1848 – 13-15.VII.2022 (11); 29-31.VII.2022 (2);
17. *Myelois circumvoluta* (Fourcroy, 1785) – 13-15.VII.2022 (2); 29-31.VII.2022 (6);
18. *Nyctegretis lineana* (Scopoli, 1786) – 13-15.VII.2022 (4);
19. *Nyctegretis triangulella* Ragonot, 1901 – 13-15.VII.2022 (4); 29-31.VII.2022 (3);
20. *Homoeosoma inustella* Ragonot, 1884 – 29-31.VII.2022 (6);
21. *Homoeosoma nebulella* (Denis & Schiffermüller, 1775) – 27.VIII.2022 (12);
22. *Phycitodes binaevella* (Hübner, 1813) – 29-31.VII.2022 (6);
23. *Phycitodes lacteella* (Rothschild, 1915) – 27.VIII.2022 (7);
24. *Phycitodes albatella* (Ragonot, 1887) – 13-15.VII.2022 (1);
25. *Cadra furcatella* (Herrich-Schäffer, 1849) – 27.VIII.2022 (1);

Family Crambidae

Subfamily Scopariinae

26. *Scoparia pyralella* (Denis & Schiffermüller, 1775) – 13-15.VII.2022 (28); 29-31.VII.2022 (2);
27. *Scoparia ingratella* (Zeller, 1846) – 13-15.VII.2022 (24);
28. *Eudonia lacustrata* (Panzer, 1804) – 13-15.VII.2022 (1);
29. *Eudonia mercurella* (Linnaeus, 1758) – 19-21.VII.21 (2); 29-31.VII.2022 (22);

Subfamily Crambinae

30. *Euchromius ocellea* (Haworth, 1811) – 27.VIII.2022 (1);
31. *Chrysoteuchia culmella* (Linnaeus, 1758) – 13-15.VII.2022 (1);
32. *Crambus pascuella* (Linnaeus, 1758) – 13-15.VII.2022 (1); 29-31.VII.2022 (4);
33. *Crambus lathoniellus* (Zincken, 1817) – 13-15.VII.2022 (6);
34. *Crambus perlella* (Scopoli, 1763) – 29-31.VII.2022 (1);
35. *Agriphila tristella* (Denis & Schiffermüller, 1775) – 29-31.VII.2022 (3); 27.VIII.2022 (4);
36. *Agriphila straminella* (Denis & Schiffermüller, 1775) – 29-31.VII.2022 (12);
37. *Agriphila poliellus* (Treitschke, 1832) – 29-31.VII.2022 (3); 27.VIII.2022 (4);
38. *Catoptria falsella* (Denis & Schiffermüller, 1775) – 13-15.VII.2022 (4); 27.VIII.2022 (1);
39. *Pediasia luteella* (Denis & Schiffermüller, 1775) – 13-15.VII.2022 (6); 29-31.VII.2022 (4);
40. *Pediasia contaminella* (Hübner, 1796) – 13-15.VII.2022 (1);

Subfamily Acentropinae

41. *Cataclysta lemnata* (Linnaeus, 1758) – 13-15.VII.2022 (2);

Subfamily Pyraustinae

42. *Loxostege sticticalis* (Linnaeus, 1761) – 13-15.VII.2022 (230); 29-31.VII.2022 (150); 27.VIII.2022 (300);
43. *Ecpyrrhorrhoe rubiginalis* (Hübner, 1796) – 29-31.VII.2022 (8); 27.VIII.2022 (4);
44. *Pyrausta rectefascialis* Toll, 1936 – 29-31.VII.2022 (1); 27.VIII.2022 (3);
45. *Pyrausta sanguinalis* (Linnaeus, 1767) – 13-15.VII.2022 (11); 29-31.VII.2022 (6);
46. *Pyrausta aurata* (Scopoli, 1763) – 13-15.VII.2022 (2); 29-31.VII.2022 (26);
47. *Sitochroa verticalis* (Linnaeus, 1758) – 13-15.VII.2022 (2); 29-31.VII.2022 (3);
48. *Anania lancealis* (Denis & Schiffermüller, 1775) –13-15.VII.2022 (1);
49. *Anania coronata* (Hufnagel, 1767) – 13-15.VII.2022 (1);
50. *Anania hortulata* (Linnaeus, 1758) – 13-15.VII.2022 (5);
51. *Ostrinia nubilalis* (Hübner, 1796) – 13-15.VII.2022 (11); 29-31.VII.2022 (2);
52. *Paratalanta hyalinalis* (Hübner, 1796) – 13-15.VII.2022 (5);

Subfamily Spilomelinae

53. *Patania ruralis* (Scopoli, 1763) – 13-15.VII.2022 (4); 29-31.VII.2022 (2); 27.VIII.2022 (2);
54. *Mecyna flavalis* (Denis & Schiffermüller, 1775) – 13-15.VII.2022 (3); 27.VIII.2022 (6);
55. *Nomophila noctuella* (Denis & Schiffermüller, 1775) – 27.VIII.2022 (2).

Currently, according to various publications, the firefly moths fauna of the Reserve includes 112 species [2].

The analysis of the ratio of dendrobiont species (caterpillar development is associated with tree and shrub vegetation) to representatives of other ecological groups of these moths shows the predominance of the latter. However, if we remove from the general list of species those whose development has not yet been sufficiently studied (in particular, those with unknown attachments to forage plants), species whose caterpillars are detritophages, saprophages, lichenophages and bryophages, species associated with different types of aquatic vegetation, and species recorded extremely irregularly (they can be considered a migrants), there is a clear dominance of moth species not associated with steppe and meadow vegetation.

To further analyse the impact of changes in the Reserve's plant communities (overgrowth of the territory with shrubs and trees) on the moths fauna, we compared the lists of species of these moths in the Reserve and in other well-studied areas of Sumy region: the biological station of Sumy State Pedagogical University named after A.S. Makarenko «Vakalivshchyna» (51.03572808790789, 34.92658605843207), the national nature park «Getmanskyi» and the national nature park «Desniansko-Starohutskyi». The degree of uniqueness (similarity) was calculated using the Jaccard coefficient (J), which shows the distance (uniqueness) between samples. The highest similarity value was found between the Reserve and

the biological station «Vakalivshchyna» (j = 0.81). The lower coefficient values were found between the Reserve and national parks «Getmanskyi» (j = 0.72) and «Desniansko-Starohutskyi» (j = 0.54).) In general, these indicators of similarity to forest and forest-meadow habitats are extremely high.

Comparison of species lists of these territories based on the calculations of the Chekanovsky-Sorensen coefficient (Q) shows the following indicators of sample uniqueness: Q (Reserve – the biological station «Vakalivshchyna») = 0.92, q (Reserve – national park «Getmanskyi») = 0.84, q (Reserve – national park «Desniansko-Starohutskyi») = 0.7. These calculations confirm the high affinity of the species composition of the Reserve's firefly moths with forest and forest-meadow habitats.

Despite the obvious «forest» features of the firefly moths fauna, the Reserve remains a place where their diversity is observed. For example, our studies in agro-landscapes, the area of which is constantly increasing in Sumy region, reveal from 20 to 40 species, depending on the nature of the agrocenosis, the presence of forest belts, water bodies, etc.

The works planned in the project for the organisation of the Reserve's territory to reduce tree growth (removal of forest belts) are likely to reduce biodiversity, including firefly moths, in the area. At the same time, further overgrowth of the steppe will reduce the number of butterfly species whose development is associated with steppe vegetation. In our opinion, it is necessary to prevent and/or stop further afforestation of the protected area. This can be done by periodically mowing the steppe areas that are still preserved; moderate grazing of cattle; reintroducing a wild population of large ungulates into the territory with the provision of conditions for their habitat; periodic controlled burning of certain areas in autumn. However, unfortunately, the current environmental legislation prohibits the use of all of the above methods in nature reserves.

CONCLUSIONS

In total, 55 species of firefly moths from 2 families and 8 subfamilies were identified on the Reserve territory in 2022. For the first time 2 species of firefly moths were registered (*Clasperopsis fumella* and *Acrobasis sodalella*) which were previously registered only in the south of Ukraine.

The fauna of firefly moths on the territory of the Reserve has been studied quite completely. For now it is one of the most complete lists in the northeastern Ukraine.

The obtained data indicate a small share of steppe component in the fauna of the Reserve. Despite the obvious “forest” features of the firefly moths fauna, the Reserve remains a place where their diversity is observed.

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