NEW AND RARE DIURNAL BUTTERFLIES (LEPIDOPTERA: PAPILIONOIDEA) FROM THE “COBÎLENI” NATURAL RESERVE (REPUBLIC OF MOLDOVA)

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Abstract. In the present paper data on seven rare species of diurnal butterflies (Lepidoptera: Papilionoidea) in the fauna of the “Cobîleni” Natural Reserve (Orhei district) are given. The investigations were carried out during 2012-2020 in different habitats of the Reserve: like forest, forest edge, meadows and calcareous canyons. The species *Nymphalis xanthomelas* (Esper, 1781) and *Papilio machaon* (Linnaeus, 1758) are reported as new for the fauna of the “Cobîleni” Natural Reserve. Thus, the number of diurnal butterflies in the fauna of the “Cobîleni” Natural Reserve reached 64 species.

Introduction

In the Republic of Moldova, nature reserves are protected areas, which represent natural spaces, valuable from a scientific point of view, intended to preserve and restore one or more components of nature to maintain ecological balance. According to Law no. 1538 of 25.02.1998 on the fund of natural areas protected by the state, 51 forest reserves, 9 medicinal plants and 3 mixed ones are registered, in total 63 nature reserves with a total area is 8,009 ha, one of them being and the “Cobîleni” Natural Reserve [7].

Despite of small territory (33.5 ha), the “Cobîleni” Natural Reserve includes many types of biotopes such as landscapes of flooded meadows, mixed forests and limestone rocks. The rock forest, specific to the steep slopes of the Dniester valley, are dominated by *Quercus robur* and *Fraxinus excelsior* species.

The study of Lepidoptera fauna in the „Cobîleni” Natural Reserve started in 2012. Until then, the entomological fauna of the reserve has not been researched. So far, 298 species of diurnal butterflies and moths have been reported on the territory of the reserve [10, 11, 12, 14]. Faunal diversity of diurnal butterflies in the reserve consists of 62 species belonging to 39 genera and taxonomic 6 families: Hesperidae (6 species), Pieridae (10), Papilionidae (2), Nymphalidae (19), Riodinidae (1) and Lycaenidae (24 species) [10].

During the research, several new lepidopteran species for the fauna of the Republic of Moldova were reported in the “Cobîleni” Natural Reserve such as *Acontia candefacta* (Hübner, 1831), *Eucarta amethystina* (Hübner, 1803), *Cucullia fraterna* Butler, 1878, *Chersotis margaritacea* (Villers, 1789), *Ch. rectangula* (Denis & Schiffermüller, 1775), *Euxoa cos* (Hübner, 1824), *E. birivia* (Denis & Schiffermüller, 1775), *Noctua tertia* Mentzer & al., 1991, *Dasypolia templi* (Thunberg, 1792) and *Aedophron rhodites* (Eversmann, 1851) [11-14]. Many of the reported species are endangered and protected by law both in Europe and Republic of Moldova, being cited in various Red Lists as well Habitats Directive (Annex II and IV), Bern Convention, European Red List of Butterflies, Red Book of the Republic of Moldova, etc.

The purpose of the study was to identify the faunal diversity of rare diurnal butterflies on the territory of the “Cobîleni” Natural Reserve.

Materials and methods

The study was conducted in the “Cobîleni” Natural Reserve (47°30′51″N, 29°1′20,37″E) of the Republic of Moldova, which is taken under protection since 1998. The Reserve belongs to the Forest District Susleni, of State Forestry Enterprise Orhei [8]. The “Cobîleni” Natural Reserve is a natural forest area with a surface of 33.5 ha, situated near Lopatna village, Orhei district on the bank of the Dniester River.

According to the geomorphological regionalization, the Reserve is located on the west Dniester's hills and its terraces, at 250-300 m altitude, characterized by a vertical fragmentation. Flooded meadows, mixed forests and limestone rocks, specific to the steep slopes of the Dniester valley, covered by *Quercus robur* and **Fraxinus excelsior**, represent the studied Reserve.

There are also ephemeral and ephemeroid plants growing under the shade of the trees – *Convallaria majalis*, *Anemone ranunculoides*, *Ficaria verna*, but especially of rare species: *Fritillaria montana*, *Lunaria annua* and *Galanthus nivalis*. Numerous species of ferns, mosses, lichens (*Cladonia pyxidata*, *C. fimbriata*, etc.) and some angiosperms are growing on the limestone rocks in the Dniester valley, which, combined, create a mosaic, similar to that of the mountainous areas [1]. The vegetation of steep section in the middle part of the Reserve, exposed to the east, consist of *Stipa pulcherrima*, *Amygdalus nana*, *Rhamnus cathartica*, *Thalictrum minus*, *Silene fabaria*, etc.

The research was carried out during the vegetation period of 2012-2020. The entomological material were collected in different habitats of the “Cobîleni” Natural Reserve like forest, forest edge, meadows and calcareous canyons.

Collecting of diurnal butterflies was done with entomological net, manually, or only photos were taken for rare species. For species identification we have used the work by L. Rakosy [9].

Results and discussions

During the research seven species of diurnal butterflies rare in the fauna of the Republic of Moldova, have been reported in “Cobîleni” Natural Reserve taxonomically classified in five families: Nymphalidae – 2 species, Lycaenidae – 1, Riodinidae – 1, Papilionidae – 2 and Pieridae – 1 species. Of these, all species are included in the Red Book of the Republic of Moldova [2], one species are mentioned in the Habitats Directive (Annex IV) [5], one species is cited in the Bern Convention [4] and another three species – in the European Red List of Butterflies [3]. The species *Polyommatus daphnis* are included in the IUCN Red List (LC category) for Europe [6].

The species *Nymphalis xanthomelas* (Esper, 1781) and *Papilio machaon* (Linnaeus, 1758) represent new taxa for the fauna of the “Cobîleni” Natural Reserve. The species are protected by law, included in the European Red List of Butterflies and in the Red Book of the Republic of Moldova.

In the list of butterflies shown below, we mention the most important rare species, their records, some ecological and distribution data as well the conservation status.

Family NYMPHALIDAE

1. *Neptis sappho* (Pallas, 1771) (fig. 1, a)

Collected material: July 20, 2016, 1 spec.

Geographical spread: it is spread in temperate zone of Eurasia.

Ecological preferences: meadows and humid forest edges.

Protection and conservation: the species is protected by law, included in European Red List of Butterflies and in the Red Book of the Republic of Moldova.

2. *Nymphalis xanthomelas* (Esper, 1781)

Collected material: June 24, 2016, 1 spec.

Geographical spread: it is spread in temperate zone of Eurasia.

Ecological preferences: meadows and moist forest edges, especially those in the flood-plains.

Protection and conservation: the species is protected by law, included in European Red List of Butterflies and in the Red Book of the Republic of Moldova.

Family LYCAENIDAE

3. *Polyommatus daphnis* (Denis & Schiffermüller, 1775) (fig. 1, b)

Collected material: May 28, 2017, 3 specs.

Geographical spread: it is spread in Europe and to the east of the Black Sea, including Iran.

Ecological preferences: sunny and dry meadows, with a large amount of florigenic vegetation on the limestone slopes; rich pastures and soil containing limestone.

Protection and conservation: the species is protected by law, included in the IUCN Red List (LC category) for Europe and in the Red Book of the Republic of Moldova.

Family RIODINIDAE

4. *Hamearis lucina* (Linnaeus, 1758) (fig. 1, c)

Collected material: July 12, 2012, 5 specs.; July 08, 2014, 8 specs.

Geographical spread: it is spread in Central and Southern Europe and Asia Minor.

Ecological preferences: meadows and forest edges.

Protection and conservation: the species is protected by law, included in the Red Book of the Republic of Moldova.

Family PAPILIONIDAE

5. *Zerynthia polyxena* (Denis & Schiffermüller, 1775) (fig. 1, d)

Collected material: the species was observed in all years of research in May.

Geographical spread: it is spread in Central, South and South-Eastern Europe, Western Caucasus and Asia Minor.

Ecological preferences: shrubberies, orchards, agricultural fields.

Protection and conservation: the species is protected by law, included in the Annex II of the Berne Conventions, 1979; the Annex IV of Habitats Directive and in the Red Book of the Republic of Moldova.

6. *Papilio machaon* (Linnaeus, 1758)

Collected material: the species was observed in all years of research in May.

Geographical spread: it is spread in Europe, Asia, North Africa, North America, including some tropical regions.

Ecological preferences: open biotopes – meadows, sectors of steppe vegetation, groves.

Protection and conservation: the species is protected by law, included in the Red Book of the Republic of Moldova.

Family PIERIDAE

7. *Leptidea morsei* (Fenton, 1882)

Collected material: June 06, 2012, 2 specs.; July 02, 2014, 1 spec.

Geographical spread: it is spread in Eastern Europe, temperate Asia, Sakhalin Island and Japan.

Ecological preferences: humid meadows and shady forest roads.

Protection and conservation: the species is protected by law, included in European Red List of Butterflies and in the Red Book of the Republic of Moldova.

Figure 1. The species of diurnal butterflies reported in „Cobîleni” Natural Reserve: a – *Neptis sappho*, b – *Polyommatus daphnis*, c – *Hamearis lucina*, d – *Zerynthia polyxena* (orig.).

Conclusions

So far, 62 species of diurnal butterflies have been identified in the „Cobîleni” Natural Reserve. The species *Nymphalis xanthomelas* (Esper, 1781) and *Papilio machaon* (Linnaeus, 1758) represent new taxa for the reservation's fauna. Thus, the number of diurnal butterflies in the fauna of the „Cobîleni” Natural Reserve reached 64 species.

The species *Zerynthia polyxena* (Denis & Schiffermüller, 1775), *Polyommatus daphnis* (Denis & Schiffermüller, 1775), *Neptis sappho* (Pallas, 1771), *Nymphalis xanthomelas* (Esper, 1781), *Hamearis lucina* (Linnaeus, 1758), *Papilio machaon* (Linnaeus, 1758) and *Leptidea morsei* (Fenton, 1882) are endangered and require protection and conservation.

The large number of rare and new species proves that the „Cobîleni” Natural Reserve represents an area of particular importance for the conservation of biological diversity, and research in Reserve needs to be continued.

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Bibliography

1. Begu Ad., Begu A. Rezerve de extindere a rezervației naturale „Cobîleni” In: Buletin Științific. Revistă de Etnografie, Științele Naturii și Muzeologie. Vol. 2 (15). Serie nouă. Fascicula Științele Naturii. Chișinău, 2005, p. 22-24.
2. Cartea Roșie a Republicii Moldova. Ediția a 3-a. Chișinău: Știința, 2015. 492 p.
3. Chris van Swaay, Annabelle Cuttelod, Sue Collins et al. European Red List of Butterflies. Luxembourg: Publications Office of the European Union, 2010, 47 p.
4. Convention on the Conservation of European Wildlife and Natural Habitats. ETS/STE 104 – Bern Convention / Convention de Berne (Appendix/Annexe III), November, 1979.
5. Directiva Habitata. Disponibil pe: [https://eur-lex.europa.eu/legal-content/ EN/TXT/?uri=CELEX:01992L0043-20070101](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01992L0043-20070101)
6. IUCN. Red List of Threatened Species. Disponibil pe: <https://www.iucnredlist.org>.
7. Legea nr. 1538 din 25.02.1998 privind fondul ariilor naturale protejate de stat.
8. Postolache Gh., Lazu Ș. Ariile naturale protejate din Moldova. Rezervații Silvice. 2018, 3: 212 pp.
9. Rakosy L. Fluturii diurni din România. Cunoaștere, protecție, conservare. Cluj-Napoca, Editura MEGA, 2013. p. 192-193.
10. Țugulea (Hacina) Cr., Derjanschi V. Fauna diversity of diurnal butterflies (Lepidoptera, Rhopalocera) from the Natural Forest Reserve „Cobîleni”. In: Actual problems of protection and sustainable use of the animal world diversity: 8-th Intern Conf. of Zoologists, 10-12.08.2013, Chișinău, 2013, p. 134-136.
11. Țugulea C., Mocreac N., Țugulea A. The fauna of Geometrid Moths of the Natural Forest Reserve “Cobîleni” of the Republic of Moldova - preliminary data. In: Travaux du Muséum National d’Histoire Naturelle “Grigore Antipa”, 2021, 64(1), p. 101-114.
12. Țugulea C. Contribution to the knowledge of the Lepidoptera fauna (Insecta) of the Nature Forest Reserve „Cobîleni”. In: IX-th International Conference of zoologists „Sustainable use, protection of animal word and forest management in the context of climate change”, October 12-13, 2016. Chișinău, 2016, p. 286-288.
13. Țugulea C. Specii noi de Noctuide (Lepidoptera, Noctuidae) în fauna Republicii Moldova. In: International symposium „Actual problems of zoology and parasitology: Achievements and prospects”, October 13, 2017. Chișinău, 2017, p. 347.
14. Țugulea C. Spectrul faunistic al noctuidelor (Lepidoptera, Noctuidae) semnalate în s. Lopatna (Orhei) în anul 2016. In: Materialele Conferinței științifice a doctoranzilor (cu participare internațională) „Tendințe contemporane ale dezvoltării științei: viziuni ale tinerilor cercetători”: Ediția a 7-a. Chișinău, 2018, p. 215-224