

BIOLOGICAL DIVERSITY OF BUTTERFLIES (RHOPALOCERA) ON SHARR MOUNTAIN AND POLLOG VALLEY

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Abstract

Based on desktop analysis and our complementary researches on field trips carried out on Sharr Mountain and Pollog Valley, we established a total of 175 species (belonging to six families: *Hesperiidae*, *Papilionidae*, *Pieridae*, *Riodinidae*, *Lycaenidae*, *Nymphalidae*) representing 86,2 % of the fauna of daily butterflies in North Macedonia.

During field trips have been used two basic methods: catcher – for hunting avio-entomofauna and classic method of investigation.

The investigated territory owns high level of biological diversity, presence of endemic species, target species, refuge species and also protected species with law. They are found on different lists globally threatened at European level and according to them is evaluated the quality of habitats. Rarely butterfly species are significant in terms of biodiversity conservation: *Pyrgus andromedae* (Wallengren, 1853), *Euphydryas maturna* (Linnaeus, 1758), *Erebia gorge* (Hübner, 1804), *Erebia alberganus* (de Prunner, 1798), *Erebia rhodopensis* Nicoll, 1900, *Erebia pandrose* (Borkhausen, 1788), *Plebejus (Vacciniina) optilete* (Knoch 1781), *Phengaris arion* (Linnaeus, 1758), *Zerynthia (Zerynthia) polyxena* (Denis & Schiffermuller, 1775).

Keywords: *Rhopalocera*, biodiversity, Sharr Mountain, Pollog Valley.

1. Introduction

Sharr Mountain represents the largest massif in the Republic of North Macedonia. Sharr Mountain is located in the northwestern side of the Republic of North Macedonia which includes a length of 85 km and width of 15 – 20 km and with a surface of 1607 km² located in the northern geographic latitude 42° 41', 43" and eastern 20° 34', 51" [1]. It starts with an altitude above the sea level from 600 up to 2748m (Titov vrh) in which are interlocked a large number of various forest and grassy generations up to the alpine zone. (Xhezair Abdija, Vol 8, 2013) Pollog Valley is a low valley located at 380-550m above sea level and which lies between the Sharr Mountain and the Mali i Thatë, Skopje. It has almost a meridian stretch and its length is 44 km and width 7 km (West-East), with an area of 250 km² that ranks immediately after the Pelagonija and Skopje. It consists of Tetovo valley (Lower Polog) and the valley of Gostivar or Vardar [2].

From the faunistic point of view, Sharr Mountain is characterized by high leveled diversity, beautiful, abundant ambient landscapes. The impact of the two climates (moderated the Mediterranean and continental), presence of numerous vegetation communities as well as biotopes diversity, have conditioned appearance and presence of abundant and various animal life. There are found a larger number of species, especially in the world of insects with their colorful variousness and forms which more and more attract human attention.

Sharr Mountain is one of the richest massifs with species of the suborder Rhopalocera, Diurna (daily butterflies) not only in North Macedonia but as well as in the Balkan Peninsula.

Rhopalocera or the daily butterflies constitute the most notable ssp of Lepidoptera order, with nearly 174,250 gathered species in 126 families.

In the world, there are known 17. 500 species of the daily butterflies (Rhopalocera, Diurna), whereas in Europe, there are 482 species and in the Republic of North Macedonia, there are 201 species. If these 201 species are calculated with %, it appears that 46% of the total number in Europe is found in North Macedonia, that based on the area of the territory is a very high (%) [3-4].

For the Macedonian Lepidoptera fauna in total are recognized only three researchers: Austrians, Rebel & Dr. Dr. Hans. Zerny [5, 16] and Josef Thurner [18, 15] and researcher Scheider P. [9], P. Jaksic [8, 17], with co-author Krpaç. In the latest edition of Krpaç et al., 2008 [10] reported 201 species of Rhopalocera in the Republic of North Macedonia. Until now there are recognized superficial fauna studies for Sharr Mountain Rhopalocera Fauna and its surroundings, D. Melovski [13, 14]. In the research of all these authors, it is still left out space for the Rhopalocera fauna to be studied.

2. Materials and methods

We have used different methods during the research of Lepidoptera: catcher- for hunting avio-entomofauna, the classic method of investigation. The determinations were performed in science laboratory of Nature Science Museum in Skopje, with the help of stereomicroscope of the M5A Wild type (Vladimir T. Krpaç), based on morphological characteristics used for the determination of the systematic units. Entire caught material is located in the Institute of Ecology and Technology and this collected material has 2387 exemplars.



Figure 1. Republic of North Macedonia



Figure 2. Sharr Mountain

3. Results and Discussion

The results of our field trip are presented in Table 1 in which are given this information: family, genus, and species.

Table 1. Family, genus and species of Lepidoptera (Rhopalocera) on Sharr Mountain and Pollog Valley

<p>HESPERIIDAE (7 genus, 19 species)</p> <p><i>Erynnis</i> Schrank, 1801</p> <p><i>Erynnis marloyi</i> (Boisduval, 1843)</p> <p><i>Erynnis tages</i> (Linnaeus, 1758)</p> <p><i>Carcharodus</i> Hübner, 1819</p> <p><i>Charcharodus alceae</i> (Esper, 1780)</p> <p><i>Charcharodus floccifera</i> (Zeller, 1847)</p> <p><i>Spialia</i> Swinhoe, 1912</p> <p><i>Spialia phlomidis</i> (Herrich & Schäffer, 1845)</p> <p><i>Spialia orbifer</i> (Hübner, 1823)</p> <p><i>Pyrgus</i> Hübner, 1819</p> <p><i>Pyrgus alveus</i> (Hübner, 1803)</p> <p><i>Pyrgus andromedae</i> (Wallengren, 1853)</p> <p><i>Pyrgus armoricanus</i> (Oberthur, 1910)</p> <p><i>Pyrgus carthami</i> (Hübner, 1813)</p> <p><i>Pyrgus cinarea</i> (Rambur, 1839)</p> <p><i>Pyrgus malvae</i> (Linnaeus, 1758)</p> <p><i>Pyrgus serratulae</i> (Rambur, 1839)</p>	<p>PAPILIONIDAE (4 genus, 6 species)</p> <p><i>Parnassius</i> Latreille, 1804</p> <p><i>Parnassius apollo</i> (Linnaeus, 1758)</p> <p><i>macedonicus</i> (Bollow, 1931)</p> <p><i>Parnassius mnemosyne</i> (Linnaeus, 1758)</p> <p><i>Zerynthia</i> Ochsenheimer, 1816</p> <p><i>Zerynthia (Allancastris) cerisy</i> (Godart, 1824)</p> <p><i>Zerynthia (Zerynthia) polyxena</i> (Denis & Schiffermuller, 1775)</p> <p><i>Iphiclides</i> Hübner, 1819</p> <p><i>Iphiclides podalirius</i> (Linnaeus, 1758)</p> <p><i>Papilio</i> Linnaeus, 1758</p> <p><i>Papilio machaon</i> Linnaeus, 1758</p> <p>PIERIDAE (8 genus, 18 species)</p> <p><i>Leptidea</i> Billberg, 1820</p> <p><i>Leptidea duponcheli</i> (Staudinger, 1871)</p> <p><i>Leptidea sinapis</i> (Linnaeus, 1758)</p> <p><i>Aporia</i> Hübner, 1819</p> <p><i>Aporia crataegi</i> (Linnaeus, 1758)</p> <p><i>Euchloe</i> Hübner 1819</p> <p><i>Euchloe ausonia</i> (Hübner, 1823)</p> <p><i>Pieris</i> Schrank, 1801</p>
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<i>Pyrgus sidae</i> (Esper, 1784) Dime	<i>Pieris balcana</i> Lorkovic, 1970
<i>Thymelicus</i> Hübner, 1819	<i>Pieris brassicae</i> (Linnaeus, 1758)
<i>Thymelicus sylvestris</i> (Poda, 1761)	<i>Pieris ergane</i> (Geyer, 1828)
<i>Thymelicus acteon</i> (Rottemburg, 1775)	<i>Pieris krueperi</i> Staudinger, 1860
<i>Thymelicus lineola</i> (Ochsenheimer, 1808)	<i>Pieris manni</i> (Mayer, 1851)
<i>Hesperia</i> Fabricius, 1793	<i>Pieris napi</i> (Linnaeus, 1758)
<i>Hesperia comma</i> (Linnaeus, 1758)	<i>Pieris rapae</i> (Linnaeus, 1758)
<i>Ochlodes</i> Scudder, 1872	<i>Pontia</i> Fabricius, 1807
<i>Ochlodes sylvanus</i> Esper, 1777 = <i>Ochlodes venatus</i>	<i>Pontia edusa</i> (Fabricius, 1777)
(Bremer and Grey, 1953)	<i>Anthocharis</i> Boisduval, Rambur, Duméril & Graslin, 1833
	<i>Anthocharis cardamines</i> (Linnaeus, 1758)
	<i>Anthocharis gruneri</i> Herrich-Schäffer, 1851
	<i>Colias</i> Fabricius, 1807
	<i>Colias alfacariensis</i> Ribbe, 1905
	<i>Colias caucasica balcanica</i> Rebel, 1901
	<i>Colias croceus</i> (Fourcroy, 1785)
	<i>Gonepteryx</i> Leach, 1815
	<i>Gonepteryx rhamni</i> (Linnaeus, 1758)
RIODINIDAE (1 genus, 1 species)	<i>Cupido (Cupido) osiris</i> (Meigen, 1829)
<i>Hamearis</i> Hübner, 1819	<i>Cupido (Everes) alctas</i> (Hoffmannsegg, 1804)
<i>Hamearis lucina</i> (Linnaeus, 1758)	<i>Cupido (Everes) argiades</i> (Pallas, 1771)
LYCAENIDAE (18 genus, 52 species)	<i>Cupido (Everes) decolorata</i> (Staudinger, 1886)
<i>Favinius</i> Sibatini & Ito, 1942	<i>Celastrina</i> Tutt, 1906
<i>Favonius quercus</i> (Linnaeus 1758)	<i>Celastrina argiolus</i> (Linnaeus, 1758)
<i>Thecla</i> Fabricius, 1807	
<i>Thecla betulae</i> (Linnaeus, 1758)	

Satyrium Scudder, 1876
Satyrium acaciae (Fabricius, 1787)
Satyrium ilicis (Esper, 1779)
Satyrium w-album (Knoch, 1782)
Satyrium pruni (Linnaeus, 1758)
Satyrium spini (Denis & Schiffermüller, 1775)
Callophrys Billberg, 1820
Callophrys rubi (Linnaeus, 1758)
Lycaena Fabricius, 1807
Lycaena alciphron (Rottenburg, 1775)
Lycaena candens (Herrich-Schäffer, 1844)
Lycaena dispar (Haworth, 1802) Jakonov
Lycaena hippothoe (Linnaeus, 1761)
Lycaena ottomanus (Lefèbvre, 1830)
Lycaena phlaeas (Linnaeus, 1761)
Lycaena thersamon (Esper 1784) Jakonov
Lycaena tityrus (Poda, 1761)
Lycaena virgaureae (Linnaeus, 1758)
Leptotes Scudder, 1876
Leptotes pirithous (Linnaeus, 1767)
Lampides Hübner, 1819
Lampides boeticus (Linnaeus, 1767)
Cupido Schrank, 1801
Cupido (Cupido) minimus Fuessly, 1775

SATYRNIDAE AND NYMPHALIDAE (30 genus, 79

Glaucopsyche Scudder, 1872
Glaucopsyche (Glaucopsyche) alexis (Poda, 1761)
Phengaris Doherty, 1891
Phengaris alcon (Denis & Schiffermüller 1775)
Phengaris arion (Linnaeus, 1758)
Iolana Bethune-Baker, 1914
Iolana iolas (Ochsenheimer, 1816)
Pseudophilotes Beuret, 1958
Pseudophilotes vicrama schiffermuelleri (Hemming, 1929)
Scolitantides Hübner, 1819
Scolitantides orion (Pallas, 1771)
Cyaniris Dalman, 1816
Cyaniris semiargus (Rottenburg, 1775)
Polyommatus Latreille, 1804
Polyommatus (Agrodiaetus) admetus (Esper, 1785)
Polyommatus (Agrodiaetus) damon (Denis & Schiffermüller, 1775)
Polyommatus (Agrodiaetus) ripartii (Freyer, 1830)
Polyommatus (Lysandra) bellargus (Rottenburg, 1775)
Polyommatus (Lysandra) coridon (Poda, 1761)
Polyommatus (Meleageria) daphnis (Denis & Schiffermüller, 1775)
Polyommatus (Polyommatus) amandus (Scheider, 1792)
Polyommatus (Polyommatus) dorylas (Denis & Schiffermüller, 1775)

species)	<i>Polyommatus (Polyommatus) thersites</i> (Cantener 1835)
<i>Pararge</i> Hübner, 1819	<i>Polyommatus (Polyommatus) icarus</i> (Rottemburg, 1775)
<i>Pararge aegeria</i> (Linnaeus, 1758)	<i>Polyommatus (Polyommatus) eros eroides</i> (Frivaldszky, 1835)
<i>Kirinia</i> Moore 1893	<i>Arícia</i> Reienbach, 1817
<i>Kirinia roxelana</i> (Cramer, 1777)	<i>Arícia agestis</i> (Denis & Schiffermuller, 1775)
<i>Lasiommata</i> Westwood, 1841	<i>Arícia anteros</i> (Freyer, 1839)
<i>Lasiommata maera</i> (Linnaeus, 1758)	<i>Arícia artaxerxes</i> (Fabricius, 1793)
<i>Lasiommata megera</i> (Linnaeus, 1767)	<i>Arícia (Eumedonia) eumedon</i> (Esper 1780)
<i>Lasiommata petropolitana</i> (Fabricius, 1787)	<i>Plebejus</i> Kluk, 1780
<i>Coenonympha</i> Hübner, 1819	<i>Plebejus (Plebejus) argus</i> (Linnaeus, 1758)
<i>Coenonympha arcania</i> (Linnaeus, 1761)	<i>Plebejus (Plebejus) argyrognomon</i> (Bergsträsser, 1779)
<i>Coenonympha leander</i> (Esper, 1784)	<i>Plebejus (Plebejus) idas</i> (Linnaeus, 1761)
<i>Coenonympha pamphilus</i> (Linnaeus, 1758)	<i>Plebejus (Plebijases) pylaon</i> (Fischer von Waldhem, 1832)
<i>Coenonympha rhodopensis</i> Elwes, 1900	<i>Plebejus (Vacciniina) optilete</i> (Knoch 1781)
<i>Pyronia</i> Hübner, 1819	<i>Apatura</i> Fabricius, 1807
<i>Pyronia (Pyronia) tithonus</i> (Linnaeus, 1767)	<i>Apatura ilia</i> (Denis & Schiffermüller, 1775)
<i>Aphantopus</i> Wallengren, 1853	<i>Apatura iris</i> (Linnaeus, 1758)
<i>Aphantopus hyperantus</i> (Linnaeus, 1758)	<i>Argynnis</i> Fabricius, 1807
<i>Hyponephele</i> Muschamp, 1915	<i>Argynnis (Argynnis) paphia</i> (Linnaeus, 1758)
<i>Hyponephele lupinus</i> (O. Costa, 1836)	<i>Argynnis (Fabriciana) adippe</i> (Denis & Schiffermuller, 1775)
<i>Hyponephele lycaon</i> (Rottemburg 1775)	<i>Argynnis (Fabriciana) niobe</i> (Linnaeus, 1758)

<i>Maniola</i> Schrank, 1801	<i>Argynnis (Mesoacidalia) aglaja</i> (Linnaeus, 1758)
<i>Maniola jurtina</i> (Linnaeus, 1758)	<i>Argynnis (Pandoriana) pandora</i> (Denis & Schiffermuller, 1775)
<i>Erebia</i> Dalman, 1816	<i>Issoria</i> Hübner, 1819
<i>Erebia cassioides</i> (Reiner & Hochenwarth 1792)	<i>Issoria (Issoria) lathonia</i> (Linnaeus, 1758)
<i>Erebia alberganus</i> (de Prunner, 1798)	<i>Brenthis</i> Hübner, 1819
<i>Erebia euryale</i> (Esper, 1805)	<i>Brenthis daphne</i> (Bergsträsser, 1780)
<i>Erebia gorge</i> (Hübner, 1804)	<i>Brenthis hecate</i> (Denis & Schiffermüller, 1775)
<i>Erebia ligea</i> (Linnaeus, 1758)	<i>Boloria</i> Moore, 1900
<i>Erebia epiphron</i> (Knoch, 1783)	<i>Boloria (Boloria) graeca</i> (Staudinger, 1870)
<i>Erebia manto</i> (Denis & Schiffermüller, 1775)	<i>Boloria (Boloria) pales</i> (Denis & Schiffermüller, 1775)
<i>Erebia medusa</i> (Denis & Schiffermüller, 1775)	<i>Boloria (Clossiana) dia</i> (Linnaeus, 1767)
<i>Erebia melas</i> (Herbst, 1796)	<i>Boloria (Clossiana) euphrosyne</i> (Linnaeus, 1758)
<i>Erebia ? oeme</i> (Hübner, 1804)	<i>Limenitis</i> Fabricius, 1807
<i>Erebia ottomana</i> Herrich-Schaffer, 1847	<i>Limenitis reducta</i> Staudinger, 1901
<i>Erebia pandrose</i> (Borkhausen, 1788)	<i>Limenitis populi</i> (Linnaeus, 1758)
<i>Erebia pronoe</i> (Esper, 1780)	<i>Neptis</i> Fabricius, 1807
<i>Erebia tyndarus</i> (Esper, 1781)	<i>Neptis sappho</i> (Pallas, 1771)
<i>Erebia rhodopensis</i> Nicoll, 1900	<i>Libythea</i> Fabricius, 1807
<i>Melanargia</i> Meigen, 1828	<i>Libythea celtis</i> (Laicharting, 1782)
<i>Melanargia galathea</i> (Linnaeus, 1758)	<i>Nymphalis</i> Kluk, 1780
<i>Melanargia larissa</i> (Geyer, 1828)	<i>Nymphalis antiopa</i> (Linnaeus, 1758)
<i>Satyrus</i> Latreille, 1810	<i>Nymphalis polychloros</i> (Linnaeus, 1758)
<i>Satyrus actaea</i> (Esper, 1783)	<i>Nymphalis xanthomelas</i> (Esper,
<i>Brintesia</i> Fruhstorfer, 1911	
<i>Brintesia circe</i> Fabricius, 1775	
<i>Arethusana</i> De Lesse, 1951	

<i>Arethusana arethusa</i> (Denis & Schiffermüller, 1775)	1781)
<i>Chazara</i> Moore, 1893	<i>Nymphalis vaualbum</i> (Denis & Schiffermuller 1775)
<i>Chazara briseis</i> (Linnaeus, 1764)	<i>Aglais</i> Hubner, 1819
<i>Hipparchia</i> Fabricius, 1807	<i>Aglais io</i> (Linnaeus, 1758)
<i>Hipparchia</i> (<i>Neohipparchia</i>) <i>statilinus</i> Hufnagel, 1766	<i>Aglais urticae</i> (Linnaeus, 1758)
<i>Hipparchia</i> (<i>Parahipparchia</i>) ? <i>aristaeus</i> (Bonelli 1826)	<i>Vanessa</i> Fabricius, 1807
<i>Hipparchia</i> (<i>Parahipparchia</i>) <i>semele</i> (Linnaeus, 1758)	<i>Vanessa atalanta</i> (Linnaeus, 1758)
<i>Hipparchia</i> (<i>Parahipparchia</i>) <i>senthes</i> (Fruhstorfer, 1908)	<i>Vanessa cardui</i> (Linnaeus, 1758)
<i>Hipparchia</i> (<i>Parahipparchia</i>) <i>volgensis</i> (Mazochin-Porshnjakov, 1952)	<i>Polygonia</i> Hubner, 1819
<i>Melitaea</i> Fabricius, 1807	<i>Polygonia c-album</i> (Linnaeus, 1758)
<i>Melitaea arduinna</i> (Esper, 1783)	<i>Araschnia</i> Hubner, 1819
<i>Melitaea athalia</i> (Rottemburg, 1775)	<i>Araschnia levana</i> (Linnaeus, 1758)
<i>Melitaea aurelia</i> Nickerl. 1850	<i>Melitaea phoebe</i> (Denis & Schiffermüller, 1775)
<i>Melitaea cinxia</i> (Linnaeus, 1758)	<i>Melitaea telona</i> Frühstorfer, 1908
<i>Melitaea diamina</i> (Lang, 1789)	<i>Melitaea trivia</i> (Denis & Schiffermüller, 1775)
<i>Melitaea didyma</i> (Esper, 1778)	<i>Euphydryas</i> Scudder, 1872
	<i>Euphydryas aurinia</i> (Rottemburg, 1775)
	<i>Euphydryas matura</i> (Linnaeus, 1758)



A

B

C

Figure 3. *A - Parnassius apollo* Linnaeus, 1758) *ssp. macedonicus* Bollow, 1931, **B - Zerynthia polyxena** (Denis & Schiffermuller 1775 and **C - Scolitantides orion** (Pallas, 1771)

In Table 12 is given a number of present species in our researched territory (Sharr Mountain and Pollog Valley), a number of species in Republic of North Macedonia and a number of species in Europe. Compared to Europe, out of 482 known species in Europe, R.N. Macedonia confirmed 203 species daily butterflies [6, 12] and in a Sharr Mountain the number of species is 175 and this data shows that the researched territory have a large diversity of daily butterflies.

Table 2. Present species (LEPIDOPTERA: RHOPALOCERA) in Europe, Republic of North Macedonia and Sharr Mountain

FAMILY	EUROPE	R.N. MACEDONIA	SHARR MOUNTAIN
<i>Hesperiidae</i>	46	25	19
<i>Papilionidae</i>	13	7	6
<i>Pieridae</i>	56	24	18
<i>Riodinidae</i>	1	1	1
<i>Lycaenidae</i>	129	57	52
<i>Nymphalidae</i>	237	87	79
TOTAL	482	203	175
DATA IN %	100%	42.1%	36.3%

4. Conclusions

- Research of literature data from museum collection and of doctorate thesis of Xhezair Abdija collection, showed that this family butterflies (Lepidoptera: Rhopalocera) is well investigated in qualitative and quantitative terms. If we take into account the numeral representation of North Macedonian fauna species (table 2), compared to Europe, out of 482 known species in Europe, R.N. Macedonia confirmed 203 species daily butterflies (Krpach et al 2013).
- On Sharr Mountain are determined: 175 taxa of rhopaloceras butterflies with 68 genera from 6 families.
- Sharr Mountain shows a high level of biological diversity concentrated on a surface of 1600 km².
- Presence of endemic species, target species, refuge species, but also such which are protected with law. They are found on different lists globally threatened at a European level and according to them is evaluated the quality of habitats.
- Rarer butterfly species are significant in terms of biodiversity conservation: *Pyrgus andromedae*, *Euphydryas maturna*, *Erebia gorge*, *Erebia alberganus*, *Erebia rhodopensis*, *Erebia pandrose*, *Plebeius (Vacciniina) optilete*, *Plebeius (Agriades) pyrenaica*, *Maculinea arion*, *Zerynthia polyxena*.
- River valleys as refuge centres, high mountaneous forest biotopes, and alpine pastures are shelters for a huge number of species from different faunas.

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