NAT. CROAT. | VOL. 21 | No 2 | 471–481 | ZAGREB | December 31, 2012

original scientific paper / izvorni znanstveni rad

REVIEW OF THE BUTTERFLY FAUNA (HESPERIOIDEA & PAPILIONOIDEA) OF THE DINARA MOUNTAIN RANGE

NIKOLA TVRTKOVIĆ, MARTINA ŠAŠIĆ, IVA MIHOCI, MARIJANA VUKOVIĆ & MAJA BJELIĆ

Croatian Natural History Museum, Department of Zoology, Demetrova 1, HR-10000 Zagreb, Croatia

Tvrtković, N., Šašić, M., Mihoci, I., Vuković, M. & Bjelić, M.: Review of the butterfly fauna (Hesperioidea & Papilionoidea) of the Dinara mountain range. Nat. Croat., Vol. 21, No. 2, 471–481, 2012, Zagreb.

During a butterfly inventory from 2005 to 2012 on Mt Dinara along the transect from Knin to the Sinjal peak (1831 m a.s.l.), 116 species were found. There are 23 newly-found species for the Mt Dinara area, and 7 species have not been confirmed. With 130 registered species this area is a hot spot of butterfly diversity. 15 species belong to Alpine elements, but in comparison with other better investigated Dinaric mountains, Ponto-Mediterranean oreal species are more numerous than Euro/Alpine species.

Key words: Butterflies, Mt Dinara, Croatia, Bosnia and Herzegovina

Tvrtković, N., Šašić, M., Mihoci, I., Vuković, M. & Bjelić, M.: Pregled faune danjih leptira (Hesperioidea i Papilionoidea) planinskog masiva Dinare. Nat. Croat., Vol. 21, No. 2, 471–481, 2012, Zagreb.

Tijekom istraživanja danjih leptira na planini Dinari na transektu od Knina do vrha Sinjal (1831 m n/m) u razdoblju od 2005. do 2012. godine prikupljeni su podaci o 116 vrsta od kojih je po prvi puta nađeno njih 23, dok 7 od prije poznatih vrsta nije ponovo zabilježeno. S ukupno 130 vrsta Dinara predstavlja područje sa značajnom raznolikošću danjih leptira. Među nađenim vrstama je 15 planinskih, ali za razliku od drugih bolje proučenih planina Dinarida tu su brojnije pontomediteranske orealne vrste od onih euroalpskih.

Ključne riječi: danji leptiri, planina Dinara, Hrvatska, Bosna i Hercegovina

INTRODUCTION

According to POLJAK (1974) the Dinara mountain chain is situated in the central part of the Dinaric Alps, and consists of four very connected mountains, with passes (notches) between them at altitudes of over 1000 m a.s.l. These four parts from west to east are: Ilica, Dinara *sensu stricto*, Troglav and Kamešnica (Fig. 1). Inhabitants from the southern Dalmatian slopes (Croatia) use the term Mt Dinara for the whole massif or only for Dinara s.s. and Troglav, while inhabitants from the northern part (Bosnia) restrict this term to the Dinara s.s. from the notch between Bosansko Grahovo in Bosnia and Herzegovina and Strmica village in Croatia to the notch Privija near Uništa Village (Bosnia and Herzegovina). The highest peak of Dinara s.s in Croatia is Sinjal at 1831 m a.s.l., often marked (labelled) as Dinara on maps. The highest peak of the whole massif is Troglav with 1913 m a.s.l., situated

in Bosnia and Herzegovina. The Dinara mountain chain extends over 100 km, from Dugopolje village in the Lika area, which is situated west of the source of the Una River, to the southeastern part of Buško blato in Bosnia and to the hills towards Imotsko polje. Also the state border between Bosnia and Herzegovina and Croatia passes through this mountain range northwest of Ličko Dugopolje village towards the area near Aržano village in the southeast. North of the massif (in Bosnia and Herzegovina) there are the karst poljes 'plains' Grahovsko, Pašačko and Livanjsko polje; to the southwest (in Croatia) there are poljes with the source of the Krka River, and to the southeast (in Croatia, too) there is the Cetina River with several large poljes, the last being Sinjsko polje.

Geologically speaking, the massif is built of limestone and dolomite. The Dinara mountain chain is a natural border between continental and Mediterranean climate and vegetation (BERTOVIĆ, 1975), and contemporary transitive zone between continental and Mediterranean faunistic elements (SIJARIĆ, 1974). The vegetation of southern slopes consists of Mediterranean belts of degraded pubescent oak forests alternating with several types of dry grasslands. According to KUŠAN (1956) and PELCER *et al*. (1985) with nomenclature after VUKELIĆ (2012) in the lower belt there are oak forests with the oriental hornbeam (*Querco pubescentis-Carpinetum orientalis*) up to 600 m a.s.l. on Dinara and up to 800 m a.s.l. on Kamešnica, and in the higher belt there are oak forests with hop hornbeam (*Aristolochio luteae-Quercetum pubescentis*). In the belt higher than 1100 m a.s.l. beech forests (maritime *Seslerio autumnalis – Fagetum sylvaticum* and subalpine *Doronico columnae – Fagetum sylvaticum*) follow. The border belt zone between the Mediterranean and the continental (Euro-Siberian) vegetation region is mostly overgrown with the European black pine (*Pinus nigra*). Above the beech forests there is a mosaic of shrub habitat with the mountain dwarf pine (*Pinus mugho*) from 1550 m a.s.l. to the peaks, and mountain grasslands (*Festucetum bosniacae*) created mostly because people have set fire to the original vegetation to increase pastures. On the northern slopes only, somewhere among continental beech forests, there is mixed altimontane beech forest with spruce and pine.

The fauna of the area is more or less unknown, primarily because in the past it was hardly accessible and quite unsafe**.** Josef Mann was probably the first entomologist who collected butterflies on Mt Dinara: he visited »Prologgebirge« (Kamešnica near Vaganj passage) on one of his fieldtrips to Dalmatia (in the years 1850, 1862 and 1868), but his list of collected butterflies was without data and localities (MANN, 1869). The first data on butterfly fauna with exact localities were published by the Austrian entomologist Hermann Stauder (STAUDER, 1911, 1913, 1920–1923) who collected them on Mt Dinara near Knin and during his trip to the Vaganj pass area (»einige Gehstunden von Sinj gegen des Prologgebirge«) during 1907 and 1908 (STAUDER, 1913; LORKOVIĆ, 2009). The first collected *Parnassius apollo* from Kamešnica (=Prologgebirge) was a present to Stauder from Triestine professor Giuseppe Müller (STAUDER, 1921), found during a biospeleological excursion in 1912 (NONVEILLER, 1989). Branimir Gušić also collected in 1934 around Knin, and Slavoljub Valjavec collected during 1926, 1927, 1929 and 1931 in Knin, Strmica and on Mt Dinara. These specimens are kept in the collections of the Croatian Natural History Museum (MLADINOV, 1973). Butterflies collected by J. Fernbach in 1962 on a field trip near Troglav were published without locations by MLADINOV & LORKOVIĆ (1985) and LORKOVIĆ (2009). During the years 1935 and 1936 Slovenian entomologist Ivan Hafner collected rich material which has provided most of the data known from the vicinity of Knin, and

it is held in the Hafner Lepidoptera Collection in the Slovenian Museum of Natural History in Ljubljana, Slovenia, also published later after Hafner's manuscript from 1939 (HAFNER, 1994) with certain taxonomic revision (CARNELUTTI, 1994). Part of the data is from the southwestern foothills of Dinara mountain nearby the city of Knin. Bosnian lepidopterologist Rizo Sijarić published findings from the northern slopes of Troglav peak and from Vaganj pass on Kamešnica (SIJARIĆ, 1977) mentioning for the first time *Aricia eumedon* and *Erebia euryale*. In the paper by MLADINOV & LORKOVIĆ (1985) nine mountain species from Dinara are mentioned, among them *Polyommatus eros* and six species from the genus *Erebia*. One of them is also the first finding of *E. triaria* in Croatia, collected by Croatian entomologist Matija Franković in the summer of 1985 during a fieldtrip to Troglav peak. Additionally, recent findings for the Dinara mountain chain were: *Polyommatus damon* (MIHOCI *et al*., 2006), *Polyommatus thersites* (MIHOCI & ŠAŠIĆ, 2006), *Proterebia afra* (MIHOCI & ŠAŠIĆ, 2005, 2007; KOREN *et al*., 2010), *Colias caucasica* (TVRTKOVIĆ *et al*., 2011) and *Melitaea britomartis* (KOREN & JUGOVIĆ, 2012). The aim of this paper is to supplement the review of the butterfly fauna of the whole Dinara Mt chain, while the ecological aspects and some interesting taxonomical features will be shown in additional papers.

MATERIAL AND METHODS

Research into butterfly fauna started in 2005 with several field trips from the Croatian Natural History Museum to the surroundings of Brezovac mountaineering hut on Dinara s.s. (B. Jalžić, I. Mihoci, M. Vuković, N. Tvrtković) and to Gornja Korita village on Kamešnica (I. Mihoci, M. Vajdić). The main part of the research was continued from March to September in 2008 to 2012 by N. Tvrtković, M. Vuković and M. Bjelić. Overall, 1580 data units (species/locality/date) were collected at 23 localities. Butterflies were collected, photographed or observed at nine main localities along an altitudinal transect. There were altogether 24 fieldtrips during all seasons. The transect (Fig. 1) was situated on southern slopes from the village Guge (250 m a.s.l.) near Knin to the Sinjal peak (1831 m a.s.l.) including Leurdovac (1700 m a.s.l.) on the eastern hiking trail to the peak from Glavaš near the village of Kijevo. Two additional localities were situated on the northern slopes: Ledenica (1500 m a.s.l.) and Risovac (1070 m a.s.l.; BiH).

Identification of taxa was done according to TOLMAN & LEWINGTON (1997) and LAFRANCHIS (2004), while additionally for doubtful taxa, male genital slides were made or the genitalia were examined in hand (HIGGINS, 1975; LAFRANCHIS, 2004; SETTELE *et al*., 2005). Because of the unusual variability of some species like those from the genera *Coenonympha* and *Colias* the identification had in some cases to be confirmed by mtDNA analysis in the Croatian Natural History Museum DNA Laboratory. The nomenclature follows the check list of Croatian butterflies (ŠAŠIĆ & MIHOCI, 2011).

RESULTS AND DISCUSSION

Along the altitudinal transect from Knin to the Sinjal peak on Mt Dinara a total of 116 butterfly species were found. Consequently, the butterfly diversity rises, from the older published records for Mt Dinara, to 130 species (Appendix 1). The length of Dinara mountain chain is 100 km, less than Mt Velebit which is 145 km long

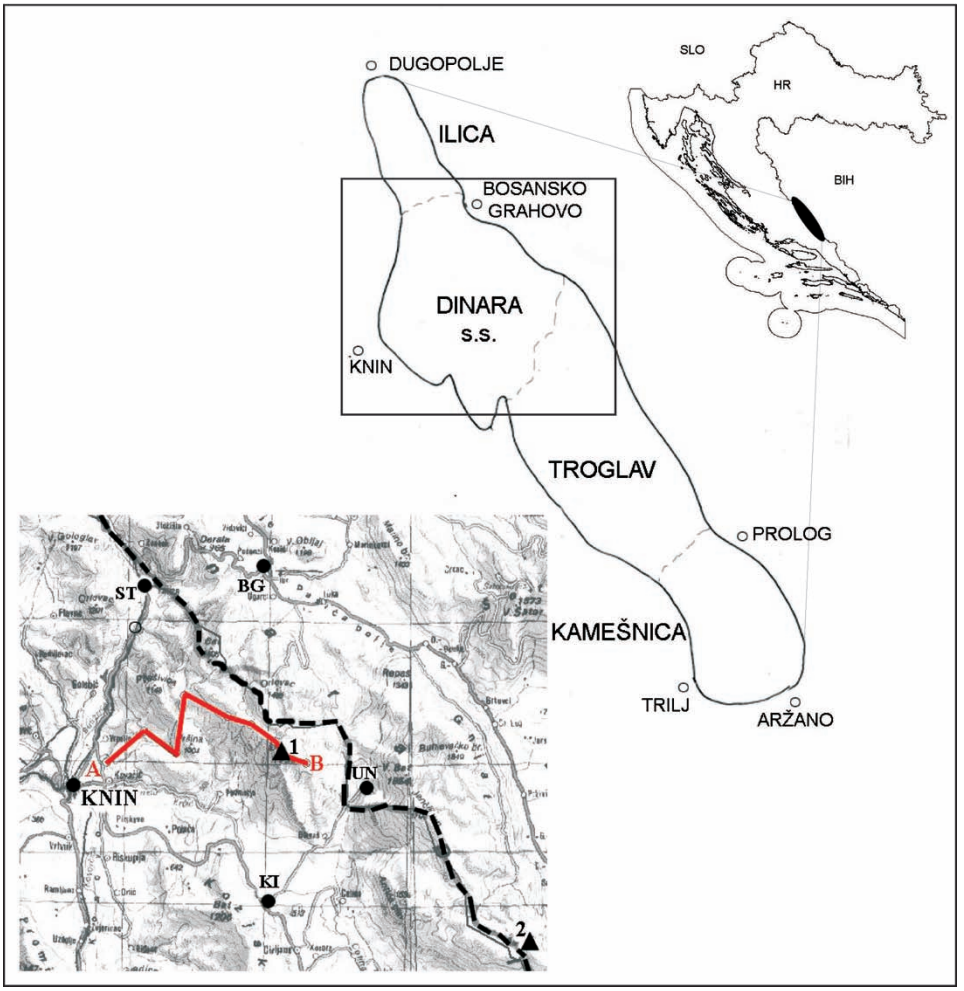

Fig. 1. Sketch of the Dinara mountain chain with its four parts (Ilica, Dinara s.s., Troglav and Kamešnica) after POLJAK (1974), and location of the altitudinal transect (A – B) from Guge village to the Sinjal peak. Abbreviations: KN = Knin, KI = Kijevo, ST = Strmica, BG = Bosansko Grahovo, UN = Uništa, 1 = Sinjal peak, 2 = Troglav peak. State border is marked with a dotted line.

with 137 recorded species (MIHOCI *et al*., 2007). During our research on the transect from Knin to Sinjal peak, 7 previously recorded species were not confirmed: *Aphantopus hyperantus* (STAUDER, 1923), *Spialia sertorius, Quercusia quercus, Polygonia egea, Melitaea aurelia, Hyponephele lupina* (HAFNER, 1994) and *Hipparchia syriaca* (HAFNER, 1994; CARNELUTTI, 1994; LORKOVIĆ, 1976), as well as species found on Troglav and Kamešnica only: *Parnassius apollo, Aricia eumedon, Lycaena virgaureae, Erebia euryale* (SIJARIĆ, 1977), *Erebia ligea* (MLADINOV & LORKOVIĆ, 1985), *Polyommatus damon* (MIHOCI *et al*., 2006) and *Melitaea britomartis* (KOREN & JUGOVIĆ, 2012). Species previously not recorded for the Dinara mountain range were *Thymelicus lineola,*

Pyrgus malvae, *Pyrgus sidae*, *Parnassius mnemosyne*, *Zerynthia polyxena*, *Pieris balcana*, *Anthocharis cardamines*, *Lycaena alciphron*, *L. candens*, *L. tityrus*, *Plebejus argyrognomon*, *Phenagris (alcon) rebeli*, *Hamearis lucina*, *Nymphalis antiopa*, *N. polychloros*, *Brenthis daphne*, *Boloria euphrosyne*, *Melitaea trivia*, *M. diamina*, *M. athalia*, *Arethusana arethusa*, *Erebia aethiops* and *Coenonympha glycerion*, all of which were found in the research period 2005-2012. As Kamešnica and Troglav together with northern slopes of the whole Mt Dinara range are still far from being well-researched, Ilica being completely unexplored, we expect that this central Dinaric Alps mountain range to be extremely rich in butterfly fauna, a hot-spot area for the biodiversity of this insect group in Croatia /Bosnia and Herzegovina.

Comparing Mt Dinara with Mt Velebit (Croatia) and Mt Durmitor (Montenegro), relatively well-studied areas of Dinaric Alps regarding butterflies (SIJARIĆ *et al*., 1984; MIHOCI *et al*., 2006), we can conclude that on the Dinara mountain chain the proportion of Ponto-Mediterranean oreal elements (VARGA, 1977) exceeds the Euro-Alpine by far, with the ratio 5:1, while on Mt Velebit and Mt Durmitor these biogeographic elements are almost equal in number (MLADINOV & LORKOVIĆ, 1985). According to MLADINOV & LORKOVIĆ (1985) there are 15 mountain butterfly species on Mt Dinara and 17 on Mt Velebit, but considering the length and surface area of each mountain range, a similarity in mountain butterfly richness is suggested. The Dinara mountain chain is an area with residual transhumance activities that are favourable for the long-term conservation of mountain grasslands that can support a rich and preserved butterfly fauna. We expect initiatives by the Croatian State Institute for Nature Protection to improve on the current poor knowledge of the diversity of fauna on the Dinara mountain range in such a way that its natural values will stay well preserved.

Appendix 1. List of recorded butterfly species on Mt Dinara: following the species name, references of older findings are separately given for Dinara s.s., Troglav and Kamešnica. Exceptions are findings from HAFNER (1994), all from the Knin surroundings, referring to the foothills of Dinara s.s. ('Hügel I' and 'Hügel II'). Species that have not been recently confirmed are emphasized, and for species found for the first time the total number of sites is given. A simple abundance estimate (rare/not rare/common) is given for all species.

HESPERIIDAE

1. *Hesperia comma* (Linnaeus, 1758) – (HAFNER, 1994); common;
2. *Ochlodes sylvanus* (Poda, 1761) – (HAFNER, 1994); common; Kamešnica on one locality;
3. *Thymelicus acteon* (Rottemburg, 1775) – (HAFNER, 1994); rare;
4. *Thymelicus sylvestris* (Poda, 1761) – (HAFNER, 1994); common;
5. *Thymelicus lineola* (Ochenheimer, 1808) – Dinara s.s.: on 6 localities; common;
6. *Spialia orbifer* (Hoffmannsegg, 1804) – (HAFNER, 1994); rare;
7. *Spialia sertorius* (Hübner, 1823) – (HAFNER, 1994; CARNELUTTI, 1994); not confirmed;
8. *Erynnis tages* (Linnaeus, 1758) – HAFNER, 1994); common;
9. *Pyrgus malvae* (Linnaeus, 1758) – Dinara s.s.: on 5 localities; common;
10. *Pyrgus armoricanus* (Oberthür, 1910) – (HAFNER (1994) as *P. carthami*; CARNELUTTI (1994) after redet. by Z. Lorković); common;
11. *Pyrgus serratulae* (Rambur, 1839) – (HAFNER, 1994); rare;
12. *Pyrgus sidae* (Esper, 1784) – Dinara s.s.: only on 2 localities;

13. *Carcharodus flocciferus* (Zeller, 1847) – (HAFNER, 1994); rare;
14. *Carcharodus alceae* (Esper, 1780) – (HAFNER, 1994); rare;

PAPILIONIDAE

15. *Iphiclides podalirius* (Linnaeus, 1758) – (STAUDER, 1911; MLADINOV, 1973; HAFNER, 1994); common;
16. *Papilio machaon* Linnaeus, 1758 – (STAUDER, 1921; HAFNER, 1994); not rare; Kamešnica on one locality;
17. *Parnassius mnemosyne* (Linnaeus, 1758) – Dinara s.s. on one locality; Troglav on one locality;
18. *Parnassius apollo* (Linnaeus, 1758) – (STAUDER, 1921: Kamešnica; MLADINOV, 1973; SIJARIĆ, 1977: Troglav; LORKOVIĆ, 2009); Kamešnica on one locality, not found on Dinara s.s.;
19. *Zerynthia polyxena* (Godart, 1824) – Dinara s.s.: on 3 localities;

PIERIDAE

20. *Aporia crataegi* (Linnaeus, 1758) – (HAFNER, 1994); not rare;
21. *Gonepteryx rhamni* (Linnaeus, 1758) – (STAUDER, 1922; SIJARIĆ, 1977: Troglav; HAFNER, 1994); common;
22. *Pieris brassicae* (Linnaeus, 1758) – (HAFNER, 1994); not rare;
23. *Pieris ergane* (Geyer, 1828) – (HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
24. *Pieris mannii* (Mayer, 1851) – (STAUDER, 1913, 1921: Dinara bei Knin, Kamešnica; HAFNER, 1994; MIHOCI *et al*., 2006); not rare;
25. *Pieris rapae* (Linnaeus, 1758) – (HAFNER, 1994); common;
26. *Pieris napi* (Linnaeus, 1758) – (STAUDER, 1921; SIJARIĆ, 1977: Troglav; HAFNER, 1994); common;
27. *Pieris balcana* Lorković, 1968 – Dinara s.s.: on 4 localities; rare;
28. *Anthocharis cardamines* (Linnaeus, 1758) – Dinara s.s.: on 7 localities; common;
29. *Pontia daplidicae* (Linnaeus, 1758) – (MLADINOV, 1973; HAFNER, 1994); rare;
30. *Colias caucasica* Staudinger, 1871 – (TVRTKOVIĆ *et al*., 2011); rare;
31. *Colias crocea* (Geoffroy, 1785) – (HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
32. *Colias alfacariensis* Ribbe, 1905 – (HAFNER (1994) as *C. hyale*; redet. CARNELUTTI, 1994); common;
33. *Leptidea sinapis* (Linnaeus, 1758) – (HAFNER, 1994); common;

LYCAENIDAE

34. *Satyrium acaciae* (Fabricius, 1787) – (SIJARIĆ, 1977: Kamešnica); not found on Dinara s.s.;
35. *Satyrium ilicis* (Esper, 1783) – (MLADINOV, 1973; SIJARIĆ, 1977: Kamešnica; HAFNER, 1994); not rare;
36. *Satyrium spini* (Denis et Schiffermüller, 1775) – (MLADINOV, 1973; HAFNER, 1994); common;
37. *Callophrys rubi* (Linnaeus, 1758) – (HAFNER, 1994); common;
38. *Favonius quercus* (Linnaeus, 1758) – (HAFNER, 1994); not confirmed for Dinara s.s.;;
39. *Leptotes pirithous* (Linnaeus, 1767) – (HAFNER, 1994); rare;
40. *Lycaena alciphron* (Rottemburg, 1775) – Dinara s.s.: only on one locality;
41. *Lycaena candens* (Herrich-Schäffer, 1844) – Dinara s.s.: on 6 localities; Troglav: one locality;
42. *Lycaena phlaeas* (Linnaeus, 1761) – (STAUDER, 1923; HAFNER, 1994); common;
43. *Lycaena tityrus* (Poda, 1761) – Dinara s.s: only on one locality;

44. *Lycaena virgaureae* (Linnaeus, 1758) – (SIJARIĆ, 1977: Troglav); not confirmed for Dinara s.s.;
45. *Cupido minimus* (Fuessly, 1775) – (STAUDER, 1923; HAFNER, 1994); common;
46. *Cupido osiris* (Meigen, 1829) – (HAFNER, 1994); rare;
47. *Celastrina argiolus* (Linnaeus, 1758) – (HAFNER, 1994); rare;
48. *Plebejus argus* (Linnaeus, 1758) – (HAFNER, 1994); common;
49. *Plebejus argyrognomon* (Bergsträsser, 1779) – Dinara s.s.: only on 1 locality;
50. *Aricia agestis* (Denis et Schiffermüller, 1775) – (HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
51. *Aricia artaxerxes* (Fabricius, 1793) – (MIHOCI *et al*., 2006: Kamešnica); Dinara s.s.: only on 2 localities;
52. *Aricia eumedon* (Esper, 1783) – (SIJARIĆ, 1977: Kamešnica); not confirmed for Dinara s.s.;
53. *Cyaniris semiargus* (Rottemburg, 1775) – (SIJARIĆ, 1977: Troglav; HAFNER, 1994); common;
54. *Glaucopsyche alexis* (Poda, 1761) – (HAFNER, 1994); rare;
55. *Phengaris arion* (Linnaeus, 1758) – (HAFNER, 1994); rare;
56. *Phengaris* (*alcon*) *rebeli* (Hirschke, 1904) – Dinara s.s.: on one locality, eggs on *Gentiana cruciata*;
57. *Scolintatides orion* (Pallas, 1771) – (HAFNER, 1994); not rare;
58. *Pseudophilotes vicrama* (Moore, 1865) – (HAFNER, 1994); rare; Troglav on one locality;
59. *Iolana iolas* (Ochsenheimer, 1816) – (HAFNER, 1994); rare;
60. *Polyommatus eros* (Ochsenheimer, 1808) – (MLADINOV & LORKOVIĆ, 1985); common, but restricted to the highest altitudes;
61. *Polyommatus icarus* (Rottemburg, 1775) – (HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
62. *Polyommatus thersites* (Cantener, 1835) – (MIHOCI & ŠAŠIĆ, 2006: Kamešnica); rare;
63. *Polyommatus amandus* (Schneider, 1792) – (STAUDER, 1923: Dinara s.s.); common;
64. *Polyommatus admetus* (Esper, 1783) – (HAFNER, 1994; LORKOVIĆ, 2009); common;
65. *Polyommatus damon* (Denis et Schiffermüller, 1775) – (? MANN, 1869; MIHOCI *et al*., 2006: Kamešnica); not confirmed for Dinara s.s.;
66. *Polyommatus escheri* (Hübner, 1823) – (HAFNER, 1994); rare;
67. *Polyommatus dorylas* (Denis et Schiffermüller, 1775) – (SIJARIĆ, 1977: Kamešnica; HAFNER, 1994; MIHOCI et al., 2006); common;
68. *Polyommatus bellargus* (Rottemburg, 1775) – (HAFNER 1994; MIHOCI *et al*. 2006: Kamešnica); common;
69. *Polyommatus coridon* (Poda, 1761) – (MLADINOV, 1973; HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
70. *Polyommatus daphnis* (Denis et Schiffermüller, 1775) – (HAFNER, 1994); rare;

RIODINIDAE

71. *Hamearis lucina* (Linnaeus, 1758) – Dinara s.s.: only on one locality;

NYMPHALIDAE: LIBITHEINAE

72. *Libythea celtis* (Laicharting, 1782) – (MLADINOV, 1973; HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); not rare;

NYMPHALIDAE: NYMPHALINAE

73. *Limenitis reducta* Staudinger, 1901 – (HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;

74. *Neptis rivularis* (Scopoli, 1763) – (HAFNER, 1994); rare;
75. *Nymphalis antiopa* (Linnaeus, 1758) – Dinara s.s.: only on one locality;
76. *Nymphalis polychloros* (Linnaeus, 1758) – (STAUDER, 1922: Knin); Dinara s.s.: on 4 localities; not rare;
77. *Vanessa atalanta* (Linnaeus, 1758) – (HAFNER, 1994; MIHOCI *et al*. 2006: Kamešnica); not rare;
78. *Vanessa cardui* (Linnaeus, 1758) – (HAFNER, 1994); rare;
79. *Inachis io* (Linnaeus, 1758) – (SIJARIĆ, 1977: Troglav; HAFNER, 1994); not rare;
80. *Aglais urticae* (Linnaeus, 1758) – (HAFNER, 1994; SIJARIĆ, 1977: Troglav); common;
81. *Polygonia c-album* (Linnaeus, 1758) – (HAFNER, 1994); common;
82. *Polygonia egea* (Cramer, 1775) – (HAFNER, 1994); not confirmed;
83. *Argynnis addipe* (Denis et Schiffermüller, 1775) – (SIJARIĆ, 1977: Troglav); common;
84. *Argynnis aglaja* (Linnaeus, 1758) – (SIJARIĆ 1977: Troglav); common;
85. *Argynnis pandora* (Denis et Schiffermüller, 1775) – (STAUDER, 1911: Knin; MLADINOV, 1973; HAFNER, 1994); common;
86. *Argynnis paphia* (Linnaeus, 1758) – (SIJARIĆ, 1977: Troglav; HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
87. *Issoria lathonia* (Linnaeus, 1758) – (SIJARIĆ 1977: Troglav; HAFNER, 1994); common;
88. *Brenthis daphne* (Bergsträsser, 1780) – Dinara s.s.: on 4 localities;
89. *Brenthis hecate* (Denis et Schiffermüller, 1775) – (SIJARIĆ, 1977: Kamešnica); common;
90. *Boloria euphrosyne* (Linnaeus, 1758) – Dinara s.s.: on 5 localities;
91. *Melitaea didyma* (Esper, 1778) (STAUDER, 1922: Knin; MLADINOV, 1973; HAFNER, 1994); common;
92. *Melitaea phoebe* (Denis et Schiffermüller, 1775) (HAFNER, 1994); rare;
93. *Melitaea trivia* (Denis et Schiffermüller, 1775) – Dinara s.s.: only one locality;
94. *Melitaea cinxia* (Linnaeus, 1758) – (HAFNER, 1994); common;
95. *Melitaea diamina* (Lang, 1789) – Dinara s.s.: on 3 localities;
96. *Melitaea athalia* (Rottemburg, 1775) – Dinara s.s.: on 6 localities;
97. *Melitaea aurelia* Nickerl,1850 – (HAFNER, 1994); not confirmed;
98. *Melitaea britomartis* Assman, 1847 – (KOREN & JUGOVIĆ, 2012: Troglav); not confirmed;
99. *Euphydryas aurinia* (Rottemburg, 1775) – (HAFNER, 1994); not rare;

NYMPHALIDAE: SATYRINAE

100. *Melanargia galathea* (Linnaeus, 1758) – (STAUDER, 1911, 1922: Knin and Dinara bei Knin; SIJARIĆ, 1977: Kamešnica; HAFNER, 1994); common;
101. *Melanargia larissa* (Geyer, 1828) – (HAFNER, 1994); rare;
102. *Hipparchia fagi* (Scopoli, 1763) – (MLADINOV, 1973; SIJARIĆ, 1977: Troglav); common;
103. *Hipparchia syriaca* (Staudinger, 1871) – (HAFNER, 1994: *H. fagi* /as *hermione*/, but redet. in CARNELUTTI, 1994); not confirmed;
104. *Hipparchia semele* (Linnaeus, 1758) – (STAUDER, 1922: Knin; MLADINOV, 1973; HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
105. *Neohipparchia statilinus* (Hufnagel, 1766) – (MLADINOV, 1973; HAFNER, 1994); common;
106. *Arethusana arethusa* (Denis et Schiffermüller, 1775) – Dinara s.s.. on 14 localities; common;
107. *Brintesia circe* (Fabricius, 1775) – (MIHOCI *et al*., 2006: Kamešnica); common;
108. *Chazara briseis* (Linnaeus, 1758) – (MLADINOV, 1973; HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;

109. *Satyrus ferula* (Fabricius, 1793) – (MIHOCI *et al*., 2006: Kamešnica; STAUDER in LORKOVIĆ, 2009); common;
110. *Erebia aethiops* (Esper, 1777) – Dinara s.s. on 4 localities;
111. *Erebia euryale* (Esper, 1805) – (SIJARIĆ, 1977: Troglav); not confirmed for Dinara s.s.;
112. *Erebia ligea* (Linnaeus, 1758) – (MLADINOV & LORKOVIĆ, 1985: Troglav); not confirmed for Dinara s.s.;
113. *Erebia melas* (Herbst, 1796) – (MLADINOV, 1973; LORKOVIĆ, 2009); common;
114. *Erebia oeme* (Hübner, 1804) – (SIJARIĆ, 1977: Troglav; MLADINOV & LORKOVIĆ, 1985); common;
115. *Erebia ottomana* Herrich-Schäffer, 1847 – (probably »*E. tyndarus*« in STAUDER (1922), who received one damaged specimen from a shepherd from »Dinaraspitze«; SIJARIĆ, 1977: Troglav; MLADINOV & LORKOVIĆ, 1985; LORKOVIĆ, 2009); not rare;
116. *Erebia medusa* (Denis et Schiffermüller, 1775) – (MLADINOV, 1973; MLADINOV & LORKOVIĆ, 1985); common;
117. *Erebia triaria* (de Prunner, 1798) – (MLADINOV & LORKOVIĆ, 1985: Troglav); Dinara s.s. on 7 localities; Troglav on 6 localities; common;
118. *Proterebia afra* (Fabricius, 1787) – (HAFNER, 1994; MIHOCI & ŠAŠIĆ, 2005, 2007: Kamešnica; KOREN *et al*., 2010: Troglav); common;
119. *Hyponephele lycaon* (Kühn, 1774) – (SIJARIĆ, 1977: Kamešnica; HAFNER, 1994: probably one specimen); not rare;
120. *Hyponephele lupina* (Costa, 1836) – (MLADINOV, 1973; HAFNER, 1994: several specimens); not confirmed;
121: *Aphantopus hyperantus* Linnaeus, 1758 – (STAUDER, 1923: Knin); not confirmed;
122: *Maniola jurtina* (Linnaeus, 1758) – (SIJARIĆ, 1977: Kamešnica; HAFNER, 1994, MIHOCI *et al*., 2006); common;
123. *Coenonympha arcania* (Linnaeus, 1758) (SIJARIĆ, 1977: Kamešnica); common;
124. *Coenonympha glycerion* (Borkhausen, 1788) – Dinara s.s. on 5 localities; Troglav at one locality;
125. *Coenonympha pamphilus* (Linnaeus, 1758) – (STAUDER, 1911; HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
126. *Coenonympha rhodopensis* Elves, 1900 – (MLADINOV, 1973; SIJARIĆ, 1977: Troglav); common;
127. *Pyronia tithonius* (Linnaeus, 1758) – (MLADINOV, 1973; HAFNER, 1994); rare;
128. *Lasiommata maera* (Linnaeus, 1758) – (STAUDER, 1922; MLADINOV, 1973; HAFNER, 1994; MIHOCI *et al*., 2006: Kamešnica); common;
129. *Lasiommata megera* (Linnaeus, 1767) – (SIJARIĆ, 1977: Kamešnica; HAFNER, 1994); common;
130. *Pararge aegeria* (Linnaeus, 1758) – (HAFNER, 1994); rare;

ACKNOWLEDGEMENTS

This research was partially funded by the Croatian Ministry of Science, Education and Sports in the form of a grant to project 183-1193080-083. We would like to thank Milivoj Marić and Petar Šimić (Knin) for their hospitality and support in the field, and Martina Podnar Lešić from the Croatian Natural History Museum for DNA analyses.

Received October 10, 2012

REFERENCES

Bertović, S., 1975: Contribution to knowledge of relation between climate and vegetation in Croatia (for the period 1948 – 1960) (in Croatian with Summary in English). Prirodoslovna istraživanja, **41**, Acta Biol. **7** (2), 89–216.

Carnelutti, J., 1994: Moderensiertes »Verzeichnis der bei Knin gesammelten Schmetterlinge« von I. Hafner. Natura Croatica, **3** (2), 185–223.

Hafner, I., 1994: Verzeichnis der bei Knin gesammelten Schmetterlinge (Lepidoptera). Natura Croatica, **3** (2), 119–184.

Higgins, L.G., 1975: The classification of European butterflies. Collins, London.

Koren, T., Burk, I., Štih, A., Zakšek, V. & Verovnik, R., 2010: New data about the distribution and altitudinal span of the Dalmatian ringlet, *Proterebia dalmata* (Godart, /1824/) (Lepidoptera: Satyrinae) in Croatia. Acta entomologica Slovenica, **18** (2), 143–150.

Koren, T. & Jugović, J., 2012: New data on the presence of the three similar species of the genus *Melitaea*: *M. athalia*, *M. aurelia* and *M. britomartis* (Lepidoptera: Nymphalidae) in the North--western Balkans. Annales, **22** (1), 25–34.

Kušan, F., 1956: Sastav i raspored vegetacije na planini Kamešnici. Godišnjak Biološkog instituta u Sarajevu, 1–2.

Lafranchis, T., 2004: Butterflies of Europe, new field guide and key. Diatheo, Paris.

Lorković, Z., 1976: Taxonomische, okologische und chorologische Beziehungen zwischen *Hipparcia fagi* Scop., *H. syriaca* Stgr. und *H. alcyone* D. & S. (Lepidopt. Satyridae). Acta entomologica Jugoslavica, **12** (1–2), 11–33.

Lorković, Z., 2009: The Rhopalocera fauna of Croatia with special respect to the fauna of Plitvice Lakes (In Croatian). Entomologia Croatica, **13** (1), 15–78.

Lorković, Z. & Sijarić, R., 1968: Der Grad der morphologische und ökologischen Differenzierung zwischen *Aricia agestis* (Schiff.) und *A. allous* (Hübn.) in der Umgebung von Sarajevo. Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu, **6**, 129–170.

Mann, J., 1869: Lepidopteren gesammelt während dreier reisen nach Dalmatien in den Jahren 1850, 1862 und 1868. Verhandlungen zoologisch-botanischen Gesellschaft in Wien, **19**, 371–388.

Mihoci, I. & Šašić, M., 2005: New findings of the butterfly Dalmatian ringlet, *Proterebia afra dalmata* (Godart, /1824/) (Lepidoptera, Satyrinae) in Croatia. Natura Croatica, **14**(2), 121–129.

Mihoci, I. & Šašić, M., 2006: New data on the distribution of the Chapman's blue *Polyommatus thersites* (Cantener, 1835) (Lepidoptera: Lycaenidae) in Croatia. Entomologica Croatica, **15** (1–2), 7–14.

Mihoci, L., Vajdić, M. & Šašić, M., 2006: The status of the Damon blue *Polyommatus* (*Agrodiaetus*) *damon* (Denis and Schiffermüller, 1775) (Papilionoidea: Lycaenidae, Polyommatini) in the Croatian butterfly fauna. Natura Croatica, **15** (1–2), 15–25.

Mihoci, I. & Šašić, M., 2007: New distribution data on the endemic butterfly *Proterebia afra dalmata* (Godart, /1824/) (Nymphalidae, Satyrinae) in Croatia. Natura Croatica, **16**(3), 205–210.

Mihoci, I., Šašić, M. & Vuković, M., 2007: Contribution to the butterfly fauna (Hesperioidea & Papilionoidea) of Velebit Mountain, Croatia. Natura Croatica, **16** (1), 29–62.

Mladinov, L., 1973: Die Tageschmeterlinge der Sammlungen des Kroatischen Zoologischen Museums in Zagreb Lepidoptera (Rhopalocera) (in Croatian with Summary in German). Hrvatski narodni zoološki muzej Zagreb, **7**, 125 pp.

Mladinov, L. & Lorković, Z., 1985: Die Vorkommen der montanen Lepidopteren in der Fauna S.R. Kroatien, Jugoslawien (in Croatian with Summary in German). Acta entomologica Jugoslavica, **21** (1–2), 17–36.

Nonveiller, G., 1999: The pioneers of the research on the insects of Dalmatia. Croatian Natural History Museum, Zagreb.

Poljak, Ž., 1986: Mountains of Croatia (In Croatian). Planinarski savez Hrvatske, Zagreb.

Pelcer, Z., Medvedović, J. & Lindić, V., 1985: Unpublished vegetation map Knin 4. Botanical Institute of Zagreb University, Zagreb.

Settele, J., Steiner, R., Reinhardt, R. & Feldmann, R., 2005: Die Tagfalter Deutschlands. Eugen Ulmer KG, Stuttgart.

SIJARIĆ, R., 1974: Characteristics of entomofauna of the karst region of Bosnia and Hercegovina with special attention paid to Rhopalocera. Acta entomologica Jugoslavica, **10** (1–2), 55–61.

SIJARIĆ, R., 1977: Faunistic survey of the Rhopalocera and Hesperioidea of the western Bosnia (Lepidoptera). Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu, **16**, 175–192.

SIJARIĆ, R., LORKOVIĆ, Z., CARNELUTTI, J. & JAKŠIĆ, P., 1981: Rhopalocera (Insecta, Lepidoptera). In: NONVEILLER, G. *et al*.: The Fauna of Durmitor, Part 1. The Montenegrin Academy of Sciences and Arts, Spec. Ed. **18**,Titograd, 95–184.

STAUDER, H., 1911: Beiträge zur Kenntnis der Makrolepidopterenfauna der adriatischen Küstengebiete. Bollettino della Società Adriatica di Scienze Naturali in Trieste **25**

STAUDER, H., 1913: Weitere Beiträge zur Kenntnis der Makrolepidopterenfauna der adriatischen Küstengebiete. Bollettino della Società Adriatica di Scienze Naturali in Trieste **27** (1), 105–166, +3 Taf.

STAUDER, H., 1921: Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica). Zeitschrift für wissenschaftliche Insektenbiologie Berlin **16** (1/2), 16–23; (3/4), 43–49; (5/6), 101–108; (7/8), 143–153; (9/10), 166–176; (11/12), 219–224.

STAUDER, H., 1922: Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica). Zeitschrift für wissenschaftliche Insektenbiologie Berlin **17** (1/2), 14–21; (3/4), 58–64; (5/6), 83–92; (7/8), 135–147; (9/12), 165–176.

STAUDER, H., 1923: Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica.). Zeitschrift für wissenschaftliche Insektenbiologie Berlin **18** (1/2), 10–18; (3/4), 58–68; (5/7),106–114; (8/9), 187–202.

ŠAŠIĆ, M. & MIHOCI, I., 2011: Annotated checklist of Croatian butterflies with vernacular names. Natura Croatica **20** (2), 425–436.

TOLMAN, T. & LEWINGTON, R., 2008: Collins butterfly guide. HarperCollins Publishers, London.

TVRTKOVIĆ, N., MIHOCI, I. & ŠAŠIĆ, M., 2011: *Colias caucasica balcanica* Rebel, 1901 (Pieridae) in Croatia – the most western distribution point. Natura Croatica **20** (2), 375–385.

VARGA, Z., 1975: Geographische Isolation und Subspeziation der Lepidopteren in den Hochgebirgen Balkans. Acta entomologica Jugoslavica, **11** (1–2), 5–38.

VUKELIĆ, J., 2012: Forest vegetation in Croatia. Šumarski fakultet Sveučilišta u Zagrebu, Državni zavod za zaštitu prirode, Zagreb.