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Original scientific paper

A CONTRIBUTION TO THE STUDY OF DAILY BUTTERFLIES (LEPIDOPTERA) OF THE UZLOMAC MOUNTAIN

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Summary

Rizo Sijarić conducted the initial studies on the daily butterfly fauna in the foothills of Bosnian Mountains (Uzlomac, Čemernica and Borja) in the last decades of the 20th century. For that reason, this study represents an appendix to the earlier studies which took place in the mountain Uzlomac. The research was conducted over the period between 2008 and 2011 when 78 species on the mountain were determined. The butterflies were collected with the entomological net at the previously marked research sites. In this study, a systematic review of the butterfly species found here has been given, together with a systematic review of the species, as well as the analyses and comparisons to other mountains.

Key words: daily butterflies, the Uzlomac Mountain, species diversity

INTRODUCTION

Studies of butterflies in the area of Bosnia and Herzegovina can be divided into two periods - before and after World War II. The first period was marked by foreign researchers Apfelbek, 1892, Nichol, 1899, 1902, Rebel 1904, Frhstorfer, 1906-1910, Schawerda, 1908-1922, Lorković, 1955-1975, and others (Lelo, 2008). The mountains are rich in biodiversity, especially species of butterflies and they have attracted the attention of researchers. In the 1970s the studies were carried out on complex mountains: Maglić, Volujak and Zelengora (Sijarić, 1970**)**, then the studies of mountains in Herzegovina: Prenj, Čvrsnica and Čabulja (followed and after that, the mountains Vranica, Vlašić, Cincar, Vran planina (Sijarić, 1971; 1977; 1979, 1982; 1983; 1984; 1986; 1996a; 1996b), Igman (Sijarić and Mihljević, 1975), Orjen were studied, as well as the mountains of the Bosnian hills: Čemernica, Borja and Uzlomac (Sijarić, 1971; 1983).

The first study of the Bosnian hills was done in 1990. Within 10 days of research, there were only 49 species found, 16 of which were on the mountain Uzlomac (Sijarić, 1996b). The research on this mountain was carried out in one day and, consequently, there was a small number of recorded species. Very similar results were obtained by studying the low mountains of northern Bosnia: Kozara, Prosara and Motajica (Sijarić, 1996b). Therefore, there was a need of studying this area in order to obtain a complete faunistic picture and to give a contribution to the study of biodiversity of Bosnia and Herzegovina.

MATERIALS AND METHODS

Research on daily butterflies on the mountain Uzlomac was conducted in 2008 and 2009, from April to September, with one or two monthly field trips. One part of the research was conducted at other sites (Savići, Zmajevac and Bilice) in 2011. On the vertical profile from Baština to Marijanovo gnijezdo, 7 points of the research were determined according to the type of habitat and vegetation (Figure 1, Table 1). Butterflies were captured in an entomological net, some were determined on the spot, while others were packaged in envelopes of tracing paper with the appropriate label.

Keys with the morphological characteristics were used for the determination: Living butterflies of Bosnia and Herzegovina (Lelo, 2008), Collins Butterflies Guide (Tolman, 2008) and the key with the features of the genital apparatus of male (Jakšić, 1998). Also, the binocular loupe (Kruss Optronic, WF 10X) was used, as well as accessories and supplies for preparing the male genitalia. About 200 products of genital apparatus were created. For each type data are given on site, the date of finding and the type of habitat. Information on height above sea-level, geographical latitude and longitude are taken from Google Earth.

Uzlomac is the mountain on the east side of Kotor Varoš, stretching from the northwest to the southeast to the mountain of Borja. The length of the massif is about 20, and width is 8-12 km. It represents the boundary between the Pannonian Plain in the north and a chain of high Dinarides in the south. The most important peaks are Prdeljica 944m and Marijanovo gnijezdo, 837 m. Geological features of the mountain are heterogeneous, dominated by Chert (Brujić, 2004). It is almost completely covered with deciduous forests of oak and beech. It is quite rich hydrologically, there are many springs, and some confluents of the Vrbanja River: Bosanka, Hrvaćanska rijeka, Vodalska rijeka, Slatinska rijeka and Svinjara can be distinguished.

Figure 1. Map outline of vertical profile points at the Uzlomac Mountain (*Google Earth*, modified by Filipović, S., 2018)

Table 1. Basic data on geo-environmental parameters (locations and habitat types)

Location	Type of habitat	Altitude (m)	Coordinates	
			N	E
I - Baština	Meadows	272	44°38'12.95"	17°22'43.31"
II - Rustina	Flood- meadows	288	44°38'46.63"	17°23'5.60"
III - Rustina	Forests with hornbeam	342	44°39'05.52"	17°23'47.30"
IV - Marijanovo gnijezdo	Oak forest	419	44°38'47.83"	17°24'41.04"
V - Marijanovo gnijezdo	Beech forest	482	44°39'55.35"	17°25'4.30"
VI - Marijanovo gnijezdo	Mountain meadows	548	44°40'9.19"	17°25'15.34"
VII - Golo brdo	Mixed coniferous forests	540-837	44°38'42.80"	17°24'27.65"

RESULTS

The three-year-long study on the Uzlomac Mountain resulted in the detection of 74 species recorded, which is significantly higher than in 1990, when only 16[1] species of daily butterflies were recorded (Table 2).

Table 2. Systematic and faunistic analysis (the number of record on the investigated localities)

Species	I	II	III	IV	V	VI	VII	out	First record	Last record	Sum
HESPERIIDAE											
Thymelicus sylvestris P.	5	1	1		1	1		1	12.7.08.	21.7.11.	10
Thymelicus lineola Och.	2	1				1			25.6.08.	14.7.09.	4
Ochlodes sylvanus Esp.	3	2	5	1	1			1	12.5.08.	7.8.11.	13
Erynnis tages Esp.	7	2	3	1	2			1	12.5.08.	21.7.11.	16
Pirgus malvae L.	3		2		1				12.5.08.	21.7.11.	6
Carterocephalus palaemon Led.		1							12.5.08.		1
Carcharodus alceae Esp.		1							14.7.09.		1
Heteropterus morpheus Pall.			1						25.6.08.		1
PAPILIONIDAE											
Iphiclides podalirius L.	5		1				1		23.6.08.	7.8.11.	7
Papilio machaon L.	2	2		1			2	1	12.5.08.	7.8.11.	8
Zerynthia polyxena D&S.	1								2.5.08.		1
PIERIDAE											
Pieris brassicae L.	2	3		1	1			1			8
Pieris napi L.	1	7	9	1	2	2					22
Pieris rapae L.	3	4	4	1	1	1		2			16
Pieris balcana Lor.		2	1								3
Pontia edusa Fab.	1										1
Leptidea sinapis L.	12	9	7	7	4	3	1	2			55
Anthocharis cardamines Bo.			1			1					2

[1] Species recorded in 1990: *Erynnis tages, Pieris napi, Gonopteryx rhamni, Leptidea sinapis, Lycaena phleas, Lycaena tityrus, Satyrium ilicis, Phengaris arion, Plebejus argus, Vanessa atalanta, Vanessa carudi, Aglais urticae, Argynnis paphia, Issoria lathonia, Melanargia galathea* and *Maniola jurtina.*

Gonepteryx rhamni L.	4	4	5	2	1			2			18
Colias crocea Geo.	9	4	1	1		2		4			21
Colias hyale L.						1	1				2
Aporia crataegi L.		1									1
LYCAENIDAE											
Callophrys rubi L.		2	2			1					5
Lycaena dispar Haw.	3	3									6
Lycaena tityrus P.	5	1	1	1		1					9
Lycaena virgaureae L.	2										2
Lycaena phlaeas L.	1										1
Satyrium ilicis Esp.	1	1									2
Satyrium w-album Kn.		1									1
Plebejus idas L.	5	1	2	2			1				11
Plebejus argus L.	3		1	1	1			2			8
Polyommatus icarus Rott.	8	6	1	4		4		3			26
Aricia agestis D&S.		2	1								3
Cupido decoloratus St.	5	4	3	1		1		2			16
Cupido argiades Pall.	4	4	3	2		7	1				21
Cupido minimus Fu.	1										1
Cupido alcetas Hoff.		2		1							3
Celastrina agriolus L.	2	2	3		1			1			9
Glaucopsyche alexis P.			1								1
Favonius quercus L.	1					1	1				3
Phengaris arion L.	1							1			2
RIODINIDAE											
Hamearis lucina L	1										1
NYMPHALIDAE											
Melitaea athalia Rott.	6	3	3	3		5		1			21
Melitaea aurelia Nick.	1	2		1		1					5
Melitaea didyma Esp.	5	1	1			1		1			9
Melitaea cinxia L.	1										1
Melitaea phoebe D&S.	4	2	1			1	1				9
Euphydryas aurinia Rott.	2	1									3
Brenthis hecate D&S.	3										4
Brenthis daphne D&S.	2	2	4								8
Araschnia levana L.	1	6	7								14
Polygonia c-album L	2	3	6	1	1	3					16
Argynnis paphia L.	2	7	4	3	2	1	1	1			21
Argynnis adippe D&S.	1	4	6								11
Argynnis aglaja L.			1								1
Apatura ilia D&S.	1	2				1					3
Neptis sappho Pall.		6	8	2	2			2			20
Neptis rivularis Scop.		2									2
Nymphalis antiopa L.		3	1								4
Nymphalis polychloros L.		1	3		2						6
Aglais io L.	2	2	3		1			1			9
Vanessa atalanta L.	1	2	3		1		2	3			12
Vanessa cardui L.	1	2	1		1	2	1	2			10
Issoria lathonia L.		1	1								2
Boloria dia L.						1	1				2
Maniola jurtina L.	10	7	3	5	4	4	1	4			38

Pyronia tithonus L.	3	4	1	2	2	5	1	2			20
Coenonympha pamphilus L.	12	7	6	2	2	7		2			38
Coenonympha arcania L.	1	1	1			1	1				5
Coenonympha glycerion Bork.	5	3		4		2	1				15
Aphantopus hyperanthus L	4	4	5		2			2			17
Melanargia galathea L.	3	3	4	3	2	1	1				17
Minois dryas Scop.	5	2		2	2	3	1				15
Satyrus ferula Fab.	1										1
Pararge aegeria L.		2	1				3				6
Lasiommata maera L		1									1
Lasiommata megera L.							1				1
Brintesia circe Fab.					1						1

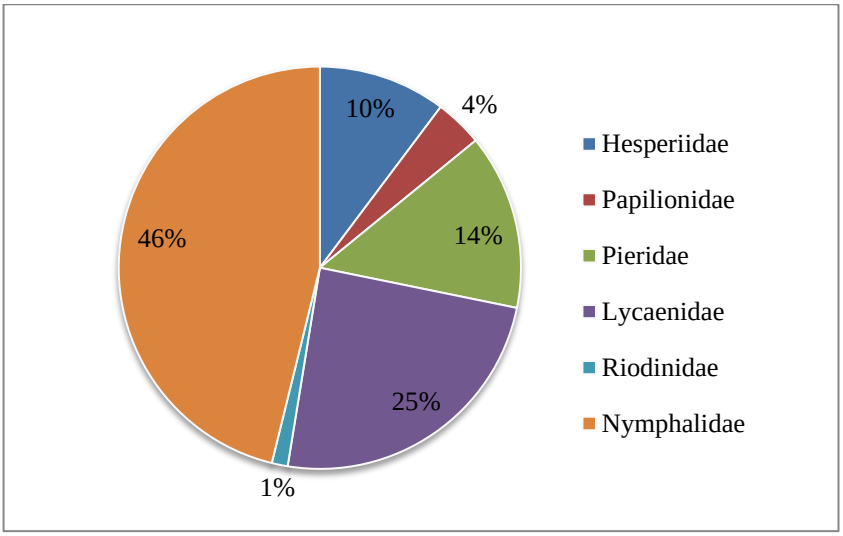

Figure 2. The number of species by families

A systematic analysis of fauna resulted in the following daily butterfly distribution per family: Nymphalidae 46%, Lycaenidae 25%, Pieridae 14%, Hesperiidae 10%, Papilionidae 4% and Riodinidae 1% (Figure 2).

DISCUSSION

This study is a continuation of the research on the Bosnian hills, which was initiated by Rizo Sijarić in the early 1990s. Given that the first results, as the author had pointed out, were incomplete but relevant to these geographical and ecological spheres, the new results represent complement to the research and give a fuller picture of the presence of faunal species of daily butterflies in this area[2].

The faunistic analysis of our results shows that 78 species of daily butterfliewere identified on the mountain Uzlomac, which is significantly higher than in the previous studies. However, the number of species is low compared to some other mountains in the eastern part of the country, and some mountains in the region. Previous studies suggest that western

[2] In the first study, only 49 species for Čemernica, Ugar, Borja and Uzlomac were found.

Bosnia is relatively poor with the species. In 1977, there were only 106 species found there (Sijarić, 1977). When comparing the low mountains of northern Bosnia and the Bosnian hills, the results are quite expected (Figure 3). According to the criteria for the selection of the protected areas based on the total number of species, mountains up to 1000 m are considered poor if they have less than 80 species (Jakšić, 2008).

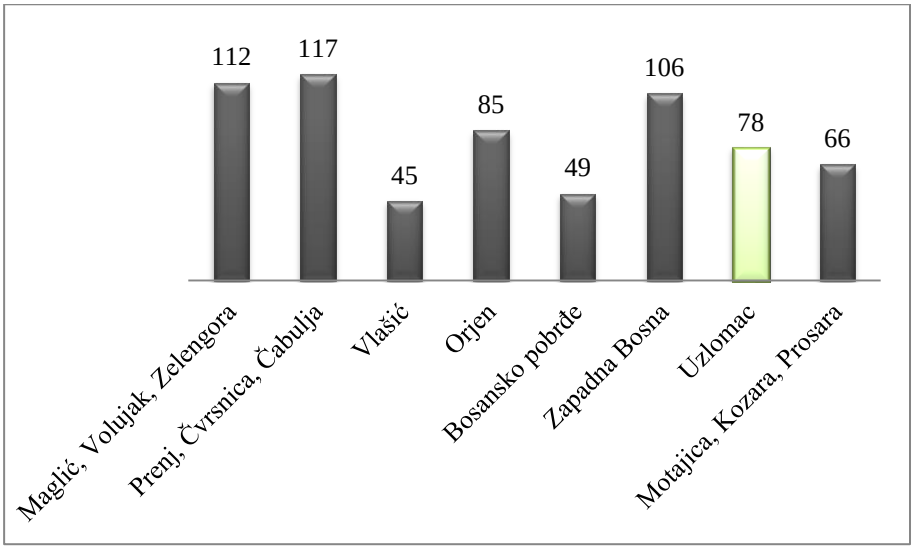

Figure 3. Comparison between Uzlomac Mountain and other Bosnian mountains and areas (number of daily butterfly species)

There is no clear line between the survey points and vertical differentiation of species, which can be interpreted by the height of mountains, the low diversity of habitats, a large forest cover, the absence of vast meadows, pastures and mountain grasslands and anthropogenic (deforestation, settlements, waste). Most species were marked on the first three spots. These habits are more open compared to the other spots which are almost all covered by forest. The number of species decreases from the lowest to the highest spot of the research.

It was in 1990 that *Aglais urticae* was found - a specimen which had not been recorded in the previous studies. By adding this species, the total number for Uzlomac is 79 or 42% of the total number of species in Bosnia and Herzegovina (189 species of daily butterflies have been registered in B&H so far). It should be assumed that this is not the final number and that future research will reveal some new species.

The species that are endangered are especially important and are on the European Red List and the Red Book of Serbia: *Carterocephalus palemon, Papilio machaon, Zerintia polyxena, Pieris brassicae, Lycaena dispar, Cupido minimus, Phengaris arion, Nymphalis antiopa, Euphydryas aurinia, Melitaea aurelia, Apatura ilia* and *Satyrus ferrula.* In terms of percentage, 16% of species are considered to be important for the protection of natural rarities.

CONCLUSION

Studies of the mountain Uzlomac were carried out in two periods, the first one in 1990 when only 16 species were recorded and the second one in 2008, 2009, and 2011, when 78 species were recorded. Butterflies have been classified into six families: Nymphalidae (35

species), Lycaenidae (17 species), Pieridae (10 species), Hesperiidae (8 species), Papilionidae (3 species) and Riodinidae (1 species). The presence of some species from the European Red List and Red Book of Serbia is also significant.

Uzlomac is poorly differentiated floristically; therefore the differences in the types among research points are minor. According to the criteria for determining the number of species in an area, Uzlomac and the complete western region of Bosnia are relatively poor with butterflies. The reasons for the presence of a small number of species can be interpreted in several ways: by these being low mountains, the lack of mountain pastures, meadows and mountain grasslands; the dominance of large forests over open terrain; geological features and characteristics of relief and the human impact.

It is essential to continue the research of Uzlomac, as well as the Bosnian hills, because we can expect some new species of butterflies to be found.

REFERENCES

Brujić, J. (2004). Šumska vegetacija sjevernog dijela planine Uzlomac kod Banjaluke. (Master thesis). Beograd: Šumarski fakultet, Univerzitet u Beogradu.

Jakšić, N. P. (1998). *Male genitalia of butterflies on Balkan Peninsula with a check-list. Lepidoptera: Hesperioidea and Papilionoidea*. Bratislava: Slamka.

Jakšić, P. (2008) *Prime Butterfly Areas in Serbia / Odabrana područja za dnevne leptire u Srbiji*. Beograd: HabiProt.

Lelo, S. (2008). *Dnevni leptiri Bosne i Hercegovine (Lepidoptera: Papilionoidea i Hesperioidea): Ključ za determinaciju vrsta sa osnovnim monografskim podacima*. Sarajevo: Prirodno - matematički fakultet Univerziteta u Sarajevu, pp. 133.

Sijarić, R. (1970). Fauna Rhopalocera i Hesperoidea (Lepidoptera) na području prašume Perućica u kompleksu planina Maglić, Volujak i Zelengora. *Glasnik Zemaljskog muzeja (PN) NS 9*, 186-191.

Sijarić, R. (1971). Faunistička istraživanja Rhopalocera (Lepidoptera) na kompleksu hercegovačkih visokih planina (Prenj, Čvrsnica i Čabulja). *Glasnik Zemaljskog muzeja (PN), NS, 10*, 163-184.

Sijarić, R. (1977). Faunistički prikaz Rhopalocera (Lepidoptera) zapadne Bosne. *Glasnik Zemaljskog muzeja (PN), NS, 16,* 175-192.

Sijarić, R. (1979). Populacije Rhopalocera (Lepidoptera) u ekosistemima planina Vranice u Bosni. Drugi kongres ekologa Jugoslavije, pp. 1953–1961.

Sijarić, R. (1982). Sastav populacija Rhopalocera (Lepidoptera) u ekosistemima planine Vlašić. *Glasnik Zemaljskog muzeja (PN), NS, 21,* 163-172.

Sijarić, R. (1983). Sastav i struktura populacija Rhopalocera (Lepidoptera) u ekosistemima krša jugoistočne Hercegovine i Orjena. *Glasnik Zemaljskog muzeja (PN), NS, 22*, 81-93.

Sijarić, R. (1984). Naselja Rhopalocera (Lepidoptera) u biocoenozama planine Cincar (Bosna). Bilten Društva ekologa Bosne i Hercegovine, Serija B - Naučni skupovi i savjetovanja. No 2. III Kongres ekologa Jugoslavije. Knjiga I, pp. 385 – 390.

Sijarić, R., (1986): Faunistička istraživanja Rhopalocera (Lepidoptera) u sjevernoj Bosni. *Glasnik Zemaljskog muzeja (PN), NS, 25-26*, 173-194.

Sijarić, R. (1996a). Fauna Rhopalocera (Lepidoptera) Vran planine (Hercegovina). *Glasnik Zemaljskog muzeja (PN), NS, 31,* 369-388.

Sijarić, R. (1996b). Faunistička istraživanja Rhopalocera (Lepidoptera) bosanskog pobrđa. *Glasnik Zemaljskog muzeja (PN), NS, 31,* 389-402.

Sijarić, R. & Mihljević, B. (1975). Rhopalocera i Hesperoidea (Lepidoptera), planine Igman kod Sarajeva. *Glasnik Zemaljskog muzeja (PN), NS, 14*, 163-175.

Tolman, T. (2008). *Collins butterflies guide. The most complete guide to the butterflies of Britain and Europe.* London: Collins.

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