

CONTRIBUTION TO THE KNOWLEDGE OF THE BUTTERFLY FAUNA (INSECTA: LEPIDOPTERA) FROM APUSENI NATURAL PARK

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ABSTRACT

*This paper presents a checklist of the butterfly fauna from the Apuseni Natural Park. The study aimed to inventory the fauna of Lepidoptera and their distribution in the park. In the investigated area, a number of 56 species of Lepidoptera were recorded. The research study of butterfly species in the southeastern area of the Apuseni Natural Park was realized over two years (2021 and 2022). In the researched area, the following species protected by European and/or National Legislation were identified: *Parnassius mnemosyne*, *Neptis sappho*, *Euphydryas maturna* and *Euplagia quadripunctaria*. Threats to some populations of butterflies were reported, predominantly the loss of preferential habitats. Several measures have been proposed for the conservation of the Lepidoptera species including maintaining preferential habitats, mowing meadows at the right time and moderate grazing of animals.*

KEY WORDS: *Lepidoptera, protected species, biodiversity, conservation, Apuseni Natural Park*

INTRODUCTION

Butterflies (Insect: Lepidoptera) have a fundamental role in an ecosystem, participating in the reproduction of plants, constituting a food source for insectivorous animals, and, last but not least, acting as bioindicators of environmental quality. The diversity of Lepidoptera species is directly proportional to the diversity of plants in a habitat.

The aim of this study was to provide important information concerning the inventory and distribution of Lepidoptera encountered in the southeastern area of the Apuseni Natural Park.

MATERIAL AND METHODS

In the period June-August 2021 and June 2022, an inventory study of Lepidoptera species was made in the South-East area of the Apuseni Mountains.

Apuseni Natural Park, located in the Central-North-West of the Apuseni Mountains in Romania, is one of the most important protected areas at national level. The location where we performed this study on butterflies was Alba Country and the investigated area was represented on the maps (Figures 1 and 2).



FIGURE 1. Geographical location of the Apuseni Natural Park

(Sources: <https://earth.google.com/download-earth.html>; <https://www.qgis.org/en/site/>)



FIGURE 2. Geographical location of the investigated area from Apuseni Mountains (color: yellow)

For those species of butterflies for which determination was not possible in the field, the methods of collection and preparing genitalia were used. The butterflies have been collected with the entomological net.

During the fieldwork, photos were taken with the camera (Nikon D3100, DSLR, Sigma 18-250 mm. F3.5-6.3 DC Macro OS HSM lens). For the taxonomy and correct identification of Lepidoptera species, scientific determinants and books specific for this group of insects were used (Lafranchais, 2004; Tolman & Lewington, 2009; Rákósy *et al.* 2003; Tatole *et al.* 2009; Rákósy, 2013; Iorgu *et al.* 2015; Rákósy & Goia, 2021; Wiemers *et al.* 2018).

As regards the conservation status of the identified species of Lepidoptera, European and National Legislation (Habitats Directive 92/43/EEC; Government Emergency Ordinance 57/2007; Romanian Law 49/2011) and the Romanian Red List of Lepidoptera (Rákósy *et al.* 2021) were used.

The research carried out in the Apuseni Natural Park was focused on the study of protected species of butterflies and especially on day species.

RESULTS AND DISCUSSION

In the investigated area, 56 species of Lepidoptera were recorded and classified in 6 families: Hesperidae, Papilionidae, Pieridae, Lycaenidae, Nymphalidae and Erebididae (table 1). More than half of the species belong to the Nymphalidae family.

The preferential habitat type for butterflies was represented by meadows. A number of 15 species were found at the edge of the forest and two species (*Limenitis camilla* and *Euplagia quadripunctaria*) were found on the edge of the streams, where there were host plants.

The species *Euphydryas maturna* was found damaged on the road. The presence of this species in the investigated area is uncertain, because in this location the host species for larva, ash (*Fraxinus excelsior*), is especially rare.

Taking into account the European and National conservation status of butterflies, four of the species in the Apuseni Natural Park are protected. These are *Parnassius mnemosyne*, *Neptis sappho*, *Euphydryas maturna* and *Euplagia quadripunctaria*.

Parnassius mnemosyne (figure 3) is a species of Community interest. It is protected according to Annex II of the Habitats Directive 92/43/CEE and Annex 4A of Romanian Law 49/2011 which was approved by Government Emergency Ordinance 57/2007.

Neptis sappho (figure 4) is protected according to Annex 4B (species of national interest) of Romanian Law 49/2011 which was approved by Government Emergency Ordinance 57/2007.

Euphydryas maturna (figure 5) is a species of Community interest. It is protected according to Annex II of the Habitats Directive 92/43/CEE, Annexes 3 and 4A of Romanian Law 49/2011 which was approved by Government Emergency Ordinance 57/2007.

Euplagia quadripunctaria (figure 6) is a species of Community interest. It is protected according to Annex II of the Habitats Directive 92/43/CEE and Annex 3 of Romanian Law 49/2011 which was approved by Government Emergency Ordinance 57/2007.

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FIGURE 3. *Parnassius mnemosyne*
(Photo: Claudia Covaciu)



FIGURE 4. *Neptis sappho*
(Photo: Claudia Covaciu)



FIGURE 5. *Euphydryas maturna*
(Photo: Claudia Covaciu)



FIGURE 6. *Euplagia quadripunctaria*
(Photo: Claudia Covaciu)

TABLE 1. List of butterfly species (Insecta: Lepidoptera) identified on Apuseni Mountains

No.	Taxon	Preferential habitat	Location
HESPERIIDAE			
1.	<i>Pyrgus malvae</i> (Linnaeus, 1758)	Meadow	Dobrești (AB)
2.	<i>Hesperia comma</i> (Linnaeus, 1758)	Meadow	Gârda Seacă (AB); Munună (AB)
3.	<i>Ochlodes sylvanus</i> (Esper, [1777])	Meadow	Gârda Seacă (AB); Mățișești (AB); Sfoarța (AB); Dobrești (AB)
PAPILIONIDAE			
4.	<i>Parnassius mnemosyne</i> (Linnaeus, 1758)	Forest habitats; Meadow	Dobrești (AB); Ordâncușa confluence with Grâda Seacă (AB)
5.	<i>Iphiclides podalirius</i> (Linnaeus, 1758)	Meadow	Mățișești (AB); Dobrești (AB)
6.	<i>Papilio machaon</i> Linnaeus, 1758	Meadow	Mățișești (AB)
PIERIDAE			
7.	<i>Leptidea sinapis</i> (Linnaeus, 1758)	Meadow	Mățișești (AB)
8.	<i>Anthocaris cardamines</i> (Linnaeus, 1758)	Forest habitats; Meadow	Dobrești (AB)
9.	<i>Aporia crataegi</i> (Linnaeus, 1758)	Meadow	Dobrești (AB)
10.	<i>Pieris brassicae</i> (Linnaeus, 1758)	Meadow	Ghețari (AB)
11.	<i>Pieris rapae</i> (Linnaeus, 1758)	Meadow	Ghețari (AB)
12.	<i>Pieris napi</i> (Linnaeus, 1758)	Meadow	Ghețari (AB)
13.	<i>Colias croceus</i> (Fourcroy, 1785)	Meadow	Ghețari (AB); Dobrești (AB); Prelucă (AB)
14.	<i>Gonepteryx rhamni</i> (Linnaeus, 1758)	Forest habitats; Meadow	Dobrești (AB)
LYCAENIDAE			
15.	<i>Lycaena phlaeas</i> (Linnaeus, 1761)	Mesophilous Meadows	Dobrești (AB); Mățișești (AB); Gârda Seacă (AB)
16.	<i>Lycaena virgaureae</i> (Linnaeus, 1758)	Mesophilous Meadows	Gârda de Sus (AB); Dobrești (AB)
17.	<i>Lycaena alciphron</i> (Rottemburg, 1775)	Meadows	Munună (AB)
18.	<i>Satyrrium w-album</i> (Knoch, 1782)	Forest Edge	Dobrești (AB)
19.	<i>Celastrina argiolus</i> (Linnaeus, 1758)	Forest Edge	Gârda de Sus (AB); Cionești (AB)

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20.	<i>Plebejus argus</i> (Linnaeus, 1758)	Meadow	Ghețari (AB); Ocoale (AB); Mățișești (AB)
21.	<i>Aricia agestis</i> ([Denis & Schiffermüller], 1775)	Meadow	Dobrești (AB); Sfoartea (AB)
22.	<i>Cyaniris semiargus</i> (Rottemburg, 1775)	Meadow	Dobrești (AB)
23.	<i>Polyommatus dorylas</i> ([Denis & Schiffermüller], 1775)	Xerophylous Meadow	Dobrești (AB)
24.	<i>Polyommatus icarus</i> (Rottemburg, 1775)	Meadow	Mățișești (AB); Arieșeni (AB); Dobrești (AB); Gârda Seacă (AB)
NYMPHALIDAE			
25.	<i>Argynnis paphia</i> (Linnaeus, 1758)	Forest habitats; Meadow	Mățișești (AB)
26.	<i>Speyeria aglaja</i> (Linnaeus, 1758)	Forest habitats; Meadow	Ocoale (AB)
27.	<i>Fabriciana addipe</i> ([Denis & Schiffermüller], 1775)	Forest habitats; Meadow	Arieșeni (AB); Ocoale (AB)
28.	<i>Fabriciana niobe</i> (Linnaeus, 1758)	Forest habitats; Meadow	Arieșeni (AB)
29.	<i>Issoria lathonia</i> (Linnaeus, 1758)	Meadow	Trăncești-Cheile Ordâncușei (AB)
30.	<i>Brenthis ino</i> (Rottemburg, 1775)	Meadow	Mățișești (AB)
31.	<i>Brenthis daphne</i> ([Denis & Schiffermüller], 1775)	Meadow; Forest Edge	Dobrești (AB); Trăncești (AB)
32.	<i>Boloria euphrosyne</i> (Linnaeus, 1758)	Meadow	Ghețari (AB)
33.	<i>Boloria selene</i> ([Denis & Schiffermüller], 1775)	Meadow	Gârda Seacă (AB)
34.	<i>Boloria dia</i> (Linnaeus, 1767)	Meadow	Gârda Seacă (AB)
35.	<i>Limnitis camilla</i> (Linnaeus, 1764)	Riparian habitats	Gârda Seacă (AB)
36.	<i>Neptis sappho</i> (Pallas, 1771)	Forest Edge	Izvoarele (AB); Albac (AB)
37.	<i>Neptis rivularis</i> (Scopoli, 1763)	Forest Edge	Munună (AB)
38.	<i>Aglais urticae</i> (Linnaeus, 1758)	Meadow	Arieșeni (AB); Ghețari (AB); Mățișești (AB)
39.	<i>Aglais io</i> (Linnaeus, 1758)	Forest Edge	Ocoale (AB); Sfoartea (AB)
40.	<i>Vanessa atalanta</i> (Linnaeus, 1758)	Meadow	Dobrești (AB)
41.	<i>Vanessa cardui</i> (Linnaeus, 1758)	Meadow	Dobrești (AB)

42.	<i>Polygonia c-album</i> (Linnaeus, 1758)	Forest Edge	Gârda Seacă (AB); Mățișești (AB)
43.	<i>Araschnia levana</i> (Linnaeus, 1758)	Forest Edge	Gârda Seacă (AB); Trâncești (AB)
44.	<i>Melitaea athalia</i> (Rottemburg, 1775)	Meadow	Dobrești (AB); Ocoale (AB); Rusești (AB)
45.	<i>Euphydryas maturna</i> (Linnaeus, 1758)	-	Hodobana (AB)
46.	<i>Pararge aegeria</i> (Linnaeus, 1758)	Forest habitats; Meadow	Sfoartea (AB)
47.	<i>Lasiommata megera</i> (Linnaeus, 1767)	Meadow	Sfoartea (AB)
48.	<i>Lasiommata maera</i> (Linnaeus, 1758)	Meadow	Dobrești (AB)
49.	<i>Coenonympha glycerion</i> (Borkhausen, 1788)	Meadow	Dobrești (AB)
50.	<i>Coenonympha pamphilus</i> (Linnaeus, 1758)	Meadow	Dobrești (AB)
51.	<i>Erebia aethiops</i> (Esper, [1777])	Meadow	Dobrești (AB)
52.	<i>Erebia medusa</i> ([Denis & Schiffermüller], 1775)	Meadow	Dobrești (AB); Prelucă (AB)
53.	<i>Aphantopus hyperantus</i> (Linnaeus, 1758)	Meadow	Arieșeni (AB); Dobrești (AB)
54.	<i>Maniola jurtina</i> (Linnaeus, 1758)	Meadow	Arieșeni (AB); Ocoale (AB); Dobrești (AB)
55.	<i>Melanargia galathea</i> (Linnaeus, 1758)	Meadow	Arieșeni (AB); Dobrești (AB)
EREBIDAE			
56.	<i>Euplagia quadripunctaria</i> (Poda, 1761)	Riparian habitats	Dobrești (AB); Gârda Seacă (AB); Ocoale (AB); Gârda de Sus (AB)

Legend: AB=Alba Country.

Figure 7 illustrates the distribution of all Lepidoptera specimens observed and/or collected from the investigated area of the Apuseni Natural Park.

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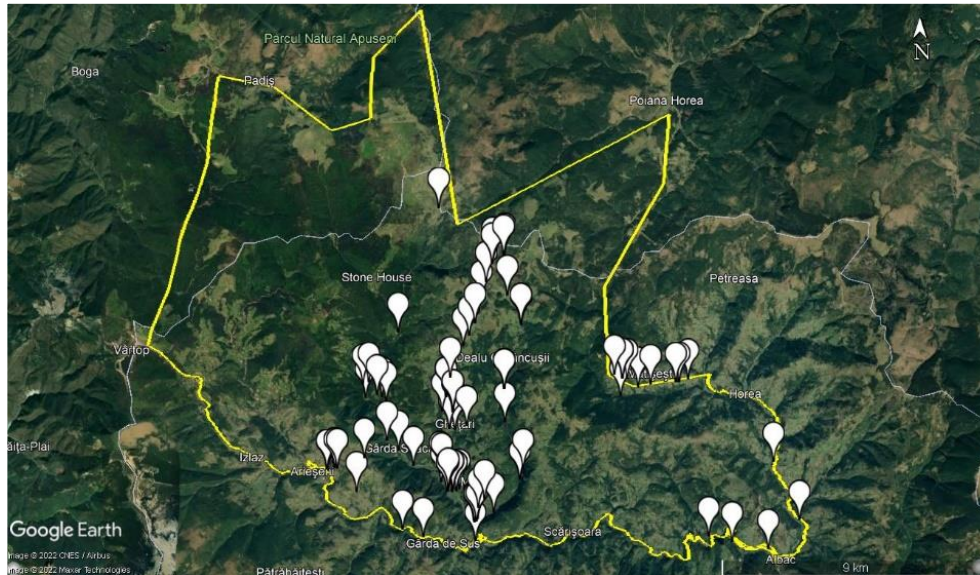


FIGURE 7. Locations of all Lepidoptera specimens observed and/or collected from the investigated area of the Apuseni Natural Park (Source: <https://earth.google.com/download-earth.html>)

Butterflies are considered bioindicators of the environment, being very sensitive to the changes that occur in the ecosystems in which they live.

According to the Romanian Red List regarding the protection and preservation of Lepidoptera, species of butterflies considered near threatened (NT) are: *Pieris brassicae*, *Satyrrium w-album* and *Aglais io*.

In recent decades, the species *Pieris brassicae* has become increasingly rare. It is considered threatened in the Transylvania region (Rákósy *et al.* 2021). This is due to the excessive use of pesticides by farmers in Brassicaceae crops. The implementation of protective measures is difficult because *Pieris brassicae* is adapted to the cabbage crops (*Brassica oleracea*) and rapeseed crops (*Brassica napus*) (Rákósy, 2013).

Satyrrium w-album is considered a threatened species in the Transylvania region, the cause being the disappearance of elm populations (Rákósy, 2013; Rákósy *et al.* 2021).

Aglais io is also assessed as a threatened species in the Transylvania region, due to the decrease in populations through the destruction of habitats and the use of pesticides (Rákósy, 2013).

From a conservative point of view, *Euphydryas maturna* and *Euplagia quadripunctaria* have a good conservation status, the populations being not isolated with a wide spread, and the overall assessment of the value of the site with respect to the conservation of the species is a good one, according to the Natura 2000 Standard Data Form. As regards the conservation of *Parnassius mnemosyne*, this species has good conservation status, with a large area of spread, having a sufficiently large habitat (according to the Natura 2000 Standard Data Form).

Unfortunately, threats to butterflies have been identified in the investigated area, among which we mention: habitat degradation; mowing of meadows much too early, which leads to the destruction of the preimago stages of butterflies; overgrazing and waste present in the meadows.

As measures and recommendations for the conservation of butterflies in the investigated area, we proposed: the maintenance of grassland habitats; the revival of elm populations; mowing at the right time; moderate grazing of animals and collection of waste from meadows.

CONCLUSIONS

In the Apuseni Natural Park, 56 species of butterflies have been identified. Most species belong to the Nymphalidae family. From the point of view of their favorite habitat, most butterflies were present in the meadows, because here they have the most favorable environmental conditions.

From a conservative point of view, four species of Lepidoptera are protected by European and/or National Legislation (*Parnassius mnemosyne*, *Neptis sappho*, *Euphydryas maturna* and *Euplagia quadripunctaria*).

As the butterflies conservation measures, we propose maintaining areas of preferential habitats, mowing at the right time and moderate grazing of animals.

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