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CONTRIBUTION TO THE KNOWLEDGE OF THE BUTTERFLY DIVERSITY (HESPEROIDEA & PAPILIONOIDEA) OF BANJA LUKA, BOSNIA AND HERZEGOVINA

PRILOG POZNAVANJU DIVERZITETA DNEVNIH LEPTIRA (HESPEROIDEA & PAPILIONOIDEA) GRADA BANJA LUKA, BOSNA I HERCEGOVINA

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Abstract

The paper deals with the fauna of butterflies in the Banja Luka area, located in the northwest part of the Republic of Srpska (Bosnia and Herzegovina). The paper presents data from the field research and literature. The total number of registered species for the area of Banja Luka is 93, which is quite well considering the size of the researched area. However, the number of species registered in the last survey is about 16% less than the total registered number for this area, which could indicate certain negative trends.

Key words: butterfly, insect, IUCN Red List, the Habitats Directive

1. INTRODUCTION / UVOD

The butterfly fauna of Banja Luka and the surrounding area has been the subject of interest from the beginning of the end 19th century (Mitis, 1882; Rebel, 1904). The most significant contribution to the knowledge of the butterfly fauna of this area was published by Sijarić (1991), where in addition to data from field research, the author also published records from the entomological collection donated by Boro Mihaljević to the National Museum of Bosnia and Herzegovina in Sarajevo.

In the last 30 years, changes in habitats in and around the city became obvious. Urbanization

of the city led to the disappearing of habitats, especially grasslands inside the city. The city limits spread towards the west, close to Suturlija River in the south, north to Zalužani, and east near Trapisti. Hence, many of the former natural and semi-natural habitats became urbanized, which led to their fragmentation which quite possibly harmed the diversity of butterfly fauna.

This paper aims to give a comprehensive overview of the butterfly fauna of Banja Luka and, based on recent surveys, to compare the species diversity between the “green belt” around the city and the green areas within the urban area.

2. MATERIAL AND METHODS / MATERIJAL I METOD RADA

This paper presents a faunal list with an overview of species, localities and dates of visits to the mentioned localities. This is complemented by a section providing the geographical and ecological characteristics of the visited localities.

A section of the topographic map, sheet Banja Luka, 1:100,000, Gaus-Kruger Projection, was taken (Vojnogeografski institut Beograd, 1986) and processed in GIS software for the cartographic basis and for identification by toponyms. The transect path and coordinates were determined using GPS "Garmin e-Trex 35". The threat status in Europe is shown according to the work of Van Swaay et al. (2010). The taxonomic order and the nomenclature follow Wiemers et al. (2018).

2.1 The study area / Područje istraživanja

Banja Luka is the capital city of the Republic of Srpska, covering an area of about 100 km², and the second largest city in Bosnia and Herzegovina. It is located in the northwest part of the country, along the Vrbas River, at an elevation of approximately 163 m a.s.l. As the capital city, Banja Luka is the administrative, political, cultural and university center. The city developed mainly following the course of the Vrbas River, and the residential settlements that were built after the Second World War developed towards the hills that surround the city center. After the Civil War, Banja Luka experienced expansion and became the most important center of the Republic of Srpska.

The study area is characterized by the great diversity of natural habitats and land use, from city parks to green areas intended for recreation and the rural area around the city.

This research was conducted between March 2019 and September 2022. We visited 11 localities situated in meadows, forests, and grassland in the area of Trapisti, Priječani, Suturlija, Ponir, the area above the Vrbas canyon and Starčevica forest park with Šehitluci, and, also four localities inside the urban zone of the city - Botanical Garden of the University Center, City park "Mladen Stojanović", Ada settlement and green areas of the Starčevica settlement (Figure 1). We

chose these two groups of areas with completely different purposes to clearly show how urbanization affects the diversity of butterfly fauna.

2.2 Description of the selected localities / Opis odabranih lokaliteta

*The underlined localities belong to the urban part of the city.

- 1) Šehitluci, next to the Monument, elevation 431 a.s.l., 44.743899°N and 17.162729°E, 04/01/2019, 08/13/2020 and 05/10/2022 - hiking path from the main road to the Monument. This locality belongs to the habitat type *Quercus petraea-Tilia tomentosa*. Most of the herb layer is covered with *Rubus hirtus* and *Ruscus hypoglossum*.
- 2) Trešnjik, road to Kozarevac, elevation 450 a.s.l., 44.732081°N and 17.175322°E, 04/01/2019, 05/22/2020 and 05/10/2022 - road from picnic area to Kozarevac. This locality is characterized by vegetation consisting of pure beech forests with very poor floristic composition. In the herb layer we found *Rubus hirtus*, *Galium odoratum* and *Lamium galeobdolon*.
- 3) Ponir, near to Mišin prevoj, elevation 330 a.s.l., 44.733062°N and 17.220210°E, 04/21/2020, 06/30/2020 and 05/25/2022 - pure beech forest intersected by abandoned meadows and orchards. Species from the genera *Rubus*, *Lotus*, *Trifolium* and *Brachypodium* were noticed on the site, on woodland clearings..
- 4) Ponir, elevation 290 a.s.l., 44.749888°N and 17.222299°E, 03/19/2020, 05/21/2020 and 07/15/2022 - road to Gornji Ponir, stone pit next to Drenovača creek - this habitat has similar characteristics as the previous one.
- 5) Botanical Garden, in University Campus, elevation 154 a.s.l. 44.774309°N and 17.214509°E, 03/18/2019, 08/12/2020 and 05/10/2022.
- 6) Čokorska polja, SW from the equestrian club, elevation 310 a.s.l., 44.786819°N and

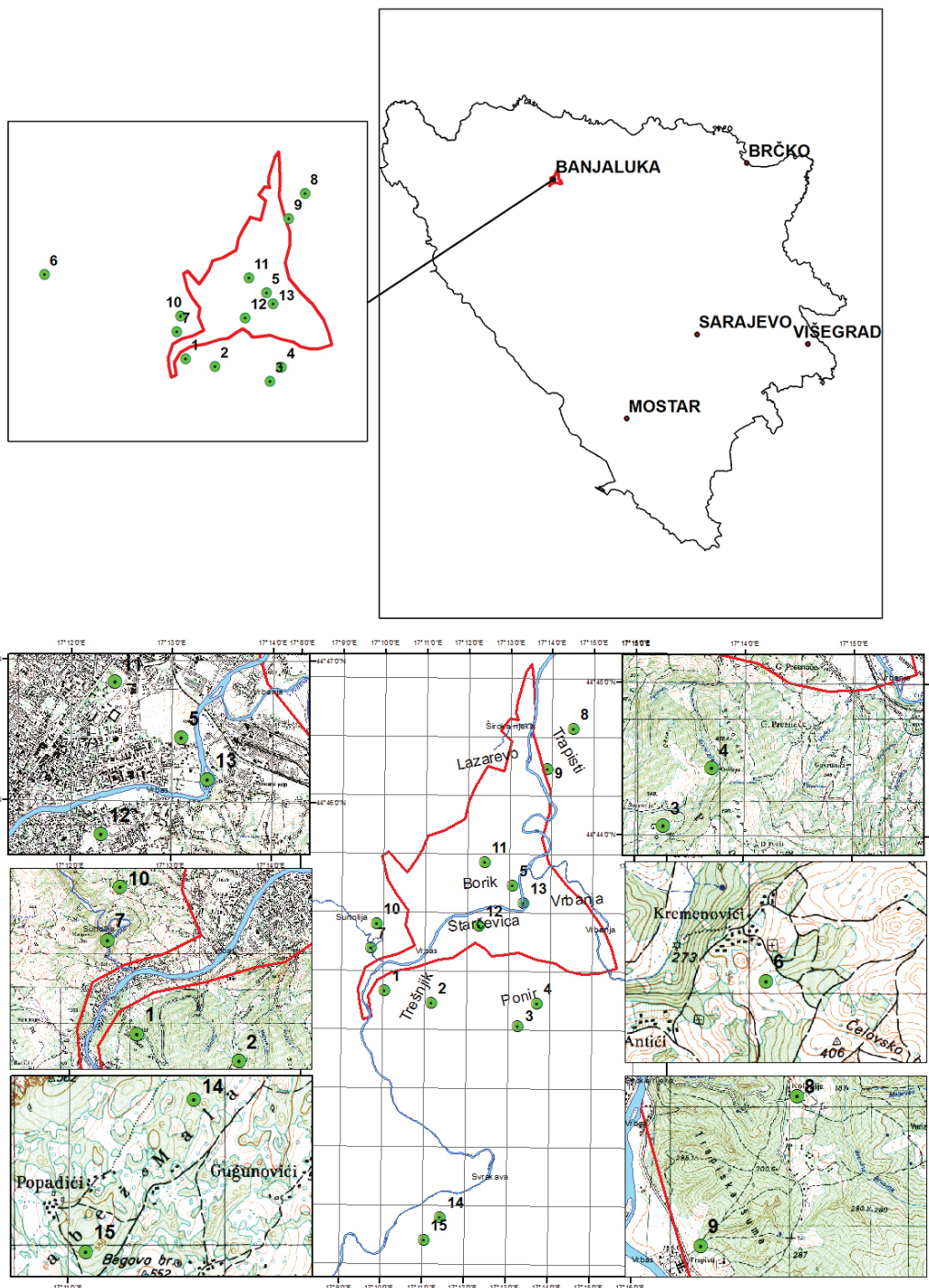


Figure 1. The geographical location of the study area around Banja Luka with localities from field research (green dots) done by the author where butterfly data were collected. The ordinal numbers of the localities marked on the map match those in the text / Slika 1. Geografski položaj istraživanog područja i lokaliteta područja Banjaluke sa kojih su pokupljeni podaci o leptirima tokom terenskog istraživanja autora (zelenе tačke). Redni brojevi lokaliteta označenih na karti odgovaraju onima u tekstu

- 17.094990°E, 04/02/2019, 05/22/2020, 08/12/2020 and 04/30/2022 - this locality is dotted with meadows and orchards with small fragments of oak and hornbeam forests. The herb layer is covered with species of the *Fabaceae* family such as *Lotus corniculatus*, *Medicago sativa*, *Lathyrus pratensis*, etc.
- 7) Suturlija, elevation 150 a.s.l., 44.754956°N and 17.157466°E, 06/09/2019, 08/12/2020 and 04/22/2022 - next to Suturlija creek – the banks of the stream are covered with *Robinia pseudoacacia* and *Salix alba*.
- 8) Priječani, near peak Piskavica, elevation 300 a.s.l., 44.818611°N and 17.237524°E, 04/22/2019, 06/25/2020, 07/15/2020 and 05/03/2022 – the area is characterized with partly abandoned meadows and mild slopes inside the oak and hornbeam forests. Plant species from genera *Festuca*, *Bromus*, *Urtica*, *Primula* and *Rubus* are noticed on this site.
- 9) Trapisti, elevation 170 a.s.l., 44.807626°N and 17.226454°E, 07/15/2019, 04/22/2019 06/25/2020 and 05/03/2022 - forest clearings within the oak and hornbeam forest. This is a humid habitat, with species such as *Salix alba*, *Alnus glutinosa* and *Carpinus betulus* along the stream. The herb layer is covered with species from the genera *Bromus*, *Festuca* and *Brachypodium*.
- 10) Šibovi, near Hunting Lodge, elevation 357 a.s.l., 44.763156°N and 17.159584°E, 05/11/2019, 08/12/2020 and 06/12/2022 – meadows next to hunting lodge. These are grassy, flowery and bushy places on the woodland clearings. Species like *Brachypodium pinnatum*, *Dactylis glomerata* and *Potentilla recta* and *Rubus fruticosus* are noticed on this locality.
- 11) City park „Mladen Stojanović“, elevation 160 a.s.l., 44.780701°N and 17.202036°E, 08/10/2020, 05/02/2020 and 06/01/2022.
- 12) Starčevica settlement, elevation 192 a.s.l., 44.754874°N and 17.210619°E, 03/19/2020, 04/21/2020, 05/21/2020, 06/02/2020, 09/30/2020 and 05/05/2022 - green areas between residential buildings.
- 13) Ada settlement, the area along the Vrbas coast, elevation 150 a.s.l., 44.769069°N and 17.217780°E, 05/04/2020, 08/10/2020, 04/15/2022 and 07/15/2022.
- 14) Ravna gora, elevation 550 a.s.l., 44.679882°N and 17.190830°E, 05/22/2022, 06/25/2022 and 08/01/2022. The area is characterized by partly abandoned meadows and mild slopes inside the oak and hornbeam forests. Plant species from the genera *Potentilla*, *Fragaria*, *Corydalis*, *Malva*, *Lonicera*, *Gentiana*, *Primula* and *Rubus* are noticed on this site.
- 15) Ajderi, elevation a.s.l., 44.673396°N and 17.184581°E, 05/22/2022, 06/25/2022 and 08/01/2022. This locality is dotted with meadows and orchards with the fragments of oak and hornbeam forests. Plant species from the genera *Potentilla*, *Fragaria*, *Corydalis*, *Malva*, *Lonicera*, *Gentiana*, *Primula*, *Geranium* and *Rubus* are noticed on this site.

2.3 Data sources / Izvori podataka

A total of 52 field trips were conducted during the entire flight period of butterflies, between March 2019 and September 2022. Butterflies were caught with an entomological net. Species identification was mainly performed by the ocular method (Lelo, 2008; Popović & Djurić, 2011; Tolman & Lewington, 2008). Most butterflies were released after identification, except for species from the genera *Melithaea* and *Leptidea*, specimens of which were collected for accurate identification based on the male genitalia (Jakšić, 1998).

Samples were deposited in the author's collection. The production of genitalia slides was done in a standard procedure: maceration in potash, washing to remove potash, dissecting and cleaning, staining, dehydrating and hardening, and mounting in Canada balsam.

The paper also presents the literature data. The largest number of data for the area of Banja Luka is found in the entomological collection of Boro Mihaljević, published in the Bulletin of the National Museum of Bosnia and Herzegovina in

Sarajevo (Sijarić, 1991). The collected samples from the Banja Luka area, which are in this collection, originate from the period 1956–1984.

Also, the paper includes data from Rebel (1904) and Pašić et al. (2012) that listed only a few specimens around Banja Luka.

3. RESULTS / REZULTATI

According to the data from the literature, including data from the field research performed by the author, the number of butterflies recorded in Banja Luka was 93, which indicates a good di-

versity. The systematic list of species along with their presence in each locality during the field research of the author and data from the literature is shown in Table 1.

Table 1. A complete list of all registered butterfly species from the available data for the Banja Luka City area with a presentation of data sources. The numbers of the localities match those in the text / **Tabela 1.** Kompletan lista svih registrovanih vrsta dnevnih leptira iz dostupnih podataka za područje Banja Luke sa prikazom izvora podataka. Brojevi lokaliteta odgovaraju onima u tekstu

No	Species / Ime vrste	Field research / Terensko istraživanje		Data from the literature / Podaci iz literature
		Suburban area	Urban area	
Hesperiidae				
1	<i>Erynnis tages</i> (Linnaeus, 1758)	6,8,9		+
2	<i>Carcharodus alceae</i> (Esper, 1780)	1,14		+
3	<i>Spialia orbifer</i> (Hübner, 1823)			+
4	<i>Pyrgus armoricanus</i> (Oberthur, 1910)			+
5	<i>Pyrgus serratule</i> (Rambur, 1839)	10		
6	<i>Pyrgus malvae</i> (Linnaeus, 1758)	6,8,9,10		
7	<i>Heteropterus morpheus</i> (Pallas, 1771)	7		+
8	<i>Thymelicus lineola</i> (Ochsenheimer, 1808)	8,9		+
9	<i>Thymelicus sylvestris</i> (Poda, 1761)	9		+
10	<i>Ochlodes sylvanus</i> (Esper, 1777)			+
Papilionidae				
11	<i>Zerynthia polyxena</i> (Denis & Schiffermüller, 1775)	6		+
12	<i>Parnassius mnemosyne</i> (Linnaeus, 1758)	14,15		+
13	<i>Iphiclides podalirius</i> (Linnaeus, 1758)	1,2,6,8,9,10,14,15	5,11,12,13	+
14	<i>Papilio machaon</i> (Linnaeus, 1758)	1,6,7,9,10,14,15	5,11,12,13	+
Pieridae				
15	<i>Leptidea morsei</i> (Fenton, 1882)			+
16	<i>Leptidea sinapis</i> (Linnaeus, 1758)	1,2,3,4,6,7,8,9,10,14,15	5,11,12,13	+
17	<i>Anthocharis cardamines</i> (Linnaeus, 1758)	1,2,14,15		+
18	<i>Aporia crataegi</i> (Linnaeus, 1758)	7,14		+
19	<i>Pieris brassicae</i> (Linnaeus, 1758)	2,7,9,10,14		+
20	<i>Pieris ergane</i> (Geyer, 1828)	14,15		+
21	<i>Pieris napi</i> (Linnaeus, 1758)	7,8,9	11	+
22	<i>Pieris rapae</i> (Linnaeus, 1758)	4,14,15		+
23	<i>Pontia edusa</i> (Fabricius, 1777)*			+
24	<i>Colias hyale</i> (Linnaeus, 1758)			+
25	<i>Colias crocea</i> (Geoffroy, 1785)	4,6,9,10,14,15	5,11,12,13	+

continued / nastavak na sljedećoj stranici

continuation of Table 1 / nastavak Tabele 1

No	Species / Ime vrste	Field research / Terensko istraživanje		Data from the literature / Podaci iz literature
		Suburban area	Urban area	
26	<i>Colias alfacariensis</i> (Ribbe, 1905)*			+
27	<i>Gonepteryx rhamni</i> (Linnaeus, 1758)	4,6,8,14,15	5,11,12,13	+
Riodinidae				
28	<i>Hamearis lucina</i> (Linnaeus, 1758)	4,8,9,14,15		+
Lycaenidae				
29	<i>Lycaena phlaeas</i> (Linnaeus, 1761)	6,7,9	12	+
30	<i>Lycaena dispar</i> (Haworth, 1802)	7,		+
31	<i>Lycaena hippothoe</i> (Linnaeus, 1761)			+
32	<i>Lycaena tityrus</i> (Poda, 1761)	1,6		+
33	<i>Thecla betulae</i> (Linnaeus, 1758)			+
34	<i>Callophrys rubi</i> (Linnaeus, 1758)			+
35	<i>Satyrrium w-album</i> (Knoch, 1782)	1,2		+
36	<i>Satyrrium spini</i> (Denis & Schiffermüller, 1775)			+
37	<i>Satyrrium acaciae</i> (Fabricius, 1787)			+
38	<i>Leptotes pirithous</i> (Linnaeus, 1767)			+
39	<i>Cupido minimus</i> (Fuessly, 1775)	1,7		+
40	<i>Cupido argiades</i> (Pallas, 1771)	3,4,6,7,9,10		+
41	<i>Cupido decolorata</i> (Staudinger, 1886)			+
42	<i>Celastrina argiolus</i> (Linnaeus, 1758)	4,7,9,14	12	+
43	<i>Pseudophilotes vicrama</i> (Moore, 1865)	6,		+
44	<i>Scolitantides orion</i> (Pallas, 1771)	2,7		+
45	<i>Glaucopteryx alexis</i> (Poda, 1761)	2,15		
46	<i>Phengaris arion</i> (Linnaeus, 1758)	1,6,		+
47	<i>Plebejus argus</i> (Linnaeus, 1758)	6,		+
48	<i>Plebejus argyrognomon</i> (Bergstrasser, 1779)			+
49	<i>Aricia agestis</i> (Denis & Schiffermüller, 1775)	1,2,6,7,15		+
50	<i>Polyommatus icarus</i> (Rottemburg, 1775)	4,6,7,9,		+
51	<i>Polyommatus amandus</i> (Schneider, 1792)	6,		
52	<i>Polyommatus coridon</i> (Poda, 1761)			+
53	<i>Polyommatus daphnis</i> (Denis & Schiffermüller, 1775)			+
54	<i>Polyommatus dorylas</i> (Denis & Schiffermüller, 1775)			+
Nymphalidae				
55	<i>Argynnis paphia</i> (Linnaeus, 1758)	1,7,9		+
56	<i>Argynnis aglaja</i> (Linnaeus, 1758)	1,14		+
57	<i>Fabriciana adippe</i> (Denis & Schiffermüller, 1775)	14,15		+
58	<i>Fabriciana niobe</i> (Linnaeus, 1758)	1,2		+
59	<i>Isoria lathonia</i> (Linnaeus, 1758)	4,9		+
60	<i>Brenthis daphne</i> (Bergstrasser, 1779)	3,4,8,9		+
61	<i>Brenthis hecate</i> (Denis & Schiffermüller, 1775)			+
62	<i>Boloria dia</i> (Linnaeus, 1767)	6,14		+
63	<i>Vanessa atalanta</i> (Linnaeus, 1758)	3,4,7,9,		+
64	<i>Vanessa cardui</i> (Linnaeus, 1758)	10,	11,12	

No	Species / Ime vrste	Field research / Terensko istraživanje		Data from the literature / Podaci iz literature
		Suburban area	Urban area	
65	<i>Aglais io</i> (Linnaeus, 1758)	2,4,8,9,14,15	5,11,13	+
66	<i>Aglais urticae</i> (Linnaeus, 1758)	1,4		+
67	<i>Polygonia c-album</i> (Linnaeus, 1758)	1,2,4,7,9,15		+
68	<i>Araschnia levana</i> (Linnaeus, 1758)	7,8,9		+
69	<i>Euphydryas aurina</i> (Rottenburg, 1775)	7,15		
70	<i>Melitaea athalia</i> (Rottenburg, 1775)	2,6,7,9,10,14,15	12,	+
71	<i>Melitaea cinxia</i> (Linnaeus, 1758)			+
72	<i>Melitaea diamina</i> (Lang, 1789)			+
73	<i>Melitaea didyma</i> (Esper, 1778)	1,2		+
74	<i>Melitaea phoebe</i> (Denis & Schiffermüller, 1775)	1,6,7		+
75	<i>Melitaea trivia</i> (Denis & Schiffermüller, 1775)	3,7		
76	<i>Limenitis camilla</i> (Linnaeus, 1764)			+
77	<i>Limenitis reduca</i> (Staudinger, 1901)			+
78	<i>Neptis sappho</i> (Pallas, 1771)	2,6,7,8,9		+
79	<i>Apatura ilia</i> (Denis & Schiffermüller, 1775)	1,		+
80	<i>Apatura iris</i> (Linnaeus, 1758)	3,4		+
81	<i>Pararge aegeria</i> (Linnaeus, 1758)	2,4,7,8,9,14,15		+
82	<i>Lasiommata maera</i> (Linnaeus, 1758)	1,2,9		+
83	<i>Lasiommata megera</i> (Linnaeus, 1767)	1,9,		+
84	<i>Coenonympha glycerion</i> (Borkhausen, 1788)	2,6,9,14,15	11,13	+
85	<i>Coenonympha arcania</i> (Linnaeus, 1761)	2,4,14,15	12,13	+
86	<i>Coenonympha pamphilus</i> (Linnaeus, 1758)	2,4,6,9,14	12,13	+
87	<i>Pyronia tithonus</i> (Linnaeus, 1767)	6,7,9		
88	<i>Aphantopus hyperantus</i> (Linnaeus, 1758)	1,7,		+
89	<i>Maniola jurtina</i> (Linnaeus, 1758)	2,3,4,6,7,8,9,10,14,15	11,13	+
90	<i>Melanargia galathea</i> (Linnaeus, 1758)	3,8,9,14		+
91	<i>Minois dryas</i> (Scopoli, 1763)	6,8,9,10		
92	<i>Hipparchia fagi</i> (Scopoli, 1763)	9,		
93	<i>Brintesia circe</i> (Fabricius, 1775)	1,		+
Total number of species / Ukupan broj vrsta		70	15	83

Note / Napomena. *A reference to the species *Pontia daplidice* was found in the literature (Sijarić, 1991, p. 222), however, the species is not known in Bosnia and Herzegovina, so it is probably the species *Pontia edusa* / *Navod vrste *Pontia daplidice* poznat je iz literature (Sijarić, 1991, p. 222). Međutim, vrsta nije poznata sa teritorije BiH i vjerovatno se navod odnosi na vrstu *Pontia endusa*

However, it should be pointed out that the total number registered in the field by the author is 70 (Tabela 1), which is 16% less than the total number which includes literature references. Also, the field research recorded only 15 species in the urban areas of the city, which is 16% of the total number of registered species.

At least two specimens from the genus *Leptidea* and *Melithaea* were collected from each locality. After observing the genitals of these species, it was concluded that all specimens belong to the species *Leptidea sinapis* and *Melithaea athalia* (Figures 2a and 2b).

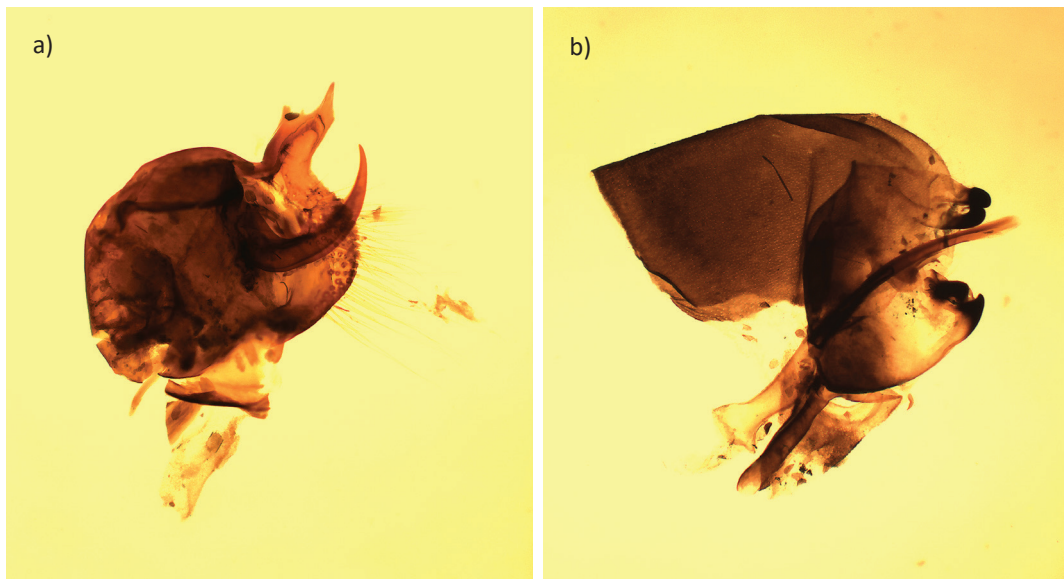


Figure 2. a) *M. athalia*, male genitalia, Banja Luka, Trapisti, 19 June 2020, Dukić B. leg. (left); b) *Leptidea sinapis*, Male genitalia, Banja Luka, Suturlija, 12 August 2020, Dukić B., leg. / **Slika 2.** a) *M.athalia*, preparat genitalne armature, Banja Luka Trapisti, 19.06.2020., Dukić B. leg.; b) *Leptidea sinapis*, preparat genitalne armature, Banja Luka, Suturlija, 12.08.2020., Dukić B.

4. DISCUSSION / DISKUSIJA

The total number of registered species of butterflies in this area is 93, i.e. 48% of the total registered number in Bosnia and Herzegovina (Lelo, 2016). This quantitative indicator shows that the fauna of this group of insects is relatively rich. Among the mentioned species, 10 of them were registered for the first time in this area. On the other hand, 23 species known in the literature were not confirmed.

The faunistic character of the researched area can best be assessed by comparing the fauna of the researched area with the composition of the fauna of neighboring areas. We chose the comparison with the city of Zagreb, as the closest urban environment for which we have data for butterfly fauna.

Comparing the list of species from the area of Zagreb (88 species) and Banja Luka (93 species), using the Jaccard formula (Jaccard similarity coefficient) which determines the similarity coefficient made in percentages, we found that the similarity of these two areas is 74%. The

difference can be explained in two ways. First, the differences between the habitat types and characteristics of Zagreb city and Banja Luka city could have caused or contributed to the differences in butterfly fauna. Second, the data about the butterflies in the city of Zagreb were collected during a long period in contrast to the area of Banja Luka, where the last research was done before the Civil War in the 90s of the last century, so the number of species known in the literature but not confirmed could suggest that those species are missing from the present fauna.

Endangered and protected species at the European level are shown in Table 2. Through regular monitoring over a longer period, population trends of certain species could be obtained. This paper can serve as a control sample for some further research on the diversity of butterflies in this area.

It is important to mention that certain localities (Suturlija, Šehitluci and Trešnjik) stood out for

their species richness. Species that are on important European lists of protected species are also registered there. Those habitats, as such, should certainly be considered as a potential

protected area, since due to the rapid expansion of the city core and the urbanization of the green belt of Banja Luka, the number of species in this area will inevitably decline.

Table 2. An overview of Banja Luka butterfly species that are on the most important European and national lists of protected species / **Tabela 2.** Pregled vrsta dnevnih leptira Banja Luke koji su na važnijim evropskim i nacionalnim listama zaštićenih vrsta

No	Species / Vrsta	Convention on the conservation of European Wildlife and Natural habitat, Bern 1979 (Annex II) (Council of Europe, 1979)		EHabitats directive 92/43/EEC EU Habitat Directive (Council of the European Union, 2006)		European Red List of Butterflies (Van Swaay et al., 2010)	Natura 2000 species for Bosnia and Herzegovina
				Annex II	Annex IV		
1	<i>Leptidea morsei</i> (Fenton, 1882)			*	*	NT	*
2	<i>Lycaena dispar</i> (Haworth, 1802)	*		*	*	NT	*
3	<i>Satyrrium w-album</i> (Knoch, 1782)						
4	<i>Phengaris arion</i> (Linnaeus, 1758)	*			*	EN	
5	<i>Euphydryas aurina</i> (Rottenburg, 1775)	*		*			*
6	<i>Pseudophilotes vicrama</i> (Moore, 1865)					NT	
7	<i>Hipparchia fagi</i> (Scopoli, 1763)					NT	

Also, it is important to emphasize that during the period 2019–2022, ten new species were found in this area, as follows: *Pyrgus serratulae*, *Pyrgus malvae*, *Polyommatus amandus*, *Glaucopteryx alexis*, *Melitaea trivialis*, *Vanessa cardui*, *Euphydryas aurina*, *Pyronia tithonus* *Minois dryas* and *Hipparchia fagi*. It is possible that these species were simply not observed in previous

research (Sijarić, 1977, 1991), given the fact that they were relatively short and in a small number of localities.

However, it would be necessary to pay more attention to monitoring the status of biodiversity in the future (Jakšić, 2008), since it could eventually contribute to the preservation and improvement of our environment.

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Sažetak

Grad Banja Luka, kao glavni administrativni, politički i kulturni centar Republike Srpske doživio je ekspanziju u poslednjih 30 godina. Kao posljedica urbanizacije, fauna Banja Luke se značajno promijenila tokom prošlog vijeka, i promjene koje su se dogodile na staništima unutar i oko grada su imale negativan uticaj na biodiverzitet. Svrha ovog rada jeste da bude polazna tačka budućih sistematskih faunističkih istraživanja i monitoringa i to na način da su u radu prikazani svi dostupni podaci o registrovanim vrstama za ovo područje.

Terenskim istraživanjem obuhvaćeno je 11 lokaliteta koji se nalaze u “zelenom pojasu” grada dok se četiri lokaliteta nalaze unutar urbane zone (Slika 1). Ukupan broj registrovanih vrsta (*Hesperoidea* i *Papilionoidea*), uzimajući u obzir terenska istraživanja autora i literaturne podatke je 93 (Tabela 1) što predstavlja 48 % ukupnog broja vrsta u Bosni i Hercegovini. Ukupan broj registrovanih vrsta u trogodišnjem terenskom istraživanju autora je 70 (Tabela 1), što je za 16 % manje od ukupnog registrovanog broja vrsta za ovo područje. Broj vrsta registrovanih u urbanoj zoni grada je svega 15. Na osnovu navedenog može se izvući zaključak o negativnim posljedicama urbanizacije na brojnost vrsta dnevnih leptira. Međutim, samo sistematskim istraživanjima i monitoringom kroz naredne godine moguće je jasno ustanoviti promjene u diverzitetu i trendovima populacija.

Ključne riječi: Direktiva o staništima EU, insekti, IUCN Crvena Lista, leptiri