

Status of Butterflies (Lepidoptera, Rhopalocera) in the Sharr Mountains in the Republic of North Macedonia

Vladimir Krpač¹, Christian Darcemont², Michèle Lemonnier–Darcemont², Mirjana Krpač³,
Matjaž Černila⁴ and Xhezair Abdija⁵

¹Institute of Ecology and Technology, Popova Šapka, Republic of North Macedonia (vkrpach@gmail.com)

²Groupement d'Études Entomologiques Méditerranée (G.E.E.M.), PO BOX 60, 48060 Parga, Greece
(darcemont@free.fr; lemonniergeem@free.fr)

³Entomological Society for the Investigation and Conservation of Biodiversity and Sustainable Development of Natural Ecosystems,
Vladimir Komarov Street 20/6, 1000 Skopje, Republic of North Macedonia (mirjana.krpač@gmail.com)

⁴Prirodoslovni muzej Slovenije, Prešernova 20, p.p. 290, SI - 1001 Ljubljana, Slovenija (matjazcernila@yahoo.com)

⁵Department of Biology, Faculty of Natural Sciences, University of Tetova (xhezair.abdiu@unite.edu.mk)

Abstract

Lepidoptera (butterflies and moths) is the best-studied order of insects in the Republic of North Macedonia. Butterflies (Lepidoptera, Rhopalocera) are represented by 204 species in the country.

In this paper, we focused on the Macedonian part of the Sharr Mountain range, by gathering and checking literature data, including data from two entomological collections, and adding the results and observations from our recent intensive field research on the butterfly fauna performed during the last 6 years (2014-2019).

As a result, 179 taxa are reported on the Sharr Mountains. They belong to 6 families: Hesperidae with 21 species, Papilionidae with 6 species, Pieridae with 20 species, Riodinidae with 1 species, Lycaenidae with 51 species, and Nymphalidae with 80 species.

Among these 179 taxa, 52 of them are key species for the protection of this national natural heritage (Red listed or concerned by another protection). The data of these taxa are detailed in the paper.

We conclude that the Sharr Mountains hosts a high degree of biodiversity of butterflies.

Keywords: *Butterflies, Sharr Mountains, checklist, indicators, endemism*

Introduction

In the early stages, most of the researchers on butterfly fauna in the Republic of North Macedonia (including Sharr Mountains) were partial, with scarce information about their distribution. A first summary has been done by Thurner who gathered all previous data for Macedonia (including data for the Sharr Mountains) and published them in the book printed in 1964: "Die Lepidopterenfauna Jugoslawisch Mazedoniens – I. Rhopalocera, Grypocera und Noctuidae". More than two decades after, in 1989, Paul Schaidler and Predrag Jakšić published a book with data, illustrations and distribution maps for the whole country: "Die Tagfalter von jugoslawisch Mazedonien".

For 6 years, we performed research on the Sharr Mountains butterflies (2014-2019) to assess the status of the butterfly's fauna in this mountain range.

Materials and method

We included in this paper data from two entomological collections (Macedonian Museum of Natural History - **SKO**) and Institute of Ecology and Technology - **IET**), data from the literature, and the results of our field research. Under the term "Authors unpublished data" are all the data collected in-situ during our 6 years study 2014-2019.

Concerning the literature data, some names of localities and some erroneous data have been corrected. During our research in-situ, we used the classic avio-entomofauna hunting method with an entomological net (catcher) (Fig. 1). All the material captured was deposited in the Macedonian Museum of Natural History (**SKO**) or the collection of the Institute of Ecology and Technology (**IET**), for a total of 4.380 butterflies.

The geo-referenced data can be found at <http://www.geem.org/SharMt/maps.html>.

The butterfly systematics is in accordance with Wiemers et al. (2018). The synonyms of the species have been corrected and clarified as well.

The endangered species is according to IUCN European Red List, Van Swaay et al (2010), Maes et al. (2019, 2020), and Macedonian Red List Krpač and Darcemont (2012).



Figure 1. Hunting with entomological net

Area of investigation

The Sharr Mountains are in the northwest part of the Republic of North Macedonia. The massif extends northeast-west-southwest in the length of 80 km, over an area of 1600 km² (Fig. 2). The average altitude of the peaks is 2200m.

The Sharr Mountains extend also in Kosovo, with many peaks on the border between the two countries. In this paper, under the name "Sharr Mountains", we will refer to the Macedonian part of the massive.

The Sharr Mountains form a region of natural beauty. It is known in Europe as a spot of biological diversity. Numerous researchers have qualified it as a "hot spot". From a faunistic point of view, the Sharr Mountains are characterized by a high degree of diversity with many beautiful and different

natural landscapes. The impact of the two climates (the moderate Mediterranean and continental), the presence of numerous plant communities as well as the diversity of biotopes, have contributed to the emergence and presence of abundant and varied animal life. There are a greater number of species, especially in the world of butterflies which, with their various shapes and colors, particularly attract human attention.

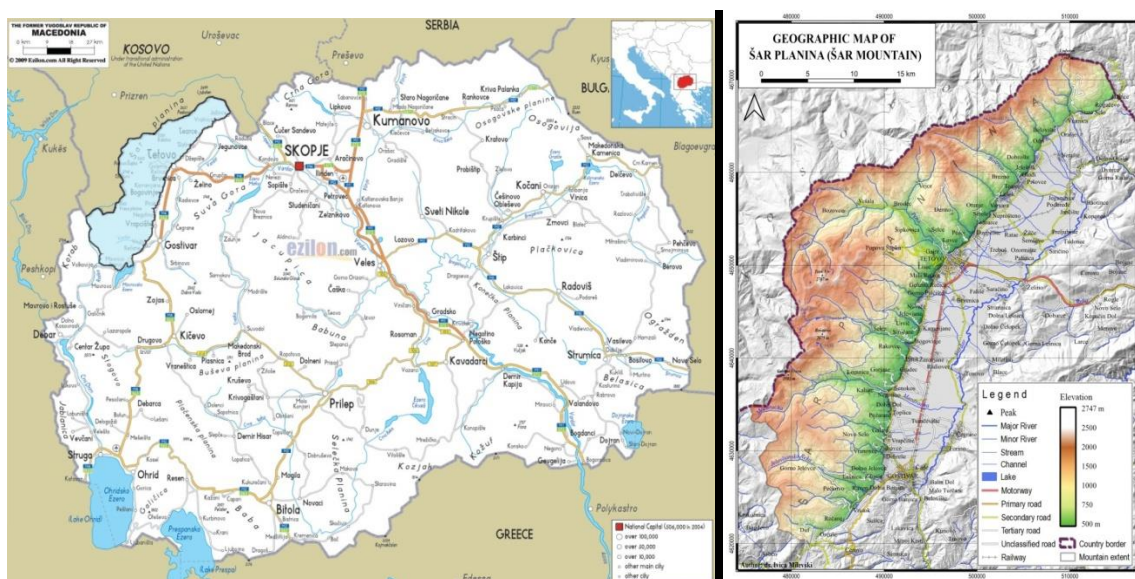


Figure 2. Area of investigation (on left side Republic of North Macedonia and on the right side Sharr Mountains)

History of research

The first butterfly's data on the Sharr Mountains have been published just before the World War I by Rebel (1913). Then, the following authors have published data: Doflein (1921), Alberti (1922); Rebel and Zerny (1931); Daniel et al. (1951); Lorković (1953); Michieli (1963). Thurner (1964), Dufay (1973, 1977), Arnscheid and Arnscheid (1980); De Freina (1983); Schaidler (1980, 1984); Jakšić (1988; 1989, 1998a, 1998b, 2001); Schaidler and Jakšić (1989); Kocak (1989); Beshkov (1996); Melovski (2002, 2004); Abadjiev (2006); Krpač et al. (2008); Kolev (2010); Huemer et al. (2011); Krpač and Darcemont (2012); Krpač et al. (2013); Abdija et al. (2013a; 2013b; 2013c; 2013d; 2017; 2019a; 2019b); Louy et al. (2013; 2014); Varga (2014), Melovski and Božinovska (2014).

Result and discussion

We count a total of 179 species of butterflies (Lepidoptera, Rhopalocera) present in the Sharr Mountains, which is 88% of the total number of the known species (204) in the Republic of North Macedonia. The list of the taxa is given in Annex.

The 52 butterfly species listed below are very important indicators of the quality of the habitats. That is the reason why we give more details hereafter for these species. These are threatened species and their relationship with specific biotopes indicates the current quality of habitats of the area and could be used among the tools to determines the zoning of the future protected area within the Sharr Mountains.

Fam. HesperIIDae Latreille, 1809

1. *Carcharodus floccifera* (Zeller, 1847)

syn. *Carcharodus altheae* (Hübner, 1803) in Daniel et al (1951); Thurner (1964)

In IUCN Red List Europe: Near Threatened (NT), in Macedonian Red List: NT.

Present in foothills and montane zones, in the meadow, rocky meadow, mesophilic grassland, forest edge or clearing habitats.

Literature data: Sharr Mountains, v. Brodec (Pena r.), v. Lešok as *Carcharodus altheae* Daniel et al (1951); v. Brodec, Crn Vrv as *Carcharodus altheae* in Thurner (1964: 49); Jakšić (1988); Sharr Mountains, Kocak (1989); v. Brodec, Jakšić (1998a); Mavrovo Radika r. Abdija (2013d); Gorno Lukovo Pole, Krpač et al (2013).

Collection data (IET): v. Staro Selo, 817 m, July 01, 2013; 1♂ 1♀; v. Rakovec, 962 m, in 2013; Bistrica, (v. Tearce), 769 m, in 2013; v. Gajre - v. Lisec, 1204 m, in 2013; v. Belovište, 785 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: nord-est of v. Vratnica near Kosovo border, 725 m, June 25, 2012, meadows.

2. *Muschampia proto* (Ochsenheimer, 1808)

syn. *Sloperia* (*Hesperia*) *proto* (Ochsenheimer, 1808) in Thurner (1964)

In Macedonian Red List: Near Threatened (NT).

Present in foothills zone, in meadow habitats.

Literature data: v. Vratnica, 700 m, (leg. F. Daniel) as *Sloperia* (*Hesperia*) *proto* in Thurner (1964); in Jakšić (1988).

3. *Pyrgus andromedae* (Wallengren, 1853)

In Macedonian Red List: Near Threatened (NT).

Present in the subalpine zone in the meadow, rocky meadow, and low shrubbery habitats.

Literature data: Jakšić (1988); Meanče, Jakšić (1998a); Sharr Montanes, Kolev (2010); Borislavec, Abdija et al (2013d).

Collection data (IET): Crno Lake, 2122 m, in 2013; Borislavec, 1679 m, in 2013, (leg. Xh. Abdija).

4. *Spialia phlomidis* (Herrich and Schäffer, 1845)

In Macedonian Red List: Near Threatened (NT).

Present in foothills zone, in the meadow and rocky meadow habitats.

Literature data: v. Jažince (668), Abdija (2013d: 49).

Collection data (IET): v. Jažince, 677 m, 26.06.2012, 1♂ 1♀; v. Jažince, 720 m, July 26, 2013, (leg. Xh. Abdija).

Authors unpublished data: northeast of v. Vratnica near Kosovo border, 725 m, June 25, 2012; v. Vratnica, 742 m, July 25, 2013.

5. *Carterocephalus palaemon* (Pallas, 1771)

In Macedonian Red List: Near Threatened (NT).

Present in foothills and montane zones, in forest edge or clearing habitats.

Literature data: Jakšić (1988).

Authors unpublished data: v. Brodec, 1040 m, June 12, 2019.

6. *Thymelicus acteon* (Rottemburg, 1775)

syn. *Thymelicus heydeni* Plötz, 1884 in Jakšić (1988)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills and montane zones, in the meadow and rocky meadow habitats.

Literature data: as *Thymelicus heydeni* in Jakšić (1988); v. Nerašte, Abdija (2013d); Mazdrača, Abdija (2017); v. Gajre, v. Lisec, Abdija et al (2019).

Collection data (IET): v. Staro Selo, 896 m, 01.07.2013, 1♂ 1♀; v. Staro Selo, 1630 m, in 2013; Popova Šapka, 1436 m, in 2013; Bistrica (v. Tearce), 769 m, in 2013; v. Gajre - v. Lisec, 1204 m, in 2013; v. Jažince, 720 m, 26.07.2013; v. Vrutok, 787 m, in 2013; Mazdrača v. Lomnica, 750 m, in 2013; v. Rakovec, 962 m, in 2013; v. Kalište, 728 m, in 2013; v. Jelovjane, 1142 m, in 2013, (leg. Xh. Abdija); Dolna Lešnica, 1480 m, August 17, 2019, 2 ex (leg. V. Krpač).

Fam. Papilionidae Latreille, 1802

7. *Zerynthia polyxena* ([Denis and Schiffermuller], 1775)

as *Zerynthia polyxena demnosia* Freyer, 1833 in Daniel et al (1951)

In Macedonian Red List: Near Threatened (NT), in Bern Convention appendices II and IV.

Present in foothills and montane zones, in mesophilic grassland, forest edge or clearing and riparian vegetation habitats.

Literature data: v. Vratnica, Lešok Monastery, as *Zerynthia polyxena demnosia* Daniel et al (1951); Jakšić (1988); v. Gajre, v. Lisec, Abdija et al (2019); Gostivar, v. Vrutok, springs of Vardar r. Krpač et al (2013).

Collection data (IET): Lešok Monastery, 600 m, August 02, 2011. (leg. V. Krpač); v. Stenče, 575 m, June 01, 2012, 2♂ 4♀; v. Jelovjane, 1142 m, in 2013; Mazdrača v. Lomnica, 750 m, in 2013; above v. Vratnica, 910 m, in 2013, (leg. Xh. Abdija).

8. *Zerynthia cerisy* (Godart, [1824])

as *Zerynthia cerisy ferdinandi* in Daniel et al (1951)

In IUCN Red List Europe: Near Threatened (NT), in Macedonian Red List: NT.

Present in foothills and montane zones, in mesophilic grassland, forest edge or clearing habitats.

Literature data: Tetovo, v. Lešok as *Zerynthia cerisy ferdinandi* Daniel et al (1951); Tetovo, v. Orašje, v. Lešok, v. Vratnica Thurner (1964); Jakšić (1988); v. Vratnica, v. Lešok Jakšić (1998a); v. Gajre, v. Lisec Abdija et al (2019).

Collection data (SKO): v. Varvara, 850 m, 06.06.1978. (leg. J. Čingovski).

Collection data (IET): v. Nerašte, 536 m, May 20, 2012, 1♂ 1♀; v. Jelovjane, 1142 m, in 2013; Mazdrača v. Lomnica, 750 m, in 2013; v. Rakovec, 962 m, in 2013; v. Vratnica 910 m, in 2013, (leg. Xh. Abdija); v. Lisec, 1188 m, 24.05.2019, 1 ex (leg. V. Krpač).

Authors unpublished data: v. Vrutok, 710 m, May 24, 2010; v. Vratnica, 700 m, Lešok Monastery, 600 m, spring of Vardar r, 710 m, May 24, 2010.

9. *Parnassius mnemosyne* (Linnaeus, 1758)

as. *Parnassius mnemosyne bureschi* in Daniel et al (1951); *Parnassius mnemosyne parvasi* in Thurner (1964)

In IUCN Red List Europe: Near Threatened (NT), in Macedonian Red List: NT, in Bern Convention appendices II and IV, in Habitat directive annex IV.

Present in foothills zone, in mesophilic grassland and forest edge or clearing habitats.

Literature data: Ljuboten Rebel (1913); Ljuboten Rebel and Zerny (1931); v. Lisec as *Parnassius mnemosyne bureschi* Daniel et al (1951); in the area of Sharr Mountains as ssp. *parvasi* Thurner (1964); Jakšić (1988); Ljuboten near mountain refuge, Jelak - Crn Vrv Melovski (2002); Radika r. Lukovo Pole, Mavrovi Anovi to v. Vrben, Crn Kamen Lukovo Pole Krpač et al (2013); Mazdrača Abdija (2017); v. Gajre, v. Lisec Abdija et al (2019).

Collection data (SKO): Radika r. Lukovo Pole May 25, 1995. (leg. V. Krpač).

Collection data (IET): Lukovo Pole, 1527 m, May 26, 2010. (leg. Krpač); v. Pirok, 645 m, May 25, 2012; v. Belovište, 785 m, in 2013; Borislavec, 1679 m, in 2013; v. Kalište, 728 m, in 2013; Popova Šapka, 1436 m, in 2013; v. Rakovec, 962 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: v. Vrben, 1335 m, 18.06.2010; road to v. Vrben, 1350 m, June 18, 2010; near Kosovo border, 1530 m, 18.06.2010; Crn Kamen, 1536 m, 18.06.2010; Popova Šapka, 1719 m, June 26, 2013; near v. Šipkovica, 1208 m, June 09, 2014.

10. *Parnassius apollo* (Linnaeus, 1758) ssp. *macedonicus* Bollow, 1931

as. *Parnassius apollo dardanus* in Rebel and Zerny (1931); *Parnassius apollo macedonicus* in Daniel et al (1951)

In IUCN Red List: Near Threatened (NT), in Macedonian Red List: Vulnerable (VU), in Bern Convention appendices II and IV, in Habitat directive annex IV, in CITES list.

Present in montane and subalpine zones, in meadow, rocky meadow, low shrubbery, mesophilic grassland and forest edge or clearing habitats.

Literature data: Kobilica, Ljuboten Rebel (1913); as *Parnassius apollo dardanus* Rebel and Zerny (1931); as *Parnassius apollo macedonicus* Daniel et al (1951); Sharr Mountains Radika r. Michieli (1963); Crn Vrv, Kobilica, Ljuboten Thurner (1964); Radika r. v. Trnica Dufay (1973); Jakšić (1988); Ljuboten, Kobilica in Jakšić (1998a); v. Melovo near the river Bistrica, Ljuboten over v. Staro Selo, Čaušica, Ljuboten over Elezova Rupa, Jelak – Crn Vrv, Jelak Mountain Lodge Melovski (2002); Radika valley around bridge 10 km NNW Sveta Voda Huemer et al (2011); canyon of Radika r. v. Trnica,

Radika r. Pilana, Radika r., v. Ničpur, Strezimirska River near Sveta Voda, Adžina River II, canyon of Radika r. close to Sveta Voda Krpač et al (2013).

Collection data (SKO): Ceripašina, 2500 m, July 26, 1952. (leg. J. Čingovski); Radika r., 942 m, July 12, 1975. (leg. S. Jakonov); Ljuboten, 2460 m, August 28, 1976. (leg. S. Jakonov); Radika r. upper course, 1527 m, July 04, 1995; v. Ničpur, 986 m, August 11, 2004; Kobilica Gornovica, 2450 m, July 26, 2007; above Sveta Voda, 1573 m, August 14, 2011. (leg. V. Krpač).

Collection data (IET): v. Vešala, June 23, 2012; Popova Šapka, 1436 m, in 2013; v. Staro Selo, 1655 m, in 2013; v. Brodec, 1090 m, in 2013, (leg. Xh. Abdija); Popova Šapka, 1745 m, July 23, 2016; under Karanikoličko Lake, 1766 m, 04.08.2017; Dolna Lešnica, 1476 m, August 18, 2018; Jelak, 1823 m, August 08, 2019. (leg. V. Krpač).

Authors unpublished data: v. Ničpur, 1086 m, August 11, 2004; Kobilica, 2360 m, July 26, 2007; Kobilica Gornovica, 2450 m, July 26, 2007; Radika r. v. Trnica, 942 m, July 21, 2009; Radika r. Lukovo Pole, 1550 m, July 26, 2010; Mavrovo, 1750 m, June 16, 2010; Mavrovo - mountain northwest of v. Ničpur, 2105 m, August 20, 2010; Mavrovo - mountain northwest of v. Ničpur, 1945 m, August 20, 2010; Sharr Mountains south 1540 m, August 22, 2010; Mavrovo Adžina River II - north mountain of v. Brodec, 1540 m, August 22, 2010; spring of Strezimirska River near Sveta Voda, 1247 m, August 01, 2012; mountain above Popova Šapka Ceripašina, 2382 m, August 05, 2012; Ljuboten, 1960 m, August 06, 2012; Ljuboten, 1963 m, August 06, 2012; Jelak 1780 m, July 22, 2016; Lešnica, 1432 m, 24.07.2016; Plat mountain, 1820 m, July 24, 2016; near Lešnica, 1820 m, July 24, 2016; Krivošija, 2139 m, July 27, 2016; road to Tri Vodi, 1614 m, July 08, 2017; Gorna Lešnica, 1776 m, 15.07.2017; Gorna Lešnica, 2018 m, 03.08.2017; Krivošija, 1880 m, August 03, 2017; road to Karanikola, 1754 m, 04.08.2017; Jelak - Crn Vrv, 1752 m, August 11, 2019.

Fam. Pieridae Swainson, 1820

11. *Pieris krueperi* Staudinger, 1860

In Macedonian Red List: Near Threatened (NT), in Bern Convention appendix II.

Present in foothills zone, in meadow, rocky meadow, low shrubbery habitats.

Collection data (IET): close to v. Jažince, 677 m, June 25, 2012, 1ex (leg. V. Krpač).

Authors unpublished data: near v. Jažince, 739, June 25, 2012; northeast of v. Vratnica near the Kosovo border, 725 m, June 25, 2012.

12. *Anthocharis gruneri* Herrich-Schäffer, 1851

In Macedonian Red List: Near Threatened (NT).

Present in foothills and montane zones, in meadow, rocky meadow, low shrubbery, forest edge or clearing habitats.

Literature data: Schaidler and Jakšić (1989); v. Nerašte, Abdija (2013a); Adžina River Torbeški Most 1390 m, Adžina River, 1549 m, in Krpač et al (2013).

Collection data (SKO): v. Vratnica, 715 m, June 29, 1975, 1ex (leg. S. Jakonov).

Collection data (IET): v. Radiovce, 515 m, April 17, 2013, 2♂ (leg. Xh. Abdija).

Authors unpublished data: Radika r. Lukovo Pole, 1550 m, 26.05.2010; Torbeški Most - Adžina River, 1390 m, May 26, 2010; Ljuboten, 1963 m, August 06, .2012.

13. *Colias caucasica* Staudinger, 1871 subsp. *balcanica* Rebel, 1903

In Macedonian Red List: Near Threatened (NT).

Present in montane zone, in meadow, low shrubbery, mesophilic grassland, forest edge or clearing, riparian vegetation habitats.

Literature data: Jakšić (1988); v. Gorno Jelovce (Dedel Beg), v. Gorno Jelovce, Bojkov Kamen Melovski (2002); v. Ničpur 986 m, Mavrovi Anovi to v. Vrben, Mavrovi Anovi from v. Bogdevo to v. Krakornica, Crn Kamen Lukovo Pole, Crn Kamen Dolno Lukovo Pole Krpač et al (2013).

Collection data (SKO): v. Ničpur, 986 m, August 11, 2004, 1ex; v. Bogdevo – v. Krakornica, 1412 m, June 18, 2010, 1ex; Crn Kamen Lukovo Pole, 1536 m, June18, 2010, 1ex (leg. V. Krpač).

Authors unpublished data: Radika r. Lukovo Pole, 1550 m, May 26, 2010; v. Vrben, 1335 m, June 18, 2010; Dolno Lukovo Pole Crn Kamen, 1539 m, July 03, 2010; road after v. Vrben, 1380 m, June18, 2010; proximity to the Kosovo border, 1530 m, June18,2010.

14. *Gonepteryx farinosa* (Zeller, 1847)

This species was insufficiently researched and has not been confirmed by our research on Sharr Mountains. There are only two old reports observed by De Freina, published by Schaidler (1980). and De Freina (1983).

In Macedonian Red List: Near Threatened (NT).

Present in foothills zone, in the meadow, rocky meadow and low shrubbery habitats.

Literature data: Ljuboten, v. Vratnica Shaidler (1980); v. Lešok De Freina (1983); Jakšić (1988); Schaidler and Jakšić (1989).

Fam. Lycaenidae Leach, 1815

15. *Thecla betulae* (Linnaeus, 1758)

as *Zephyrus betulae* Linnaeus 1758 in Daniel et al (1951)

In Macedonian Red List: Near Threatened (NT).

Present in foothills and montane zones, in forest edge or clearing, riparian vegetation habitats.

Literature data: Crn Vrv, as *Zephyrus betulae* Daniel et al (1951); Crn Vrv, Thurner (1964); Jakšić (1988); Kobilica, in Jakšić (1998a); Popova Šapka, Abdija (2013).

Collection data (IET): Popova Šapka, 1056 m, 19.08.2011, 1♂ 1♀; Bistrica (v. Tearce), 769 m, in 2013; v. Gajre - v. Lisec, 1204 m, in 2013, (leg. Xh. Abdija).

16. *Satyrrium pruni* (Linnaeus, 1758)

In Macedonian Red List: Near Threatened (NT).

Present in foothills zone, in low shrubbery, forest edge or clearing habitats.

Literature data: v. Negotino-v. Lomnica Abdija (2013c); Mazdrača Abdija et al (2017).

Collection data (IET): v. Kalište, 729 m, June 12, 2012, 1♂ (leg. Xh. Abdija).

17. *Lycaena dispar* ([Haworth], 1802)

In IUCN Red List Europe: Near Threatened (NT), in Macedonian Red List: NT, in Bern Convention appendices II and IV, in Habitat directive annex II and annex IV.

Present in foothills and montane zones, in mesophilic grassland and riparian vegetation habitats.

Literature data: v. Pršovce, 475 m, Abdija (2013c); Mazdrača, Abdija et al (2017); v. Gajre, v. Lisec, Abdija et al (2019).

Collection data (IET): v. Pršovce, 475 m, August 01, 2011, 1♂1♀; v. Jažince, 720 m, July 26, 2013; v. Vrutok, 787 m, in 2013; Mazdrača v. Lomnica, 750 m, in 2013; v. Rakovec, 962 m, in 2013; Bistrica (v. Tearce), 769 m, in 2013; v. Gajre - v. Lisec, 1204 m, in 2013; Kalište, 728 m, in 2013; above v. Vratnica, 910 m, in 2013; Popova Šapka, 1436 m, in 2013, (leg. Xh. Abdija).

18. *Cupido decoloratus* (Staudinger, 1886)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills and montane zones, in meadow, mesophilic grassland and forest edge or clearing habitats.

Literature data: Jakšić (1988); Titov Vrv, Jakšić (1998a); v. Kamenjane, Abdija (2013c); Mazdrača, Abdija et al (2017).

Collection data (IET): v. Pirok, 630 m, June 01., 2013; 2♀; v. Vrutok, 787 m, in 2013; v. Rakovec, 962 m, in 2013; v. Belovište, 785 m, in 2013; v. Jelovjane, 1142 m, in 2013; v. Kalište, 728 m, in 2013; above v. Vratnica, 910 m, in 2013, (leg. Xh. Abdija).

19. *Iolana iolas* (Ochsenheimer, 1816)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills and montane zones, in low shrubbery and forest edge or clearing habitats.

Literature data: v. Orašje, Thurner (1964); Jakšić (1988); v. Negotino – v. Lomnica, Abdija (2013c); Mazdrača, Abdija et al (2017); v. Gajre, v. Lisec, Abdija et al (2019).

Collection data (SKO): v. Lešok, 600 m, May 26, 1979, 1ex (leg. S. Jakonov).

Collection data (IET): v. Lomnica, 720 m, 08.06.2012, 1♂ 2♀; Mazdrača v. Lomnica, 750 m, in 2013; v. Rakovec, 962 m, in 2013; v. Jelovjane, 1142 m, in 2013; v. Gajre - v. Lisec, 1204 m, in 2013; v. Kalište, 728 m, in 2013; above v. Vratnica, 910 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: Popova Šapka, 1719 m, June 26, 2013.

20. *Phengaris alcon* ([Denis and Schiffermüller], 1775)

as *Glaucopteryx (Maculinea) alcon sevastios* in Daniel et al (1951); in Thurner (1964); as *Maculinea alcon* in Jakšić (1998a)

In Macedonian Red List: Near Threatened (NT).

Present in montane and subalpine zones, in meadow, low shrubbery, mesophilic grassland, forest edge or clearing habitats.

Literature data: Crn Vrv, as *Glaucopsyche (Maculinea)alcon sevastios* Daniel et al (1951); Crn Vrv, Ljuboten, as *Maculineaalcon sevastios* Thurner (1964); Jakšić (1988); Ljuboten, as *Maculineaalcon* in Jakšić (1998a); v. Ničpur Sveta Voda, Reč springs of Strežimirska River, valley of Radika r. Pilana Krpač et al (2013).

Collection data (SKO): v. Ničpur Sveta Voda, 980 m, July 03, 2010; 1ex; Reč springs of Strežimirska River, 1254 m, August 22, 2010, 1ex (leg. V. Krpač).

Collection data (IET): Crno Lake, 2284 m, June 22, 2016, 1 ex (leg. V. Krpač).

Authors unpublished data: Strežimirska River, 1254 m, July 03, 2010. Reč springs of Strežimirska River, 1234 m, July 03, 2010; Reč, 1232 m, August 01, 2010.

21. *Phengaris arion* (Linnaeus, 1758)

as *Lycaena arion* (L.) in Rebel and Zerny (1931); as *Glaucopsyche (Maculinea) arion antension* in Daniel et al (1951) and Thurner (1964); *Maculinea arion* in Jakšić (1998a); Abdija et al (2013c; 2017)

In IUCN Red List Europe: Endangered (EN), in Macedonian Red List: Near Threatened (NT), in Bern Convention appendices II and IV, in Habitat directive annex IV.

Present in all vegetation belts (Foothills, montane and subalpine), in meadow, rocky meadow, low shrubbery mesophilic grassland and forest edge or clearing habitats.

Literature data: Ljuboten, as *Lycaena arion* (L.) Rebel and Zerny (1931); v. Brodec, Crn Vrv as *Glaucopsyche (Maculinea) arion antension* Daniel et al (1951); v. Brodec, v. Vratnica as *Maculinea arion antension* Thurner (1964); Jakšić (1988); v. Vratnica, v. Brodec, as *Maculinea arion* Jakšić (1998a); Radika valley around bridge 10 km NNW Sveta Voda, Huemer et al (2011); v. Negotino – v. Lomnica, as *Maculinea arion* Abdija et al (2013c); Mazdrača, as *Maculinea arion* Abdija et al (2017); Reč springs of Strežimirska River, Krpač et al (2013).

Collection data (IET): v. Negotino, 668 m, June 02, 2012, 2♂ 1♀ (leg. Xh. Abdija).

Authors unpublished data: Reč springs of Strežimirska River, 1234 m, July 03, 2010.

22. *Pseudophilotes vicrama* (Moore, 1865) subsp. *schiffmuelleri* (Hemming, 1929)

as *Philotus vicrama schiffmuelleri* in Daniel et al (1951); Thurner (1964); as *Scolitantides schiffmuelleri* in Jakšić (1998)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills and montane zones, in the meadow, rocky meadow, low shrubbery and forest edge or clearing habitats.

Literature data: v. Lešok as *Philotus vicrama schiffmuelleri* Daniel et al (1951); v. Lešok, v. Vratnica, as *Philotus vicrama schiffmuelleri* Thurner (1964); as *Scolitantides schiffmuelleri* Jakšić (1998a); v. Lakavica, Abdija (2013c).

Collection data (SKO): v. Lešok, 600 m, July 17, 1980, 1ex (leg. S. Jakonov).

Collection data (IET): v. Pirok, 631 m, August 02, 2012, 2♂; Bistrica (v. Tearce), 769 m, in 2013; v. Rakovec, 962 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: v. Brodec, 678 m, May 20, 2011.

23. *Kretania sephirus* (Frivaldzky, 1835)

as *Plebejus pylaon zephyrus* in Arnscheid and Arnscheid (1980); as *Plebejus pylaon* in Abdija (2013c; 2019); Krpač et al (2013)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills and montane zones, in meadow, mesophilic grassland, forest edge or clearing and riparian vegetation habitats.

Literature data: Tetovo as *Plebejus pylaon zephyrus* Arnscheid and Arnscheid (1980); Jakšić (1988); v. Rakovec – Borislavec, *Plebejus pylaon* Abdija (2013c); Mazdrača, *Plebejus pylaon* Abdija et al (2017); v. Gajre, v. Lisec, *Plebejus pylaon* Abdija et al (2019); Crn Kamen Lukovo Pole. *Plebejus pylaon* Krpač et al (2013).

Collection data (IET): v. Pirok, 631 m, 19.07.2013, 5ex; v. Belovište, 785 m, in 2013; v. Jelovjane 1142 m, in 2013; Bistrica (v. Tearce), 769 m, in 2013; v. Gajre - v. Lisec, 1204 m, in 2013; v. Kalište, 728 m, in 2013; above v. Vratnica, 910 m, in 2013; Popova Šapka, 1436 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: Crn Kamen, 1536 m, June 18, 2010.

24. *Agriades optilete* (Knoch, 1781)

as *Polyommatus (Vacciniina) optilete* in Daniel et al (1951); as *Vacciniina optilete* in Michieli (1963); Arnscheid and Arnscheid (1980); Jakšić (1998a)

In Macedonian Red List: Near Threatened (NT).

Present in montane and subalpine zones, in mesophilic grassland, forest edge or clearing habitats.

Literature data: Crn Vrv, as *Polyommatus (Vacciniina) optilete* Daniel et al (1951); Crn Vrv, as *Vacciniina optilete* Thurner (1964); Ceripašina, as *Vacciniina optilete* Michieli (1963); Šarr Mountains, as *Vacciniina optilete* Arnscheid and Arnscheid (1980); Jakšić (1988); Piri Beg, Popova Šapka, Jelak, Jakšić (1998a); Popova Šapka, as *Vacciniina optilete* Jakšić (1998a).

Collection data (SKO): Popova Šapka, 1700 m, July 24, 1975, 1ex (leg. S. Jakonov).

Collection data (IET): Popova Šapka, Ambassadorska Livada, 1525, July 08, 2017, 1ex; Gorna Lešnica, 1776 m, July 15, 2017, 7ex (leg. V. Krpač).

25. *Agriades dardanus* (Freyer, 1843)

This species is insufficiently researched. We were unable to find it in the study area. Only one Karabunar site is known so far.

In IUCN Red List Europe: Near Threatened (NT), in Macedonian Red List: NT.

Present in subalpine zone, in rocky meadow habitats.

Literature data: under Karabunar, Jakšić (1988) and Shaider and Jakšić (1989).

26. *Aricia anteros* (Freyer, 1838)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills, montane and subalpine zones, in the meadow, rocky meadow, low shrubbery, mesophilic grassland and forest edge or clearing habitats.

Literature data: Crn Vrv, Daniel et al (1951); Crn Vrv, Thurner (1964); Jakšić (1988); Kobilica Jakšić (1998a); Mavrovo, Abdija (2013c).

Collection data (SKO): v. Ničpur, 1086 m, August 11, 2004, 2ex; Kobilica, 2360 m, July 26, 2007. 1ex (leg. V. Krpač).

Collection data (IET): v. Jelošnik, 1000 m, September 15, 2011, 1ex; Sharr Planina (around the Mountain Lodge Ljuboten) in 2013, 2♀; v. Vrutok, 787 m, in 2013; v. Rakovec, 962 m, in 2013; v. Jelovjane, 1142 m, in 2013; Bistrica (v. Tearce), 769 m, in 2013; Popova Šapka, 1436 m, in 2013; v. Staro Selo, 1655 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: near Lešnica, 1820 m, 24.07.2016; Ceripašina (ski resort), 2110 m, August 05, 2012; south of Sharr Mountains, 1255 m, 22.08.2010; south of Sharr Mountains, 1450 m, August 22, 2010; south of Sharr Mountains, 1540 m, August 22, 2010; Mavrovo Adžina Reka 2 - north mountain of v. Brodec, 1450 m, August 22, 2010; Mavrovo Adžina River II - north mountain of v. Brodec, 1540 m, August 22, 2010; Popova Šapka (ski resort), 2275 m, August 05, 2012; Popova Šapka (ski resort), 2110 m, August 05, 2012; Lešnica, 1432 m, July 24, 2016.

27. *Polyommatus dorylas* ([Denis and Schiffermüller], 1775)

as *Polyommatus (Lysandra) hylas* Esper 1793 in Daniel et al (1951); Thurner (1964); as *Plebicula dorilas* in Jakšić (1988)

In IUCN Red List Europe: Near Threatened (NT).

Present in montane and subalpine zones, in meadow, rocky meadow and low shrubbery habitats.

Literature data: Crn Vrv, as *Polyommatus (Lysandra) hylas* Daniel et al (1951); Crn Vrv, v. Vratnica, Ljuboten as *Lysandra hylas* Thurner (1964); as *Plebicula dorilas* Jakšić (1988); Kučibaba under Kule, Ljuboten over Elezova Rupa, Melovski (2002); v. Vrben, Krpač et al (2013).

Collection data (SKO): v. Vrben, June 30, 1985, 1ex (leg. P. Meškovski).

Collection data (IET): v. Negotino – Mazdrača, 742 m, 02.08.2012, 1♂ (leg. Xh. Abdija).

Authors unpublished data: Ljuboten, 1963 m, August 06, 2012; near Lešnica, 1820 m, July 24, 2016.

28. *Polyommatus eros* (Ochsenheimer, 1808) *subsp. eroides* (Frivaldszky, 1835)

In IUCN Red List Europe: Near Threatened (NT), in Macedonian Red List: NT.

Present in foothills and montane zones, in the meadow, rocky meadow and mesophilic grassland habitats.

Literature data: Crn Vrv, Daniel et al (1951); Crn Vrv, Ljuboten, Thurner (1964); Jakšić (1988); Ljuboten, Jakšić (1998a); Popova Šapka, Abdija (2013c).

Collection data (IET): Popova Šapka, 1436 m, in 2013, 1ex (leg. Xh. Abdija); Popova Šapka, 1947 m, 22.06.2016, 1♂; Popova Šapka, 1719 m, July 07, 2016, 1ex (leg. V. Krpač).

29. *Polyommatus ripartii* (Freyer, 1830)

as *Agrodiaetus ripartii* in Melovski (2002)

In Macedonian Red List: Near Threatened (NT).

Present in montane and subalpine zones, in the meadow, rocky meadow, low shrubbery and forest edge or clearing habitats.

Literature data: Ljuboten, as *Agrodiaetus ripartii* Melovski (2002); v. Rakovec – Borislavec, Abdija (2013c); v. Ničpur, Radika r. v. Trnica, Strežimir Reč, in Krpač et al (2013).

Collection data (SKO): v. Ničpur, 986 m, 11.08.2004, 1ex; v. Ničpur, 1086 m, August 11, 2004. 2ex; Radika r., 942 m, July 21, 2009, 1ex (leg. V Krpač).

Collection data (IET): v. Pirok, 637 m, July 27, 2012, 2ex; v. Rakovec, 962 m, in 2013, (leg. Xh. Abdija); Bogovinjsko Lake, 1949 m, September 24, 2016, 1ex (leg. V. Krpač).

Authors unpublished data: Ljuboten, 1963 m, 06.08.2012; Ljuboten Mountain Lodge, 1623 m, August 06, 2012; Bogovinjsko Lake, 1950 m, September 24, 2016.

30. *Polyommatus damon* ([Denis and Schiffermuller], 1775)

as *Polyommatus (Agrodiatus) damon ausonia* in Daniel et al (1951); Michieli (1963); as *Agrodiatus damon ausonia* in Thurner (1964); as *Agrodiatus damon* in Dufay (1973); Melovski (2002)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills, montane and subalpine zones, in the meadow, rocky meadow, low shrubbery, mesophilic grassland and forest edge or clearing habitats.

Literature data: Sharr Mountains, Doflein (1921); Crn Vrv, Sharr Mountains, Kobilica as *Polyommatus (Agrodiatus) damon ausonia* Daniel et al (1951); Popova Šapka, as *Agrodiatus damon ausonia* Michieli (1963); Crn Vrv, Kobilica, as *Agrodiatus damon ausonia* Thurner (1964); Radika r. v. Trnica, as *Agrodiatus damon* Dufay (1973); Jakšić (1988); Kobilica, Jakšić (1998a); Ljuboten Elezova Rupa, as *Agrodiatus damon* Melovski (2002); Radika valley around bridge 10 km NNW Sveta Voda, Huemer et al (2011); Ljuboten, Abdija (2013c); Mazdrača, Abdija et al (2017); v. Ničpur, Adžina River I, Adžina River II, Strežimir Reč, Krpač et al (2013).

Collection data (SKO): Ljuboten, 2460 m, August 28, 1976, 17 ex. (leg. S. Jakonov); v. Ničpur, 986 m, 11.08.2004, 3ex; Kobilica, 2470 m, July 26, 2007, 14. ex; Kobilica Gornovica, 2450 m, 26.07.2007, 6ex; Adžina River II, 1549 m, August 22, 2010, 7ex; Strežimir Reč, 1353 m, August 12, 2011, 5ex (leg. V. Krpač).

Collection data (IET): v. Novo Selo, July 30, 2012, 962 m, 1♂ 1♀; v. Rakovec, 962 m, in 2013; v. Vrutok, 787 m, in 2013; Mazdrača v. Lomnica, 750 m, in 2013, 1ex (leg. Xh. Abdija); Karanikoličko Lake, 2200 m, August 04, 2017, 1ex; Jelak, 1823 m, August 08, 2019, 2ex (leg. V. Krpač).

Authors unpublished data: Mavrovo - mountain northwest of v. Ničpur 2105 m, August 20, 2010; Sharr Mountains south, 1890 m, August 20, 2010; Mavrovo - mountain northwest of v. Ničpur, 1890 m, August 20, 2010; Sharr Mountains south, 1450 m, August 22, 2010; Mavrovo Adžina River II - North mountain of v. Brodec, 1450 m, August 22, 2010; Sharr Mountains south, 1540 m, August 22, 2010; Popova Šapka Ceripašina, 2382 m, August 05, 2012; Ljuboten, 1960 m, 06.08.2012; Ljuboten, 1640 m, August 06, 2012; Ljuboten Mountain Lodge, 1623 m, 06.08.2012; Ljuboten, 1963 m, August 06, 2012; v. Bozovce, 1399 m, 28.07.2013; Jelak, 1780 m, July 22, 2016; v. Lešnica, 1432 m, July 24, 2016, Bogovinjsko Lake, 1950 m, September 24, 2016.

Fam. Nymphalidae Rafinesque, 1815

31. *Kirinia climene* (Esper, 1783)

In Macedonian Red List: Vulnerable (VU).

Present in foothills zone, in forest edge or clearing habitats. *K. climene* has been mentioned only in one locality over v. Vrapčište.

Literature data: over v. Vrapčište in Jakšić (1988); Schaidler and Jakšić (1989).

32. *Erebia epiphron* (Knoch, 1783)

as *Erebia epiphron otientalis* in Doflein (1921); as *Erebia epiphron retyetzatensis* in Daniel et al (1951); Jakšić (1998a)

In Macedonian Red List: Near Threatened (NT).

Present in subalpine zone, in the meadow and rocky meadow habitats.

Literature data: Kobilica as *Erebia epiphron otientalis* Doflein (1921); Kobilica as *Erebia epiphron retyetzatensis* Daniel et al (1951); Titov Vrv, Michieli (1963); Jakšić (1988); Piribeg as *Erebia epiphron retyetzatensis* Jakšić (1998a); Kučibaba under Kule, v. Melovo near the river Bistrica, Melovski (2002).

Collection data (SKO): Ljuboten 2460 m, August 28, 1976, 1 ex. (leg. S. Jakonov); Kobilica Gornovica, 2450 m, July 26, 2007, 1ex (leg. V Krpač).

Collection data (IET): Karabunar, 2382 m, July 31, 2014, 1♂ 1♀, (leg. Xh. Abdija); Karabunar, 2490, July 31, 2014, 1ex; Gorna Lešnica, 1820 m, July 15, 2017, 1ex; under Karanikoličko Lake, 1754 m, August 04, 2017, 5ex (leg. V. Krpač).

Authors unpublished data: Karabunar – Titov Vrv, 2373 m, July 31, 2014; Titov Vrv, 2747 m, August 02, 2014.

33. *Erebia albergana* (Prunner, 1798)

In Macedonian Red List: Near Threatened (NT).

Present in montane and subalpine zones, in the meadow and forest edge, or clearing and riparian vegetation habitats.

Literature data: Jakšić (1988); Ljuboten over Elezova Rupa, Čaušica, v. Melovo near the river Bistrica, Melovski (2002).

Collection data (IET): Ljuboten, 1945 m, in 2013, (leg. Xh. Abdija).

34. *Erebia gorge* (Hübner, [1804])

In Macedonian Red List: Near Threatened (NT).

Present in montane and subalpine zones, in the meadow and rocky meadow habitats.

Literature data: Jakšić (1988); Mala Vraca, Jakšić (1998a); Sharr Mountains, Varga (2014).

Collection data (SKO): Ceripašina, 1700-2000 m, July 26-28, 1952, 1ex (leg. T. Petkovski).

Collection data (IET): Karabunar, 2382 m, in 2013, (leg. Xh. Abdija); Titov Vrv Karabunar, 2373 m, July 31, 2014, 1ex (leg V. Krpač).

Authors unpublished data: Karabunar - Titov Vrv, 2373 m, July 31, 2014; Titov Vrv, 2747 m, August 02, 2014.

35. *Erebia rhodopensis* Nicoll, 1900

In Macedonian Red List: Near Threatened (NT).

Present in montane and subalpine zones, in the meadow and rocky meadow habitats.

Literature data: Kobilica, as *Erebia typhon* f. *rhodopensis* Doflein (1921); Kobilica, Daniel et al (1951); Kobilica, Ljuboten Thurner (1964); Jakšić (1988); Ljuboten, Schaidler and Jakšić (1989); Ljuboten, Mala Vraca, Kobilica, Popova Šapka, Jelak, Jakšić (1998a); Piribeg, Jakšić (1998a); Čaušica, Dedel Beg, Idrizova Rupa, Melovski (2002); Popova Šapka, Abdija et al (2013b); Sharr Mountains, Varga (2014).

Collection data (IET): Popova Šapka, 1966 m, 21.07.2012, 3ex; Crno Lake, 2200 m, in 2013; Popova Šapka, 1436 m, in 2013; Karabunar, 2382 m, in 2013, (leg. Xh. Abdija); Titov Vrv Karabunar, 2373 m, July 31, 2014, 1ex; Crno Lake, 2177 m, June 24, 2016, 2ex (leg. V. Krpač).

Authors unpublished data: Titov Vrv, 2747 m, August 02, 2014.

36. *Erebia pronoe* (Esper, 1780)

as *Erebia pronoe fruhstorferi* in Daniel et al (1951); Michieli (1963); Thurner (1964)

In Macedonian Red List: Near Threatened (NT).

Present in the subalpine zone, in the meadow, mesophilic grassland, and forest edge or clearing habitats.

Literature data: Kobilica, Doflein (1921); Kobilica, as *Erebia pronoe fruhstorferi* in Daniel et al (1951); Titov Vrv, as *Erebia pronoe fruhstorferi* Michieli (1963); Jakšić (1988); Kobilica, as *Erebia pronoe fruhstorferi* Thurner (1964); Kobilica, Jakšić (1998a).

Collection data (IET): Borislavec, 1509 m, July 17, 2012, 1ex; Karabunar, 2382 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: Karabunar - Titov Vrv, 2373 m, July 31, 2014; Titov Vrv, 2747 m, August 02, 2014.

37. *Erebia pandrose* (Borkhausen, 1788)

as *Erebia pandrosa lappona* in Thurner et al (1964)

In Macedonian Red List: Near Threatened (NT).

Present in subalpine zone, in meadow, mesophilic grassland and forest edge or clearing habitats.

Literature data: Ljuboten, as *Erebia pandrosa lappona* Thurner et al (1964); Jakšić (1988); Ljuboten, Jakšić (1998a); Čaušica, Ljuboten, Jelak Mountain Lodge, Melovski (2002).

Collection data (SKO): Sharr Mountains, 1700, July 28, 1939. (leg. A Fadeev).

Collection data (IET): Titov Vrv Karabunar, 2488 m, June 22, 2016; Crno Lake, 2177 m, June 24, 2016, 5ex; Ambassadorska Livada, 1525 m, July 08, 2017, 4ex; Gorna Lešnica, 1820 m, July 15, 2017, 6ex (leg. V. Krpač).

Authors unpublished data: towards Titov Vrv, 1949 m, June 22, 2016.

38. *Chazara briseis* (Linnaeus, 1764)

as *Satyrus briseis albanica* in Daniel et al (1951)

In IUCN Red List Europe: Near Threatened (NT).

Present in all vegetation belts, in meadow, rocky meadow habitats.

Literature data: v. Lešok, v. Brodec, Crn Vrv as *Satyrus briseis albanica* Daniel et al (1951); Jakšić (1988); Ljuboten, Melovski (2002); Mavrovo, Abdija et al (2013b).

Collection data (SKO): Ceripašina, 2500m, July 26, 1952, 1ex (leg. T. Petkovski).

Collection data (IET): Sharr Mountains, 1180 m, September 01, 2012. (leg. Xh. Abdija).

Authors unpublished data: near v. Jažince, 739 m, July 25, 2013; v. Vratnica, 730 m, July 25, 2013; v. Vratnica, 742 m, July 25, 2013.

39. *Hipparchia fagi* (Scopoli, 1763)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills and montane zones, in low shrubbery and forest edge or clearing habitats.

Literature data: Jakšić (1988); Adžina River II, Krpač et al (2013).

Authors unpublished data: Sharr Mountains south, 1255 m, August 22, 2010.

40. *Hipparchia statilinus* (Hufnagel, 1766)

In IUCN Red List Europe: Near Threatened (NT).

Present in foothills and montane zones, in the meadow, rocky meadow, low shrubbery, and forest edge or clearing habitats.

Literature data: Jakšić (1988); Borislavec, Abdija et al (2013b); Mavrovo Pilana, Radika r. v. Trnica, Adžina River II, Krpač et al (2013); Mazdrača, Abdija et al (2017).

Collection data (SKO): Mavrovo Pilana, July 21, 2009, (leg. M. Krpač); Adžina River II, 1549 m, August 22, 2010. (leg. V. Krpač).

Collection data (IET): v. Rakovec, 962 m, 15.09.2011, 1♂ 1♀; Mazdrača v. Lomnica, 750 m, in 2013; v. Gajre - v. Lisec, 1204, in 2013; v. Kalište, 728 m, in 2013; above v. Vratnica, 910 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: Radika r. v. Trnica, 942 m, July 21, 2019.

41. *Limnitis populi* (Linnaeus, 1758)

In Macedonian Red List: Near Threatened (NT).

Present in montane zone, in forest edge or clearing, and riparian vegetation habitats.

Literature data: Jakšić (1988); v. Gorno Jelovce, Sharrski Vodi around the Mountain Lodge, beetwin v. Brezno - Tri Vodi, Melovski (2002); Mavrovi Anovi, Trnica, Krpač et al (2013); v. Lisec, Abdija et al (2019).

Collection data (IET): near stream v. Lisec, 1160 m, June 24, 2019, 1ex (leg. V. Krpač).

Authors unpublished data: Mavrovi Anovi, 1272 m, June 16, 2010; Trnica, 1003 m, June 16, 2010.

42. *Neptis rivularis* (Scopoli, 1763)

as *Limenitis rivularis* in Daniel et al (1951).

In Macedonian Red List: Near Threatened (NT).

Present in montane zone, in riparian vegetation habitats.

Literature data: v. Brodec (Pena r.), Crn Vrv, as *Limenitis rivularis* Daniel et al (1951).

43. *Neptis sappho* (Pallas, 1771)

In Macedonian Red List: Vulnerable (VU).

Present in foothills and montane zones, in forest edge or clearing and riparian vegetation habitats.

Literature data: Over v. Tearce near the river Bistrica Melovski (2002); v. Stenče, Abdija et al (2013b).

Collection data (IET): v. Pirok, 645 m, August 13, 2012, 2♂; v. Rakovec, 962 m, in 2013, (leg. Xh. Abdija).

44. *Araschnia levana* (Linnaeus, 1758)

In Macedonian Red List: Near Threatened (NT).

Present in foothills and montane zones, in mesophilic grassland, forest edge or clearing and riparian vegetation habitats.

Literature data: Tri Vodi around the Mountain Lodge Melovski (2002); Kučibaba (Tri Vodi), Melovski (2004); v. Tearce, Abdija et al (2013b); Mazdrača, Abdija et al (2017), v. Gajre, v. Lisec, Abdija et al (2019).

Collection data (IET): v. Kalište, 729 m, 30.04.2012, 1♂; v. Kalište, 728 m, in 2013; above v. Vratnica, 910 m, in 2013; Borislavec, 1679 m, in 2013; Popova Šapka, 1436 m, in 2013, (leg. Xh. Abdija); road to v. Lisec, 1160 m, July 23, 2016, 1♀ (leg. V. Krpač).

45. *Nymphalis xanthomelas* ([Denis & Schiffermüller], 1775)

In Macedonian Red List: Near Threatened (NT).

Present in foothills zone, in forest edge or clearing and riparian vegetation habitats.

Literature data: v. Pirok, Abdija et al (2013b); Adžina River, Krpač et al (2013).

Collection data (IET): v. Tearce, 759 m, March18,2012, 1♀; v. Vratnica, 910 m, in 2013, (leg. Xh. Abdija).

46. *Brenthis ino* (Rottemburg, 1775)

In Macedonian Red List: Near Threatened (NT).

Present in foothills and montane zones, in the meadow, mesophilic grassland, forest edge or clearing habitats.

Literature data: Jakšić (1988).

Authors unpublished data: Ski resort road north of v. Lisec, 1420 m, July 31, 2011.

47. *Boloria pales* ([Denis & Schiffermüller], 1775)

as *Argynis pales contempta* in Doflein (1921); as *Argynis (Brenthis) pales contempta* in Daniel et al (1951)

In Macedonian Red List: Near Threatened (NT).

Present in montane and subalpine zones, in the meadow, rocky meadow habitats.

Literature data: Kobilica as *Argynis pales contempta* in Doflein (1921); Ljuboten, in Rebel and Zerny (1931); Crn Vrv, as *Argynis (Brenthis) pales contempta* in Daniel et al (1951); Ceripašina, Michielli (1963); Crn Vrv, Thurner (1964); Jakšić (1988); Bistravec, Abdija et al (2013b); Sharr ms, Varga (2014).

Collection data (IET): Borislavec, 1679 m, 08.08.2012, 1♂; Borislavec, 1679, in 2013; Crno Lake, 2200, in 2013, (leg. Xh. Abdija).

48. *Boloria graeca* (Staudinger, 1870)

as *Argynis (Brenthis) graeca balcanica* in Rebel and Zerny (1931); as *Boloria graeca balcanica* in Daniel et al (1951); Michielli (1963); Jakšić (1998a); as *Boloria (Argynis) graeca balcanica* in Thurner (1964)

In Macedonian Red List: Near Threatened (NT).

Present in all vegetation belts (foothills, montane and subalpine zones), in meadow, rocky meadow, low shrubbery, mesophilic grassland and forest edge or clearing habitats.

Literature data: Ljuboten, Kobilica, as *Argynis (Brenthis) graeca balcanica* in Rebel and Zerny (1931); Crn Vrv, Kobilica, as *Boloria graeca balcanica* in Daniel et al (1951); Popova Šapka (1800-2000) as *Boloria graeca balcanica* Michielli (1963); Crn Vrv, Kobilica, Ljuboten as *Boloria (Argynis) graeca balcanica* Thurner (1964); Sharr Mountains in Arnscheid and Arnscheid (1980); Popova Šapka, Jakšić (1988); Sharr Mountains Piribeg, as *Boloria graeca balcanica* in Jakšić (1998a); Ljuboten, Kobilica, Jelak, Jakšić (1998a); Ljuboten, Ljuboten over Elezova Rupa, Ljuboten near mountain refuge, Jelak - Crn Vrv, Melovski (2002); Borislavec, Abdija et al (2013b); Sharr Mountains, Varga (2014).

Collection data (SKO) Ceripašina, 2500 m, July 26, 1952, 3ex (leg. T. Petkovski); Ljuboten, 2460 m, August 28, 1976, 7ex (leg. S. Jakonov).

Collection data (IET): Borislavec, 1679 m, 08.08.2012, 1♂; Crno Lake, 2200 m, in 2013, (leg. Xh. Abdija); Popova Šapka, 1745 m, 12.07.2016, 1ex; Krivošija, 1766 m, July 27, 2016, 1♂; under Karanikoličko Lake, 1754 m, August 04, 2017, 2 ex (leg. V. Krpač).

Authors unpublished data: Mavrovo - mountain northwest of v. Ničpur, 2105 m, August 20, 2010, Popova Šapka Ceripašina, 2382 m, August 05, 2012; Crno Lake, 2174m, August 07, 2012, Crno Lake, 2284 m, August 07, 2012; Titov Vrv, 2747 m, August 02, 2014; Popova Šapka, 1719 m, July 12, 2016; Krivošija 2139 m, July 27, 2016, under Karanikoličko Lake, 1754 m, August 04, 2017.

49. *Melitaea arduinna* (Esper, 1783)

In Macedonian Red List: Near Threatened (NT).

Present in montane and subalpine zones, in the meadow, low shrubbery and mesophilic habitats.

Literature data: Mavrovi Anovi, from v. Bogdevo to v. Krakornica, 1412 m, Krpač et al (2013); v. Lakavica, 585 m, Abdija et al (2013b).

Collection data (IET): v. Lakavica, 585 m, June 30, 2012, 1♂, (leg. Xh. Abdija).

Authors unpublished data: v. Vrben, 1335 m, 18.06.2010; v. Bogdevo – v. Krakornica, 1412 m, June 18, 2110; Crn Vrv, 936 m, June 01, 2013.

50. *Melitaea aurelia* Nickerl 1850

In IUCN Red List Europe: Near Threatened (NT), in Macedonian Red List: NT.

Present in foothills, montane and subalpine zones, in the meadow, rocky meadow, low shrubbery and mesophilic grassland habitats.

Literature data: v. Pršovce, Abdija et al (2013b).

Collection data (IET): v. Pršovce, 475 m, September 08, 2011, 1♂ 1♀; Mavrovo, 1026 m, May 05, 2012, 1ex; v. Negotino, 668 m, June 03, 2012, 4ex; v. Jažince, 720 m, July 26, 2013; v. Vrutok, 787 m, in 2013; Mazdrača v. Lomnica, 750 m, in 2013; v. Rakovec, 962 m, in 2013; v. Belovište, 785 m, in 2013; v. Jelovjane, 1142 m, in 2013; Bistrica (v. Tearce), 769 m, in 2013; Gajre - v. Lisec 1204 m, in 2013; v. Kalište, 728 m, in 2013; v. Vratnica, 910 m, in 2013; Popova Šapka, 1436 m, in 2013, (leg. Xh. Abdija).

Authors unpublished data: v. Lisec (1188) May 24, 2019.

51. *Euphydryas aurinia* (Rottemburg, 1775)

In Macedonian IUCN Red List: Near Threatened (NT), in Bern Convention appendix II.

Present in all vegetation belts, in the meadow, low shrubbery mesophilic grassland and forest edge or clearing habitats.

Literature data: Bunec, Adžina Reka, Melovski (2002); Mavrovi Anovi to v. Vrben, Krpač et al (2013); Mavrovo, Abdija et al (2013b).

Collection data (SKO): v. Vratnica, July 21, 1971, 16ex (leg. J. Čingovski); v. Vratnica, July 26, 1971, 14ex (leg. J. Čingovski).

Collection data (IET): Sharr Mountains Mavrovo, 991 m, May 05, 2012, 1♂ 1♀, (leg. Xh. Abdija); Uliverica, 1750 m, May 25, 2019, 2ex (leg. M. Černila, V. Krpač).

Authors unpublished data: The mountain above Mavrovi Anovi, 1680 m, June 16, 2010; Mavrovo, 1270 m, June 16, 2010; mountain above Mavrovo, 1750 m, June 16, 2010; the road to v. Vrben, 1350 m, June 18, 2010; v. Vrben, 1335 m, June 18, 2010; the road between v. Vrben and v. Bogdevo, 1550 m, June 18, 2010; v. Vrben proximity to the Kosovo border, 1530 m, June 18, 2010; Sharr Mountains south, 1540 m, August 22, 2010; Uliverica, 1790 m, May 25, 2019.

52. *Euphydryas maturna* (Linnaeus, 1758)
as *Euphydryas maturna macedonica* in Dufay (1977)

In IUCN Red List Europe: Vulnerable (VU), in Macedonian Red List: VU, in Bern Convention appendices II and IV.

Present in foothills zone, in forest edge and riparian vegetation habitats.

Literature data: Radika r. v. Trnica Dufay (1973); Radika r. v. Trnica as *Euphydryas maturna macedonica* in Dufay (1977); Jakšić (1988); Radika r., Jakšić (1998a); Radika r. near v. Trnica, Radika r. v. Ničpur Sveta Voda, Krpač et al (2013).

Collection data (SKO): Radika r., 942 m, 12.07.1975, 2ex (leg. S. Jakonov); Radika r. v. Ničpur Sveta Voda, 980 m, 03.07.2010, 1ex (leg. V. Krpač).

Conclusion

According to the species richness of butterflies of the Sharr Mountains (179 taxa) with 52 species important for the valorization of the investigated area, we can conclude that the Sharr mountain range is a hot spot of biodiversity in the Republic of North Macedonia.

Over the past 50 years, humans have placed increasing pressure on nature. This leads to a decrease in biological diversity, which can be observed by the local extinction of some species of organisms, including butterflies. This is the main potential threat for the Sharr Mountains.

The butterflies are well known and quite easily observed. The species richness, or at least, the 52 target species can be monitored in the future to foresee the trend of the evolution of the biodiversity in this mountain range. In addition, it is a tool to help to find the most important areas to be protected within the Sharr Mountains.

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ANNEX

Check-List of butterflies on the Sharr Mountains

Fam. Hesperidae Latreille, 1809

Carcharodus alceae (Esper, 1780)
Carcharodus floccifera (Zeller, 1847)
Carcharodus orientalis Reverdin, 1913
Erynnis tages (Linnaeus, 1758)
Muschampia proto (Ochsenheimer, 1808)
Pyrgus malvae (Linnaeus, 1758)
Pyrgus serratulae (Rambur, 1839)
Pyrgus armoricanus (Oberthür, 1910)
Pyrgus alveus (Hübner, [1803])
Pyrgus cinarae (Rambur, 1839)
Pyrgus sidae (Esper, 1784)

Pyrgus carthami (Hübner, [1813])
Pyrgus andromedae (Wallengren, 1853)
Spialia orbifer (Hübner, [1823])
Spialia phlomidis (Herrich and Schäffer, 1845)
Carterocephalus palaemon (Pallas, 1771)
Thymelicus acteon (Rottemburg, 1775)
Thymelicus lineola (Ochsenheimer, 1808)
Thymelicus sylvestris (Poda, 1761)
Hesperia comma (Linnaeus, 1758)
Ochlodes sylvanus (Esper, 1777)

Fam. Papilionidae Latreille, 1802

Zerynthia polyxena ([Denis and Schiffermüller], 1775)
Zerynthia cerisy (Godart, [1824])
Parnassius mnemosyne (Linnaeus, 1758)

Parnassius apollo (Linnaeus, 1758) ssp. *macedonicus* Bollow, 1931
Iphiclydes podalirius (Linnaeus, 1758)
Papilio machaon Linnaeus, 1758

Fam. Pieridae Swainson, 1820

Leptidea duponcheli (Staudinger, 1871)
Leptidea sinapis (Linnaeus, 1758)
Leptidea juvernica Williams 1946
Aporia crataegi (Linnaeus, 1758)
Pieris krueperi Staudinger, 1860
Pieris rapae (Linnaeus, 1758)
Pieris mannii (Mayer, 1851)
Pieris ergane (Geyer, [1828])
Pieris napi (Linnaeus, 1758)
Pieris balcana Lorković, [1979]
Pieris brassicae (Linnaeus, 1758)

Pontia edusa (Fabricius, 1777)
Euchloe ausonia (Hübner, [1804])
Anthocharis cardamines (Linnaeus, 1758)
Anthocharis gruneri Herrich-Schäffer, 1851
Colias crocea (Geoffroy, 1785)
Colias alfarcariensis Ribbe, 1905
Colias caucasica Staudinger, 1871 subsp. *balcanica* Rebel, 1903
Gonepteryx rhamni (Linnaeus, 1758)
Gonepteryx farinosa (Zeller, 1847)

Fam. Riodinidae Grote, 1895

Hamearis lucina (Linnaeus, 1758)

Fam. Lycaenidae Leach, 1815

Favonius quercus (Linnaeus 1758)
Thecla betulae (Linnaeus, 1758)
Callophrys rubi (Linnaeus, 1758)
Satyrus acaciae (Fabricius, 1787)
Satyrus ilicis (Esper, 1779)
Satyrus spini ([Denis and Schiffermüller], 1775)
Satyrus w-album (Knoch, 1782)
Satyrus pruni (Linnaeus, 1758)
Lycaena phlaeas (Linnaeus, [1760])
Lycaena dispar ([Haworth], 1802)
Lycaena candens (Herrich-Schäffer, 1844)
Lycaena thersamon **Esper**, 1784
(*Lycaena alciphron* (Rottemburg, 1775)
Lycaena virgaureae (Linnaeus, 1758)
Lycaena tityrus (Poda, 1761)
Lampides boeticus (Linnaeus, 1767) Esper 1784)
Leptotes pirithous (Linnaeus, 1767)
Cupido alcetas (Hoffmannsegg, 1804)
Cupido argiades (Pallas, 1771)
Cupido decoloratus (Staudinger, 1886)

Scolitantides orion (Pallas, 1771)
Pseudophilotes vicrama (Moore, 1865) subsp. *schiffermuelleri* (Hemming, 1929)
Kretania sephirus (Frivaldzky, 1835)
Plebejus argus (Linnaeus, 1758)
Plebejus idas (Linnaeus, [1760])
Plebejus argyrognomon (Bergsträsser, 1779)
Agriades optilete (**Knoch**, 1781)
Agriades dardanus (Freyer, 1843)
Eumedonia eumedon (Esper, 1780)
Aricia agestis (Denis and Schiffermüller, 1775)
Aricia artaxerxes (Fabricius, 1793)
Aricia anteros (Freyer, 1838)
Cyaniris semiargus (Rottemburg, 1775)
Polyommatus amandus (Scheider, 1792)
Polyommatus dorylas ([Denis and Schiffermüller], 1775)
Polyommatus icarus (Rottemburg, 1775)
Polyommatus thersites (Cantener 1835)
Polyommatus eros (Ochsenheimer, 1808) subsp. *eroides* (Frivaldszky, 1835)

Cupido osiris (Meigen, 1829)
Cupido minimus (Fuessly, 1775)
Iolana iolas (Ochsenheimer, 1816)
Glaucopsyche alexis (Poda, 1761)
Phengaris alcon ([Denis and Schiffermüller], 1775)
Phengaris arion (Linnaeus, 1758)
Celastrina argiolus (Linnaeus, 1758)

Polyommatus daphnis ([Denis and Schiffermüller], 1775)
Polyommatus ripartii (Freyer, 1830)
Polyommatus admetus (Esper, 1783)
Polyommatus damon ([Denis and Schiffermüller], 1775)
Lysandra bellargus (Rottemburg, 1775)
Lysandra coridon (Poda, 1761)

Nymphalidae Rafinesque, 1815

Libythea celtis (Laicharting, 1782)
Kirinia roxelana (Cramer, 1777)
Kirinia climene (Esper, 1783)
Pararge aegeria (Linnaeus, 1758)
Lasiommata maera (Linnaeus, 1758)
Lasiommata petropolitana (Fabricius, 1787)
Lasiommata megera (Linnaeus, 1767)
Coenonympha arcania (Linnaeus, [1760])
Coenonympha leander (Esper, 1784)
Coenonympha pamphilus (Linnaeus, 1758)
Coenonympha rhodopensis Elwes, 1900
Pyronia tithonus (Linnaeus, 1771)
Maniola jurtina (Linnaeus, 1758)
Hyponphele lycaon (Kühn, 1774)
Hyponphele lupina (Costa, 1836)
Aphantopus hyperantus (Linnaeus, 1758)
Erebia ligea (Linnaeus, 1758)
Erebia euryale (Esper, 1805)
Erebia epiphron (Knoch, 1783)
Erebia albergana (Prunner, 1798)
Erebia medusa ([Denis & Schiffermüller], 1775)
Erebia gorge (Hübner, [1804])
Erebia rhodopensis Nicoll, 1900
Erebia cassioides (Hohenwarth, 1792)
Erebia ottomana Herrich & Schaffer, 1847
Erebia melas (Herbst, 1796)
Erebia pronoe (Esper, 1780)
Erebia oeme (Hübner, [1804])
Erebia pandrose (Borkhausen, 1788)
Chazara briseis (Linnaeus, 1764)
Brintesia circe (Fabricius, 1775)
Hipparchia semele (Linnaeus, 1758)
Hipparchia volgensis (Mazochin-Porshnjakov, 1952)
Hipparchia fagi (Scopoli, 1763)
Hipparchia syriaca (Staudinger, 1871)
Hipparchia statilinus (Hufnagel, 1766)
Arethusana arethusa ([Denis & Schiffermüller], 1775)
Satyrus ferula (Fabricius, 1793)
Melanargia galathea (Linnaeus, 1758)
Melanargia larissa (Geyer, [1828])

Apatura ilia ([Denis & Schiffermüller], 1775)
Apatura iris (Linnaeus, 1758)
Limenitis populi (Linnaeus, 1758)
Limenitis reducta Staudinger, 1901
Neptis rivularis (Scopoli, 1763)
Neptis sappho (Pallas, 1771)
Araschnia levana (Linnaeus, 1758)
Vanessa atalanta (Linnaeus, 1758)
Vanessa cardui (Linnaeus, 1758)
Polygonia c-album (Linnaeus, 1758)
Polygonia egea (Cramer, 1775)
Aglais io (Linnaeus, 1758)
Aglais urticae (Linnaeus, 1758)
Nymphalis polychloros (Linnaeus, 1758)
Nymphalis xanthomelas ([Denis & Schiffermüller], 1775)
Nymphalis vaualbum ([Denis & Schiffermüller], 1775)
Nymphalis antiopa (Linnaeus, 1758)
Fabriciana niobe (Linnaeus, 1758)
Fabriciana adippe ([Denis & Schiffermüller], 1775)
Speyeria aglaja (Linnaeus, 1758)
Argynnis paphia (Linnaeus, 1758)
Argynnis pandora ([Denis & Schiffermüller], 1775)
Brenthis ino (Rottemburg, 1775)
Brenthis daphne ([Denis & Schiffermüller], 1775)
Brenthis hecate ([Denis & Schiffermüller], 1775)
Issoria lathonia (Linnaeus, 1758)
Boloria euphrosyne (Linnaeus, 1758)
Boloria dia (Linnaeus, 1767)
Boloria pales ([Denis & Schiffermüller], 1775)
Boloria graeca (Staudinger, 1870)
Melitaea phoebe ([Denis & Schiffermüller], 1775)
Melitaea arduinna (Esper, 1783)
Melitaea didyma (Esper, 1778)
Melitaea trivia ([Denis & Schiffermüller], 1775)
Melitaea diamina (Lang, 1789)
Melitaea aurelia Nickerl 1850
Melitaea athalia (Rottemburg, 1775)
Melitaea cinxia (Linnaeus, 1758)
Euphydryas aurinia (Rottemburg, 1775)
Euphydryas maturna (Linnaeus, 1758)