

Butterfly fauna (Lepidoptera: Rhopalocera) of Donji Emovci, Požega, Croatia

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Abstract. An example of a photographic faunistic study of butterflies implemented in Croatia is presented herewith. The survey was conducted in the near surroundings of Donji Emovci village, near Požega, Slavonia, between 2009 and 2013. The surveyed area consists mostly of a mosaic of different kinds of monocultures, scattered grasslands and forest fragments. Seventy-nine butterfly species could have been reliably identified from the photographs, several of which are rare or interesting records for Croatia (e.g. *Colias erate*, *Parnassius mnemosyne* and *Cupido decoloratus*). This study shows that butterfly photography can indeed be a useful tool for faunistic studies, although additional methods should be used to gain complete species lists.

Key words: photography, Lepidoptera, diversity, interesting records, Požega, Croatia

Izvleček. Favna dnevnih metuljev (Lepidoptera: Rhopalocera) Donjih Emovceva, Požega, Hrvatska

– V članku predstavljamo primer favnistične raziskave metuljev na Hrvaškem na podlagi njihovih fotografij. Raziskava je bila opravljena v bližini vasi Donji Emovci blizu mesta Požega v Slavoniji med letoma 2009 in 2013. Preiskano območje je mozaik različnih tipov monokultur, travnišč in zaplat gozda. Na podlagi fotografij smo lahko zanesljivo določili 79 vrst metuljev, med katerimi jih je veliko redkih ali zanimivih najdb za Hrvaško (npr. *Colias erate*, *Parnassius mnemosyne* in *Cupido decoloratus*). Ta raziskava dokazuje, da je fotografiranje metuljev lahko uporaben način v favnističnih raziskavah, vendar pa bi za pridobitev celotnega seznama vrst določenih območij morali uporabiti še dodatne metode.

Ključne besede: fotografija, Lepidoptera, pestrost, zanimive najdbe, Požega, Hrvatska

Introduction

Butterflies are one of the most beautiful and charismatic groups of insects, regularly observed by both amateurs and professional entomologists, as they are, in most cases, large, colourful, and easy to recognize (e.g. Tolman & Lewington 2008). This is especially true in Europe where 482 species of butterflies are known to occur (Van Swaay et al. 2010). In Croatia, 197 species have been recorded so far (Šašić & Mihoci 2011, Koren & Štiš 2013, Koren et al. 2013a, b), of which 43 (22%) are listed in the Croatian Red Butterfly List (Šašić et al. 2013). The largest number of those species have a Near Threatened status (17), followed by Data Deficient (8), Critically Endangered (8), Vulnerable (6) and Endangered (4) (Šašić et al. 2013).

Most species of butterflies occurring in Europe are generally easily identified in the field just by observing their external morphological characteristics, without the need to kill them. With this in mind, modern butterfly identification guides are based on the principle of visual identification of specimens (Lafranchis 2004, Tolman & Lewington 2008). Still, this method implies that the observer needs to have considerable knowledge on the local butterfly fauna to easily and correctly identify most species encountered. While such data are very valuable from the conservation point of view, in particular due to non-invasive sampling, some problems are linked within such records. The greatest among them is the non-existent possibility of re-evaluation of the identification, due to the lack of a collected and preserved specimen. Another way to collect valuable data regarding butterfly diversity without the need to kill specimens is butterfly photography. In this way, a specimen is preserved in the picture which, when paired with the correct coordinates, locality name, date and observer, become valuable and useful data in any study or research paper. The power of photography, especially the ones shared by social media, is nowadays immense, resulting even in description of species new to science in collaboration with the scientists (Winterton et al. 2012). And what is very important, anybody can nowadays take pictures of a butterfly and send them to a researcher for correct identification. However, complete butterfly surveys (or surveys of other insect species) done with this method are very rare, and actually non-existent in Croatia. Although not all butterfly species can be identified by just observing or photographing, the vast majority of species occurring in Croatia can be correctly assigned to the species level by entomologists from good quality pictures, without the need of removing the specimen from nature. However, it is important to emphasize that not all butterfly species can be easily photographed, especially strong and fast fliers like the genus *Colias*, or the HesperIIDae genera *Pyrgus* and *Spialia*.

We present the first photographic survey of butterfly diversity in Croatia, based exclusively on the identification of specimens on the photographs taken in the surveyed area. The main aim of this study is to present the butterfly fauna of a previously unsurveyed area in eastern Croatia, Slavonia region. This region has traditionally been an agricultural part of Croatia and is still mostly covered with agricultural fields and plantations, which contain a total of about 45% of agricultural land in Croatia (DZS 2003). Natural and semi-natural habitats in the region can mostly be found scattered around river valleys, forest edges or rare mountainous regions (e.g. Papuk, BANSKO BRDO). It is difficult to find suitable habitats to monitor butterfly diversity in such landscape. In the past century, several regions of Slavonia were surveyed in terms of

butterfly distribution. Probably the first overview was done by Bohatsch (1891), citing most records as »Slavonia«. After him, further records can be found in several papers (e.g. Grund 1913, Steiner 1916, Koča 1900, 1901, Mihoci et al. 2012). Most species records for the region are depicted in the provisional distribution maps of the butterflies of Yugoslavia (Jakšić 1988). According to the maps, about 126 species have been recorded for Slavonia (Jakšić 1988), however, a critical and modern update to the butterfly fauna of the region is needed, as several species records are probably erroneous, and some species may have even disappeared from the region. With that in mind, faunistic surveys of different parts of the region are needed to gain a more recent knowledge about the butterfly fauna of Slavonia.

Materials and methods

We conducted the photographic survey between 2009 and 2013, each year from spring to autumn, in the near surroundings of Donji Emovci village, in the vicinity of Požega, Croatia. The survey took place in a radius of one kilometre around the village (Fig. 1). The habitats present in the area include wet and dry grasslands (Fig. 2), agricultural land, forest edges, forests and river banks. The terrain around the village is mostly flat with small valleys. The village is located close to one of the few mountains in Slavonia – Mt. Papuk. The river Orlava flows past the village nearby.

Each species was photographed at least once on different occasions in order to maximize the potential number of photographed species. Butterflies were photographed using Olympus μ 840 and Pentax optio I-100 digital cameras throughout the entire adult flight season by the second author. To identify the photographs, standard determination literature was used (Lafranchis 2004, Tolman & Lewington 2008). Systematics follows Van Swaay et al. (2010).

Results

More than 3,500 photos taken during this survey yielded 79 butterfly species, which could be reliably identified (Tab. 1). Most species belong to the Nymphalidae family (35), followed by Lycaenidae (19), Pieridae (10), Hesperidae (10), Papilionidae (4), and Riodinidae (with a single species).

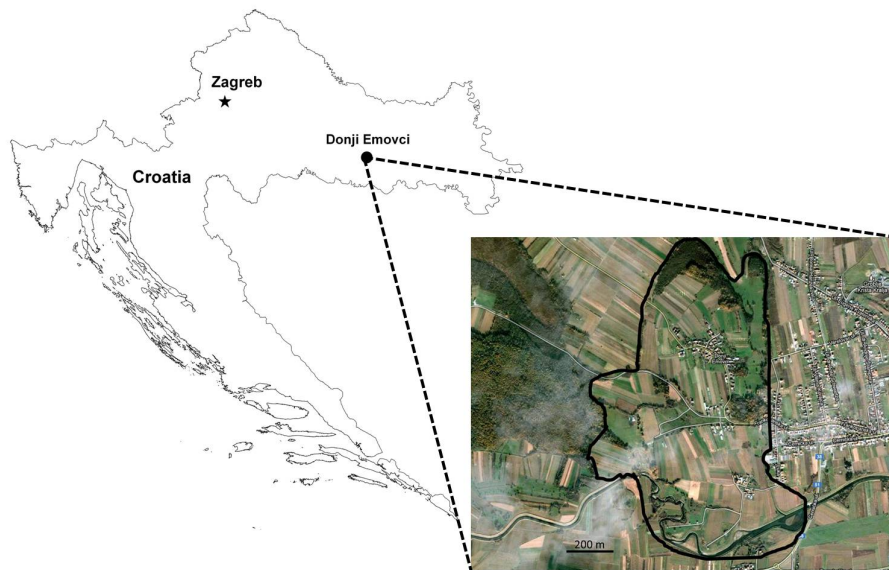


Figure 1. Location of the surveyed locality at Donji Emovci near Požega, Croatia.

Slika 1. Položaj raziskovanega območja v kraju Donji Emovci, blizu Požege, Hrvaška.



Figure 2. Dry meadow on the northern side of the study area, on which most butterfly species were recorded.

Slika 2. Suhi travnik na severnem delu raziskovanega območja, na katerem smo zabeležili največje število metuljev.

Table 1. List of recorded butterfly species in the study area near Donji Emovci (Požega), observation dates, Red List category (according to Šašić et al. 2013) and confirmed presence of each species in nearby Mt. Papuk (after Koča 1900, 1901, Lorković 1927, Mladinov 1973, Lorković et al. 1992, Lorković 2009, Mihoci et al. 2012; marked with +). Red List categories: VU – Vulnerable, DD – Data Deficient, NT – Near Threatened.

Tabela 1. Vrstni seznam metuljev območja študije v bližini Donjih Emovcev (Požega), datumi opažanja, kategorija rdečega seznama (po Šašić et al. 2013) in potrjeno pojavljanje vsake od vrst v bližini gore Papuk (po Koča 1900, 1901, Lorković 1927, Mladinov 1973, Lorković et al. 1992, Lorković 2009, Mihoci et al. 2012; oznaka +). Kategorije rdečega seznama: VU – ranljiva vrsta, DD – premalo podatkov, NT – potencialno ogrožena vrsta.

Species	Observation dates	Red List category	Presence in Mt. Papuk.
Fam. Hesperidae			
1. <i>Erynnis tages</i> Linnaeus, 1758	21.4.2010, 5.5.2010, 10.7.2011, 7.8.2011		+
2. <i>Carcharodus alceae</i> (Esper, 1780)	13.4.2009, 7.7.2011, 19.8.2011, 25.9.2011		+
3. <i>Carcharodus floccifera</i> (Zeller, 1847)	21.5.2011, 20.7.2011, 29.7.2011, 8.8.2011		+
4. <i>Heteropterus morpheus</i> (Pallas, 1771)	12.7.2013		
5. <i>Carterocephalus palaemon</i> (Pallas, 1771)	7.5.2013		+
6. <i>Pyrgus armoricanus</i> (Oberthür, 1910)	12.5.2010, 1.6.2010, 4.7.2011, 20.8.2012		
7. <i>Pyrgus malvae</i> (Linnaeus, 1758)	27.4.2010, 5.5.2010, 13.5.2011, 15.8.2012		+
8. <i>Thymelicus lineola</i> (Ochsenheimer, 1808)	17.6.2009, 19.6.2009, 27.8.2011, 3.9.2012		+
9. <i>Thymelicus sylvestris</i> (Poda, 1761)	11.6.2010, 13.6.2011, 14.8.2011, 20.8.2011		+
10. <i>Ochlodes sylvanus</i> (Esper 1777)	6.5.2009, 14.6.2010, 7.8.2010, 10.8.2012		+
Fam. Papilionidae			
11. <i>Iphiclides podalirius</i> (Linnaeus, 1758)	6.5.2009, 15.7.2009, 27.8.2011, 6.9.2011		+
12. <i>Papilio machaon</i> (Linnaeus, 1758)	9.4.2009, 12.6.2012, 8.7.2012, 29.8.2012	NT	+
13. <i>Zerynthia polyxena</i> (Dennis & Schiffermüller, 1775)	15.4.2009, 23.4.2011, 1.5.2012, 11.5.2011	NT	+
14. <i>Parnassius mnemosyne</i> (Linnaeus, 1758)	18.5.2013	NT	+
Fam. Pieridae			
15. <i>Anthocharis cardamines</i> (Linnaeus, 1758)	3.4.2009, 17.4.2011, 23.4.2011, 1.5.2012		+
16. <i>Pieris brassicae</i> (Linnaeus, 1758)	23.4.2011, 3.5.2011, 18.9.2012, 25.10.2012	DD	+
17. <i>Pieris rapae</i> (Linnaeus, 1758)	11.4.2009, 10.6.2011, 10.9.2011, 22.10.2011		+
18. <i>Pieris napi</i> (Linnaeus, 1758)	3.4.2009, 8.7.2009, 19.9.2011, 26.10.2011		+
19. <i>Pontia edusa</i> (Fabricius, 1777)	10.6.2008, 9.7.2009, 19.8.2011, 27.8.2013		+
20. <i>Colias erate</i> (Esper, 1805)	13.6.2009, 21.7.2009, 28.9.2011, 10.10.2012		

	Species	Observation dates	Red List category	Presence in Mt. Papuk.
21.	<i>Colias croceus</i> (Fourcroy 1785)	9.6.2009, 2.7.2009, 16.10.2010, 26.10.2012		+
22.	<i>Colias hyale</i> (Linnaeus, 1758)	1.7.2009, 12.7.2009, 13.9.2012, 24.9.2012		+
23.	<i>Gonepteryx rhamni</i> (Linnaeus, 1758)	27.3.2009, 23.6.2009, 30.9.2012, 22.10.2012		+
24.	<i>Leptidea sinapis/juvernica</i>	30.3.2009, 29.6.2009, 14.7.2012, 28.8.2012		+
Fam. Riodinidae				
25.	<i>Hamearis lucina</i> Linnaeus, 1758	2.5.2011, 15.5.2011, 12.7.2012, 13.7.2012		+
Fam. Lycaenidae				
26.	<i>Lycaena phlaeas</i> (Linnaeus, 1761)	17.5.2011, 22.8.2011, 20.9.2012, 20.10.2012		+
27.	<i>Lycaena dispar</i> (Haworth, 1802)	13.5.2011, 9.6.2011, 29.7.2011, 25.9.2013	NT	+
28.	<i>Lycaena tityrus</i> (Poda, 1761)	3.5.2011, 17.8.2011, 27.8.2011, 21.9.2011		+
29.	<i>Lycaena hippothoe</i> (Linnaeus, 1761)	20.5.2009, 1.6.2010, 5.8.2011, 17.9.2012	NT	
30.	<i>Callophrys rubi</i> (Linnaeus, 1758)	10.5.2011		+
31.	<i>Satyrrium w-album</i> (Knoch, 1782)	12.6.2012, 25.6.2012, 7.6.2012, 5.7.2012		+
32.	<i>Satyrrium acaciae</i> (Fabricius, 1787)	6.6.2011, 17.6.2011, 20.6.2012, 2.7.2012		+
33.	<i>Celastrina argiolus</i> (Linnaeus, 1758)	10.6.2009, 16.6.2009, 17.7.2011, 26.7.2012		+
34.	<i>Glaucopteryx alexis</i> (Poda, 1761)	29.4.2011	NT	+
35.	<i>Phengaris arion</i> (Linnaeus, 1758)	20.7.2012, 26.7.2012, 1.8.2012, 22.8.2012	VU	+
36.	<i>Aricia agestis</i> (Dennis & Schiffermüller, 1775)	15.5.2009, 20.5.2011, 18.9.2011, 20.9.2012		+
37.	<i>Cyaniris semiargus</i> (Rottemburg, 1775)	12.5.2009, 12.7.2011, 20.9.2012, 23.9.2012		+
38.	<i>Cupido alceas</i> (Hoffmannsegg, 1804)	28.4.2010, 12.7.2012, 14.8.2011, 28.8.2012		
39.	<i>Cupido argiades</i> (Pallas, 1771)	6.5.2011, 15.7.2011, 3.8.2011, 20.8.2012		
40.	<i>Cupido decolorata</i> (Staudinger, 1886)	22.5.2011, 7.8.2012, 21.8.2012, 29.8.2012		
41.	<i>Plebejus argus</i> (Linnaeus, 1758)	3.5.2009, 12.5.2011, 15.5.2010, 23.5.2012		+
42.	<i>Plebejus argyrognomon</i> (Bergsträsser, 1779)	3.5.2010, 31.5.2011, 2.6.2011, 12.8.2012		
43.	<i>Plebejus idas</i> (Linnaeus, 1761)	18.7.2010, 21.7.2011, 16.9.2011, 20.9.2011		
44.	<i>Polyommatus icarus</i> (Rottemburg, 1775)	8.5.2011, 25.8.2011, 21.9.2012, 27.10.2012		+

Species	Observation dates	Red List category	Presence in Mt. Papuk.
Fam. Nymphalidae			
45. <i>Argynnis paphia</i> (Linnaeus, 1758)	21.6.2009, 18.7.2010, 23.8.2011, 7.9.2012		+
46. <i>Issoria lathonia</i> (Linnaeus 1758)	21.7.2010, 7.9.2010, 1.10.2012, 22.10.2012		+
47. <i>Brenthis ino</i> (Rottemburg, 1775)	1.6.2010, 16.6.2010, 19.6.2012, 26.6.2012		
48. <i>Brenthis daphne</i> (Bergsträsser, 1780)	27.5.2010, 10.6.2010, 14.6.2012, 13.8.2012		+
49. <i>Brenthis hecate</i> (Dennis & Schiffermüller, 1775)	7.6.2010, 14.6.2010, 2.7.2012, 8.7.2012		+
50. <i>Boloria dia</i> (Linnaeus, 1767)	5.7.2013, 9.7.2013, 19.7.2013, 25.7.2013		+
51. <i>Boloria euphrosyne</i> (Linnaeus, 1758)	28.9.2011		+
52. <i>Vanessa atalanta</i> (Linnaeus, 1758)	13.7.2009, 21.8.2010, 17.9.2010, 1.11.2011		+
53. <i>Vanessa cardui</i> (Linnaeus, 1758)	13.5.2011, 12.7.2011, 2.9.2011, 18.11.2012		+
54. <i>Aglais io</i> (Linnaeus, 1758)	16.3.2011, 26.6.2011, 2.9.2011, 27.10.2011		+
55. <i>Aglais urticae</i> (Linnaeus, 1758)	23.3.2011		+
56. <i>Polygonia c-album</i> (Linnaeus, 1758)	5.4.2011, 27.6.2011, 18.7.2012, 23.10.2012		+
57. <i>Araschnia levana</i> (Linnaeus, 1758)	25.3.2011, 11.4.2011, 19.5.2011, 10.7.2012		+
58. <i>Nymphalis antiopa</i> (Linnaeus, 1758)	23.3.2011, 1.4.2011, 19.10.2011, 22.10.2012		+
59. <i>Nymphalis polychloros</i> (Linnaeus, 1758)	25.6.2011, 1.7.2011, 15.9.2011, 29.10.2012		+
60. <i>Euphydryas aurinia</i> (Rottemburg, 1775)	3.5.2011	NT	+
61. <i>Melitaea phoebe</i> (Dennis & Schiffermüller, 1775)	8.5.2011, 15.7.2011, 25.9.2011, 26.10.2012		+
62. <i>Melitaea didyma</i> (Esper, 1778)	22.6.2009, 5.7.2010, 8.7.2011, 29.8.2011		+
63. <i>Melitaea diamina</i> (Lang, 1789)	31.5.2011, 26.7.2011		
64. <i>Melitaea athalia</i> (Rottemburg, 1775)	10.5.2011, 2.6.2011, 19.8.2011, 28.8.2011		+
65. <i>Neptis sappho</i> (Pallas, 1771)	7.5.2011, 21.7.2011, 29.7.2011, 28.8.2011		+
66. <i>Neptis rivularis</i> (Scopoli, 1763)	14.6.2011, 18.6.2011, 18.7.2011, 1.8.2011		+
67. <i>Apatura ilia</i> (Dennis & Schiffermüller, 1775)	25.6.2011, 1.7.2011, 7.8.2011, 20.8.2011	NT	+
68. <i>Apatura iris</i> (Linnaeus, 1758)	16.6.2011, 18.6.2011, 12.8.2011, 19.8.2011	NT	+

	Species	Observation dates	Red List category	Presence in Mt. Papuk.
69.	<i>Pararge aegeria</i> (Linnaeus, 1758)	14.4.2011, 19.7.2011, 3.9.2011, 4.10.2011		+
70.	<i>Lasiommata megera</i> (Linnaeus, 1767)	22.4.2010, 5.5.2011, 15.7.2011, 5.10.2011		+
71.	<i>Coenonympha arcania</i> (Linnaeus, 1761)	15.6.2011		+
72.	<i>Coenonympha glycerion</i> (Borkhausen, 1788)	24.5.2011, 19.7.2012, 13.8.2012, 17.9.2012		+
73.	<i>Coenonympha pamphilus</i> (Linnaeus, 1758)	1.5.2011, 15.6.2011, 16.9.2011, 27.10.2011		+
74.	<i>Pyronia tithonus</i> (Linnaeus, 1767)	19.7.2011, 29.7.2011, 12.8.2011, 29.8.2011		+
75.	<i>Aphantopus hyperantus</i> (Linnaeus, 1758)	10.7.2011, 12.7.2011, 13.7.2011, 3.8.2011		+
76.	<i>Maniola jurtina</i> (Linnaeus, 1758)	1.6.2011, 9.7.2011, 6.8.2011, 13.9.2011		+
77.	<i>Melanargia galathea</i> (Linnaeus, 1758)	11.6.2011, 26.6.2011, 4.7.2011, 20.9.2011		+
78.	<i>Minois dryas</i> (Scopoli, 1763)	29.7.2011, 1.8.2011, 6.8.2011, 13.8.2011		+
79.	<i>Brintesia circe</i> (Fabricius, 1775)	17.6.2011, 20.6.2011, 29.8.2011, 22.9.2011		

Discussion

The 79 species recorded in this study constitute 40% of all the butterfly species known from Croatia (Šašić & Mihoci 2011, Koren & Štih 2013, Koren et al. 2013a, b). Twelve of them are listed in the Red List of Butterflies of Croatia (Šašić et al. 2013): 1 species as Vulnerable, 1 as Data Deficient and 10 as Near Threatened. The species listed as Vulnerable is *Phengaris arion* (Linnaeus, 1758). This myrmecophilus species has a scattered distribution in Croatia (Lorković 2009). It has even disappeared from some areas, like central Istria (Koren & Ladavac 2010). The species listed as Data Deficient is *Pieris brassicae* (Linnaeus, 1758), a widespread and locally common species (Lorković 2009), photographed several times in the surveyed area.

Another interesting species is *Colias erate* (Esper, 1805), which has been a part of Croatia's butterfly fauna for only a few decades (Lorković et al. 1992). It has been recorded several times during our survey. Observations of *C. erate* perfectly fit into the known range of this species in Croatia and show that it is still present in Slavonia (Lorković et al. 1992). For example, in nearby Slovenia, it occurs only occasionally and does not have a permanent population (Verovnik et al. 2012).

One of the most interesting records concerns *Parnassius mnemosyne* (Linnaeus, 1758), one of the last species noted during this photo-survey, with a single specimen photographed. This species is present in two ecotypes in Croatia: the mountain form, found mostly at higher altitudes in the mountains, and the lowland form found in northern Croatia. The closest known record of this species is from the village of Duboka in Slavonia, on the slopes of Mt. Papuk (Koča 1901), located about 20 kilometres from the study site. However, no recent records from that area exist. It is possible that the specimen observed on our site may just be a record of a vagrant individual from Mt. Papuk. On the other hand, it is also possible that a population of *P. mnemosyne* inhabits the surveyed area. To confirm that, distribution of its larval host plant, *Corydalis solida* (L.), in the surveyed area should be mapped and checked for larval stages. How little we know about the lowland populations of *P. mnemosyne* is shown by the fact that a population was discovered in the eastern part of the country, on BANSKO HILL, just a few years ago (Koren et al. 2012).

Regarding the Lycaenidae family it is important to note the record of *Cupido decolorata* (Staudinger, 1886), a rare and local species in Croatia. It is mostly known from its northern parts (Lorković 2009), but has also been recorded on Krk Island (Habeler 2003). In nearby Slovenia, which represents the southwestern distribution border of this species, it is extremely rare and known only from several records (Verovnik et al. 2012). It was photographed several times in the study area.

From the genera represented in this study area, only two could not be reliably identified from the pictures. The first is the genus *Leptidea* Billberg, 1820, with two similar species possibly occurring in the area: *Leptidea sinapis* (Linnaeus, 1758) and *Leptidea juvernica* Williams, 1946, and can be correctly identified only by the examination of the genital structures (Dincă et al. 2011). The other problematic group is the genus *Melitaea*, and the species complex that includes *Melitaea athalia* (Rottemburg, 1775), *Melitaea aurelia* (Nickerl, 1850) and *Melitaea britomartis* Assmann, 1847. To check whether some or all species of this complex occur in the study area, additional surveys will need to be done in the future.

Mt. Papuk is the closest location to Donji Emovci with historical records, therefore useful for the faunal comparison. Major work was done by Koča (1900, 1901), but additional records can be found in many other papers (e.g. Lorković 1927, Mladinov 1973, Lorković et al. 1992, Lorković 2009, Mihoci et al. 2012). Direct comparison between the two sites is not applicable due to large difference in size, altitudinal span, habitat diversity and the fact that Mt. Papuk was surveyed almost a century ago. However, a rough comparison, in terms of species diversity and recorded species, can be useful. Based on literature records, 92 butterfly species are known from the area of Mt. Papuk. In total, there are 23 species recorded in Mt. Papuk, but not in the area of Donji Emovci: *Hesperia comma* (Linnaeus, 1758), *Pyrgus alveus* (Hübner, 1803), *Spialia sertorius* (Hoffmannsegg, 1804), *Leptidea morsei* (Fenton, 1881), *Thecla betulae* (Linnaeus, 1758), *Favonius quercus* (Linnaeus, 1758), *Satyrium pruni* (Linnaeus, 1758), *Satyrium ilicis* (Esper, 1779), *Pseudophilotes vicrama* (Moore, 1865), *Polyommatus amandus* (Schneider, 1792), *Polyommatus bellargus* (Rottemburg, 1775), *Polyommatus coridon* (Poda, 1761), *Argynnis aglaja* (Linnaeus, 1758), *Argynnis adippe* (Dennis & Schiffermüller, 1775), *Argynnis niobe* (Linnaeus, 1758), *Nymphalis vaualbum* (Denis & Schiffermüller, 1775), *Melitaea cinxia* (Linnaeus, 1758), *Melitaea aurelia* (Nickerl, 1850), *Limnitis populi* (Linnaeus, 1758), *Lopinga achine* (Scopoli, 1763), *Erebia aethiops* (Esper, 1777) and *Hipparchia fagi* (Scopoli, 1763), *Hipparchia semele* (Linnaeus, 1758). Some

differences are probably the result of different methodologies (photography versus classical net hunting). This is especially true for large and fast flying nymphalids, like members of the genus *Argynnis* Fabricius, 1807, from which only *Argynnis paphia* (Linnaeus, 1758) was recorded during this survey, while three additional species are known from Mt. Papuk. The differences also arise from the habitat preferences of some species. Some strictly woodland species such as *Erebia aethiops* (Esper, 1777), *Limenitis populi* (Linnaeus, 1758) or *Lopinga achine* (Scopoli, 1763), which were recorded in Mt. Papuk, can hardly be expected at the study site. Even if they are present there, some species like *L. achine* can hardly be observed, as well as photographed. With additional surveys of both localities, the differences in the composition of recorded species could probably be reduced, and more species recorded for both areas.

It is important to emphasize the importance of such data gathering as each photograph, containing correct time and locality, is an important contribution to the knowledge of the butterfly fauna of Croatia. What we are missing in Croatia is a website on which such photographs could be easily posted, correctly identified by entomologists and eventually incorporated in the also non-existent national database. Such web sites already exist in Europe (e.g. www.observado.org), but are not generally visited by nature enthusiasts from Croatia. In this country, photographs usually end up on web sites dedicated to photography itself, usually with no correct locality, making them less valuable, and more time consuming to find the correct data from the photograph's authors. The creation of a national database, with a web site on which users could upload photographs and request the correct identification, not only for butterflies or even insects, but wider, could greatly contribute to our knowledge of the flora and fauna of the country.

Butterfly photography is useful for the research of butterfly diversity at the local scale. Rare species can usually be recorded as well, raising the importance and value of such surveys. However, for one to gain a complete picture about the butterfly fauna of a selected area, additional methods, such as the collection of specimens and the preparation of genitalia are needed. Compared to the classical net hunting, this method always comes second, since not all species and their diagnostic characteristics can always be photographed.

The 79 recorded butterfly species is a high number, especially if one has in mind that Slavonia is one of the regions in Croatia with the strongest and most intensive anthropogenic impact. On the other hand, this is also one of the less surveyed regions in Croatia, especially considering the published data (e.g. Jakšić 1988). Recent surveys of Slavonia are almost non-existing, so this survey represents an important insight into the current butterfly fauna of the region. Even though the survey area was relatively small, such a high number of recorded species indicates that many butterfly species are still present in Slavonia, and more systematic surveys of larger areas are needed.

Povzetek

Slavonija obsega severovzhodni del Hrvaške, ki je danes pod močnim antropogenim vplivom. Tu se razteza kar 45 % vseh kmetijskih površin Hrvaške. Raziskave dnevnih metuljev Slavonije potekajo že od konca 19. stoletja, vendar so nesistematične. Tako je večji del regije še vedno favnistično neraziskan, večina podatkov pa je starejša od 100 let. V raziskavi smo naredili favnistični popis dnevnih metuljev okolice vasi Donji Emovci pri Požegi med letoma 2009 in 2013. Metulje smo beležili s fotografiranjem. Skupno smo zabeležili 79 vrst oziroma 40 % favne Hrvaške (Šašić & Mihoci 2011, Koren & Štih 2013, Koren et al. 2013b). Najzanimivejše najdbe so vrste *Colias erate*, *Parnassius mnemosyne* in *Cupido decoloratus*, ki so redke ali lokalno razširjene na Hrvaškem. Na raziskovanem območju je bilo večino vrst dnevnih metuljev možno določiti na podlagi fotografij, medtem ko je bila za rodova *Melitaea* in *Leptidea* potrebna dodatna analiza spolnega aparata. Fotografiranje metuljev je ena izmed metod za pridobivanje novih najdb metuljev in kljub temu, da vseh vrst ni možno določiti na ta način, je ta metoda primerna za zbiranje podatkov. Kar na Hrvaškem pogrešamo, obstaja pa v drugih državah Evrope, je spletni portal, na katerega bi ljubitelji narave lahko naložili fotografije, entomologi pa pravilno določili in dodali v nacionalno podatkovno bazo.

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